

Renewable Power Purchase Agreements in the Energy Community

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Renewable Energy



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List of abbreviations

ADEX	Alpine-Adriatic Danube Power Exchange, (Slovenia)
AIB	Association of Issuing Bodies
ALPEX	Albanian Power Exchange, (Albania)
B2B	Business to Business
BAU	Business As Usual
BELEN	Berza električne energije/Montenegrin Power Exchange, (Montenegro)
BOO	Build-Own-Operate
BRP	Balance Responsible Party
BSP	Balance Service Provider
CAGR	Compound Annual Growth Rate
CBAM	Carbon Border Adjustment Mechanism
CEDIS	Crnogorski elektrodistributivni system, (Montenegro)
CEE	Central and Eastern Europe
COD	Commercial Operational Date
COTEE	Crnogorski operator tržišta električne energije/ Montenegrin Market Operator, (Montenegro)
CfD	Contract-for-Difference
CGES	Crnogorski elektroprenosni system, (Montenegro)
CP	Contracting Party
cPPA	Corporate Power Purchase Agreement
DA	Day-ahead
DAM	Day-ahead Market
DERK	State Electricity Regulatory Commission, (Bosnia and Herzegovina)
DSO	Distribution System Operator
EC	Efficient Cogeneration
EIB	The European Investment Bank

EBRD	European Bank for Reconstruction and Development
ECRB	Energy Community Regulatory Board
ELES	Elektro-Slovenija/Slovenian transmission system operator, (Slovenia)
EPCG	Elektroprivreda Crne Gore, (Montenegro)
EPBiH	Elektroprivreda BiH, (Bosnia and Herzegovina)
EPEX SPOT	European Power Exchange
EPHZHB	Elektroprivreda Hrvatske Zajednice Herceg-Bosna (Bosnia and Herzegovina)
EPS	Elektroprivreda Srbije, (Serbia)
EMS	Elektromreža Srbije, (Serbia)
EnC	Energy Community
ERC	Energy and Water Services Regulatory Commission of the Republic of North Macedonia, (North Macedonia)
ERO	The Energy Regulatory Office of Kosovo (Kosovo*)
ESG	Environmental, Social and Governance
ETS	Emissions Trading System
EPRS	Elektroprivreda Republika Srpske, (Bosnia and Herzegovina)
ESM	Elektrani na Severna Makedonija/ AD ESM Skopje, (North Macedonia)
ERS	Elektroprivreda RS, (Bosnia and Herzegovina, (Republika Srpska))
EU	European Union
FSHU	Universal Service Supplier, (Albania)
FiTs	Feed-in-Tariffs
FBiH	Federation of Bosnia and Herzegovina
FERK	Regulatory Commission for Energy of Federation Bosnia and Herzegovina
FiP	Feed-in-Premium
GGF	The Green for Growth Fund
GO/GoO	Guarantee of Origin
HHI	Herfindahl-Hirschman Index

HUPX	Hungarian Power Exchange, (Hungary)
HV	High Voltage
ICIS	Independent Commodity Intelligence Services
ID	Intraday
IPS	Integrated Power System of Ukraine, (Ukraine)
IT	Information Technology
IRENA	The International Renewable Energy Agency's
KAP	Kombinat aluminijuma Podgorica/ The Aluminium Plant Podgorica, (Montenegro)
KEK	Kosovo Energy Corporation, (Kosovo*)
KESCO	Kosovo Electricity Supply Company, (Kosovo*)
LW	Low Voltage
MEMO	Electricity Market Operator of North Macedonia, (North Macedonia)
MEPX	Montenegrin Power Exchange, (Montenegro)
MRVA	Monitoring, Reporting, Verification and Accreditation of Verifiers in and Emissions Trading System
MS	Member States
MW	Medium Voltage
NECP	National Energy and Climate Plan
NEMO	Nominated Electricity Market Operator
NOS BiH	Independent System Operator in Bosnia and Herzegovina, (Bosnia and Herzegovina)
OeEB	The Development Bank of Austria/Oesterreichische Entwicklungsbank AG, (Austria)
OP OIEiEK	Operator for Renewable Energy Sources and Efficient Cogeneration (Bosnia and Herzegovina)
PaP	Pay-as-Produced
PaF	Pay-as-forecasted
PMO	Project Management Office

PPA	Power Purchase Agreement
PPAs	Power Purchase Agreements
PPP	Public Private Partnership
PV	Photovoltaic
RAI	Regulatory Assessment Indicators
RE	Renewable Energy
RED II	Renewable Energy Directive II
Regulatory Authority	Regulatory authority for electricity market in CPs
REO	Renewable Energy Operator
RERS	Regulatory Commission for Energy Of Republika Srpska (Bosnia and Herzegovina)
RES	Renewable Energy Sources
RS	Republika Srpska (Bosnia and Herzegovina)
RtM	Route-to-Market
SDAC	Single Day-Ahead Coupling
SEE	Southeast Europe
SEEPEX	South East European Power Exchange, (Serbia)
SERC	State Electricity Regulatory Commission, (Bosnia and Herzegovina)
SECO	Swiss State Secretariat for Economic Affairs, (Switzerland)
SIDC	Single Intraday Coupling
ToR	Terms of Reference
TSO	Transmission System Operator
USAID	United States Agency for International Development (United States of America)
VPPs	Virtual Power Plants
WAM	Scenario with the additional measures
WB 6	Western Balkan 6 (Albania, Bosnia and Herzegovina, Kosovo*, North Macedonia, Montenegro and Serbia)

WEM	Scenario with the existing measures
XB	Cross-border

1. Executive summary

This report provides a comprehensive analysis of the renewable energy sector within the Energy Community Contracting Parties (CPs), focusing on Renewable Power Purchase Agreements (PPAs) as pivotal tools for achieving energy and climate targets. The report is based on data available up to April 2024, any developments or updates beyond this date are not reflected in the analysis. The study reveals several overarching challenges and opportunities common across all CPs, with key findings and strategic recommendations outlined below.

Key Findings and Common Challenges

1. Insufficient Supply of Renewable Energy (Excluding Hydro):

Across all CPs, there is a significant shortfall in the supply of electricity from renewable energy sources other than hydro. This scarcity heavily impacts the effectiveness of virtual, physical, corporate, and utility PPAs. The urgent need for expanding renewable energy projects and enhancing existing infrastructure is evident.

2. Electricity Pricing:

While electricity prices are generally stable, they are relatively low across the region. This price stability moderately affects the attractiveness of utility PPAs for investors. It underscores the necessity for dynamic pricing mechanisms that accurately reflect the true costs of energy production to stimulate investment in renewable energy.

3. Limited Supply Options and Incentive Mechanisms:

All CPs face challenges due to limited supply options and insufficient incentive mechanisms. This significantly impacts virtual, physical, and corporate PPAs. The introduction of diverse supply options, such as virtual and physical PPAs, along with robust incentive mechanisms like feed-in premiums or renewable energy certificates, is crucial for market growth.

4. Underdeveloped Wholesale Markets:

The wholesale markets in CPs are generally underdeveloped, with limited business-to-business (B2B) products available. This presents a high-impact challenge for large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and sophisticated financial instruments, is essential to address this issue.

A liquid electricity power exchange is a critical prerequisite for the effective negotiation and conclusion of PPA contracts. However, majority of Contracting Parties lack access to such liquid markets. A potential solution is market coupling, where neighbouring countries integrate their wholesale electricity markets to form a more liquid power exchange with a larger pool of participants. This integration fosters healthy competition and helps align pricing more closely to actual market conditions.

5. Legal and Regulatory Uncertainty:

The regulatory framework governing the electricity markets and the legal environment for renewable PPAs in CPs of the Energy Community is highly country-specific, reflecting each CP's legal, regulatory, and market conditions. Some CPs have specific provisions within their energy laws or RES laws governing PPAs, while others rely on general contract and commercial law to regulate these agreements. Countries with explicit regulations, including provisions for virtual PPAs, provide greater legal clarity and reduce risks for investors.

In some CPs the producers and offtakers are able to negotiate directly, bypassing intermediaries such as utilities. In most of the CPs, direct renewable PPAs are typically limited to large offtakers, such as industrial plants or consumers meeting specific electricity consumption thresholds.

6. Market Structure:

The level of market liberalization significantly influences PPA availability. Fully liberalized electricity markets support diverse contractual structures, including corporate PPAs and direct utility contracts. In contrast, vertically integrated or less liberalized markets offer limited PPA options.

7. Support schemes:

The presence or absence of renewable energy support schemes, such as feed-in tariffs, feed-in premiums, or auctions, influences PPA dynamics. Almost all CPs are now transitioning to market-based mechanisms and this make a room for corporate PPAs as well, as the producers are exposed to market price risks, this exposure incentivizes them to seek long-term revenue stability. Usually, the developers diversify their portfolio, meaning that some percentage is covered with stated-baked support mechanism and some portion is left for potential commercial PPAs.

8. Cross-border PPAs:

All CPs are working on regional electricity market integration, bringing compatibility with neighbouring countries' regulations and market coupling. Physical PPAs face challenges, particularly with transmission rights. Currently, interconnection transmission rights in CPs are allocated for a maximum of one year. This mismatch with the long-term nature of PPAs (typically 5+ years) creates uncertainty and risks for both parties that the transaction can be executed for the whole tenor of the PPA, as the parties are not protected upfront that they will be able to allocate the transmission right for the following years.

In terms of the virtual cross-border PPAs, there are no barriers in the CPs. However, certain CPs are imposing reporting requirements with the National Banks and approvals for foreign exchange transactions. Additionally, some CPs lack regulations supporting mechanisms like close-out netting and collateral rules, which virtual PPAs rely on.

9. Environmental and Social Regulations:

The regulations about sustainability tracking of the corporate sector play roles in the attitude of the corporate in seeking renewables PPAs. EU directives, such as the Corporate Sustainability Reporting Directive (CSRD), require companies to report on their sustainability performance, influencing demand for renewable energy. However, these regulations are not part of the Energy Community acquis, leaving local companies in CPs without mandatory obligations to pursue cPPAs.

Therefore, The PPA market in CPs is currently driven by voluntary sustainability goals or requirements imposed by parent companies that operate in EU markets which should reflects the local company's ESG operations (cPPA or GOs) in their sustainability reporting.

10. Guarantees of origin (GOs):

GOs are essential for PPAs, as they allow industries and consumers to verify and demonstrate their use of renewable electricity. Both physical and virtual PPAs may involve the sale and transfer of GOs. In physical PPAs, GOs are typically bundled with the renewable electricity supply, enabling the offtaker to claim "additionality" by directly supporting renewable energy projects. All CPs besides Serbia have participated in Energy Community-supported projects to establish GOs electronic registries. Most CPs now have operational registries, while others are in the process of setting them up.

On the other side, GOs issued in CPs cannot yet be traded within the EU. Under the Renewable Energy Directive applicable to EU MSs, GOs issued in CPs are not currently recognized for disclosure in the EU. To enable the recognition, the following criteria should be met:

- A mutual recognition agreement is established between the CP and the EU.
- The CP's GO system aligns with EU standards.
- There is evidence of direct energy trade (import/export), though this does not necessarily require a physical infrastructure connection.

At the 21st Energy Community Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs between CPs and EU MSs. The roadmap outlines criteria CPs must fulfil for recognition. In the coming period, it is expected that the Energy Community's Ministerial Council will adopt the roadmap and initiate its implementation across CPs.

The GOs market operates and develops independently of the electricity market. At present, CPs have not yet established fully functional GO markets, including mechanisms such as auctions for GOs, though there is significant potential for development in the near future.

One important aspect concerns renewable energy developers who benefit from financial support mechanisms (preferential producers). These producers are generally not granted with GOs for the supported electricity. Instead, market operators or designated entities, acting as offtakers for such preferential producers, can issue GOs for the supported electricity. These GOs can then be auctioned on trading platforms, with revenues used to offset the costs of the support system. Corporations can acquire GOs through such auctions to demonstrate renewable energy usage, aligning with sustainability goals and meeting regulatory or voluntary environmental standards. In this scenario, the recognition of GOs plays a crucial role, as buyers must ensure that the certificates are recognized in the jurisdiction where they intend to claim renewable energy use.

11. CBAM

The EU Carbon Border Adjustment Mechanism (CBAM) is going to take effect in EU on 1 January 2026. The CBAM Regulation in the EU is intended to reduce carbon leakage. The CPs will be affected with the implementation of CBAM as they most probably will not be exempted from CBAM application due to not fulfilling the exemption criteria.

With the start of the CBAM implication, the EU companies importing electricity from the CPs, will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported electricity.

Therefore, CBAM will increase electricity costs for CPs exporting to the EU, as non-having EU ETS compatible carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Physical cross-border PPAs between CPs and EU MSs will be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.

The Energy Community Secretariat has issued the CBAM-Readiness Tracker¹, which give broader understanding of the potential impact of the CBAM on each CP. On the other hand, to achieve CBAM exemption, the CPs must conduct market coupling with EU MSs and introduce national carbon pricing mechanism equivalent to the EU ETS. All CPs work on fulfilling these criteria, however, considering their dynamic, it probably would not happen until the start of the CBAM implementation.

On the side how the CBAM charges will be calculated in terms of embedded emissions in imported electricity, the CBAM declarant may apply the default values of embedded emissions

¹https://www.energy-community.org/dam/jcr:49614eb6-4596-492a-816a-31a6f86dda1f/EnC_CBAM-Readiness_Tracker_2024_11.11.pdf

determined for a third country, group of third countries or region within a third country or may apply actual embedded emissions.

However, in order the CBAM declarant (EU electricity importer) to use the actual embedded emissions, the below factors should be cumulatively met:

- (a), The imported electricity to be covered with a PPA;
- (b), the installation producing electricity is either directly connected to the Union transmission system or it can be demonstrated that at the time of export there was no physical network congestion at any point in the network between the installation and the Union transmission system;
- (c), the installation producing electricity does not emit more than 550 grammes of CO₂ of fossil fuel origin per kilowatt-hour of electricity;
- (d), the amount of electricity has been firmly nominated to the allocated interconnection capacity by all responsible transmission system operators in the country of origin, the country of destination and, if relevant, each country of transit, and the nominated capacity and the production of electricity by the installation refer to the same period of time, which shall not be longer than one hour;
- (e), the fulfilment of the above criteria is certified by an accredited verifier, who shall receive at least monthly interim reports demonstrating how those criteria are fulfilled.

As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

In addition to the CBAM effect on the electricity as a good, CBAM also applies to indirect emissions linked with the electricity used for the production process of other CBAM goods (fertilizers, cement).

The CBAM declarants would be able to declare actual indirect emissions in the production process (instead of country or regional average default emission factors for grid electricity) if there is a physical PPA related to the installation that produces the good. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

Strategic Recommendations

To navigate these challenges and foster a sustainable renewable energy sector, the report proposes the following strategic recommendations:

1. Enhancing Renewable Energy Deployment:

Accelerate the deployment of new renewable energy projects and improve existing infrastructure to address the insufficient supply of renewable energy.

2. Implementing Dynamic Pricing Mechanisms:

Introduce dynamic pricing mechanisms that reflect the actual costs of energy production to make utility PPAs more attractive to investors.

3. Diversifying Supply Options and Incentive Mechanisms:

Introduce a variety of supply options, such as virtual and physical PPAs, and establish robust incentive mechanisms like feed-in premiums or renewable energy certificates to foster market growth.

4. Developing Comprehensive Market Products:

Develop comprehensive market products, including long-term contracts, spot market trading, and advanced financial instruments, to address the underdeveloped wholesale markets.

5. Strengthening Legal and Regulatory Frameworks:

Enhance legal and regulatory frameworks to provide greater investment stability and protection. This includes transposing relevant packages such as the Electricity Integration Package and ensuring consistent and transparent legal environments across the region.

6. Providing Capacity Building

The report also emphasizes the importance of capacity building through ongoing educational and training initiatives for stakeholders involved in the energy market, from policymakers to private sector participants. Keeping all parties well-informed about the latest developments in renewable energy technologies, financing mechanisms, and regulatory changes is vital for successful implementation.

Power Purchase Agreements hold indispensable potential in transforming the energy markets of the Contracting Parties. By leveraging detailed market analysis and implementing practical policy recommendations, CPs can achieve a resilient, efficient, and sustainable energy future. This approach aligns with regional energy strategies and supports the broader global commitment to sustainable energy transitions.

2. Introduction

Power Purchase Agreements (PPAs) are crucial in the global push towards sustainability, enabling the integration of renewable energy into the market. With the urgent need to reduce carbon emissions and transition from fossil fuels, PPAs facilitate financing and consumption of renewable energy. This study explores Virtual PPAs (vPPAs), Physical PPAs, and Utility PPAs, examining their roles and functions in the renewable energy ecosystem. Virtual PPAs are financial agreements that do not involve the physical delivery of electricity but instead focus on the financial exchange between renewable energy producers and corporate buyers. In a vPPA, the power producer sells the generated electricity to the local power grid, while the associated environmental attributes and financial benefits are sold to a corporate off-taker. This allows the corporate off-taker to support renewable energy and claim the environmental benefits without directly receiving the electricity. Essentially, the company funds green energy while the power goes into the broader grid. Moreover, this arrangement also allows companies to claim renewable energy usage and reduce their carbon footprint without having to directly consume the energy produced. The appeal of vPPAs lies in their flexibility, allowing companies with distributed operations across various energy markets to support green energy projects without logistical constraints related to energy transmission.

Physical PPAs represent a more traditional approach where there is a direct physical flow of electricity from the producer to the consumer. These agreements are crucial for ensuring the stability of renewable energy projects, as they guarantee a steady revenue stream by locking in energy prices for the duration of the agreement. This stability is vital for financing large-scale renewable projects, making them more attractive to investors and financial institutions. Physical PPAs also enable energy consumers, particularly those with large, concentrated energy needs like manufacturing facilities or data centers, to significantly reduce their energy costs while directly consuming green energy.

Utility PPAs are typically entered into by utility companies who agree to purchase renewable energy over a long period. These PPAs are essential for the expansion of renewable energy infrastructure on a regional or national scale, as they provide developers with the financial security needed to undertake substantial renewable projects. Furthermore, Utility PPAs help

utilities comply with regulatory requirements for renewable energy consumption, contributing to broader national energy goals and facilitating the transition towards a more sustainable energy grid.

The study aims to dissect these PPA mechanisms to understand their impact on the renewable energy market, how they influence investment in renewable technologies, and their role in meeting global and national energy and climate targets. By analyzing the operational mechanics, benefits, and challenges associated with each PPA type, the study will provide a detailed overview of their strategic importance in the renewable energy sector.

2.1. Goal of the study

The overarching goal of this study is to systematically evaluate the strategic deployment of Power Purchase Agreements (PPAs) within the Energy Community Contracting Parties, with the intent to enhance the region's energy security and accelerate the adoption of renewable energy sources. While the study recognizes the importance of various PPA structures—such as virtual, physical, and utility PPAs—the primary focus is not merely on these instruments individually. Instead, the research aims to understand their collective impact on the market dynamics, investment climate, and regulatory frameworks that govern the energy sector within these nations.

The research seeks to identify the key factors that drive the effectiveness of PPAs in fostering a robust renewable energy market. This includes analyzing how PPAs can be tailored to meet the specific energy, economic, and environmental goals of different nations within the Energy Community. The study will examine the interplay between PPA structures and market mechanisms, investigating how they influence renewable energy project feasibility, investor confidence, and technological innovation.

An integral part of the study will be to assess the barriers to the widespread adoption of PPAs. This will involve a critical examination of current legislative, financial, and infrastructural challenges that might hinder the effective implementation of PPAs. The goal is to offer well-grounded recommendations for policy adjustments, aimed at optimizing the regulatory environment to better support and leverage the potential of PPAs in scaling up renewable energy initiatives.

Furthermore, the study aims to provide a strategic framework for enhancing the capacity of local institutions and stakeholders in managing and negotiating PPAs. By building local expertise in PPA management, the study seeks to empower local actors, ensuring that the benefits of renewable energy investments are maximized and sustainably integrated into the energy systems of the contracting parties.

Ultimately, this research aims to catalyze a broader transition towards sustainable energy practices by demonstrating how Power Purchase Agreements can be optimized to significantly impact renewable energy adoption. The study will develop actionable, practical recommendations designed to enhance the effectiveness of PPAs in various jurisdictions, addressing unique economic and environmental challenges. These insights will guide policymakers, investors, and energy providers in refining their strategies to leverage PPAs more effectively, fostering a supportive environment for renewable energy growth. By doing so, the research hopes to contribute to global efforts in ensuring energy security, economic stability, and environmental sustainability, providing a comprehensive blueprint for harnessing the potential of renewable energy through innovative contractual mechanisms.

2.2. Methodology

To evaluate PPA maturity and potential in each CP, this study examines six key driving factors: RES electricity demand and supply, electricity prices, supply options and incentive mechanisms, power

wholesale market maturity and B2B products, and legal and regulatory certainty. Understanding these factors helps stakeholders make informed PPA decisions, ensuring long-term viability and profitability in a competitive energy landscape. Figure 1 Key PPA driving factors

Key PPA drivers	Hypothesis	Key indicator
RES electricity demand	- Assess the depth and structure of electricity demand to evaluate PPA market potential from the offtake perspective - Determine the propensity to purchase electricity from RES due to ESG agenda, regulatory impact, economic incentive (i.e. electricity prices), etc. to understand demand drivers - In scenarios with limited industrial corporate demand, utility PPAs become increasingly pertinent	- HV/MV electricity consumption size versus RE supply (excl. hydro) - HV/MV electricity consumption CAGR (2018-2022)
RES electricity supply	- Assess formal targets outlined in the National Energy and Climate Plan, such as the percentage of renewable energy in total generation, which are essential for potential PPA volumes - Understand equilibrium of investment attractiveness in renewable energy, which is a priority for Contracting Parties	NECP targets clearly signal renewable energy growth (share of total RES excl. hydro in 2022 vs. 2030)
Electricity prices	Determine if retail price regulation below wholesale levels in Contracting Parties would present a challenge to the PPA market	Retail (non-household) electricity prices vs. wholesale electricity prices
Supply options and incentive mechanisms	Evaluate the stage of mechanisms such as Feed-in-Premium (FiP), Contracts-for-Difference (CfD), and wholesale market liquidity as they are crucial in encouraging the entrance of RES investors and cultivating a conducive environment for corporate PPAs	- Clearly defined/announced RE incentives (Feed-in-Premium quotas vs. RES targets) - PPP² and offtake combination provided by national power utility for large scale RE assets
Power wholesale market maturity & B2B product	To enable the functioning of the corporate PPA market, CPs should ensure the access to spot markets, fully operational Guarantees of Origin (GoO) system for electricity, and a liquid wholesale market that can support virtual cPPA settlements and/or demonstrate a readiness from suppliers to provide a sleeving option for physical PPA	- Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark³) - For virtual cPPA – RtM offering for RE developer and spot/forward product for offtaker - For physical cPPA – “sleeving” service from electricity supplier to both electricity offtaker and RE asset - GoOs market existence and functioning in part of AIB

² Public Private Partnership

³ Churn rates for HUPX (Hungary), CROPEX (Croatia), and IBEX (Bulgaria) power exchanges

Legal and regulatory certainty

- Assess the **ease of investment, transparency in permitting and grid connection, and support for B2B products** as they are essential for fostering or hindering a favorable PPA market environment

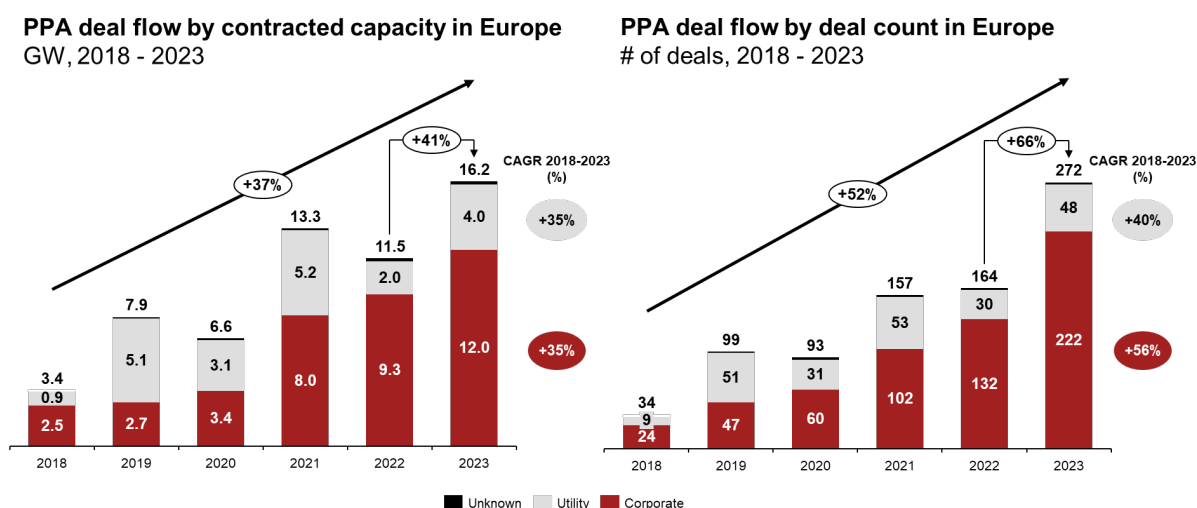
- Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)
- GoOs framework & mutual recognition
- XB market integration

Source: PwC Analysis

2.3. Introduction to PPA fundamentals

PPAs are critical tools for facilitating the deployment of RE resources, but the sheer volume and rate of growth in recent years highlight a broader industry shift towards more sustainable energy solutions. Over the past five years, from 2018 to 2023, the European market has seen a significant surge in PPA activity. The total contracted capacity of RE through PPAs has grown exponentially, reaching over 16 gigawatts by 2023 alone. Such growth not only reflects the increasing demand for RE, but also the growing confidence of industry players in PPAs as a viable financial mechanism. The number of deals has also shown impressive growth. In 2023, there were 272 new PPAs signed. This growth in deal count is indicative of the diversifying market participants, which now include not only traditional utility companies, but also a broad spectrum of corporate off-takers from various sectors such as manufacturing, data centers and retail. Another key aspect of this growth is the geographical diversification within Europe. Initially concentrated in markets with mature RE sectors like Germany and the UK, we now see significant PPA activities spreading to newer markets such as the Nordic countries, Spain and Eastern Europe. This geographic spread is facilitated by improvements in regulatory frameworks and an increasing number of RE projects seeking secure financial streams. The sectoral diversification of PPAs is also worth noting. Initially dominated by wind energy, the portfolio now includes a significant proportion of solar energy PPAs, reflecting technological advancements and cost reductions in solar energy production.

Figure 2 PPA deals in Europe by capacity and deal count



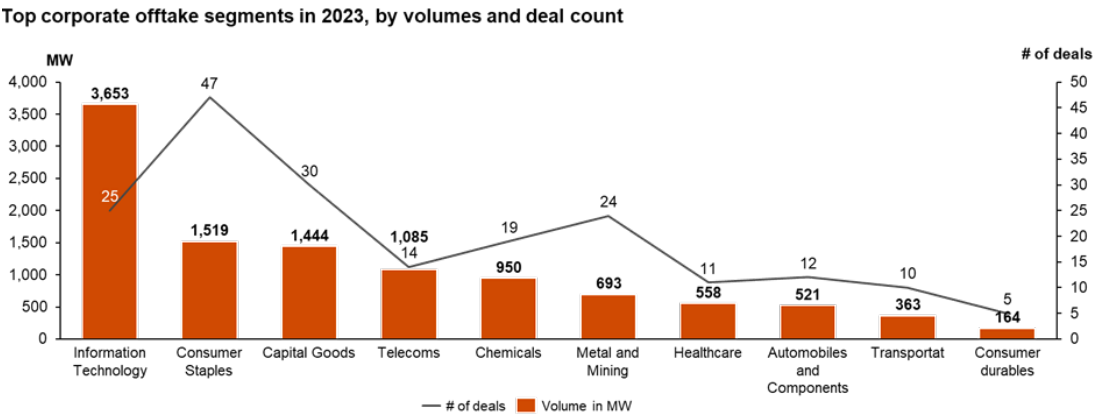
Source: Pexapark

IT conglomerates continue to hold the top ranking, securing a total of 3.7 GW of power across 25 deals. The sector leader alone accounted for just over half of this capacity. Other notable companies in this sector also made significant procurements.

In the Consumer Staples sector, the industry retained its leadership in deal count and moved up to second in terms of volume. This trend indicates strong demand from industries such as

retail, food, beverages and electronics. The sector saw a total of 1.52 GW contracted, reflecting a 120% increase in both power capacity and deal count from the previous year, with 47 deals finalized.

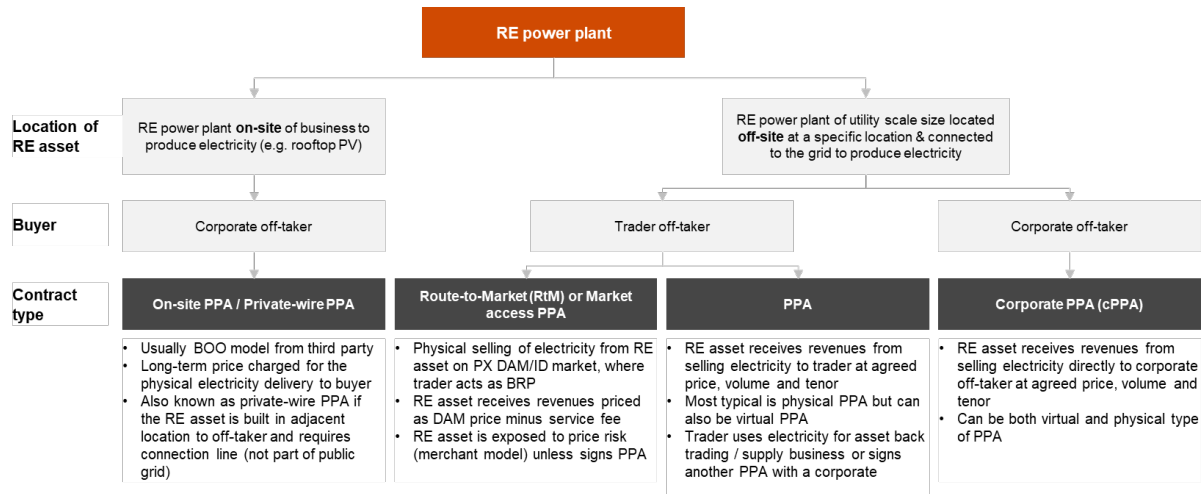
Figure 3 Top corporate offtake segments in 2023, by volumes and deal count



Source: Pexapark

Power Purchase Agreements (PPAs) come in various types, each tailored to specific market needs and strategic goals. An On-site PPA, also known as a Private-wire PPA, involves the direct physical delivery of electricity from a RE generator located on the consumer's premises and offering enhanced energy security. Route-to-Market (RtM) or Market Access PPAs facilitate the sale of generated electricity directly into the wholesale market, providing flexibility and potentially higher returns for generators, while cPPAs allow businesses to purchase RE directly from a producer, significantly aiding corporations in achieving their sustainability targets and stabilizing energy costs over a long period.

Figure 4 Main PPA types & common nomenclature



Source: PwC Analysis

According to the PwC Strategy& study “Mastering the challenges of energy costs in Europe”⁴, the energy crisis has significantly impacted the industrial sector, particularly those already struggling with supply chain disruptions and reduced demand. High energy costs and market instability have decreased profits and could deter future investments. So far, most companies have only applied quick fixes, neglecting more comprehensive strategies. To navigate these challenges effectively, businesses must enhance their energy management approaches.

⁴ PwC Strategy&. (March 2024). Mastering the challenges of energy costs in Europe: How industrial companies can survive the deindustrialisation.

Long-term success will require a thorough revision of their overall business strategies. While some forecasts suggest a stabilization of energy prices, the potential for significant disruptions could pose risks to Europe's energy assets. Factors such as electricity supply issues, gas transport disruptions and strategic oil output reductions could lead to high volatility in energy prices, affecting both short-term and long-term market stability. The new normal will require a full strategic recalibration, with energy resilience as a first step to safeguard against competitive spikes. Companies impacted by the energy crisis can be categorized into three archetypes: those seeking cost efficiency, those driven by sustainability pressures, and hedgers. Each group is adapting in distinct ways to navigate the complexities of energy management and market volatility.

Figure 5 cPPA demand archetypes

1	Cost efficiency seekers	2	Sustainability pressured players	3	Hedgers
	- A significant proportion of operational expenses is attributed to electricity costs - Pressure to innovate and streamline operations in order to sustain a competitive edge in the market		- Growing supply chain demand from buyers/customers looking for “green” products „Green” products are being a part of commercial strategy and value proposition		Frequently, subsidiaries of multinational corporations are seeking to streamline their business planning by reducing complexity, or they engage in CPPA as an integral element of their overarching group strategy

Source: PwC analysis

Due to different ambitions, from lower electricity cost to green agenda, companies from various industries enter cPPAs. It signals growing prioritization of RES as integral components of corporate responsibility and environmental supervision in 2023.

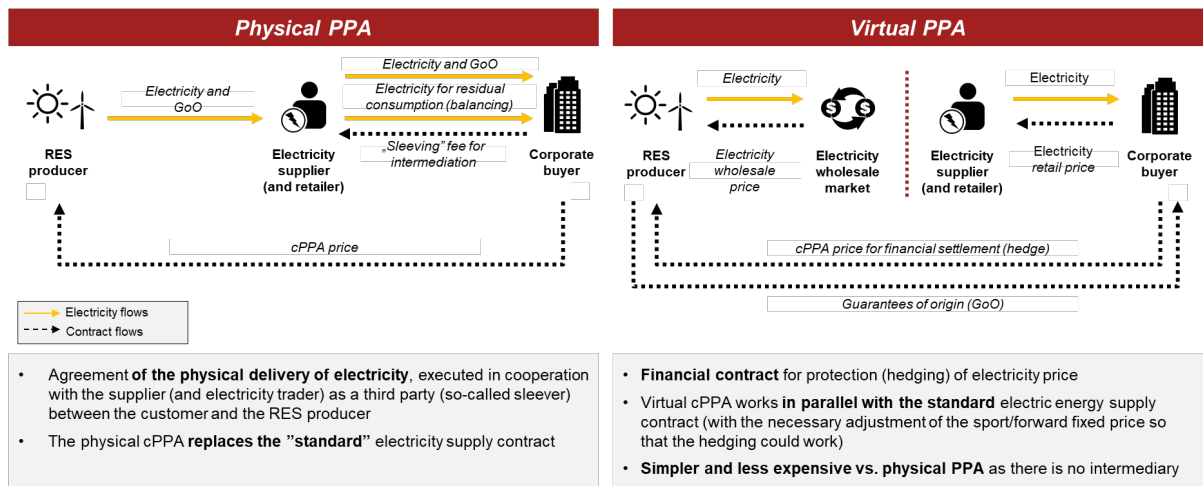
Figure 6 Shortlist of selected PPA deals on European markets in 2023

Industrial	Telco	Hospitality	FMCG	Retail	Pharma	Logistics

Source: Pexapark PPA Tracker

Two most common types of PPA models are physical and virtual (financial). The basic difference between a physical PPA and a virtual PPA lies in the actual delivery of electricity. A physical PPA involves the physical delivery of electricity from the RES producer to the customer, often facilitated by a third party, and the PPA replaces the standard electricity supply contract. In contrast, a virtual PPA, also known as a synthetic or financial PPA, is a financial contract that does not involve the physical delivery of electricity; instead, it is a financial agreement where the payment is based on the market price of electricity versus the agreed PPA price, serving as a hedge against price volatility.

Figure 7 PPA Business models



Source: PwC Analysis

In physical PPA business model, the RES producer and (corporate) buyer or off-taker agree to sign a PPA to hedge their position where the agreement includes the physical delivery of electricity. Since the RE asset and buyer are not located in the same site, this means that the electricity supplier has a role of a sleever to deliver the electricity via the grid and manage volume fluctuations between actual RE asset production and buyer electricity consumption. In case of excess of volume produced over volume consumed, the total electricity cost for the off-taker will consist of electricity consumed via PPA and the result of excess electricity sales closed by the sleever. In case of deficit volume produced in relation to consumption, the total electricity cost for the off-taker will consist of electricity consumed via PPA and remaining volume procured by the supplier (e.g. on forward and/or spot market) to meet consumption needs. For such service the supplier will charge a sleeving fee (including balancing costs). Hence, the physical PPA is a tripartite agreement which replaces the "standard" electricity supply contract.

In virtual PPA business model, the RES producer and (corporate) off-taker agree to sign a PPA to hedge their position where the agreement does not include any physical delivery of electricity. In order to enable proper functioning of a virtual PPA, this means that both parties still need to have secured physical electricity flow. RES producer will physically sell electricity on the wholesale spot market via a separate Route-to-Market contract, while the corporate off-taker will physically buy all of its electricity from its electricity supplier via a separate supply contract. The only difference for the off-taker is the pricing of electricity delivery, where the volume that is planned to be hedged via virtual PPA (e.g. 60% of consumption needs will be covered via virtual PPA) has to be priced under wholesale spot market, while the remaining volume (e.g. 40% of consumption needs) not intended to be under PPA can be priced on forward market (or mix of forward and spot market based on off-takers commercial decision). In this way, both parties' planned volume under virtual PPA are exposed to the price volatility risk on the wholesale spot market with their physical electricity deliver contracts. This is prerequisite that both parties can hedge their volume exposed on wholesale spot price with a virtual PPA and perform the financial settlement between the wholesale spot price and PPA price. To provide an example for the buyer, this means that if the wholesale spot price is higher than the PPA price (e.g. wholesale spot price is 120 €/MWh and PPA price is 100 €/MWh), this means that the buyer will have to pay to its electricity supplier 120 €/MWh for the volume exposed under the supply contract, but from the virtual PPA contract the RES producer will have to pay financially the delta between wholesale spot price and PPA price to the buyer (120 €/MWh – 100 €/MWh = 20 €/MWh) - the final net electricity cost for the buyer is 100 €/MWh. If the wholesale spot price is lower than the PPA price (e.g. wholesale spot price is 90 €/MWh and PPA price is 100 €/MWh), this means that the buyer will have to pay to its electricity supplier 90 €/MWh for the volume exposed under the supply contract, but from the virtual PPA

contract now the buyer will have to pay financially the delta between wholesale spot price and PPA price to the RES producer ($90 \text{ €/MWh} - 100 \text{ €/MWh} = -10 \text{ €/MWh}$) - the final net electricity cost for the buyer is 100 €/MWh. The same principle applies for the RES producer vice versa. Hence, the virtual PPA represents a financial contract to hedge the position of the parties versus the wholesale spot price on the electricity market. Since there is no physical delivery in the virtual PPA between the parties, it needs to function in parallel with separate contracts for physical delivery.

There are nominally two PPA products: Pay-as-Produced (PaP) and different variations of baseload. Both products can be modified and tailored based on contract terms. PaP is possible in both physical & virtual cPPAs. In physical cPPAs, the risk of actual production deviating from planned production is assumed by the off-taker. Conversely, virtual cPPAs often encounter baseload variations, where a predefined volume serves as a reference, and the risk falls on the RE generator.

Figure 8 PPA product types

	Pay-as-produced (PaP)	Variations of baseload
Description	• Volume from the RE asset is based on the real production at a given time – typically measured on an hourly basis • RE producer puts the volume risk (i.e. changes of the RE actual production vs planned) and profile risk (i.e. market price of RE asset vs average market price) on the off-taker • Market standard for physical PPA but also used in virtual PPA • PaP risks should result in lower cPPA price for the off-taker vs PaF	• Volume from the RE asset is fixed and agreed upon at the beginning of the agreement – typically measured as a monthly baseload or annual baseload • RE producer takes the volume risk & profile risk • Market standard for virtual PPA (too theoretical for physical PPA) • PaF risks result in higher cPPA price for the off-taker vs PaP – the PaF premium depends on technology type (profile cost), tenor, volume size and risk policies
Pros	• The easiest option for the RE developer (as was for FiT projects) in avoiding volume and profile risk • Traders should be able to manage PaP risks and could provide additional options to end users (corporate off-takers)	• The easiest option for corporate off-taker as the assumption is that energy management is not their core business – the corporate off-taker only needs to take care that physical delivery is priced in spot by their Supplier • Allows substantially more volume for the corporate off-taker consumption coverage if avoiding over-hedge risk (i.e. production > consumption) • No technical restrictions for corporates if not having smart meters (monthly data is ok) • No over-hedge and easier implementation of hedge accounting principles in virtual PPA
Cons	• Allows less volume for corporate off-taker consumption coverage if avoiding over-hedge risk (i.e. production > consumption) • In case of the virtual PPA, it could result in harder implementation of hedge accounting principles (by directly impacting the effectiveness of established hedging relationship) • Technical restriction is possible for corporates if not having smart meters	• RE producer takes volume & profile risk for the corporate off-taker but can charge PaF premium for it or sell it to trader off-taker who can take PaP instead

Source: PwC Analysis

3. PPA market maturity



3.1.

Albania

3.1.1. Overview of RES electricity supply & demand

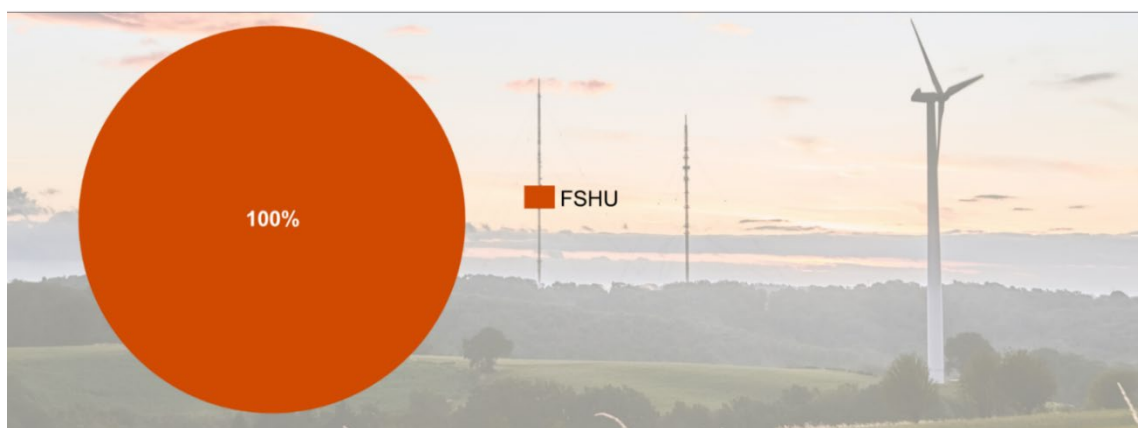
This section covers electricity supply and demand trends in Albania, examining both existing and forecasted RE supply and consumption patterns. RES electricity supply in each market is critical for PPAs, as it ensures there is sufficient generation capacity to meet consumer demand under long-term RE procurement contracts. Furthermore, the section includes insights into corresponding generation development scenarios outlined in the NECP and additional strategies. It also provides a comprehensive analysis and commentary on RES nominations.

Lastly, electricity consumption by key customer segments is discussed. RES electricity demand in each market is crucial for PPAs, as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In Albania, the retail market is open, allowing consumers the freedom to choose their supplier. The universal service supplier (FSHU) provides regulated-price electricity to household and small-scale consumers. From 1 January 2022, consumers connected to 20 kV, 10 kV and 6 kV transitioned into the liberalized market. However, they were automatically shifted to supply from the supplier of last resort (FSHU) for an initial period of two years. Meanwhile, consumers connected to a 35 kV and higher voltage levels procure electricity from the open market⁵. Furthermore, in 2022, in Albania there were 27 active suppliers in the retail market. There was only one supplier selling at least 5% of the total electricity consumed by final customers. Three largest retail suppliers covered 75.7% of the total electricity consumption⁶.

To elaborate, Albania was among the Contracting Parties (CPs) that declared a state of emergency on 8 October 2021, and chose to provide direct financial assistance to consumers through incumbent companies. This state of emergency was extended until the end of 2023, during which consumers connected to the 35 kV were supplied at regulated prices. However, industrial consumers operating in the free market were subject to purchasing electricity at regional market prices, resulting in a substantial price hike that directly affected their operations⁷.

Figure 9 Overview of Albanian electricity supply¹ in 2022



Note: 1) Electricity supply for households, small consumers, 20 kV, 10 kV, and 6 kV consumers. Higher voltage consumers, such as 35 kV and higher voltage level are supplied in the free market

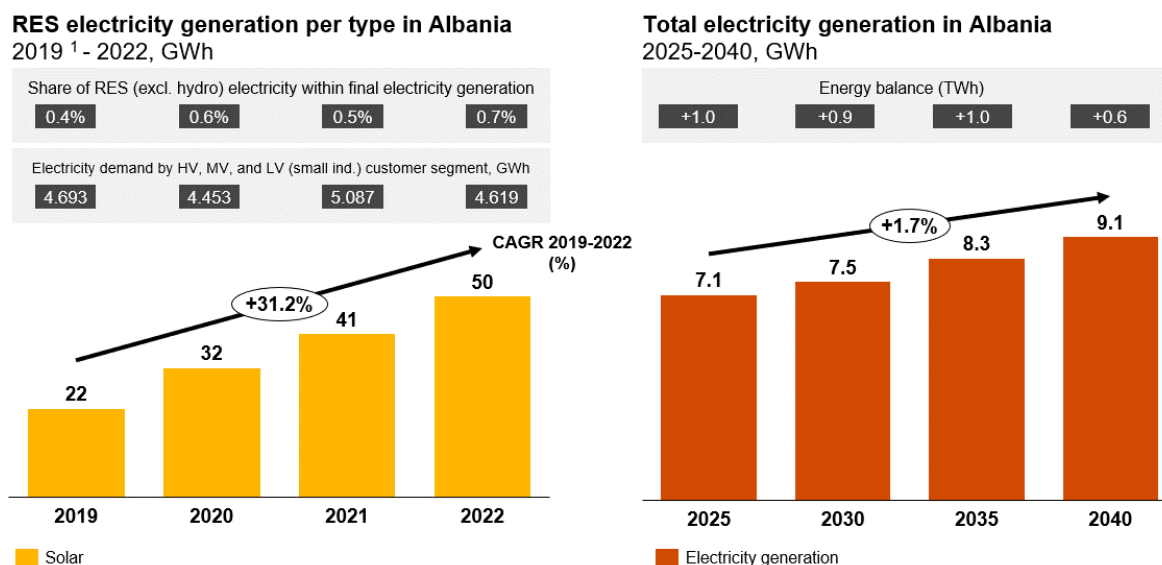
Source: ERE Annual Report 2022, Albanian Annual Implementation Report 2023, PwC Analysis

⁵ Energy Community Secretariat (November 2023). Albanian Annual Implementation Report 2023.

⁶ ECRB Market Monitoring Report (2022).

⁷ ECRB Impact of the energy crisis on electricity and gas price regulation in the Energy Community Contracting Parties (2023).

Figure 10 Historical and projected RES electricity generation in Albania



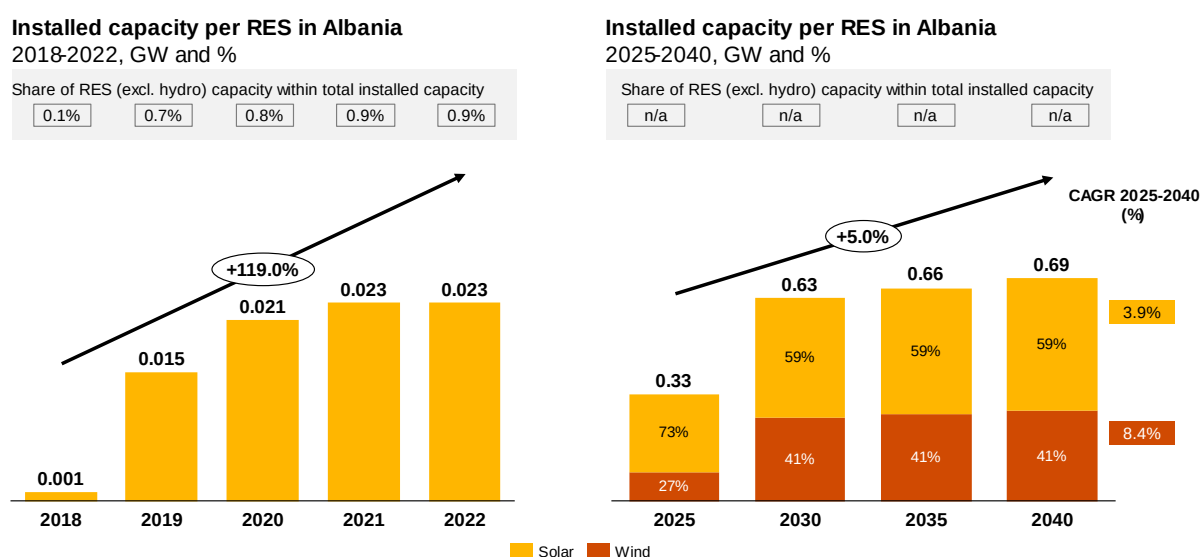
Note: 1) Solar generated electricity in Albania emerged in 2019, 2) RES-E – share of renewable energy sources in electricity generation

Source: Albania's Draft NECP, ERE Annual Reports (2018-2022), PwC Analysis

The draft of National Energy and Climate Plan of Albania was concluded in 2021, but it does not provide updated perspective on wind and solar share in RE electricity production by 2040. Its WEM scenario forecasts total electricity generation to rise to over 9 terawatt-hours (TWh) per year by 2040, marking an increase of 2 TWh compared to 2022.

This plan, however, is based on data that has not been updated since 2021, raising concerns about its relevance and alignment with current market conditions and technological advancements. This outdated foundation may impede effective strategic planning and investment decisions, as it fails to accurately reflect the latest trends and potential future shifts in the energy sector. However, it is important to note that the update of the NECP is ongoing in 2024. This forthcoming update presents an opportunity to incorporate the latest data and insights, thereby enhancing the plan's accuracy and effectiveness in guiding strategic initiatives and investments in the renewable energy landscape..

Figure 11 Historical and projected RES installed capacity in Albania



Source: Albania's Draft NECP, ERE Annual Reports (2018-2022), PwC Analysis

The Compound Annual Growth Rate (CAGR) of solar-only Renewable Energy Sources (RES) capacity in Albania has shown significant growth. For solar energy, the CAGR from 2025 to 2040 is projected at approximately 3.9%, while wind energy is projected to grow at a CAGR of 8.4% over the same period. This growth in solar and wind installations has the potential to increase the share of RES, however, specific data needed for the computation of projected installed RES capacities share in Albania is unavailable in the latest version of Albanian NECP.

As outlined in Albania's NECP, which is currently available in its adopted version from 2021, this trend indicates a positive framework for expanding RE, which could be further supported through mechanisms such as Power Purchase Agreements (PPAs). These agreements could play a crucial role by ensuring a reliable and increasing supply of sustainable energy. However, the absence of an updated version of the NECP limits specific conclusions regarding the potential and framework for PPAs. Without detailed quantitative effects of policies such as specific installed capacities supported or not supported by government schemes, it is challenging to assess the full potential capacity eligible for PPAs.

Planned energy infrastructure development

Planned energy infrastructure development for Albania from 2021 to 2030 includes strategic investments designed to enhance the national grid's robustness and efficiency. These initiatives are integral to supporting the integration of RES, ensuring stability and improving the reliability of the electrical grid across Albania. Key projects and initiatives include⁸:

- **Upgrades to existing substations:**

- Closing the 400 kV Albanian internal Ring - The project aims to complete the 400 kV internal transmission ring in Albania by constructing a new 400 kV line between the Fier, Rrashbull, and Tirana-2 substations.

- OST 400/220/110 kV Fier: Following upgrades are planned to improve reliability and expand capacity in response to ageing infrastructure and increasing demand:
 - Construction of a new 400 kV single circuit OH transmission line from Fier substation to Rrashbull substation (78 km, ACSR 2x490/65 mm²).
 - Extension of the 400 kV Fier substation
 - Extension and reinforcement of the Rrashbull substation.
 - OST 400/220/110 kV Tirana 2: This includes equipment replacements and upgrades across various voltage levels, along with enhancements in systems for plant consumption, protection, control and measurement:
 - Conversion works at the 400 kV Tirana-2 substation for operation at 400 kV.
 - Additional project details: Existing 220 kV double circuit line between Tirana2 and Rrashbull will have one circuit upgraded to 400 kV, eliminating the need for a new 400 kV line.
 - Main project outcomes:
 - Enforced energy flow corridor in the North-South direction.
 - Enhanced Fier substation for solar power plant connections.
 - Ensured security of supply and meet demand increase in Durres (new marine and cargo ports planned).

⁸ Operatori i Sistemit të Transmetimit (OST), (2022). Annual report 2022. Retrieved from <https://ost.al/en/annual-report-2022/>

- Completed internal 400 kV network ring connecting major substations (Tirana, Elbasan, Durres, Fier).
- Avoided bottlenecks and increased transmission capacity (NTC) with neighboring countries.
- Reduced dependence on hydrological conditions, allowing better energy exchange and mitigating some effects of climate change.
- **New substations and power lines:**
 - Connection from OST Elbasan 2 to OST Berat: Construction of a new dual-system 110 kV line aimed at improving reliability and consumer supply.
 - OST Vlora: Installation of new transformers to increase capacity and accommodate rising consumption needs.
- **Interconnections with neighbouring countries:**
 - Albania - North Macedonia: Development of new 400 kV interconnection between Fier in Albania, and Bitola in North Macedonia. On the Albanian side, the project includes a construction of 400 kV single circuit transmission line: Fier - Elbasan – Qafë Thanë (approx. 130 km); and a construction of Elbasan 3 substation and reinforcement/extension of Fier substation.
 - First overhead 400 kV power line enabling market coupling and direct trade.
 - Boosts Albania's border transmission capacity to 1.5 GW.
 - Part of an energy corridor from Bulgaria to Italy (i.e. Bulgaria, North Macedonia, Albania, Montenegro, Italy), supporting clean energy transition.^{9,10}
 - Albania – Kosovo*: Development of new 400 kV interconnection between Fierza in Albania, and Prizren in Kosovo*. On the Albanian side, the project also includes an extension of Fierza substation to 400 kV level.
 - Enhances reliability, security of supply, and operational flexibility of the regional network.
 - Increases Net Transfer Capacity (NTC) and energy exchange between neighbouring countries.
 - Improves distribution of generation flows from HEC Fierze and Drina river cascade in the 400 kV network.
 - Boosts commercial exchanges with Kosovo* and regional energy market development.
 - Albania – Greece: Development of new 400 kV Overhead Transmission Line (OHTL) from Fier substation to Arachthos substation in Greece (203 km).
 - OST Kukës to OST Prizren (Kosovo*): Construction of a 110 kV line to facilitate XB energy transfer.

⁹ Balkan Green Energy News, (2023, December 25th). Albania begins construction of its part of power link with North Macedonia. Retrieved from <https://balkangreenenergynews.com/albania-begins-construction-of-its-part-of-power-link-with-north-macedonia/>

¹⁰ Western Balkans Investment Framework, (n.a.). Albania – North Macedonia Power Interconnection (I): Grid Section in Albania. Retrieved from <https://wbif.eu/investmentgrants/WB-IG00-ALB-ENE-01#:~:text=This%20investment%20project%20implements%20the,%2C%20Albania%2C%20Montenegro%20and%20Italy.>

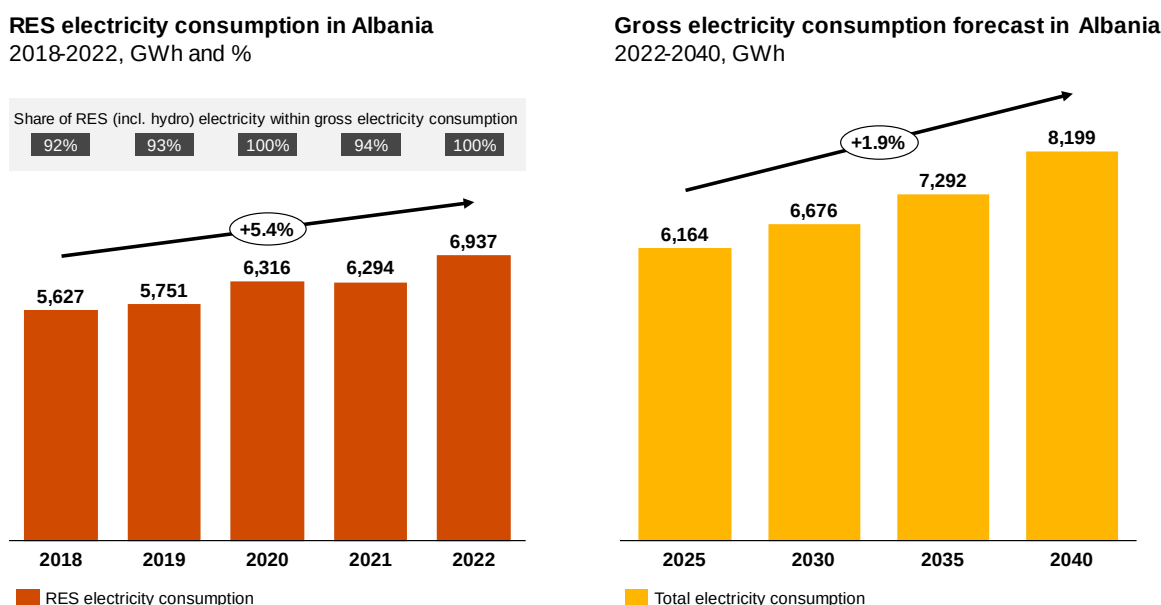
- **Implementation of grid control technologies:**

- Remote management of OST elements: Modernization projects involving the control of switching equipment from dispatch centers, enabling unmanned operations with SCADA systems and video control of command execution.

These projects highlight Albania's commitment to upgrading its power infrastructure, improving grid reliability, and meeting rising energy demand, all while boosting the proportion of renewable energy in its national energy portfolio.

Although substantial upgrades and new constructions like the OST 400/220/110 kV Fier and the interconnections with North Macedonia, Kosovo*, and Greece are planned, the existing grid may face challenges in terms of capacity and technological readiness to handle the intermittent renewable energies. These challenges could significantly impact the implementation of Power Purchase Agreements (PPAs). PPAs rely on the consistent integration of RE into the grid to deliver a reliable return on investment. If the grid lacks the capacity or the technological advancement to manage the variability of RE effectively, it could lead to reliability issues. This might deter investors, as PPAs often hinge on the predictable and stable generation of energy to ensure financial viability and contractual fulfilment. Thus, enhancing physical infrastructure alongside advanced grid management technologies is crucial to mitigate variability and secure the reliability needed for effective PPA implementation.

Figure 12 Historical and projected RES electricity consumption in Albania



Note: 1) Due to the lack of data on RES electricity consumption forecast, a gross electricity consumption forecast is provided for Albania

Source: Albania's Draft NECP, Eurostat, PwC Analysis

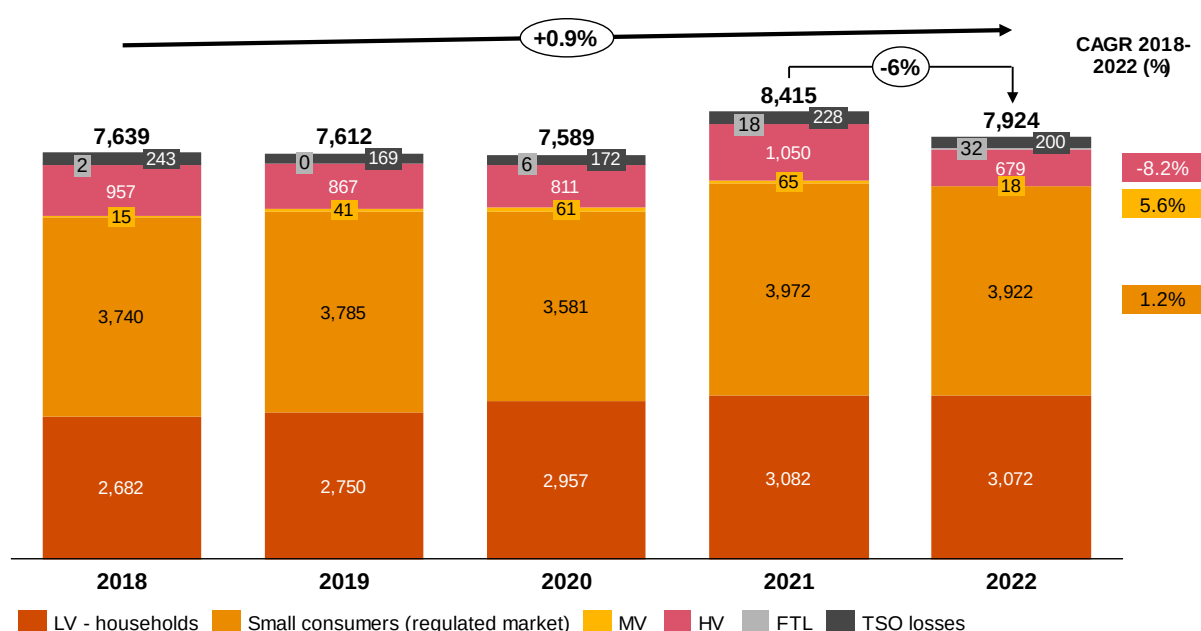
Electricity consumption sourced from renewable energy sources (including hydro power) in Albania experienced a consistent growth from 2018 to 2022, with a total increase of 5.4% over these five years. Despite the upward trend in electricity consumption sourced from renewable energy sources (including hydro power) from 2018 to 2022, the NECP lacks specific projections or detailed pathways for future electricity consumption sourced from renewable energy sources (including hydro power), which is critical for aligning with longer-term sustainability goals and ensuring the effectiveness of policy measures. This lack of detailed electricity consumption sourced from renewable energy sources (including hydro power) projections could undermine strategic planning and the achievement of renewable energy targets, suggesting a need for more robust and detailed forecasts in future revisions of the

plan. This gap is particularly concerning given the outdated status of the NECP draft from 2021, which may not fully capture recent advancements or changes in the energy market landscape. Moreover, the absence of specific and updated renewable energy projections hinders the uptake of Power Purchase Agreements (PPAs) by failing to provide a reliable framework for investors and developers to assess future demand and profitability.

In Albania, the customer segment with the highest consumption for the period from 2018 to 2022 was the small consumer segment, with almost half (47%-50% range) of the total share in electricity consumption per different segments. However, high voltage customers' consumption decreased at 8.2% CAGR from 2018 to 2022, while medium voltage customers' consumption grew by 5.6% CAGR. The drop in high voltage customers' electricity consumption could lessen PPA appeal, necessitating strategy adjustments to align with this segment's reduced demand.

Figure 13 Electricity consumption per customer segment in Albania

Consumption per customer segment, 2018-2022, GWh



Note: LV – Low Voltage, MV – Medium Voltage, HV – High Voltage, FTL – Free market supplier

Source: ERE Annual reports (2018-2022), PwC analysis

For detail list of electricity consumption per customer segment accompanied by a number of customers per customer segment, electricity consumption by sectors, and electricity consumption by major industrial consumers, please see appendix.

3.1.2. Electricity prices

Retail (non-household) prices¹¹ in Albania did not change significantly from 2022 to 2023, showing a modest increase of 7 €/MWh over the observed period. This stability suggests a significant level of government intervention in regulating electricity prices. While this may pose challenges for Power Purchase Agreements (PPAs) due to the lack of full market liberalization and substantial government influence, there are also positive developments. In April 2023, the wholesale day-ahead market (DAM) was introduced, achieving a daily average market clearing price of 101 €/MWh (average monthly traded volume of 92 GWh) in April-December 2023

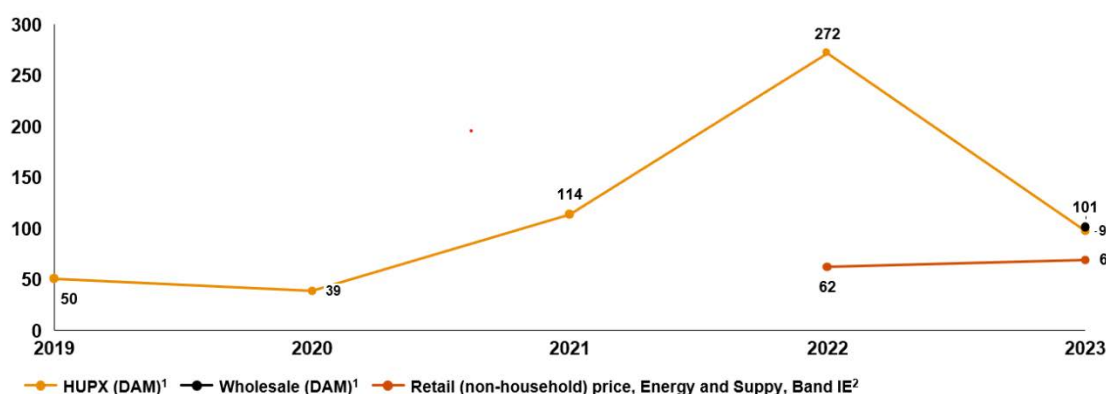
¹¹ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

period. This price is higher than both the daily baseload price on the Hungarian Power Exchange (HUPX) exchange in April-December 2023 period of 97 €/MWh (average monthly traded volume of 2,149 GWh), and from the retail price for non-household consumers in Albania in 2023 which amounted to 69 €/MWh. These conditions create an unfavorable environment for the utilization of PPAs in Albania, in which the average market clearing price on the Albanian Power Exchange (ALPEX) does not reflect the retail (non-household) price. In other words, electric utilities are offering prices lower than the market rates, hence obstructing the PPAs implementation.

As illustrated in the figure below, from 2019 to 2023, HUPX average daily baseload prices on DAM severely fluctuated and were significantly higher than the retail (non-household) prices in Albania during the comparable period (2022 and 2023).

Figure 14 Overview of wholesale and retail electricity prices in Albania

Wholesale and retail electricity prices in Albania from 2019 to 2023 (€/MWh)



Note: 1) HUPX (DAM) & Wholesale (DAM) prices present the April-December 2023 period, 2) Retail (non-household) price showcases 2022 & 2023 period, due to unavailability of data for other years

Source: ALPEX Monthly Reports 2023 (April-December), HUPX Annual Reports (2019-2023), Eurostat, PwC Analysis

3.1.3. Supply options and incentive mechanisms

In Albania, the Feed-in-Tariff (FiT) system has been phased out as a support mechanism for renewable energy. Instead, it has been replaced by contracts for difference (CfD) and contracts for premium (CfP), which are awarded through a competitive process. This strategic shift aims to reduce the country's reliance on hydropower and facilitate a transition toward wind and solar energy sources. Once approved, producers secure contracts lasting up to 15 years, encouraging long-term investments in sustainable energy.¹²

Albania's energy market is enhancing its dynamics through the development of the Albanian Power Exchange (ALPEX), which allows for direct contracts between buyers and sellers. This setup is crucial for integrating RES efficiently and ensuring energy sustainability.

In 2023, Albania has made substantial progress in the RE sector, particularly through its initiatives in solar power development. The government has been actively supporting the expansion of solar energy with significant projects and auctions aimed at boosting Albania's RE capabilities.

One of the major steps taken was the launch of a 300 MW solar power auction in 2024, part of Albania's broader strategy and EBRD Renewable Energy Auction program to enhance its energy independence and the transition towards more sustainable energy sources. This

¹² CMS Legal (2024, February 22nd). Renewable energy in Albania. Retrieved from: <https://cms.law/en/int/expert-guides/cms-expert-guide-to-renewable-energy/albania>

auction is expected to play a crucial role in helping Albania reach its goal of becoming a net exporter of electricity by 2030. The Contracts-for-Difference (CfDs) offered in these auctions guarantee financial incentives for developers for a period of 15 years, ensuring stability and attractiveness for investments in the renewable sector.¹³

Four other renewable energy auctions took place in Albania, out of which three were for solar power and one was for wind power. First one occurred in 2018 when a consortium led by India Power Corporation won a bid to build a solar power plant near the city of Vlora. The plant will have an installed capacity of 100 MW, while the government committed itself to buy electricity from a 50 MW portion of the plant at a fixed price of 59.9 EUR/MWh over 15 years. The electricity produced from the remaining 50 MW of installed capacity will be sold by the investor on the market without any support measures.¹⁴

In 2020, another auction took place in which a winning bidder, French company Voltalia, is to build a solar power plant in Karavasta with an installed capacity of 140 MW. The government committed itself to purchase the electricity produced from half of the installed capacity (70 MW), while the rest will be sold on the open market. The price that is agreed upon through the auction is 24.89 EUR/MWh for a period of 15 years.¹⁵ Voltalia won another auction in 2021 for the Spitalla solar park. The power plant has an installed capacity of 100 MW, however the government has agreed upon a deal for 70% of the electricity at a 29.89 EUR/MWh price over a 15-year period.¹⁶

The only power auction for wind energy in Albania occurred in 2023 when the Albanian Ministry of Infrastructure and Energy awarded contracts for difference (CfDs). Three bidders won the contracts for a total of 222.5 MW in installed capacity. The best bid came from a consortium made of Total Eren and KMV for a 75 MW project and a price of 44.88 EUR/MWh. Second contract awarded went to the three companies that joined forces, namely, Güris, Mogan Energy and BRD Energy for a 75 MW project and a price of 74.95 EUR/MWh. The last bid came from Verbund and was awarded a 72.6 MW project with a price of 74.95 EUR/MWh.¹⁷

Albania developed international partnerships and financial backing from institutions like the European Bank for Reconstruction and Development (EBRD), which aids in the financing and strategic development of these projects that are further mentioned in the appendix. Such support is vital for Albania as it continues to diversify its energy sources away from an over-reliance on hydropower, which has traditionally dominated its energy landscape. An example of a project like that is large-scale solar projects such as the Karavasta Solar Project, which has already commenced operation and will significantly contribute to the country's RE supply.¹⁸

¹³ Balkan Green Energy News, (2024, January 15th). Albania kicks off qualifications for 300 MW solar power auction. Retrieved from <https://balkangreenenergynews.com/albania-kicks-off-qualifications-for-300-mw-solar-power-auction/>

¹⁴ Balkan Green Energy News, (2018, November 13th). Consortium led by India Power Corporation wins bid to build 100 MW solar power plant. Retrieved from <https://balkangreenenergynews.com/consortium-led-by-india-power-corporation-wins-bid-to-build-100-mw-solar-power-plant/>

¹⁵ Balkan Green Energy News, (2020, August 4th). Albania inks concession with Voltalia for Karavasta solar power plant. Retrieved from <https://balkangreenenergynews.com/albania-inks-concession-with-voltalia-for-karavasta-solar-power-plant/>

¹⁶ Balkan Green Energy News, (2021, March 26th). Voltalia wins auction in Albania for Spitalla solar power plant of 100 MW. Retrieved from <https://balkangreenenergynews.com/voltalia-wins-auction-in-albania-for-spitalla-solar-power-plant-of-100-mw/>

¹⁷ Balkan Green Energy News, (2023, July 26th). Albania selects winners of its first wind power auction. Retrieved from <https://balkangreenenergynews.com/albania-selects-winners-of-its-first-wind-power-auction/>

¹⁸ European Bank for Reconstruction and Development, (2023). EBRD supports Albania in new solar power auction. Retrieved from <https://www.ebrd.com/news/2023/ebrd-supports-albania-in-new-solar-power-auction.html>

3.1.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

The Albanian Power Exchange (ALPEX, a joint venture company owned by the TSOs of Albania/OST, and Kosovo*/KOSTT) plays a crucial role in providing a structured and liquid market. For the year 2023, the average monthly trading volume on the Albanian Power Exchange (ALPEX) was approximately 91,949 MWh, and the average market clearing price was 100.94 €/MWh. These averages are based on the available data from April to December. As of 2023, the Albanian Power Exchange (ALPEX) has 23 exchange members. These members include a mix of TSOs, free market suppliers, universal service suppliers, power corporations, DSOs, and various energy trading and production companies from both Albania and Kosovo*.

The current state of market coupling between Albania and Kosovo* is marked by significant advancements, notably with the operational launch of a joint DAM in February 2024. This development was facilitated by the Albanian Power Exchange (ALPEX), which began hosting DA auctions for Albania in April 2024. This initiative represents a critical step towards integrating the electricity markets of the two countries, enhancing both the efficiency and stability of the regional power supply¹⁹. However, the development of the ID market is still pending, while the balancing market is operational and organized in a competitive manner with four balancing service providers.

Furthermore, a Memorandum of Understanding on the coupling of DA electricity markets was signed by Albania, North Macedonia, Greece and Kosovo* in 2023.²⁰ In addition, a similar Memorandum of Understanding on the DAM coupling was previously signed between Bulgaria, North Macedonia and Albania in 2019²¹.

The coupling was enabled by the establishment of a 400 kV HV power interconnection back in 2016 and further supported by the designation of ALPEX as the nominated electricity market operator (NEMO) for both countries. These steps are integral to the broader regional goal of integrating with the European electricity market, promoting better electricity trade efficiencies, and aligning with the EU energy market regulations.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "PaP" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all MV and HV consumers are using smart meters already; therefore, there is no limitation for PPA. In Albania, there exists a

¹⁹ Balkan Green Energy News, (20 July 2023). ALPEX becomes nominated electricity market operator in Albania, Kosovo. Retrieved from <https://balkangreenenergynews.com/alpex-becomes-nominated-electricity-market-operator-in-albania-kosovo/>

²⁰ Balkan Green Energy News, (14 November 2023). North Macedonia, Greece, Albania, Kosovo* take step towards day-ahead market coupling. Retrieved from <https://balkangreenenergynews.com/north-macedonia-greece-albania-kosovo-take-step-towards-day-ahead-market-coupling/>

²¹ Balkan Green Energy News, (12 March 2019). Bulgaria, North Macedonia, Albania sign memorandum on day-ahead market coupling. Retrieved from <https://balkangreenenergynews.com/bulgaria-north-macedonia-albania-sign-memorandum-on-day-ahead-market-coupling/>

smart metering system to some extent, although the precise count of smart meters is not publicly accessible. It is anticipated that significant industrial entities have implemented smart metering systems.

Details of each CP market player and market interaction can be found in the Appendix and Legal section of the document.

Figure 15 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprijenos BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektro distribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-oblenenergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State-owned entities

Source: PwC analysis

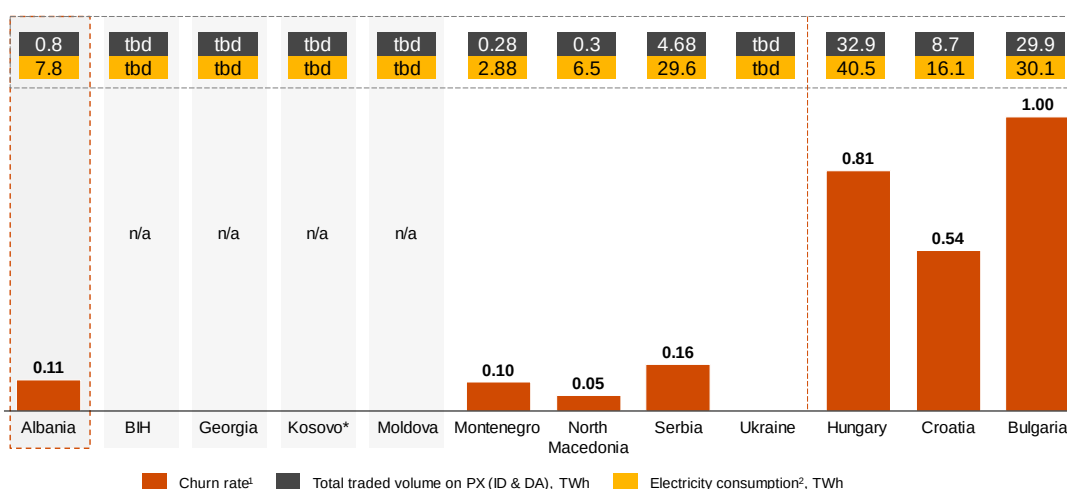
Apart from the assessing the existence of the Power exchange in CPs, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

When evaluating the liquidity of the power exchanges among the CPs, the data suggests that ALPEX exhibits the third-best churn rate²² among other CPs, while only Ukraine and Serbia possess a higher churn rate. Furthermore, when comparing these churn rates with those of power exchanges in other SEE countries, notably Hungary, Croatia and Bulgaria, it becomes apparent that their churn rates are significantly higher, indicating superior liquidity in their power exchanges (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78). However, it is important to note that the DAM on a power exchange in Albania commenced operations in April 2023, and since then the total traded volume on DAM soared from 65 GWh in April to 107 GWh in December 2023. Therefore, a more accurate assessment of liquidity on APEX will be attainable with the total traded volume for 2024.

²² Apart from the sheer volume of transactions, it is crucial for a market to handle them without causing significant fluctuations in transaction prices. In this regard, analysts often turn to a metric known as the churn rate. This ratio compares the trading volume to the physical demand and reflects how frequently a product, such as electricity, is traded. A high churn rate signifies robust market liquidity, indicating that products are readily bought and sold.

Figure 16 Overview of CPs and chosen SEE Power Exchanges

Power exchange liquidity in Contracting Parties and SEE countries in 2023²³ (traded volume/el. consumption)



Note: 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data.

Source: ALPEX Monthly Reports 2023 (April-December), MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.1.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

After conducting comprehensive desktop research and analysis of publicly accessible information, it has been observed that there have been no publicly disclosed PPA deals reported in Albania. However, there was a tender initiated by Albania's energy corporation, KESH, in March 2023 for long-term PPAs, which failed due to high price of offers. The tender, which sought PPAs spanning three to five years, received a total of five offers from three different companies: Albania's GSA, Switzerland's EFT and Romania's EDS. EFT offered the lowest price, of 169.77 €/MWh²³. Furthermore, the list of existing and announced RES projects, developers and financing examples are provided in the Appendix.

Key investors in the Contracting Party

The key financial institutions in Albania encompass entities like the National Commercial Bank, Credins Bank, Raiffeisen Bank Albania, KfW Development Bank, BKT Bank Albania, Union Bank and the EBRD. Among these, two stand out for their involvement in financing energy projects in Albania. Specifically, the EBRD allocated EUR 6 million to Union Bank to bolster investments in green energy²⁴. Additionally, BKT Bank Albania plays an active role in the Albanian energy sector by supporting green energy initiatives through financing energy efficiency projects. This includes initiatives like the Green for Growth Fund (Green Loan), which offers up to EUR 1 million for investments in energy-saving measures to reduce consumption

²³ SeeNews, (23 May 2023). Albanian PPA tender fails due to high offers. Retrieved from <https://seenews.com/news/albanian-ppa-tender-fails-due-to-high-offers-report-823813>

²⁴ Green Economy Financing Facility. (n.a.). EBRD lends €6 million to Union Bank to boost green energy investments in Albania. Retrieved from <https://ebrdgeff.com/ebrd-lends-e6-million-to-union-bank-to-boost-green-energy-investments-in-albania/>

and enhance efficiency, aiding Albanian businesses in transitioning to a future focused on clean energy²⁵.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS. Albania has not established a cap-and-trade system in line with EU ETS to internalize the cost of carbon emissions. A carbon tax on petrol and diesel has been in place since 2008 though and a coal tax is in place. Albania has adopted its Law on Climate Change in 2020. Any form of credible carbon pricing requires robust emission data. In this context Albania has not transposed the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022.²⁶

Additionally, Albania has not transposed the Electricity Integration Package (including market coupling) on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend. However, Albania is also unlikely to be significantly affected by the CBAM, as it relies on hydropower rather than coal for its energy production and industry.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CP and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this first tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

²⁵ BKT Bank Albania. (n.a.). Retrieved from <https://www.bkt.com.al/en/business/industry-expertise/energy-sector>

²⁶ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.²⁷

Considering that Albania exported only 7% of its total electricity, generation between 2011 and 2020, with none of it sourced from coal, the introduction of the CBAM is unlikely to have a substantial impact.²⁸ However, it's worth noting that in 2023 Albania has introduced a new thermal power plant project, fueled by gas, that could potentially be affected by CBAM.²⁹

Overall, Albania is progressing towards readiness for being less negatively affected by the CBAM.

Figure 17 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in Albania

Albania		
Net electricity export/import ¹ (average 2021-2023, GWh)		34 GWh
Share of thermal electricity in total electricity generation (average 2020 -2022, %)		0%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		1,482 GWh and 22%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	22%
	Food, beverages and tobacco	16%
	Mining and quarrying	12%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Given Albania's heavy reliance on hydroelectric power for electricity generation, the CBAM's impact on Albania would be minimal. However, if Albania continues to expand its positive net electricity export trade, cross-border PPAs could enhance the competitiveness of Albanian electricity, thereby reducing or eliminating the CBAM effect.

²⁷ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

²⁸ Euractiv (2023, February 6th). EU's carbon levy poses new test for Western Balkan integration. Retrieved from <https://www.euractiv.com/section/energy/news/eus-carbon-levy-poses-new-test-for-western-balkan-integration/>

²⁹ Balkan Green Energy News (2023, February 27th). GEK Terna launches 170 MW thermal power plant project in Albania. Retrieved from <https://balkangreenenergynews.com/gek-terna-launches-170-mw-thermal-power-plant-project-in-albania/>

CBAM recommendations

Figure 18 Overview of CBAM recommendations in Albania

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Introduction of carbon pricing mechanism	Yes	Law on Climate Action	Incorporation of a national carbon pricing mechanism should be made in the Law on Climate Change. Additionally, to transpose the MRVA package adopted at the EnC acquis with the 2022 Ministerial Council Decision.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonization with the EnC Electricity Integration Package	Yes	Energy Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.



3.2.

**Bosnia and
Herzegovina**

3.2.1. Overview of RES electricity supply & demand

This section covers electricity supply and demand trends in Bosnia and Herzegovina, examining both existing and forecasted RE supply and consumption patterns. RES electricity supply in each market is critical for PPAs, as it ensures there is sufficient generation capacity to meet consumer demand under long-term RE procurement contracts. Furthermore, the section includes insights into corresponding generation development scenarios outlined in the NECP and additional strategies. It also provides a comprehensive analysis and commentary on RES nominations.

Lastly, electricity consumption by key customer segments is discussed. RES electricity demand in each market is crucial for PPAs, as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In 2022, three incumbent companies, namely Elektroprivreda BiH (EPBiH), Elektroprivreda Republike Srpske (EPRS), and Elektroprivreda Hrvatske Zajednice Herceg-Bosna (EPHZHB), are the dominant suppliers and universal service providers in Bosnia and Herzegovina with 97% of total electricity supply in Bosnia and Herzegovina. In 2022, most customers were supplied from incumbents, while only 2.6% of total electricity withdrawn by end customers in BiH was supplied to customers who switched their supplier (available since 2015)³⁰. In more detail, there were 27 licensed electricity suppliers, out of which 7 were active in Bosnia and Herzegovina during 2022, while only three of them, more precisely, the incumbent companies (EPBiH, EPRS, EPHZHB) were selling at least 5% of the total electricity consumed by final customers (i.e. in 2022, only incumbent companies in BiH supplied 5% or more of the total electricity that was supplied to final customers. The remaining four active electricity suppliers each had a market share of less than 5%).³¹

In Bosnia and Herzegovina in 2022, small and medium enterprises³² connected to the 0.4 kV network were eligible for regulated end-user electricity prices. However, for the remaining customers (approximately 11.5% of non-household customers, responsible for 73% of total non-household electricity consumption), prices were not regulated³³. The Government of the Federation of Bosnia and Herzegovina has decided to cap the increase in electricity supply prices for qualified customers at 20% for 2023, applicable to contracts of one year or longer. This decision aimed to provide price stability and predictability for energy consumers. On December 15, 2022, the Energy Regulatory Commission of Republika Srpska approved new tariff rates for distribution system users and public supply, introducing a block pricing scheme for household electricity consumption: up to 0.5 MWh at 27.8 €/MWh, 0.501 to 1.5 MWh at 46.7 €/MWh, and more than 1.5 MWh at 102.9 €/MWh.

³⁰ SERC Annual Report (2022)

³¹ ECRB Market Monitoring Report (2022)

³² Federation BiH: small company means any company which meets at least two of the three mentioned criteria: it has fewer than 50 employees, to annual turnover less than 2 million BAM (1EUR=1,95583BAM) and with a value of operating assets at the end of the financial year less than 1 million BAM, and whose facilities are connected to the distribution system voltage levels lower than 1 kV;

Republika Srpska: small customer means any customer whose facilities are connected to the distribution system at the voltage level lower than 1 kV, which meets the following criteria (a) at least two of the three mentioned criteria: (1) it has fewer than 50 employees, (2) annual turnover is less than 2 million BAM, (3) a value of operating assets is less than 1 million BAM or (b) annual consumption in previous year is lower than 35000 kWh.

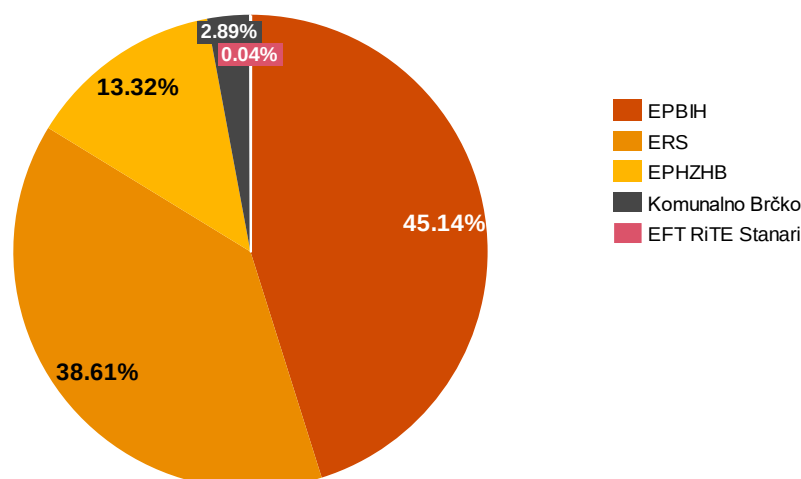
Brcko District: Small customer means any customer whose facilities are connected to the distribution system at the voltage level lower than 1 kV and that have less than 50 employees with total annual revenue not exceeding 10 million BAM.

³³ ECRB Market Monitoring Report (2022)

Moreover, in February 2023, the State Electricity Regulatory Commission (SERC) enacted decisions regarding tariffs for distribution services and electricity supply within the universal service in the Brčko District of BiH. Effective from 1 March 2023 in Brčko district of BiH, the average electricity price for customers supplied within the universal service rose by 26.36%, reaching 101 €/MWh for households and 111 €/MWh for other consumers. This pertains to commercial customers connected to the 0.4 kV network whose annual consumption does not exceed 35 MWh³⁴.

Figure 19 Overview of electricity supply in Bosnia and Herzegovina 2022

Electricity supply in Bosnia and Herzegovina 2022, %



Note: Energy withdrawn from the transmission network in 2022 per supplier

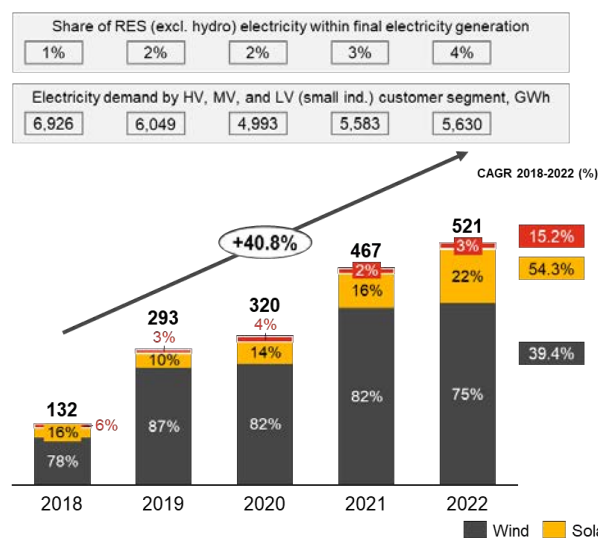
Source: SERC Annual Report 2022, PwC Analysis

As per the Policy scenario outlined in the NECP, projections for RES (excluding hydro) electricity generation in 2030 suggest that RES is expected to constitute 17% of total electricity generation. This forecast is bolstered by a notable surge in installed RES capacity, reaching 2.12 GW by 2030, primarily driven by a rise in solar technology. According to the NECP, the installation of 500 MW is planned for prosumers, and these facilities would not be included in PPAs. Nonetheless, this rise marks a significant increase from the current 5% to a projected 33% share of RES within the total installed capacity by 2030. The substantial growth in RES electricity generation, coupled with the anticipation of RES capacity representing 33% of the total installed capacity, highlights a potentially promising market for PPAs in Bosnia in Herzegovina in the near future.

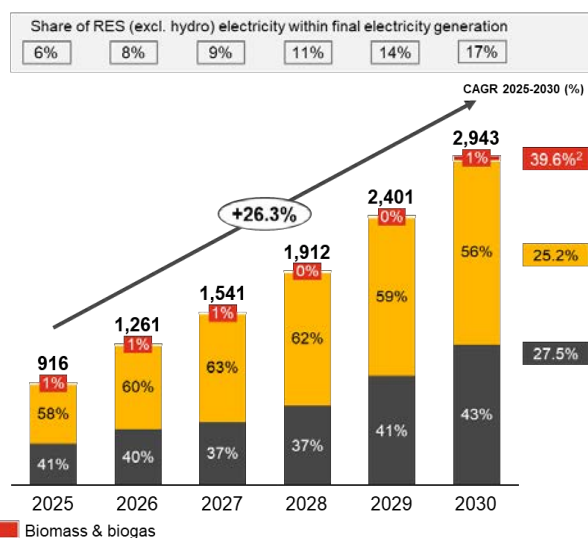
³⁴ ECRB Impact of the energy crisis on electricity and gas price regulation in the Energy Community Contracting Parties (2023)

Figure 20 Historical and projected RES electricity generation in Bosnia and Herzegovina

RES electricity generation per type in BiH 2018-2022, GWh and %



RES electricity generation per type in BiH 2025-2030¹, GWh and %

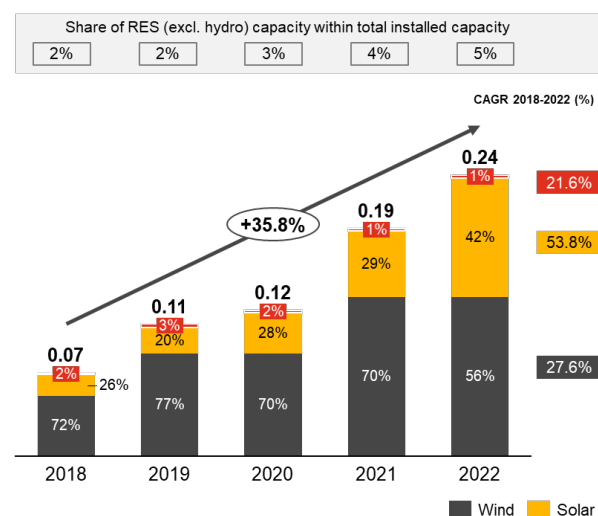


Note: 1) Calculation was based on the provided data in NECP, which included electricity production projection until the 2030; 2) Biomass & biogas el. output for years from 2025 to 2029 expressed as the value from the latest available data from 2022

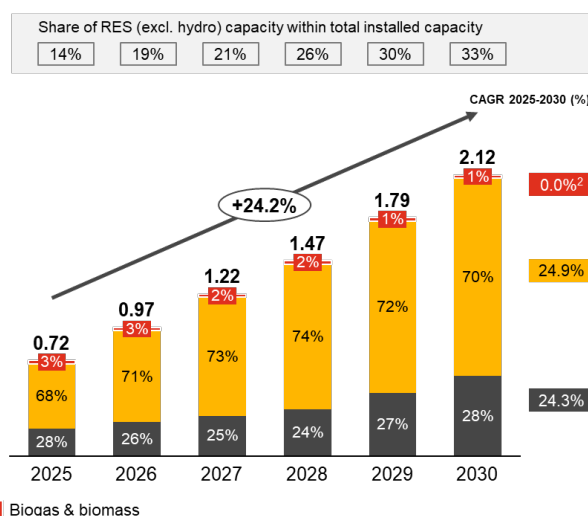
Source: NECP for Bosnia and Herzegovina, SERC Annual Reports (2018-2022), PwC Analysis

Figure 21 Historical and projected RES installed capacity in Bosnia and Herzegovina

Installed capacity per RES in BiH 2018-2022, GW and %



Installed capacity per RES in BiH 2025-2030¹, GW and %



Note: 1) Calculation was based on the provided data in NECP, which included electricity capacity projection until the year 2030; 2) Biomass & biogas el. capacity for years 2025-2029 is expressed as the value from the forecasted 2030 value due to the lack of data in the 2025-2029 period

Source: NECP for Bosnia and Herzegovina, SERC Annual Reports (2018-2022), PwC Analysis

The Compound Annual Growth Rate (CAGR) of 35.8% in RES capacity from 2018 to 2022, primarily led by wind and solar installations, increased RES's proportion of total installed capacity from 2% to 5%. This expansion underscores the potential for PPAs by ensuring a steadily increasing sustainable energy supply. As outlined in the NECP for Bosnia and Herzegovina, this upward trajectory is anticipated to persist, with RE capacity projected to

grow at a 24.2% CAGR from 2025 to 2030, reaching 33% of the total installed capacity by 2030.³⁵

Due to the lack of data in the Policies and measures section in NECP for Bosnia and Herzegovina, such as quantitative effects of policies (e.g. installed RES capacity) it is not possible to assess the potential capacity supported or not supported by government schemes (i.e. capacity eligible for PPAs).

The International Renewable Energy Agency's (IRENA) report on Bosnia and Herzegovina highlights the country's significant potential for developing the solar PV and wind energy sectors. It underscores the geographical and climatic advantages that can be leveraged to expand RES. Specifically, Bosnia and Herzegovina has favorable solar irradiation levels conducive for large-scale solar PV installations, and areas with consistent wind patterns ideal for wind farms. These renewable resources present an opportunity to diversify the country's energy mix and reduce its reliance on traditional fossil fuels³⁶.

The new Market Rules in BiH, effective since January 1, 2022, include a Decision by ISO BiH on a temporary model allowing non-discriminatory access to Bosnia and Herzegovina's (BiH) single electricity market for distribution network-connected power plants. This includes the Instruction for implementing the temporary "virtual power plants" model, which has been amended several times.³⁷ Virtual power plants (VPPs) aggregate production from smaller renewable energy plants, simplifying energy sales for their owners, who can be prosumers. Aggregators also offer balancing services through these virtual power plants.³⁸

The model promotes renewable electricity, improves wholesale and local distribution services, optimizes renewable generation with system needs, and ensures free market access for generators. Since the first virtual power plant in May 2022, their capacity has grown significantly, reaching a total of 214.02 MW by December 2023, with contributions from photovoltaic (107.32 MW), small hydro (104.24 MW), and biomass & biogas (2.46 MW) plants.³⁹ The companies with virtual power plant status in BiH include EFT, Elektroprivreda BiH, Winter Wind, Hifa-oil, Renewable Energy Solutions BH, Vibar, and Petrol BH Oil Company.⁴⁰

The introduction of VPPs in BiH might initiate a trend where major producers and suppliers purchase green electricity directly from small, independent producers and then market it. This development is expected to boost the construction of small-scale facilities for distributed power generation.⁴¹ VPPs in BiH have enabled small green energy producers, particularly

³⁵ It is important to clarify that this pertains to the average annual increase in installed capacities between 2025 and 2030, as the NECP projects a non-linear growth pattern for electricity production capacities from RES

³⁶ International Renewable Energy Agency. (2023). Renewables Readiness Assessment: Bosnia and Herzegovina. Abu Dhabi: International Renewable Energy Agency

³⁷ SERC Annual Report 2023

³⁸ Balkan Green Energy News. (2022, August 29th). EPBiH plans to start buying electricity from private producers. Retrieved from <https://balkangreenenergynews.com/epbih-plans-to-start-buying-electricity-from-private-producers/>

³⁹ SERC Annual Report 2023

⁴⁰ NOSBiH. (2022, December 29th). List of registered BRPs with "Virtual Power Plant". Retrieved from <https://www.nosbih.ba/files/2022/12/20221229-lat-Registar-Balansno-odgovornih-strana-sa-Virtuelnom-Elektranom.pdf>

⁴¹ Balkan Green Energy News. (2022, August 29th). EPBiH plans to start buying electricity from private producers. Retrieved from <https://balkangreenenergynews.com/epbih-plans-to-start-buying-electricity-from-private-producers/>

those operating solar and hydropower plants, to sell their electricity on the market at higher prices compared to those offered under feed-in tariffs.⁴²

Lastly, a buyer can finalize a PPA with an aggregator or a virtual power plant, with the transmission network usage expenses being borne by the buyer. Since aggregators and virtual power plants draw electricity from distribution network-connected plants and introduce it into the transmission network at virtual points, there remains ambiguity concerning the rights of Distribution System Operators and the allocation of costs related to distribution network usage fees incurred from evacuating the generated electricity from these plants.⁴³

Planned energy infrastructure development

Based on the "Transmission Network Development plan 2021-2030"⁴⁴ for Bosnia and Herzegovina, here are specific infrastructure projects planned:

- **Upgrades/reconstruction of existing substations:**
 - TS 400/110/35/10 kV Banja Luka 6: Reconstruction of HV, expansion of MV.
 - TS 400/110/35/6,3 kV Gacko: Construction of a new HV transmission line field, HV, replacement of TR 110/x kV.
 - TS 400/220/110/35/10 kV Mostar 4 (Čule): Replacement of TR 220/110/x kV (150 MVA).
 - TS 400/220/110/10 kV Sarajevo 20: Construction of a new HV and MV transmission line field, replacement of TR 110/x kV.
 - Numerous other projects can be found in the "Transmission Network Development plan 2021-2030" for Bosnia and Herzegovina.
- **New substation construction:**
 - TS 110/x kV Jahorina, 2x20 MVA, with connection to the transmission line (input/output on the 110 kV transmission line Pale - Goražde 1).
 - TS 110/x kV Jelah, 2x20 MVA, with connection to the transmission line (input/output on the 110 kV transmission line Doboj 1 – Teslić).
 - TS 110/x kV Banja Luka 10, 2x40 MVA, with connection to the transmission line (cable connection 2x110 kV Banja Luka 10 to the 110 kV transmission line Banja Luka 1 – Banja Luka 2 and cable connection 110 kV Banja Luka 10 – Banja Luka 3).
 - TS 110/x kV Prijedor 6, 2x20 MVA, with connection to the transmission line (input/output on the 110 kV transmission line Banja Luka 6 – Prijedor 2 (Prijedor 1)).
 - Numerous other projects can be found in the "Transmission Network Development plan 2021-2030" for Bosnia and Herzegovina.

⁴² Balkan Green Energy News. (2023, March 24th). Virtual power plants emerge in BiH as seven aggregators pool 120 MW in total. Retrieved from <https://balkangreenenergynews.com/virtual-power-plants-emerge-in-bih-as-seven-aggregators-pool-120-mw-in-total/#:~:text=Currently%20there%20are%20seven%20virtual,the%20end%20of%20the%20year>.

⁴³ Input provided by the Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina

⁴⁴ Elektroprijenos BiH (2021, February). Dugoročni plan razvoja prenosne mreže 2021. – 2030. Retrieved from <https://www.nosbih.ba/files/2021/03/20210311-lat-Dugorocni-plan-razvoja-prenosne-mreze-2021-2030-Knjiga-1.pdf>

- **Upgrades/reconstruction of existing transmission lines:**
 - 400 kV transmission line Sarajevo 10 - Tuzla 4.
 - 220 kV transmission line Jablanica – RP Kakanj (1968).
 - 220 kV transmission line Mostar 3 – Trebinje (2) (1968/2007).
 - 110 kV transmission line Čapljina – RP Mostar 1 (1960).
 - Numerous other projects can be found in the "Transmission Network Development plan 2021-2030" for Bosnia and Herzegovina.
- **New transmission lines:**
 - 400 kV transmission line Tuzla 4 – Tuzla Power Plant – Block 7.
 - 400 kV transmission line Sarajevo 10 – Tuzla 4 (input/output for Kakanj Power Plant – Block 8).
 - 110 kV transmission line Kiseljak – Fojnica.
 - 110 kV transmission line Vareš – Kladanj.
 - Numerous other projects can be found in the "Transmission Network Development plan 2021-2030" for Bosnia and Herzegovina.
- **Integration of renewable energy (RE):**
 - The document outlines projects for several two small hydropower plants, totaling about 50 MW (HPP Ulog with - projected capacity of 35.12 MW & HPP Janjići - projected capacity of 15.8 MW), along with the development of wind farm Podveležje near Mostar with an installed capacity of around 48 MW, which started operating in 2021.
 - It should be noted that two hydroelectric power plants, Ulog and Janjići, are believed by some to potentially have negative impacts on the ecosystem in Bosnia and Herzegovina. Their future remains uncertain.^{45, 46, 47}
 - Additional list of RES projects in BiH can be available in the appendix (i.e. Figure 127: Overview of RES developers with corresponding projects in Bosnia and Herzegovina).
- **Interconnections with neighbouring countries:**
 - Bosnia plans to construct a new 400 kV transmission line from Višegrad (BiH) to Bajina Bašta (Serbia), which is expected to be commissioned by 2025. Another planned project is a 110 kV transmission line from Srebrenica (BiH) to Ljubovija (Serbia).
 - It is planned to construct a 400kV transmission line from Banja Luka (BiH) to Lika (Croatia) in 2032. The other project includes connecting TE Tuzla and Gradačac (BiH) with Đakovo (Croatia) by 400kV transmission line, with a planned year of

⁴⁵ Euronatur Stiftung, (2022, January 1st). Major blow to Bosnia hydropower project as Germany's KfW drops financing plans. Retrieved from <https://www.euronatur.org/en/what-we-do/news/major-blow-to-bosnia-hydropower-project-as-germanys-kfw-drops-financing-plans>

⁴⁶ Bankwatch Network, (n.a.). Ulog and Upper Neretva hydropower plants, Bosnia and Herzegovina. Retrieved from <https://bankwatch.org/project/ulog-and-upper-neretva-hydropower-plants-bosnia-and-herzegovina>

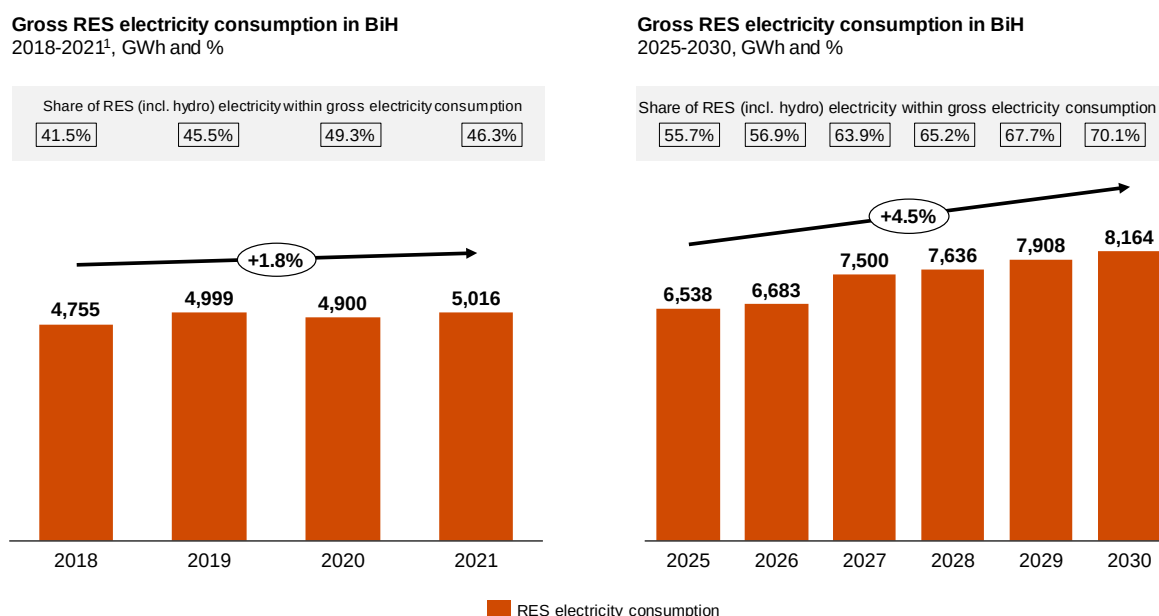
⁴⁷ Reuters, (2024, June 26th). Activists say Bosnian dam threatens river life and rafters. Retrieved from <https://www.reuters.com/business/environment/activists-say-bosnian-dam-threatens-river-life-rafters-2024-06-25/>

commissioning being 2032. Both projects are planned in coordination with Croatia.

These projects underscore Bosnia and Herzegovina's efforts to modernize its power infrastructure, enhance grid reliability, and meet growing energy demand while increasing the share of RE in its national energy mix.

The draft NECP for Bosnia and Herzegovina, submitted in June 2023, sets out the expected growth trajectory for gross electricity consumption sourced from renewable energy sources until 2030. In 2021, electricity consumption sourced from renewable energy sources (including hydro) accounted for 46.3% of the total gross electricity consumption. By 2030, this share is projected to rise to 70.1%, meeting the Energy Community's 2030 target for the share of electricity consumption sourced from renewable energy sources with hydro considered. However, the gap of 23.8% between the share in 2021 and the target in 2030 presents a serious challenge for the gross electricity consumption sourced from renewable energy sources in BiH in the upcoming years. The mentioned challenge and projections suggest a favorable landscape for PPAs, given their potential to play a pivotal role in facilitating the significant rise in RE generated and subsequently consumed electricity.

Figure 22 Historical and projected RES electricity consumption in Bosnia and Herzegovina



1) Due to the lack of data for 2022, Gross RES electricity consumption is analyzed until 2021

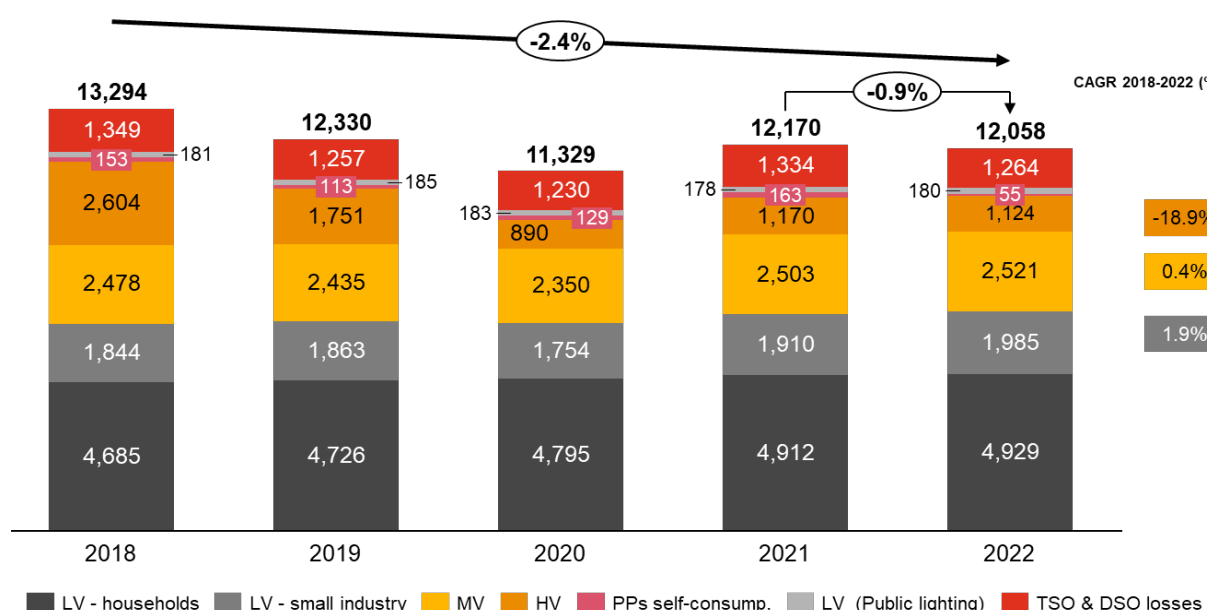
Source: NECP for Bosnia and Herzegovina, Eurostat, PwC Analysis

In Bosnia and Herzegovina, the customer segment with the highest consumption for the period from 2018 to 2022 was the household segment, with a range from 35% to 42% of total share in electricity consumption per different segments. However, HV customers' consumption decreased at a 18.9% CAGR from 2018 to 2022, while MV customers' consumption slightly rose by a 0.4% CAGR. The considerable decline in HV customer consumption from 2018 to 2022 may diminish the attractiveness of PPAs, requiring strategic adaptations to accommodate the decreased demand within this segment.

Moreover, the decline in HV electricity consumption in 2020 is mostly due to the cessation of operations at Aluminium Mostar company, while the decrease from 2021 to 2022 is attributed to the reduced consumption of major electricity consumers in Bosnia and Herzegovina: ArcelorMittal Zenica d.o.o. in Zenica, B.S.I. d.o.o. in Jajce, and R-S Silicon d.o.o. in Mrkonjić Grad, with reductions of 15.3%, 3.2%, and 0.5%, respectively.

Figure 23 Electricity consumption per customer segment in Bosnia and Herzegovina

Consumption per customer segment, 2018-2022, GWh



Source: SERC Annual Reports (2018-2022), PwC analysis

For a detailed list of electricity consumption per customer segment, along with the number of customers per customer segment, electricity consumption by sectors and electricity consumption by major industrial consumers, please see the Appendix.

3.2.2. Electricity prices

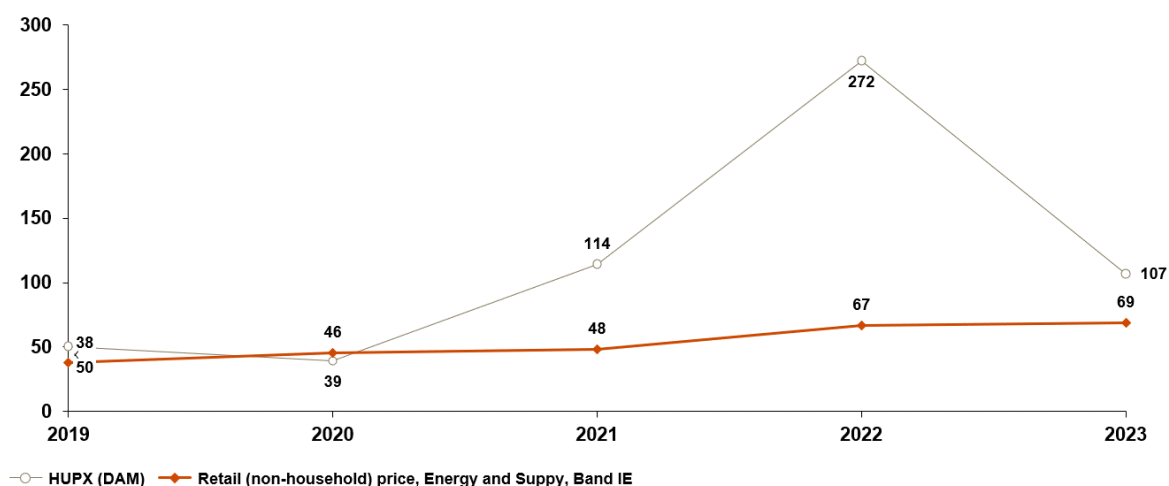
During the observed period (from 2019 to 2023), there was a 82% increase in retail (non-household) prices⁴⁸ in Bosnia and Herzegovina, a growth rate much lower than in some other Contracting Parties (CPs) such as Georgia, Serbia, and North Macedonia. This suggests government intervention in electricity pricing, potentially hindering the PPA landscape due to limited market liberalization and predominant government control. An exemption could arise with the entry of major industrial players from Western or developing countries with substantial demand levels.

As illustrated in the figure below, from 2021 to 2023, Hungarian Power Exchange (HUPX) average daily baseload prices on DAM consistently exceeded retail (non-household) prices in Bosnia and Herzegovina, with the most notable difference reaching 205 €/MWh in 2022. However, the distinction between the mentioned prices significantly decreased in 2023 and reached 38 €/MWh in price difference.

⁴⁸ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

Figure 24 Overview of wholesale and retail electricity prices in Bosnia and Herzegovina

Wholesale and retail electricity prices in BiH from 2019 to 2023 (€/MWh)



Source: HUPX Annual Reports (2019-2022), Eurostat, PwC analysis

3.2.3. Supply options and incentive mechanisms

In Bosnia and Herzegovina, the RE sector is evolving towards a more structured and incentivized framework, like trends observed in other European nations. The Federation of Bosnia and Herzegovina (FBiH) has recently updated its legal framework to foster the integration of RE through a system of auctions. These mechanisms aim to encourage investment in RE technologies by providing financial incentives.

Bosnia and Herzegovina, specifically the Federation of Bosnia and Herzegovina (FBiH), plans to develop its RE sector through the introduction of RE auctions. Specifically, Federation of Bosnia and Herzegovina (FBiH) aims to launch auctions for large wind and solar power projects totaling 240 MW, along with supporting smaller PV, biomass and biogas facilities combining for additional 61.2 MW for the period 2025-2030. This initiative is part of a broader legislative framework, the Law on the Use of RES and Efficient Cogeneration, which also introduces the concept of prosumers and energy cooperatives, allowing individuals and communities to produce and sell RE.

The auctions are divided into two types: Feed-in-Tariffs (FiTs) and Feed-in-Premiums (FiPs). The FiT system is designed to support smaller renewable projects such as small wind farms and solar installations, allowing them to benefit from fixed purchase prices over specific periods. This not only makes these projects financially viable, but also attractive to investors looking for stable returns. On the other hand, FiPs offer a supplementary payment over the market price to the energy producers from larger installations, ensuring financial stability and further incentivizing the shift towards RES. Details for legal framework of FiTs are further assessed in the Legal section. These auctions will be conducted by the Operator for RES and Efficient Cogeneration and are planned to occur at least once every two years for each technology category⁴⁹.

Additionally, Republika Srpska (entity in BiH) has in 2022 adopted a new law that introduces auctions for premiums for the construction of power plants. Under this new legislation, smaller power plants will continue to operate under the existing subsidy system. This includes small hydropower plants, ground-mounted solar power plants, and wind farms with an installed

⁴⁹ Federation of Bosnia and Herzegovina, (2023). Law on the use of RES and efficient cogeneration. Official Gazette of the Federation of Bosnia and Herzegovina

capacity of up to 150 kW, as well as rooftop solar, biomass, and biogas power plants with a capacity of up to 500 kW. These plants will continue to benefit from feed-in-premiums or guaranteed purchase prices. In contrast to that, all power plants with a larger capacity (up to 50 MW) will be able to receive subsidies through auctions for premiums that will be conducted every two years.⁵⁰

However, the first boost that the renewable energy sector in Bosnia and Herzegovina experienced was prompted by the laws that were in place before the ones mentioned above. In both entities, FBiH and RS (entities in BiH), electricity generated from renewable sources was promoted through feed-in-tariffs, with RS also offering premiums for electricity produced from RES. In FBiH, the tariffs were guaranteed for 12 years, while in RS they were guaranteed for 15 years.⁵¹

This structured approach not only promotes the integration of RE into the national grid but also aligns with EU standards and energy policies, aiming to boost the share of renewables in Bosnia and Herzegovina's energy mix.

Moreover, Bosnia and Herzegovina is focusing on strengthening the bilateral electricity market to support the integration of RE. Efforts are underway to establish systems that can handle real-time or near-real-time trading and adjustments in electricity supply and pricing⁵². Moreover, there is a significant push to improve XB electricity trading capabilities. This effort involves enhancing the physical and regulatory infrastructure necessary for XB electricity flows, which is essential for balancing the variability introduced by higher shares of RE. Improved XB connections also help stabilize the electricity market by allowing Bosnia and Herzegovina to participate more actively in the regional energy market, offsetting periods of low domestic generation with imports and vice versa⁵³.

While the new laws which mention auction systems in Bosnia and Herzegovina provide a structured approach to RE development, the success of PPAs in this context is not guaranteed. Effective implementation of the law, a supportive regulatory environment, stable market conditions and robust infrastructure are all crucial for creating favorable environment for PPAs. Moreover, ongoing political and economic stability will be essential to attract and maintain investment in RE through PPAs. Thus, while the outlook is cautiously optimistic, all these factors must align to realize the full potential of PPAs in advancing BiH's RE goals.

3.2.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot

⁵⁰ Balkan Green Energy News. (2022 February 17th). Republic of Srpska adopts new law on renewable energy sources. Retrieved from <https://balkangreenenergynews.com/republic-of-srpska-adopts-new-law-on-renewable-energy-sources/>

⁵¹ United Nations Development Programme. Renewable Energy Snapshot: Bosnia and Herzegovina. Retrieved from <https://www.undp.org/sites/g/files/zskgke326/files/migration/eurasia/19419ac2cd1e24c4213195961507c68ab5abf39a0758f3db1b6ba58f394d19c1.pdf>

⁵² World Bank, (26 March 2024). Bosnia and Herzegovina's continued progress requires more economic and energy reforms. Retrieved from <https://www.worldbank.org/en/news/press-release/2024/03/26/bosnia-and-herzegovina-s-continued-progress-requires-more-economic-and-energy-reforms>

⁵³ International Monetary Fund. (19 March 2024). Bosnia and Herzegovina: Concluding statement of the 2024 Article IV consultation mission. Retrieved from <https://www.imf.org/en/News/Articles/2024/03/19/cs31924-bosnia-and-herzegovina-concluding-statement-2024-article-iv-consultation-mission>

markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

Bosnia and Herzegovina still lacks some fundamental pre-requisites in place to meet the fundamental criteria necessary for implementing PPA.

In Bosnia and Herzegovina, the wholesale electricity market lacks the robustness necessary to support virtual cPPA settlements effectively. The market is primarily controlled by three public monopolies: Elektroprivreda BiH (EPBiH, Sarajevo area), Elektroprivreda RS (ERS) and Elektroprivreda HZ HB (EPHZHB), which dominate generation and distribution. There is no power exchange, organized DA or ID market yet. The absence of these markets limits the ability to provide sleeving options or access to spot markets, both of which are essential components for a functional cPPA framework.

Wholesale market in BiH consist of bilateral, and balancing market (since 2016). Bilateral market is not fully institutionalized (no market operator or power exchange). The total of 18 entities participated on bilateral market in 2022 and traded 2,180 GWh under the internal market transactions, with state-owned companies dominating the wholesale market, namely EPBiH at 42%, ERS at 9%, and EPHZHB at 18% of the total traded volume on the wholesale bilateral market in 2022. However, both FBiH and the Republic of Srpska, the two entities of Bosnia and Herzegovina, have concurred that setting up the electricity exchange must be prioritized. Their respective ministers have pledged to exert maximum effort to finalize Bosnia and Herzegovina's electricity law, with a primary focus on establishing the power exchange⁵⁴.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "PaP" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all MV and HV consumers are using smart meters already, therefore, there is no limitation for PPA. In Bosnia, a smart metering system is partially established, though the specific number of smart meters is not publicly disclosed. Major industrial entities have adopted smart metering systems, and the majority of MV level consumers already have smart meters installed.

Details of each CP market player and market interaction can be found in the Appendix and Legal section of the document.

⁵⁴ Balkan Green Energy News. (29 February 2024). BiH entities agree that establishing power exchange is priority. Retrieved from <https://balkangreenenergynews.com/bih-entities-agree-that-establishing-power-exchange-is-priority/>

Figure 25 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022 ¹	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivnos BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2 TWh / n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energopro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh / n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh / 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektro distribucija DOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkivoblenergo*	UEEX	✓	14.9 TWh / 81 (€/MWh)	✓	20.8 TWh / 83 (€/MWh)	✓	1657 GWh / 95 (€/MWh)	✓

Note: *State-owned entities, 1) Latest available data on the bilateral market in Bosnia and Herzegovina

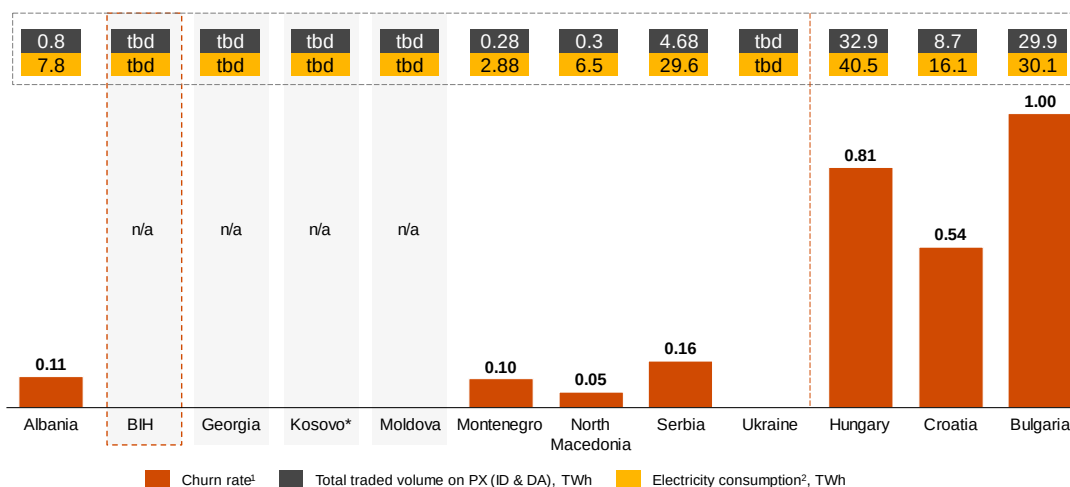
Source: PwC analysis

Apart from the assessing the existence of the Power exchange in contracting parties, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

As there is an absence of power exchange, organized day-ahead or intraday market in Bosnia and Herzegovina, the liquidity comparison for Bosnia and Herzegovina's organized market is not feasible. Hence, an assessment of liquidity of Bosnia and Herzegovina's power exchange will be attainable once the day-ahead market or intraday market becomes operational.

Figure 26 Overview of Contracting Parties and chosen SEE Power Exchanges

Power exchange liquidity in Contracting Parties and & SEE countries in 2023, ratio (traded volume/el. consumption)



Note 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

3.2.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

After conducting thorough desktop research and analyzing publicly accessible data, it has been observed that there has been an absence of publicly disclosed PPA deals in Bosnia and Herzegovina thus far. However, the list of existing and announced RES projects and developers can be found in the Appendix.

Key investors in the Contracting Party

The leading financial institutions in Bosnia and Herzegovina include both domestic and international commercial banks, such as NLB BiH, Nova Banka, and UniCredit BiH. Additionally, there are specialized entities like the EFT, which focuses on energy trading and investment in energy infrastructure. The country also has a local development bank, Razvojna Banka FBiH, and benefits from the involvement of the KfW Development Bank and the European Bank for Reconstruction and Development (EBRD), which provided a EUR 20 million loan to Elektroprijenos BiH in 2022 for the purpose of upgrading its transmission grid⁵⁵. Furthermore, the Appendix includes additional examples of financing energy projects within the CP.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

BiH has not established a cap-and-trade mechanism in line with EU ETS to internalize the cost of carbon emissions. In this context BiH has not transposed the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022.⁵⁶

Additionally, BiH has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to

⁵⁵ The European Bank for Reconstruction and Development. (12 April 2022). EBRD lends €20 million to upgrade Bosnia's electricity transmission grid. Retrieved from <https://www.ebrd.com/news/2022/ebrd-lends-20-million-to-upgrade-bosnias-electricity-transmission-grid-.html>

⁵⁶ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average emission factors by default. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.⁵⁷

In Bosnia and Herzegovina, 20% of the total electricity generated within the country from 2011 to 2020 was exported to EU countries. At the same time 63% (2020-2022) of the electricity produced in the country comes from coal (mostly lignite) which would make it subject to Carbon Border Adjustment Mechanism (CBAM). For this reason, BiH will be heavily exposed to the introduction of CBAM.⁵⁸

Bosnia and Herzegovina has partially aligned with the EU's Renewable Energy Directive II (RED II), which is a crucial step towards harmonizing its RE policy with EU standards. Additionally, the country has not yet fully established market coupling or an effective ETS at levels comparable to the EU ETS, which are essential for CBAM exemption⁵⁹.

Overall, while Bosnia and Herzegovina is making strides towards CBAM readiness, significant legislative and regulatory efforts are still needed to meet all the EU's conditions for exemption from CBAM.

Figure 27 Overview of CBAM and PPA connection per Contracting Party

⁵⁷ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

⁵⁸ Euractiv (2023, February 6th). EU's carbon levy poses new test for Western Balkan integration. Retrieved from <https://www.euractiv.com/section/energy/news/eus-carbon-levy-poses-new-test-for-western-balkan-integration/>

⁵⁹ International Monetary Fund, (19 March 2024). Bosnia and Herzegovina: Concluding statement of the 2024 Article IV consultation mission. Retrieved from <https://www.imf.org/en/News/Articles/2024/03/19/cs31924-bosnia-and-herzegovina-concluding-statement-2024-article-iv-consultation-mission>

Analysis of CBAM and PPA connection in Bosnia and Herzegovina

Bosnia and Herzegovina		
Net electricity export/import ¹ (average 2021-2023, GWh)		1,956 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		63%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		2,865 GWh and 27%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	26%
	Food, beverages and tobacco	11%
	Non-ferrous metals	9%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Between 2020 and 2022, Bosnia and Herzegovina consistently operated as a net exporter of electricity, averaging 1956 GWh in exports per year. On average, 63% of the electricity generated during this period came from thermal power plants, which makes Bosnia and Herzegovina's electricity exports susceptible to upcoming CBAM regulations. This effect could be mitigated through utility PPAs, in which the electricity would be produced using only renewable energy, which is not subject to CBAM tax.

CBAM recommendations

Figure 28 Overview of CBAM recommendations in Bosnia and Herzegovina

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Adoption of Law on Climate Action	Yes	Law on Climate Action	BiH should prepare Law on Climate Action and incorporate national carbon pricing mechanism therein. Additionally, to transpose the MRVA package adopted at the EnC acquis with the 2022 Ministerial Council Decision.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	FBiH-RS-Brcko District Electricity Laws	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	FBiH-RS-Brcko District New RES Laws; New Decree on GOs	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. FBiH-RS-Brcko District New

RES Laws should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted.

In relation to this, FBiH-RS-Brcko District New RES Laws should be adopted to introduce the PPA agreements, and the necessary secondary legislation for operation of GOs register should be adopted in FBiH-Brcko District. Both have already been explained above in this report.



3.3.

Georgia

3.3.1. Overview of RES electricity supply & demand

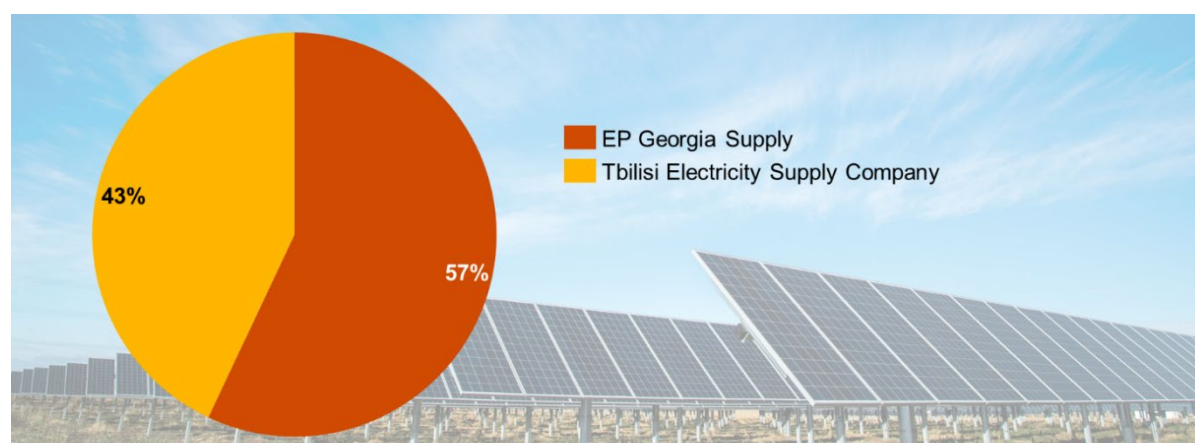
This section covers electricity supply and demand trends in Georgia, examining both existing and forecasted RE supply and consumption patterns. RES electricity supply in each market is critical for PPAs, as it ensures there is sufficient generation capacity to meet consumer demand under long-term RE procurement contracts. Furthermore, the section includes insights into corresponding generation development scenarios outlined in the NECP and additional strategies. It also provides a comprehensive analysis and commentary on RES nominations.

Lastly, electricity consumption by key customer segments is discussed. RES electricity demand in each market is crucial for PPAs, as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

As depicted in the figure below, electricity retail supply market in Georgia is divided between two electricity suppliers (unbundled in 2021), namely EP Georgia Supply and Tbilisi Electricity Supply Company, which are appointed as universal service suppliers (household consumers and small enterprises), electricity public service providers (for other customer categories) and suppliers of last resort in their respective territories. The retail market is to be deregulated by July 2025, according to the schedule in the Concept of Electricity Market Model. Mentioned electricity suppliers are regional and incumbent companies with a combined share of 100% of the total end-user supply.

Moreover, in accordance with the Concept of Electricity Market Model, market liberalization process, which started in 2020 and will take place in the following years including 2026, entails the opening of the market and transition to the wholesale and retail competitive market of both the supply and consumption sides. Georgia did not declare a state of emergency in its energy sector in response to the war of aggression against Ukraine, unlike some other Contracting Parties, as mentioned in report.

Figure 29 Overview of Georgian electricity supply in 2022



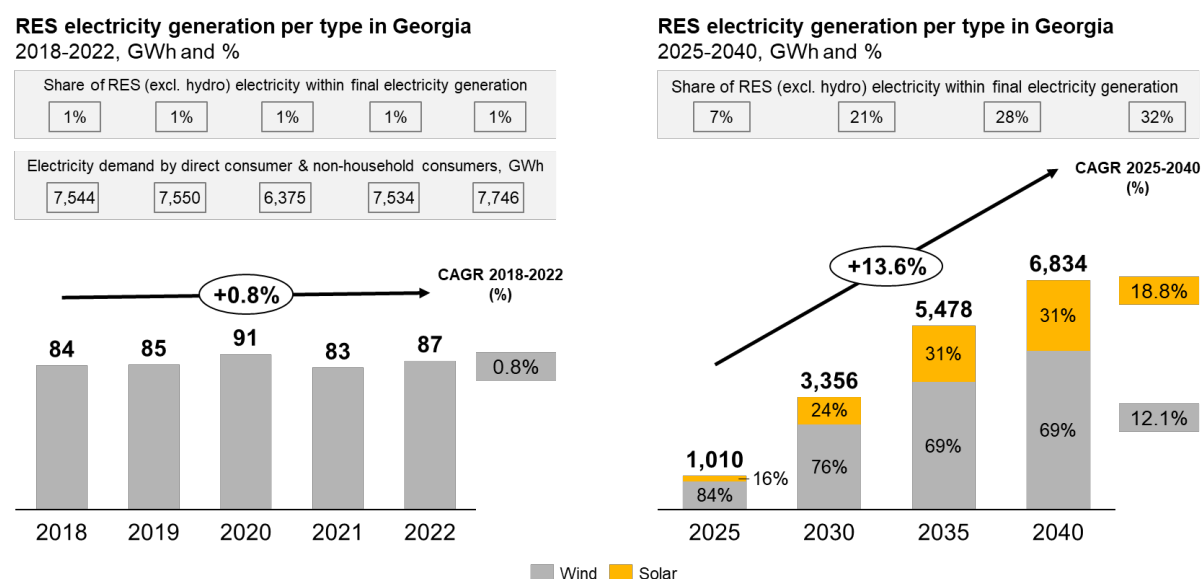
Source: GNERC Annual Report (2022), PwC Analysis

According to the Georgian WAM (NECP) scenario⁶⁰ with additional measures within NECP and the Respective development scenario within NECP; projection for RES electricity (excluding hydro) to constitute 32% of total electricity generation by 2040, supported by a substantial increase in installed RES capacity to 2.62 GW, predominantly from wind technology, represents a significant leap from the current 1% share of electricity generation. This growth, alongside the expectation for RES (excluding hydro) capacity to comprise 33%

⁶⁰ In Georgian NECP, WAM scenario is also referred as the NECP scenario (i.e. WAM and NECP scenario are used interchangeably)

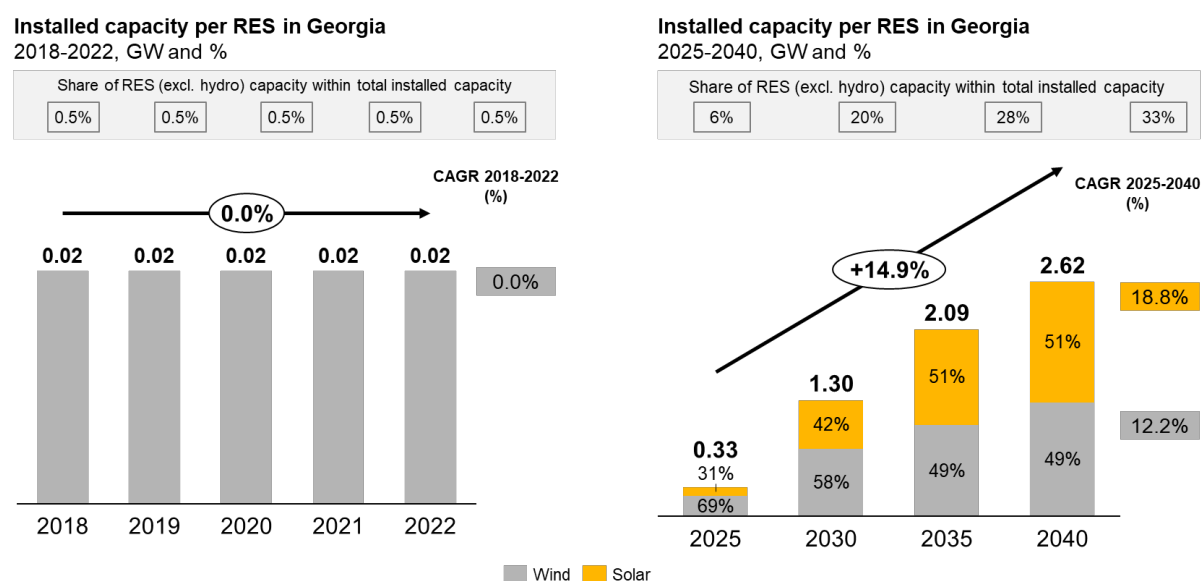
of the total installed capacity, up from 0.5% in 2022, indicates a robust and favorable market for PPA, reflecting a strong commitment to renewable energy development.

Figure 30 Historical and projected RES electricity generation in Georgia



Source: Georgian NECP, GNERC Annual Reports (2018-2022), PwC analysis

Figure 31 Historical and projected RES installed capacity in Georgia



Source: Georgian NECP, GNERC Annual Reports (2018-2022), PwC analysis

The Compound Annual Growth Rate (CAGR) of 0.0% in RES capacity (excluding hydro) from 2018 to 2022, indicates no changes in RES installed capacity during the mentioned period. However, as per WAM scenario current situation is about to change, and RES proportion of total installed capacity (excluding hydro) is projected to increase from 0.02 GW in 2022 to 2.62 GW in 2040. This growth supports the potential for Power Purchase Agreements by providing a steadily increasing sustainable energy supply. According to Georgian NECP, RES capacity is forecasted to grow at 14.9% CAGR from 2025 to 2040, comprising 33% of the total installed capacity by 2040.

As pointed, in 2022, Georgian installed RES capacity (excluding hydro) was 0.02 GW. According to projections in the National Energy and Climate Plan (NECP), this is expected to increase to 2.62 GW by 2040, revealing a gap of 2.6 GW. Out of this gap, according to NECP's

plan, government-supported RES capacities will account for 0.4 GW, leaving 2.2 GW of RES capacities potentially available for Power Purchase Agreements.

In Georgia, Contracts for Difference (CfDs) are set to function similarly to Power Purchase Agreements (PPAs) after the day-ahead market (DAM) becomes operational.

Planned energy infrastructure development

Georgia's energy infrastructure development⁶¹ is focused on enhancing the reliability, capacity, and integration of renewable energy sources within its national grid. Key projects include:

- **Upgrades and expansions:**
 - Upgrades are planned for existing substations like Tskaltubo 500. Specifically, for SS Tskaltubo 500, an extension of the existing Substation Tskaltubo 220 is planned, which includes the addition of a 500 kV switchyard and the installation of a 500/220 kV autotransformer. These enhancements are designed to significantly boost the substation's overall performance and ensure a more reliable electricity supply.
 - New substations such as SS Lajanuri and Ozurgeti are in development to support regional demand and integration of renewable energy sources.
- **New transmission lines:**
 - Development of key transmission lines such as 500 kV Lajanuri-Tskaltubo and 220 kV Namakhvani-Tvishi-Lajanuri to strengthen internal grid connectivity.
- **Renewable energy integration:**
 - Ongoing construction and planned integration of new hydropower plants aim to increase Georgia's self-sufficiency in renewable energy production.
 - Installation plans for additional wind and solar capacities by 2033 to diversify energy sources and reduce carbon emissions.
- **Grid modernization:**
 - Implementation of advanced grid technologies such as smart metering systems and upgraded control systems to enhance operational efficiency and reliability.
 - Continuous improvements in safety standards and environmental protection measures across all projects.
- **Interconnections with neighbouring countries:**
 - Enhancements in cross-border electricity trade capabilities with Azerbaijan, Armenia, Russia, Turkey, and potentially direct connections to the European grid through submarine cables.
 - Cross-border projects - initiatives like the Black Sea Submarine Cable Project aim to enhance international connections and provide a direct link to European electricity markets.

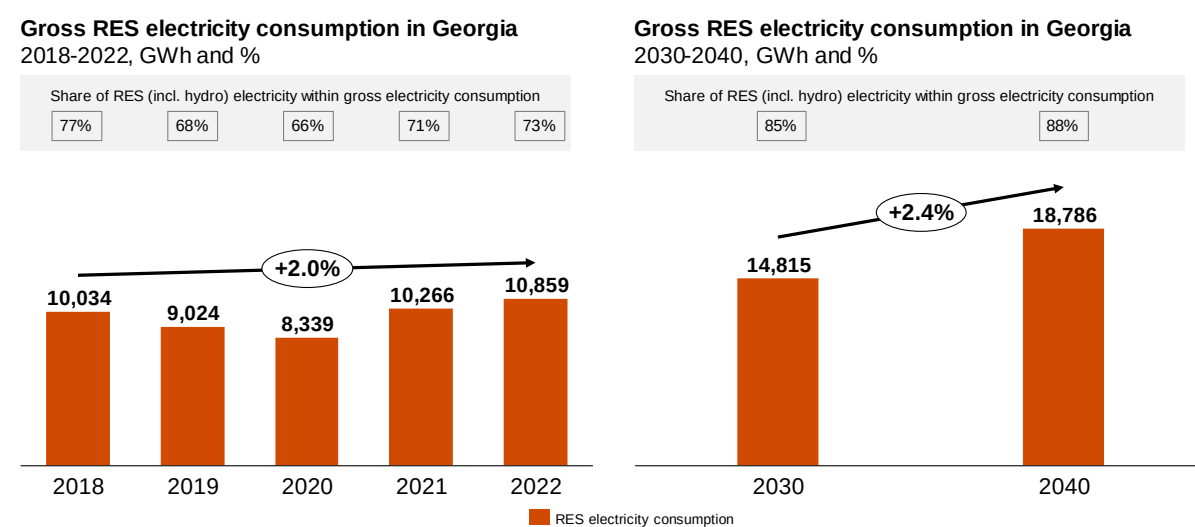
Georgia aims to improve energy security, stabilize regional power supplies, and increase the share of renewable energy in its grid. By 2033, these initiatives are expected to support not only local demands but also facilitate greater energy exports, leveraging Georgia's geographical position as a regional energy corridor. On the other hand, careful management

⁶¹ Georgian State Electrosystem. (2023). Ten-Year Network Development Plan of Georgia (2023-2033). Georgian State Electrosystem JSC

of technical and regulatory risks is essential to fully realize the benefits of Georgia's strategic enhancements to its energy infrastructure, which could significantly promote the implementation of PPAs by improving grid reliability and capacity.

The Georgian NECP, submitted in July 2023, sets out the expected growth trajectory for gross electricity consumption sourced from renewable energy sources until 2040. In 2022, electricity consumption sourced from renewable energy sources (including hydro) accounted for 73% of total gross electricity consumption. By 2030, this share is projected to rise to 85%, meeting the Energy Community's 2030 target of 85% for a share of electricity consumption sourced from renewable energy sources with hydro considered. However, the gap of 12 percentage points between the share in 2022 and the target in 2030 presents a serious challenge for the gross electricity consumption sourced from renewable energy sources in Georgia in the upcoming years. The mentioned challenge and projections suggest a favorable landscape for Power Purchase Agreements (PPAs), given their potential to play a pivotal role in facilitating the significant rise in renewable energy generated and subsequently consumed electricity.

Figure 32 Historical and projected RES electricity consumption in Georgia

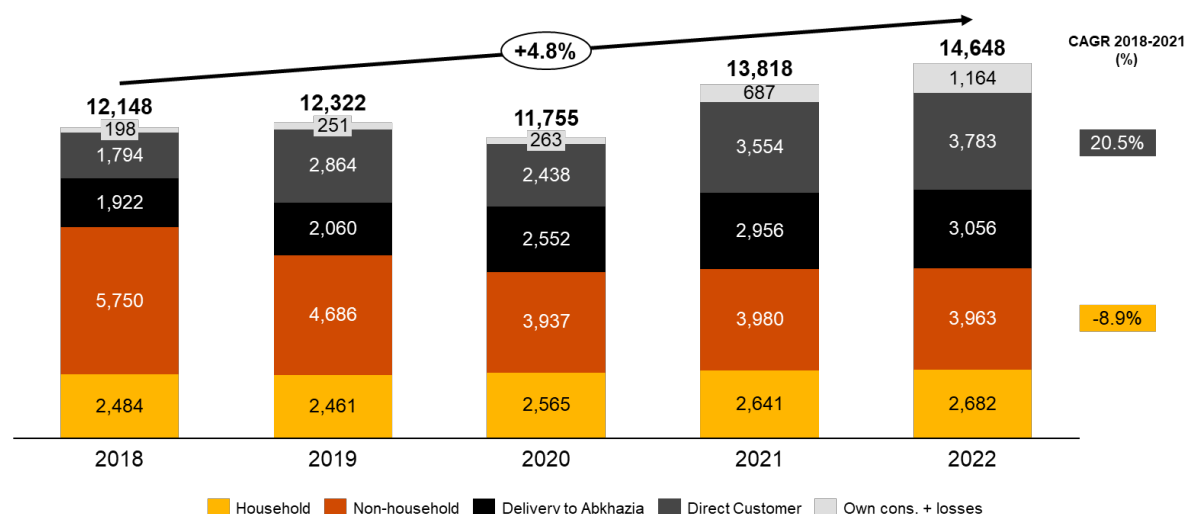


Source: Georgian NECP, JSC Georgian State Electro system, PwC Analysis

In Georgia, the customer segment with the highest consumption for the period from 2018 to 2022 was the non-household segment, with a range from 27% to 47% of total share in electricity consumption per different segments. Furthermore, direct consumers' (granted the status of large consumers since 2021) consumption increased at 20.5% CAGR from 2018 to 2022. The considerable rise in large consumers' consumption from 2018 to 2022 presents a favorable environment for PPA utilization.

Figure 33 Electricity consumption per customer segment in Georgia

Consumption per customer segment 2018-2022, GWh



Source: GNERC Annual Reports (2018-2022), PwC analysis

For detail list of electricity consumption per customer segment accompanied by a number of customers per customer segment, electricity consumption by sectors, and electricity consumption by major industrial consumers, please see appendix.

3.3.2. Electricity prices

During the observed period, retail (non-household) electricity prices in Georgia increased by 122%⁶², representing one of the highest price surges alongside Serbia and North Macedonia. Unlike these Contracting Parties, where governments implemented measures to regulate electricity prices—such as declaring a state of emergency in North Macedonia and several interventions in Serbia—no such measures were taken in Georgia. Therefore, it can be concluded that the price surge in Georgia, despite the lack of regulatory actions, is comparable to that in the Contracting Parties with significant government interventions.

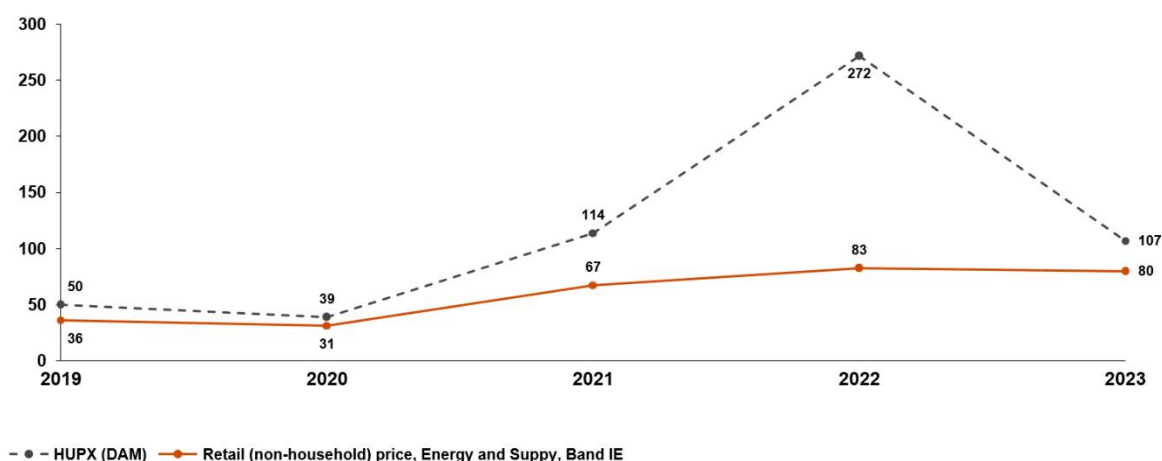
As illustrated in the figure below, from 2019 to 2023, Hungarian Power Exchange (HUPX) average daily baseload prices on DAM consistently exceeded retail (non-household) prices in Georgia, with the most notable difference reaching 189 €/MWh in 2022. However, the distinction between the mentioned prices significantly decreased in 2023 and reached 27 €/MWh in price difference.

Georgia currently lacks an operational power exchange, complicating the implementation of power purchase agreements (PPAs) within the country. This absence reduces transparency in electricity pricing and limits flexible trading opportunities, which are crucial for the effectiveness and appeal of PPAs. Historically, retail non-household electricity prices in Georgia have been lower than wholesale proxy prices, as indexed by HUPX (Hungarian Power Exchange). However, in 2023, this price difference significantly decreased, creating a less favorable economic environment for non-household consumers. Paradoxically, this development could create potential opportunities for PPAs. As traditional electricity costs become less predictable and potentially more expensive, PPAs could offer a more stable and cost-effective alternative, especially if tied to competitive renewable energy pricing. This could spark greater interest and investment in renewable projects, promoting a shift towards more sustainable energy solutions in Georgia.

⁶² Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

Figure 34 Overview of wholesale and retail electricity prices in Georgia

Wholesale and retail electricity prices in Georgia from 2019 to 2023 (€/MWh)



Source: HUPX Annual (2019-2022), Eurostat, PwC analysis

3.3.3. Supply options and incentive mechanisms

In 2023, the Georgian government took a significant step in improving its renewable energy sector by holding its first auction for renewable energy projects. This auction was part of a broader strategy to enhance Georgia's energy independence and transition towards more sustainable energy sources. The auction resulted in the selection of 24 companies for projects that span solar, wind, and hydropower, reflecting a high interest from investors, with applications submitted for 1200 MW of installed capacity despite the auction calling for only 300MW⁶³.

In the second auction, which concluded in February 2024, successful bidders were granted 800 MW of installed capacity. Notably, there were 147 applications totaling 1877 MW of capacity submitted, indicating even greater interest compared to the first auction. Of the awarded capacity, 400 MW were allocated to various kinds of hydropower plants.⁶⁴

These renewable energy auctions are designed to foster competition and attract investment by offering financial incentives such as contracts for difference (CfDs). Under a CfD, the government commits to paying the energy producer the difference between the market price and a fixed strike price, which provides a stable revenue stream and encourages investment. This auction mechanism aligns with international energy market trends and supports the integration of sustainable energy sources into the national grid⁶⁵.

In Georgia, the implementation of feed-in tariffs (FiTs) for renewable energy is designed to support the deployment and integration of various renewable energy technologies including solar, wind, and biomass. These FiTs ensure that energy producers receive a guaranteed price for the electricity they generate from renewable sources, which is critical for encouraging investment and ensuring financial viability of renewable energy projects.

⁶³ Ministry of economy and sustainable development of Georgia (2023, April 28th). First Auction on Power Generation Capacity of Renewable Sources by Power Stations Revealed 24 Winner Companies. Retrieved from <https://www.economy.ge/index.php?page=news&nw=2222&s=ganaxlebad-wyaroebidan-eleqtrosadguris-mier-eleqtroenergiis-warmoebis-simdzlavis-pirvel-augcionshi-24ma-kompaniam-gaimarjva&lang=en>

⁶⁴ Ministry of economy and sustainable development of Georgia (2024, February 2nd). Retrieved from: <https://www.economy.ge/index.php?page=news&nw=2457&s=ekonomikisa-da-mdgradi-ganvitarebis-saministroshi-simdzlavis-meore-augcionze-1877-mqvt-simdzlavis-147-proeqti-shemovida>

⁶⁵ European Bank for Reconstruction and Development (EBRD). (2019). Support for the Implementation of Renewable Energy Auctions in Georgia. Retrieved from <https://www.ebrd.com>

The Ministry of economy and sustainable development of Georgia oversees these incentives, aligning them with broader national energy goals such as enhancing energy security, reducing dependence on imported fuels, and promoting environmental sustainability. Georgia's FiTs provide long-term contracts that not only stabilize investment returns but also foster both local and international investment in the renewable sector.

The tariff rates provided for the non-household sector in Georgia vary by voltage levels and are inclusive or exclusive of VAT. For the highest voltage category (110-35 kV), the tariffs are around €0.0743 per kWh excluding VAT and €0.0876 per kWh including VAT. For intermediate voltages (10-6-3.3 kV), the costs are slightly higher, at approximately €0.0811 per kWh excluding VAT and €0.0957 per kWh including VAT. For the lowest voltage (0.4 kV), the tariffs are the highest at approximately €0.0840 per kWh excluding VAT and €0.0991 per kWh including VAT. Tariffs are offered by EP Georgia Supply and Tbilisi Electricity Supply Company.⁶⁶

This initiative is not only about enhancing domestic energy production but also about positioning Georgia as a green energy supplier to Europe, leveraging its strategic geographic and natural resources. This effort is supported by international financial institutions, including the European Bank for Reconstruction and Development (EBRD), which provides technical assistance and financial backing to ensure the success and expansion of Georgia's renewable energy capabilities.⁶⁷

3.3.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

In 2022, Georgia's wholesale electricity market primarily operated through direct contracts and a balancing market, managed by the Electricity Market Commercial Operator (ESCO). A significant volume of electricity, totaling 15,485 GWh, was traded under these contracts, with an additional 3,197 GWh sold on the balancing market. This setup highlights the market's reliance on structured trading mechanisms to manage electricity distribution and ensure system stability.⁶⁸

The wholesale electricity power exchange in Georgia is currently undergoing significant changes as part of broader efforts to liberalize and integrate with European energy markets. The market is still in a transitional phase, with electricity production largely regulated until 2027. This gradual opening includes plans for the deregulation of smaller hydropower plants (below 75 MW) starting in May 2024, signaling a move towards more market-driven dynamics⁶⁹. Additionally, Georgia is currently working towards implementing operational day-ahead and intraday electricity markets. The full implementation of these markets, along with balancing and ancillary services markets, is scheduled for July 1, 2025. This initiative is part

⁶⁶ Georgian National Energy and Water Supply Regulatory Commission. (n.d.). Tariffs. Retrieved from <https://gnerc.org/en/tariffs/tariffs2?formsubmit=1&company=&sector=1>

⁶⁷ Chambers and Partners. (2023). Plans to grow renewable energy in Georgia. Retrieved from <https://chambers.com/legal-trends/plans-to-grow-renewable-energy-in-georgia>

⁶⁸ Georgian National Energy and Water Supply Regulatory Commission. (2022). Annual Report 2022. Tbilisi: GNERC.

⁶⁹ EnC Implementation Report 2023

of a broader reform to open and liberalize the electricity market, aiming to align with European Union directives and increase market efficiency and competition⁷⁰.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "pay-as-produced" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all MV and HV consumers are using smart meters already, therefore, there is no limitation for PPA. In Georgia, a smart metering system is partially established, though the specific number of smart meters is not publicly disclosed. It is expected that major industrial entities have adopted smart metering systems.

Details of each CP market player and market interaction can be found in the appendix and legal section of the document.

Figure 35 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023 ¹	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektro distribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-obleneergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State owned entities, 1) The Georgian Energy Exchange was established in 2019, but ID and DA markets are still not operational

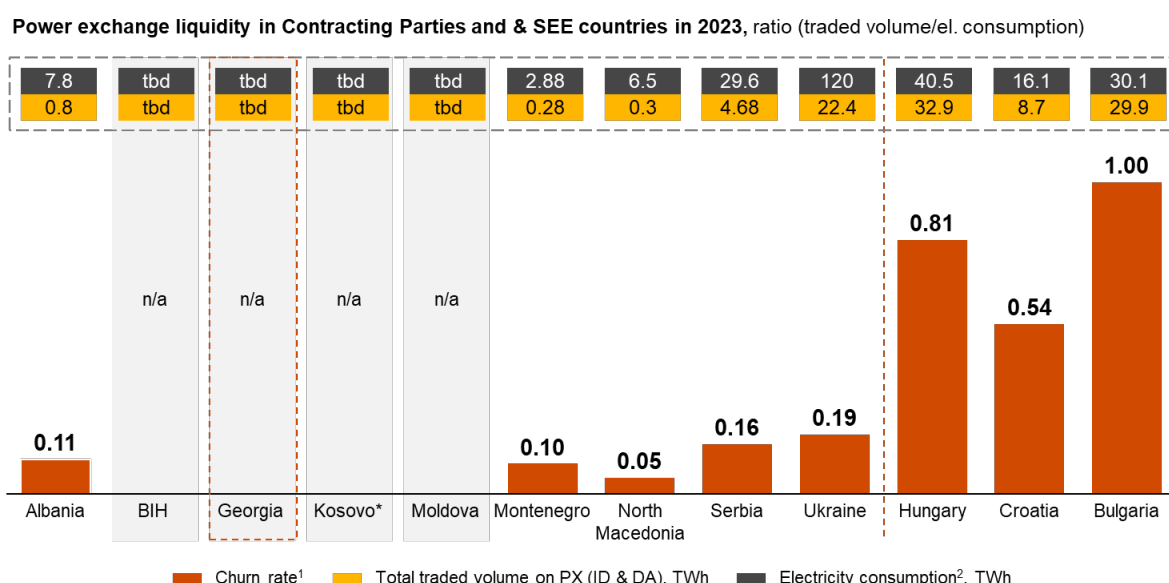
Source: PwC analysis

Apart from the assessing the existence of the Power exchange in contracting parties, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

⁷⁰ International Energy Agency. (n.d.). Georgia energy profile: Overview. Retrieved from <https://www.iea.org/reports/georgia-energy-profile/overview>

As there is an absence of power exchange, organized day-ahead or intraday market in Georgia, the liquidity comparison for Georgian organized market is not feasible. Hence, an assessment of liquidity of Georgian power exchange will be attainable once the day-ahead market or intraday market becomes operational.

Figure 36 Overview of Contracting Parties and chosen SEE Power Exchanges



Note 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: ALPEX Monthly Reports 2023 (April-December), MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.3.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each Contracting Party. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Based on publicly available data and thorough desktop research, as of 2024, there are no existing or announced Power Purchase Agreements (PPA) in Georgia that have been publicly disclosed. It is important to note that in 2017, following a recommendation by the International Monetary Fund (IMF), the Government of Georgia (GoG) ceased the issuance of new PPAs due to increased fiscal risks.

However, the list of existing and announced Renewable Energy Sources (RES) projects and developers can be found in the appendix.

Key investors in the Contracting Party

The leading financial institutions in Georgia comprise both domestic and international commercial banks, including entities such as Liberty Bank, TBC Bank, Basis Bank, Bank of Georgia, and EBRD. In more detail, the EBRD operates within the country, and has invested over EUR 5.1 billion across the 292 projects in energy, financial, infrastructure, and corporate sectors since the commencement of investing in Georgia.⁷¹ Furthermore, the appendix includes additional examples of financing energy projects within the Contracting Party.

⁷¹ The EBRD. (2024, February 29). Georgia data: EBRD projects in Georgia. Retrieved from <https://www.ebrd.com/georgia-data.html>

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

Georgia has not established a cap-and-trade system mechanism in line with EU ETS to internalize the cost of carbon emissions. Georgia is currently developing climate framework legislation that includes the carbon tax. Any form of credible carbon pricing requires robust emission data. In this context Georgia has not transposed the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022.⁷²

Additionally, Georgia has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

⁷² Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.⁷³

The introduction of CBAM will have significant implications for Georgia's trade with the EU, particularly for energy-intensive industries. Up to 97% of CBAM payments in Georgia are expected to come from fertilizers that are imported in EU.⁷⁴ This could affect their competitiveness unless balanced by domestic advancements in emission reductions and renewable energy adoption.⁷⁵ However, it's important to note that Georgia does not currently export electricity to EU countries, which means that the introduction of the Carbon Border Adjustment Mechanism (CBAM) won't have any direct impact on Georgia's electricity trade.

Overall, while the path toward CBAM exemption involves substantial regulatory and infrastructural challenges, it also provides an opportunity for Georgia to advance its environmental policies and integrate more closely with the EU's energy and environmental landscape.

Figure 37 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in Georgia

Georgia		
Net electricity export/import ¹ (average 2021-2023, GWh)		-97 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		23%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		3,344 GWh and 27%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	56%
	Non-metallic minerals	9%
	Chemical and petrochemical	9%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Since Georgia has no interconnection with the EU's internal energy market, CBAM will not directly impact electricity exports. However, Georgia could use the PPAs to transition its industry toward greater reliance on renewable energy sources, indirectly mitigating CBAM. The industry sector, particularly the iron and steel sub-sector, remains a significant consumer of electricity. By sourcing electricity for this category through PPAs, Georgian products could gain a competitive edge in EU markets, as they would either mitigate or avoid CBAM costs. Additionally, as it was already mentioned, it is expected that fertilizers, which are part of the Chemical and petrochemical sub-sector, are going to make 97%⁷⁶ of Georgia's CBAM payments from 2026 to 2035. This underscores the potential

⁷³ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

⁷⁴ Sudakov S. (2023, May 23th). Effects of the EU's CBAM on Eurasian Countries. Istanbul Journal of Economics. Retrieved from <https://iupress.istanbul.edu.tr/en/journal/ije/article/effects-of-the-eus-cbam-on-eurasian-countries>

⁷⁵ EEAS. (2023). Carbon Border Adjustment Mechanism. Retrieved from <https://www.eeas.europa.eu>

⁷⁶ Sudakov S. (2023, May 23th). Effects of the EU's CBAM on Eurasian Countries. Istanbul Journal of Economics. Retrieved from <https://iupress.istanbul.edu.tr/en/journal/ije/article/effects-of-the-eus-cbam-on-eurasian-countries>

benefits of PPAs for this industry, enabling a shift away from non-renewable sources and enhancing overall competitiveness.

CBAM recommendations

Figure 38 Overview of CBAM recommendations in Georgia

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Adoption of Law on Climate Change	Yes	Law on Climate Change	Incorporation of national carbon pricing mechanism with the Law on Climate Change. Additionally, to transpose the MRVA package adopted at the EnC acquis with the 2022 Ministerial Council Decision.
B – Options for actual indirect emissions based on PPAs			
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	Renewable Energy Law;	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted. In relation to this, Renewable Energy Law should be adopted to introduce the PPA agreements, and the necessary secondary legislation for operation of GOs register should be adopted. Both have already been explained above in this report.



3.4.

Kosovo*

3.4.1. Overview of RES electricity supply & demand

This section examines electricity supply and demand trends in Kosovo*, focusing on existing and forecasted RE supply and consumption patterns. The analysis includes insights into corresponding generation development scenarios from the NECP and additional strategies, as well as a comprehensive analysis and commentary on RES nominations. Additionally, it discusses electricity consumption by key customer segments.

RES electricity supply in each market is critical for PPAs, as it ensures sufficient generation capacity to meet consumer demand under long-term RE procurement contracts. On the other hand, RES electricity demand is crucial for PPAs, as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In 2022, electricity supply to final customers in Kosovo* was managed by the Kosovo Electricity Supply Company (KESCO), a privately-owned supplier with a universal service obligation. KESCO supplied customers at regulated prices⁷⁷ as well as those with unregulated prices, maintaining separate accounts for each⁷⁸. KESCO also operated as a billing organization (Limak-Çalik consortium). Despite the ability for customers to select their supplier, all except those on HV were supplied at regulated prices from KESCO. KESCO will continue as the universal service supplier for another year, effective from 1 April 2023. Additionally, the Kosovo Energy Corporation (KEK) was designated as the supplier of last resort for a three-year term starting 31 July 2022. From 24 June 2022, the electricity provider Elektrosever, a subsidiary of EPS, obtained a license to supply customers in four municipalities located in the northern region of Kosovo*. This license is valid for five years⁷⁹. Lastly, in 2022, Kosovo* had two operational electricity suppliers. With the exception of a single industrial customer, the incumbent supplier (KESCO) dominated the market, holding a 99.3% share of the total electricity sales to end customers⁸⁰.

Kosovo* was one of the CPs that declared a state of emergency in 2021, opting to offer direct financial aid to consumers through incumbent companies. Nonetheless, Kosovo* has raised the universal supply electricity tariff since the onset of the energy crisis. This increase has had a direct impact on a handful of industrial customers who are supplied at market rates, with some already experiencing payment delays. Notably, one of the largest industrial customers has temporarily ceased its operations⁸¹.

To assist businesses and industries in tackling high electricity prices, several measures have been undertaken in Kosovo*. On 22 November 2023, the Ministry of Economy in Kosovo* initiated a call for heating equipment targeted at small and medium-sized enterprises. The initiative aims to support approximately 1,000 businesses in implementing energy efficiency measures⁸². Moreover, Kosovo* is utilizing an EU grant (EUR 75 million for Kosovo*) for public calls to encourage firms to install solar power panels and solar thermal collectors. Micro, small and medium-sized enterprises will receive a subsidy of EUR 250 per kW for PV systems ranging from 3 kW to 9 kW, with a maximum payment of EUR 2,000 per beneficiary.

⁷⁷ ERO Annual Report (2022): Customers who are billed with regulated tariffs are customers connected to the voltage levels 35kV, 10kV and 0.4kV, while customers connected to the voltage level 220kV and those to 110kV are supplied with unregulated prices (market prices).

⁷⁸ ERO Annual Report (2022)

⁷⁹ Energy Community Secretariat (November 2023) Kosovo* Annual Implementation Report 2023

⁸⁰ ECRB Market Monitoring Report (2022)

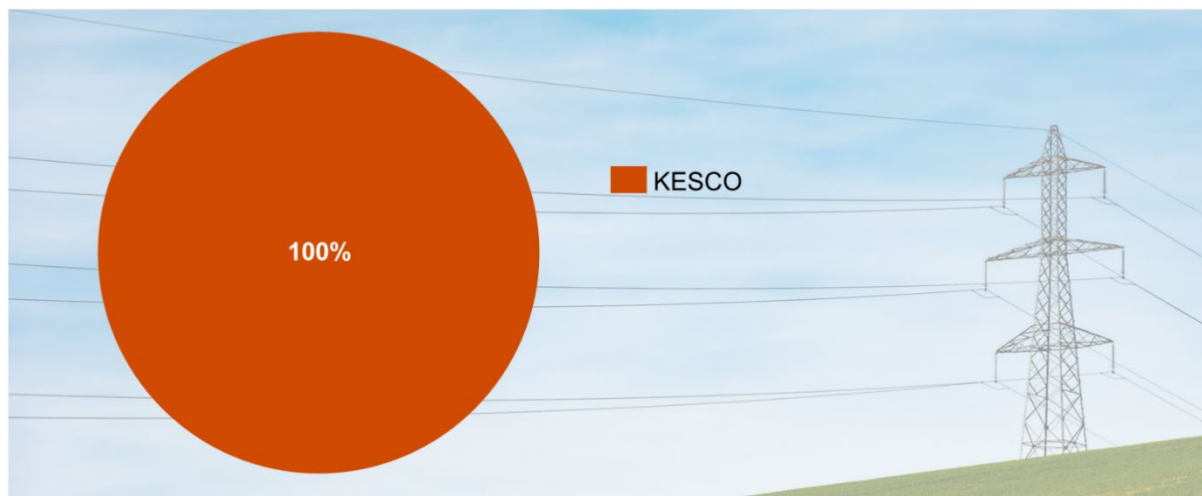
⁸¹ ECRB Impact of the energy crisis on electricity and gas price regulation in the Energy Community Contracting Parties (2023)

⁸² Europe House, (25 January 2024). The impact of the EU Energy Support Package in Kosovo. Retrieved from <https://www.europehouse-kosovo.com/energy-support-package-in-kosovo/>

Prosumers in the business sector with capacities of 10 kW and above will be eligible for a subsidy of EUR 200 per kW or up to a total of EUR 6,000⁸³.

Figure 39 Overview of Kosovo* electricity supply in 2022

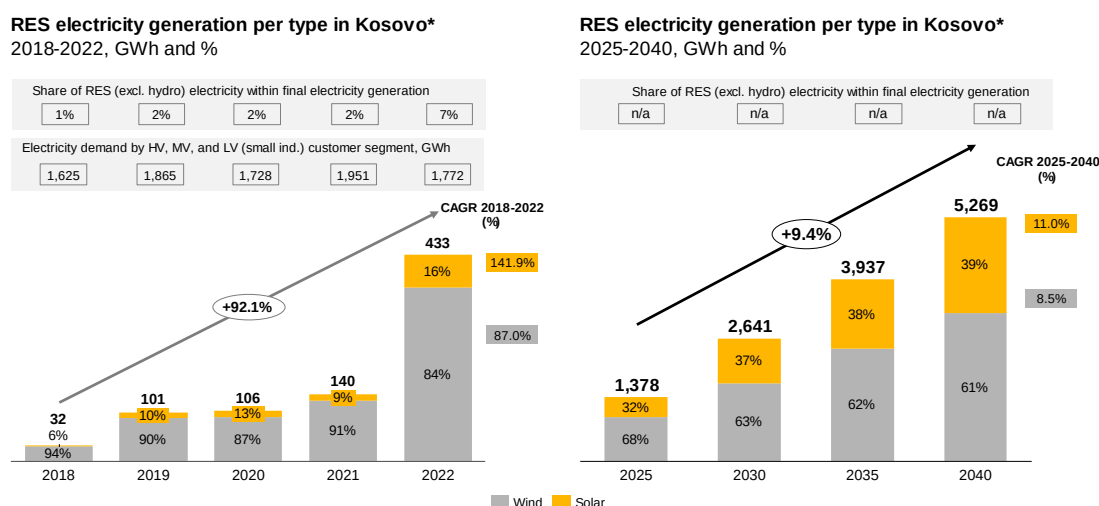
Electricity supply in Kosovo*2022, %



Source: ERO Annual Report (2022), PwC Analysis

According to the Estimated trajectory scenario within Kosovo* NECP; it is projected for RES electricity production to amount to 5,269 GWh (wind 3,195 GWh, solar 2,074 GWh) by 2040, however as the forecast of the total electricity generation is not incorporated in the Kosovo's* NECP, the share of RES electricity in generation in total electricity generation is not assessed. In more detail, a jump in RES electricity generation from 2022 (433 GWh) to 2040 is supported by a considerable increase in installed RES capacity, which is forecasted to amount to 2.84 GW in 2040 or 70% of total installed capacity in Kosovo*. A leap in RES (excluding hydro) installed capacity share from 9% in 2022 to 70% share in 2040 indicates a robust and favorable market for PPA, reflecting a strong commitment to renewable energy development.

Figure 40 Historical and projected RES electricity generation in Kosovo*



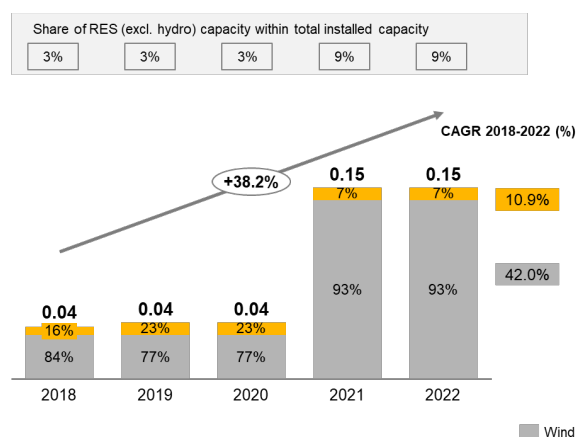
Source: Kosovo* NECP, ERO Annual Reports (2018-2022), PwC analysis

⁸³ Balkan Green Energy News. (7 February 2024). Kosovo* to subsidise solar panels for prosumers, solar thermal systems. Retrieved from <https://balkangreenenergynews.com/kosovo-to-subsidize-solar-panels-for-prosumers-solar-thermal-systems/>

Figure 41 Historical and projected RES installed capacity in Kosovo*

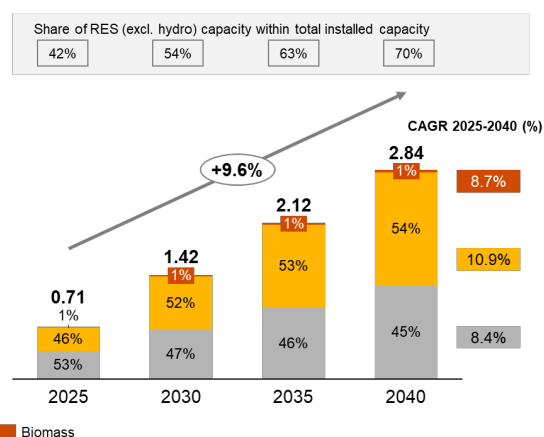
Installed capacity per RES in Kosovo*

2018-2022, GW and %



Installed capacity per RES in Kosovo*

2025-2040, GW and %



Source: Kosovo* NECP, ERO Annual Reports (2018-2022), PwC analysis

The Compound Annual Growth Rate (CAGR) of 38.2% in RES capacity from 2018 to 2022, primarily led by wind installations, increased RES's proportion of total installed capacity from 3% to 9%. This growth supports the potential for Power Purchase Agreements by providing a steadily increasing sustainable energy supply. According to Kosovo's* NECP, this upward trend is expected to continue, with RES capacity projected to grow at 9.6% CAGR from 2025 to 2040, comprising 70% of the total installed capacity by 2040.

As pointed, in 2022, Kosovo's* installed RES capacity was 0.15 GW. According to Estimated trajectory scenario in NECP, this is expected to increase to 2.84 GW by 2040, revealing a gap of 2.7 GW. Out of this gap, according to NECP, government-supported RES capacities will account for 1.7 GW in WEM scenario and 1.98 GW in WAM scenario, leaving 0.99 GW (WEM) and 0.71 GW (WAM) of RES capacities potentially available for Power Purchase Agreements. However, upon examining the projected RES capacities for the WEM and WAM scenarios in 2040, which stand at 2.67 GW and 2.85 GW respectively, there is a shift in the potential RES capacities available for PPA deals. Specifically, the RES capacities potentially available for PPA deals amount to 0.82 GW in the WEM scenario and 0.72 GW in the WAM scenario.⁸⁴

Planned energy infrastructure development

Kosovo's* strategic plan for the development of its transmission system from 2023 to 2032 includes key investments aimed at enhancing the robustness and efficiency of the national grid. These investments are designed to support the integration of RES, ensure stability and improve the reliability of the electrical grid across the country. Here are some of the primary projects and initiatives outlined in the Development Transmission Plan⁸⁵:

• Upgrades to existing substations:

- TS 400/110/35 kV Pristina 2: Reconstruction to enhance reliability and capacity due to ageing infrastructure and increased demand.

⁸⁴ The outlined differences in RES capacity potentially eligible for PPA deals per WEM and WAM scenario occur due to different projected values of RES installed capacity in Estimated trajectory, WEM, and WAM scenario, as well as due to the fact that the Policy and measures section within NECP makes a distinction between WEM and WAM policies and measures

⁸⁵ KOSTT, (2022). Plani Zhvillimor i Transmetimit 2023-2032. Office of Long-Term Planning and Development.

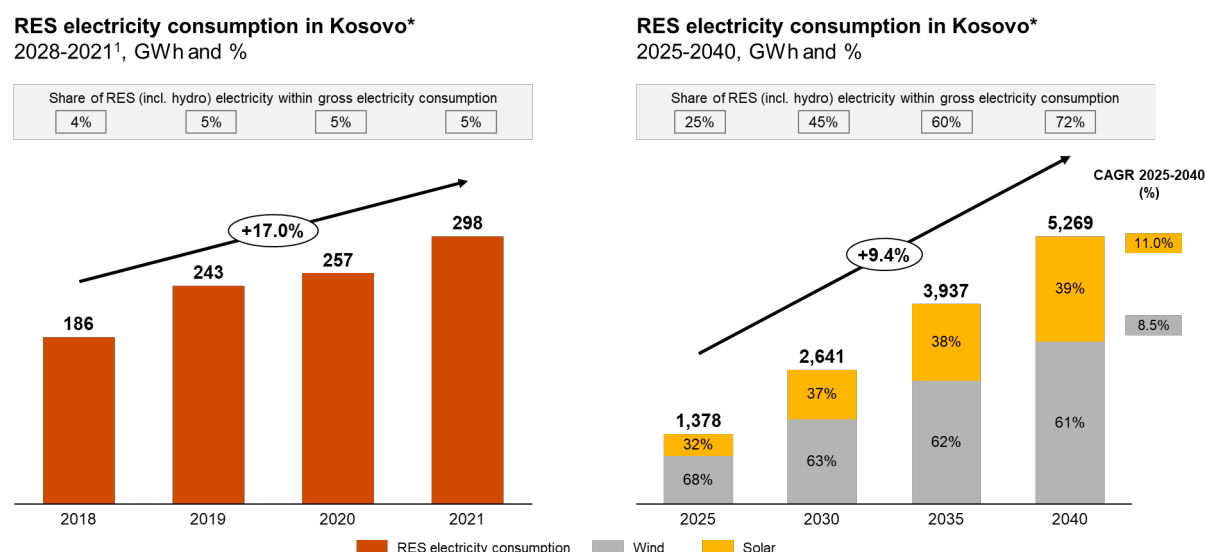
- TS 220/110 kV Gjakova 3: Equipment replacements and upgrades in various voltage fields, along with improvements in systems for plant consumption, protection, control and measurement.
- **New substations and power lines:**
 - TS Mitrovica 4 to TS Peja 5: Construction of a new dual-system 220 kV line aimed at improving reliability and consumer supply.
 - TS Ferizaj 4: Installation of new transformers to increase capacity and meet rising consumption needs.
- **Interconnections with neighbouring countries:**
 - Kosovo* - North Macedonia: Development of new 400 kV interconnections planned for completion in 2026, enhancing regional connectivity and supporting RE integration.
 - Kosovo* - Albania: Development of new 400 kV interconnection between Prizreni-4 in Kosovo* and Fierza in Albania. On the Kosovo* side, the project includes the extension of SS Prizreni 2 (actual voltage 220/110 kV) to Prizreni-4 at the 400 kV level.
 - Enables the support of new generation capacities from RES.
 - Improves reliability, security of supply, and operational flexibility of the regional network.
 - Increases the Net Transfer Capacity (NTC) between OST and KOSTT, facilitating energy exchange between neighboring countries.
 - Increases commercial exchanges with Albania and other regional countries, fostering the development of a competitive regional energy market and integration into the Pan-European Electricity Market.
- **Implementation of grid control technologies:**
 - Remote Management of KOSTT Elements: Modernization projects involving the control of switching equipment from dispatch centers enabling unmanned operations with SCADA systems and video control of command execution.

Kosovo's* NECP aligns with these developments, outlining a roadmap to boost the share of RE in the national grid. By 2032, Kosovo* aims to increase the penetration of RE significantly, focusing on solar and wind as the primary sources. This is in line with the broader European goals for sustainable and RE use. However, the successful implementation of PPAs may be challenged by the current infrastructure's limited capacity to manage intermittent RES without substantial grid enhancements. The implementation of these projects is expected to facilitate Kosovo's compliance with EU energy directives, enhance grid stability, improve energy security and support the economic viability of RE through improved infrastructure for PPAs.

Kosovo's* NECP, submitted in July 2023, sets out the expected growth trajectory for gross electricity consumption sourced from renewable energy sources. In 2021, electricity consumption sourced from renewable energy sources (including hydro) accounted for 5% of total gross electricity consumption. By 2030, as per Estimated trajectory and WAM scenario, this share is projected to rise to 45%, meeting the Energy Community's 2030 target share of electricity consumption sourced from renewable energy sources (including hydro) in gross electricity consumption. Needless to say, a substantial effort is needed for Kosovo* in order to achieve the 2030 target. With growth of electricity consumption sourced from renewable energy sources depicted in the figure below, the 2030 target is projected to be achieved.

By 2030, solar energy is forecasted to provide 38% and wind energy 62% of the total gross electricity consumption sourced from renewable energy sources. These projections indicate a promising market for Power Purchase Agreements (PPAs), as they will likely play a critical role in achieving the substantial increase in RES-generated electricity.

Figure 42 Historical and projected RES electricity consumption in Kosovo*

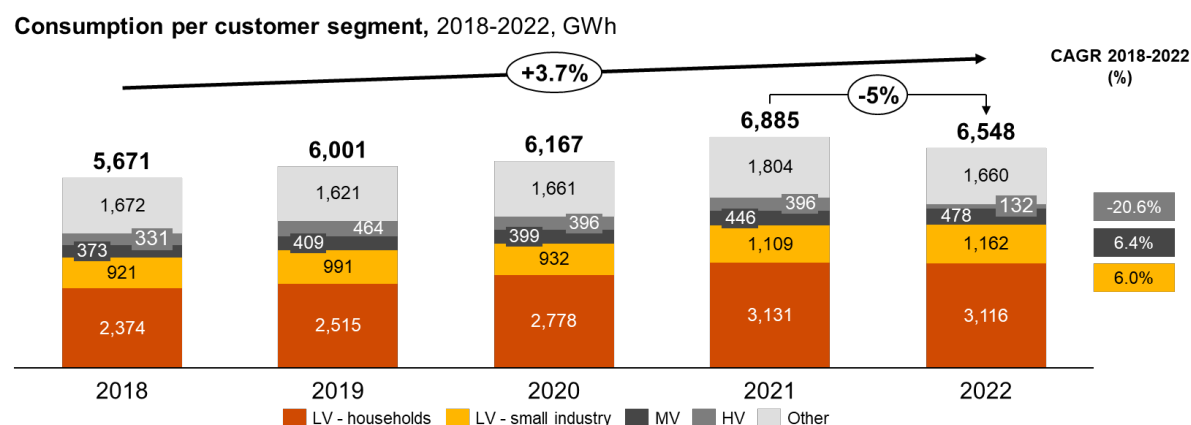


1) Due to the lack of data for 2022, Gross RES electricity consumption is analyzed until 2021

Source: Kosovo's* NECP, Eurostat, PwC Analysis

In Kosovo* the customer segment with the highest consumption for the period from 2018 to 2022 was the household segment, with 42% to 48% of total share in electricity consumption per different segments. However, high voltage customers' consumption decreased at 20.6% CAGR from 2018 to 2022, while medium voltage customers' consumption rose by 6.4% CAGR. The drop in high voltage customer consumption could lessen PPA appeal, necessitating strategy adjustments to align with this segment's reduced demand. A substantial drop in HV customer consumption is explained by a decrease of 269 GWh in electricity consumption of the Ferronikeli nickel production plant in 2022, compared to 2021. In more detail Ferronikeli plant ceased production in October 2021 due to the high energy prices but restarted production in June 2023.⁸⁶

Figure 43 Electricity consumption per customer segment in Kosovo*



Note: LV – Low Voltage, MV – Medium Voltage, HV – High Voltage, 1) Other - Public lighting, KEK consumption, DSO losses, KOSTT losses

⁸⁶ SEE News. (2023, June 21). Kosovo's* NewCo Ferronikeli resumes production. SEE News. Retrieved from <https://seenews.com/news/kosovos-newco-ferronikeli-resumes-production-826523>

Source: ERO Annual reports (2018-2022), PwC analysis

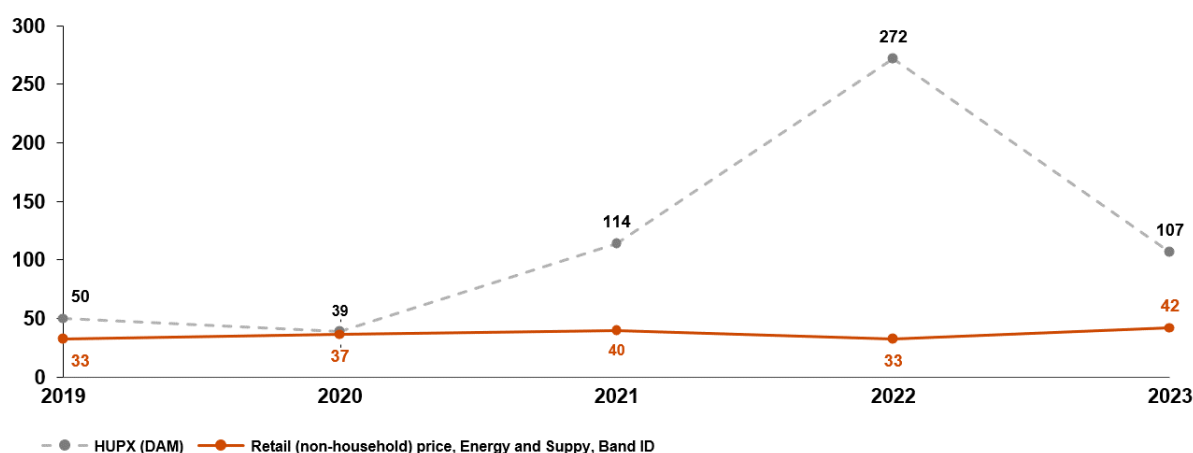
For detail list of electricity consumption per customer segment accompanied by a number of customers per customer segment, electricity consumption by sectors, and electricity consumption by major industrial consumers, please see appendix.

3.4.2. Electricity prices

Retail (non-household) prices⁸⁷ in Kosovo* remained consistent from 2019 to 2023, showing only a slight increase of 9 €/MWh over the observed period. This stability suggests a significant level of government intervention in regulating electricity prices. While this may pose challenges for PPAs due to the lack of full market liberalization and substantial government influence, there are also positive developments. In 2024, the wholesale DAM was introduced, achieving a daily average market clearing price of 69 €/MWh (February-April 2024, average monthly traded volume of 61 GWh). The retail (non-household) price in Kosovo* was lower from the daily baseload price on the HUPX exchange throughout the whole observed period from 2019 and 2023, with the peak difference of 239 €/MWh in 2022 (HUPX DAM average monthly traded volume of 2,257 GWh in 2022). The price gap has decreased in 2023 (HUPX DAM average monthly traded volume of 2,171 GWh in 2023), when the HUPX daily baseload price was 64 €/MWh higher than the retail (non-household) price in Kosovo*. This situation indicates an unfavorable environment for PPA utilization; however, the scenario may change in 2024 when the retail (non-household) prices become comparable with the prices on the newly opened DAM in Kosovo*⁸⁸.

Figure 44 Overview of wholesale and retail electricity prices in Kosovo*

Wholesale and retail electricity prices in Kosovo* from 2019 to 2023 (€/MWh)



Source: HUPX Annual Reports (2019-2023), Eurostat, PwC Analysis

3.4.3. Supply options and incentive mechanisms

In 2024, Kosovo* has shown notable advancements in its RE initiatives, marked by significant investments and strategic developments aimed at enhancing its energy sector's sustainability. The European Investment Bank (EIB) has facilitated this progress by funding one of Kosovo's largest solar PV projects near Pristina, which, upon completion, is expected to produce approximately 169 GWh of electricity annually, potentially offsetting around

⁸⁷ Eurostat - For non-household consumers Band ID: 1 999 MWh < Consumption < 20 000 MWh; Components of energy price: Energy and Supply.

⁸⁸ Retail (non-household) prices for Kosovo* were analysed for the consumer Band ID, different from other CPs (band IE), due the lack of data on consumer band IE prices for Kosovo*

174,000 tons of CO₂ each year. This project aligns with Kosovo's broader goals to increase the share of RE and ensure energy security while transitioning away from coal-based power generation⁸⁹.

Moreover, the Kosovo* government has adopted a forward-looking energy strategy spanning from 2022 to 2031, emphasizing market-based solutions to boost RE production. This strategy includes conducting competitive auctions for solar energy, which began in 2023, to stimulate private sector investment and development of RE resources. The results of the auction came in the early 2024, when a consortium led by a construction company Orlatti won a right to take land on a lease for a photovoltaic park of 90 MW to 105 MW in total connection capacity. The company agreed to build and operate the facility for 30 years, of which the first 15 years it would sell electricity under a contract for difference (CfD) at the winning price of 48.88 EUR/MWh.⁹⁰ Such initiatives are designed to transform Kosovo's* energy landscape into a modern, reliable and affordable service, supporting the country's economic growth and aligning with its climate change mitigation commitments. These auctions aim to rapidly deploy new renewable resources, ensuring energy security and fostering economic growth through sustainable means.⁹¹

In legal frameworks, the new Law on RES was adopted in the early 2024.⁹² This law is critical for facilitating the auction or competitive processes for new RE capacities, ensuring that Kosovo* aligns with the EU's stringent climate policies and energy sector reforms aimed at achieving carbon neutrality by 2050⁹³.

In Kosovo*, eligibility for Feed-in-Tariffs (FiTs) is part of a comprehensive set of incentives aimed at promoting renewable energy sources (RES). According to the Energy Regulatory Office of Kosovo* (ERO), the newly adopted law outlines that producers can obtain FiT benefits for solar, wind, and biomass, thereby ensuring financial viability and stability for long-term investments. Additionally, specific capacity limits are set to facilitate the integration of these technologies into the national energy grid. As part of the broader support scheme, Kosovo* is transitioning from FiTs to Feed-in Premiums (FiPs) and also introducing renewable energy auctions to promote market-based mechanisms for allocating incentives. This integrated approach supports smaller, scalable renewable projects, progressively enhancing Kosovo's* energy independence and aligning with EU state aid guidelines for environmental protection and energy.⁹⁴

According to ERO, solar PV receives the highest tariff at 136.4 €/MWh with a contract duration of 12 years, while wind energy offers a FiT of 85 €/MWh with an equivalent long-term contract

⁸⁹ European Investment Bank, (18 March 2024). Kosovo: EIB accelerates green transition with €33 million for new solar power plant. Retrieved from <https://www.eib.org/en/press/all/2024-088-eib-accelerates-green-transition-with-eur-33-million-for-new-solar-power-plant-in-kosovo>

⁹⁰ Balkan Green Energy News (2024, April 3rd). Kosovo* completes first solar power auction at EUR 48.88 per MWh. Retrived from <https://balkangreenenergynews.com/kosovo-completes-first-solar-power-auction-at-eur-48-88-per-mwh/>

⁹¹ Republic of Kosovo Energy Sector (RESKosovo), (2024). Energy Strategy 2022-2031. Retrieved from <https://reskosovo.rks-gov.net/energy-strategy>

⁹² Ministry of economy (2024, April 5th). Law on the Promotion of the Use of Renewable Energy Sources adopted. Retrieved from <https://me.rks-gov.net/en/blog/law-on-the-promotion-of-the-use-of-renewable-energy-sources-adopted/>

⁹³ Republic of Kosovo Energy Sector (RESKosovo), (2023). Law on Renewable Energy Sources. Retrieved from <https://reskosovo.rks-gov.net/law-on-renewable-energy-sources>

⁹⁴ Energy Regulatory Office of Kosovo. (n.d.). Feed-in Tariff. Retrieved from <https://www.ero-ks.org/zrre/en/pjesemarresit-ne-treg/bre/tarifa-nxitesse>

duration, demonstrating Kosovo's* strategic initiatives to support and enhance RE production through incentivized financial agreements.

Kosovo's* approach includes market-based mechanisms such as net-metering for renewables self-consumers and is moving towards eliminating subsidies for non-RES to make renewable options more attractive and financially feasible. The government also focuses on reducing transmission and distribution losses, which is essential for improving overall energy efficiency and sustainability in the region⁹⁵.

3.4.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

The wholesale market in Kosovo* recently experienced positive developments in terms of joining Albania on the joint day-ahead market, and since then ALPEX (a joint venture company owned by the TSOs of Albania/OST, and Kosovo*/KOSTT) plays a crucial role in providing a structured and liquid market for Kosovo*. In more detail, on February 1st, 2024, ALPEX launched day-ahead auctions in market coupling mode for Kosovo* and Albania bidding zones. As a consequence of the mentioned market coupling, the wholesale market in Kosovo* includes day-ahead market, and balancing market (ERO regulated). The opening of the intraday market is still pending and is expected to commence its operation in 2024. From commencing with operations in February 2024, the average monthly trading volume in Kosovo* block of ALPEX is approximately 60,898 MWh, and the average market clearing price is 69.08 €/MWh. These averages are based on the available data from February to April 2024. As of 2023, ALPEX has 23 exchange members. These members include a mix of transmission system operators, free market suppliers, universal service suppliers, power corporations, distribution system operators, and various energy trading and production companies from both Albania and Kosovo*.

The current state of market coupling between Albania and Kosovo* is marked by significant advancements, notably with the operational launch of a joint day-ahead market in February 2024. This development was facilitated by the Albanian Power Exchange (ALPEX), which began hosting day-ahead auctions for Albania in April 2024. This initiative represents a critical step towards integrating the electricity markets of the two countries, enhancing both the efficiency and stability of the regional power supply.⁹⁶

Furthermore, memorandum of understanding on coupling of day-ahead electricity markets was signed by Albania, North Macedonia, Greece, and Kosovo* in 2023.⁹⁷

The coupling was enabled by the establishment of a 400 kV high-voltage power interconnection back in 2016 and further supported by the designation of ALPEX as the nominated electricity market operator (NEMO) for both countries. These steps are integral to

⁹⁵ Organisation for Economic Co-operation and Development, (n.d.). A green recovery in Kosovo. Multi-dimensional Review of the Western Balkans: From Analysis to Action. Retrieved from <https://www.oecd-ilibrary.org/sites/c9f1bbb7-en/index.html?itemId=/content/component/c9f1bbb7-en>

⁹⁶ Balkan Green Energy News. (2023, July 20). ALPEX becomes nominated electricity market operator in Albania, Kosovo*. Balkan Green Energy News. <https://balkangreenenergynews.com/alpex-becomes-nominated-electricity-market-operator-in-albania-kosovo/>

⁹⁷ Balkan Green Energy News. (2023, November 14). North Macedonia, Greece, Albania, Kosovo* take step towards day-ahead market coupling. Retrived from <https://balkangreenenergynews.com/north-macedonia-greece-albania-kosovo-take-step-towards-day-ahead-market-coupling/>

the broader regional goal of integrating with the European electricity market, promoting better electricity trade efficiencies, and aligning with EU energy market regulations.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "pay-as-produced" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all mid and high voltage consumers are using smart meters already, therefore, there is no limitation for PPA. In Kosovo* smart metering system is somewhat in place. There is a current initiative funded by the European Commission to supply smart electricity meters specifically for the northern municipalities of Kosovo*⁹⁸, however exact figure of number of smart meters is not publicly unavailable.

Details of each CP market player and market interaction can be found in the appendix and legal section of the document.

Figure 45 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023 ¹	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh/ 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EPBiH*, ERS*, EPHZHB*, Komunalno Brčko*	No power exchange	✓	2.2 TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energopro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 TWh/ 69 (€/MWh)	✗	n/a	✓
	Termoelektrika*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh/ 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektrodistribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh/ 262 (€/MWh)	✓	0.3 TWh/ 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEPEX	✓	n/a	✓	4.7 TWh/104 (€/MWh)	✓	4 GWh/ 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkivoblenergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State owned entities, 1) Volume and price for DAM in Kosovo* represents 2024 data

Source: PwC analysis

Apart from the assessing the existence of the Power exchange in contracting parties, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

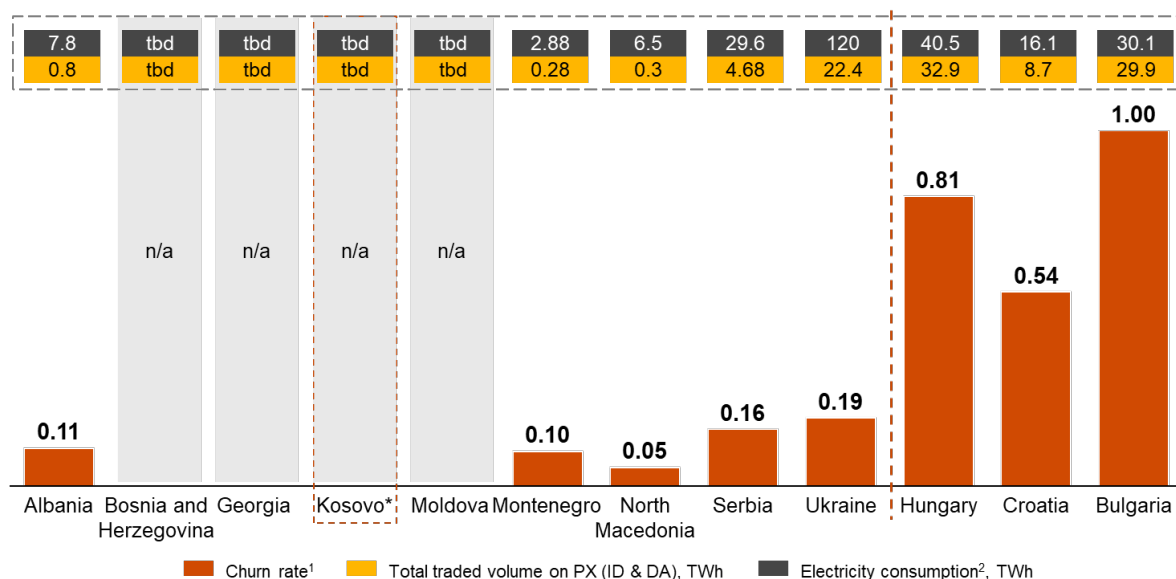
As the day-ahead market (DAM) in Kosovo* started with operations in February 2024, the liquidity comparison between power exchanges of the Contracting Parties and Kosovo* for

⁹⁸ European Commission. (2024, February 16). Open tender — Supply of smart electricity meters for the Kosovo* northern municipalities. DevelopmentAid. Retrieved from <https://www.developmentaid.org>

the last year of 2023 is not viable. Hence, an assessment of liquidity on APEX (Kosovo* block) will be attainable with the total traded volume for 2024.

Figure 46 Overview of Contracting Parties and chosen SEE Power Exchanges

Power exchange liquidity in Contracting Parties and SEE countries in 2023, ratio
(traded volume/el. consumption)



Note 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: ALPEX Monthly Reports 2023 (April-December), MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.4.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Based on publicly available data and thorough desktop research, as of 2024, there is a single announced PPA deal in Kosovo* that has been publicly disclosed with information depicted in the figure below.

Figure 47 Announced and expected PPA projects in Kosovo*

Investor	Orlati, Jaha, Holdigaz and ZVP (consortium)
Project	Rahovica
PPA phase	Expected
Off-taker	KOSTT
PPA type	Utility
Technology	
Capacity	100 MW
Output	27-29 GWh/year
Duration	15 years
Investment	€70 million
PPA price	48.88 €/MWh
Expected COD	n/a

Legend: ☐ Closed ☒ Expected

Source: PV magazine India web page, SeeNews web page, PwC Analysis

Key investors in the Contracting Party

The most significant financial institutions in Kosovo*, with previous experience in financing energy projects within Kosovo* are European Bank for Reconstruction and Development (EBRD), Erste Bank, NLB Group, The Green for Growth Fund (OeEB has a stake in the GGF), BKT Kosovo, The European Investment Bank (EIB), Western Balkans Investment Framework and KfW Development Bank. In more detail, the Bajgora wind farm received a EUR 58 million⁹⁹ loan from the EBRD, with additional participation in the financing from Erste Bank and NLB Group, for the construction of the EUR 170 million worth project. Moreover, The Green for Growth Fund has secured a EUR 10 million credit package for BKT Kosovo (bank) in 2020¹⁰⁰, helping the BKT Kosovo with its first dedicated funding for green lending initiatives. Other significant financial institutions in Kosovo* represent Banka Ekonomike, BPB Bank, ProCredit Bank, TEB SH.A, Isbank, Ziraat Bank, Isbank, Raiffeisen Bank Kosovo and Turk Ekonomi Bankasi. Furthermore, the Appendix includes additional examples of financing energy projects within the CP.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded

⁹⁹ EBRD, (16 December 2019). €58m EBRD loan to build Kosovo's biggest wind farm. Retrieved from <https://www.ebrd.com/news/2019/58m-ebrd-loan-to-build-kosovos-biggest-wind-farm.html#:~:text=Kosovo%2C%20which%20largely%20relies%20on,the%20north%20of%20the%20country>

¹⁰⁰ Balkan Green Energy News, (14 February, 2020). GGF approves EUR 10 million for BKT Kosovo's* green lending portfolio. Retrieved from <https://balkangreenenergynews.com/ggf-approves-eur-10-million-for-bkt-kosovos-green-lending-portfolio/>

emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

One of the strategic objectives of Kosovo's* energy strategy for 2022-2031 is introducing a cap-and-trade mechanism, including setting the required institutional and technical infrastructure and transposing the EU regulation related to monitoring, reporting, and verification of carbon emissions. Although Kosovo* has not yet established a cap-and-trade mechanism in line with EU ETS to internalize the cost of carbon emissions, it has adopted the Law on Climate Change in 2024 which partially sets the institutional and technical infrastructure related to monitoring, reporting, and verification of carbon emissions.

The law prescribes implementation of a Long-term De-carbonization Strategy, which is envisaged as one of the strategic documents for climate change, and establishment of a system for monitoring, reporting, and verification of greenhouse gas emissions. The Long-Term Decarbonization strategy will cover at least a (30) years' period and shall be consistent with the Energy Community's climate neutrality objective.

The law specifies the greenhouse gasses subject of monitoring and reporting. The collected data on emission of greenhouse gases will be used for the purpose of policy planning and undertaking specific mitigation measures. Such data will be also used for reporting purposes as prescribed by this law, including reporting on the state of implementation of the Long-term Decarbonization Strategy. Furthermore, as per this law, the responsible Ministry will have to create a working group for the study on the impact of CBAM for Kosovo*, after entry into force of this law (January 21, 2024).¹⁰¹

Additionally, Kosovo* has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect

¹⁰¹ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.¹⁰²

At this moment Kosovo's* electricity generation is heavily dependent on coal, however its exports to the EU remain relatively small. As a result, the introduction of the CBAM is unlikely to significantly impact the current electricity trade. However, if Albania receives an exemption for electricity from CBAM, it will need to decouple from Kosovo*, affecting bilateral trade between the two countries and the operation of ALPEX. During the 2021-2023 period, Kosovo* has on average exported 1.43 TWh of electricity per year to Albania, while yearly average electricity import from Albania to Kosovo* amounted to 0.8 TWh¹⁰³. Moreover, only about 1% of Kosovo's* GDP consisted of exports to the EU that would be affected by CBAM rules.¹⁰⁴

During the transition phase of CBAM, which began in October 2023 and will run until December 2025, Kosovo* and other affected countries are encouraged to focus on setting up the necessary infrastructure for reporting greenhouse gas emissions embedded in their exports to the EU¹⁰⁵. This phase does not require the purchase of CBAM certificates yet, but sets the groundwork for full alignment by January 2026, when the purchase of certificates, reflecting the carbon content of imports, becomes mandatory.

Figure 48 Overview of CBAM and PPA connection per Contracting Party

¹⁰² REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

¹⁰³ ENTSO-E

¹⁰⁴ Allert V. et al (2023, June). Impacts of the EU carbon border adjustment mechanism on the Western Balkans and Ukraine: policy options for governments. Retrieved from https://www.germanwatch.org/sites/default/files/germanwatch_impacts_of_the_cbam_on_the_western_balkans_and_ukraine_2023_0.pdf

¹⁰⁵ Reed Smith LLP, (13 January 2023). EU Carbon Border Adjustment Mechanism will be implemented from 1 October 2023. Retrieved from www.reedsmith.com

Analysis of CBAM and PPA connection in Kosovo*

Kosovo*		
Net electricity export/import ¹ (average 2021-2023, GWh)		-393 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		94%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		1,107 GWh and 21%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	44%
	Food, beverages and tobacco	34%
	Not elsewhere specified ³	13%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity; 2) Share in total electricity consumption of the country; 3) Not specified in any of the other categories, which are: Iron and steel, Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Transport equipment, Machinery, Mining and quarrying, Food, beverages and tobacco, Paper, pulp and printing, Wood and wood products, Construction and Textile and leather

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. From 2020 to 2022, Kosovo* produced an average of 94% of its electricity from thermal sources. Although Kosovo* exports very little of its electricity to the EU, introducing PPAs in its Iron and steel industry sub-sector, a significant electricity consumer, would be highly beneficial. This would reduce the industry's reliance on non-renewable energy, thereby mitigating the impact of the CBAM tax and enhancing its competitiveness in the EU market.

CBAM recommendations

Figure 49 Overview of CBAM recommendations in Kosovo*

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Drafting and adoption of a Long-Term DeCarbonization Strategy	Yes	Strategy	Drafting and adoption of the Long-Term DeCarbonization Strategy by the Ministry responsible for the environment in cooperation with the central and local institutions authorized for the energy, transport, agriculture, waste management, forestry, industry, infrastructure, construction, and tourism sectors as envisaged with the Law on Climate change. Given that the Strategy will include all professional bodies responsible for its implementation and will also set the principles, standards for reaching low-carbon emissions, it is of key importance that this comprehensive strategy be drafted promptly since it will benefit for the incorporation of a national carbon pricing mechanism and further alignment with EU regulation in this area.
Continue the transposition of MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of December 15, 2023	Yes	Secondary legislation	Continue the transposition and implementation of MRVA in Kosovo* based on the provisions of the adopted Climate Law and Energy Community obligations.
A3 - Establishment of a working group for the study on the impact of CBAM for Kosovo**	No	/	The Ministry responsible for the environment should create this working group to assess the impact of CBAM for Kosovo* which findings will further serve for the incorporation of a national carbon pricing mechanism.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.

B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	No	Secondary Legislation on GOs	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted. In relation to this, the necessary secondary legislation for operation of GOs register should be adopted, explained above in this report.



3.5.

Moldova

3.5.1. Overview of RES electricity supply & demand

This section covers electricity supply and demand trends in Moldova, examining existing and forecasted renewable energy supply and consumption patterns. RES electricity supply in each market is critical for PPAs as it ensures that there is sufficient generation capacity to meet the demand of consumers under long-term renewable energy procurement contracts. Additionally, insights into corresponding generation development scenarios from NECP and additional strategies, as well as RES nominations comprehensive analysis and commentary is discussed.

Lastly, electricity consumption by key customer segments will be discussed. RES electricity demand in each market is crucial for PPAs as it directly influences the feasibility and attractiveness of renewable energy projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In Moldova, there were five electricity suppliers active in the retail market in 2022¹⁰⁶, and the electricity supply¹⁰⁷ was dominated by the two main suppliers, namely, Premier Energy (private) and FEE Nord (state owned), who act as universal service suppliers and suppliers of last resort (imposed by the Law on Electricity in 2016 for a 10-year period). In more detail, Premier Energy supplied 3.143 GWh or 73.7%, while FEE Nord supplied 1.067 GWh or 26.3% of total electricity that was supplied to the final consumers in 2022. Although there are other competitive suppliers who provide consumers who make use of eligibility status, their share is only 0.2% of supplied electricity due to limited access to wholesale supplies of electricity. In 2022, Premier Energy, the provider of universal and last-resort services, experienced a rise in electricity supply to end consumers by 6.8%. This increase is attributed to their absorption of the consumer base previously serviced by Furnizare Energie, which occurred towards the end of 2021.

Furthermore, the Moldovan retail market remained closed due to regulatory decisions and the inability to reliably access the Ukrainian wholesale market for Moldovan suppliers. Consequently, by the end of 2021, all end consumers were transferred to universal service suppliers offering regulated prices. The provision of regulated-price universal service to all final customers continued in 2023. This practice is not compliant with the Third Energy Package, which restricts access to universal service supply only to households and small customers.¹⁰⁸

Moldova was among the Contracting Parties that declared a state of emergency on October 22nd, 2021, and chose to provide direct financial assistance to consumers through incumbent companies. Effective January 28th, 2022, the Moldovan Emergency Situations Commission has prohibited the disconnection or penalization of household consumers for late payment of bills related to electricity, heating, and natural gas. On January 28th, 2022, ANRE sanctioned a secondary modification of prices for gas, heating, and electricity generated at combined heat power plants (CHP accounts for 72% of generated electricity in right bank of Moldova). These updated terms elevated the wholesale electricity price beyond the 5% margin delineated by Electricity Law. Responding to suppliers' appeals, ANRE sanctioned revised electricity retail tariffs on March 18th, 2022, reflecting an average surge of 18%, effective as of April 1, 2022. Throughout 2022, ANRE made several adjustments to the regulated prices for electricity provided by the two universal service suppliers and last-resort suppliers. Initially, these prices were raised in response to the escalating costs of purchasing electricity. However, towards the year's end, ANRE sanctioned a decrease in regulated prices, effective

¹⁰⁶ ECRB Market Monitoring Report (2022)

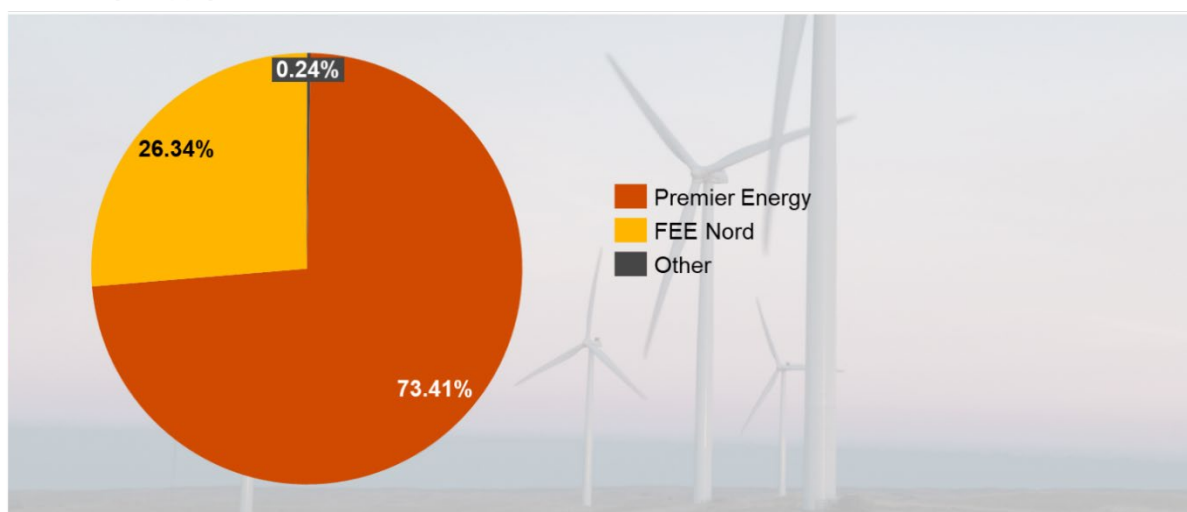
¹⁰⁷ ANRE Annual Reports (2020-2022)

¹⁰⁸ Energy Community Secretariat (November 2023). Moldovan Annual Implementation Report 2023

from January 1st, 2023. ANRE's approval of these decisions was imperative to ensure the uninterrupted provision of electricity supply services to all end consumers.¹⁰⁹

Figure 50 Overview of Moldovan electricity supply in 2022

Electricity supply in Moldova 2022, %



Source: ANRE Annual Report 2022, PwC Analysis

From 2018 to 2022, Moldova experienced a robust increase of 39.8% in RES generation, with solar power significantly increasing its share from 3% to 15% of total RES output, and wind power rising from 43% to 73%. This period also saw a noteworthy overall increase in electricity demand from non-household customer segments, emphasizing a growing reliance and integration of renewable energy in Moldova's energy mix. Looking ahead, according to the Moldovan NECP, precisely scenario with existing measures, to 2025-2040, the projections suggest a further increase of 7.8% CAGR in the RES electricity output. This is expected to be driven by a balanced contribution from both solar and wind sources, accounting for 61% and 27% of the RES mix by 2040, with an additional contribution from bioenergy expected to increase to 12%. These changes underscore Moldova's commitment to enhancing its renewable energy sector, with projections indicating that RES will make up a larger portion of the nation's total energy matrix. This shift is aligned with global trends towards sustainability and reducing carbon emissions, and it presents a favorable environment for PPA.

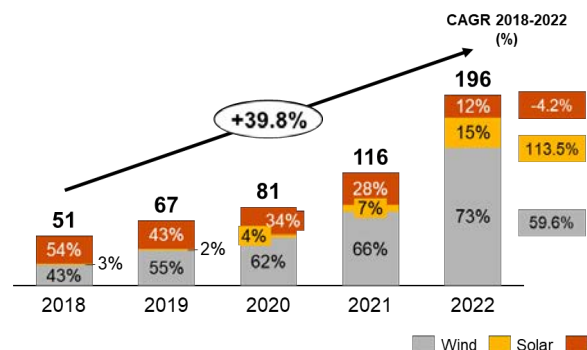
¹⁰⁹ ECRB Impact of the energy crisis on electricity and gas price regulation in the Energy Community Contracting Parties (2023)

Figure 51 Historical and projected RES electricity generation in Moldova

RES electricity generation per type in Moldova
2018-2022, GWh and %

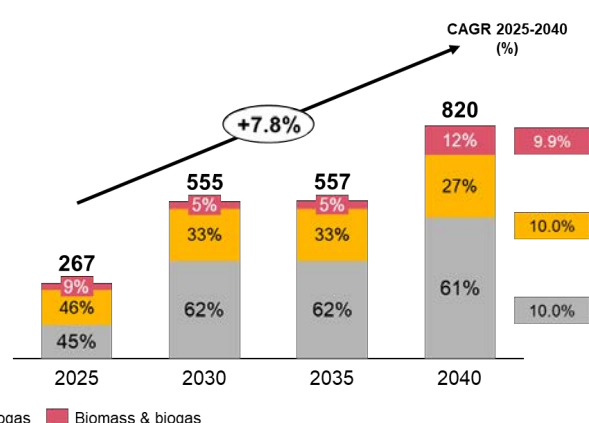
Share of RES (excl. hydro) electricity within final electricity generation				
6%	8%	10%	12%	23%

Electricity demand by non-household customer segment, GWh				
2,225	2,212	2,145	2,337	2,323



RES electricity generation per type in Moldova
2025-2040, GWh and %

Share of RES (excl. hydro) electricity within final electricity generation			
n/a	n/a	n/a	n/a

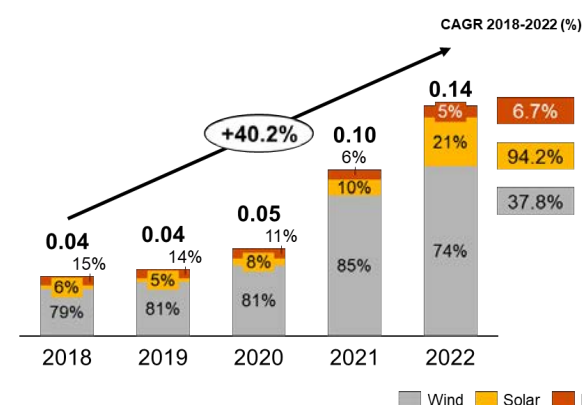


Source: Moldovan NECP, ANRE Annual Reports (2018-2022), PwC analysis

Figure 52 Historical and projected RES installed capacity in Moldova

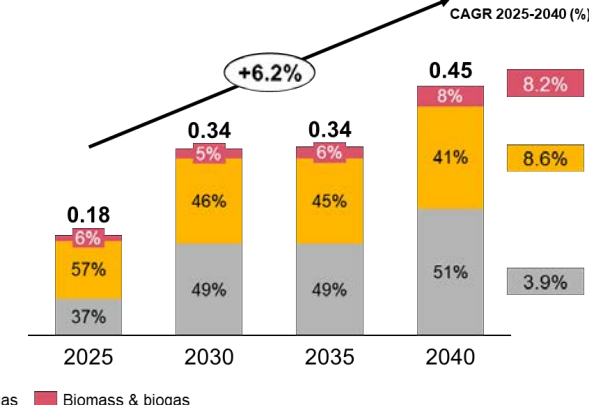
Installed capacity per RES in Moldova
2018-2022, GW and %

Share of RES (excl. hydro) capacity within total installed capacity				
8%	9%	11%	19%	25%



Installed capacity per RES in Moldova
2025-2040, GW and %

Share of RES (excl. hydro) capacity within total installed capacity			
n/a	n/a	n/a	n/a



Source: Moldovan NECP, ANRE Annual Reports (2018-2022), PwC analysis

Between 2018 and 2022, Moldova saw a significant growth in RES capacity, with an increase of 40.2% CAGR. This rise was primarily driven by substantial advancements in solar power¹¹⁰, which grew at ~95% compound annual growth rate. Concurrently, wind power was increasing at almost 38% rate.

Looking ahead to 2025-2040, according to NECP, projections suggest a slower pace of increase in RES capacity by an additional 6.2% until 2040, with solar and wind power expected to maintain substantial shares of 41% and 51%, respectively. According to the projections, this trajectory aligns with Moldova's strategic energy planning, which anticipates

¹¹⁰ ANRE Annual Report 2022: Data on capacity values for which ANRE confirmed the status of eligible producer in 2022, regarding the maximum capacity quota for solar PV for the period until 2025 (for the - 13.3 MW in PV installations mounted on buildings with an individual installed capacity of <1 MW, 120 MW in PV installations other than those mounted on buildings (mounted on land) with individual installed capacity of <1 MW. Moreover, the electricity delivered to network, in 2022, from PV prosumers amounted to 11.5 MWh, which is 2.8 times higher than in 2021 and 8 times higher than in 2020.

a strong increase in total RES installations, thereby expanding the scope for PPAs and enhancing the sustainability of the nation's energy supply.

Moldova had an installed renewable energy sources (RES) capacity of 0.14 GW in 2022. Projections outlined in the NECP, specifically WEM scenario anticipate this capacity to surge to 0.45 GW by 2040, indicating a gap of 0.31 GW. On the other hand, government-backed RES capacities are projected to amount to only 0.39 GW. Taking this into account, this leave no capacity for potential PPA utilization, since there is a lack of projected installed RES capacity in 2040.

However, due to inconsistencies in the figures presented for two different scenarios in Moldova's Draft NECP—a baseline scenario with existing measures (WEM) and a policy scenario with additional measures (WPM)—it is difficult to assess the actual RES projections and targets. As a result, the overall ambitions and direction of the Draft NECP are unclear.

According to the Energy Community Secretariat's recommendations on Moldova's Draft NECP, a thorough revision of all the figures in the plan is necessary to ensure that the descriptive parts are supported by the results of the analysis and modeling.¹¹¹

For a detailed explanation of the inconsistencies in Moldova's Draft NECP, refer to the Energy Community Secretariat's recommendations on the Draft NECP.

Planned energy infrastructure development

Moldova's electricity grid, largely based on Soviet-era infrastructure, faces challenges in efficiency and modernization. The grid is interconnected with Ukraine and has limited connection capabilities with Romania¹¹², consisting of a single 400 kV line between Moldova and Romania. In March 2022, due to the Russian invasion of Ukraine, the electricity grids of Ukraine and Moldova were urgently synchronized with the Continental European Grid.¹¹³

Moldova's energy infrastructure development plans from 2021 to 2030 include strategic enhancements aimed at supporting the integration of renewable energies and improving grid efficiency. A major projects consist of the construction of a new 400 kV overhead transmission lines to Romania, and a second 330 kV overhead transmission line to Ukraine. These developments, along with the synchronization of Moldova's electricity grid with the Continental European Grid, not only should enable the stable and efficient transmission of electricity generated from renewable sources, but also ensure the reliability needed to support Power Purchase Agreements (PPAs). Reliable grid infrastructure is crucial for PPAs as it guarantees that the energy produced can be effectively delivered and traded. However, more focused efforts on enhancing grid flexibility and regulatory adjustments are required to fully capitalize on infrastructure developments. The integration of advanced technologies and the establishment of supportive policies will be key to promote a conducive environment for renewable energy investments through PPAs.

¹¹¹ Energy Community Secretariat (April 2024). Recommendations by the Energy Community Secretariat on the integrated Draft National Energy and Climate Plan of the Republic of Moldova. Retrieved from: <https://www.energy-community.org/implementation/package/NECP.html>

¹¹² International Energy Agency. (n.d.). System integration of renewables in Moldova: A roadmap - Context of renewables in Moldova's electricity sector. Retrieved from <https://www.iea.org/reports/system-integration-of-renewables-in-moldova-a-roadmap/context-of-renewables-in-moldova-s-electricity-sector>

¹¹³ ENTSO-E. (March 2022). Continental Europe successful synchronisation with Ukraine and Moldova power systems. Retrieved from <https://www.entsoe.eu/news/2022/03/16/continental-europe-successful-synchronisation-with-ukraine-and-moldova-power-systems/>

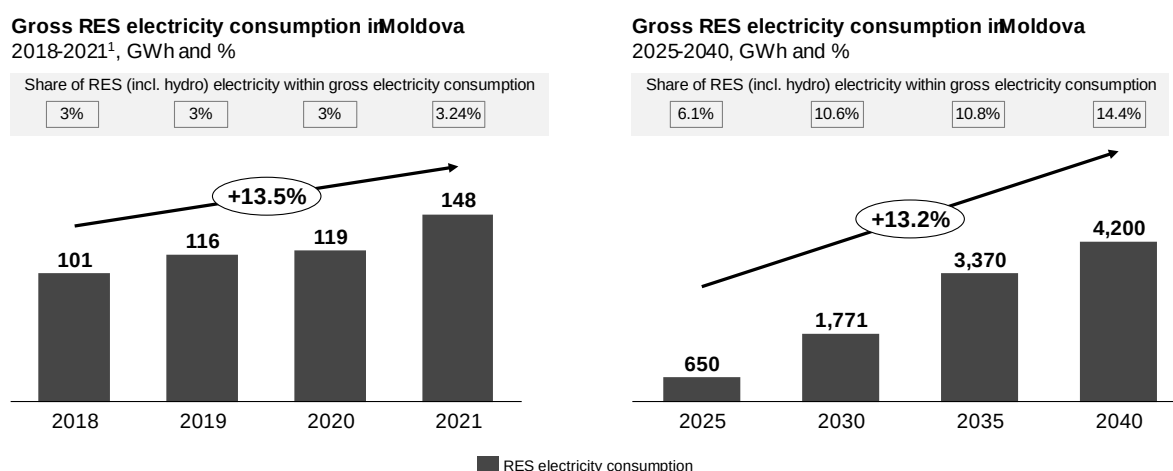
- **Interconnections with neighbouring countries:**

- o Moldova – Romania: Development of new 400 kV OHL interconnection between Bălți in Moldova and Succeava in Romania
- o Moldova – Romania: Development of new 400 kV OHL interconnection between Strășeni in Moldova and Gutinas in Romania
- o Moldova – Ukraine: Development of second 330 kV OHL interconnection between Bălți in Moldova and Dnestrovsk in Ukraine ¹¹⁴

Moldova's trajectory for gross electricity consumption sourced from renewable energy sources reflects an ambitious growth pattern, as outlined in Moldovan NECP. From 2018 to 2021, the electricity consumption sourced from renewable energy sources (including hydro) increased by 13.5% CAGR, highlighting a steady advancement in the adoption of renewable energy sources. Looking forward to the period from 2025 to 2040, the projected increase is almost identical, with an expected rise of 13.2% CAGR. By 2040, Moldova aims to reach almost 4.2 TWh in total electricity consumption sourced from renewable energy sources. While these figures indicate a positive trajectory for the adoption of renewable energy, the implications for PPAs are less straightforward. The relatively steady but not rapid growth rate in electricity consumption sourced from renewable energy sources could mean that while the market for PPAs exists, it might not be as expansive or rapidly developing as in markets with more aggressive RES adoption rates. Potential PPA investors might find these conditions somewhat challenging due to the slower pace of growth, which could affect the speed at which investments can be recouped. Additionally, the absence of a power exchange in Moldova complicates the implementation of PPAs, as it limits market transparency and the ability to adjust to price signals quickly. This factor alone could deter the rapid deployment of PPAs unless there are significant shifts in market structure, or regulatory frameworks designed to enhance market clarity and investor confidence.

In 2021, electricity consumption sourced from renewable energy sources (including hydro) accounted for 3.24% of total gross (right bank) electricity consumption. By 2030, as per Moldovan WEM scenario, this share is projected to rise to 14.4%, which is still not enough, according to Moldovan NECP, to reach an overall target of 27% share of renewable energy in the gross final energy consumption.

Figure 53 Historical and projected RES electricity consumption in Moldova

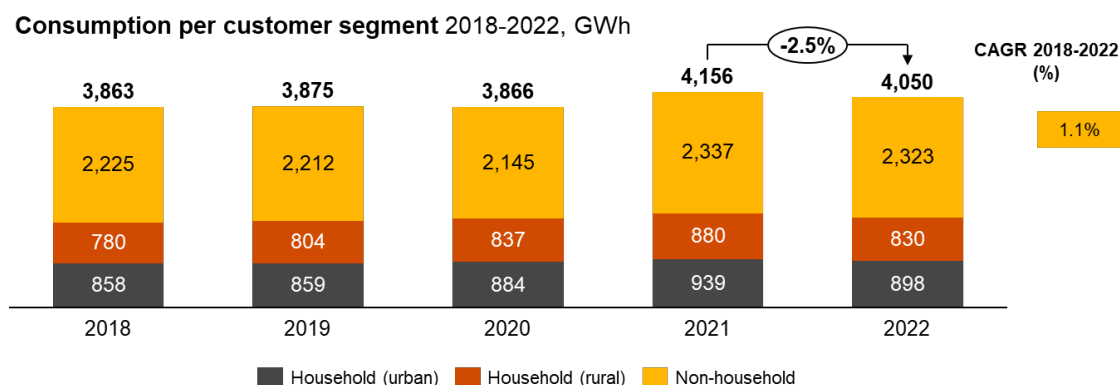


1) Due to the lack of data for 2022, Gross RES electricity consumption is analyzed until 2021

¹¹⁴ Moldelectrica. (January 2018). Electricity transmission network development plan for 2018-2027 period. Retrieved from https://www.moldelectrica.md/ro/network/perspective_plan

Despite the overall reduction in electricity consumption from 2021 to 2022 by 2.5%, there was a notable variation in consumption patterns across different customer segments. Notably, non-household consumption demonstrated a positive trend, increasing from 2,225 GWh to 2,323 GWh during the period observed. This trend could suggest a stabilizing or potentially increasing demand for electricity, signaling a more predictable and secure market for power purchase agreements (PPAs). This is a positive indicator for investors and developers in renewable energy, as PPAs offer a mechanism for securing long-term sales of electricity at predetermined prices, providing financial stability and encouraging further investments in the sector.

Figure 54 Electricity consumption per customer segment in Moldova



Source: ANRE Annual Reports (2018-2022), PwC analysis

For detail list of electricity consumption per customer segment accompanied by a number of customers per customer segment, electricity consumption by sectors, and electricity consumption by major industrial consumers, please see appendix.

3.5.2. Electricity prices

During the observed period, there was a 37% increase in retail (non-household) prices¹¹⁵ in Moldova, a growth rate considerably lower than in some other Contracting Parties (CPs) such as Georgia, Serbia, and North Macedonia. This suggests government intervention in electricity pricing, potentially hindering the Power Purchase Agreement (PPA) landscape due to limited market liberalization and predominant government control.

As illustrated in the figure below, during the observed period from 2019 to 2023, Hungarian Power Exchange (HUPX) average daily baseload prices on DAM severely fluctuated and were lower from retail (non-household) prices in Moldova at the start of the period during 2019 and 2020. However, in the years when HUPX DAM average daily baseload prices exceeded Moldovan retail (non-household) prices, as in 2021, 2022, and 2023 the difference between the two was significantly larger, with the peak difference of 197 €/MWh in 2022. The distinction between the mentioned prices majorly declined in 2023, when HUPX DAM average daily baseload prices were higher by 22 €/MWh from retail (non-household) prices.

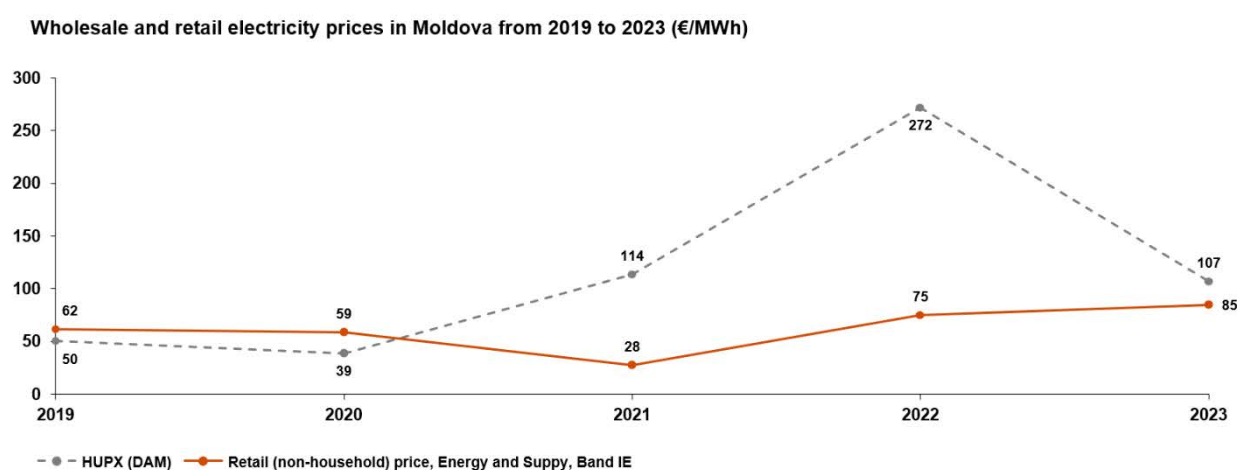
It needs to be noted that at the end of 2023, the Moldovan parliament took a significant step forward by passing, in its initial reading, a bill proposed by the Energy Ministry for the establishment of an energy exchange within the country. This legislative initiative is designed to enhance transparency and integration within the Moldovan electricity market, while also laying the groundwork for the creation of a structured energy market. The envisioned timeline

¹¹⁵ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

includes the establishment of the organized market in 2024, offering large industrial consumers the opportunity to select from various tariff plans.¹¹⁶

Moldova currently lacks an operational power exchange, a critical factor that complicates the implementation of power purchase agreements (PPAs) within the country. This absence of a power exchange means that there is less transparency in electricity pricing and fewer opportunities for flexible trading, which are key components for the effective functioning and attractiveness of PPAs. Historically, retail non-household electricity prices in Moldova have been lower than the wholesale proxy electricity prices, as indexed by HUPX (Hungarian Power Exchange). However, in 2023, this price difference significantly decreased, creating a less favorable economic environment for non-household consumers. Paradoxically, this development could create potential opportunities for PPAs. As traditional electricity costs become less predictable and potentially more expensive, PPAs could offer a more stable and cost-effective alternative, especially if tied to competitive renewable energy pricing. This could spark greater interest and investment in renewable projects, promoting a shift towards more sustainable energy solutions in Moldova.

Figure 55 Overview of wholesale and retail electricity prices in Moldova



Source: HUPX Annual (2019-2022), Eurostat, PwC analysis

3.5.3. Supply options and incentive mechanisms

In 2023, Moldova has demonstrated notable advancements in the renewable energy sector, with significant emphasis on enhancing its solar and wind energy capacities.¹¹⁷ The Moldovan government has been proactive in fostering the development of renewable energy through several mechanisms, including feed-in tariffs for small projects and competitive auctions for larger projects, aligning with the state aid legislation to stimulate both local and international investment in renewables.¹¹⁸ Moldova has planned significant renewable energy auctions as part of its strategic initiatives to boost renewable capacities. First auction has kicked-off on April 9th, 2024 and is offering a fixed price for larger-scale renewable projects exceeding 1 MW for photovoltaic and 4 MW for wind capacities with a term of 15 years. Capacity offered for wind projects is 105 MW, while 60 MW is reserved for solar PV projects. These are

¹¹⁶ Live News. (2023). Moldova prepares to launch its own energy exchange. Retrieved from <https://livenews.md/en/moldova-prepares-to-launch-its-own-energy-exchange/>

¹¹⁷ United Nations in Moldova. (n.d.). How much renewable energy is there in Moldova and how much could it be? Retrieved from <https://moldova.un.org>

¹¹⁸ Enerdata (2024, January 26th). Moldova will launch tenders for 165 MW of renewable capacity in April 2024. Retrieved from <https://www.enerdata.net/publications/daily-energy-news/moldova-will-launch-tenders-165-mw-renewable-capacity-april-2024.html>

designed to attract substantial investments, ensuring long-term financial incentives and stability for developers.¹¹⁹

In 2023, Moldova has received substantial international support, notably from European institutions like the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB), which provided both financial and technical assistance. Finally, in 2023, the United States has announced plans to provide \$300 million¹²⁰ to enhance Moldova's energy security. This external support is crucial for advancing Moldova's renewable energy projects and aligning its legislative framework with European Union energy standards, a process facilitated by the Energy Community¹²¹. The aid highlights the strategic significance of Moldova's energy reforms and underscores its ongoing integration into the broader European energy market.¹²²

The bulk of Moldova's electricity is generated by the Moldavskaya GRES power plant (MGRES) in Transnistria, accounting for a significant portion of the supply, especially to right-bank Moldova. This dependency presents a risk in terms of energy security, prompting the need for diversification. Seasonal variations affect the energy mix, with MGRES providing up to 95% of supply in summer but less in winter due to combined heat and power plants that operate mostly in colder months¹²³.

Renewable energy forms a small but growing part of Moldova's electricity generation, with recent figures showing about 6% of electricity comes from renewables such as hydro, wind, and solar PV. Efforts to integrate more renewable sources are supported by feed-in tariffs and government auctions designed to stimulate the development of renewable projects.¹²⁴

In 2020, Moldova revised its feed-in tariff scheme to specifically promote small-scale solar power¹²⁵:

- The new scheme applies to solar facilities ranging from 10 kW to 1 MW, with a total allocation of 15 MW across the country.
- The specific FiT for solar has been set at MDL1.88 (€0.09982744) per kWh. This tariff aims to cover the generation costs and provide a reasonable profit margin to attract investment in solar technologies.

These incentives align with Moldova's national energy goals set forth in its Energy Strategy, which targets a 30% renewable share in total energy consumption by 2030. This is in line with

¹¹⁹ UNECE. (2022). UNECE-REUptake_Factsheet_Moldova_Final. Retrieved from https://unece.org/sites/default/files/2022-11/UNECE-REUptake_Factsheet_Moldova_Final.pdf

¹²⁰ U.S. Agency for International Development. (2023, February 24). United States plans to provide \$300 million to strengthen Moldova's energy security. Retrieved from <https://www.usaid.gov/news-information/press-releases/feb-24-2023-united-states-plans-provide-300-million-strengthen-moldovas-energy-security>

¹²¹ Energy Community. (2023). Implementation Report - Energy Community Homepage. Retrieved from <https://www.energy-community.org>

¹²² European Union. (2023). EU-Moldova Energy Dialogue reaffirms close cooperation. Retrieved from <https://energy.ec.europa.eu>

¹²³ German Economic Team. (n.d.). Key challenges in Moldova's electricity sector. Retrieved from <https://www.german-economic-team.com/en/newsletter/key-challenges-in-moldovas-electricity-sector/>

¹²⁴ International Energy Agency. (n.d.). Context of renewables in Moldova's electricity sector. Retrieved from <https://www.iea.org/reports/system-integration-of-renewables-in-moldova-a-roadmap/context-of-renewables-in-moldova-s-electricity-sector>

¹²⁵ Bellini, E. (2020, March 2). Moldova introduces feed-in tariff for small scale solar. pv magazine International. Retrieved from <https://www.pv-magazine.com>

Moldova's commitments to improve energy efficiency and reduce CO2 emissions as part of its revised Energy Strategy.¹²⁶

3.5.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

Moldova still lacks some fundamental pre-requisites in place to meet the fundamental criteria necessary for implementing PPA.

The wholesale electricity market is based on bilateral contracts. Currently, Moldova's electricity market is primarily sustained by supply, from the Moldavskaya GRES (MGRES) in Transnistria and imports from Ukraine¹²⁷ and Romania. This heavy reliance on imports is coupled with a lack of substantial domestic production, which challenges the stability and independence of the market. The country does not yet have an operational power exchange, which is fundamental for establishing cPPA structures as it would allow for more dynamic pricing and risk management.

In more detail, the wholesale market in Moldova is stagnating with implementing envisaged market improvements due to the ongoing Russian aggression on Ukraine. Specifically, market rules implementation (approved in June 2022), which ensure the electricity market development, is hindered due nationwide state of emergency. Trader Energocom is imposed with a public service obligation to directly negotiate contracts for the supply of electricity and sell it to Moldovan market participants (universal service suppliers, suppliers of last resort, distribution and transmission system operators) contrary to competitive electricity procurement.¹²⁸

Moldova's electricity sector is undergoing gradual changes towards market liberalization and integration with European networks. The synchronization of Moldova's grid with the European Network of Transmission System Operators for Electricity (ENTSO-E) via Ukraine has already been technically completed, enhancing the potential for energy trading across borders¹²⁹. This could pave the way for more integrated market operations including day-ahead and intraday markets, crucial for effective cPPA execution.

Furthermore, Moldova's renewable energy capacity, though growing, is still quite modest but critical for the long-term sustainability of PPAs. The country has implemented policies like net-metering, feed-in tariffs, and government auctions to stimulate the renewable sector.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "pay-as-produced" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their

¹²⁶ CEE Legal Matters. (2023). CEELM Comparative Legal Guide: Renewable Energy in Moldova 2023. Retrieved from <https://ceelegalmatters.com>

¹²⁷ International Energy Agency. (n.d.). System Integration of Renewables in Moldova: A Roadmap. Retrieved from <https://www.iea.org>

¹²⁸ Energy Community Secretariat (November 2023). Moldovan Annual Implementation Report 2023

¹²⁹ German Economic Team. (2022, May-June). Key challenges in Moldova's electricity sector. Retrieved from <https://www.german-economic-team.com>

significance in both virtual and physical PPA contexts. The industry standard is that all mid and high voltage consumers are using smart meters already, therefore, there is no limitation for PPA. The Ministry of Energy launched a pilot program in June 2023 to install smart meters as part of a national plan to digitize the energy sector, supported by the United Nations Development Programme (UNDP)¹³⁰. The program is expected to expand after the initial phase, which focuses on testing and evaluating the technology's effectiveness in various conditions. The exact figure of number of smart meters is not publicly unavailable.

Details of each CP market player and market interaction can be found in the appendix and legal section of the document.

Figure 56 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EPT, RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, KomunalnoBrčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektrodistribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-oblenenergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State owned entities

Source: PwC analysis

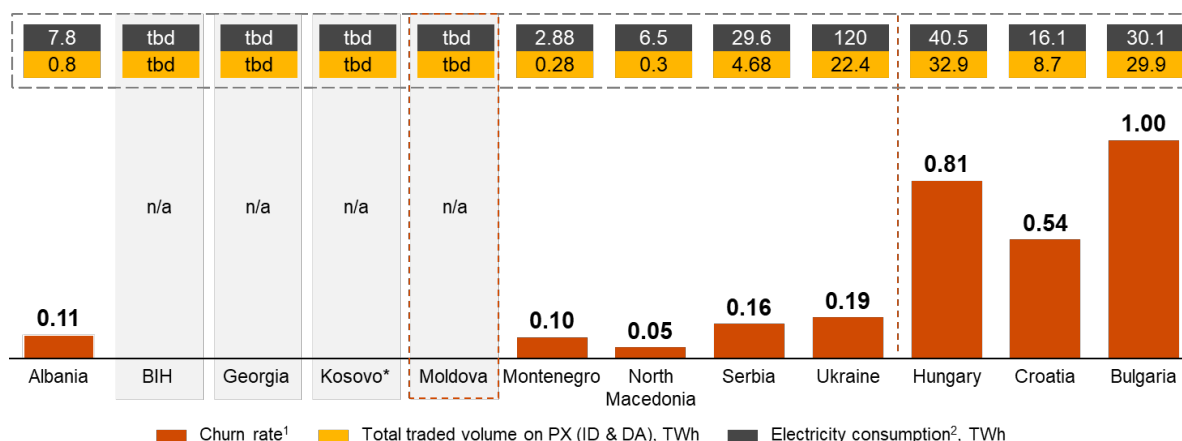
Apart from the assessing the existence of the Power exchange in contracting parties, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

As there is an absence of power exchange, organized day-ahead or intraday market in Moldova, the liquidity comparison for Moldovan organized market is not feasible. Hence, an assessment of liquidity of Moldovan power exchange will be attainable once the day-ahead market or intraday market becomes operational.

¹³⁰ United Nations. (n.d.). Ministry of Energy starts installation of smart electricity meters with support from UNDP. Retrieved from <https://moldova.un.org/en/238286-ministry-energy-starts-installation-smart-electricity-meters-support-undp>

Figure 57 Overview of Contracting Parties and chosen SEE Power Exchanges

Power exchange liquidity in Contracting Parties and & SEE countries in 2023, ratio (traded volume/el. consumption)



Note 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: ALPEX Monthly Reports 2023 (April-December), MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.5.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each Contracting Party. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Based on publicly available data and thorough desktop research, as of 2024, there are no existing or announced Power Purchase Agreements (PPA) in Moldova that have been publicly disclosed. However, the list of existing and announced RES projects and developers can be found in the appendix.

Key investors in the Contracting Party

The leading financial institutions in Moldova comprise both domestic and international commercial banks, including entities such as Moldova Agroindbank, Moldindconbank, Victoriabank, and The European Investment Bank (EIB). Additionally, the EBRD operates within the country, which can be seen in providing the financial support to Moldova for the procurement of crucial gas reserves through a fresh package worth EUR 199 million. This comprises a EUR 165 million EBRD loan alongside a EUR 34 million grant from Norway. With this addition, the total EBRD-led financing for gas acquisitions in Moldova has nearly reached EUR 500 million since the onset of Russia's conflict with Ukraine, effectively ensuring Moldova's energy security. Furthermore, the appendix includes additional examples of financing energy projects within the Contracting Party.¹³¹

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly

¹³¹ The European Bank for Reconstruction and Development. (2023, October 17). EBRD and Norway provide a further €199 million financing package for Moldova gas purchases. Retrieved from <https://www.ebrd.com/news/2023/ebrd-and-norway-provide-a-further-199-million-financing-package-for-moldova-gas-purchases.html>

affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

Moldova has not established a cap-and-trade mechanism in line with EU ETS to internalize the cost of carbon emissions. The Ministry of Environment adopted a Climate Law in May 2024, in order to implement policies for the reduction of GHG emissions. With the new law the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022 is planned to be implemented.¹³²

Additionally, Moldova has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios

¹³² Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.¹³³

Moldova's engagement with the Carbon Border Adjustment Mechanism (CBAM) is part of its broader efforts to align with EU regulations and market standards, with an ultimate goal of achieving carbon neutrality and aligning with the EU's energy and environmental landscape. Around 2.7% of Moldova's exports to EU fall within the CBAM categories, mainly impacting the iron and steel industry sector. This accounts for 2% of Moldovan workforce who would be exposed.¹³⁴

Moreover, the introduction of CBAM is expected to have profound implications for Moldova's trade with the EU, particularly for its energy-intensive industries. The mechanism requires that imports into the EU, such as steel and cement, are subjected to a carbon price equivalent to that which would have been paid if the goods were produced under EU regulations. This will increase the cost of Moldovan exports to the EU, affecting competitiveness unless offset by equivalent advancements in emission reductions domestically.

Overall, while Moldova's path toward CBAM compliance involves substantial regulatory and infrastructural challenges, it also offers an opportunity to accelerate its environmental reforms and enhance its trade relations with the EU under a shared commitment to sustainability.

Figure 58 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in Moldova

Moldova		
Net electricity export/import ¹ (average 2021-2023, GWh)		-250 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		79%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		728 GWh and 18%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Food, beverages and tobacco	46%
	Non-metallic minerals	23%
	Not elsewhere specified ³	7%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity; 2) Share in total electricity consumption of the country; 3) Not specified in any of the other categories, which are: Iron and steel, Chemical and petrochemical, Non-ferrous metals, Non-metallic minerals, Transport equipment, Machinery, Mining and quarrying, Food, beverages and tobacco, Paper, pulp and printing, Wood and wood products, Construction and Textile and leather

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Moldova is a net importer of electricity, so their electricity production and export will not be directly impacted by the CBAM, even though most of their electricity is generated from thermal power plants. Additionally, less than 3% of Moldova's exports fall under CBAM regulations, which primarily affect the iron and steel sector, resulting in minimal CBAM-related costs for Moldova. Nonetheless, the introduction of PPA deals would benefit Moldova by diversifying its energy portfolio. This would enhance their ability to export products to the EU at a lower cost, mitigating the CBAM impact and strengthening Moldova's energy and economic resilience.

¹³³ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

¹³⁴ Magacho, G.; et al (2022, March) Impacts of CBAM on EU trade partners: consequences for developing countries. Agence Francaise de Developpement. Retrieved from <https://www.afd.fr/en/ressources/impacts-cbam-eu-trade-partners-consequences-developing-countries>

CBAM recommendations

Figure 59 Overview of CBAM recommendations in Bosnia and Herzegovina

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Implementation of Law on Climate Change and adoption of relevant secondary legislation	Yes	Law on Climate Change	Incorporation of national carbon pricing mechanism with the Law on Climate Change. Additionally, to transpose the MRVA package adopted at the EnC acquis with the 2022 Ministerial Council Decision.
B – Options for actual indirect emissions based on PPAs			
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	Renewable Energy Law;	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted. In relation to this, Renewable Energy Law should be adopted to introduce the PPA agreements, and the necessary secondary legislation for operation of GOs register should be adopted. Both have already been explained above in this report.



3.6.

Montenegro

3.6.1. Overview of RES electricity supply & demand

This section examines electricity supply and demand trends in Montenegro, focusing on both existing and forecasted RE supply and consumption patterns. RES electricity supply in each market is crucial for PPAs as it ensures there is sufficient generation capacity to meet consumer demand under long-term RE procurement contracts. Additionally, this section includes insights into corresponding generation development scenarios from the Energy Development Strategy of Montenegro until 2030, due to the absence of a Montenegrin NECP). A comprehensive analysis and commentary on RES nominations are also discussed.

Lastly, electricity consumption by key customer segments will be addressed. RES electricity demand in each market is critical for PPAs as it directly influences the feasibility and attractiveness of RE projects, driving the need for stable, long-term contracts between energy producers and purchasers.

In 2024, Montenegro's electricity market is characterized by a mix of state-dominated supply and significant steps toward RE integration. The market includes both regulated and open segments, with state-owned Elektroprivreda Crne Gore (EPCG) playing a central role. EPCG not only serves as a primary supplier, but also engages significantly in renewable projects. These developments are part of Montenegro's strategy to increase its RE capacity and reduce dependency on traditional fossil fuels.

Additionally, in 2024, Montenegro has made significant advancements in its electricity market, particularly with the introduction of the Montenegrin Power Exchange (MEPX) DAM. DAM is expected to offer more competitive pricing and efficient electricity trading, which is particularly beneficial for medium and large electricity consumers in Montenegro. These consumers, including industrial and large commercial users, stand to benefit from more stable and potentially lower electricity prices due to increased market liquidity and competition.

Amid rising wholesale electricity prices during 2022, Montenegro took a different approach from its EU neighbors and several Energy Community member states. Instead of introducing direct financial assistance measures, Montenegro focused on structural enhancements to its energy market. This included the significant development of the MEPX DAM, a step aimed at boosting market liquidity and facilitating RE integration¹³⁵.

Figure 60 Overview of Montenegrin electricity supply in 2022



Source: REGAGEN Annual Report 2022, PwC Analysis

The Energy Development Strategy of Montenegro does not provide expected installed RES capacities until 2030 but showcases RES electricity generation per type. The projected increase of the total share of RES (excluding hydro) electricity generation within final

¹³⁵ Balkan Green Energy News, (27 April 2023). Montenegro launches day-ahead electricity market at MEPX. Balkan Green Energy News. <https://balkangreenenergynews.com/montenegro-launches-day-ahead-electricity-market-at-mepx/>

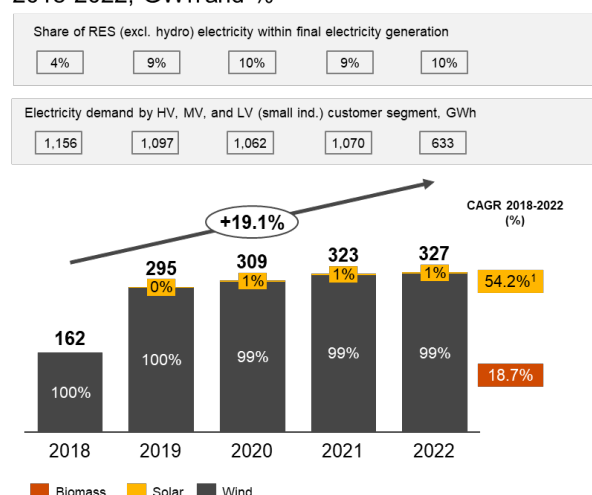
electricity generation to 12% by 2030 suggests a modest rise in RES supply, growing by a 3.6% CAGR over a five-year period (2025-2030), indicating a gradual rather than a rapid expansion in RE production. This is supported by a fact that historic RES generation increased by a 19.1% CAGR from 2018 until 2022, and anticipated growth is at only 3.6%. This trend presents a less optimistic outlook for PPAs, signaling a cooling in the previously robust expansion of RE supply.

It is important to note that the projected scenario for RES electricity generation in Montenegro, as outlined in The Energy Development Strategy until 2030, originates from 2014. The forthcoming Montenegrin draft of the NECP is expected to provide pertinent and updated information regarding RES electricity generation and installed capacity, aligning with the envisioned and obligatory RES targets.

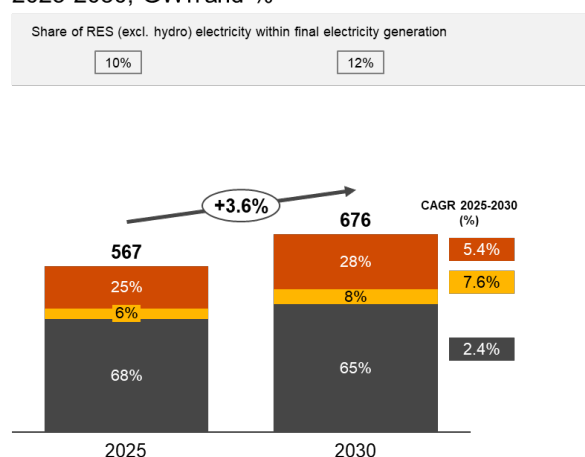
Furthermore, a dominant RES technology is anticipated to be wind with 65% share in total RES generation by 2030, which amounts to 440 GWh. This coincides with existing installed RES capacities, since wind seems to dominate RES market by contributing with 96% of total RES installed capacities in Montenegro in 2022.

Figure 61 Historical and projected RES electricity generation in Montenegro

RES electricity generation per type in Montenegro 2018-2022, GWh and %



RES electricity generation per type in Montenegro 2025-2030, GWh and %

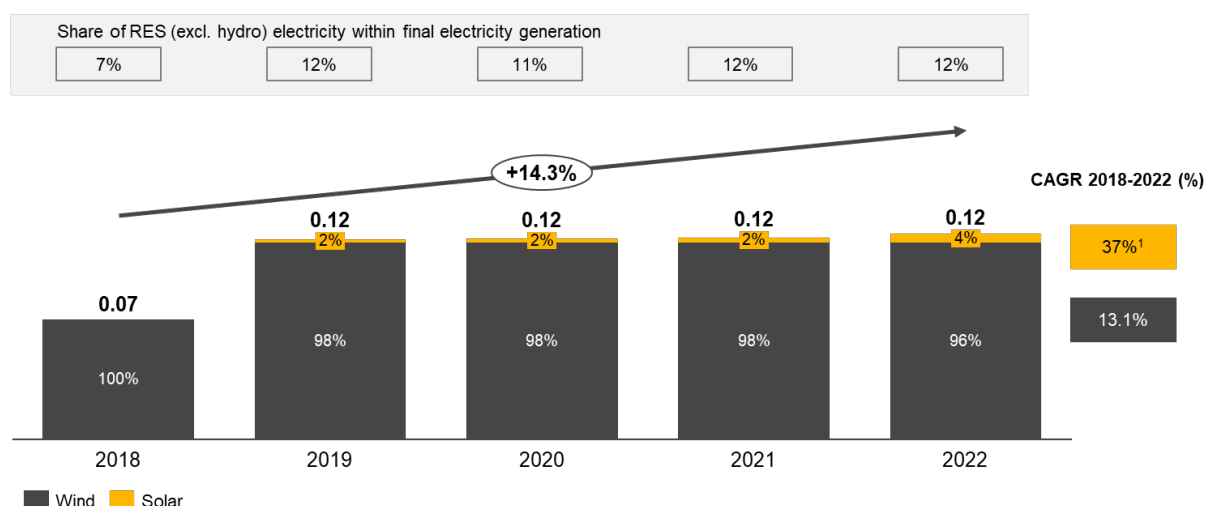


Note: 1) CAGR for Solar refers to the time frame 2019-2022

Source: The Energy Development Strategy of Montenegro until 2030, REGAGEN Annual Reports (2018-2022), PwC analysis

Figure 62 RES installed capacity in Montenegro

Installed capacity per RES in Montenegro 2018-2022, GW and %



Note:1) Solar installed capacity CAGR includes the period from 2019 to 2022

Source: REGAGEN Annual Reports (2018-2022), PwC Analysis

Additionally, electricity generation share from RE (excluding hydro) sources¹³⁶ in Montenegro rose from 4% (162 GWh) in 2018 to 10% (327 GWh) in 2022. This increase was primarily due to a 99% rise in wind-generated electricity, which contributed an additional 160 GWh. Solar energy, the other significant RE source in Montenegro, solar, began electricity production in 2019 with an annual output of 1 GWh, which increased to 4 GWh by 2022.

The main market player in Montenegro, EPCG, initiated the Solari 3,000+/500+ and 5,000+ projects, aiming to add up to 44 MW of solar installed capacities to the Montenegrin electricity market by the end of 2024 (the state of solar installed capacities in 2022 amounted to 5.14 MW). Specifically, EPCG plans to install solar panels on the roofs of households and businesses, enabling citizens and businesses to produce green energy for self-consumption (i.e. becoming prosumers). Moreover, a new solar subsidy program, Solari Sjever, agreed upon on 9 February 2024, should offer better terms compared to existing subsidy schemes, further expanding installed solar capacities in the northern part of the country¹³⁷.

As Montenegro is finalizing its draft NECP, there is a limit on specific conclusions regarding the potential and framework for PPAs. Without detailed quantitative effects of policies such as specific installed capacities supported or not supported by government schemes, it is challenging to assess the full potential capacity eligible for PPAs.

Planned energy infrastructure development

According to the updated development plan of the transmission system in Montenegro for the period 2023-2032¹³⁸, significant investments and projects are outlined to bolster the transmission grid, support RE integration, and enhance overall grid stability and reliability. Key projects include:

¹³⁶ REGAGEN Annual Reports (2018-2022)

¹³⁷ Balkan Green Energy News, (9 February 2024). Montenegro initiates new solar subsidy program – Solari Sjever. Retrieved from <https://balkangreenenergynews.com/montenegro-initiates-new-solar-subsidy-program-solari-sjever/>

¹³⁸ CGES (March 2022). Plan razvoja prenosnog sistema Crne Gore 2023-2032. Retrieved from <https://regagen.co.me/wp-content/uploads/2022/04/Nacrt-plana-razvoja-prenosnog-sistema-elektricne-energije-za-period-2023-2032.-godine.pdf>

- **New substation construction and substation connection:**

Construction of several new substations is planned to cater to growing electricity demands and distribute loads efficiently across the network. Moreover, the plan includes the integration of substations with the transmission network, enhancing the grid's capability to manage electricity flow from various sources, including RE installations:

- o Reconstruction and expansion of the TS 110/35 kV Pljevlja 1 (projected end date: after 2023).
- o Construction of the TS 400/110/35 kV Brezna (projected end date: 2026).
- o Construction of the TS 110/35 kV Luštica with a connection to the 110 kV network (projected end date: 2024).
- o Construction of the TS 110/35 kV Žabljak (projected end date: 2024).
- o Construction of the TS 110/10 kV Podgorica 7 and connecting it to the 110 kV network (projected end date: 2026).
- o Construction of the TS 110/35 kV Buljarica and connecting it to the 110 kV network (projected end date: 2026).
- o Construction of the TS 110/10 kV Bečići (projected end date: 2027).
- o Construction of the TS 110/35 kV Kolašin (projected end date: after 2025).
- o Construction of the TS 110/35 kV V.Plaza with a connection to the transmission network (projected end date: after 2025).
- o Construction of the TS 110/10 kV Igalo (projected end date: after 2025).
- o Construction of the TS 110/10 kV Podgorica 6 (projected end date: after 2025).
- o Construction of the TS 110/10 kV Podgorica 8 (projected end date: after 2025).
- o Construction of the TS 110/35 kV Bijela (projected end date: after 2025).

- **Line upgrades and new transmission lines**

Extensive upgrades to existing lines and the construction of new transmission lines that are planned:

- o Development of 400 kV transmission line Čevo – Pljevlja (projected end date: 2023).
- o Development of 110 kV transmission line Virpazar - Briska Gora - Ulcinj (projected end date: after 2026).
- o Development of 110 kV transmission line Ulcinj – Briska Gora – Kosmač (projected end date: after 2025).
- o Development of 110 kV transmission line Vilusi - Herceg Novi (projected end date: after 2026).
- o Reconstructions of 110 kV transmission line Lastva - Budva (projected end date: 2024).
- o Reconstructions of 110 kV transmission line Lastva - Tivat (projected end date: 2022).
- o Reconstructions of 110 kV transmission line Podgorica - Danilovgrad - Perućica (projected end date: 2023).
- o Reconstructions of a part of 110 kV transmission line Nikšić – Bileća (Vilusi) (projected end date: 2022).

- o New reconstruction of 110 kV transmission line Bar - Budva (projected end date: 2022).
- o Revitalization of 110 kV transmission line Herceg Novi - Tivat (projected end date: 2022).
- o Revitalization of 110 kV transmission line Bar – Možura - Ulcinj (projected end date: 2024).
- o Reconstructions of 110 kV transmission line Podgorica1 – EVP Trebješica – Andrijević (projected end date: after 2025).
- o Reconstructions of 110 kV transmission line Bar - Možura - Ulcinj (increasing transmission capacity; projected end date: after 2025).
- o Reconstructions of 110 kV transmission line Bar – Budva (increasing transmission capacity; projected end date: after 2025).
- o Reconstructions of 110 kV transmission line Podgorica 2 - Virpazar (increasing transmission capacity; projected end date: after 2025).
- **Interconnections with neighbouring countries:**
 - o Montenegro – Serbia – Bosnia and Herzegovina/ Trans-Balkan Corridor: Development of new 400 kV interconnection between Pljevlja 2 in Montenegro, Bajina Bašta in Serbia, and Višegrad in Bosnia and Herzegovina (projected end date: 2026). The project aims to boost transmission capacity within Montenegro and at its borders with neighboring countries.
 - o Montenegro – Italy: Second pole of the cable (600 MW), involving a new HVDC submarine cable between Lastva in Montenegro and Villanova in Italy, along with DC converter stations. The second HVDC module (600 MW) of the Montenegro-Italy interconnection project is closely linked with the Trans-Balkan Corridor and significantly enhances transmission capacity between Montenegro and SEE countries (projected end date: n.a.).
 - o Montenegro – Bosnia and Herzegovina: Development of new 400 kV interconnection between Brezna in Montenegro and Sarajevo in Bosnia and Herzegovina (projected end date: after 2025).
 - o Montenegro – Bosnia and Herzegovina: Development of new 400 kV interconnection between Pljevlja in Montenegro and Lastva in Bosnia and Herzegovina (Phase 1 completed).
 - o Montenegro – Albania: Development of new 110 kV interconnection between Briska Gora in Montenegro and Dajç in Albania.
- **Integration of RES:**
 - o The grid enhancements aim to facilitate the increased integration of RES. The plan aligns with national energy policies focusing on boosting RE's share in the energy mix, leveraging Montenegro's potential in solar and wind energy.
- **Investment in grid management and digital infrastructure:**

Transition to new technologies, key projects include:

 - o New SCADA system and remote power system management
 - o Video surveillance of substations and facility protection
 - o Disaster Recovery Data Center
 - o Remote access to process networks and SCADA integration

- o Expansion of the AMR system
- o Implementation of the ENTSO-E IP/MPLS network
- o Balkans Digital Highway project

These technologies will enhance system reliability, information security, management, and maintenance.

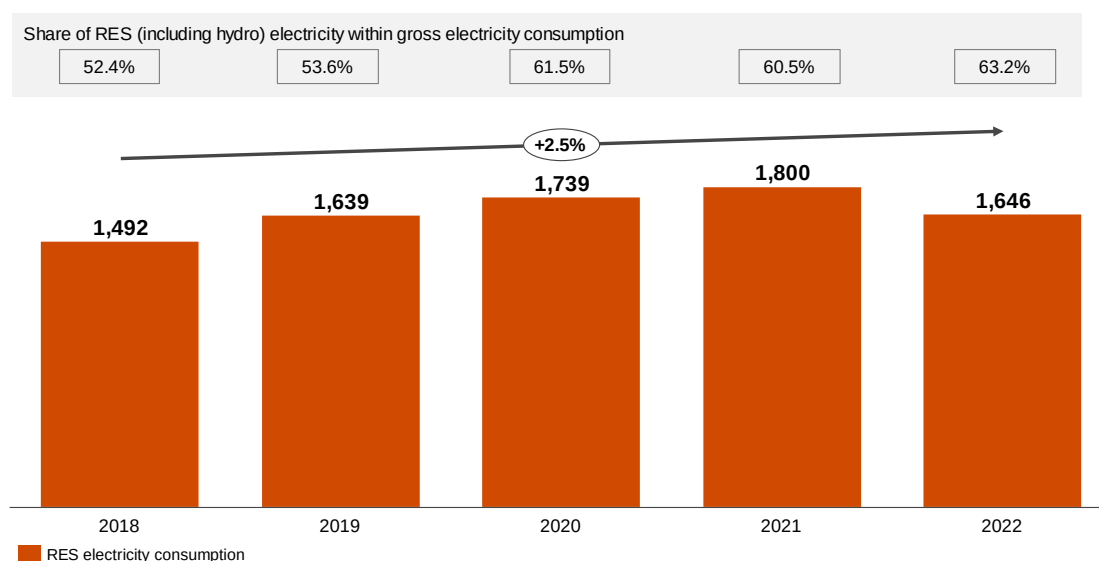
These projects form part of a comprehensive strategy to modernize Montenegro's electrical infrastructure, aligning with broader European energy objectives and the country's commitment to sustainable energy development. By 2032, these investments are expected to significantly enhance the operational capabilities of the grid, ensuring it can meet future demands, support economic growth, and further integrate with the European grid network.

As indicated in the Figure 63 below, share of energy from renewable sources in gross electricity consumption was 63.2% or 1,646 GWh in 2022, marking an increase of 2.7 percentage points from the previous year 2021 (60.5%). Gross electricity consumption sourced from renewable energy sources increased by a 2.5% CAGR in the period from 2018 to 2022, indicating a positive trend in the green electricity consumption over the observed period. This steady increase in RE consumption signals a positive trend and need for the expansion of green energy initiatives. Furthermore, Montenegro has successfully met the 2020 target for RE in gross electricity consumption, attaining 51.4% over the five-year period from 2018 to 2022. However, Montenegro has not established the electricity consumption sourced from renewable energy sources targets for 2030, which is considered inadvisable given the importance of long-term planning in energy policy.

Forecast for gross electricity consumption sourced from renewable energy sources in Montenegro is not available in national energy plans. However, predictions from The Energy Development Strategy of Montenegro until 2030 for the share of energy from renewable sources in the gross final consumption of energy are 48.1% (6 TWh/0.51 Mtoe) in 2025 and 44.8% (6.1 TWh/0.53 Mtoe) in 2030, which is still below the 2030 target of 50% in RES within the gross final energy consumption.

Figure 63 RES electricity consumption in Montenegro

Gross RES electricity consumption in Montenegro, 2018-2022, GWh and %



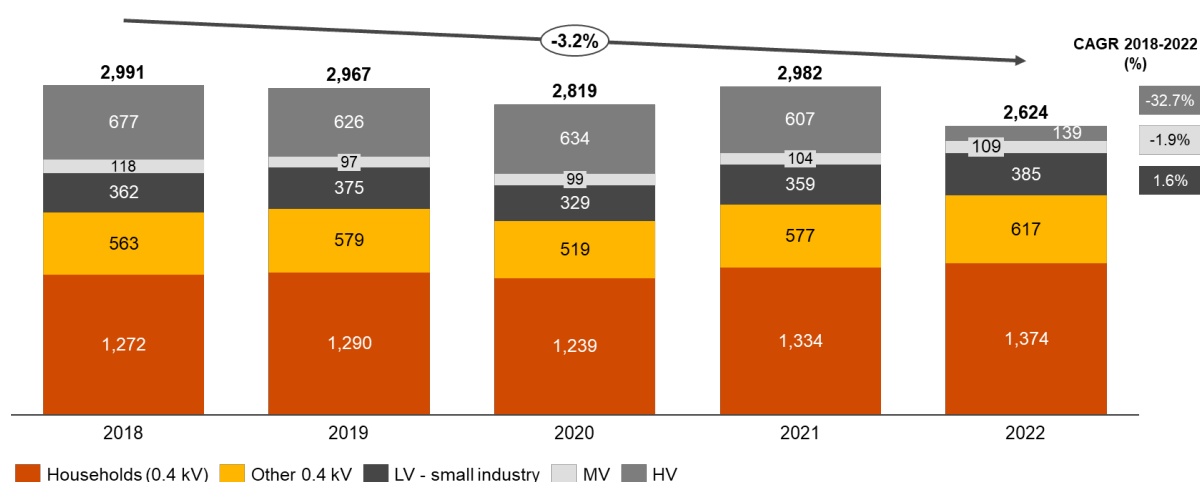
Source: Eurostat, PwC analysis

In Montenegro, during the observed period from 2018 to 2022, a customer segment with the most significant share in electricity consumption¹³⁹ was the household segment that contributed to 52.4% of total electricity consumption among different segments in 2022, which amounted to 1,374 GWh of consumed electricity. On the other hand, HV customers consumption declined by a 32.7% CAGR from 2018 to 2022. Decline in consumption among transmission system customers indicates a potential shift in the market or changes in industrial activity, which could reduce the attractiveness of PPAs, as it may signal a decrease in demand for large-scale electricity supply, potentially leading to less favourable terms for PPAs.

In more detail, for customers connected to the transmission system, compared to consumption in 2021, a decrease in electricity consumption of 77.12% is recorded, while for customers connected to the distribution system, an increase in electricity consumption by 4.6% occurred. At the level of the power system, a drop in electricity consumption of 12.03% compared to 2021 was recorded, which was primarily caused by a decline in the consumption of the customer connected to the transmission system - DOO "Uniprom" (Aluminium Plant Podgorica - KAP)¹⁴⁰.

Figure 64 Electricity consumption per customer segment in Montenegro

Consumption per customer segment, 2018-2022, GWh



Source: REGAGEN Annual Reports (2018-2022), PwC analysis

For a detailed list of electricity consumption per customer segment, along with the number of customers per customer segment, electricity consumption by sectors and electricity consumption by major industrial consumers, please see the Appendix.

3.6.2. Electricity prices

Retail (non-household) prices¹⁴¹ in Montenegro have not experienced significant fluctuations throughout the observed period indicating strong government interference in the electricity prices. This can potentially hinder the PPA market, as the market remains largely under government control. However, an exemption could be the entry of major industry players from Western or developing countries with significant demand levels. In April 2023, the wholesale DAM was opened, achieving average daily baseload prices of 98 €/MWh (average monthly traded volume of 31 GWh) in April-December 2023 period. This price is higher than both the daily baseload price on the Hungarian Power Exchange (HUPX) exchange in April-December

¹³⁹ REGAGEN Annual Reports (2018-2022)

¹⁴⁰ REGAGEN Annual Report 2022

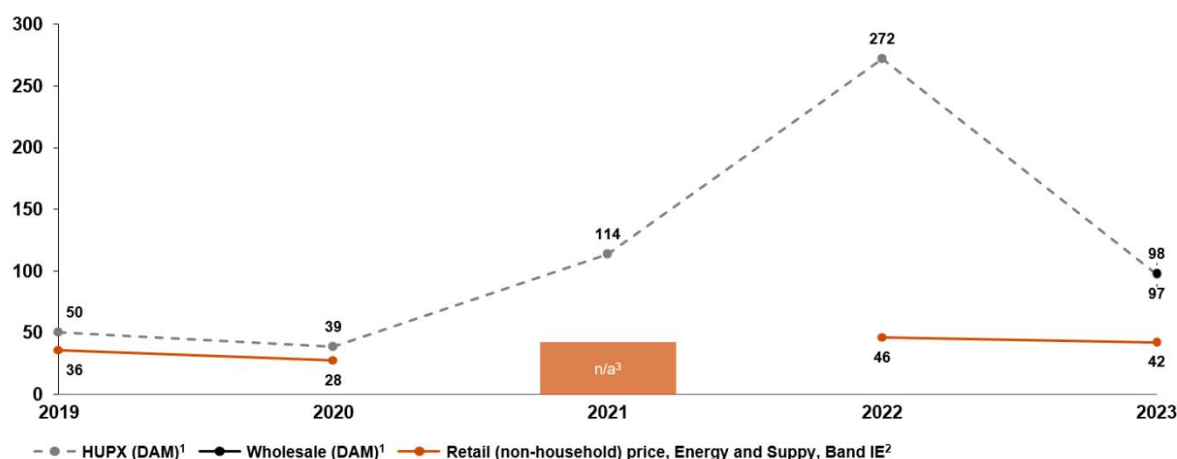
¹⁴¹ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

2023 period of 97 €/MWh (average monthly traded volume of 2,149 GWh), and from the retail price for non-household consumers in Montenegro in 2023 which amounted to 42 €/MWh.

As illustrated in the figure below, from 2019 to 2020 and from 2022 to 2023, Hungarian Power Exchange (HUPX) average daily baseload prices on DAM consistently exceeded retail (non-household) prices in Montenegro, with the most notable difference reaching 226 €/MWh in 2022 (HUPX DAM average monthly traded volume of 2,257 GWh in 2022).

Figure 65 Overview of wholesale and retail electricity prices in Montenegro

Wholesale and retail electricity prices in Montenegro from 2019 to 2023 (€/MWh)



Note: 1) HUPX (DAM) & Wholesale (DAM) prices present the April-December 2023 period, 2) Retail (non-household) price showcases 2019-2020 & 2022-2023 period, due to unavailability of data for 2021

Source: REGAGEN Annual Report 2022, MEPX Monthly Reports 2023 (April-December), HUPX Annual Reports (2019-2023), Eurostat, PwC analysis

3.6.3. Supply options and incentive mechanisms

Montenegro is expected to hold its first RE auctions in early 2025, with the support of the EBRD. The establishment of these auctions is contingent upon the implementation of a new RE law, which has been published in the form of a draft Energy Law for a public debate in August 2024 (comments receiving period until September 16th 2024). This new law aims to align Montenegro's regulatory framework with the EU's Renewable Energy Directive II, as adapted and adopted in the Energy Community.^{142, 143, 144}

Montenegro's electricity market features both a DAM and opportunities for bilateral contracts. The DAM, managed by the MEPX, was launched in April 2023, facilitating short-term electricity trading. This market enables dynamic pricing and better integration with European electricity markets.

In addition to the DAM, bilateral contracts remain a significant component of Montenegro's energy market. They allow for direct agreements between producers and consumers, enabling parties to negotiate terms directly. Bilateral contracts offer price stability and risk

¹⁴² Balkan Green Energy News, (2023, December 16th). Montenegro to announce auctions for renewables by 2025. Retrieved from <https://balkangreenenergynews.com/montenegro-to-announce-auctions-for-renewables-by-2025/>

¹⁴³ Balkan Green Energy News, (2024, August 9th). Montenegro publishes draft Energy Law for public debate. Retrieved from <https://balkangreenenergynews.com/montenegro-publishes-draft-energy-law-for-public-debate/>

¹⁴⁴ Balkan Green Energy News, (2024, June 4th). Montenegro to launch renewables auctions in early 2025 – ministry. Retrieved from <https://balkangreenenergynews.com/montenegro-to-launch-renewables-auctions-in-early-2025-ministry/>

management benefits, which are particularly important for larger consumers and producers looking to hedge against market volatility¹⁴⁵.

In January 2020, the government initiated a phase-out of FiTs for RE sources. This policy shift aimed to promote the construction of RE installations, such as wind farms, solar power plants and large hydropower plants, without guaranteed incentive prices. This move aligns with the European Commission's guidelines for environmental protection and energy, fostering a more market-driven approach to RE development¹⁴⁶.

3.6.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

Montenegro still lacks some fundamental pre-requisites in place to meet the fundamental criteria necessary for implementing PPA.

The DAM has been operational in Montenegro since April 2023, with a trading volume of 0.3 TWh and an average price of 98 €/MWh for the year. The DAM allows electricity transactions to be scheduled a day in advance, enhancing price transparency and market liquidity. This setup is vital for PPAs, as it enables effective price prediction and management, which supports financial planning and risk management for involved parties.

Montenegro has collaborated with the EPEX SPOT and Slovenian BSP SouthPool, to establish and operationalize its DAM (April 2023), which is managed by MEPX. While the market is not yet directly coupled with other national markets, steps towards integration with European markets are underway. This includes discussions and potential agreements aimed at market coupling, which would enhance market efficiency and stability¹⁴⁷. Moreover, Montenegro plans to integrate its DA electricity market with Italy's in 2026, following a proposal by the Ministry of Energy and Mining and subsequent adoption by the Montenegrin government. This initiative aims to integrate Montenegro into the broader single European market. Initially, Montenegro explored two potential options for this coupling: one with Serbia and the other with a broader consortium consisting of Albania, Kosovo*, North Macedonia and Greece¹⁴⁸.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "PaP" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all MV and HV consumers

¹⁴⁵Mondaq, (2020). A legislative boost to the energy sector in Montenegro. Retrieved from <https://www.mondaq.com/renewables/993014/a-legislative-boost-to-the-energy-sector-in-montenegro>

¹⁴⁶ Balkan Green Energy News. (2020). Montenegro to start phasing out feed-in tariffs for renewables in 2020. Retrieved from <https://balkangreenenergynews.com/montenegro-to-start-phasing-out-feed-in-tariffs-for-renewables-in-2020/>

¹⁴⁷ BELEN, (2020). BELEN and Nord Pool to establish Montenegrin power market. Retrieved from <https://belen-spot.me/en/belen-and-nord-pool-to-establish-montenegro-power-market/>

¹⁴⁸ Balkan Green Energy News, (11 March 2024). Montenegro to couple day-ahead electricity market with Italy. Retrieved from <https://balkangreenenergynews.com/montenegro-to-couple-day-ahead-electricity-market-with-italy/>

are using smart meters already, therefore, there is no limitation for PPA. In Montenegro in 2022, 339,857 electricity users, or 79.81% of all users¹⁴⁹, had installed smart meters.

Details of each CP market player and market interaction can be found in the Appendix and Legal section of the document.

Figure 66 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh / n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh / n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh / 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektrodistribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergō*	DTEK, Kharkiv-obleneergō	UEEX	✓	14.9 TWh / 81 (€/MWh)	✓	20.8 TWh / 83 (€/MWh)	✓	1657 GWh / 95 (€/MWh)	✓

Note: *State-owned entities

Source: PwC analysis

Apart from the assessing the existence of the Power exchange in CPs, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

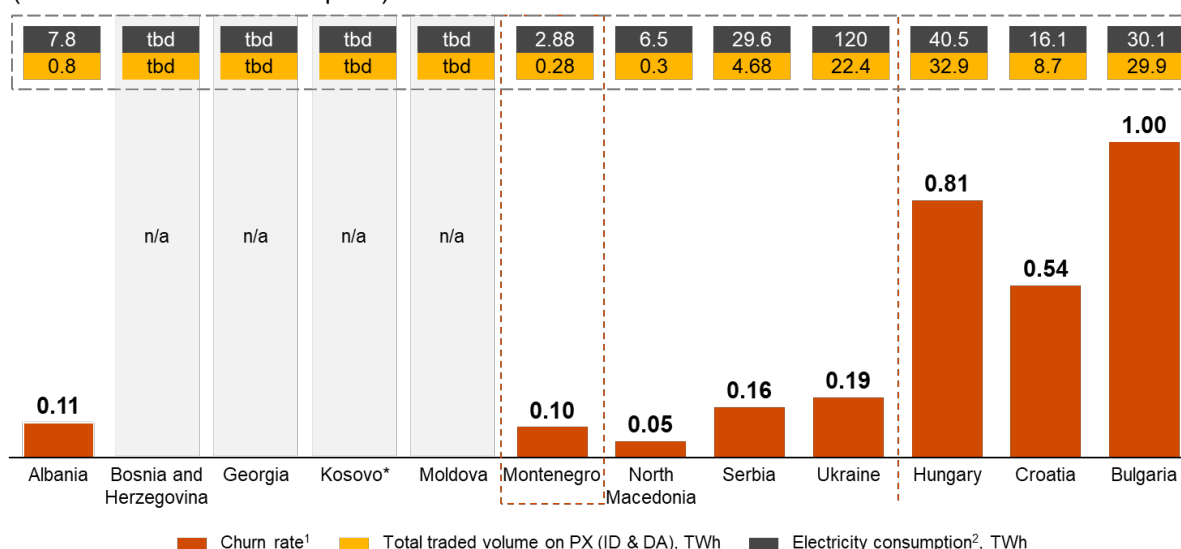
When evaluating the liquidity of the power exchanges among the CPs, the data suggests that MEPX exhibits a subpar churn rate¹⁵⁰ compared to Ukrainian, Serbian, and Albanian power exchanges, but also a moderately higher churn rate than the North Macedonia's power exchange. Furthermore, when comparing these churn rates with those of power exchanges in other SEE countries, notably Hungary, Croatia and Bulgaria, it becomes apparent that their churn rates are significantly higher, indicating superior liquidity in their power exchanges (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78). However, it is important to note that the power exchange in Montenegro commenced operations only in April 2023. Since then, the total traded volume soared from 3 GWh in April to 41 GWh in December 2023. Therefore, a more accurate assessment of MEPX liquidity will be attainable with the total traded volume for 2024.

¹⁴⁹ REGAGEN Annual Report 2022

¹⁵⁰ Apart from the sheer volume of transactions, it is crucial for a market to handle them without causing significant fluctuations in transaction prices. In this regard, analysts often turn to a metric known as the churn rate. This ratio compares the trading volume to the physical demand and reflects how frequently a product, such as electricity, is traded. A high churn rate signifies robust market liquidity, indicating that products are readily bought and sold.

Figure 67 Overview of CPs and chosen SEE Power Exchanges

Power exchange liquidity in Contracting Parties and SEE countries in 2023, ratio (traded volume/el. consumption)



Note: 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption; 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.6.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Following a comprehensive desktop research and analysis of publicly accessible data, it has been observed that no PPA agreements have been officially revealed or made publicly available within the Montenegrin energy sector as of the present time. However, the list of existing and announced RES projects and developers can be found in the Appendix.

Key investors in the Contracting Party

The leading financial institutions in Montenegro comprise CKB Bank, NLB Bank, Erste Bank and Hipotekarna Bank. BRD's involvement has contributed to the growth of renewable energy production in Montenegro, notably through the provision of a EUR 82 million loan¹⁵¹ to EPCG. Furthermore, the Appendix includes additional examples of financing energy projects within the CP.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable

¹⁵¹ EBRD web page, (19 June 2023). EBRD finances 55 MW wind farm in Montenegro with €82 million loan. Retrieved from: <https://www.ebrd.com/news/2023/ebd-finances-55-mw-wind-farm-in-montenegro-with-82-million-loan.html>

CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

Montenegro is one of the more advanced CP countries in terms of introducing a cap-and-trade mechanism. Namely, Montenegro has established a cap-and-trade mechanism in 2020 to internalize the cost of carbon emissions. Reporting rules were established along with the cap-and-trade mechanism, however, additional provisions from the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022 shall be transposed.¹⁵²

Additionally, Montenegro has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include GOs. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging GOs, particularly in scenarios

¹⁵² Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

where CPs are developing and integrating GOs markets. Furthermore, the exclusion of GOs means that cross-border virtual PPAs would not qualify for CBAM exemption.¹⁵³

In Montenegro, the share of total CBAM exports to the EU in 2021 has been 53% and mostly attributable to aluminum and electricity industries. This underscores the potential significant impact of CBAM on Montenegro. Notably, in 2020, 46% of Montenegro's electricity generation relied on coal-powered plants, primarily fueled by lignite. Consequently, the introduction of CBAM is likely to significantly impact electricity trade. Additionally, it is noteworthy that Montenegro's prominent aluminum plant ceased operations in 2021, mitigating the CBAM's impact on that industry.¹⁵⁴

¹⁵³ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

¹⁵⁴ Allert V. et al (2023, June). Impacts of the EU carbon border adjustment mechanism on the Western Balkans and Ukraine: policy options for governments. Retrieved from https://www.germanwatch.org/sites/default/files/germanwatch_impacts_of_the_cbam_on_the_western_balkans_and_ukraine_2023_0.pdf

Figure 68 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in Montenegro

Montenegro		
Net electricity export/import ¹ (average 2021-2023, GWh)		1,776 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		43%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		525 GWh and 18%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Non-ferrous metals	69%
	Food, beverages and tobacco	12%
	Wood and wood products	5%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. In the period from 2021 to 2023, Montenegro has been a net exporter of electricity, but over 40% of its electricity (averaged 2020-2022) has been produced from thermal powerplants. This makes the electricity Montenegro exports highly susceptible to CBAM taxes. Through the use of PPA deals, Montenegro could substantially change its electricity generation landscape enhancing its electricity competitiveness in EU markets.

CBAM recommendations

Figure 69 Overview of CBAM recommendations in Montenegro

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Fully transposition of the MRVA package	Yes	Law on climate changes	The MRVA package as adopted at the EnC acquis with the 2022 Ministerial Council Decision shall be fully transposed.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.



3.7.

North Macedonia

3.7.1. Overview of RES electricity supply & demand

This section covers electricity supply and demand trends in North Macedonia, examining existing and forecasted RE supply and consumption patterns. RES electricity supply in each market is critical for PPAs as it ensures that there is sufficient generation capacity to meet the demand of consumers under long-term RE procurement contracts. Additionally, insights into corresponding generation development scenarios from NECP and additional strategies are discussed, alongside a comprehensive analysis and commentary on RES nominations.

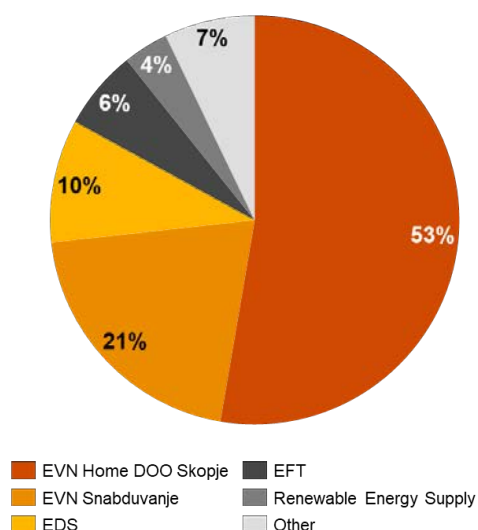
Lastly, electricity consumption by key customer segments will be discussed. RES electricity demand in each market is crucial for PPAs as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In 2022, North Macedonia's electricity market regarding electricity supply was divided between the open market, supplying 47.3%, and the regulated market, supplying 52.7%¹⁵⁵. This represents a shift from 2021, where the open market supplied 53.5% of electricity. The transition back to the regulated market was influenced by a spike in open market prices and reduced economic activity. The open market featured 19 active suppliers, with EVN Snabduvanje being the largest, providing 43% of the open market's electricity. Other significant suppliers included EDS, EFT, Renewable Energy Supply, Duferco MK and Future Energy.

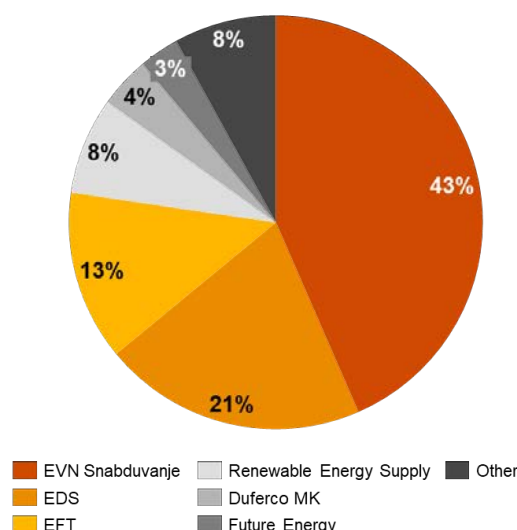
Additionally, regulated market prices were significantly lower for small consumers compared to open market prices, prompting a continued preference for the regulated market. Moreover, the North Macedonia's government implemented price interventions such as lowering tariffs for over 70,000 small businesses by 20.15%¹⁵⁶ and offering temporary reduced electricity rates for food producers (October 2022) at 80 €/MWh to stabilize electricity costs in response to economic fluctuations. This demonstrates the government's efforts to manage electricity costs amid economic fluctuations.

Figure 70 Overview of North Macedonia's electricity supply in 2022

Electricity supply in North Macedonia 2022, %



Electricity supply in North Macedonia in open market 2022, %



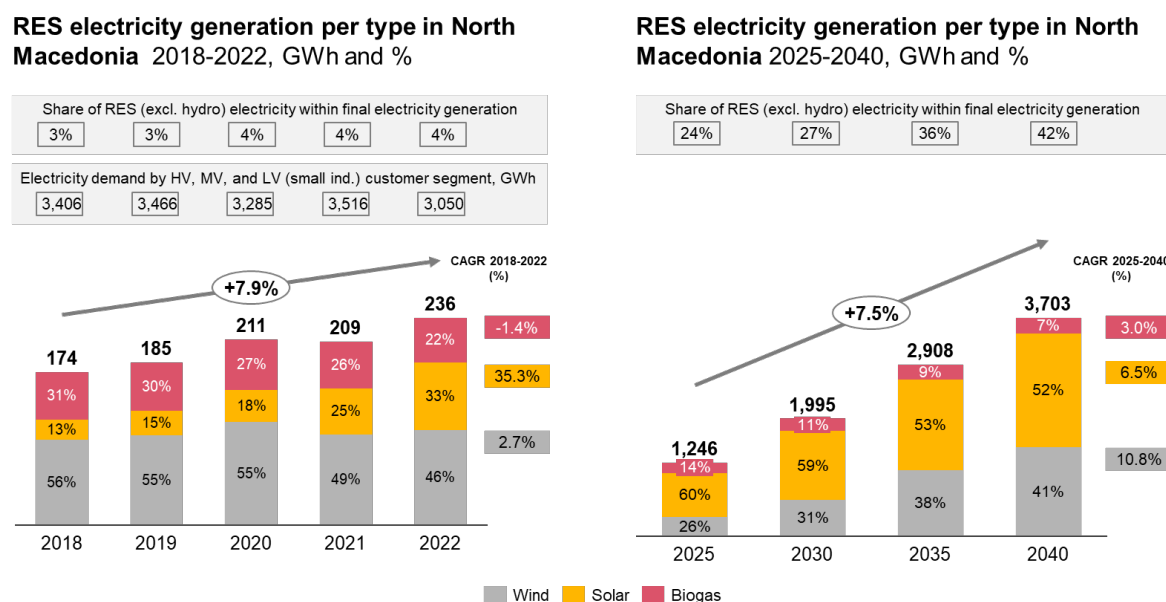
¹⁵⁵ ECRB Market Monitoring Report (2022)

¹⁵⁶ Western Balkans Investment Framework, (13 March, 2023). EU disburses €80 million to North Macedonia as part of energy support package. Retrieved from: <https://www.wbif.eu/news-details/eu-energy-support-package-80-million-north-macedonia-budget>

Source: ERC Annual Report (2022), PwC Analysis

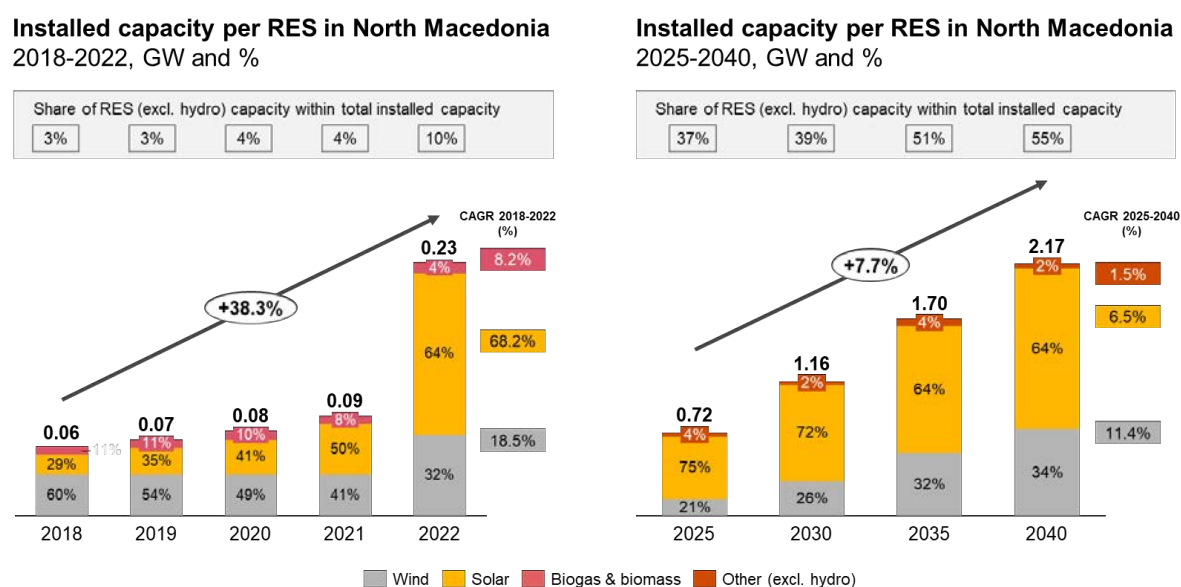
According to North Macedonia's scenario with additional measures (WAM) within the NECP, which was adopted in May 2022 (making the base year earlier than other NECPs), and the Green scenario within The Strategy for Energy Development of North Macedonia until 2040, the projection for RES electricity is to constitute 42% of total electricity generation by 2040. This is supported by a substantial increase in installed RES capacity to 2.17 GW, predominantly from solar technology, representing a significant leap from the current 4% share. This growth, alongside the expectation for RES capacity to comprise 55% of the total installed capacity, up from 10%, indicates a robust and favorable market for PPA, reflecting a strong commitment to RE development.

Figure 71 Historical and projected RES electricity generation in North Macedonia



Source: The Strategy for Energy Development of MK until 2040, ERC Annual Reports (2018-2022), PwC analysis

Figure 72 Historical and projected RES installed capacity in North Macedonia



Source: North Macedonia's NECP, ERC Annual Reports (2018-2022), PwC analysis

The Compound Annual Growth Rate (CAGR) of 38.3% in RES capacity from 2018 to 2022, primarily led by solar installations, increased RES's proportion of total installed capacity from 3% to 10%. This growth supports the potential for PPAs by providing a steadily increasing

sustainable energy supply. According to the North Macedonia's NECP, this upward trend is expected to continue, with the RES capacity projected to grow at a 7.7% CAGR from 2025 to 2040, comprising 55% of the total installed capacity by 2040.

As pointed, in 2022, North Macedonia's installed RES capacity was 0.23 GW. According to projections in the NECP, this is expected to increase to 2.17 GW by 2040, revealing a gap of 1.95 GW. Out of this gap, according to NECP's plan, government-supported RES capacities will account for 0.78 GW, leaving 1.17 GW of RES capacities potentially available for PPAs.

Planned energy infrastructure development

According to the MEPSO's "Development Plan of the Electric Transmission System for the Period 2023-2032" report, there are five key investments projects planned for the transmission grid during this period:

- **New Substation Construction:**
 - o New 400/110 kV substation in Miletkovo, with provisions for future expansion.
- **Substation Connection:**
 - o Connection to the existing 400 kV Dubrovo-Thessaloniki line at the new Miletkovo substation.
- **Line Upgrades:**
 - o Conversion of a 110 kV line from dual-system two-phase to single-system three-phase between Valandovo and Miletkovo.
- **New Transmission Lines:**
 - o Construction of a new 110 kV dual-system two-phase line and a cable line to connect new infrastructure in the Miletkovo area.
- **Additional New Lines:**
 - o New 110 kV line and cable line connecting Valandovo and Strumica.

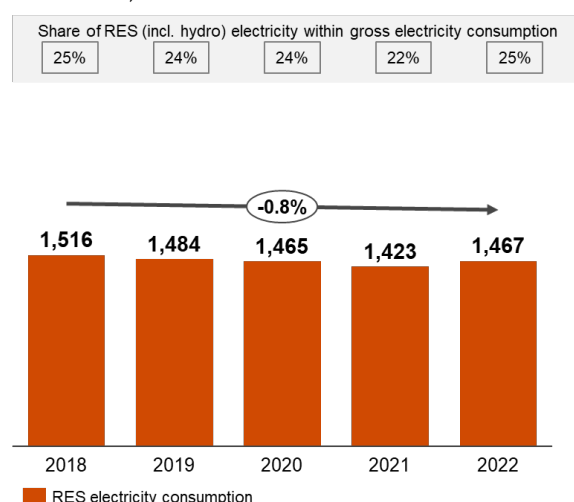
These investments are part of a comprehensive strategy to strengthen the transmission network, facilitate the integration of RE, and enhance grid stability and reliability.

North Macedonia's NECP, established in May 2022, outlines the expected growth trajectory for gross electricity consumption sourced from renewable energy sources. In 2022, electricity consumption sourced from renewable energy sources, including hydro, accounted for 25% of total gross electricity consumption. By 2030, this share is projected to rise to 22% excluding hydro, and up to 66% when including hydro, potentially meeting the Energy Community's 2030 target of a 66% RES share when hydro is considered.

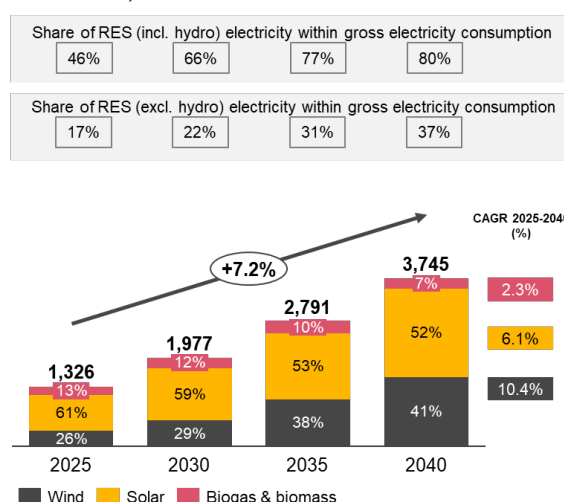
By 2030, solar energy is forecasted to provide 59% and wind energy 29% of the total gross electricity consumption sourced from renewable energy sources. These projections indicate a promising market for PPAs, as they will likely play a critical role in achieving the substantial increase in RES-generated electricity.

Figure 73 Historical and projected RES electricity consumption in North Macedonia

RES electricity consumption in North Macedonia 2018-2022, GWh and %



RES electricity consumption in North Macedonia 2025-2040, GWh and %

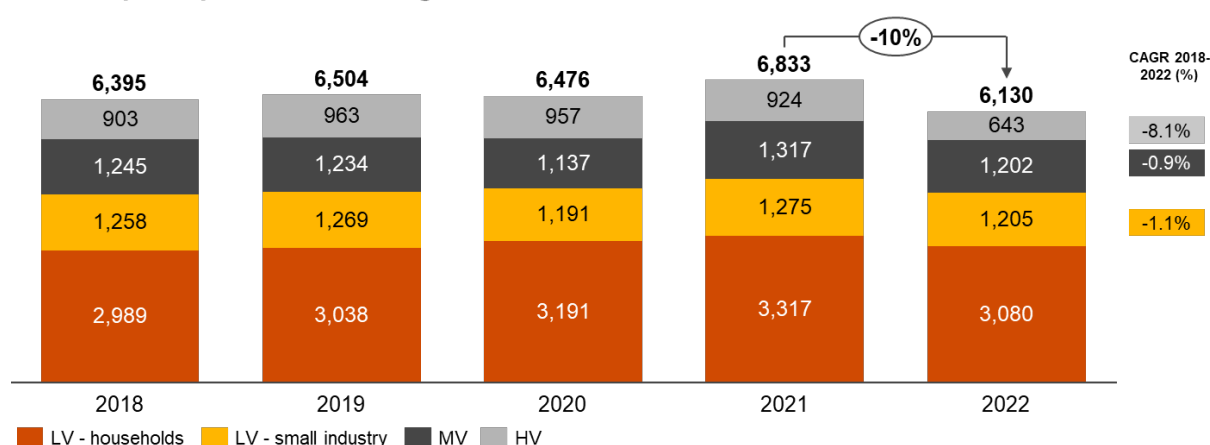


Source: North Macedonia's NECP, Eurostat, PwC Analysis

In North Macedonia, the customer segment with the highest consumption¹⁵⁷ for the period from 2018 to 2022 was the household segment, with 50% of the total share in electricity consumption across different segments. However, consumption among HV customers decreased at an 8.1% CAGR from 2018 to 2022, while consumption among MV customers decreased by a ~1% CAGR. The drop in consumption among HV and MV customers could diminish the appeal of PPAs, necessitating strategy adjustments to align with the reduced demand in this segment.

Figure 74 Electricity consumption per customer segment in North Macedonia

Consumption per customer segment 2018-2022, GWh



Source: ERC Annual Reports (2018-2022), PwC analysis

For a detailed list of electricity consumption per customer segment, along with the number of customers per customer segment, electricity consumption by sectors and electricity consumption by major industrial consumers, please see the Appendix.

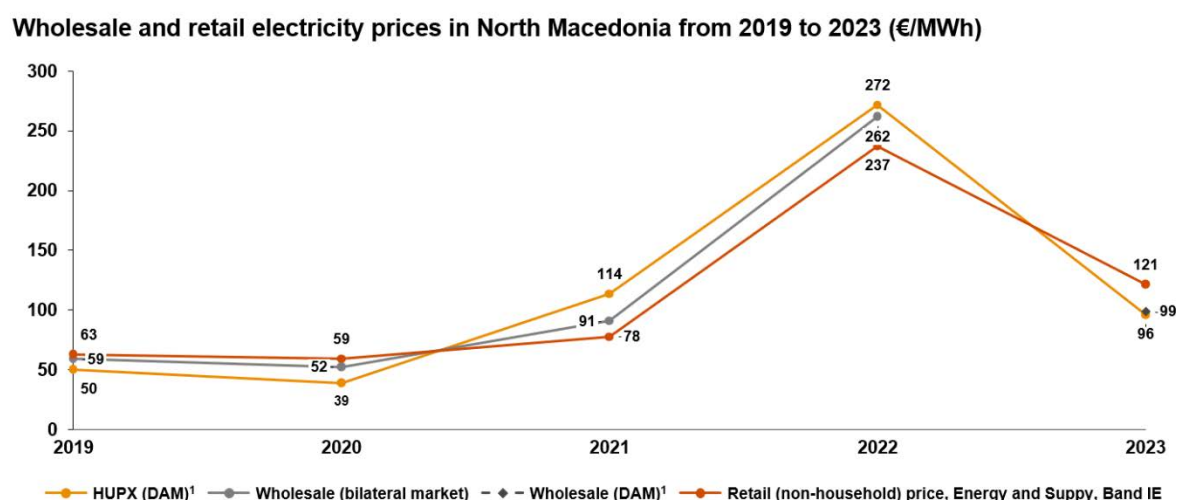
3.7.2. Electricity prices

Expanding on the fluctuations in North Macedonia's wholesale and retail electricity prices, the implementation of PPAs can serve as a tool for achieving price stability amid market volatility.

¹⁵⁷ ERC Annual Reports (2018-2022)

The DAM, operational since May 2023, underscores this potential by offering an average daily baseload price of 99 €/MWh in 2023 (average monthly traded volume of 42 GWh). This competitive pricing is compared to the retail non-household sector, where prices¹⁵⁸ are 22 €/MWh higher, suggesting an advantageous environment for the establishment of PPAs. Furthermore, in 2023 (May-December), when comparing North Macedonia's DAM with the Hungarian Power Exchange (HUPX DAM average monthly traded volume of 2,172 GWh during May-December period in 2023), the average daily baseload prices are higher by 3 €/MWh on the North Macedonia's DAM. Lower electricity prices on the North Macedonia's DAM compared to retail (non-household) prices could further incentivize the transition to locally generated RE facilitated by PPAs, as North Macedonia's DAM could offer cost advantages.

Figure 75 Overview of wholesale and retail electricity prices in North Macedonia



Note: 1) HUPX (DAM) & Wholesale (DAM) prices present the May-December 2023 period

Source: ERC Annual Reports (2019-2022), MEMO Monthly Reports 2023 (May-December), HUPX Annual Reports (2019-2023), Eurostat, PwC analysis

3.7.3. Supply options and incentive mechanisms

In 2023, North Macedonia has experienced a significant surge in solar power projects, with construction permits issued for projects exceeding a total capacity of 400 MW. This increase is anticipated to result in surplus electricity from renewable sources between May and October. The country's TSO, MEPSO, received an unexpectedly high demand for grid connections, with 43 requests amounting to 5.14 GW in the previous year and an additional 8 GW expected. In the latest available MEPSO report ("Development Plan of the Electric Transmission System for the Period 2023-2032"), newly planned solar PV projects/installed capacity have a total installed capacity of ~6.3 MW, alongside an expected onshore wind capacity of around 1.4 MW. While it remains to be seen whether all these plans will be realized, this development indicates strong interest in the RE sector in North Macedonia.

In North Macedonia, in order to be eligible for FiTs, energy producers must be categorized as "preferential" producers. Upon approval, producers enter a 15 to 20 years contract depending on the type of power plant. The FiTs scheme is detailed for different technologies, with each having a defined upper limit of installed capacity that qualifies for the tariff. For instance, hydro power plants have an installed capacity limit of 10 MW, wind farms at 50 MW, and biomass/biogas plants at 1 MW post-July 2021 adjustments. Wind power plants have a capacity limit of 50 MW, with a FiT rate of 8.9 cents/kWh over a duration of 20 years.

¹⁵⁸ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

In addition to FITs, North Macedonia has implemented renewable energy auctions as part of its strategy to increase the share of renewable energy sources. These auctions are designed to promote competition and attract investments by offering incentives such as feed-in premiums. The Ministry of Economy of the Republic of North Macedonia organized three auctions for investors to bid on feed-in-premium subsidies for their photovoltaic power plants. Two auctions were held in 2019 and one in 2021, all using a reverse bidding auction format where the lowest bid won. The Government of North Macedonia has not disclosed the premium amounts awarded to the selected investors.

The first auction was announced on June 10, 2019. Applications were accepted for photovoltaic power plants on state land in ten locations in the Sveti Nikole region and one in the Makedonski Brod region, totalling 35MW. Out of 80 applications, 11 agreements were signed, each with a 15-year feed-in-premium period.¹⁵⁹

The second auction was announced on July 31, 2019. This auction aimed to subsidise photovoltaic power plants on privately owned land with a planned capacity of 27MW. Agreements for 21MW were signed by 23 investors across 29 locations in 16 municipalities, all with a 15-year feed-in-premium period. The premium amounts awarded with the agreements remain undisclosed.¹⁶⁰

The third auction announced on 04.08.2021. Feed-in-premiums were offered for a total installed capacity of 80MW of photovoltaic power plants, on both public and private land. A total of 53 investors signed agreements, but the total installed capacity and premium amounts have not been disclosed.¹⁶¹

This integrated approach supports both smaller, scalable projects and larger-scale investments, enhancing North Macedonia's energy independence and market stability.^{162,163}

The Macedonian bilateral market is operational allowing for direct contracts between buyers and sellers. ESM aims to sign several utility PPAs for the next 30 years that indicates ESM's commitment to long-term energy sustainability and stability. Details are discussed in the section 3.7.5.

Additionally, in November 2023, the launch of the €30 million Green Finance Facility marked a collaborative effort between North Macedonia's government, the UN, EBRD¹⁶⁴ and local commercial banks. This initiative will provide new loan options for SMEs, and creditworthy

¹⁵⁹ Balkan Green Energy News. (2020, February 19). Bulgarian, Slovenian, local firms to install solar PV plants in North Macedonia. Retrieved from <https://balkangreenenergynews.com/bulgarian-slovenian-local-firms-to-install-solar-pv-plants-in-north-macedonia/>

¹⁶⁰ Balkan Green Energy News. (2020, May 20). Contracts signed for solar power plants of 21 MW in N. Macedonia. Retrieved from <https://balkangreenenergynews.com/contracts-signed-for-solar-power-plants-of-21-mw-in-n-macedonia/>

¹⁶¹ Balkan Green Energy News. (2020, May 20). North Macedonia calls for bids in 80 MW solar power auction. Retrieved from <https://balkangreenenergynews.com/north-macedonia-calls-for-bids-in-80-mw-solar-power-auction/>

¹⁶² Balkan Green Energy News. (2023, December 2). North Macedonia presents just energy transition platform worth EUR 3 billion. Retrieved from <https://balkangreenenergynews.com/north-macedonia-presents-just-energy-transition-platform-worth-eur-3-billion/>

¹⁶³ USAID. (2021, October 14). USAID celebrates energy sector reforms in North Macedonia. Retrieved from <https://www.usaid.gov/news-information/press-releases/oct-14-2021-usaid-celebrates-energy-sector-reforms-north-macedonia>

¹⁶⁴ EBRD, (9 November, 2023). New green finance for SMEs and underserved individuals in North Macedonia. Retrieved from <https://www.ebrd.com/news/2023/new-green-finance-for-smes-and-underserved-individuals-in-north-macedonia.html>

individuals and households to invest in RE and energy efficiency solutions. The aim is to boost sustainable investments in RE technologies.

3.7.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

North Macedonia still lacks some fundamental pre-requisites in place to meet the fundamental criteria necessary for implementing PPA.

The Day-Ahead Market became operational in May 2023, with a volume/price in 2023 recorded at 0.3 TWh/99 €/MWh. DAM facilitates electricity transactions to be scheduled a day in advance, thereby enhancing price transparency and market liquidity. This setup is crucial for PPAs, as it enables effective price prediction and management. Such predictability supports financial planning and risk management for all parties involved in PPAs. However, the development of the ID market is still pending, while there is a functional balancing market (MEPSO operated) in North Macedonia.

DAM in North Macedonia is not coupled with any other DAM, but a Memorandum of Understanding¹⁶⁵ on the coupling of DA electricity markets was signed by North Macedonia, Greece, Albania and Kosovo* in 2023. In addition, a similar Memorandum of Understanding on the DAM coupling was previously signed between Bulgaria, North Macedonia and Albania in 2019.¹⁶⁶ According to the Electricity Market Operator of North Macedonia (MEMO), North Macedonia anticipates finalizing the initial integration of its organized electricity market with that of a neighboring EU member state by the end of 2026.¹⁶⁷

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual “PaP” arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. In North Macedonia, there exists a smart metering system to some extent, although the precise count of smart meters is not publicly accessible. It is anticipated that significant industrial entities have implemented smart metering systems. Moreover, in research conducted by the Energy Regulators Regional Association from July to August 2021, the share of smart meters in North Macedonia was 14.8% of the total number of metering points.¹⁶⁸

Details of each CP market player and market interaction can be found in the Appendix and Legal section of the document.

¹⁶⁵ Balkan Green Energy News, (14 November 2023). North Macedonia, Greece, Albania, Kosovo* take step towards day-ahead market coupling. Retrieved from <https://balkangreenenergynews.com/north-macedonia-greece-albania-kosovo-take-step-towards-day-ahead-market-coupling/>

¹⁶⁶ Balkan Green Energy News, (12 March 2019) Bulgaria, North Macedonia, Albania sign memorandum on day-ahead market coupling. Retrieved from <https://balkangreenenergynews.com/bulgaria-north-macedonia-albania-sign-memorandum-on-day-ahead-market-coupling/>

¹⁶⁷ MEMO. (2023). Annual Report 2023. Macedonian Electricity Market Operator. Retrieved from <https://memo.mk>

¹⁶⁸ ERRA. (2022). Smart Meter Penetration in Select ERRA Member Countries. Results of the Joint Analysis by the ERRA Committees and Working Group. Retrieved from https://erranet.org/wp-content/uploads/2022/04/Kasepalu_Smart_Metering_ERRA_CPWG_Jan2022.pdf

Figure 76 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022 ¹	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelektrika*, CET-Nord*	Moldelektrika*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektro distribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-oblenevro*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State-owned entities; 1) Latest available data on the bilateral market in North Macedonia

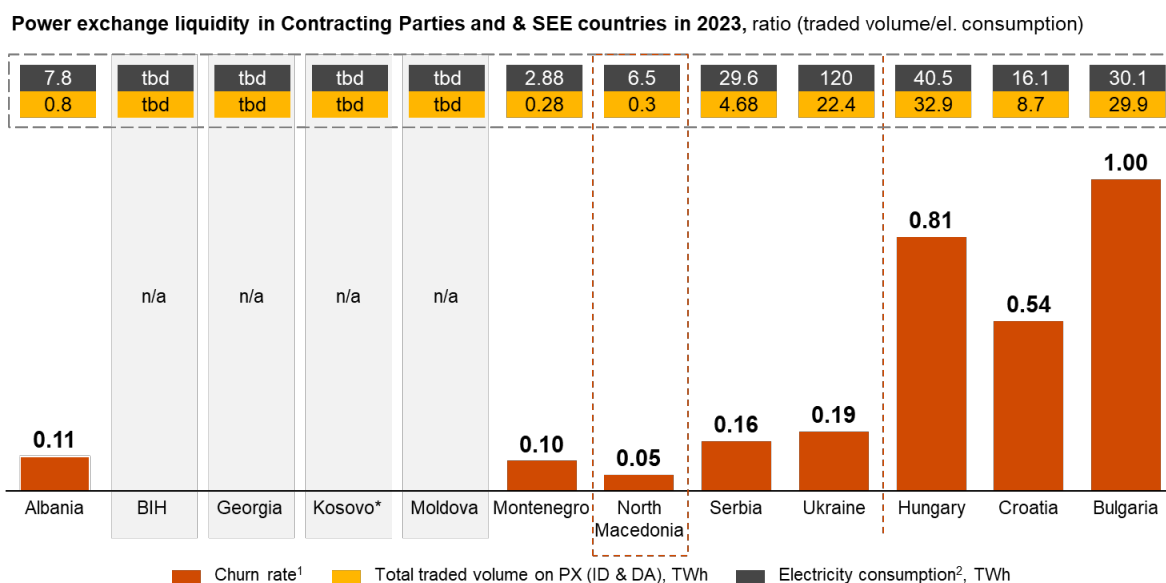
Source: PwC analysis

Apart from the assessing the existence of the Power exchange in CPs, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

When evaluating the liquidity of the power exchanges among the CPs, the data suggests that North Macedonia's power exchange exhibits the lowest churn rate¹⁶⁹ compared to the others. Furthermore, when comparing these churn rates with those of power exchanges in other SEE countries, notably Hungary, Croatia and Bulgaria, it becomes apparent that their churn rates are significantly higher, indicating superior liquidity in their power exchanges (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78). However, it is important to note that the power exchange in North Macedonia commenced operations in May 2023, and since then the total traded volume soared from 7 GWh in May to 82 GWh in December 2023. Therefore, a more accurate assessment of liquidity in the North Macedonia's power exchange will be attainable with the total traded volume for 2024.

¹⁶⁹ Apart from the sheer volume of transactions, it is crucial for a market to handle them without causing significant fluctuations in transaction prices. In this regard, analysts often turn to a metric known as the churn rate. This ratio compares the trading volume to the physical demand and reflects how frequently a product, such as electricity, is traded. A high churn rate signifies robust market liquidity, indicating that products are readily bought and sold.

Figure 77 Overview of CPs and chosen SEE Power Exchanges



Note: 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption; 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.7.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Based on publicly available data and thorough desktop research, as of 2024, there are no completed Power Purchase Agreements (PPA) in North Macedonia that have been publicly disclosed. However, there are indications that the PPA market is expected to change, once the four investors sign PPA deals with the state-owned power utility ESM. These projects represent significant advancements in North Macedonia's efforts to expand its energy capacity and diversify its energy sources. The government plays a critical role in facilitating these agreements through negotiations and providing state aid where necessary. It is assumed that the power utility Elektrani na Severna Makedonija (ESM) will offer a sleeving arrangement and/or similar arrangements for upcoming utility Power Purchase Agreement (PPA) deals.¹⁷⁰

¹⁷⁰ Balkan Green Energy News (2024, February 5th). UPDATE: North Macedonia prepares first agreements with strategic investors for solar power plants, cogeneration. Retrieved from <https://balkangreenenergynews.com/update-north-macedonia-prepares-first-agreements-with-strategic-investors-for-solar-power-plants-cogeneration/>

Figure 78 Announced and expected PPA projects in North Macedonia

Investor	Ostro Solar ¹	AIM Green Tech	Mytilineos	HEC Solar MK ²
Project	Stipion solar project	AIM Green Tech project	Skopje CHP	Pehčevo solar plant
PPA phase	Expected	Expected	Expected	Expected
Offtaker	ESM	ESM	ESM	ESM
PPA type	Utility	Utility	Utility	Utility
Technology				
Capacity	400 MW	150 MW	130 to 165 MW	73 MW
Output	650 GWh/year	n/a	1,150 GWh/year	n/a
Duration	30 years	30 years	30 years	25 years
Investment	€270 million	€174 million	€290 million	€52 million
PPA price	€56/MWh	Confidential	n/a	Confidential
Expected COD	n/a	n/a	Within five years from start	Within five years from start

Legend:  Closed  Expected

Note: 1) Owned by Akuo Energy 2) Owned by HEC Solar, based in Bulgaria

Source: Mytilineos web page, Akuo Energy web page, HEC Solar web page, Balkan Green Energy News, Wind Park Bogoslovec web page, PwC analysis

Key investors in the Contracting Party

The most significant financial institutions in North Macedonia, with previous experience in financing energy projects within North Macedonia are European Bank for Reconstruction and Development (EBRD), NLB Banka Skopje, ProCredit Bank Skopje, Development Bank of North Macedonia, Erste Group, Oesterreichische Entwicklungsbank AG (OeEB), Sparkasse Bank Makedonija AD Skopje, Komercijalna Banka AD Skopje and The Green for Growth Fund (GGF). Furthermore, the Appendix includes additional examples of financing energy projects within the CP.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

North Macedonia has not established a cap-and-trade mechanism in line with EU ETS to internalize the cost of carbon emissions. North Macedonia has prepared a draft Law on Climate Action that includes the carbon tax, but this law is still not adopted. Any form of credible carbon pricing requires robust emission data. In this context North Macedonia has not transposed the MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022.¹⁷¹

¹⁷¹ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

Additionally, North Macedonia has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include Gos. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging Gos, particularly in scenarios where CPs are developing and integrating Gos markets. Furthermore, the exclusion of Gos means that cross-border virtual PPAs would not qualify for CBAM exemption.¹⁷²

Between 2011 and 2020, North Macedonia exported 38% of its electricity to EU countries. Under the current Carbon Border Adjustment Mechanism (CBAM) framework, North Macedonia may face additional financial implications for electricity exports, however, they aim to close all its coal powered power plants by 2030¹⁷³. If this transition is successful, North Macedonia's electricity exports to EU would not be affected by the introduction of CBAM. North Macedonia's companies could leverage PPAs to invest in local RES. This investment

¹⁷² REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

¹⁷³ EBRD (2023, December 3rd). North Macedonia launches just energy transition investment platform at COP28. Retrieved from <https://www.ebrd.com/news/2023/north-macedonia-launches-just-energy-transition-investment-platform-at-cop28.html>

would not only offer price predictability but also potentially mitigate CBAM-related costs.¹⁷⁴ Beyond electricity, the most significant effects of CBAM's introduction are anticipated in the iron and steel export sector.¹⁷⁵

¹⁷⁴ Euractiv (2023, February 6th). EU's carbon levy poses new test for Western Balkan integration. Retrieved from <https://www.euractiv.com/section/energy/news/eus-carbon-levy-poses-new-test-for-western-balkan-integration/>

¹⁷⁵ Allert V. et al (2023, June). Impacts of the EU carbon border adjustment mechanism on the Western Balkans and Ukraine: policy options for governments. Retrieved from https://www.germanwatch.org/sites/default/files/germanwatch_impacts_of_the_cbam_on_the_western_balkans_and_ukraine_2023_0.pdf

Figure 79 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in North Macedonia

North Macedonia		
Net electricity export/import ¹ (average 2021-2023, GWh)		-449 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		70%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		1,590 GWh and 25%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	42%
	Food, beverages and tobacco	11%
	Non-metallic minerals	9%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Although North Macedonia has been a net importer of electricity from 2021 to 2023, it has still exported a considerable amount of electricity to EU countries. With 70% of its electricity generated from thermal power plants (averaged from 2020 to 2022), the potential impact of CBAM is substantial. To mitigate this, North Macedonia could utilize PPAs to enhance its renewable energy portfolio, thereby reducing its vulnerability to CBAM and improving the competitiveness of its electricity in the EU market.

CBAM recommendations

Figure 80 Overview of CBAM recommendations in North Macedonia

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Adoption of Law on Climate Action	Yes	Law on Climate Action	Incorporation of national carbon pricing mechanism with the Law on Climate Action. Additionally, to transpose the MRVA package adopted at the EnC acquis with the 2022 Ministerial Council Decision.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	Renewable Energy Law; New Decree on GOS	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted. In relation to this, Renewable Energy Law should be adopted to introduce the PPA agreements, and the necessary secondary legislation for operation of Gos register should be adopted. Both have already been explained above in this report.



3.8.

Serbia

3.8.1. Overview of RES electricity supply & demand

This section covers electricity supply and demand trends in Serbia, examining existing and forecasted RE supply and consumption patterns. The RES electricity supply in each market is critical for PPAs, as it ensures sufficient generation capacity to meet the demand of consumers under long-term RE procurement contracts. Additionally, insights into corresponding generation development scenarios from the NECP and additional strategies, as well as a comprehensive analysis and commentary on RES nominations will be discussed.

Lastly, electricity consumption by key customer segments will be discussed. The demand for RES in each market is crucial for PPAs, as it directly influences the feasibility and attractiveness of RE projects by driving the need for stable, long-term contracts between energy producers and purchasers.

In 2022, electricity supply in Serbia market was divided between the open market, supplying 52%, and the regulated market, supplying 48% of the customers. This depicts a change from 2021, when the open and regulated market shared the equal proportion of total electricity supply at 50% each. Moreover, a figure below showcases a breakdown of the electricity supply in the open market (2018-2022), indicating a dominance of medium and high voltage customers (i.e. 100 kV, 35 kV, and 10 & 20 kV customers).

Electricity supply in Serbia is dominated by the state-owned company Elektroprivreda Srbije (EPS), which is appointed as the supplier of the last resort and the guaranteed supplier of households and small customers. Out of total 30.2 TWh of final customers' consumption, EPS sold 99.9% of electricity (all under regulated supply regime and over 99%/14,726 GWh in the open market).¹⁷⁶ The open market in Serbia, in 2022, featured 60 suppliers who were licensed for electricity supply, while only four suppliers were active on the open retail market. The figure below depicts the total electricity supply in Serbia in 2022, with 48% of electricity supplied on the regulated market (EPS only) and 52% on the open market.

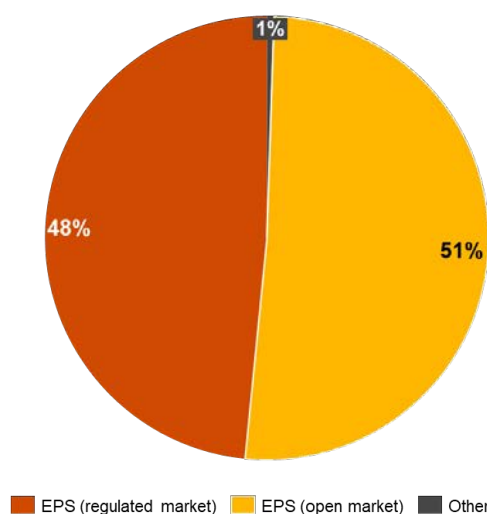
When observing the latest measures in the electricity market in Serbia, in January 2023, an 8% increase¹⁷⁷ in electricity tariffs for households (to 102.6 €/MWh) was implemented and the cap for electricity prices for the corporate sector was raised by the same percentage, with an additional 8% hike in May 2023 (households – to 110.81 €/MWh), and the latest rise of 8% in November 2023. Further increase by 8% is scheduled for May 2024.

¹⁷⁶ AERS Annual Reports (2020-2022)

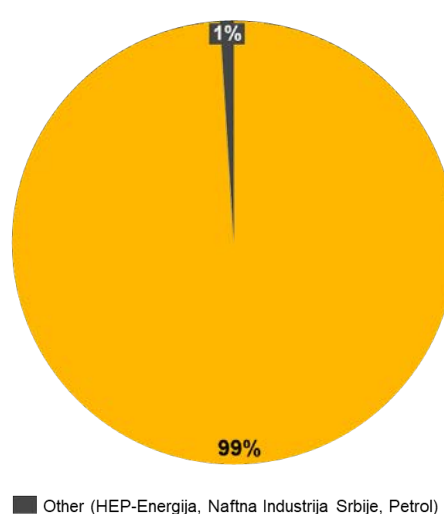
¹⁷⁷ IMF Country Reports, Republic of Serbia: 2023 Article IV Consultation

Figure 81 Overview of Serbian electricity supply in 2022

Electricity supply in Serbia 2022, %



Electricity supply in Serbia in open market 2022, %



Source: AERS Annual Reports (2021-2022), PwC Analysis

Figure 82 Overview of open market electricity supply in Serbia from 2018 to 2022

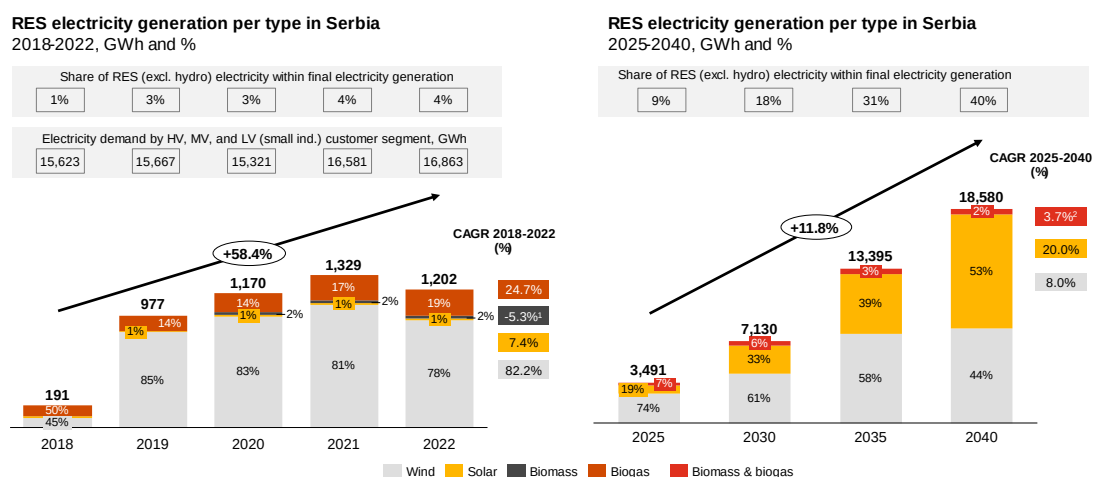
Breakdown of open market electricity supply in Serbia 2018-2022, GWh

	2018	2019	2020	2021	2022
HV (110 kV)	2,798	2,637	2,653	3,019	3,262
MV (35 kV)	1,006	1,101	1,148	1,144	1,002
MV (10 & 20 kV)	6,022	6,176	6,105	6,560	6,860
LV (0.4 kV)	3,706	3,842	3,631	3,837	3,920
LV (households)	13	14	17	20	22
LV (public lightning)	472	491	478	461	422

Source: AERS Annual Report (2022), PwC Analysis

The Serbian NECP's scenario with the additional measures (WAM-S) projects that RES electricity generation will constitute 40% of the final electricity generation by 2040, marking a tenfold increase from the current 4% share in 2022. Mentioned details are thoroughly assessed in the figure below, and present a highly promising indication for PPAs, reflecting a substantial and committed expansion in RE. This growth is expected to be underpinned by an impressive 10 GW rise in the installed RES capacity, exclusively from solar and wind technologies, ensuring that all newly installed capacity contributes to a sustainable and RE future.

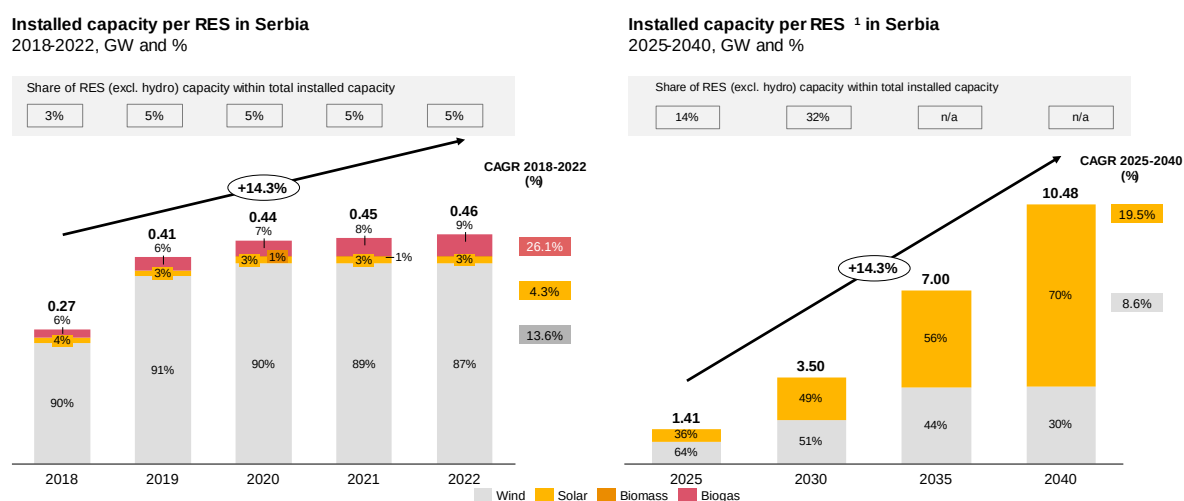
Figure 83 Historical and projected RES electricity generation in Serbia



Note: 1) CAGR for Biomass refers to time frame 2020-2022; 2) Due to the lack of data for Biomass & biogas projections for 2025, a value from 2022 is taken as a proxy for 2025

Source: Serbian NECP, AERS Annual Reports (2018-2022), PwC analysis

Figure 84 Historical and projected RES installed capacity in Serbia



Note: 1) WAM scenario for installed capacity does not include other RES (excl. hydro) installed technologies (i.e. Biomass & biogas)

Source: Serbian NECP, AERS Annual Reports (2018-2022), PwC analysis

Between 2018 and 2022, the Compound Annual Growth Rate (CAGR) in RES capacity amounted to 14.3%, primarily driven by wind installations. This growth elevated the RES share of total installed capacity from 3% in 2018 to 5% in 2022, laying a robust foundation for expanding the adoption of PPAs and ensuring a progressively sustainable energy supply. As outlined in Serbia's NECP, this positive trajectory is anticipated to persist, with the RES capacity forecasted to expand at a 14.3% CAGR from 2025 to 2040, reaching 32% of the total installed capacity by 2030.

As noted, Serbia had an installed RES capacity of 0.46 GW in 2022. Projections outlined in the NECP anticipate this capacity to surge to 10.48 GW by 2040, indicating a significant gap of 10.02 GW. Within this disparity, as per Serbian NECP, government-backed RES capacities are projected to amount to 3.1 GW, leaving 6.92 GW potentially open for PPAs. This suggests that Serbia has set forth an ambitious plan to install approximately 6.92 GW of a new PPA capacity by 2040, according to the projected Serbian WAM scenario outlined in the NECP.

Planned energy infrastructure development

Serbia's strategic plan for the development of its transmission system over the decade from 2023 to 2032¹⁷⁸ includes key investments aimed at enhancing the robustness and efficiency of the national grid. These investments are designed to support the integration of RES, ensure stability and improve the reliability of the electrical grid across the country. Here are some of the primary projects and initiatives:

- **Upgrades to existing substations:**

- o TS Smederevo 3: Increasing the installed power.
- o TS 400/220/110 kV Sremska Mitrovica 2: Reconstruction.
- o TS 400/220/110 kV Niš 2: Replacement of transformer 400/110 kV.
- o TS 400/220/110 kV Kragujevac 2: Replacement of transformer 400/110 kV.
- o Numerous other projects can be found in the "Plan for the Development of the Transmission System for the Period 2023-2032" for Serbia.

- **New substation construction:**

- o TS 400/110 kV Nikolinici.
- o TS 400/110 kv north of Niš.
- o TS Kraljevo 3 to TS Novi Pazar 1: Construction of a new dual-system 110 kV line aimed at improving reliability and consumer supply.
- o TS Valjevo 3: Installation of new transformers to increase capacity and meet rising consumption needs.
- o Numerous other projects can be found in the "Plan for the Development of the Transmission System for the Period 2023-2032" for Serbia.

- **New transmission lines:**

- o 400 kV transmission line TS Kraljevo 3 – RP Požega – Vardište.
- o 400 kV transmission line TS Kraljevo 3 – TC Kruševac 1 – TS Niš 2.
- o 110 kV transmission line TC Ušće – TS Brus.
- o Numerous other projects can be found in the "Plan for the Development of the Transmission System for the Period 2023-2032" for Serbia.

- **Interconnections with neighboring countries:**

- o 400 kV transmission line between Serbia and Romania.
- o 400 kV transmission line between Serbia and Croatia.
- o 400 kV transmission line between Serbia and Bulgaria.
- o 400 kV transmission line between Serbia and Hungary.
- o Serbia – Bosnia and Herzegovina – Montenegro: Development of new 400 kV interconnections planned for completion in 2027, enhancing regional connectivity and supporting RE integration.
- o TS Ljubovija to TS Srebrenica (Bosnia and Herzegovina): Construction of a 110 kV line to facilitate XB energy transfer.

¹⁷⁸ Elektromreža Srbije, (2023). Plan for the Development of the Transmission System for the Period 2023-2032

- o 110 kV transmission line between Serbia and Montenegro.

- **Implementation of grid control technologies:**

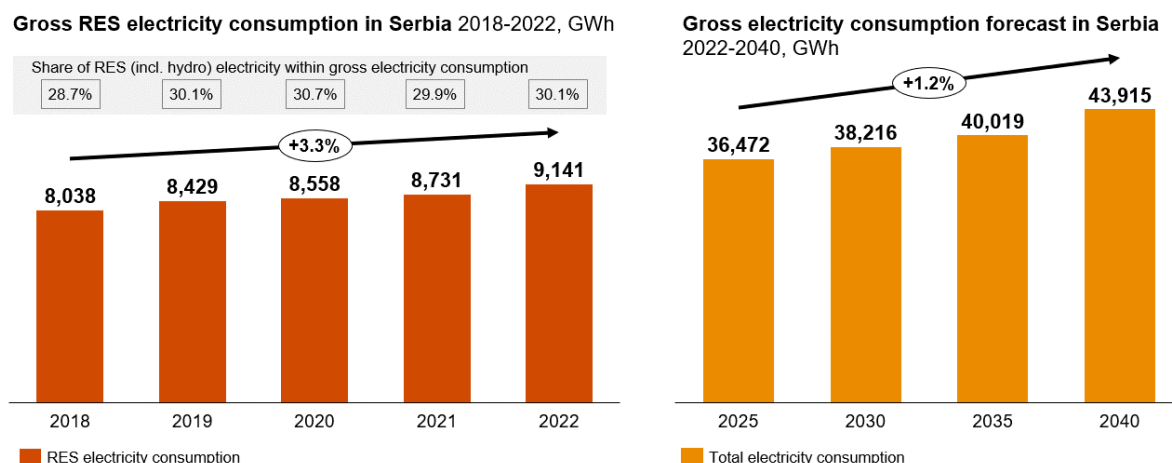
- o Remote Management of EPS Elements: Modernization projects involving the control of switching equipment from dispatch centers enabling unmanned operations with SCADA systems and video control of command execution.

Serbia's NECP aligns with these developments, outlining a roadmap to boost the share of RE in the national grid. By 2032, Serbia aims to increase the penetration of RE significantly, focusing on solar and wind as the primary sources. This is in line with the broader European goals for sustainable and RE use.

The implementation of these projects is expected to facilitate Serbia's compliance with EU energy directives, enhance grid stability, improve energy security and support the economic viability of RE through an improved infrastructure for PPAs.

Serbia's NECP, submitted in June 2023, does not specifically provide gross electricity consumption sourced from renewable energy sources, yet it showcases total existing electricity consumption and respective forecasts. Total expected electricity consumption in Serbia is anticipated to increase by a CAGR 1.2% until 2040, reaching 43.9 TWh. According to Eurostat, the share of energy from renewable sources (including hydro) in gross electricity consumption reached 30.1% in 2022. Additionally, Serbia is still 14.9% short of reaching the 2030 target of a 45% RE (including hydro) share in gross electricity consumption.

Figure 85 Historical RES electricity consumption and projected electricity consumption in Serbia



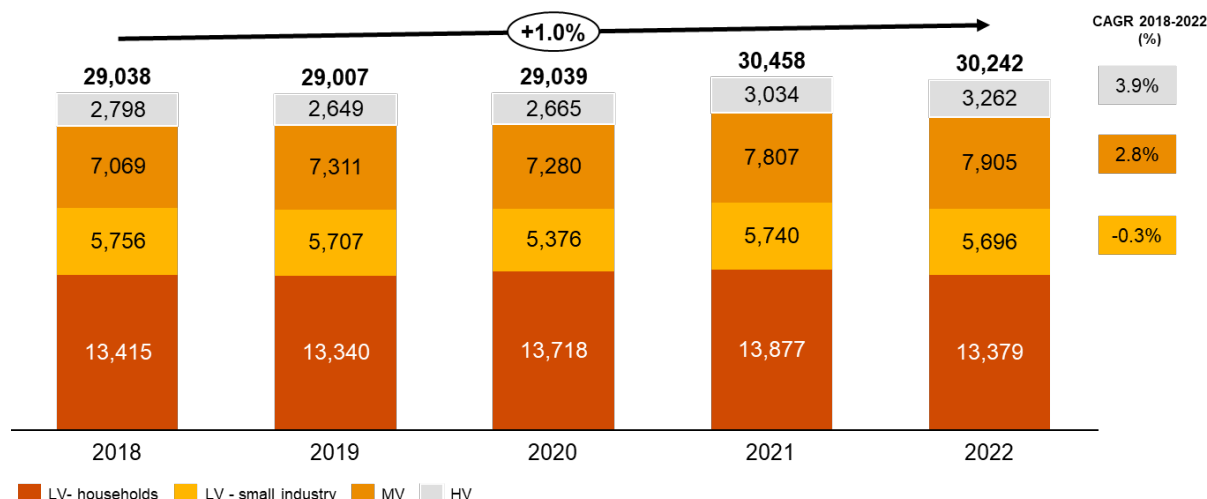
Note: 1) Due to the lack of data on RES electricity consumption forecast, a gross electricity consumption forecast is provided for Serbia

Source: Serbian NECP, Eurostat, PwC Analysis

In 2022, household segment in Serbia had the highest consumption of 13,379 GWh. On the other hand, 52 consumers on transmission network (High Voltage – HV) consumed 3,262 GWh (10.8%) of electricity in 2022. Consumption of HV customers increased from 2018 to 2022 at a 3.9% CAGR, while MV customers consumption increased at a 2.8% CAGR. Therefore, potential PPA consumers showed minor historical consumption increase.

Figure 86 Electricity consumption per customer segment in Serbia

Consumption per customer segment, 2018-2022, GWh



Source: AERS Annual Reports (2018-2022), PwC analysis

For a detailed list of electricity consumption per customer segment, along with the number of customers per customer segment, electricity consumption by sectors and electricity consumption by major industrial consumers, please see the Appendix.

3.8.2. Electricity prices

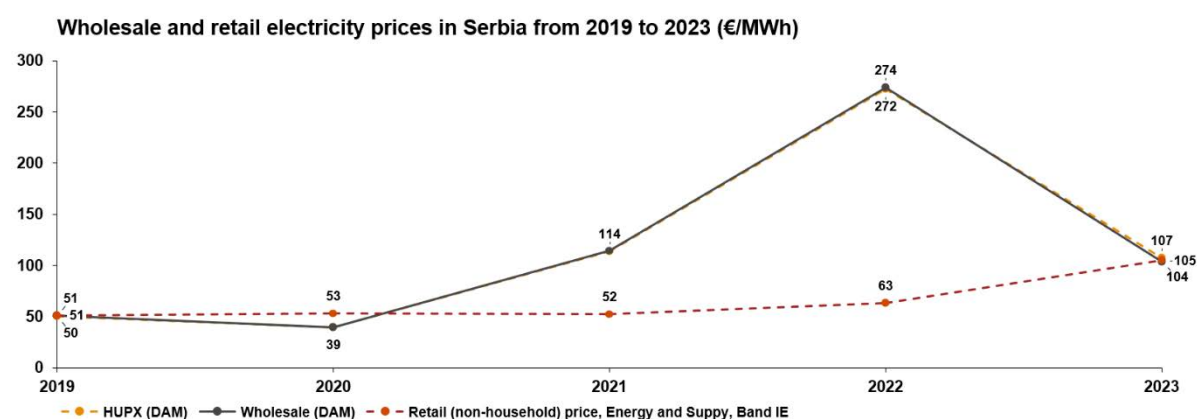
Compared to other CPs, the Serbian wholesale market stands out as one of the most advanced (alongside Ukrainian wholesale market), boasting an active bilateral market, a day-ahead market (opened since 2016), an intraday market (launched in July 2023), and a balancing market with one Balancing Service Provider (pricing for both balancing capacity and ancillary services are determined annually by decisions made by AERS).

Figure below showcases the sharp rise and fall in Serbia's wholesale average daily baseload electricity prices on the day-ahead market (DAM), against a backdrop of relatively stable retail (non-household) prices¹⁷⁹ and suggests that PPAs can provide a buffer for consumers against wholesale market volatility while offering predictable pricing for renewable energy producers in a market where retail prices remain consistent. Relatively stable retail (non-household) prices are explained by government intervention in electricity price regulation.¹⁸⁰ In more detail, an average daily baseload price on day-ahead market in Serbia peaked in 2022 at 274 €/MWh (average monthly traded volume of 267 GWh), which was 211 €/MWh above the retail non-household price in 2022. However, in 2023 situation on the Serbian electricity market changed, and retail non-household prices increased to 105 €/MWh, 1 €/MWh above the average daily baseload price on Serbian DAM in 2023 (average monthly traded volume of 390 GWh), indicating an advantageous environment for PPAs establishment. Furthermore, in 2023 when comparing Serbia's DAM with the Hungarian Power Exchange (HUPX), the average daily baseload prices on DAM are similar, even though the prices on Serbian DAM were 3 €/MWh lower from the HUPX DAM prices (HUPX DAM average monthly traded volume of 2,171 GWh in 2023).

¹⁷⁹ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

¹⁸⁰ Balkan Green Energy News (2023, April 27th). The electricity price for the industry in Serbia as of May 1st is 110 euros per MWh. Retrieved from <https://balkangreenenergynews.com/rs/cena-struje-za-privredu-u-srbiji-od-1-maja-110-evra-po-mwh/>

Figure 87 Overview of wholesale and retail electricity prices in Serbia



Source: AERS Annual Reports (2019-2022), SEEPEX Annual Reports (2019-2023), HUPX Annual Reports (2019-2023), Eurostat, PwC analysis

3.8.3. Supply options and incentive mechanisms

In 2023, Serbia has made significant strides in the RE sector, particularly in launching RE auctions. The Serbian government has initiated an auction for a total of 450 MW, consisting of 400 MW of wind power and 50 MW of solar PV power. These projects are supported through CfDs, ensuring financial incentives for RE developers over a 15-year period.

Furthermore, Serbia is committed to a substantial expansion of RE capacity, with plans to build power plants totaling 3,000 MW within the next several years. This ambitious project underscores Serbia's dedication to increasing its energy security and independence while fulfilling its international obligations and environmental commitments. The RE auctions represent the first phase of a three-year plan aiming to allocate premiums for a total of 1,300 MW of renewable capacity. This development is supported financially by the European Bank for Reconstruction and Development (EBRD) and aims to facilitate Serbia's transition from coal-powered energy to more sustainable sources, aligning with the broader European goals of reducing carbon emissions and enhancing RE usage¹⁸¹.

In Serbia, the renewable energy (RE) sector is transitioning towards a more structured and competitive framework with the introduction of market premiums and updated feed-in tariff systems to encourage RE investments. The government has established specific quotas for solar and wind power in the initial auction round. For instance, the quota for the first auction was set at 50 MW for solar power plants with a minimum capacity of 500 kW, and 400 MW for wind power. These measures are designed to facilitate the integration of substantial RE capacities into the national grid. Future auctions are expected to build on this foundation, supporting further development and integration of renewable energy sources in Serbia.¹⁸²

For instance, FiTs in Serbia have been designed to support smaller RE projects, with eligibility extending to projects like small wind farms (up to 3 MW) and solar installations (up to 500 kW). These projects can benefit from fixed purchase prices over defined periods, making them financially attractive and viable. The market premium model, however, is designed for larger renewable energy projects that exceed the capacity limits set for FiTs. The market premium is provided by the Serbian government through the Ministry of Mining and Energy. It is intended to offer supplementary payments over the market price to producers, thereby

¹⁸¹ European Bank for Reconstruction and Development, (2023). Serbia launches first 450 MW renewables auction, designed with EBRD support. Retrieved from <https://www.ebrd.com/news/2023/serbia-launches-first-450-mw-renewables-auction-designed-with-ebrd-support.html>

¹⁸² CEE Legal Matters, (2023). Renewable energy: Serbia 2023. Retrieved from <https://ceelegalmatters.com/renewable-energy-2023/renewable-energy-serbia-2023>

ensuring financial stability and incentivizing investment in larger RE projects. This model ensures that projects such as larger wind farms and extensive solar installations receive adequate financial support to promote their development and integration into the national energy grid.¹⁸³¹⁸⁴

In Serbia, the bilateral electricity market is evolving and becoming more dynamic. The introduction of liquid ID and DAMs by SEEPEX helps in balancing electricity supply close to real time, which is crucial for integrating RES efficiently. Moreover, Serbia is working towards integrating its electricity market more deeply with the European markets. This includes efforts to join the Single Intraday Coupling (SIDC) and the Single Day-Ahead Coupling (SDAC), aiming to enhance XB electricity trading and market efficiency¹⁸⁵. This strategic move enhances the efficiency of Serbia's energy sector by enabling access to broader energy trading platforms, which facilitates more accurate energy pricing and efficient resource allocation across borders, thereby supporting Serbia's ongoing efforts towards energy market liberalization and sustainability.

3.8.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of physical PPAs (thoroughly assessed in the Legal part).

Serbia appears to be the sole CP that currently meets the fundamental criteria necessary for implementing PPA.

Serbia's DAM and ID market, operated by SEEPEX, is robust, allowing for electricity transactions to be scheduled a day in advance but also within the day, thus enhancing price transparency and market liquidity. This setup is vital for PPAs, supporting effective price prediction and risk management for involved parties¹⁸⁶.

It is worth noting that SEEPEX operates as a Serbian subsidiary of Alpine-Adriatic Danube Power Exchange (ADEX), the first regional power exchange for Central and South-Eastern Europe, established in December 2022. The founding members include the TSO in Slovenia (ELES), Elektromreža Srbije (EMS) and European Power Exchange (EPEX SPOT), all holding equal shares¹⁸⁷.

¹⁸³ Bojović Drašković Popović & Partners. (2021). Serbia: The Government adopted bylaws in relation to the Law on Use of Renewable Energy Sources. Retrieved from <https://www.bd2p.com/news/2021/serbia-adopts-bylaws-renewable-energy-sources>

¹⁸⁴ Serbia SEE Energy Mining News. (2021, November 30). Serbia, Government adopted two decrees related to the regulation of electricity production from renewable energy sources. Retrieved from <https://serbia-energy.eu/serbia-adopted-two-decrees-related-regulation-electricity-production-renewable-energy-sources>

¹⁸⁵ Balkan Green Energy News. (2023). Serbia issues quota for upcoming solar power auction, adopts rules on balancing, premiums, feed-in tariffs. Retrieved from <https://balkangreenenergynews.com/serbia-issues-quota-for-upcoming-solar-power-auction-adopts-rules-on-balancing-premiums-feed-in-tariffs/>

¹⁸⁶ Elektromreža Srbije, (n.d.). EMS is connected to AIB Hub – A place for exchanging guarantees of origin internationally. Retrieved from <https://ems.rs/en/ems-is-connected-to-aib-hub-a-place-for-exchanging-guarantees-of-origin-internationally/>

¹⁸⁷ SEEPEX Annual report 2022

In March 2024, an agreement was reached to form an association of electricity exchanges of Serbia (SEEPEX), Slovenia (BSP Southpool), and Hungary (HUPX)¹⁸⁸. Furthermore, according to SEEPEX, there are plans to couple the SEEPEX DA and ID markets with the single European electricity market by the end of 2026¹⁸⁹.

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual “PaP” arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all MV and HV consumers are using smart meters already, therefore, there is no limitation for PPA. In Serbia, a smart metering system is in place, however the exact number of smart meters is not publicly unavailable.

Overall, these developments demonstrate Serbia’s commitment to promoting a supportive environment for RE investments and the facilitation of cPPAs, reflecting a mature power wholesale market.

Details of each CP market player and market interaction can be found in the Appendix and Legal section of the document.

Figure 88 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023 ¹	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektrodistribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-obleneergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

Note: *State-owned entities; 1) Volume Weighted Average Price (intraday market)

Source: PwC analysis

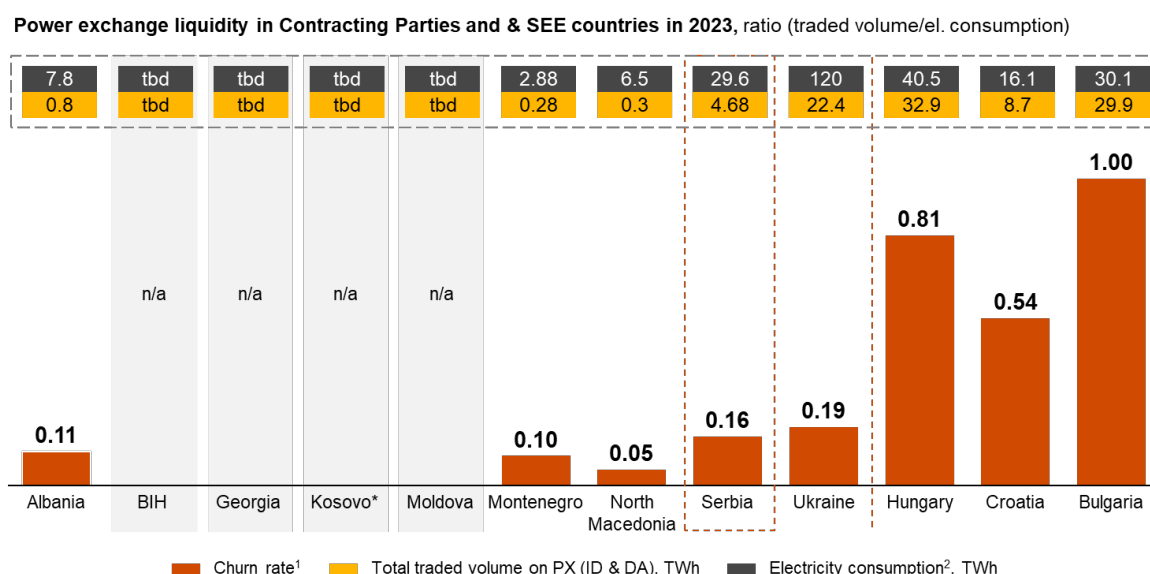
¹⁸⁸ SEEPEX, (April 2024). Signed agreement for the association of the electricity exchanges of Serbia, Slovenia, and Hungary. Retrieved from <https://seepex-spot.rs/seepex-news/signed-agreement-for-the-association-of-the-electricity-exchanges-of-serbia-slovenia-and-hungary/>

¹⁸⁹ Balkan Green Energy News, (March 2024). Retrieved from <https://balkangreenenergynews.com/serbia-to-couple-electricity-market-with-eu-by-2026-seepex/>

Apart from assessing the existence of the Power exchange in CPs, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

The figure below is used for evaluating the liquidity of the power exchanges among the CPs, and it indicates that a power exchange in Serbia (i.e. SEEPEX) has a superior liquidity over Albanian, Montenegrin, and North Macedonia's power exchanges in 2023. Additionally, when comparing SEEPEX churn rate in 2023 with those of power exchanges in other SEE countries, notably Hungary, Croatia and Bulgaria, it becomes apparent that SEEPEX churn rate still lacks behind the SEE power exchanges in terms of power exchange liquidity (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78).

Figure 89 Overview of CPs and chosen SEE Power Exchanges



Note: 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption; 2) Electricity consumption for 2023 expressed as an average for 2018-2022, due to the lack of 2023 data

Source: MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report 2023

3.8.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

When comparing the existing PPA market in Serbia with those of other CPs, it can be concluded that Serbia is the clear frontrunner with the most existing PPA deals signed, hence indicating a high PPA market maturity, as well as a favorable environment for new for PPA deals. The exact number and details of current and expected PPA projects in Serbia are presented in the Figure below.

Figure 90 Current and expected PPA projects in Serbia

Investor	Vetrozelená	Vetroelektrane Balkana ²	IVICOM energy ⁴	Enlight Renewable Energy ⁵	Wind Park Plandište ⁶	Enlight Renewable Energy	B2 Nova Sun & B2 Sunspot	Rudis
Project	Vetrozelena	Čibuk 1	Krivača	Kovačica	Plandište	Pupin	B2 Nova Sun & B2 Sunspot	Alibunar 1
PPA phase	Expected	Closed	Closed	Closed	Expected	Closed	Expected	Expected
Offtaker	EPS	EPS	Axpo	EPS	EPS	EPS	EPS	PLC Interenerg
PPA type	Utility	Utility	Utility	Utility	Utility	Utility	Utility	Utility
Technology								
Capacity	300 MW	158 MW	105.6 MW	105 MW	102 MW	94.5 MW	13.6 MW	9 MW
Output	750 GWh/year	475 GWh/year	310 GWh/year	298 GWh/year	212 GWh/year	n/a	25 GWh/year	27-29 GWh/year
Duration	10 years	12 years	10 years	8 years	12 years	15 years	15 years	8 years
Investment	n/a	€300 million	€165 million	n/a	n/a	€163.6 million	n/a	€20.6 million
PPA price	64.48 €/MWh ²	n/a	n/a	95.23 €/MWh	91.71 €/MWh	68.88 €/MWh ⁷ (inflation linked ⁸)	€89.7 €/MWh	95.23 €/MWh
Expected COD	2025	Operational since 2019	May 2024	Operational since 2019	2025	Second half of 2025	Signed 03/24, COD TBD	Operational since 2023

Legend:  Closed  Expected

Note: 1) Vetrozelena company is a special purpose vehicle – Power China and CWP Europe; 2) PPA deal includes 210 (out of 300) MW capacity of the plant 3) Vetroelektrane Balkana is project company owned by Tesla Wind (A joint venture between Abu Dhabi Future Energy Company – Masdar (60%), Finnish energy infrastructure developer Taaleri Energia (30%), and DEG, the investment arm of Germany's KfW Development Bank (10%)); 4) IVICOM Energy is a RE project co-owned by Serbian MK Group and Slovenian ALFI Green Energy Fund; 5) Enlight Renewable Energy has been doing projects in Serbia in partnership with a Serbian company New Energy Solutions; 6) Wind Park Plandište is a project company owned by NIS MET Energowind that is co-owned by NIS PETROL; 7) PPA deal includes 72% of electricity generated while the remainder will be sold on a merchant basis; 8) linked to Eurostat Consumer Price Index;

Source: Axpo Group web page, MK Energy web page, karanovic/partners web page, Power Technology web page, EBRD web page, Renewables Now web page, Enlight Energy web page, WPP Plandište web page, Balkan Green Energy News web page, CWP Global web page, EPS web page, Tesla Wind web page, PwC analysis

Key investors in the Contracting Party

Serbia, as a CP with the highest number of closed PPA deals also has an advanced opportunities in financing institutions experienced with financing RE projects, which consist of local and foreign commercial banks, as well as the Austrian Development Bank (OeEB) and the European Bank for Reconstruction and Development (EBRD). Lenders in the Serbian PPA between Axpo Group and IVICOM Energy were led by Erste Group, while other lenders included Raiffeisen Bank (international and domestic), NLB Komercijalna bank and the OeEB. Furthermore, the Appendix includes additional examples of financing energy projects within the CP.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly affected, with EU off-takers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

Serbia has not established a cap-and-trade mechanism in line with EU ETS to internalize the cost of carbon emissions.

Serbia set up the legal base for MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022 in its Law on Climate Change in 2021 and the three secondary acts in 2023 related to the types of activities and GHGs to be subject to the MRVA, to the verification and accreditation of verifiers of reports on GHG emissions and to the monitoring and reporting of GHG emissions.¹⁹⁰

Serbia has not transposed the Electricity Integration Package on which the further implementation actions, including exemptions envisaged by CBAM regulation, depend.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as Gos for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include Gos. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging Gos, particularly in scenarios where CPs are developing and integrating Gos markets. Furthermore, the exclusion of Gos means that cross-border virtual PPAs would not qualify for CBAM exemption.¹⁹¹

¹⁹⁰ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

¹⁹¹ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

The EU's CBAM targets carbon-intensive imports impacting Serbia significantly due to its dependency on EU exports¹⁹², particularly of CBAM-targeted products like iron, steel, and electricity. According to a research paper by The Agence Française de Développement on the impacts of CBAM on EU trade partners, Serbia faces substantial economic risks from CBAM, as more than 5% of Serbia's total exports are CBAM products exported to the EU, which could potentially impact employment and wages.¹⁹³

Figure 91 Overview of CBAM and PPA connection per Contracting Party

Analysis of CBAM and PPA connection in Serbia

Serbia		
Net electricity export/import ¹ (average 2021-2023, GWh)		-447 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		66%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		9,183 GWh and 31%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Food, beverages and tobacco	17%
	Iron and steel	15%
	Chemical and petrochemical	13%

Source: ENTSOE, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity; 2) Share in total electricity consumption of the country

To establish a connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. With 66% of its electricity generation relying on thermal power plants (averaged from 2020 to 2022), CBAM may be charged when exporting Serbia's carbon-intensive goods or electricity to the EU, thus negatively impacting Serbia's competitiveness in EU. In order to mitigate or avoid paying CBAM tax, Serbia can utilize PPAs to increase its competitiveness, and even enlarge its renewable energy portfolio.

¹⁹² EU Delegation to the Republic of Serbia. (n.d.). Main Trade Partners of Serbia in 2022. Retrieved from <https://europa.rs/trade/?lang=en>

¹⁹³ The Agence Française de Développement. (March 2022). Impacts of CBAM on EU trade partners: consequences for developing countries. Retrieved from <https://www.afd.fr/en/ressources/impacts-cbam-eu-trade-partners-consequences-developing-countries>

CBAM recommendations

Figure 92 Overview of CBAM recommendations in Serbia

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 – Incorporation of national carbon pricing mechanism	Yes	Law on Climate Change	Incorporation of national carbon pricing mechanism with the Law on Climate Change.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	RES Law; New Decree on Gos	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted.



3.9.

Ukraine

3.9.1. Overview of RES electricity supply & demand

This section covers electricity supply and demand trends in Ukraine, examining existing and forecasted renewable energy supply and consumption patterns. RES electricity supply in each market is critical for PPAs as it ensures that there is sufficient generation capacity to meet the demand of consumers under long-term renewable energy procurement contracts. Additionally, insights into corresponding generation development scenarios from strategies and recovery plans, as well as RES nominations comprehensive analysis and commentary is discussed.

Lastly, electricity consumption by key customer segments will be discussed. RES electricity demand in each market is crucial for PPAs as it directly influences the feasibility and attractiveness of renewable energy projects by driving the need for stable, long-term contracts between energy producers and purchasers. Before proceeding with the sections mentioned in the document, it's essential to provide an overview of the current state of the Ukrainian energy and electricity sector following the onset of Russian aggression against Ukraine.

The war in Ukraine has severely impacted its electricity and renewable energy sectors from an investor's perspective. The conflict has led to the destruction of critical energy infrastructure, including power plants, transmission lines, and substations, which has caused widespread power outages and instability in the electricity supply. This damage has made the operational environment highly uncertain and risky for investors. For instance, reports indicate that several renewable energy projects, particularly in regions close to conflict zones, have been halted or significantly delayed due to the destruction of infrastructure and the danger posed to personnel¹⁹⁴. Specifically, in 2022, approximately 15% of solar capacity and 80% of installed wind capacity were either destroyed, damaged, or located in regions occupied by the aggressor.¹⁹⁵ The heightened risk and instability have deterred both current and potential investors, making it difficult for Ukraine to attract the necessary capital to rebuild and expand its energy sector.

Additionally, the war has created financial and logistical challenges that further complicate investments in Ukraine's renewable energy sector. The conflict has led to increased costs for materials and equipment due to disrupted supply chains and higher transportation costs. Furthermore, the economic instability caused by the war has resulted in a devaluation of the local currency, making imports more expensive and squeezing project budgets¹⁹⁶. Investors also face uncertainties related to regulatory and policy environments, as the government focuses on immediate war-related needs rather than long-term energy policies. Despite international support and potential for future recovery, the immediate outlook for investment in Ukraine's renewable energy infrastructure remains grim due to these compounded risks and uncertainties.

Ukraine had the highest quantity of electricity suppliers among all Contracting Parties, with a total of 451 active suppliers in 2022. However, just four suppliers managed to distribute at least 5% of the total electricity consumed by final customers during the same year. Among these, the three largest suppliers collectively held a market share of 21.06%, with the leading supplier accounting for 10.70% of the market.¹⁹⁷

Retail market customers in Ukraine are free to choose their electNo

¹⁹⁴ International Energy Agency. (2022). Ukraine Energy Profile. Retrieved from <https://www.iea.org/reports/ukraine-energy-profile>

¹⁹⁵ NEURC Bulletin for the 2021 annual report

¹⁹⁶ World Bank. (2023). Ukraine Economic Update. Retrieved from <https://www.worldbank.org/en/country/ukraine/publication/economic-update-april-2023>

¹⁹⁷ ECRB Market Monitoring Report (2022)

ricity supplier. Providers of universal service are required to supply electricity to households, small-scale consumers, and various other customer segments eligible for regulated pricing.¹⁹⁸ In 2020, more than 17 million contracts for the supply of electricity by 25 universal service suppliers (6 state-owned) were concluded, of which 506,812 contracts were concluded with non-household customers.¹⁹⁹ Ukrinterenergo will act as a supplier of last resort until June 30th, 2024. Additionally, universal service providers are mandated to supply electricity to consumers whose designated supplier has defaulted or lost their license. Essentially, in certain situations, these universal service providers serve as a replacement for the supplier of last resort.²⁰⁰

In 2021, in the regulated price segment, household consumers and small non-household consumers (with capacities of up to 50 kW) had the right to be supplied by a universal service supplier (USS) and by the supplier of last resort (SoLR)²⁰¹. The figure below showcases the shares of electricity suppliers in the regulated segment in 2021, and it can be concluded that the DTEK group dominated a regulated supply market with a share of 14% out of total electricity supplied in the regulated market. Out of 25 universal service suppliers in 2021, six were state-controlled, while the rest was privately owned, and DTEK group controlled three, while the Enera Group controlled four USSs.²⁰²

On the other hand, when it comes to non-household consumers with capacities above 50 kW that are not entitled to universal service supply and must purchase electricity at freely negotiated prices in the competitive segment (i.e. unregulated price segment), the share for year 2020 is presented in the figure below. In more detail, DTEK Group had a 36% share of the competitive segment in 2020, while the top five suppliers in the competitive segment have remained the same since the liberalization of the retail electricity market in 2019.²⁰³

Moreover, in the wake of the military invasion, the electricity market has faced exacerbation across several sectors. A significant 35% decline in demand, coupled with a substantial decrease in payment collection, poses a threat to the financial stability of the sector. As a consequence, protective measures are in place to ensure the functioning of bilateral markets, day-ahead markets, and balancing mechanisms.

Before the Russian aggression, prices for industrial consumers were tied to wholesale electricity market rates. However, starting from 2023, a majority of suppliers in the unregulated segment of the retail electricity market have adopted a new pricing approach. Instead of fixed prices, they now utilize a formula to calculate monthly electricity rates for consumers.

Under this formula, the electricity price comprises the weighted average price of electricity purchased by the supplier from wholesale markets (including imbalances settlement and taxes), transmission and distribution tariffs, and a service premium. Consequently, suppliers pass on market fluctuations to industrial consumers under unregulated pricing, as well as non-household consumers under universal supply.²⁰⁴

¹⁹⁸ Energy Community Secretariat (November 2023). Ukrainian Annual Implementation Report 2023

¹⁹⁹ NEURC Annual Reports 2020

²⁰⁰ Energy Community Secretariat (November 2023). Ukrainian Annual Implementation Report 2023

²⁰¹ OECD Competition Market Study of Ukraine's Electricity Sector 2023: It is important to note that USS or SoLR status does not preclude the possibility of supplying electricity at freely negotiated prices in the unregulated segment. USSs' supply volumes depend mainly on the number of households within their licensed territory.

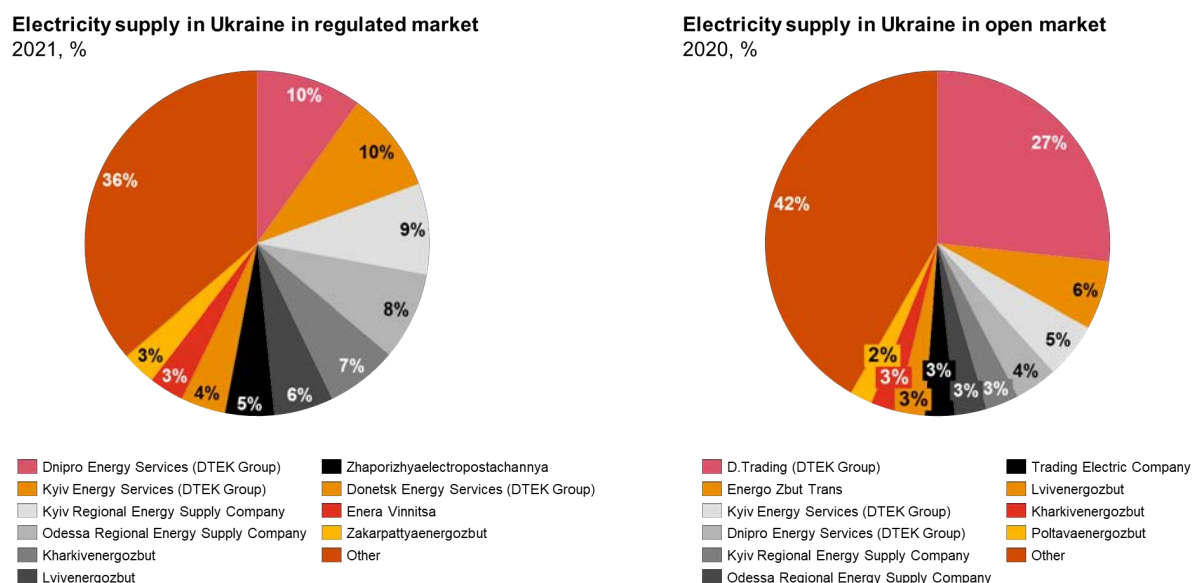
²⁰² OECD Competition Market Study of Ukraine's Electricity Sector 2023

²⁰³ OECD Competition Market Study of Ukraine's Electricity Sector 2023

²⁰⁴ ECRB Impact of the energy crisis on electricity and gas price regulation in the Energy Community Contracting Parties (2023)

There is a lack of official data regarding electricity prices in Ukraine for the year 2022. However, informal sources suggest that household prices remained unchanged throughout the year, while there was an observed increase in industrial prices.²⁰⁵

Figure 93 Overview of Ukrainian electricity supply in 2021 and 2020



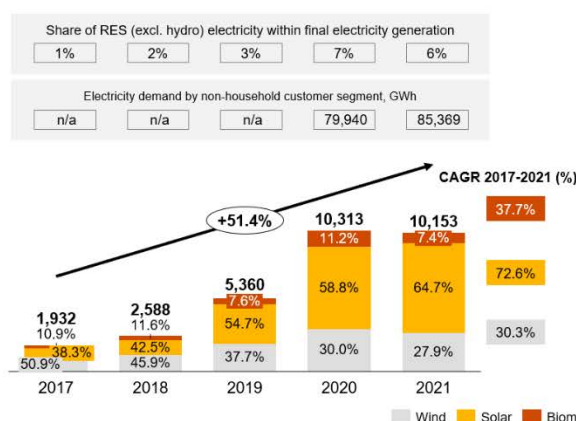
Source: OECD Competition Market Study of Ukraine's Electricity Sector 2023, PwC Analysis

From 2017 to 2021, Ukraine experienced a significant increase of 51.4% CAGR in RES (excluding hydro) electricity generation, with solar power significantly increasing its share from 38.3% to 64.7% of total RES (excluding hydro) electricity output, and wind power decreasing from 50.9% to 27.9%. Two-year period from 2020 to 2021 saw a noteworthy overall increase in electricity demand from non-household customer segments, emphasizing a growing reliance and integration of renewable energy in Ukraine's energy mix. Looking ahead, according to the Ukraine's Draft NECP, precisely Estimated trajectory scenario, for 2025-2030, the projections suggest a further increase of 8.8% CAGR in the RES electricity output. This is expected to be driven by a balanced contribution from both solar and wind sources, accounting for 39.6% and 42.6% of the RES mix in 2030, with an additional contribution from bioenergy expected to increase to 17.6%. These modifications highlight Ukraine's dedication to bolstering its renewable energy sector. Projections suggest that RES will constitute a greater share of the country's overall energy mix. This transition aligns with global sustainability trends and efforts to lower carbon emissions, creating a supportive setting for PPAs.

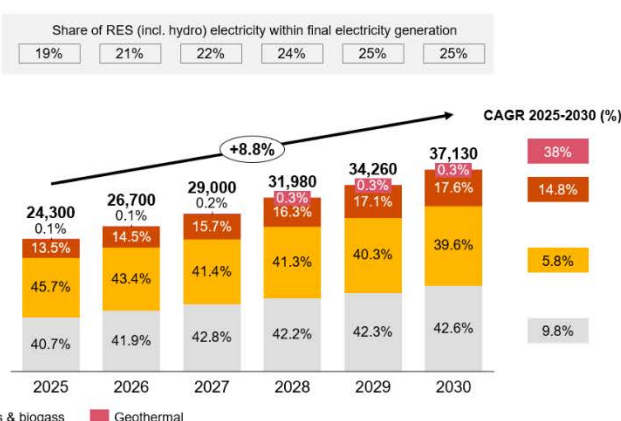
²⁰⁵ ECRB Market Monitoring Report (2022)

Figure 94 Historical and projected RES electricity generation in Ukraine

RES electricity generation per type in Ukraine¹
2017-2021², GWh and %



RES electricity generation per type in Ukraine³
2025-2030, GWh and %

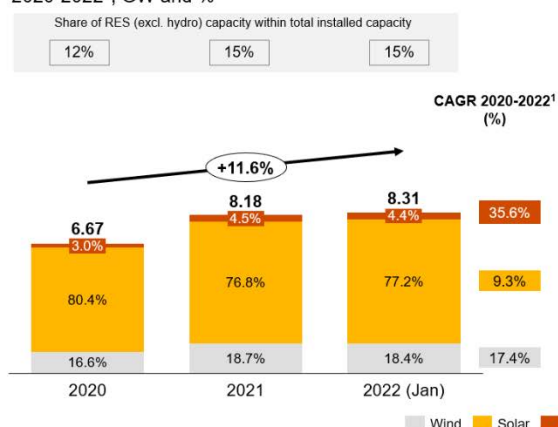


Note: 1) Without the Crimean power system (PS) and non-controlled part of the Donbas PS, 2) Due to the war conflict in Ukraine, latest available data is for the year 2021, 3) Estimated trajectory scenario does not take into account temporarily occupied territories

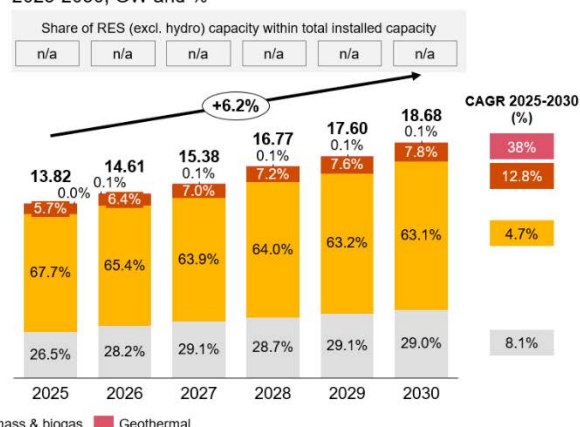
Source: Ukraine's Draft NECP, NEURC Annual Reports, OECD Market Study, IEA Publications, Energy Map web page, PwC analysis

Figure 95 Historical and projected RES installed capacity in Ukraine

Installed capacity per RES in Ukraine¹
2020-2022², GW and %



Installed capacity per RES in Ukraine³
2025-2030, GW and %



Note: 1) Without the Crimean power system (PS) and non-controlled part of the Donbas PS, 2) Due to the war conflict in Ukraine, latest available data is for the January 2022, 3) Estimated trajectory scenario does not take into account temporarily occupied territories

Source: Ukraine's Draft NECP, NEURC Annual Reports, OECD Market Study, IEA Publications, Energy Map web page, PwC Analysis

The Compound Annual Growth Rate (CAGR) of 11.6% of RES capacity from 2020 to 2022, primarily led by solar installations, increased RES's proportion of total installed capacity from 12% to 15%. Looking ahead to 2025-2030 period, according to NECP, projections suggest a slower pace of increase in RES capacity by an additional 6.2% CAGR until 2030, with solar and wind power expected to maintain substantial shares of 63.1% and 29%, respectively. Projections indicate that this path is consistent with Ukraine's strategic energy planning, which foresees a significant rise in total renewable energy installations. This expansion will broaden the opportunities for PPAs and improve the sustainability of the country's energy supply.

Ukraine adopted its draft version of NECP in June 2024, but there is a limit on specific conclusions regarding the potential and framework for PPAs. Without detailed quantitative effects of policies such as specific installed capacities supported or not supported by government schemes, it is challenging to assess the full potential capacity eligible for PPAs.

However, with a gap of more than 10 GW of installed RES capacity in 2022 and 2030, it could be assumed that there will be a significant capacity available for PPA utilization within Ukrainian electricity sector.

Planned energy infrastructure development

Ukraine's strategic plan for the development of its transmission system from 2022²⁰⁶ and beyond includes substantial investments aimed at rebuilding and enhancing the resilience and efficiency of the national grid. These investments focus on repairing war damages and integrating renewable energy sources to ensure stability and improve the reliability of the electrical grid across the country. Notable projects and initiatives include:

- **Emergency repairs and upgrades to existing infrastructure:**
 - o Immediate emergency repairs to restore functionality to facilities damaged due to military activities, ensuring the stability of power supply during crisis periods.
 - o Upgrades at critical substations like the Kyiv North substation, involving modern equipment installations to handle increased demand and integration with the European grid.
- **New Substations and power lines:**
 - o Development of new transmission lines such as the Zaporizhzhia to Kakhovka line to improve redundancy and reliability in power distribution across regions severely affected by the conflict.
- **Interconnections with European grids:**
 - o Enhancements in infrastructure to maintain and strengthen synchronization with the European Network of Transmission System Operators, facilitating smoother energy trade and cooperation.
 - o Development of new interconnection lines with neighbouring countries like Poland, Slovakia, and Romania, aimed at bolstering security of supply and export capabilities.
- **Implementation of grid control technologies:**
 - o Rollout of advanced SCADA systems for enhanced monitoring and control of the grid remotely, ensuring better response rates to outages and grid issues.
- **Integration of renewable energy sources:**
 - o Significant investment in grid enhancements to support the increasing share of renewable energy sources, including solar and wind, aligning with Ukraine's goals to reduce dependency on fossil fuels and increase sustainability in energy production.

The execution of these projects is crucial for Ukraine not only to recover from current challenges but also to build a more resilient and modern energy sector that can contribute to the country's long-term energy security and economic stability. These efforts are supported by international loans and grants, including significant contributions from the EBRD and partnerships with EU bodies.

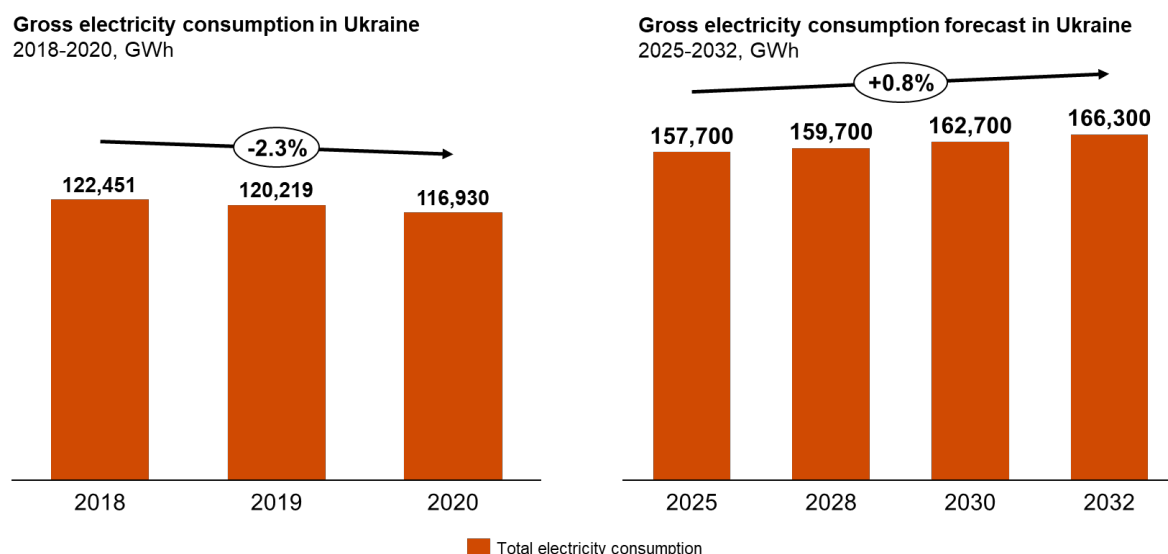
Due to the lack of data on various topics within the Ukrainian energy and electricity sector, since the commencement of Russian aggression, the computation of electricity consumption

²⁰⁶ European Bank for Reconstruction and Development. (2022). Ukrenergо Transmission Network Emergency Restoration (Document No. 54138).

sourced from renewable energy sources for Ukraine is not feasible. However, a figure below offers an insight of historical and projected gross electricity consumption patterns in Ukraine.

As outlined in the figure below, gross electricity consumption has followed a descending trend of CAGR 2.3% in the period from 2018 to 2020.

Figure 96 Historical and projected electricity consumption in Ukraine

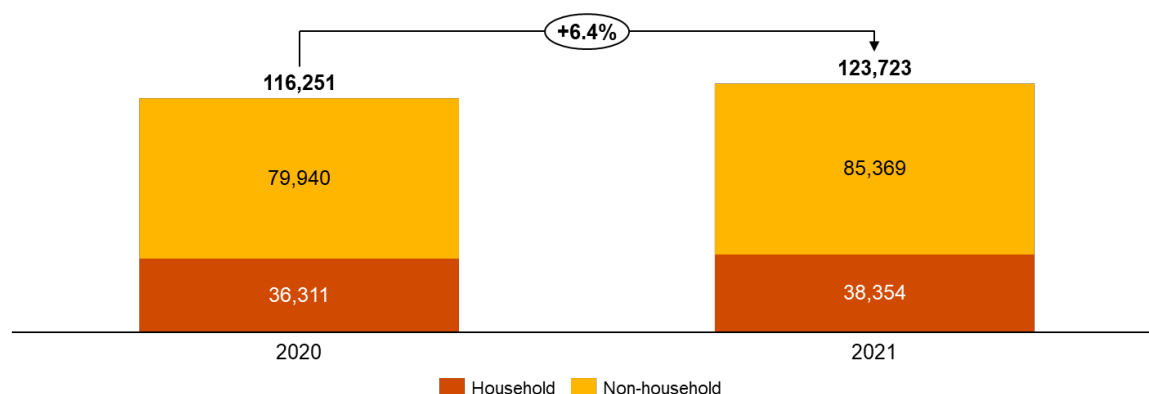


Source: Draft Ukraine Recovery Plan, Eurostat, PwC Analysis

In Ukraine the customer segment with the highest consumption²⁰⁷ for the period from 2020 to 2021 was the non-household segment, with 69% of total share in electricity consumption per different segments. In more detail, non-household customers, who comprised only 3% of total customers, consumed 85,369 GWh of electricity in 2021.

Figure 97 Electricity consumption per customer segment in Ukraine

Consumption per customer segment 2020-2021, GWh



Note: 1) Household customers – combined individual and collective household customers

Source: NEURC Annual Reports, OECD Market Study, IEA Publications, PwC Analysis

For detail list of electricity consumption per customer segment accompanied by a number of customers per customer segment, electricity consumption by sectors, and electricity consumption by major industrial consumers, please see appendix.

²⁰⁷ NEURC Annual Reports (2020-2021)

3.9.2. Electricity prices

Compared to other Contracting Parties, the Ukrainian wholesale market stands out as the only one, alongside Serbia, with functional DAM and ID market. Since July 2019, the Ukrainian wholesale electricity market consists of bilateral contracts market (UEEX operated), day-ahead and intraday market (Ukrainian Market Operator), and a balancing & ancillary services market (TSO operated/Ukrenergo). Before 2019 the market functioned as a single-buyer model.

Despite the persistent conflict and significant challenges, every sector of the market persevered, maintaining operations, and implementing various alterations within the wholesale market in Ukraine. To be more precise, in March 2022 the Ukrainian power system was synchronized with the Continental European Power System, and the two Ukrainian power trade zones, namely Burshtyn Energy Island (BEI)²⁰⁸, and Integrated Power System of Ukraine (IPS), were merged into a single power trade zone. The two figures below present insights on IPS and BEI power trade zones, and for the complete understanding of figures it must be noted that the IPS power trade zone represents the single power trade zone in Ukraine after March 2022. Therefore, in the figure for BEI power trade zone, the time frame until February 2022 is analyzed.

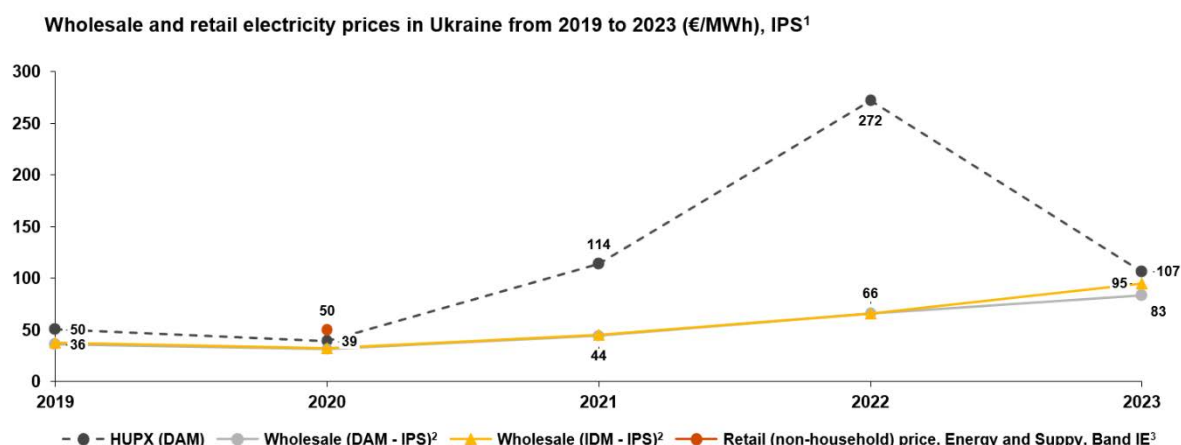
The two figures below outline a similar pattern of day-ahead and intraday monthly weighted average prices in the period from 2019 to 2023. In both, power trade zones, IPS and BEI, the monthly weighted average prices on DAM and ID were lower from retail (non-household) price in 2020²⁰⁹, and significantly lower than an average daily baseload prices on HUPX DAM, indicating government interference in the prices in a form of price caps within the wholesale market in Ukraine.

In more detail, an average daily baseload price on day-ahead market on HUPX peaked in 2022 at 272 €/MWh (average monthly traded volume of 2,257 GWh), which was 206 €/MWh above the monthly average index baseload price on DAM in IPS power trade zone (average monthly traded volume of 1,429 GWh), and 215 €/MWh higher than the BEI power trade zone DAM price (January-February 2022, average monthly traded volume of 532 GWh). However, in 2023 situation on the Ukrainian organized market changed, and the discrepancy between the Ukrainian (average monthly traded volume of 1,729 GWh) and HUPX DAM (average monthly traded volume of 2,171 GWh) decreased and amounted to 24 €/MWh. If prices on the Ukrainian DAM can remain as stable and competitive as those on the HUPX DAM without government interference or price caps, it would indicate a healthy environment for investors considering PPA deals in the Ukrainian market. Although the power exchange conditions provide a favorable environment for PPA utilization, the ongoing situation in Ukraine may present challenges for investors regarding implementation.

²⁰⁸ OECD Competition Market Study of Ukraine's Electricity Sector 2023: The Burshtyn Energy Island (BEI), a small part of Ukraine's power system that accounts for around 4% of total production and consumption, has been synchronised with the European system since 1 July 2003.

²⁰⁹ Eurostat - For non-household consumers Band IE: 19 999 MWh < Consumption < 70 000 MWh; Components of energy price: Energy and Supply.

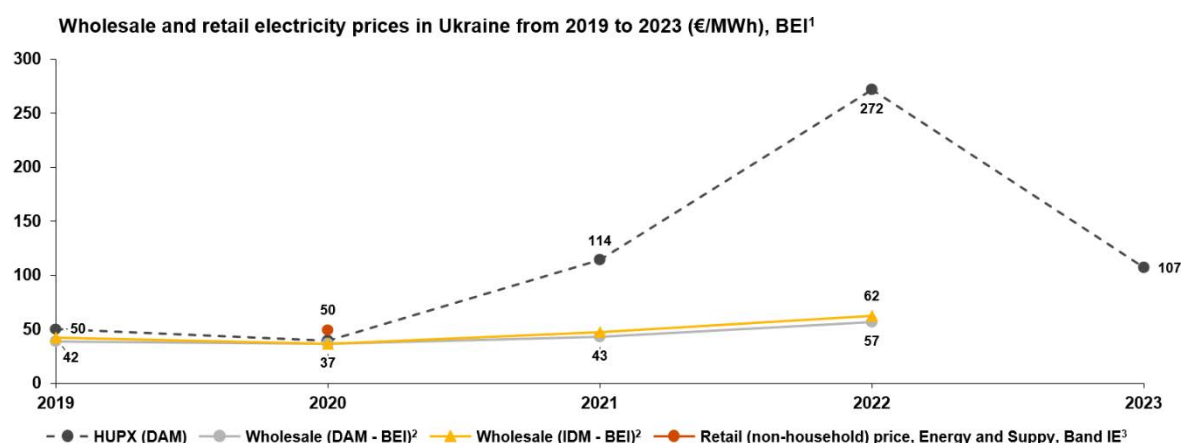
Figure 98 Overview of wholesale and retail electricity prices in Ukraine, IPS power trade zone



Note: 1) In March 2022 the two Ukrainian power trade zones (BEI & IPS) were merged into a single power trade zone, 2) Price without VAT, 3) Retail (non-household) price showcases year 2020, due to unavailability of data for other years

Source: Ukrainian Market Operator web page, HUPX Annual Reports (2019-2023), Eurostat, PwC Analysis

Figure 99 Overview of wholesale and retail electricity prices in Ukraine, BEI power trade zone



Note: 1) In March 2022 the two Ukrainian power trade zones (BEI & IPS) were merged into a single power trade zone, 2) Price without VAT for the observed period until February 2022, 3) Retail (non-household) price showcases year 2020, due to unavailability of data for other years

Source: Ukrainian Market Operator web page, HUPX Annual Reports (2019-2023), Eurostat, PwC Analysis

3.9.3. Supply options and incentive mechanisms

In 2023, Ukraine has set a new goal of having 50% of its power generated from renewable energy and 50% from nuclear energy by 2050. This reflects a strong commitment to diversifying its energy mix and enhancing energy security even in the face of the ongoing conflict.²¹⁰

Ukraine's renewable energy potential is substantial, with significant opportunities in wind, solar, and biomass. Prior to the conflict, the country had ambitious plans to expand its renewable capacity, with targeted additions in wind and solar energy. Regions such as the southern and southwestern parts of Ukraine are particularly promising for solar development due to high solar irradiance. The International Renewable Energy Agency (IRENA) has assessed Ukraine's renewable energy potential, concluding that the country possesses

²¹⁰ National Renewable Energy Laboratory (NREL). (2023). "Ukraine Fights To Build More Resilient, Renewable Energy System in Midst of War."

between 16 and 24 GW of wind energy capacity, with 16 GW deemed economically feasible. Additionally, IRENA has identified a feasible capacity of 4 GW for solar power generation.²¹¹

Ukraine has also planned renewable energy auctions to accelerate the deployment of green energy projects. These auctions are expected to facilitate investment in renewable energy by providing a structured, competitive process for awarding contracts. The Ministry of Energy has drafted an order, submitted to the Government on July 25, 2024, for pilot auctions to allocate 110 MW of annual support quotas for 2024—divided into 11 MW for solar energy, 88 MW for wind turbines, and 11 MW for other alternative energy sources. The maximum price offers are set at 9 eurocents/kWh for solar energy and wind turbines, and 12 eurocents/kWh for other sources. The first auctions are scheduled for October-November 2024. Additionally, the draft order for the approval of the annual support quota and auction schedule for 2025, along with indicative forecast indicators of the annual support quotas for 2026-2029, will be submitted for Government consideration by December 1, 2024, in compliance with current legislation. The auctions will utilize contracts for difference (CfDs), which offer price stability by compensating the difference between market prices and the agreed strike price. The auction price will be determined based on the lowest bid and will be fixed for 12 (according to acting legislation) years from the project's connection to the grid²¹².

Post-war reconstruction plans emphasize green and sustainable energy solutions. The United Nations Development Programme (UNDP) has signed a memorandum with Ukraine's Ministry of Energy to ensure that the post-war energy sector recovery is clean and inclusive. This includes initiatives to rebuild energy infrastructure in a way that supports renewable energy integration and aligns with global sustainability goals.²¹³

Financial support and technical assistance from international partners are pivotal for Ukraine's renewable energy expansion. The European Bank for Reconstruction and Development (EBRD) and other international bodies are expected to play significant roles in funding and facilitating these projects, which aim to transform Ukraine's energy landscape from reliance on fossil fuels to a more sustainable and resilient energy system.

Feed-in tariffs in Ukraine guarantee fixed purchase prices for renewable energy producers over a specified period, providing financial stability and predictability. For instance, Solar PV projects up to 1 MW receive a fixed tariff. As of recent legislation, they received approximately 15-euro cents per kWh for installations completed by the end of 2022, while small wind farms (up to 3 MW) received about 10-euro cents per kWh. This rate is adjusted annually for inflation and currency fluctuations. The feed-in tariff is established until the end of 2029 (e.g., a project starting in 2019 receives 10 years, in 2021 receives 8 years of FiT support), ensuring that renewable energy developers have long-term revenue security, which is crucial for securing financing.²¹⁴

Under the CfD scheme, renewable energy producers are compensated for the difference between the market price and a predetermined strike price. If the market price is below the strike price, the producer receives a payment to make up the difference; if the market price is above the strike price, the producer pays back the difference. For solar PV in this scheme, the market premium can add approximately 5-euro cents per kWh on top of the market price, while for wind energy, the premium is around 4-euro cents per kWh.²¹⁵ In more detail, for the

²¹¹ Center for Strategic and International Studies (CSIS). (2023). "Developing Renewable Energy in Ukraine."

²¹² Legal Developments. (2023). Renewable energy in Ukraine: green auctions launched.

²¹³ United Nations Development Programme. (2023). Ukraine works to ensure post-war energy sector recovery is clean, green and affordable. Retrieved from UNDP

²¹⁴ International Renewable Energy Agency. (2021). Renewable Energy Prospects for Ukraine. Retrieved from IRENA

²¹⁵ Legal Developments. (2023). Renewable energy in Ukraine: green auctions launched. Retrieved from Legal500

"green" tariff, a sliding premium scheme is applied. For auction winners, CfD operates such that if the market price is higher than the auction price, the difference is paid to the state-owned off-taker, the guaranteed buyer.

3.9.4. Power wholesale market maturity & B2B product

For the cPPA market to function effectively, CPs need to ensure the presence of a liquid wholesale market capable of supporting virtual cPPA settlements. Additionally, CPs should demonstrate that suppliers are prepared to offer a sleeving option and provide access to spot markets. It is also essential to have a Guarantees of Origin (GoO) scheme established to facilitate the execution of PPAs (thoroughly assessed in the Legal part).

The wholesale electricity power exchange in Ukraine has undergone significant changes, especially in response to the ongoing conflict. As of 2024, Ukraine's electricity market is characterized by a notable decline in demand and generation. Since the Russian invasion, electricity demand in Ukraine has fallen by approximately 40%, primarily affecting nuclear and coal-fired power generation. The national power company, Ukrenergo, continues to provide real-time data on electricity demand and generation, which is crucial for maintaining grid stability and managing energy resources effectively.²¹⁶

Ukraine's bilateral electricity market is evolving, becoming more dynamic with the introduction of liquid intraday and day-ahead markets. Ukraine's day-ahead and intraday electricity markets are fully operational and play a critical role in balancing supply and demand. In the day-ahead market (DAM), the average monthly volume for 2024 has been around 1,933 GWh, with prices averaging approximately €90 per MWh. The intraday market (IDM), which facilitates real-time trading adjustments, has an average monthly volume of around 700 GWh, with prices slightly higher due to the immediacy, averaging about €95 per MWh. These markets ensure grid stability and efficient energy distribution, reflecting dynamic pricing based on real-time supply and demand conditions.²¹⁷²¹⁸²¹⁹

Smart meters are essential for the successful execution of virtual PPAs in the business sector as they provide hourly consumption data crucial for business accounting. This detailed hourly data ensures that there are no issues with virtual "pay-as-produced" arrangements, which operate on an hourly basis, in contrast to the alternative of a monthly baseload approach. For physical PPAs, the ability of suppliers to offer a monthly pricing model hinges on the accurate and detailed consumption data provided by smart meters, thereby highlighting their significance in both virtual and physical PPA contexts. The industry standard is that all mid and high voltage consumers are using smart meters already, therefore, there is no limitation for PPA. In Ukraine smart metering system is in place, however exact figure of number of smart meters is not publicly unavailable. For instance, ADD Energy has launched the production of smart electricity meters in Kyiv, utilizing advanced OFDM technology.

Details of each CP market player and market interaction can be found in the appendix and legal section of the document.

²¹⁶ International Energy Agency. (2022). Ukraine real-time electricity data explorer. Retrieved from <https://www.iea.org/data-and-statistics/data-tools/ukraine-real-time-electricity-data-explorer>

²¹⁷ Market Operator. (2024). Market data and trade results. Retrieved from <https://www.oree.com.ua/?lang=english>

²¹⁸ Ukrainian Energy Exchange. (2024). Exchange trade on the Ukrainian energy market. Retrieved from <https://www.ueex.com.ua>

²¹⁹ EnExGroup. (2024). Electricity day-ahead, intraday, derivatives and NGAS markets monthly report. Retrieved from <https://www.enexgroup.gr>

Figure 100 Overview of key stakeholders and market structure in CPs

Contracting Party	Utility	TSO	DSO	Electricity exchange market	Bilateral market	Volume / price in 2022 ¹	Day-ahead market	Volume / price in 2023	Intraday market	Volume / price in 2023	Guarantee of Origin
	KESH sh.a.*	OST*	OSSH*	ALPEX	✓	n/a	✓	0.8 TWh / 101 (€/MWh)	✗	n/a	✓
	EP BiH*, ERS*, EP HZHB*, EFT RITE Stanari	NOS BiH* & Elektroprivreda BiH*	EP BiH*, ERS*, EP HZHB*, Komunalno Brčko*	No power exchange	✓	2.2. TWh/ n/a	✗	n/a	✗	n/a	✓
	Enguri HPP* & Vardnili HPP*, GOGC*, EP Generation	GSE*	Energo-Pro Georgia JSC, Telasi JSC	GENEX ¹	✓	15.5 TWh/ n/a	✗	n/a	✗	n/a	✓
	KEK*	KOSTT*	KEDS	ALPEX	✓	n/a	✓	0.2 twh/ 69 (€/MWh)	✗	n/a	✓
	Termoelectrica*, CET-Nord*	Moldelectrica*	Premier Energy Distribution, RED Nord*	No power exchange	✓	n/a	✗	n/a	✗	n/a	✗
	EPCG*	CGES*	CEDIS*	MEPX / BELEN	✓	n/a	✓	0.3 TWh / 98 (€/MWh)	✗	n/a	✓
	AD ESM*, TE-TO AD, EVN	AD MEPSO*	Elektro distribucija DOOEL AD ESM*	MEMO	✓	3.1 TWh / 262 (€/MWh)	✓	0.3 TWh / 99 (€/MWh)	✗	n/a	✗
	EPS*	EMS*	EDS*	SEEPEX	✓	n/a	✓	4.7 TWh / 104 (€/MWh)	✓	4 GWh / 116 (€/MWh)	✓
	NNEGC Energoatom*, DTEK	Ukrenergo*	DTEK, Kharkiv-oblenenergo*	UEEX	✓	14.9 TWh/ 81 (€/MWh)	✓	20.8 TWh/ 83 (€/MWh)	✓	1657 GWh/ 95 (€/MWh)	✓

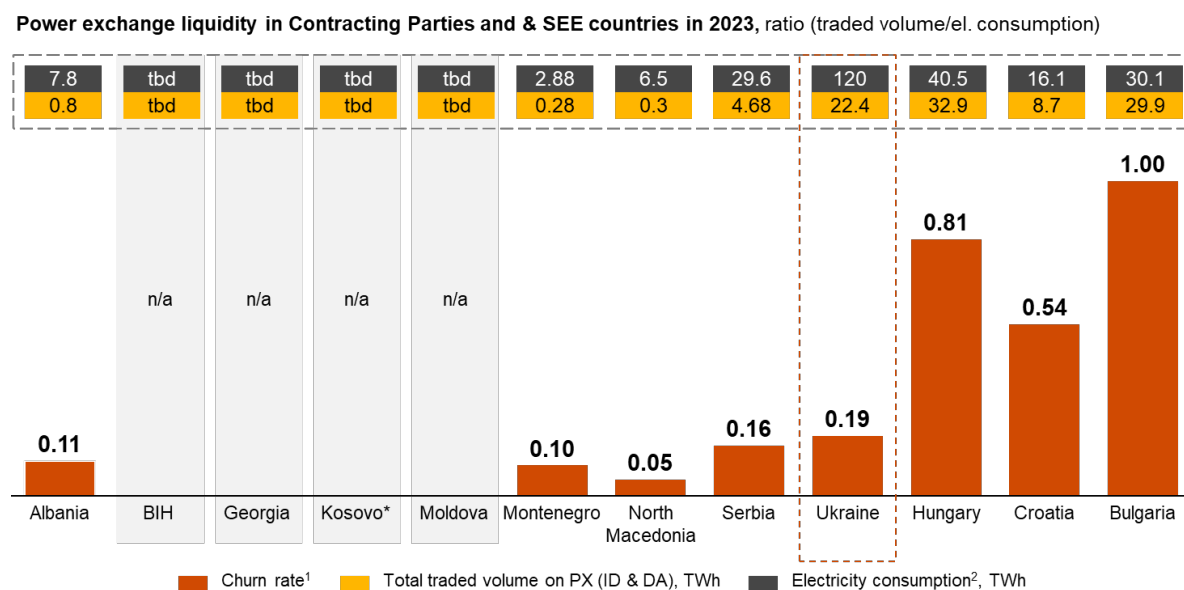
Note: *State owned entities, 1) Data for Ukrainian bilateral market (volume and price) reflects the 2023 values

Source: PwC analysis

Apart from the assessing the existence of the Power exchange in contracting parties, it is important to analyze the liquidity of the power exchange, as it serves as a pivotal analytical tool for assessing the efficiency and level of competition within energy markets. A robust level of liquidity stands as a compelling indicator of market strength. Consequently, optimal liquidity fosters a more accurate reflection of supply and demand dynamics within commodity prices. This, in turn, facilitates more efficient decision-making regarding electricity consumption.

The figure below is used for evaluating the liquidity of the power exchanges among the Contracting Parties, and it indicates that a power exchange in Ukraine (i.e. UEEX) has a superior liquidity over power exchanges in other Contracting Parties in 2023. In addition, when comparing UEEX churn rate in 2023 with those of power exchanges in other SEE countries, notably Hungary, Croatia, and Bulgaria, it becomes apparent that UEEX churn rate still lacks behind the SEE power exchanges in terms of power exchange liquidity (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78).

Figure 101 Overview of Contracting Parties and chosen SEE Power Exchanges



Note 1) Churn rate is a ratio of the total volume of power trade (ID/DA) and electricity consumption, 2) Electricity consumption for 2023 expressed as an average for 2018-2022 (Ukraine 2020-2021), due to the lack of 2023 data

Source: ALPEX Monthly Reports 2023 (April-December), MEPX Annual Report 2023, MEMO Annual Report 2023, SEEPEX Annual Report 2023, CROPEX Annual Report 2023, HUPX Annual Report 2023, IBEX Annual Report, Ukrainian Market Operator web page

3.9.5. PPA deals, key players, and CBAM assessment

PPA deals in the Contracting Party

In this section, we will delve deeper into the Historical PPA track record and its key attributes for each CP. The analysis will contain information on the number of announced and current deals, with the corresponding size and parties involved in the deal.

Based on publicly available data and thorough desktop research, as of 2024, there are no existing or announced Power Purchase Agreements (PPA) in Ukraine that have been publicly disclosed. However, the list of existing and announced RES projects and developers can be found in the appendix.

Key investors in the Contracting Party

The leading financial institutions in Ukraine comprise both domestic and international commercial banks, including entities such as PrivatBank, Oschadbank, Ukreximbank, Raiffeisen Bank, and the EBRD. Furthermore, the EBRD has had a vital function in supporting renewable energy projects in Ukraine since 2009 through initiatives like the Ukraine Sustainable Energy Lending Facility (USELF). The EBRD has also allocated substantial funds to upgrade Ukraine's power transmission system and synchronize it with the European grid.²²⁰ Furthermore, the appendix includes additional examples of financing energy projects within the Contracting Party.

CBAM assessment

The CBAM, effective from January 1, 2026, will impact the CP by increasing electricity costs for the electricity exported to the EU, as the EU importers will pay surcharge for the embedded emissions in imported electricity from CPs. The physical cross-border PPAs will be directly

²²⁰ The EBRD. (n.d.). Green EBRD Investments in Ukraine. Retrieved from <https://www.ebrd.com/what-we-do/sectors/ukraine-nuclear-safety-upgrade-green-investments.html#:~:text=Eco%2DOptima%20Wind%20Farm%20was,private%20local%20enterprises%20wishing%20to>

affected, with EU offtakers potentially seeking contract adjustments to accommodate these additional costs. Two important mechanisms that should be in place in the CP to enable CBAM exemptions are market coupling with EU MSs and introducing national carbon pricing mechanism equivalent to the EU ETS.

Ukraine is set to launch a pilot Emissions Trading System (ETS) in 2025, with full implementation by 2026, to align with EU standards and mitigate the impact of the Carbon Border Adjustment Mechanism (CBAM). This system, supported by international collaborations and detailed in the Climate Strategy 2035, aims to reduce greenhouse gas emissions and enhance decarbonization efforts, while maintaining economic competitiveness. The Ministry of Environmental Protection and Natural Resources is actively engaging with stakeholders to ensure regulatory readiness and effective operation, thereby promoting a seamless transition to high environmental standards. Additionally, a comprehensive Monitoring, Reporting, and Verification (MRV) rules have been put in place to support these initiatives.^{221, 222, 223}

Ukraine has established a cap-and-trade mechanism to internalize the cost of carbon emissions and currently holds € 0.75/tCO₂e, which is a level much lower than the price under the EU ETS. Also, Ukraine has not transposed the Electricity Integration Package on which all further implementation actions, including exemptions envisaged by CBAM regulation depend. In respect of the cross-border PPAs between EU MS and CP, the harmonization of the Electricity Integration Package and market coupling would be of high importance for the exemption of CBAM for the electricity transactions.²²⁴

It is expected that CBAM will stimulate increased adoption of renewable PPAs, as companies affected with the CBAM (producers of carbon intensive goods) would seek to reduce their carbon costs. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted.

Additionally, on the side of calculation of the CBAM charges, the CBAM declarants (EU importer) may use default or actual values of embedded emissions which are related with the renewable electricity. However, in order to use actual emission value, various criteria must be met, including non-physical network congestion at any point in the network between the installation and the Union transmission system. As a result of the above, and primarily due to the challenge of addressing non-physical congestion, the cross-border PPAs parties will face difficulties to utilize the actual emission factor related with the renewable electricity. This challenge can be addressed through infrastructure improvements within the transmission networks in the CPs and market coupling with the EU.

²²¹ Ukraine's Government portal (2024, January 31st), National emissions trading system will be launched in a pilot mode in 2025: Ruslan Strilets. Retrieved from: <https://www.kmu.gov.ua/en/news/natsionalna-sistema-torhivli-vykydamy-v-pilotnomu-rezhymi-zapratsiuiie-u-2025-rotsi-ruslan-strilets>

²²² Ukraine's Government portal (2024, July 1st), Ministry of Environmental Protection and Natural Resources is working on launching the Emissions Trading System and renewing the obligation of enterprises to report in the MRV system. Retrieved from: <https://www.kmu.gov.ua/en/news/mindovkillia-pratsiuiie-nad-zapuskom-stv-ta-ponovlennia-oboviazkovosti-zvituvannia-pidpriemstvamy-u-systemi-mzv>

²²³ Ministry of Environmental Protection and Natural Resources of Ukraine (2024, June 10th), Invitation to discuss the draft Strategy for the implementation of the system of trading quotas for greenhouse gas emissions. Retrieved from: <https://mepr.gov.ua/zaproschuyemo-obgovoryty-proyekt-strategiyi-vprovadzhennya-systemy-torgivli-kvotamy-na-vykydy-parnykovyh-gaziv/>

²²⁴ Energy Community Secretariat (2023), CBAM- Readiness Tracker. Retrieved from: <https://www.energy-community.org/news/Energy-Community-News/2023/07/05.html>

The CBAM Regulation in the EU is intended to reduce carbon leakage. EU importers of six product categories will have to pay a surcharge equivalent to the EU ETS price covering the embedded emissions of the imported products.

In addition to direct emissions, related with the production of cement and fertilizers, CBAM also applies to indirect emissions linked to production of electricity used for the production process.

Based on the CBAM rules and guidelines, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA.

According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average default emission factors for grid electricity. However, this indicates that using market-based instruments such as Gos for declaring renewable energy sources is not accepted.

This framework raised a debate regarding the interpretation of PPAs, suggesting that it should be expanded to include Gos. Presently, under the current CBAM guidelines, companies can only calculate their electricity-embedded emissions based on the grid mix of their operational location. This limitation prevents companies from leveraging Gos, particularly in scenarios where CPs are developing and integrating Gos markets. Furthermore, the exclusion of Gos means that cross-border virtual PPAs would not qualify for CBAM exemption.²²⁵

The ongoing conflict with Russia has exacerbated Ukraine's industrial and economic difficulties, significantly impacting sectors like iron and steel. With disrupted production and export routes, adapting to the new CBAM requirements is a complex task. Despite these hurdles, Ukraine is striving to reform its emissions policies and infrastructure to comply with EU standards. This effort includes plans to put in place already mentioned pilot version of the EU's Emissions Trading System (ETS), which mandates that companies pay for their carbon emissions. This system aims to mitigate the carbon tax impact on exports by aligning domestic carbon pricing with EU levels.²²⁶

Ukraine's heavy reliance on the EU market, especially for its iron and steel exports, underscores the importance of meeting CBAM requirements. As of now, around 85% of Ukraine's iron and steel exports are directed to the EU, a significant increase from pre-war levels. The CBAM will subject these exports to a carbon price, potentially raising costs unless counterbalanced by domestic emissions reductions and increased use of renewable energy.²²⁷

In conclusion, while the path to CBAM compliance is fraught with challenges, particularly due to the ongoing conflict, it also provides Ukraine with an opportunity to advance its environmental reforms and deepen its integration with the EU market.

Figure 102 Overview of CBAM and PPA connection per Contracting Party

²²⁵ REGULATION (EU) 2023/956 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (2023, May 10). Establishing a carbon border adjustment mechanism.

²²⁶ POLITICO. (2023). The EU's carbon tax may devastate a country it is trying to keep alive: Ukraine. Retrieved from <https://www.politico.eu>

²²⁷ European Parliament. (2023). Carbon border adjustment mechanism. Retrieved from <https://www.europarl.europa.eu>

Analysis of CBAM and PPA connection in Ukraine

Ukraine		
Net electricity export/import ¹ (average 2021-2023, GWh)		800 GWh
Share of thermal electricity in total electricity generation (average 2020-2022, %)		34%
Share of industry sector electricity consumption ² (average 2020-2022, GWh and %)		45,888 GWh and 39%
Leading sub-sectors within industry sector by electricity consumption (average 2020-2022, %)	Iron and steel	33%
	Mining and quarrying	21%
	Food, beverages and tobacco	10%

Source: ENTSO-E, Eurostat, PwC analysis

Note: 1) Positive value indicates a net exporter of electricity, while a negative value indicates a net importer of electricity;
2) Share in total electricity consumption of the country

To assess a possible connection between PPAs and the CBAM there is a figure presented above, followed by the subsequent text. Ukraine has increasingly turned to EU markets to export its products, particularly those from the iron and steel sub-sector, which will be impacted by the CBAM. Introducing PPAs would be highly beneficial for Ukraine, as they would help mitigate the CBAM taxes, reduce reliance on non-renewable energy, and enhance the competitiveness of its exports in the EU market.

CBAM recommendations

Figure 103 Overview of CBAM recommendations in Ukraine

Recommendation	Law intervention	Laws identifier	Comments
A- National carbon pricing mechanism			
A1 Adjusting the national carbon pricing at the level of EU ETS for CBAM goods only	Yes	Tax Code	Considering that in accordance with CBAM rules, any national carbon price will be set-off from the CBAM obligation, it seems that increasing the national carbon price on the level of the ETS will mean that the entire carbon price will remain in Ukraine, instead being paid in EU at export. On the other hand, Ukraine may consider implementing national system equivalent to CBAM for the CBAM goods imported in Ukraine outside the EU.
B – Options for actual indirect emissions based on PPAs			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Electricity Market Law	In respect of the cross-border PPAs between EU MS and CP, the transposition of the Electricity Integration Package and implementation market coupling would be of high importance for the exemption of CBAM for the electricity transactions, as it would enable the implementation of cross-border PPAs.
B2 – Adopting legislation for verifying the renewable nature of energy sources in PPAs	Yes	Green Transformation Law; New Decree on GOs	It is expected that the CBAM would stimulate increased adoption of renewable PPAs in the CP, as companies affected by the CBAM (producers of carbon intensive goods) would seek to reduce their carbon footprint. To ensure that renewable PPAs are appropriately recognized under CBAM, there is a need for transparency and standardization in reporting carbon intensity. National legislation should be adjusted and clear guidelines and mechanisms for verifying the renewable nature of energy sources in PPAs should be adopted. The national inventory system for GHG should be established and Ukraine should nominate a lead reporter. In relation to this, Green Transformation Law should be adopted to introduce the PPA agreements, and the necessary secondary

legislation for operation of GOs register should be adopted. Both
have already been explained above in this report.

4. Legal and regulatory framework in CPs

4.1. Albania

Certain regulatory barriers currently hinder the full realization of the potential for PPAs in Albania's renewable energy sector, especially due to the fact that PPAs cannot be directly entered between renewable energy producers and final consumers.

Albania should undertake regulatory reforms that facilitate renewable PPAs in line with the Energy Community acquis. The removal of these barriers will not only promote renewable energy uptake but also contribute to Albania's energy transition goals.

4.1.1. Market design assessment

4.1.1.1. Access of renewable PPAs

In general, under the Energy Law and the Market Rules: (i) physical PPAs may be entered in Albania solely on the wholesale market, which includes wholesale traders and retail suppliers, while (ii) there is no limitation for the entering into virtual PPAs.

PPAs were introduced in Albania's legislation in 2017 with the renewable energy law valid at that time. At the time of adoption, the PPAs were introduced as a support scheme with a fixed feed-in-tariff. The existing Renewable Energy Law was adopted more recently, in 2023. With this new law PPAs have been again introduced as a support scheme, but only until a liquid DAM is established, after which PPAs will be converted into CfDs. More details on this are provided in the following sections of this report.

Other than PPAs as a support scheme, the Renewable Energy Law also defines PPAs as agreements where natural and legal persons purchase renewable energy directly from renewable electricity producers. However, other than the definition, the Renewable Energy Law does not provide any additional rules on PPAs that are not entered as a support scheme. PPAs between renewable electricity producers and off takers (utilities and corporates) are not specifically defined in the Energy Law or in any other law (structure, content etc.). However, entering and realization of PPAs is possible under the general rules for trading of electricity between part of the market participants.

Under such general rules (specifically the Energy Law and the Market Rules) renewable electricity producers are free to enter into physical PPAs with wholesale traders and retail suppliers. Entering into physical PPAs by renewable electricity producers with final consumers as off-takers is not possible. All final consumers may be supplied with electricity only by licensed retail suppliers under a supply agreement regulated under law. This is applicable to final consumers connected to both the transmission grid and the distribution grid. Therefore, the Albanian energy regulation is limited in this part.

The Energy Law does not recognize possibilities for market participation of final customers and small enterprises through aggregation of generation from multiple power-generating facilities or load from multiple demand response facilities to provide joint offers on the electricity market and be jointly operated

in the electricity system. The new Renewable Energy Law defines the terms aggregator and aggregation, however, there are no specific provisions in this law or any bylaw regulating this in more detail. The only instance in which aggregation is mentioned is in light of the newly introduced renewable energy community as a separate legal entity that may be comprised of natural persons, SMEs or local authorities for the development of joint renewable energy projects and joint market participation. However, for the SMEs participating in such communities, production and sale of renewable energy cannot be the primary commercial or professional activity.

State-owned enterprises also procure energy in the capacity of final consumers under the applicable public procurement rules. Therefore, the general limitations set with the Energy Law are also applicable to them, and they may also only procure electricity from licensed retail suppliers and not from renewable electricity producers, same as all other final consumers.

Within the current regulatory framework, unlike the situation regarding physical PPAs which is subject to multiple constraints as detailed above, the implementation of a virtual PPA is feasible without the necessity of any regulatory intervention. Renewable energy producers and off-takers are free to enter into virtual PPAs and determine the terms and conditions of their relationship under market terms (reference price, settlement etc.).

Finally, the Energy Law is not in line with the Electricity Directive (as adapted and adopted by the Energy Community). From the publicly available records we were not able to identify if a new law in line with the Energy Community acquis is in the process of preparation and adoption.

4.1.1.2. Trading rules

The market participants eligible to contract PPAs (specifically the renewable electricity producers, retail suppliers, wholesale traders), are required to hold respective licenses for their activities. The licenses are issued within 60 days as of application.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the Regulatory Authority.

Renewable energy producers have a priority in both grid access and dispatch. Specifically, based on the Energy Law and the Renewable Energy Law, renewable energy producers have a statutory priority right to access to the electricity grid. In addition, the TSO and DSO should give priority dispatch to electricity generated from plants using renewable energy sources based on transparent and non-discriminatory criteria. In case of requirement for electricity reduction the TSO and DSO will initially limit the electricity coming from sources different than renewable energy sources. In case of requirement of limitation of electricity coming from renewable energy sources the TSO and DSO will notify the Regulatory Authority. The Network Codes for Distribution and for Transmission do not contain methodology for determination of the compensation for curtailment. Under the Renewable Energy Law such methodology should be adopted by the Regulatory Authority, taking into consideration the participation cost to the balancing mechanism, the set-up of imbalance prices, the incomes from the sale of electricity to the organized market (if there were no interruption) and the support from which the producer may have benefited from (if the producer uses any such support).

4.1.1.3. Balancing rules

All market participants on the Albanian electricity market (renewable electricity producers, retail suppliers, wholesale traders) have balance responsibility. This also includes privileged renewable electricity producers benefiting from a support scheme according to the provisions of the Renewable Energy Law.

Each of the above market participants may regulate its balancing responsibility through a (i) contract entered with the TSO under which the respective market participant shall become a balancing responsible party or (ii) contract with another balancing responsible party by which the respective market participant shall transfer its responsibility to the other balancing responsible party and will become a member of such balancing responsible party's balancing group. Each balance responsible party is financially responsible for its imbalances and the energy price under the PPA may depend on how such responsibility is regulated between the parties.

The Albanian balancing market is established with the balancing rules adopted by the Regulatory Authority on a market-based model. There are currently four balancing service providers registered at the Albanian balancing market. The Albanian TSO has made available an online platform for the procurement of balance capacity and energy.

4.1.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity and they can be traded bundled with the electricity or unbundled. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

GOs in Albania were already regulated with the previous renewable energy law from 2017, but are regulated in more detail in the new Renewable Energy Law from 2023. Under the new Renewable Energy Law, the Regulatory Authority is the designated issuing body which is obliged to create a system for issuing, transferring, redeeming and cancelling guarantees of origin related to energy produced from renewable energy sources.

Albania has made a significant leap towards establishment of an electronic GOs system in 2023. Namely, it has signed an agreement with Grexel as a service provider for the purposes of establishment of the GOs electronic system and as of November 2023 Albania benefits from the G-REX electronic registry that is fully compliant with the RED II requirements and EU standards. Furthermore, Albania has joined as a member to the Association of Issuing Bodies, although it is still in the process of acquiring membership to the electricity scheme group and access to the AIB hub which would enable cross border trade with GOs. Therefore, with the establishment of the electronic system Albania will significantly facilitate the entering into PPAs considering that the buyers shall be able to verify their purchase of electricity from renewable sources.

The Regulatory Authority is the issuing body of GOs in Albania. All renewable energy producers may request from the Regulatory Authority issuance of GOs for each 1MW of produced green electricity. The renewable electricity producer can further freely sell the issued GOs either to the buyer of the electricity or to a third party.

If a renewable energy producer benefits from a support scheme under the Renewable Energy Law (please see the following section) the market value of the GO will be returned to the Renewable Energy Operator which is a separate public authority in Albania in the process of establishment under the Renewable Energy Law (more details are included in the following section of this report). If as a result of the support scheme the producer benefits from direct purchase of the electricity, the GOs for such electricity will be issued to the Renewable Energy Operator.

In addition, the Renewable Energy Law authorizes the Regulatory Authority to recognize GOs issued in CPs of the Energy Community. The Regulatory Authority may refuse the GOs recognition in case of well-founded doubt concerning its accuracy, reliability, or truthfulness. The Regulatory Authority shall notify the Energy Community Secretariat for each refusal for recognition of GOs, together with the reasons of such refusal.

According to the Renewable Energy Directive as applicable in the EU MSs, currently GOs issued in Albania are not recognized for disclosure in the EU MSs unless there is an agreement between Albania and the European Union on mutual recognition of GOs issued in the European Union and compatible GOs systems is established in Albania, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.1.1.5. Support scheme

Until 2023 support schemes in renewable energy in Albania were granted mostly by way of PPAs entered with renewable energy producers for fixed price determined on previously implemented competitive bidding process (feed-in tariff) under the 2017 renewable energy law. CfD were also introduced as a support scheme in the previous renewable energy law, but no CfDs were granted because Albania, at that time, did not have an established energy power exchange.

The new Renewables Energy Law from 2023 made some updates to the existing support schemes in Albania, as well as introduced new support schemes. Under the new Renewable Energy Law, there are two main support schemes, as follows:

- o CfD which is defined as a contract for support concluded between the renewable energy producer and the Renewable Energy Operator, a separate body to be established under the new Renewable Energy Law to perform payment of the support under the contracts for support. The support under the CfD is in the form of variable premium which is calculated as the difference between (i) the strike price which was offered by the respective renewable electricity producer and elected as most favorable during the bidding process for the support; and (ii) the reference price for electricity set at the DAM of Alpex. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the Renewable Energy Operator.

- o Contract for premium which is defined as contract for support between the renewable energy producer and the Renewable Energy Operator under which the Renewable Energy Operator pays to the producer a fixed premium (that can be positive or negative depending on the result of a bidding process) or a sliding premium (as difference between the price achieved through the bidding process and the price for electricity set at the DAM of Alpex) on top of the market price.

PPAs with a feed-in tariff are still defined as a support scheme under the new Renewable Energy Law. However, the possibility for granting of PPAs as a support scheme is for a limited period. Namely, PPAs may be provided as a support scheme only until the establishment of liquid DAM in Albania. After this the PPAs entered as a support scheme under the new Renewable Energy Law will be converted into CfDs. Furthermore, the new law does not affect the PPAs entered prior to the adoption of this law, however, it does provide the possibility for existing PPAs to be converted into CfDs.

Therefore, the feed-in tariff as a support scheme is being abandoned and is to be replaced with the CfD and contracts for premium.

The support schemes are granted on the basis of competitive process initiated by way of a public call announced by the Ministry of Infrastructure and Energy. The contracts for support are generally executed with a maximum duration of 15 years. The Ministry will decide on the type of technology for which the support will be granted.

However, in order for the newly established support schemes to be fully effective, certain steps should be undertaken by Albanian authorities, including: (i) adoption of new bylaws to be in compliance with the 2023 Renewable Energy Act (the existing bylaws are adopted under the previous law that is no longer in force); and (ii) the establishment of the Renewable Energy Operator as a separate body that will act as purchaser of the energy that the privileged producers that will benefit from a support scheme will produce.

4.1.2. Market design recommendations

Recommendation	Law intervention	Laws identifier		Comments
A- Access of renewable PPAs				
A1 – Enabling entering of PPAs between renewable energy producers and final consumers	Yes	Energy Law		The Energy Law and Market Rules should be amended in order for the same to enable entry of physical PPAs directly between renewable energy producers and final consumers, eliminating the requirement for the seller to be holder of a retail supply license.
		Market Rules		
		Renewable Energy Law		Furthermore, the Renewables Energy Law should regulate in detail the status of independent aggregators who would be able to combine multiple customer loads or generated electricity which will enable corporate consumers (SMEs) with relatively small load requirements and/or renewable energy producers with small production capacities to contract aggregated PPA.
				Additionally, the Council of Ministers can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
A2 – Adoption of new Energy Law in line with the Electricity Directive	Yes	New Law	Energy	New Energy Law should be adopted to be in line with the Electricity Directive, repealing the existing Energy Law adopted on the basis of the Directive 2009/72/EC that is no longer in force. The new Energy Law may introduce the required changes in regard to PPA in line with the recommendation from item A1 above.
B- Trading rules				
B1 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	New Methodology to be adopted		The Regulatory Authority should adopt the methodology for determination of the compensation for curtailment as per the new Renewable Energy Law. The methodology should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.

Network code of TSO and DSO requires an amendment to incorporate methodology for curtailment compensation schemes in line with the adopted methodology.

C – Balancing rules

C1 – Establishment of the intraday market as a vital tool for market participants to balance their positions. No

/

The establishment of an intraday market is necessary in order for the market participants to be able to balance their positions closer to real-time.

D – GOs

D1- Adoption of the disclosure rules

Yes

New Energy Law

In relation to the recommendation made under item A2 above, with the adoption of the new Energy Law (or the amendment of the existing Energy Law) Albania should introduce disclosure rules in line with the Electricity Directive.

4.1.3. XB PPAs assessment

4.1.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in Albania allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the “off-taker” party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU MSs and CPs, as elaborated above.

Regarding physical cross-border PPAs, renewable electricity producers in Albania have the right to sell electricity to market participants on the wholesale electricity market abroad. However, limitations exist for consumers, as the Energy Law specifies that final consumers can only procure electricity from licensed suppliers in Albania, but not directly from a domestic or foreign renewable electricity producer.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering into long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

4.1.3.2. Market coupling and market liquidity

Albania has had an operational DAM since April 2023. As of 2024 market coupling was established for the DAM on the cross-border capacities of Albania and Kosovo*. The DAM is not coupled with the other neighbouring markets of the CPs and MSs. However, Albania has signed a Memorandum of Understanding on coupling of day-ahead electricity markets of North Macedonia, Greece, Albania and Kosovo* in November 2023.

The intra-day market is not established however there is a regulatory framework in place for its establishment.

Furthermore, in order to enable market coupling it is required for Albania to integrate the EnC Electricity Integration Package in the following years.

4.1.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighbouring markets based on explicit auctions. Albania has interconnectors with Montenegro, Kosovo* and Greece. The interconnector with North Macedonia is in the process of development.

For all interconnectors the allocation process is organized via border auctions made through SEECAO. There are yearly, monthly and daily auctions implemented for the allocation of the capacity of each border.

The allocation of the capacity is done in accordance with the applicable auction rules of SEECAO. Therefore, the Albanian TSO has applied harmonized allocation rules based on the Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation as adapted by Ministerial Council Decision 2022/03/MC-EnC.

Albania's bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. The TSO has not concluded agreements with neighbouring EU TSOs (Greece's TSO) as a basis for cooperation of the TSOs of MSs and CPs

The TSO determines the net available cross border capacity on the interconnectors based on the Energy Law and the Rules of Cross-Border Capacity Management and further communicates and harmonizes such capacities with neighbouring TSOs. The TSO determines the available capacity in conformity with the safety standards of system operation. However, the regulations do not set any targets for the TSO on making available cross-zonal capacity.

4.1.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Enable consumers to directly purchase electricity from renewable energy producers located abroad	Yes	Energy Law Market Rules	The existing provisions of the Energy Law and the Market Rules allow for final consumers (large corporate consumers and SMEs) to solely procure electricity from licensed retail suppliers. These provisions should be revised to allow these final consumers to purchase electricity from renewable energy producers located in another CP or MS.
A2 – Granting forward transmission rights with longer durations	Yes	Rules of Cross-Border Capacity Management	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should be harmonised with the EU Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			
B1 – Harmonization with the EnC Electricity Integration Package	Yes	Energy Law	The Energy Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.
C – Cross-border capacity			

C1 – The TSO to conclude agreements with the EU MSS' TSOs	Yes	Energy Law	The Energy Law should be amended to include the obligation of the TSO to regulate the operations of the bidding zones with EU MSS with bilateral agreements (in the specific case Greece). Additionally, the TSO should sign cooperation agreements with the TSO of its neighbours to govern bidding zone borders.
C2 – Providing targets for the TSO for available cross-zonal capacity	Yes	Energy Law Rules of Cross-Border Capacity Management	The TSO should not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside Albania bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the Energy Law and the Rules of Cross-Border Capacity Management should provide a minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by the Ministerial Council Decision 2022/03/MC-EnC.

4.1.5. RES Projects assessment

4.1.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In Albania, procedures for development and licensing of RES projects are very complex and may take longer time to be completed.

Initially, as per the Energy Law, the construction approval for RES projects is issued on central level. Local authorities have no competences to issue such approval for smaller scale RES projects. Specifically, the approval for construction of RES projects up to 2 MW capacity is issued by the minister of the Ministry of Infrastructure and Energy, while for RES projects exceeding 2MW capacity the approval is issued by the Council of Ministers upon prior proposal of the minister of the Ministry of Infrastructure and Energy.

Except for the potential involvement of the Council of Ministers in the permitting process, the other steps for obtaining of the above construction approval are similar, regardless of the capacity of the RES projects. The process involves several authorities, including the Ministry of Infrastructure and Energy, the Ministry of Tourism and Environment, the National Environmental Agency, the National Territorial Council and the TSO or DSO (as applicable). There is no one-stop-shop approach to obtaining all the required permits, consents, and other documents and to the full implementation of the development permitting process.

One of the more important steps is obtaining the required environmental clearance. For all types of renewable energy projects this involves obtaining of preliminary impact assessment approval by the National Environmental Agency on the basis of previously prepared and filed preliminary EIA Study. However, during the implementation of the procedure for issuance of the approval, the National Environmental Agency may decide to implement a more detailed procedure on preparation of an in-debt EIA study which is finalized by way of environmental declaration that is issued by the minister of the Ministry of Tourism and Environment.

The investor should also regulate the land rights before obtaining the construction approval which further complicates the process due to the fact that there are no predefined zoning areas for renewable electricity plants.

The current Renewable Energy Law only provides for simplified grid connection for demonstrative projects lower than 10.8 kW. Demonstrative projects are defined as projects demonstrating a technology as a first of its kind in the EU and Energy Community and representing a significant innovation.

In addition to the development and construction process RES projects should also implement the licensing process under the Energy Law. The process is implemented in front of the Regulatory Authority. The Regulatory Authority should issue the generation license within 60 days as of the filing of the complete documentation by the investor, however, in practice the process is usually finalized within three to four months. The license may be issued with a period of validity of up to 30 years.

4.1.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Energy Law Decision on the construction of electricity production capacities	The Energy Law and the Decision on the construction of electricity production capacities should be amended in order to provide simplified procedure for development of RES projects. This should include involvement of less authorities. Larger competences should be granted to the National Territorial Council in regard to the issuance of the construction approval instead of the Ministry of Infrastructure and Energy and the Council of Ministers. The involvement of these authorities should only be envisaged for large scale projects of greater state significance, Therefore, the threshold for involvement of the Council of Ministers in the permitting process should be increased in order for the same to apply to larger scale projects exceeding 2 MW capacity. In addition, the permitting process for the construction of smaller scale RES projects from a local significance should also be allocated to local authorities, rather than having it centralized at central government level. A scheme for organization and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.

4.1.7. Other applicable areas assessment

4.1.7.1. Derivative instrument procedures for virtual PPAs

No separate regulatory approvals or any other statutory step is required in order for a virtual PPA to be executed between a renewable electricity producer and buyers (such as approval for issuance of financial instrument, reporting to a regulator etc.).

Only in case of CfD entered as support schemes under the new Renewable Energy Law prior public bidding procedure needs to be implemented, however this is not related to CfD represented as derivative or other financial instrument. This is in no way related to entering into virtual PPAs between private entities in any manner.

4.1.7.2. Contractual limitations

In general, the parties of a PPA (physical and virtual) entered outside the framework of any support scheme are free to agree on the terms and conditions of the transaction as per the general contract regulation and market conditions. There are no statutory rules regulating the content of a PPA or the terms and conditions under which the same should be entered. The only limitation exists in case of entering of PPAs, CfDs or contracts for premium as a separate support scheme under the Renewable Energy Law where such agreement may be entered for a period of maximum of 15 years. However, no such limitation is envisaged for PPAs entered between private entities.

4.1.7.3. Competition

The Albania competition regulation does not provide any limitations for the entering into PPAs (including any limitations of the term). However, PPAs should be entered in respect of the applicable competition rules. For instance, if a PPA is found to be in breach with specific competition rules, such as the ones preventing market monopolization or unfair trade practices, such PPA may be subject to examination. Competent authorities may consider such PPA to be in breach with the applicable rules, which may potentially result with annulment or requirement for amendment of the PPA for the purposes of its alignment with the specific legal provision. But this would be determined on a case-by-case basis and cannot be applied to PPAs in general.

4.1.8. Other applicable areas recommendations

No recommendations in this section.

4.1.9. Sources

Abbreviation

Sources

Energy Law	Law no. 43/2015 on the Energy Sector published in the Official Gazette of the Republic of Albania no. 87/2015 and its subsequent amendments
Renewable Energy Law	Law no. 24/2023 on the Promotion of the Use of Energy from Renewable Sources published in the Official Gazette of the Republic of Albania no. 64/2023 and its subsequent amendments
Market rules	Provisional rules of Albanian electric power market approved by the Regulatory Authority with decision no. 139 dated 15.08.2016 and published in the Official Gazette of the Republic of Albania no. 163/2016 and its subsequent amendments
Balancing Rules	Electricity Balancing Rules approved by the Regulatory Authority with decision no. 106 on 02.07.2020 published in the Official Gazette of the Republic of Albania no. 138/2020
Rules of Cross-Border Capacity Management	Rules of Cross-Border Capacity Management approved by the Regulatory Authority with decision no. 124 on 21.07.2016 and published in the Official Gazette of the Republic of Albania no. 149/2016
Decision on the construction of electricity production capacities	Decision No. 822, dated 07.10.2015 for the approval of the rules and procedures for the construction of new electricity production capacities, which are not the subject of concession published in the Official Gazette of the Republic of Albania no. 177/2015 and its subsequent amendments
Law no. 62/2020 on capital markets	Law no. 62/2020 on capital markets published in the Official Gazette of the Republic of Albania no. 131/2020

Law no. 9121, dated 28.07.2003 on competition protection	Law no. 9121, dated 28.07.2003 on competition protection published in the Official Gazette of the Republic of Albania no. 71/2003 and its subsequent amendments
Law no. 155/2020 on climate change	Law no. 155/2020 on climate change published in the Official Gazette of the Republic of Albania no. 3/2021
Law no. 162/2020 for public procurement	Law no. 162/2020 for public procurement published in the Official Gazette of the Republic of Albania no. 30/2021 and its subsequent amendments
Law no. 10440, dated 07.07.2011 for environmental impact assessment	Law no. 10440, dated 07.07.2011 for environmental impact assessment published in the Official Gazette of the Republic of Albania no. 101/2011 and its subsequent amendments
Law no. 107/2014 for the planning and development of the territory	Law no. 107/2014 for the planning and development of the territory published in the Official Gazette of the Republic of Albania no. 137/2014 and its subsequent amendments
Network code of TSO	Network code of TSO published in the Official Gazette of the Republic of Albania no. 63/2022
Network code of DSO	Network code of DSO published in the Official Gazette of the Republic of Albania no. 142/2008

4.2. Bosnia and Herzegovina

The BiH regulatory framework for the energy sector is divided on state and entity level. While the electricity market is regulated on entity level – by FBiH and RS as constitutional entities and by Brčko District as separate administrative unit, the transmission system operation, balancing market, international trade and the supervision part for electricity market in the Brčko District remain regulated on state level. Hence:

- The state-level regulator, SERC, supervises the operation of the transmission system, international trade, and the power sector in the Brčko District, which includes generation, distribution, and retail.
- At the entity level, the electricity market is regulated by two bodies: the Regulatory Commission for Energy in the Federation of BiH - FERK and the Regulatory Commission for Energy of Republika Srpska - RERS.
- The ISO in BiH - NOSBiH, oversees the entire BiH transmission network that operates at the level of and above 110 kilovolts (kV). It also manages the balancing energy market in BiH. NOSBiH also provides guidance on integrating renewable energy sources into the transmission level.
- The TSO - Elektroprenos BiH, is responsible for linking power plants to power distribution regions or major industrial consumers. It also connects the power system to neighboring countries to facilitate power trade.

Bosnia and Hercegovina As a general conclusion, it can be noted that BiH tends to support and promote renewable energy in line with strategic documents outlining energy transition and the achievement of renewable targets. Regulatory progress has been made in recent years in FBiH, with the adoption of revised legislation on renewable energy sources and efficient co-generation, a revised Electricity Law, Law on the Use of RES and EC and Law on Energy and Regulation of Energy Activities. Similar laws were also adopted by the Brčko District and RS.

The new energy regulation adopted in FBiH, RS and Brčko District establishes a single-buyer model and opens perspectives for auctions, prosumers, and energy communities, however the right of access to PPAs remains reserved only to licenced companies responsible for generating, trading and supplying electricity, while the corporate players can access PPAs only by involving such licenced company.

The existing regulatory environment introduces a level of unpredictability in the energy sector, stemming from the anticipated adoption and execution of updated bylaws and policies. The energy sector's diverse range of participants adds another layer of complexity to the regulatory framework. For instance, the BiH has three regulators with different jurisdictions who regulate the local electricity markets independently. The licensing procedures, price-setting mechanisms, fees, and tariff methodologies do not appear to be co-ordinated between entities. Those divergences result in practice in the creation of subnational renewable energy markets, having their own traction, which makes it challenging to implement a comprehensive policy at state level.

To ensure clarity in content presentation, an individual report follows for each entity and Brčko District and, a separate report that covers the following sections regulated at the state level:

1. The Balancing Market, which falls under the Market Design Assessment Section.
2. The XB's PPA Assessment Section.

The state-level report is relevant to each entity and Brcko District and it should be reviewed as an appendix to their individual reports.

4.2.1. STATE LEVEL REPORT

4.2.1.1. Market design assessment

4.2.1.1.1. Balancing market

The balancing market in BiH is regulated on state level and it is functional on a market-based model. The TSO in BiH is tasked with managing the balancing market in BiH, under the market principles of balancing in the power system of BiH and procurement of ancillary services, equal and non-discriminatory treatment of all market participants and transparency. Reserve capacity market is established for automatic and manual activation of frequency – aFRR (automatically activated secondary reserve) and mFRR (manually activated tertiary reserve). The procurement of mFRR and aFRR in BiH is conducted on a monthly basis through auctions. According to the Market Rules of TSO, the TSO acquires secondary and tertiary reserve capacity through a public procurement process, based on the principle of Pay as Bid. SERC sets price caps for both reserve capacities, based on SERC's Decision on Determination of Coefficients and Price Caps for Ancillary Services.

Imbalance prices are determined for each 15-minute interval according to the most expensive bid activated, for realized electricity deficit and surplus respectively.

For the calculation of the imbalance of a balance responsible party, the TSO applies the one single final position approach (single imbalance volume as a sum of its commercial trade schedules and internal commercial trade schedules). The price for imbalance settlement is calculated from prices of the activated balancing energy products (aFRR, mFRR, RR) with appropriately applied coefficient by DERK determined with a Decision on Determination of Coefficients and Price Caps for Ancillary Services. The applicable pricing method is type of dual pricing, defining one price for positive imbalances and one price for negative imbalances for each imbalance price area within an imbalance settlement period.

4.2.1.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
C – Balancing Market			

C1 – Establishment of the intraday market as a vital tool for market participants to balance their positions.	No	/	The establishment of intraday market is necessary in order for market participants to be able to balance their positions closer to real-time.
C2 – Revise the settlement mechanism for activated balancing energy	Yes	Market rules of TSO Procedure for auxiliary services	The current Pay as Bid clearing method is a past practise on the European electricity market and this principle provides weak incentives, as opposed to marginal pricing. Therefore, the Market Rules and the Procedure for auxiliary services should be amended to envisage the settlement of balancing energy for standard balancing products and specific balancing products to be based on marginal pricing (pay-as-cleared) in line with the EU Electricity Balancing Guideline (EB-GL) as adopted and adapted by Ministerial Council Decision 2022/03/MC-EnC. Additionally, the price limits introduced on balancing energy need to be reconsidered, as the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. prescribes that there shall be no technical price limits to balancing energy and imbalance prices.
C3- Imbalance price should reflect the real time value of energy	Yes	Market rules of TSO Procedure for auxiliary services	Balancing energy prices are the main component for determining imbalance prices. The TSO should ensure that imposed maximum and minimum price limits for balancing energy promote market efficiency, protecting consumers from excessively high prices while incentivizing BRPs to maintain balanced positions. These limits should also encourage participation by Balance Service Providers (BSPs) and maintain market liquidity. Also, the current imbalance price calculation involves a regulated component (price coefficient determined by DERK). The TSO should inspect whether such additional limitation is necessary for efficient functioning of the market. If technical limits are unnecessary for balancing market efficiency, amendments to the Market Rules and Procedure for auxiliary services should allow imbalances to be settled at a price reflecting the real-time value of energy, aligning with the Electricity Regulation and Ministerial Council Decision 2022/03/MC-EnC.

4.2.1.3. XB PPAs assessment

4.2.1.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. However, an important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs, as elaborated in the GOs sections for each entity (For FBiH in the point 5.2.2.1.4; for RS in the point 5.3.2.1.4 and, for Brčko District in the point for 5.4.2.1.4)2.

Regarding physical cross-border PPAs, renewable electricity producers in FBiH have the right to sell electricity to market participants on the wholesale electricity market abroad, provided that they hold license for cross border trade issued by DERK. However, limitations exist for consumers, as the FBiH Electricity Law does not stipulate the possibility for consumers to procure electricity neither in BiH nor from abroad directly from a renewable electricity producer. This possibility is only reserved for the electricity producers that have not obtained a licence as a supplier.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual, basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering into long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

4.2.1.3.2. Market coupling and market liquidity

BiH has not launched a wholesale electricity market through day-ahead or intra-day markets. The lack of state-level electricity regulation prevents market coupling, given that all entities in BiH have separate electricity regulation. This acts as a barrier of the regional market coupling and further market coupling with the EU.

4.2.1.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighboring markets based on explicit auctions.

- o For the Croatia and Montenegro borders, auctions are organized through SEECAO. On the NOS BiH - Croatian transmission system operator (HOPS) BORDER (Croatia) there are yearly, monthly, and daily auctions. On the NOS BiH - Montenegrin Electric Transmission System AD (CGES), BORDER (Montenegro) there are yearly, monthly, and daily auctions. There are intraday auctions organized between NOS BiH and HOPS and CGES as well, but regulated with bilateral rulebooks between these entities, since SEECAO does not cover intraday auctions.

- o For the Serbian market, the auctions are organized bilaterally. On the NOS BiH - EMS AD BEOGRAD BORDER (Serbia) there are yearly, monthly, daily, and intraday auctions. There are separate auction rules for each bidding border and each auction timeframe.

SEECOA has organized its work accordingly with the rules for allocating cross border capacities approved by the relevant regulators of the neighboring countries, including DERK, which rules include harmonized rules for granting long-term transfer rights pursuant to Article 51 of Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation as adapted by Ministerial Council Decision 2022/03/MC-EnC. However, there is no publicly available information whether these rules are incorporated in the Rulebooks for allocation of cross-border transmission capacities concluded between NOS BiH and EMS AD BEOGRAD.

The capacity allocation methodology applied by the TSO is regulated under separate rulebooks for the allocation of cross-border transmission capacities, approved by DERK at the request of the TSO.

BiH's bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

The TSO regulates the cross-border capacity in the interconnection lines, that is available to the participants of the electricity market (that have secured the right to use cross-border transmission capacity in accordance with a procedure for obtaining the right to use cross-border transmission capacity defined by a rulebook adopted by the TSO). However, there are not any targets set for the TSO on making available cross-zonal capacity.

4.2.1.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Enable consumers to directly purchase electricity from renewable energy producers located abroad.	Yes	FBiH-RS-Brcko District Electricity Laws	FbiH-RS-Brcko District Electricity Laws should be amended to enable all consumers, whether natural or legal persons to directly purchase electricity from a renewable electricity producer located on a territory of another CP or MS.
A2 – Granting forward transmission rights with longer durations	Yes	Rules for the allocation of cross-border transmission capacities	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights at a first place for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs.

However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU Regulation (EU) 2016/1719 establishing guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.

B – Market coupling and market liquidity

B1 Harmonisation with the EnC Electricity Integration Package	Yes	FBiH-RS-Brcko District Electricity Laws State Law on Transmission of Electric Power, Regulator and System Operator	The FBiH-RS-Brcko District Electricity Laws and the State Law on Transmission of Electric Power, Regulator and System Operator and Energy Regulation should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.

C – Cross-border capacity

C1 – The TSO to apply the harmonised allocation rules for Serbian border	Yes	Rules for the allocation of cross-border transmission capacities between NOS BiH -EMS AD BEOGRADE	If it has not been done so far, the Rules for the allocation of cross-border transmission capacities between NOS BiH-EMS AD BEOGRADE should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package.
C2 – Providing targets for the TSO for available cross-zonal capacity	Yes	State Law on Transmission of Electric Power, Regulator and System Operatorz	The TSO shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside BiH bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the State Law on Transmission of Electric Power, Regulator and System Operator of BiH H and the Rules for the allocation of cross-border transmission capacities to the provided minimum level of 70%

available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

4.2.2. FBiH REPORT (ENTITY LEVEL)

4.2.2.1. Market design assessment

4.2.2.1.1. Access of renewable PPAs

The regulatory environment for electricity market in FBiH does not recognize renewable corporate PPAs as a specific agreement. Current regulations do not provide framework that regulate the form, structure, or other aspects for implementation of renewable corporate PPAs, either physical or virtual. The FBiH Law on RES and EC only regulates a form of PPAs concluded between the Renewable Energy Operator and RES generators based on an auction (FIT and FIP auctions).

The renewable electricity producers can sell electricity only to the electricity market participants in BIH and abroad. There are no legal barriers preventing a renewable electricity producer from entering direct PPAs with electricity suppliers or traders. However, there is no possibility for final consumer or any other corporate consumers to enter PPAs with renewable electricity producers given that these consumers can purchase electricity solely from licensed suppliers. In this context, the electricity producer can only sell renewable electricity if they secure a license to be an electricity supplier,

The FBiH Electricity Law, regulates the concept of aggregation of distributed resources as a commercial function of joint management of production, storing and consumption of electric energy of larger number of users of the grid with the aim of selling electricity and recognizes the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from suppliers.

State-owned enterprises procure electricity through a regulated public procurement procedure. On state level, the State Law on Public Procurement regulates that the term of a public procurement contract cannot exceed one year, unless there are justifiable reasons related to the nature of the procurement that necessitate a longer term. However, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement plans, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

4.2.2.1.2. Trading rules

The licensing rules for FBiH are regulated with the FBiH Electricity Law.

The market participants eligible to contract PPAs (specifically the renewable electricity producers, distribution operators, retail suppliers, wholesale traders) are required to hold respective licenses for their activities. In FBiH the regulatory authority in charge of issuance of the licenses is FERK.

By way of exception, FBiH Electricity Law regulate that an electricity production license is not required for an electricity producer that operates power plants with an installed capacity of up to 1 MW. However, if the same producer operates multiple facilities with a combined installed power exceeding 1 MW, it is mandated to secure a permit for electricity production activities.

Also, FBiH Electricity Law regulate that in case of development of new power plant, the electricity producer is not obligated to obtain an electricity production license for a limited period of up to six months from the date the operating permit for the facility that is granted from the Ministry of Spatial Planning in FBiH.

In the case any market participant from FBiH anticipates selling or buying electricity abroad, they are required to hold license for foreign trade issued by SERC This license is valid for 5 years.

The licensing rules are straightforward with no administrative barriers. In FBiH the licenses are issued within 60 days as of application.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent, and approved by FERK.

The FBiH Law on RES and EC, provides that renewable energy producers have priority access to the grid. Despite the measure's existence, it has not been integrated into the operational rules of the electricity system in the BiH, and as a result, it is not implemented in actual practice.

4.2.2.1.3. Balancing rules

The renewable electricity producers, the retail suppliers and wholesale traders have balance responsibility, except for the prosumers for which the responsibility is assumed by the OP OIEiEK.

The balancing responsible market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice (usually a utility). Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA.

4.2.2.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

In BiH, the issuance of GOs is decentralized under the governance of nominated bodies in each entity.

OP OIEiEK is nominated body for issuance of GOs and maintenance of the GOs registry in FBiH. OP OIEiEK is not member of the Association of Issuing Bodies (AIB).

FBiH was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GOs. However, the direct agreement with the service provider responsible to set-up the register is not yet signed with FBiH. Therefore, the electronic registry for GOs, in line with the Energy Community acquis, is not yet in place in the FBiH.

The FBiH Law on RES and EC provides that renewable electricity producers (except the ones operating under support schemes) have the right to obtain GOs. FBiH Law on RES and EC indicates that the specific rules governing GOs issuance, transfer, and termination will be addressed in a secondary regulation, i.e. Decrees on GOs. However, such secondary regulation in FBiH is absent, creating a legal gap in the effective utilization of GOs. It should be noted that FBiH already regulates the GOs with Decree on GOs, but this Decree is adopted in line with the old Law on RES and EC from 2013 that was replaced with New Law on RES and EC adopted in august 2023.

Additionally, the FBiH Law on RES and EC governs the possibility of recognition of GOs issued by a third country based on the principle of reciprocity.

According to the Renewable Energy Directive, as applicable in the EU MSs, currently GOs to be issued in BiH will not be recognised for disclosure in the EU MSs until the conclusion of an agreement between BiH and the European Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in BiH, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.2.2.1.5. Support scheme

The support scheme is regulated with the FBiH Law on RES and EC, introducing distinctions between small and large facilities, with distinct support schemes.

The FBiH Law on RES and EC, stipulates support scheme in place consisting of:

(i) support in the form of a fixed premium (FiP) available for large power plants such as wind power plants with an installed capacity from 250KW, photovoltaic power plants with an installed capacity of from 150KW and biomass / biogas power plants with an installed capacity from 500KW. The renewable electricity producer awarded with a FiP sells the electricity on the wholesale market and the FiP applies on top of the wholesale market price the producer achieves on the market.

The renewable electricity producers eligible for FiP are selected through public and competitive auction performed once every two years based on Decree for quotas for large power plants for each primary source separately adopted by the Government of the FBiH, with the actual FiP amount²²⁸ also

²²⁸ The range is determined with the annual Decision adopted by the Government of the FBiH for determining the values of maximum guaranteed purchase prices, marginal fixed premiums, upper- and lower-income limits for incentives, upper and lower limit for purchase prices.

determined through a competitive auction. The FIP has a tenor of up to 12 years. OP OIEiEK initiates the FIP action in accordance with the Rulebook for auctions adopted by OP OIEiEK and the winners are chosen based on the lowest offered fixed premium. If the sum of the offered installed power from submitted bids that met the criteria from the public call for auctions is greater than the defined volume of auctions, the bids are ranked as follows:

- a) according to the amount of the fixed premium offered, from the smallest to the largest,
- b) for offers with the same offered fixed premium, according to the installed capacity of the plant from the smallest to the largest,
- c) for offers with the same offered fixed premium and the same installed power of the plant, according to the time of receiving the offer, where earlier received offers have priority.

(ii) feed-in tariffs (FiT) applied on a quota system – allocated through auction performed every year (available for small photovoltaic power plants with capacity of up to 150KW; wind power plants with capacity of up to 250KW and biomass/biogas power plants with capacity of up to 500KW, all with a tenor of up to 12 years) where the entire electricity produced by a renewable electricity plant is purchased by OP OIEiEK at a predefined price²²⁹ based on a Resolution on the distribution of technology quotas for the current year adopted by Operator for OIEiEK determined with the Decree on Quotas adopted by the Government of FBiH, which determines free technology quotas for the current year. OP OIEiEK initiates the FIT action in accordance with the Rulebook for auctions adopted by OP OIEiEK and, if the total installed power from all bids is less than the volume of technology quotas that are the subject of the FIT auction, all bidders are declared winners.

If the total installed power from all bids exceeds the volume of technology quotas that are the subject of the FIT auction, OP OIEiEK is obliged to carry out the FIT auction, in which case FiT auction winners are chosen based on:

1. Lowest to highest offered guaranteed price.
2. If the offered price is the same, then by the smallest to largest installed capacity of the plant.
3. If both the offered price and installed capacity are the same, then by the earliest received offer.

The price at the FIT auction cannot exceed the floor or the maximum predetermined price, regulated under a Decision by the Government of FBiH regulating the values of maximum guaranteed purchase prices, marginal fixed premiums, maximum and floor income limits for incentives, maximum and floor limits for purchase prices.

Based on performed research, none of the above-mentioned bylaws and decisions/quotas for FBiH are publicly available.

²²⁹ The range is determined with the annual Decision adopted by the Government of the FBiH for determining the values of maximum guaranteed purchase prices, marginal fixed premiums, upper- and lower-income limits for incentives, upper and lower limit for purchase prices.

Based on latest publicly available information, the FBiH Ministry of Energy, Mining and Industry has published the draft-Decree on Quotas revealing the plan to launch auctions for large wind and solar power projects with a total capacity of 240 MW and subsidize the operation of small photovoltaic, biomass and biogas facilities of a combined 61.2 MW for the period of 2025-2030.

4.2.2.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Incorporating of renewable PPAs in the regulatory framework	Yes	FBiH Law on RES and EC & FBiH Electricity Law	The FBiH Law on RES and EC & FBiH Electricity Law should be revised in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC to define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis. Additionally, the FBiH Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
A2 – Update of bylaws regulating the operation system of FBiH	Yes	DSO network rules; market rules	The bylaws regulating the operation system of FBiH must be updated to include priority access/dispatch for renewable energy producers.
D – Gos			
D1- Adoption of the secondary legislation	Yes	New Decree on GOs	Adopt necessary secondary legislation to regulate the process of issuance, trade and recognition of GOs in line with REDII and European standards.
D2- Removing the limits on supported RES project to receive Gos	Yes	FBiH Law on RES and EC	Renewable electricity producers that are under support scheme should be able to obtain GOs for their generated renewable electricity. The FBiH Government should consider the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding FiT/FiP for new projects.
D3- Enable the operation of the GOs registry	No	/	OP OIEIEK in FBiH to put into operation the electronic registry for GOs.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing a two-way contract for difference. Yes

FBiH Law on RES and EC

The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Renewable Energy Regulation in BiH should abandon the feed in tariffs.

Decree on support measures for production of electricity from renewable energy sources

New support scheme- 'two-way contract for difference' to be introduced. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the state). This approach is in line with the RED II.

4.2.2.3. RES Projects assessment

4.2.2.3.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In BiH the permitting process is regulated on federal, entity and lower levels (cantons, cities, municipalities).

State-level institutions have the authority to issue only two types of 'permits':

1. Concessions for projects that are either inter-entity or international transboundary. In these cases, the relevant ministry and the state-level Concession Commission are in charge.
2. Permits for larger projects that need to connect to the transmission grid. These are granted by Elektroprenos BiH, the state-level transmission operator.

Any other permits are granted either at the entity level or by Brcko District and at lower levels (cantons, cities, municipalities).

In FBiH, the responsibility is split between entity-level and canton-level bodies, depending on the size of the facility.

The FBiH Electricity Law introduces simplified procedures for the development and operation of RES generators, especially for solar and wind power plants. RES generators with installed capacity below 1 MW are released from the obligation to obtain an energy permit²³⁰ and energy generation permit. On the other hand, the construction of small-scale hydroelectric power plants with an installed capacity lower than 10 MW (except for hydroelectric power plants on gravity water pipes) is prohibited.

Solar and wind power plants with a capacity of up to 23 KW can benefit from certified installers who should serve as a single contact point for investors in the construction process, enabling investors to avoid communication with many competent bodies.

The procedure for development and permitting of renewable electricity plants with an installed capacity above 23KW is complex and lengthy as there are multiple authorities involved, there is no one-stop shop approach and there are no predefined zoning areas for renewable electricity plants.

There is no systematic approach for acceleration of renewable energy projects by way of simplified permitting processes tailored to specific renewable technologies.

Namely, in FBiH to build and use an electricity generation facility, three basic permits are needed and those are spatial consent or location information²³¹, building consent and operating consent. In order to obtain these basic permits, one should obtain all other relevant permits and approvals in the process (such as (on a case basis) - preliminary water consent, environmental impact assessment (EIA), concession, consent for connection to the distribution grid, water consent, project documentation consent, energy permit, water permit, energy generation permit). These permits are interdependent; you cannot acquire them simultaneously. Often, the issuance of one permit is contingent upon the possession of another. Also, the process to get each permit involves several steps, including getting approvals and consents from various government authorities.

With regards to the EIA, it should be noted that while all hydro power plants are subject to EIA, every power plant with capacity of above 10MW and the installations using wind power to generate electricity from more than 4 wind turbines are subject of determination if the project should be made subject to EIA.

In FBiH there is specific issue for the investor to obtain concession for use of renewable energy sources, since the authority to grant concessions for renewable energy is divided between the federal and cantonal levels, and the regulations are not consistent across all cantons. As per the FBiH Law on Concessions, the Federal Government has the responsibility to grant concessions for hydropower plants that have a capacity of 5 MW or more, based on a conclusion of a concession agreement with a fixed duration that should not surpass 30 years (in extraordinary situations that necessitate a more

²³⁰ Energy permit is issued by the Ministry of energy, mining and industry in FBiH by means of which the investor will obtain the right to construct or reconstruct a RES-Electricity facility.

²³¹ Any electricity generation facility should be incorporated in the spatial plans at the federal, cantonal, and local levels. For larger infrastructures like hydropower plants exceeding 30 MW, a separate spatial plan for a particularly significant area is necessary as well. The investor can either acquire location information issued based on the existing spatial planning documentation, which is much quicker and easier to obtain than the spatial consent, OR a spatial consent which is required in cases where detailed spatial plans are not available.

extended investment period, the duration can be lengthened up to 50 years), with the possibility to be renewed for a period not exceeding half of the original term.

On the other hand, cantons have the authority to grant concessions for plants with less capacity. For wind and solar plants of all capacities, the cantons can issue concessions. However, several cantons have not yet established clear legislation regarding this matter. In certain cantons, land allocated for construction may require a concession, in which case, all types of power generation projects could be subject to these concessions.

On a separate note, it should be stressed out that the FBiH faces substantial challenges in updating and synchronizing its spatial planning documentation to support the development of renewable energy projects. The outdated nature of the current plans, combined with strict land conversion regulations, creates a significant barrier to investment in RES. To facilitate the growth of renewable energy infrastructure, it is crucial to revise spatial plans to include RES projects and streamline the land conversion process. This will help reduce the risks for investors and promote the utilization of renewable energy sources in the FBiH.

4.2.2.4. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	FBiH Law on RES and EC	Adoption of amendments in FBiH Law on RES and EC to streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 – Preparation and adoption of the annual Indicative plan	Yes	FBiH Law on RES and EC	FBiH Law on RES and EC should be revised to include obligation for the Government of each entity adopt the annual indicative plan to identify areas suitable for development of renewable electricity plants. and, such annual indicative plan should be adopted. Such a plan, might help the investors of renewable electricity plants to choose adequate location for development of the projects and to save time for zoning procedures and uncertainties for grid connection.

A3 – Update of spatial plans with areas of renewable energy source potential	Spatial plans of FBiH;	The spatial plans of FBiH should be updated to include the creation of designated zones for renewable energy investments within the overall urban and spatial planning framework.
A4 - Streamline the process for renewable energy power plants, making it easier to establish them on agricultural land	Law on Agricultural Land of FBiH	Law on Agricultural Land of FBiH should be amended to classify power plants using renewable energy as equivalent to auxiliary agricultural facilities, which would permit their construction on agricultural or should be revised to a unique legal treatment and status for power plants, allowing them to be built on agricultural land without the need for reclassification as construction land
A5 – Harmonisation of the rules on concessions for wind and solar farms in FBiH	Yes FBiH Law on concessions & Law on concessions concerned cantons	Implement changes to the Concession Laws in all cantons in FBiH that have not yet done so. This will standardize the concession regulations for wind and solar power plants. Any exemption to granting concession should not be extended to small hydropower plants due to their significant environmental hazards. No concessions should be granted for these plants, mirroring the prohibition on issuing energy permits for hydropower plants lower than 10 MW - at the FBiH level.

4.2.2.5. Other applicable areas assessment

4.2.2.5.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any additional regulatory requirements (ex. authorisation requirements for financial instrument; reporting requirements etc.) given the lack of specific regulation and practice. However, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.2.2.5.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.2.2.5.3. Competition

The protection of market competition is regulated on state level in BiH. The State Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.2.2.6. Other applicable areas assessment

No recommendations in this section.

4.2.3. RS REPORT (ENTITY LEVEL)

4.2.3.1. Market design assessment

4.2.3.1.1. Access of renewable PPAs

The regulatory environment for the electricity market in RS does not recognize renewable corporate PPAs as a specific agreement. Current regulations do not provide framework that regulate the form, structure, or other aspects for implementation of renewable corporate PPAs, either physical or virtual. The RS Law on RES and EC only regulates a form of PPAs concluded between the Renewable Energy Operator and RES generators based on an auction (FIT and FIP auctions).

The renewable electricity producers can sell electricity only to the electricity market participants in BiH and abroad. There are no legal barriers preventing a renewable electricity producer from entering direct PPAs with electricity suppliers or traders. However, there is no possibility for final consumer or any other corporate consumers to enter PPAs with renewable electricity producers given that these consumers can purchase electricity solely from licensed suppliers. In this context, the electricity producer can only sell renewable electricity if they secure a license to be an electricity supplier.

The RS Electricity Law, does not regulate the concept of aggregation of distributed resources as a commercial function of joint management of production, storing and consumption of electric energy of larger number of users of the grid with the aim of selling electricity, while it recognizes the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from suppliers.

State-owned enterprises procure electricity through a regulated public procurement procedure. On state level, the State Law on Public Procurement regulates that the term of a public procurement contract cannot exceed one year, unless there are justifiable reasons related to the nature of the procurement that necessitate a longer term. However, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement plans, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

4.2.3.1.2. Trading rules

The licensing rules for RS are regulated with the RS Electricity Law.

The market participants eligible to contract PPAs (specifically the renewable electricity producers, distribution operators, retail suppliers, wholesale traders), are required to hold respective licenses for their activities. In RS the regulatory authority in charge of issuance of the licenses is RERS.

By way of exception, RS Electricity Law, regulates that an electricity production license is not required for an electricity producer that operates power plants with an installed capacity of up to 1 MW. However, if the same producer operates multiple facilities with a combined installed power exceeding 1 MW, it is mandated to secure a permit for electricity production activities.

Also, RS Electricity Law regulates that in case of development of new power plant, the electricity producer is not obligated to obtain an electricity production license for a limited period of up to six months from the date the operating permit for the facility that is granted from the Ministry of Spatial Planning in FBiH/RS.

In the case any market participant from RS anticipates selling or buying electricity abroad, they are required to hold license for foreign trade issued by SERC. This license is valid for 5 years.

The licensing rules are straightforward with no administrative barriers. In RS the licenses are issued within 60 days as of application.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent, and approved by the RERS.

Renewable energy producers have priority access to the grid. Despite the measure's existence, it has not been integrated into the operational rules of the electricity system in the BiH, and as a result, it is not implemented in actual practice.

4.2.3.1.3. Balancing rules

The renewable electricity producers, the retail suppliers and wholesale traders have balance responsibility. There is an exception to this rule, the balance responsibility of the preferential renewable electricity producers granted with FIT is assumed by the Incentive operator, legal entity with public authorizations in RS²³².

The balancing responsible market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice (usually a utility). Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA.

²³² In accordance with article 17 from Law on RES and EC in RS - Electricity producers with one or more small plants having a total installed power of less than or equal to 150 kW are exempt from reporting daily work schedules to the Incentive Operator and do not bear balancing costs. However, those with a total installed power greater than 150 kW are required to report their daily work schedules and bear the balancing costs.

4.2.3.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

In BiH, the issuance of GOs is decentralized under the governance of nominated bodies in each entity.

RERS is nominated body for issuance of GOs and maintenance of the GOs registry in RS. RERS is not member of the Association of Issuing Bodies (AIB).

RS was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GOs and a direct agreement with the service provider responsible to set-up the register is signed with RS as well.

The RS Law on RES provides that renewable electricity producers (except the ones operating under support schemes) have the right to obtain GOs. RS RES Law indicates that the specific rules governing GOs issuance, transfer, and termination will be addressed in a secondary regulation, i.e. Decrees on GOs.

Additionally, the RS Law on RES governs the possibility of recognition of GOs issued by a third country based on the principle of reciprocity.

According to the Renewable Energy Directive, GOs to be issued in BiH will not be recognized for disclosure in the EU MSs until the conclusion of an agreement between BiH and the Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in BiH, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.2.3.1.5. Support scheme

The support scheme is regulated with the RS Law on RES, introducing distinctions between small and large facilities, with distinct support schemes.

The RS RES Law stipulates that small scale renewable projects will benefit in the grid connection process. In that direction, the DSO is obliged to provide, at its own expense, a detailed analysis of the possibilities and conditions for connection, along with an assessment of the connection costs and the timeframe for implementing the proposed connection method. However, precise rules on the said type of benefits should be additionally defined with the adoption of a bylaw. The RS Law on RES, regulates support schemes in the form of FiT for small power plants and in the form of FiP for small and large power plants, provided that quantities of electricity, i.e. installed the capacities of production facilities do not exceed the technological quotas for a specific

year determined by the Program for the use of the renewable energy adopted by the Government of RS, the power plant is certified for a production facility and, the equipment installed in the power plant was not previously used.

(i) The support for small power plants (available for hydropower plants, wind power plants, and solar power plants on the ground with an installed capacity of up to 150 kW; solar power plants on buildings, biomass and biogas power plants, landfill gas and gas from the municipal waste water treatment plant with an installed power greater than up to 500 kW, all with tenor of up to 15 years) is regulated as follows:

1. Support in the form of FiT where the entirety or a portion of the electricity of the small power plant can be purchased by Incentive System Operator (legal entity formed by the Government of RS) at a predefined guaranteed purchase price, based on resolution from RERS. RERS sets the guaranteed purchase price, following a methodology outlined in the Rulebook promoting renewable energy electricity production adopted by the Government of RS. The guaranteed purchase price remains the same throughout the incentive period.

2. Support in the form of FiP with a premium calculated as difference between reference market price and the predefined guaranteed purchase price regulated with RERS resolution. Hence, the premium is variable amount dependent from the reference market price. The reference market price is determined by RERS, no later than the 10th of the month for the previous quarter, as the average realized wholesale price in the previous quarter in BiH and/or on two energy exchanges in neighbouring countries (Reference Market Price). If the Reference Market Price is higher than the guaranteed one purchase price of electricity that was valid at the time of concluding the first incentive contract, the premium is zero.

(ii) The support in the form of FiP for large power plants (available for wind power plants and solar power plants on the ground with an installed capacity of above 150 kW up to 50.000 KW, solar power plants on buildings, biomass and biogas power plants, with an installed power greater than up to 500 kW, all with tenor of up to 15 years) with market premium after auctions either open or location-based performed every two years based on Decision for auction adopted by the Government of RS. The market premium is paid by the Incentive System Operator, based on the resolution for most favourable bidder from the Government of RS and concluded agreement with the bidder. The market premium is variable amount calculated as difference between the bidder's sale price of electricity from the auction procedure and the Reference Market Price. The maximum selling price and Reference Market price is determined by RERS. If the reference market price is higher than the bidder's sale price of electricity from the auction procedure, the premium is zero.

The Government of RS has adopted Program for the use of the renewable energy in January 2024, determining the maximum installed capacities and planned production of electricity up to 2030 segregated by each type of technology that will be supported by RS as follows:

For small power plants:

	MW	GWh
Small hydro power plants	4,30	18,06

Small wind power plants	1,80	4,57
Small solar power plants	225	308,25
Small biomass, biogas and landfill gas power plants	4,25	28,90
TOTAL	233,75	353,06

For large power plants:

	2024.		2026.		2028.	
	MW	GWh	MW	GWh	MW	GWh
Wind power plants	20	50,80	40	101,60	60	152,40
Solar power plants	20	27,40	40	54,80	60	82,20
Biomass, biogas, and landfill gas power plants	2	13,60	4	27,2	8	54,40
TOTAL	42	91,80	84	183,6	128	289

4.2.3.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Incorporating of renewable PPAs in the regulatory framework	Yes	RS Law on RES & RS Electricity Law	The RS Law on RES and RS Electricity Laws should be revised in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis. RS Electricity Law should also regulate the status of independent aggregators which will enable renewable electricity producers to be aggregated for the purpose of selling electricity without any restriction. Additionally, RS Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
A2 – Update of bylaws regulating the operation system of RS	Yes	DSO network rules; market rules	The bylaws regulating the operation system of RS must be updated to include priority access/dispatch for renewable energy producers.
C – Balancing rules			
C1 – Expanding the balance responsibility to all market participants	Yes	RS Law on RES	The balance responsibility shall be applicable to all market participants, with derogations permitted in specific circumstances as determined with the Electricity Regulation. Therefore, the renewable electricity producers granted with FIT in RS which balance responsibility is currently backed up by RERS, shall be balance responsible on a market base as any other market participant.
D – Gos			
D1- Removing the limits on supported	Yes	RS Law on RES	Renewable electricity producers that under support scheme should be able to obtain GOs for their generated renewable electricity. The Government in each entity should consider

RES project to receive Gos

the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding FIT/FiP for new projects.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing a two-way contract for difference. **Yes**

RS Law on RES

Decree on support measures for production of electricity from renewable energy sources

The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Renewable Energy Regulation in BiH should abandon the feed in tariffs.

New support scheme- 'two-way contract for difference' to be introduced. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the state). This approach is in line with the RED II.

4.2.3.3. RES Projects assessment

4.2.3.3.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In BiH the permitting process is regulated on state, entity and at lower levels (cantons, cities, municipalities).

State-level institutions have the authority to issue only two types of 'permits':

1. Concessions for projects that are either inter-entity or international transboundary. In these cases, the relevant ministry and the state-level Concession Commission are in charge.
2. Permits for larger projects that need to connect to the transmission grid. These are granted by Elektroprenos BiH, the state-level transmission operator.

Any other permits are granted either at the entity level or by Brcko District and at lower levels (cantons, cities, municipalities).

Safe from the exception for RES producer with small scale power plants of up to 1 MW not to obtain energy generation permit, the RS Electricity Law does not provide simplified procedures for development of RES projects.

The RS RES Law stipulates that small scale renewable projects will benefit in the grid connection process. In that direction, the DSO is obliged to provide, at its own expense, a detailed analysis of the possibilities and conditions for connection, along with an assessment of the connection costs and the timeframe for implementing the proposed connection method. However, precise rules on the said type of benefits should be additionally defined with the adoption of a bylaw.

Also, the RS RES Law regulates that a concession permit is not required for power plants using bio-mass, bio-gas, landfill gas and gas from municipal waste water treatment plants, power plants using landfill gas and gas obtained from municipal wastewater, solar plants with photovoltaic cells with an installed power of up to 250 kW on the ground and, on buildings - regardless of the installed power.

Given the above, the procedure for development and permitting of renewable electricity plants is as well complex and lengthy as there are multiple authorities involved, there is no one-stop shop approach and there are no predefined zoning areas for renewable electricity plants (the current spatial planning documents do not explicitly designate whether specific areas are set aside for renewable energy projects and where these projects can be developed).

Like FBiH, to build an electricity generation facility, three basic permits are needed and those are location conditions, building permit and operating permit. These basic permits assume all other relevant permits and approvals in the process. These permits are interconnected, meaning you can't get them all at once; getting one often depends on having another. These permits are interdependent; you cannot acquire them simultaneously. Often, the issuance of one permit is contingent upon the possession of another. Also, the process to get each permit involves several steps, including getting approvals and consents from various government authorities.

With regards to the EIA, it should be noted that in RS, all hydro power plants with a capacity of more than 5 MW undergo a mandatory EIA. All other all hydro power plants are subject to case-by-case assessment.

On a separate note, and similar as in FBiH, it should be stressed out that the RS as well faces substantial challenges in updating and synchronizing its spatial planning documentation to support the development of renewable energy projects. Despite RS having adopted its Spatial Plan in 2021, it is necessary to update it to account for areas with potential for RES. Moreover, it's crucial to ensure that the spatial plans of RS municipalities are in harmony with the overarching Spatial Plan of RS. Also, the Law on agricultural in RS imposes stringent rules on land characterization and its transformation into construction land.

And the Law on forest of RS, which is under constitutional review, needs amendments to streamline permit processes.

Regulations should be adapted to specify conditions under which power plants can be constructed on agricultural and forest lands, thereby facilitating the expansion of renewable energy infrastructure.

4.2.3.4. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	RS Law on RES	Adoption of amendments in RS Law on RES to streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 – Preparation and adoption of the annual Indicative plan	Yes	RS Law on RES	RS Law on RES should be revised to include obligation for the Government of each entity adopt the annual indicative plan to identify areas suitable for development of renewable electricity plants. and, such annual indicative plan should be adopted. Such a plan, might help the investors of renewable electricity plants to choose adequate location for development of the projects and to save time for zoning procedures and uncertainties for grid connection.
A3 – Update of spatial plans with areas of renewable energy source potential	Yes	Spatial plans of RS;	The spatial plans of RS should be updated to include the creation of designated zones for renewable energy investments within the overall urban and spatial planning framework.
A4 - Streamline the process for renewable energy power plants, making it easier to		Law Agricultural La of RS; Law	Law on Agricultural Land of RS should be amended to classify power plants using renewable energy as equivalent to auxiliary agricultural facilities, which would permit their

establish them on agricultural land and forest land	Forest Land RS.	construction on agricultural or should be revised to a unique legal treatment and status for power plants, allowing them to be built on agricultural land without the need for reclassification as construction land. Also, the Law on Forest Land of RS should be updated to introduce simplified and faster procedure for obtaining relevant approvals when construction is done on forest land.

4.2.3.5. Other applicable areas assessment

4.2.3.5.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any additional regulatory requirements (ex. authorization requirements for financial instrument; reporting requirements etc.) given the lack of specific regulation and practice. However, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.2.3.5.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.2.3.5.3. Competition

The protection of market competition is regulated on state level in BiH. The State Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.2.3.6. Other applicable areas recommendations

No recommendations in this section.

4.2.4. BRCKO DISTRICT REPORT (SEPARATE ADMINISTRATIVE UNIT)

4.2.4.1. Market design assessment

4.2.4.1.1. Access of renewable PPAs

The regulatory environment for electricity market in Brcko District does not recognize renewable corporate PPAs as a specific agreement. Current regulations do not provide framework that regulate the form, structure, or other aspects for implementation of renewable corporate PPAs, either physical or virtual. The Brcko District Law on RES and EC only regulates a form of PPAs concluded between the Renewable Energy Operator and RES generators based on an auction (FIT and FIP auctions).

The renewable electricity producers can sell electricity only to the electricity market participants in BIH and abroad. There are no legal barriers preventing a renewable electricity producer from entering direct PPAs with electricity suppliers or traders. However, there is no possibility for final consumer or any other corporate consumers to enter PPAs with renewable electricity producers given that these consumers can purchase electricity solely from licensed suppliers. In this context, the electricity producer can only sell renewable electricity if they secure a license to be an electricity supplier.

The Brcko District Electricity Law, only defines but it does not regulate the concept of aggregation of distributed resources as a commercial function of joint management of production, storing and consumption of electric energy of larger number of users of the grid with the aim of selling electricity, while it recognizes the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from suppliers.

State-owned enterprises procure electricity through a regulated public procurement procedure. On state level, the State Law on Public Procurement regulates that the term of a public procurement contract cannot exceed one year, unless there are justifiable reasons related to the nature of the procurement that necessitate a longer term. However, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement plans, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

4.2.4.1.2. Trading rules

The licensing rules for Brcko District are regulated with the State Law on Transmission of Electric Power, Regulator and System Operator.

The market participants eligible to contract PPAs (specifically the renewable electricity producers, distribution operators, retail suppliers, wholesale traders), are required to hold respective licenses for their activities. In Brcko District the regulatory authority in charge for issuance of the licenses is SERC.

As form of exception Brcko District Electricity Law, regulates that an electricity production license is not required for an electricity producer that operates power plants with an installed capacity of up to 1 MW. However, if the same producer operates multiple facilities with a combined installed power exceeding 1 MW, it is mandated to secure a permit for electricity production activities.

Also, Brcko District Electricity Law regulates that in case of development of new power plant, the electricity producer is not obligated to obtain an electricity production license for a limited period of up to three months from the date the operating permit for the facility that is granted.

In the case any market participant from Brcko District anticipates selling or buying electricity abroad, they are required to hold license for foreign trade issued by SERC. This license is valid for 5 years.

The licensing rules are straightforward with no administrative barriers. In Brcko District the deadline for issuing licenses is not determined but only is regulated that it is dependent on the complexity of the request for license, while SERC as Regulatory Authority is obliged to apply the principle of efficiency.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent, and approved by the SERC.

Renewable energy producers have priority access to the grid. Despite the measure's existence, it has not been integrated into the operational rules of the electricity system in the BiH, and as a result, it is not implemented in actual practice

4.2.4.1.3. Balancing rules

The renewable electricity producers, the retail suppliers and wholesale traders have balance responsibility. As an exception to this rule in Brcko District, the balance responsibility of the renewable electricity producers granted with FIT is assumed by Incentive System Department that is part of the Communal Affairs Sector of Brcko District in the Sub-sector for development and strategy of communal services²³³.

The balancing responsible market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice (usually a utility). Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA.

4.2.4.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

In BiH, the issuance of GOs is decentralised under the governance of nominated bodies in each entity. Communal Affairs Sector of Brcko District is the nominated body for issuance of GOs and maintenance of GOs registry for renewable electricity producers that are licensed in this area. The nominated body is not member of the Association of Issuing Bodies (AIB).

²³³ In accordance with article 16 from Law on RES and EC in Brcko District - Electricity producers with one or more small plants having a total installed power of less than or equal to 150 kW are exempt from reporting daily work schedules to the Incentive System Department and do not bear balancing costs. However, those with a total installed power greater than 150 kW are required to report their daily work schedules and bear the balancing costs.

The Brcko District Law on RES and EC regulates that renewable electricity producers (except the ones operating under support schemes) have the right to obtain GOs. The Brcko District Law on RES and EC indicates that the specific rules governing GOs issuance, transfer, and termination will be addressed in a secondary regulation, i.e. Decrees on GOs. However, such secondary regulation in Brcko District is absent, creating a legal gap in the effective utilization of GOs.

Additionally, the Brcko District Law on RES and EC governs the possibility of recognition of GOs issued by a third country based on the principle of reciprocity.

According to the Renewable Energy Directive, GOs to be issued in BiH will not be recognized for disclosure in the EU MSs until the conclusion of an agreement between BiH and the Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in BiH, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.2.4.1.5. Support scheme

The support scheme is regulated with Brcko District Law on RES and EC, introducing distinctions between small and large facilities, with distinct support schemes.

The Brcko District Law on RES and EC, regulates support schemes in the form of FiT for small power plants and in the form of FiP for small and large power plants, safe that quantities of electricity, i.e. installed the capacities of production facilities do not exceed the technological quotas for a specific year determined by the Program for the use of the renewable energy adopted by the Government of Brcko District, the power plant is certified for a production facility and, the equipment is installed in the power plant, was not previously used.

(i) The support for small power plants (available for hydropower plants, wind power plants, and solar power plants on the ground with an installed capacity of up to 150 kW; solar power plants on buildings, biomass and biogas power plants, landfill gas and gas from the municipal waste water treatment plant with an installed power greater than up to 500 kW, all with tenor of up to 10 years) is regulated as follows:

1. Support in the form of FiT where the entire or portion of the electricity of the small power plant can be purchased by Incentive System Department (as an integral part of the Department for Communal Affairs, Sub-department for development and utility services strategy) at a predefined guaranteed purchase price, based on resolution from Incentive System Department. The Government of Brcko District sets the guaranteed purchase price, following a methodology outlined in the Rulebook promoting renewable energy electricity production adopted by the Government of Brcko District. The guaranteed purchase price remains the same throughout the incentive period.

2. Support in the form of FiP with a premium (calculated as difference between reference market price and the guaranteed purchase price) based on resolution from Incentive System Department. Hence, the premium is variable amount dependent from the reference market price. The reference market price is determined by Department for Communal Affairs of Brcko District, no later than the 10th of the month for the previous quarter, as the average realized wholesale price in the previous quarter in BiH and/or on two stockenergy exchanges in neighboring countries (Reference Market Price).

(ii) The support in the form of FiP for larger power plants (available for hydropower plants with an installed capacity of above 150kW up to 10.000 kW wind power plants and solar power plants on the ground with an installed capacity of above 150 kW, solar power plants on buildings, biomass and biogas power plants, with an installed power greater than up to 500 kW, all with tenor of up to 10 years) with market premium after auctions either open or location-based (action is initiated with decision from the Government of Brcko District), paid by the Incentive System Department, based on the resolution for most favourable bidder (chosen based on lowest offered sales price of electric energy for the specific type of technology) adopted by the chief of the authorized sub-department in the Incentive System Department. The market premium is a variable amount calculated as difference between the selling price of the bidder's electricity from the auction procedure and the Reference Market Price.

Based on performed research, none of the above-mentioned Program, bylaws and or decisions for Brcko District are publicly available.

The presence of a strong support scheme for renewable electricity occasionally discourages the contracting of PPAs. Namely, the developers usually prioritize these options over entering PPAs with private entities.

4.2.4.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			

A1 – Incorporating of renewable PPAs in the regulatory framework

Yes

Brcko District Law on RES and EC & Brcko District Electricity Law

The Brcko District Law on RES and EC & Electricity Law should be revised in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.

Brcko District Electricity Law should also regulate the status of independent aggregators which will enable renewable electricity producers to be aggregated for the purpose of selling electricity without any restriction.

Additionally, each government at entity level can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.

A2 – Update of bylaws regulating the operation system of Brcko District

Yes

By laws of Brcko District regulating the operation system in Brcko District (DSO rules; market rules:)

The bylaws regulating the operation system of Brcko District must be updated to include priority access/dispatch for renewable energy producers.

C – Balancing rules

C1 – Expanding the balance responsibility to all market participants

Yes

Brcko District Laws on RES and EC

The balance responsibility shall be applicable to all market participants, with derogations permitted in specific circumstances as determined with the Electricity Regulation. Therefore, the renewable electricity producers granted with FIT in Brcko District which balance responsibility is currently backed up by Incentive System Department in Brcko District, shall be balance responsible on a market base as any other market participant.

D – Gos

D1- Adoption of the secondary legislation	Yes	New Decree on GOs in Brcko District	Adopt necessary secondary legislation to regulate the process of issuance, trade and recognition of GOs in line with REDII and European standards.
D2- Removing the limits on supported RES project to receive Gos	Yes	Brcko District Law on RES and EC	Renewable electricity producers that under support scheme should be able to obtain GOs for their generated renewable electricity. The Government in each entity should consider the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding FiT/FiP for new projects.
D3- Enable the operation of the GOs registry	No	/	Department for communal affairs in Brcko District to put into operation the electronic registry for GOs.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing a two-way contract for difference.		istrict Law on RES and EC on support measures for n of electricity from e energy sources	The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Renewable Energy Regulation in BiH should abandon the feed in tariffs. New support scheme- 'two-way contract for difference' to be introduced. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the state). This approach is in line with the RED II.

4.2.4.3. RES Projects assessment

4.2.4.3.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In BiH the permitting process is regulated on state and entity level.

State-level institutions have the authority to issue only two types of 'permits':

3. Concessions for projects that are either inter-entity or international transboundary. In these cases, the relevant ministry and the state-level Concession Commission are in charge.
4. Permits for larger projects that need to connect to the transmission grid. These are granted by Elektroprenos BiH, the state-level transmission operator.

Any other permits are granted either at the entity level or by Brcko District.

Safe from the exception for RES producer with small scale power plants of up to 1 MW not to obtain energy generation permit, the Brcko District Electricity Law does not provide simplified procedures for the development of RES projects.

The simplifications that are introduced in the Brcko District Law on RES and EC, are: excluding RES projects with an installed capacity up to 250 KW from concession permit and, the DSO must facilitate small-scale renewable projects by providing a detailed, cost-free analysis of connection possibilities, costs, and implementation timeframe.

4.2.4.4. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Brcko District Law on RES and EC	Adoption of amendments in Brcko District Law on RES and EC to streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 – Preparation and adoption of the annual Indicative plan	Yes	Brcko District Law on RES and EC	Brcko District Law on RES and EC should be revised to include obligation for adoption of annual indicative plan to identify areas suitable for development of renewable electricity plants and, such annual indicative plan should be adopted. Such a plan might help the investors of renewable electricity plants to choose adequate location for development of the projects and to save time for zoning procedures and uncertainties for grid connection.

4.2.4.5. Other applicable areas assessment

4.2.4.5.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any additional regulatory requirements (ex. authorisation requirements for financial instrument; reporting requirements etc.) given the lack of specific regulation and practice. However, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.2.4.5.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.2.4.5.3. Competition

The protection of market competition is regulated on state level in BiH. The State Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.2.4.6. Other applicable areas recommendations

No recommendations in this section.

4.2.5. Sources

Abbreviation	Sources
State level	
State Law on Transmission of Electric Power, Regulator and System Operator;	Law on Transmission of Electric Power, Regulator and System Operator of BiH (Official Gazette of BiH no. 7/02, 13/03, 76/09 and 01/11)
State Law on establishing the Company for the Transmission of Electric Power;	Law on establishing the Company for the Transmission of Electric Power in BiH (Official Gazette of BiH no. 35/04, 76/09, 20/14)
State Law on establishing an Independent System Operator for the Transmission System of BiH;	Law on establishing an Independent System Operator for the Transmission System of BiH (Official Gazette of BiH no. 35/04)
Licensing rules of TSO;	Licensing rules of DERK (Official Gazette of BiH no. 87/12, 98/15 and 63/16)
Grid Code of TSO;	Grid Code of DSO (Official Gazette of BiH no. 78/21)
Market rules of TSO;	Market Rules of NOS BiH (Official gazette of BiH no. 64/21)
Rules on the operation of the daily balance energy market;	Rules on the operation of the daily balance energy market of NOS BiH from August 2019 -published on the website of NOS BiH
Decision on determination of coefficients and price caps for ancillary services;	Decision on determination of coefficients and price caps for ancillary services (Official Gazette of BiH, 76/21, 83/22),
Procedure for auxiliary services;	Procedure for auxiliary services of NOS BiH from November 2021

	-published on the website of NOS BiH
State Law on Competition;	Law on Competition of BiH (Official Gazette of BiH no. 48/05, 76/07 and 80/09)
State Law on Public Procurements;	Law on public procurements of BiH (Official Gazette of BiH no. 39/2014 and 59/2022)
Rules for the allocation of cross-border transmission capacities	Rules for annual, monthly and daily auctions for allocation of cross-border transmission capacity at the borders between Crnogorskog elektroprenosnog sistema AD (CGES) and NOS BiH and, between Hrvatski operator transmission system (HOPS) and NOS BiH, Rules for annual and monthly auctions for allocation of cross-border transmission capacity at the borders between EMS AD Beograd (EMS) and NOS BiH, approved by DERK on November 29, 2023 Rules for daily auctions for allocation of cross-border capacity between EMS AD Beograd (EMS) and NOS BiH, approved by DERK on November 17, 2021. Rules for intraday allocation of cross-border transmission capacity between NOS BiH and CGES, approved by DERK on November 17, 2021. Rules for intraday allocation of cross-border transmission capacity between NOS BiH and EMS AD Beograd (EMS), approved by DERK on November 17, 2021. Rules for intraday allocation of cross-border transmission capacity between HOPS i NOS BiH, , approved by DERK on November 17, 2021. (all of them - published on the website of NOS BiH)

FBiH (entity level)

FBiH Law on Electricity	Law on Renewable Energy Sources and Efficient Cogeneration (Official Gazette of FBiH no. 60/2023)
FBiH Law on RES and EC	Law on Renewable Energy Sources and Efficient Cogeneration (Official Gazette of FBiH no. 82/2023)
FBiH Law on Concessions	Law on Concessions (Official Gazette of the Federation of BiH, 40/02 and 61/06)
FBiH Law on Spatial Planning	Law on Spatial Planning and Land Use of FBiH (Official Gazette of FBiH, no. 2/06, 72/07, 32/08, 4/10, 13/10, 45/10, 85/21 and 92/21).
FBiH Rulebook for issuance of permits	Rulebook for issuance of permits adopted by FERK, April 2024
Distribution Grid Code for Elektroprivreda Bosne i Hercegovine D.D. Sarajevo	Distribution Grid Code for Elektroprivreda Bosne i Hercegovine D.D. Sarajevo from April, 2018
Distribution Grid Code for Elektroprivreda Hrvatske zajednice Herceg Bosne“ dioničko društvo Mostar	Distribution Grid Code for Elektroprivreda Hrvatske zajednice Herceg Bosne“ dioničko društvo Mostar from July 2017, amended on November 2022
FBiH General Conditions for Electricity Supply	General Conditions for Electricity Supply adopted by FERK (Official Gazette of FBiH, no. 89/14, 7/18, 84/19, 101/22)

RS (entity level)

RS Law on RES	Law on Renewable Energy Sources (Official Gazette of Republika Srpska no. 16/2022)
RS Law on Electricity	Law on Electricity (Official Gazette of Republika Srpska no. 68/2020)
RS Law on Public Procurements	Law on Public Procurements (Official Gazette of Republika Srpska no. 91/2019 and 92/2023)
RS Program on the use of renewable energy sources	Program on the use of renewable energy sources of the Government of Republika Srpska (Official Gazette of Republika Srpska no. 16/2024)
RS Rulebook for issuance of permits	Rulebook for issuance of permits adopted by RERS, July 2021
Distribution Grid Code for MJESHOVITI HOLDING "ELEKTROPRIVREDA REPULBIKE SPRSKE"	Distribution Grid Code of DSO – MJESHOVITI HOLDING "ELEKTROPRIVREDA REPULBIKE SPRSKE"
RS General Conditions for Electricity Supply	General Conditions for Electricity Supply adopted by RERS, September 2012
RS Rulebook on the conditions for connecting power plants to the electricity distribution network of the Republika Srpska	Rulebook on the conditions for connecting power plants to the electricity distribution network of DSO – MJESHOVITI HOLDING "ELEKTROPRIVREDA REPULBIKE SPRSKE"
Brcko District (separate administrative unit)	
Brcko District Law on RES and EC	Law on Renewable Energy Sources and Efficient Cogeneration

	(Official Gazette of Brcko District no. 22/2022)
Brcko District Law on Electricity	Law on Electricity (Official Gazette of Brcko District no. 27/2021)
Distribution Grid Codes	Distribution Grid Codes of Javnog preduzeća „Komunalno Brčko“, d.o.o. Brčko distrikt BiH

4.3. Georgia

Georgia has made significant strides in aligning its regulatory framework with the Third Energy Package. This includes submitting its draft National Energy and Climate Plan (NECP) to the Secretariat, conducting its inaugural auction for renewable energy, and establishing an operational registry for guarantees of origin for electricity. However further adaptation of the regulatory framework is needed to align with the Electricity Integration Package.

The electricity sector in Georgia is partially deregulated, and the deregulation of production and large customers follows the market opening scheme of the Concept of Electricity Market Model. This process is expected to be finalised by 2027.

Georgia faces a period in which should establish functional internal markets, with the potential for further integration into the regional market.

4.3.1. Market design assessment

4.3.1.1. Access of renewable PPAs

The electricity market is in a transitional period from regulated to open, competitive and transparent electricity market. The Government of Georgia has adopted the Concept of Electricity Market Model in 2020 as a guiding document on opening the electricity market. Based on the Concept of Electricity Market Model the full opening of the electricity market is expected to happen in 2027.

The Concept of Electricity Market Model provides schedule for deregulation of production and gradual exemption of electricity producers from public obligation. Since the beginning of the implementation of the Concept of Electricity Market Model in 2020, hydropower plants with capacity below 65MW have been deregulated. with ability to sell electricity under market-determined prices. In the following years, starting in May 2024 the gradual deregulation of hydropower plants with capacity over 66 MW is scheduled to begin. Small power plants (up to 13MW) and power plants built after August 1, 2008, have been fully deregulated provided that they are not the source of guaranteed capacity and are eligible to trade electricity at deregulated tariffs.

The electricity from producers with public service obligation under the renewable energy support schemes is mandatory traded in the organized market and the price difference between the market price and the tariff set by the GNERC are settled by the Wholesale Public Service Organization (WPSO) based on an agreement on price difference. In case of a positive difference, the funds go to the WPSO's fund who subsidize the producers granted with a support scheme. In case the difference is negative, the WPSO shall compensate the difference to the electricity producer. The Georgian Electricity Market Operator – ESCO acts in a capacity of WPSO.

On the side of the consumption, the market would stay regulated (supply of electricity from public providers) with tariffs set by the Georgian National Energy and Water Supply Regulatory Commission (GNERC) until 2026. Based on the schedule in the Concept of Electricity Market Model until July 2025 is expected deregulation of all final customers connected to the 35-110 kV voltage levels and final customers connected to 6-10 kV voltage levels, who consume not less than 1 million kWh electricity in month. All other customers are expected to be deregulated until July 2026, except small enterprises (annual income of GEL 500,000 or ~EUR 170,000) and households which will further stay under universal supplier at a tariff regulated by GNERC.

The Energy Law adopted in 2019 and as amended in 2023 provides that participants in the wholesale market have the ability to engage in renewable PPAs. Renewable electricity producers (except for operators of micro power plants with capacities up to 100KW or up to 500KW upon a decision of GNERC are not considered wholesale market participant), have the right to sell their electricity to wholesale market participants, including retail suppliers, wholesale traders and large consumers. Large consumer is final non-household consumer of electricity who meets one of the following criteria:

- a) It is connected on a network with a voltage higher than 10kV; or ;
- b) It is connected on the 6-10kV network and its total connected capacity at the connection point to the 6-10kV network is equal to or greater than 500kW. The current regulation does not impose restrictions or regulatory limitations on the type of technology of the renewable electricity plant to be able to contract renewable PPAs

The PPAs can be concluded directly between wholesale market participants without an intermediary and under unregulated price-formation. This regulatory framework opens the opportunity for cPPAs after the transitional period and opening of the market.

The Renewable Energy Law needs to be aligned with the Renewable Energy Directive RED II in order to envisage the renewable PPAs as special type of agreements.

Energy Law does not recognize the possibility for market participation of final customers and small enterprises through aggregation of generation from multiple power-generating facilities or load from multiple demand response facilities to provide joint offers on the electricity market and be jointly operated in the electricity system.

Final customers without the status of large customer or small enterprises are unable to enter into a direct PPAs. Furthermore, the Energy Law does not recognize the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from renewable projects. Based on Law of Georgia on public procurement which enters into force in January 2025, state-owned enterprises procure electricity through a regulated public procurement procedure. The law allows multi-year public procurement which should be approved by the Ministry of Finance of Georgia or the financial authority of the relevant municipality if the public procurement is financed with funds of the state budget or the budget of the municipality. Multi-year plan of public procurement should be reflected in the annual plan. If a state-owned enterprise becomes a large consumer, arranging long-term PPAs may pose challenges under the Law on public procurement as the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement programs, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

Within the current regulatory framework, unlike the situation regarding physical PPAs which is subject to multiple constraints as detailed above, the implementation of a virtual PPA is feasible without the necessity of any regulatory intervention.

4.3.1.2. Trading rules

The Market Concept introduces the segments of the wholesale market: market for bilateral contracts, day ahead and intraday market, and the market for balancing and ancillary services. The fully operational segment is the trading with bilateral contracts. On July 1, 2024, Georgia launched a transitional model for its electricity market, introducing day-ahead and intraday markets on a limited and voluntary basis. The transitional phase will continue until July 1, 2025. At the beginning of the

transitional period, importers, exporters, and wholesale traders are restricted from participation on the organised markets, while large consumers, suppliers, and system operators are only permitted to purchase electricity. Deregulated producers are allowed to sell electricity, with the aim of effectively managing risks during the transitional phase.²³⁴The full implementation of the hourly balancing obligations, along with the balancing and auxiliary services market, is scheduled for July 1, 2025.

GNERC adopted the Electricity Market Rules on August 11, 2020, for all segments of the wholesale market. The TSO- JSC Georgian State Electrosystem (GSE) has been appointed for the operation of the balancing market. The TSO is provisionally certified by the GNERC, however it is not legally and functionally unbundled. JSC Georgian Energy Exchange has been licensed market operator to manage the intraday and day-ahead markets.

In the structure of the wholesale market is the WPSO with objective to support producers of renewable energy and management of existing PPAs and facilitating the integration of the electricity produced by them into the organized market.

Renewable electricity producers from small power plants with a capacity of up to 13 MW are not required to hold an electricity generation license. However, they must register with the market operator, ESCO, and become a qualified enterprise to participate in the wholesale market. For renewable electricity producers from power plants exceeding 13 MW, it is necessary to obtain an electricity generation license from GNERC and also register with ESCO to become a wholesale market participant. The activities of retail suppliers and wholesale traders are non-license activities.

There are no obligations for deregulated renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the Regulatory Authority.

Based on the Energy Law, the TSO is obliged to guarantee objective, transparent, and non-discriminatory priority access and dispatch for renewable electricity producers. However, the TSO may significantly limit these priorities when necessary for network stability and security of supply. The TSO should apply market-based measures for restricting access and dispatching electricity. In respect of compensation for the curtailment, the Energy Law provide that the participants will be compensated in accordance with the Network Codes for Transmission. The new version of the TSO network code, which also regulates curtailment compensation, has been drafted and discussed with stakeholders but is still awaiting adoption.

4.3.1.3. Balancing rules

The balancing market is not open, currently it is operated by the ESCO under direct contracts for purchase and sale of balancing electricity.

According to the existing market model, in Georgia does not exist a classical balancing market but rather a residual energy market with a monthly settlement period. All the energy produced/consumed that is not directly contracted by parties is sorted as balancing energy that is traded through the

²³⁴ <https://1tv.ge/lang/en/news/georgia-launches-transitional-electricity-market-model-with-future-reforms-planned/>

ESCO. The ESCO purchases the balancing electricity from the electricity generation licensee, small power plant, or importers. The balancing electricity is then to be purchased from the ESCO by distribution licensees, direct customers, and exporters.

The balancing electricity price is determined by the Electricity (Capacity) Market Rules and has large seasonal changes which are mostly influenced by the low and high hydrological characteristics of the seasons of a year. The imbalance settlement period is 1 month which creates quite a lot of room for imbalance deviations by market participants. Furthermore, electricity producers are not responsible for deviations and do not bear financial responsibility for the imbalances.

The balancing market that is scheduled to be operational from July 2025⁴ will be market based where the trade in balancing products and ancillary services is organized in order to balance the electricity system in real time. Based on the Electricity Balancing and Ancillary Services Market Rules, all legal entities that operate generation or consumption units connected to the grid above a threshold set by the TSO and approved by the GNERC are obliged to become a BRP. A BRP shall be an electricity market participant, or its chosen representative registered as a BRP that is financially responsible for its imbalances.

The balance responsible party shall be financially responsible for the imbalances caused by itself. Each balance responsible party may have one or more balancing groups under its responsibility. Electricity market participant, the capacity of which is over 15 MW, shall be liable to create a separate balancing group.

Different pricing principles apply to capacity and electricity traded on the balancing market: the pay as bid principle applies to capacity and the marginal pricing principle applies to electricity (uniform pricing mechanism).

All BRPs will be bound by the energy imbalance calculations. All BRPs are responsible for their own forecasting of generation and consumption. A BRP can assume responsibilities of other BRPs. The imbalance settlement period is set to 1 hour and is significantly longer compared to the European target model of 15 minutes.

There would be a transitional period until the full implementation of the balancing market. Namely, until July 1, 2025, bids for the balancing capacity tender announced by the Balancing Market Operator for the supply of a reserve for automatic frequency restoration shall be submitted at a zero price. The public service provider electricity producer, on the basis of a price difference agreement, shall compensate the WPSO with 90% of the amount corresponding to the positive difference between the balance price of electricity from the automatic frequency recovery reserve and the tariff set by GNERC for the relevant public service provider electricity producer. Until July 1, 2025, the supply of frequency reserve at zero cost shall be carried out by the public service provider electricity producer qualified in accordance with the law for frequency reserve.

4.3.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

Georgia was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GOs. The Georgian GOs register was launched in February 2023, and GSE is the issuing body of GOs.

Law of Georgia on Promoting the Generation and Consumption of Energy from Renewable Sources and the Resolution on the Approval of the Procedure for Issuing the Certificate of Origin of Electricity Obtained from Renewable Sources regulates the ground and the procedure for issuance, transfer, and cancelation of GOs.

The market participants, namely, the renewable electricity producer, wholesale traders, retail suppliers and the large consumers may apply for opening of an account in the registry on a basis of an electronic application form submitted to GSE. A producer of electricity from a renewable source located on the territory of Georgia cannot be registered in another register of GOs outside Georgia. The GSE shall issue the GOs to the producer in the register, electronically, no later than 8 calendar days after the end of the reporting period. A GO is issued to the account holder for every 1 MW/h of electricity supplied. Only 1 GO is issued for each unit of electricity produced (MW/h). The GOs are transferred by one account holder to another account holder on the basis of a request electronically submitted to the GSE system by the GO holder.

The GOs may be traded unbundles of the renewable electricity. The price of a GOs may be determined as a minimum guaranteed price. A GO shall be used within 12 months from the generation of the relevant energy.

The GOs shall be revoked upon its use, and it is no longer possible to transfer it to a third party.

GOs can be issued also to power plants that receive support under a support scheme. The information of the type of support scheme that is received by the power plant, if any, should be disclosed on the GOs certificate.

GOs issued by CPs are recognized in Georgia by GNERC either on its own initiative or upon request from an interested party. Recognition of GOs involves confirming that the GOs issued by the relevant CP comply with Georgian regulations. GNERC assesses the issuance, transfer, disclosure, and cancellation conditions of the GOs to ensure compliance. Once GOs from a CP are recognized at the national level, this recognition applies to all GOs issued by that CP. GNERC should publish on its website list of CPs which GOs are recognized in Georgia.

According to the Renewable Energy Directive, as applicable in the EU MSs, currently GOs issued in Georgia are not recognised for disclosure in the EU MSs unless there is an agreement between Georgia and the European Union on mutual recognition of GOs issued in the Union and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.3.1.5. Support scheme

The Renewable Energy Law enables couple of support schemes like direct price support schemes which include a special green tariff and premium tariff. Also, the Law introduces a market-based support scheme in the form of two-ways contract for difference (CfD). Based on this law, there have been issued two ordinances in 2020 (based on premium tariffs) and in 2022 (based on CfD where the reference electricity price is the day-ahead market price).

- **Currently active support mechanism is** under the Ordinance no. 556 dated 2022 on approval of the support schemes for the production and use of energy from renewable sources and the capacity auction rules.

The scheme is carried out as a CfD with the government and ESCO, offering compensation based on the day-ahead market price and CfD price difference. The support covers construction and operation of renewable power plants with an installed capacity above 0.5MW. The tenor of the support is 15 years after the commissioning of the power plant. The eligible investors are selected on a capacity auction on the basis of the power plant feasibility Study.

The Government of Georgia plans to auction 1,500 MW of renewable energy projects over the next three years under this scheme. The approximate distribution of this 1,500 MW will be as follows: 950 MW hydro (including 650 natural flows), 250 MW wind, 250 MW solar and 50 MW other renewable resources.

For solar plants and plants operating on other RES, CfD will affect the energy sold throughout the year. In the case of hydro plants, the CfD will be valid for only 8 months (September-April), and for wind plants 9 months (August-April).

Prerequisites for participation will be a pre-conducted technical and economic study, a fee for participation in the auction and a bank guarantee.

The Ordinance specifies commissioning timelines for power plants under CfD, starting from the signing of the Agreement on power plant technical and economic feasibility:

- Hydropower plants: 5 years
- Wind farms: 4 years
- Solar power plants: 3 years
- Other renewable energy plants: 5 years

The investors are obliged to sell the electricity on Georgia organized market. After every 5 years from the start of operation of the power plant, the investor has the right to terminate the CfD. In other cases, the investor loses the right to withdraw from the CfD.

The price difference will be paid by ESCO to the investor as an addition to the DAM price, if the DAM price during the power plant support period is less than the strike price set with the CfD. Contrary, the price difference will be paid by the investor to the ESCO if the DAM price during the power plant support period is higher than the strike price set with the CfD.

Prior commencement of the DAM, the investors under CfD contracts will be compensated by ESCO with full CfD price, similar to a standard PPA principle

- Besides CfD, the Government has the authority to promote RES technologies within the Public-Private Partnership Law, with the PPA mechanism. There is possibility for direct negotiations with the Government for energy projects.

The presence of a strong support scheme where the investors are obliged to sell the electricity on the organised market may be a barrier for uptake of PPAs. Namely, the developers usually prioritize these options over entering PPAs with private entities.

4.3.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1- Finalise electricity market opening	No	/	It is crucial to initiate the operation of the wholesale market segments because all the opportunities for contracted market based PPA are connected to the implementation of the electricity target model.
A2 – Incorporating of renewable PPAs in the regulatory framework	Yes	Renewable Energy Law	A Renewable Energy Law to be adopted in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.
		Energy Law	Additionally, the Energy Law should be amended to enable corporate consumers – SME that do not meet the criteria for large consumers to engage in PPAs, the law should also introduce the status of independent aggregators which will enable corporate consumers (SMEs) with relatively small load requirements to contract aggregated PPA.
			Additionally, the Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is

commonly associated with the SMEs in the PPA arrangements.

B- Trading rules

B1 – Regulation of redispatching regime for renewable electricity plants	Yes	Energy Law	The Energy Law and the secondary legislation (Market Rules; Network Rules) shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It should also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements.
		Market rules	
B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	TSO/DSO	Furthermore, the Energy Law shall regulate the exemptions when non-market-based redispatching of generation can be implemented in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.
		Network rules	
B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	Energy Law	The Energy Law should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.
		Network code of TSO	The new Network code of TSO to be adopted shall incorporate methodology for curtailment compensation schemes in line with the amendments to the Energy Law.

C – Balancing rules

C1 – Establishment of the intraday market as a vital tool for market participants to balance their positions.	No	/	The establishment of intraday market is necessary in order the market participants to be able to balance their positions closer to real-time.
C2 – Shorten the Imbalance settlement period	Yes	Balancing rules	The Balancing rules should be amended to incorporate the application of imbalance settlement period of 15 minutes.

4.3.3. XB PPAs assessment

4.3.3.1. XB PPAs

Georgia has no direct connection to energy networks of any EU MS or EnC CP.

Its electricity network is synchronized with Russia's and Azerbaijan's electricity grids, there is also interconnection with Armenia and Türkiye.

According to the EnC Study on "Electricity Interconnection Targets in the Energy Community Contracting Parties" (2021), large-scale market activities in the region around Georgia are restricted, not only due to the different synchronous areas but also due to limited capacities of transmission lines inside Georgia and at its borders. The Ten-Year Network Development Plan of Georgia (GSE 2020-2030) outlines an ambitious plan to reinforce the transmission network, with some activities completed in 2023, including the reinforcement of the interconnection with Azerbaijan and the development of up to 700 MW transit capacity between Azerbaijan, Georgia, and Turkey. Considering the above, further actions are necessary to remove the physical constraints in facilitating cross-border physical PPAs in Georgia.

Physical cross-border PPAs may be feasible in the long run, through creating a competitive market and by implementation of the EnC acquis and regional coupling of the day-ahead, intraday and balancing markets. The Concept of Electricity Market Model also aims to promote further regional integration between Georgia and its neighboring countries based on market-based solutions supported by relevant international agreements with these countries. In respect of virtual cross-border PPAs, there are no constraints for their implementation. In this respect it is positive that the Georgian legislation envisage the possibility of recognition of GOs issued in the other CPs provided that the GOs can be issued unbundled of the electricity.

There is no coordinated capacity allocation of cross-border capacities with neighboring countries, except bilateral cross-border capacity allocation on the interconnectors with Türkiye. This allocation is based on an auction with the merit order specified in the applicable Electricity (Capacity) Market Rules.

Because Georgia has no physical conditions to participate in the pan- European electricity market, parts of the EnC acquis related to cross- border capacity allocation and congestion management, cross-border capacity availability are derogated from implementation.

GSE has prepared a new version of the transmission grid code that incorporates the rules for management of cross-border electricity flows and capacity allocation. Based on the available date, its approval is expected to take place by the end of 2024, before the market opening planned for July 1, 2025. Agreements with neighboring transmission system operators and development of the framework for market-based mechanisms for cross-border exchange have not yet been signed.

Joint capacity allocations between Georgia and Türkiye via the allocation platform for the region of Southeast Europe should be discussed following the launch of market opening.

In December 2022, Georgia signed a quadrilateral Memorandum of Understanding with Azerbaijan, Romania and Hungary on a strategic partnership in the field of green energy development and transmission. The Memorandum includes the promotion of a future Black Sea electricity cable (interconnection that would be a connection with EU MS). Preparatory activities are ongoing and at the moment a pre-feasibility study is under preparation.

4.3.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Promote regional integration of the electricity market	Yes	Energy Law Transmission Grid Code	GSE to adopt the transmission grid code that incorporates the rules for management of cross-border electricity flows and capacity allocation. Also, to implement coordinated capacity allocation of cross-border capacities with the neighbouring countries. To promote regional integration with the neighbouring countries based on market-based solutions for cross-border exchange through international agreements.

4.3.5. RES Projects assessment

There is no one-stop shop for coordinating all steps. Authorization of RES projects largely depend on the type and size of the generating facility. Generally, Georgia needs to reinforce interinstitutional cooperation and coordination to improve its fragmented and inconsistent legislative framework.

Per Government Resolution №57, small hydropower plants (up to 50 kW), solar panels, and biogas installations fall under construction class I and do not require construction permits. Class III includes wind, small hydropower (up to 10 MW), and geothermal plants. Class IV covers hydropower plants (10-50 MW), requiring local authority permission. Larger hydropower plants over 50MW require construction permit which is under the authorisation of the Ministry of Economy and Sustainable Development of Georgia.

Based on the Environmental Assessment Code, the construction, and operation of hydropower plants with a capacity of 5 MW or more require a mandatory EIA. Hydropower plants with a capacity between 2 MW and 5 MW are subject to screening, which may demand the EIA procedure. Hydropower plants with a capacity below 2 MW are not subject to screening.

The wind farms regardless of the capacity are subject to screening.

For larger RES projects, the average time for obtaining an approval with ministry is very much dependent on the individual project and each investor undertaking a feasibility study. Large hydropower projects undergo a three-phase construction process involving the public and other authorities, taking several months to a year for permits.

The law doesn't distinguish between renewable energy technologies in authorization but differs in permitting based on project type and scale.

In terms of connection to the transmission/distribution grid, the operators apply the first-come-first-served principle. This provides virtual saturation of the grid and securing connection rights to the transmission grid is a significant concern for the development of large-scale RES projects. The TSO issues connection permits to RES projects without requiring financial guarantees or any other proof of financial capacity for development of the project, which in practice leads to reservation of network capacity for projects with uncertain development intentions. Consequently, investors with genuine commitment to proceed with development face higher costs for grid reinforcement to accommodate their projects.

4.3.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Renewable Energy Law	The Renewable Energy Law should streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 –Manage the high connection capacity demand through a queue management system	Yes	Network code of TSO	To prevent the virtual saturation of the grid due to slow-to-progress projects, the TSO should implement queue management system consisting of: Transparent disclosure of the connection conditions and the available capacity for consistent substations, giving location signals; Connection agreement should set specific milestones with deadlines for project progress; Projects failing to meet milestones would enter a remedy period during which developers should address delay; If milestone is not met, the connection agreement should be terminated The TSO should have authority to charge the project a termination fee. The TSO may require the project to provide a financial guarantee with the signing of the connection agreement for security of any termination event. As part of the milestones, the TSO should consider to shortening the timeframe for obtaining a construction permit for the connection point to two years. This duration allows investors sufficient time to gather the necessary technical documentation for permit acquisition. The duration of the permit-granting procedure shall be automatically extended for the duration of any judicial proceedings or ADR mechanisms encountered by the project during the permit-granting procedure.

4.3.7. Other applicable areas assessment

4.3.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any additional regulatory requirements (ex. authorization requirements for financial instrument; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

Based on the Law of Georgia on Securities Market derivatives which are not publicly offered and whose value and monetary flow do not depend on publicly held securities shall not be considered as securities and are not regulated with the requirements of the Law on Securities Market.

4.3.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.3.7.3. Competition

The Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period (10, 15 years).

4.3.8. Other applicable areas recommendations

No recommendations in this section.

4.3.9. Sources

Abbreviation	Sources
Concept of Electricity Market Model	Concept of Electricity Market Model No.246/20 and the amendments No. 239/23
Decree on the Approval of Mandatory Criteria For the Direct Consumers of Electricity	Decree N144 on Introducing Amendment to the Decree #18 (dated January 28, 2019) of the Government of Georgia "On the Approval of Mandatory Criteria for the Direct Consumers of Electricity", March 25, 2019
Electricity (Capacity) Market Rules	Electricity (Capacity) Market Rules No. 77 of 2006
Electricity Market Rules	Resolution №46 On Approving Electricity Market Rules, August 11, 2020
Energy Law	Georgian Law on Energy and Water Supply No. 5646-RS of 20 December 2019
Environmental Assessment Code	Environmental Assessment Code No. 890-II of 01/06/2017
Law of Georgia on Licences and Permits	Law of Georgia on Licenses and Permits No.1775, 24/06/2005
Law of Georgia on securities market	Law of Georgia on securities market no.1745, 24/12/1998
Law on public procurement	Law on public procurement No. 2549 dated 09.02.2023
Renewable Energy Law	Law on promotion of generation and consumption of energy from renewable sources No. 5652 Rs dated 20/12/2019
Resolution on Approval of the Support Schemes for the Production and Use of Energy from Renewable Sources and the Capacity (Power) Auction Rules	Government of Georgia Resolution # 556 December 7, 2022 (Amended as of February 7, 2023) On Approval of the Support Schemes for the Production and Use of Energy from Renewable Sources and the Capacity (Power) Auction Rules
Resolution on the approval of Support Scheme (Hydroelectric Power Plants) of the Generation and Use energy from Renewable Energy Sources Energy Support and Use Scheme from Renewable Sources	Resolution No 403 of the Government of Georgia on the approval of Support Scheme (Hydroelectric Power Plants) of the Generation and Use energy from Renewable Energy Sources Energy Support and Use Scheme from Renewable Sources
Resolution on the approval of the procedure for issuing the certificate of origin of	Resolution No. 58 on the approval of the procedure for issuing the certificate of origin of electricity

electricity obtained from renewable sources	obtained from renewable sources, December 23, 2021
Resolution on the Rules for Determining the Criteria and Status of Large Electricity Consumers	Resolution No.80 dated 28.12.2020 of the GNERC on the Rules for Determining the Criteria and Status of Large Electricity Consumers

4.4. Kosovo*

Kosovo* tends to support and promote renewable energy in line with strategic documents outlining energy transition and the achievement of renewable targets. However, the current regulations do not provide a possibility for final consumers or any other corporate consumers (like SMEs) to enter direct PPAs with renewable energy producers.

Regulatory updates in Kosovo* are expected in the coming years, with a commitment to align its electricity regulations with the Acquis Communautaire as adapted and adopted by the Energy Community (EnC), giving signals of predictability to investors. Such updates should broaden opportunities for the wider business sector to engage in renewable PPAs.

4.4.1. Market design assessment

4.4.1.1. Access of renewable PPAs

Kosovo* has adopted a Law on the Promotion of the Use of Renewable Energy Sources ("Law on Renewables"), entered into force May 18, 2024, which partially transposes the Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources, as adopted by the Decision (2021/14/MC-EnC) of the Ministerial Council of the Energy Community. However, such a dedicated regulation on renewable energy regulates PPAs solely as a specific form of physical support mechanism where the REO, serving as the designated off-taker, undertakes to buy at a predetermined price the electricity produced by a privileged producer/s who are granted support based on a PPA. However, this law does not provide for the option for consumers to buy electricity directly from renewable energy producers.

Furthermore, it can be concluded from the Energy Law, Electricity Law, and the Market Rules that participants in the wholesale market can engage in renewable PPAs. Renewable electricity producers, regardless of project size or technology, have the right to sell their electricity to wholesale market participants, including retail suppliers, and wholesale traders. However, final customers or any other corporate consumers (like SMEs) are unable to enter into a direct PPAs with renewable energy producers. Furthermore, the applicable law does not recognize the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from renewable projects.

State-owned enterprises procure electricity through a regulated public procurement procedure under the Law on Public Procurement. Although there is no maximum duration term for a PPA specified in this law, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement forecasts, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract. As an exception, the Law on Public Procurement provides an option for a public service operator engaged in a public service activity (utilities companies) to procure electricity for their net without following the provisions of the law on prescribed procedures, preparation on tender documentation and other procurement rules. Instead, for such service providers only, special provisions of this law that significantly simplify the procurement of electricity, may apply.

The current regulation does not impose restrictions or regulatory limitations on the type of technology or the capacity of the renewable electricity plant to be able to contract renewable PPAs.

Within the current regulatory framework, unlike the situation regarding physical PPAs which is subject to multiple constraints as detailed above, the implementation of a virtual PPA is feasible without the necessity of any regulatory intervention.

4.4.1.2. Trading rules

The market participants eligible to contract PPAs (specifically the renewable electricity producers, retail suppliers, wholesale traders) are required to hold respective licenses for their activities. The licensing rules are straightforward with no administrative barriers, and the licenses are issued within 60 calendar days as of the submission of a complete application.

Based on the Law on Renewables, network operators will provide objective, transparent and non-discriminatory criteria in the connection process of renewable energy generators, without any additional administrative burdens. Based on the Law on Electricity, the TSO is obliged to guarantee priority dispatch for renewable electricity producers. As per the Law on Renewables, privileged producers also have priority of dispatch. However, in both cases, the priority dispatch is conditional on not breaching the limits set in the Transmission Grid Code and regulations on system security. Renewable electricity producers have the same obligations with other electricity producers regarding the use of network, and generation planning and nomination.

Under the Law on Renewables, ERO will create a methodology on establishing the volume curtailed subject to financial compensation for curtailment under the support scheme by August 18, 2024 at the latest.

4.4.1.3. Balancing rules

The renewable electricity producers (except for the privileged renewable electricity producers selected based on a support scheme as per the Law on Renewables - who are exempted partially from the balancing obligation under specified conditions and up to the specified term with this law), the retail suppliers, and wholesale traders have balance responsibility.

The above market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice (usually a utility). Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA.

Kosovo* has established a balancing market where prices are being approved by the regulator. The TSO receives bids and offers by trading parties for the purposes of electricity system balancing, based on an economic merit order list. The TSO employs contracts for ancillary services to respond to real-time variations in planned interchange and frequency. The imbalance price is being calculated as per the methodology adopted by the TSO, publicly available at the TSO's website.

4.4.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

Currently, Kosovo* is not a member of the Association of Issuing Bodies (AIB). Kosovo* was part of the regional project initiated by the Energy Community Secretariat to support the CPs in the establishment of an EU compatible electronic registry for GOs. Consequently, Kosovo* has adopted the legal framework for establishing a national electronic registry for GOs, and it has created such a registry. However, the launch of the registry for GOs is still pending. Kosovo* has signed agreements for GoOs registry implementation and energy regulator (ERO), is acting as the designated issuing body. The final steps for the CP include completing negotiations with Grexel to operationalize the national registry and calculating the national residual mix and adjusting disclosure regulations.

The Law on Renewables permits renewable electricity producers (except the ones operating under support schemes) to obtain GOs. This law regulates the issuance, transfer, termination, and content of the GOs. Under this law, ERO as the nominated body for issuance of GOs and maintenance of the GOs registry, should adopt rules on the issuance of GOs, together with rules on the use of the register of GOs and the fees for participating in the GOs system by November 18th, 2024, at the latest.

The Law on Renewables governs the possibility of recognition of GOs issued in a Member State of the European Union or another Contracting Party of the Energy Community if they contain the elements provided with this law (the energy source from which the energy was produced, the start and end time and dates of production, the identity, location, type and capacity of the installation where the energy was produced etc).

According to the Renewable Energy Directive as applicable in the EU MSs, currently GOs to be issued in Kosovo* will not be recognised for disclosure in the EU MSs unless there is an agreement between Kosovo* the European Union on mutual recognition of GOs issued in the European Union and compatible GOs systems established in Kosovo*, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.4.1.5. Support scheme

Under the Law on Renewables there is a support scheme in place in the form of (i) a PPA signed with the REO, (ii) a Contract for Premium or (iii) a Contract for Difference, all of them implemented through Feed-in premiums or Feed-in tariffs. The renewable energy producers who will benefit from the support scheme will be chosen via a competitive bidding process. Such a process will be conducted in compliance with the provisions of the Law on Renewables and with the secondary legislation. The competent authorities in Kosovo* are obliged to adopt and align secondary legislation for the implementation of the requirements with this new law within nine months from the entry into force of this law.

- (i) Under the Feed-in Premium system, financial support is granted to beneficiaries - privileged producers, in the form of:
- o a fixed premium, based on a Contract for Premium (a fixed amount to be paid to the beneficiary on top of the market price a day ahead); or
 - o a symmetrical sliding premium, based on a Contract for Difference (the amount between the Strike Price and the Reference Price to be paid to the beneficiary or by the beneficiary). The methodology for establishing the maximum Fixed Premium or maximum Strike Price will be adopted by ERO.
- (ii) Under the Feed-in Tariff system, support is granted to beneficiaries until the conversion of PPAs to a Contract for Difference. The conversion will be initiated by ERO after the fulfilment of the following two conditions: (a) the Kosovan day-ahead market operated by the Albanian Power Exchange is established and is operational; and (b) the unit price in the day-ahead market in Kosovo* is settled for a consecutive period of twelve (12) months. The methodology for determining the Feed-in Tariff in the form of the maximum guaranteed purchase price will be adopted by ERO who will determine the maximum guaranteed purchase price for each Competitive Bidding Process.

The total capacities for each distinct technology that are qualified to take advantage of the Feed-in Tariff and/or the Feed-in Premium systems will be determined with a secondary legislation adopted by the responsible Ministry for the energy sector.

The Law on Renewables introduces a possibility for joint support schemes on renewable energy. Upon receiving a proposal from the Ministry, the Government holds the discretion to either integrate or partially coordinate its support scheme with the support schemes of one or more CPs within the Energy Community. Should this occur, a predetermined volume of energy, harnessed from Renewable Sources within the territories of the CPs/CP of the Energy Community, will be attributed to the Renewable Energy quota of the Republic of Kosovo*, or inversely, under the prescribed conditions with this law

4.4.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Incorporating of renewable PPAs in the regulatory framework	Yes	Amendments of the Law on Renewables	The Law on Renewables should be amended in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC to incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.
		Energy Law	Additionally, the Energy Law should be amended to enable natural and legal consumers to engage in PPAs. The law should also introduce the status of independent aggregators which will enable corporate consumers (SMEs) with relatively small load requirements to contract aggregated PPA. Additionally, the Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
B- Trading rules			
B1 – Regulation of redispatching regime for renewable electricity plants	Yes	Energy Law	The Energy Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It should also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements. Furthermore, the Energy Law shall regulate the exemptions when non-market-based redispatching of generation can be implemented, provided that Kosovo* fulfils the criteria for the exemption of market-based redispatching, in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	Energy Law	The Energy Law should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.
		Grid codes of TSO and DSO	Grid codes of TSO and DSO require an amendment to incorporate methodology for curtailment compensation schemes in line with the amendments to the Energy Law.
B3 - Regulation of the financial compensation in case of curtailment of renewable energy plants under the support scheme	No	/	ERO should create a methodology on establishing the volume curtailed subject to financial compensation for curtailment under the support scheme within the prescribed deadline with the Law on Renewables.
C – Balancing rules			
C1 – Establishment of the intraday market as a vital tool for market participants to balance their positions.	No	/	The establishment of an intraday market is necessary in order for the market participants to be able to balance their positions closer to real-time.
C2 – Reassessment of regulated balancing prices	Yes	Market Rules	The applied regulated prices approved by ERO should be reassessed considering the requirements of the new Electricity Integration Package. Possibility for a competitive price formation should be examined for the purpose of alignment with the said package.
D – GOs			
D1- Adoption of the secondary legislation	Yes	Secondary legislation	ERO should adopt rules on the issuance of GOs, together with rules on the use of the register of GOs and the fees for participating in the GOs system within the prescribed deadlines with the Law on Renewables.
D2- Enable the operation of the GOs registry	No	/	ERO to put into operation the electronic registry for GOs.
E – Support scheme			
E1 – Adoption of a secondary legislation	Yes	Secondary legislation	The competent authorities in Kosovo* should adopt and align secondary legislation related to the prescribed support scheme within the given deadline with the Law on Renewables.
			The responsible Ministry for the energy sector should adopt the

Secondary legislation	secondary legislation for the total capacities for each distinct technology that are qualified to take advantage of the Feed-in Tariff and/or the Feed-in Premium systems within the deadlines prescribed with the Law on Renewables.
Methodology	ERO should adopt the methodology for determining the Feed-in Tariff in the form of the maximum guaranteed purchase price.

4.4.3. XB PPAs assessment

4.4.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in Kosovo* allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the “off-taker” party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs and the CPs themselves.

Regarding physical cross-border PPAs, renewable electricity producers in Kosovo* have the right to sell electricity to market participants on the wholesale electricity market abroad. However, limitations exist for consumers, given that under the applicable regulation consumers cannot purchase electricity directly from a renewable electricity producer.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed. Additionally, uncertainties surround the pricing of capacity allocation tariffs, which are determined annually by the TSO. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market. (no).

4.4.3.2. Market coupling and market liquidity

Kosovo* has entered the day-ahead electricity market on the Albanian Power Exchange (ALPEX). ALPEX in February 2024 started with day-ahead auctions enabling market coupling for Albania and Kosovo*. Kosovo* has not yet established the intraday market, although ALPEX has confirmed its intentions for the intraday market coupling of Albania and Kosovo* to be established in June 2024.

Kosovo has signed a Memorandum of Understanding on coupling of day-ahead electricity markets of North Macedonia, Greece, Albania, and Kosovo* in November 2023.

4.4.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighbouring markets based on explicit auctions, except with Serbia.

The Available Transfer Capacity (ATC) is agreed annually by the TSOs on either side of the border (Albania, Montenegro, and North Macedonia). The cross-border allocation is done in annual, monthly, and daily auctions through SEECAO. Currently, there is not a cross-border flow with Serbia.

The intraday is done bilaterally with each neighbouring country, except with Serbia.

The capacity allocation methodology applied by the Kosovan TSO is regulated with the Procedure for Allocation of Interconnection Capacities, adopted in 2020. As per this procedure, the Kosovan TSO will allocate a share of the ATC to its interconnections and shall be held liable for half of the total ATC (50-50), unless otherwise agreed with the neighboring TSOs.

The TSO has not applied the harmonized allocation rules based on the Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation as adapted by Ministerial Council Decision 2022/03/MC-EnC.

4.4.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Enable consumers to directly purchase electricity from renewable energy producers located abroad.	Yes	Energy Law, Law on Electricity	The Law on Energy and Law on Electricity should be amended in a manner that will allow natural or legal persons to purchase electricity directly from a renewable electricity producer located on a territory of another CP or MS.
A2 – Granting forward transmission rights with longer durations	No	Procedure for Allocation of Interconnection Capacities	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights for a longer period to start matching the contract duration of the PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			

B1 – Harmonisation with the EnC Electricity Integration Package Yes

Energy Law

The Energy Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.

C – Cross-border capacity

C1 – The TSO to apply the harmonised allocation rules Yes

Energy Law
Procedure for
Allocation of
Interconnection
Capacities

The Energy Law should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package.

C2 – Providing targets for the TSO for available cross-zonal capacity Yes

Energy Law
Procedure for
Allocation of
Interconnection
Capacities

The Energy Law and the Procedure for Allocation of Interconnection Capacities to provide a minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by the Ministerial Council Decision 2022/03/MC-EnC.

4.4.5. RES Projects assessment

4.4.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

The Law on Renewables provides general directions for ERO, central and local institutions, and network operators (“Responsible Authorities”) on requirements related to the authorization, certification and licensing procedures for the development and implementation of renewable energy projects. As per this law, ERO will have to ensure that all these procedures are proportionate and contribute to the renewable energy project implementation. The Responsible authorities have an obligation (i) to undertake measures to simplify and speed up the process of issuing consents, permits and any other documents required for the renewable projects’ construction at the relevant administrative level, including an obligation (ii) to determine anticipated timeframes in each of these procedures. Additionally, the regulation imposes an obligation for the Responsible authorities to designate a single contact point who should guide the applicant through the entire administrative process in a transparent manner. Based on this legal framework, the Ministry responsible for the energy sector should adopt and publish online procedures manuals for renewable energy project developers by November 18, 2024, at the latest. Such manuals should provide specifics on all required procedures for the renewable project implementation that will enable a simplified and fast process.

Additionally, as per the provided support scheme with this law, privileged producers enter into Project Development Agreements with the Ministry responsible for the energy sector. Such agreement, among the other, defines the terms, conditions, and deadlines for construction of the electricity generation facility. The privileged producer, under such an agreement, does not have to obtain construction authorization on new generation capacities as per the requirements of the Law on Energy and Law on Energy Regulator. However, it will have to acquire all required construction permits and an environmental permit for the power plant as per applicable law.

Currently, under the Rule on Authorization Procedure for Construction of New Generation Capacities from Renewable Energy Sources, adopted by ERO, a simplified authorization procedure for renewable energy projects is established. The rules make a distinction between Large-Scale Generation Capacities (generation capacities with a capacity over 100 kW (> 100 kW), connected to the network), and Small-Scale Generation Capacities (generation capacities with a capacity up to 100 kW, connected to the network). The authorization rules for small-scale generation capacities are even simpler than the ones for large-scale generation capacities, but. For instance, publication of a project’s application in daily newspapers is not required for small-scale generation capacities. However, in both cases, regardless of the project’s capacity, both environmental and construction permits as per the applicable law will be required. ERO makes a formal decision on each project’s application within sixty (60) calendar days of the complete application. Such a deadline may be extended for an additional period of up to thirty (30) calendar days.

Based on the Law on Energy, a One-stop-shop institution is established under the Ministry responsible for the energy sector which should facilitate and accelerate investment procedures for renewable energy projects mainly through regular and continuous communication with the involved authorities. This

one-stop-shop offers a variety of services to project developers, assisting them in navigating obstacles during various phases of the permit issuance process for their project setup. Such a one-stop-shop institution is envisaged with the new Law on Renewables as well. The Ministry responsible for the energy sector should adopt the secondary regulation on the specific responsibilities of this institution by November 18, 2024, at the latest.

4.4.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Adopt manuals on each administrative procedure necessary for the implementation of the renewable energy project	Yes	Manuals	Following the deadlines for adoption of the secondary legislation, the Responsible Ministry for the energy sector should draft, adopt, and publish detailed manuals on all administrative procedures related to the renewable energy project implementation. Such manuals should include all necessary steps, with required timeframe and list of documents that need to be provided by the applicant.
A2 – Adoption of the secondary legislation on the responsibilities of one-stop-shop institution	No	Secondary legislation	The Ministry responsible for the energy sector should adopt the secondary legislation on the one-stop-shop institution which will precisely define the responsibilities and obligations of this body. This will enable greater support to project developers and will enable them a transparent and smoother navigation of the entire project implementation.

4.4.7. Other applicable areas assessment

4.4.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any particular additional regulatory requirements (ex. authorisation requirements for financial instruments; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.4.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.4.8. Other applicable areas recommendations

No recommendations in this section.

4.4.9. Sources

Abbreviation	Sources
Energy Law	Energy Law published in the Official Gazette of Kosovo* no.24/2016 and its subsequent amendments
Law on Electricity	Law on Electricity, published in the Official Gazette of Kosovo* no.26/2016
Law on the Promotion on the Use of Renewable Energy Sources	Law on the Promotion on the Use of Renewable Energy Sources, published in the Official Gazette of Kosovo* no.7/2024
Law on Climate Change	Law on Climate Change, published in the Official Gazette of Kosovo* no.1/2024
Law on Public Procurement in the Republic of Kosovo*	Law on Public Procurement in the Republic of Kosovo*, published in the Official Gazette of Kosovo* no.18/2021 and its subsequent amendments
Market rules	Market rules dated October 2018, published at the TSO's website,

Market Rules Procedure on Security Cover	Market Rules Procedure on Security Cover, dated February 2015, published online at TSO's website on the following link: https://www.kostt.com/Content/ViewFiles/MarketOperatorOfKosovoEnergy/Market_rules_procedure_on_Security_Cover.pdf
Kosovo* Electricity Market Design	Kosovo* Electricity Market Design, adopted by the TSO, published online by ERO on the following link: https://ero-ks.org/Vendimet/English/2013/Kosovo_Electricity_Market_Design_final_eng.pdf
Rule on Authorization Procedure for Construction of New Generation Capacities from Renewable Energy Sources	Rule on Authorization Procedure for Construction of New Generation Capacities from Renewable Energy Sources, adopted by ERO, dated 27.04.2017, published at ERO's website at the following link: https://ero-ks.org/2017/Rregullat/Rule%20on%20Authorization%20Procedure%20for%20Construction%20of%20New%20Generation%20Capacities%20from%20RES.pdf
Regulation (GRK) No. 05/2018 on One Stop Shop for Renewable Energy Sources	Regulation (GRK) no. 05/2018 on One Stop Shop for Renewable Energy Sources, approved on 38 meeting of the Government of the Republic of Kosovo with the decision No.10/38, date 29.03.2018
Grid Code – Connections Code of TSO	Grid Code – Connections Code of TSO, dated October 2018, published at TSO's website on the following link: https://www.kostt.com/Content/ViewFiles/TechnicalCodes/En/GCCC.pdf
Transmission Grid Code – General Provisions	Transmissions Grid Code – Connections Code of TSO, dated October 2018, published at TSO's website on the following link: https://www.kostt.com/Content/ViewFiles/TechnicalCodes/En/GCGP.pdf
Procedure for Allocation of Interconnection Capacities	Procedure for Allocation of Interconnection Capacities, dated October 2020, published at KOSTT's website on the following link: https://www.kostt.com/Content/ViewFiles/CrossBorderAllocation/EN/Procedure%20for%20Allocation%20of%20Interconnection%20Capacities.pdf
Rule On Licensing of Energy Activities in Kosovo*	Rule On Licensing of Energy Activities in Kosovo*, adopted by ERO, dated 31.03.2017, published at ERO's website on the following link: https://ero-ks.org/2017/Rregullat/07_2017_RREGULLA%20PER%20LICENCIMIN%2

0E%20AKTIVITETEVE%20TE%20ENERGJISE%20KOSOVE.pdf

4.5. Moldova

Moldova is in between some and moderate level of preparation in the area of energy.

Moldova should in particular implement the 'Clean energy for all Europeans' package, including the EU Renewable Energy Directive and the Electricity Integration Package adopted by the Energy Community in order to establish an acceptable environment and legal certainty for investments in RES Projects and generally be attractive for contracting PPAs.

Moldova faces a period in which there should be established functional internal electricity market, with the potential for further integration into the regional electricity market.

4.5.1. Market design assessment

4.5.1.1. Access of renewable PPAs

Generally, the whole energy-related framework needs to be harmonised with the EnC acquis in order to create a positive environment for contracting PPAs.

At the present regulatory framework, the Renewable Energy Law regulates the possibility for renewable producers (Eligible Renewable Developers) to contract a PPA with the Central Electricity Supplier of Moldova (Energocom). This is a PPA established under the state support schemes based on which the Eligible Renewable Developers mandatory sells the electricity to Energocom under regulated contracts.

The Law on Renewables makes a difference between small Eligible Renewable Developers (who obtain their status through a procedure administered by National Agency for Energy Regulation, the Regulator -ANRE) and large Eligible Renewable Developers (who obtain their status through tender auctions performed by the Government of Moldova).

Certain aspects of the regulatory framework still need to be addressed in order to establish a competitive PPA market., including: (i) implementation of market rules for cross-border trade in electricity; (ii) equal access to network services, non-discriminatory access to the local wholesale electricity market for both Moldovan and non-Moldovan traders; (iii) redesigning the public service obligation scheme; and (iv) allowing all customers to switch their suppliers without having to pay the "equity fee" that is currently imposed. The electricity transmission system operator Moldelectrica was certified by ANRE in July 2023, considering the opinion of the Energy Community Secretariat. Electricity distribution and supply companies were successfully unbundled. Moldova is still subject to an open infringement case under the Energy Community Treaty related to political interference in the activities of the energy regulator ANRE, particularly in setting tariffs on the electricity market.

Moldova has partially transposed the Renewable Energy Directive with the Renewable Energy Law. Alignment with the revised Renewable Energy Directive, part of the 'Clean energy for all Europeans package', is under way.

Regulatory reforms are expected in the coming years, with a commitment to align Moldova's electricity regulations with the EnC acquis. These regulatory reforms aim to create a more predictable environment for investors and broaden opportunities for businesses to engage in renewable PPAs.

4.5.1.2. Trading rules

The Electricity Law promotes the liberalization of the electricity market. The framework for the operation of the new wholesale electricity market, containing procedures for the procurement of electricity on forward, day-ahead, intraday and balancing markets, as well as rules on ancillary services procurement and imbalance settlement was adopted in August 2020 and the new market model was launched on June 1, 2022. However, there is no significant progress in its implementation since the country has declared nationwide state of emergency from February 2022 and it is ongoing due to the Russian invasion of Ukraine. As a consequence, the public service obligations are in the highlight opposed to the competitive procurement procedures outlined in the Wholesale Electricity Market Rules.

The electricity market currently experiences insufficient competition requiring further market reforms and greater integration with neighboring markets. Although integration with ENTSO-E, has improved options for supply diversification, stronger market integration remains necessary. At present, only the bilateral market segment is operational, which is managed by TSO due to the absence of an appointed electricity market operator. The TSO is also responsible for registering bilateral contracts. In this context, the electricity market participants shall ensure that the bilateral contracts concluded for the sale/procurement of electricity comply with the requirements of the Electricity Market Rules.

There is a high dependence on a supplier that does not fully operate on market principles. The public service obligation for the universal supply and supply of last resort, as imposed on the two existing suppliers by the Electricity Law, is valid for 10 years. The market will be further negatively impacted if the Decision of the Commission for Emergency Situations on imposing an exit fee ('fairness charge') on final consumers when switching supplier is included in the Moldovan primary legislation as currently envisaged by the draft law.²³⁵

The day ahead market and the intra-day market are still to be set up and a nominated electricity market operator (NEMO) is still to be designated. The day-ahead and intraday markets have not yet been established, and a nominated electricity market operator (NEMO) has not yet been designated.

The absence of a market operator and spot markets (day-ahead, intraday) creates a less dynamic and responsive electricity market, which is less conducive to integrating and maximizing the benefits of RES projects.

Eligible Renewable Developers have secured priority access to the systems and priority dispatch of electricity, without limitations on the installed capacity. TSO and DSO ensure access in an objective, transparent and non-discriminatory manner. The regulator approves transmission and distribution tariffs using transparent methodologies. The electricity generation license is issued for a period of 25 years, but if within four years of obtaining the license, the developer has not completed the construction of the generation capacity, the license shall be withdrawn by ANRE.

²³⁵ Energy Community (2023). Moldova Annual Implementation Report. Retrived from: file:///C:/Users/mnikolovsk001/Downloads/EnC_IR2023_Moldova.pdf

TSO or DSO are entitled to apply curtailment on the production of electricity from renewable sources of energy to ensure operational safety and security of electricity supply, in which case they must inform the renewable developer, Energocom and ANRE about such restrictions and to specify the measures they plan to implement to prevent such restrictions.

The financial compensation for limiting the production of electricity from RES power plants is determined based on a methodology developed and approved by ANRE.

4.5.1.3. Balancing rules

Moldova launched an hourly balancing mechanism as of 1 June 2022, administered by Moldelectrica. However, no contract for the provision of balancing services has been signed so far. From 1 June 2022 market participants are subject to financial responsibility for their imbalances. The TSO is responsible for the calculation and invoicing of imbalances. Market participants can either be balance responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice and be a part of a balancing group. The Eligible Renewable Producers are part of a balancing group for which the Energocom is financially responsible toward TSO in case of induced imbalances.

There are no balancing services provided by any parties in Moldova.

4.5.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

Moldova was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GOs. An electronic system for issuing, transferring, and cancelling GOs is currently not in place, however the country is finalizing legislative aspects for GoO registry implementation. The subsequent crucial phase for Moldova, regarding GOs implementation, involves determining their national residual mix and implementing disclosure regulations.

In Moldova the existing Renewable Energy Law provides the primary legal framework for the GOs. The procedures related to GOs issuance and use, and the structure of a GOs, are established in the Regulation on guarantees of origin. Based on the Renewable Energy Law, the central electricity supplier “Energocom” J.S.C is the designated body for issuance of GOs. ANRE keeps records and supervises the issuance, transfer, withdrawal and usage of electronic GOs, according to the Regulation approved in this regard.

The producers benefiting from the support scheme are obliged to request the issuance of the GOs which are mandatory transferred to the Central Electricity Supplier, while it further transfers such certificates to the account of the suppliers that purchased electricity from renewable energy sources.

The GOs can be transferred by the renewable energy producer to another producer or to an electricity supplier (including Energocom) or by an electricity supplier to another supplier.

In addition, in accordance with the Renewable Energy Law, the GOs issued by the authorities of the EU Member States and by the authorities of the Contracting States of the Energy Community Treaty are subject to the recognition procedure regulated with secondary legislation that must be adopted by ANRE.

According to the Renewable Energy Directive, as applicable in the EU MSs, currently GOs issued in Moldova are not recognised for disclosure in the EU MSs unless there is an agreement between Moldova and the European Union on mutual recognition of GOs issued in the European Union and compatible GOs systems established in Moldova, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.5.1.5. Support scheme

The Renewable Energy Law sets the legal basis for renewable energy support schemes.

Based on the Renewable Energy Law the available support scheme is in a form of feed-in-tariff. Two different procedures are used to select eligible projects depending on the size of the power plant. For power plants with a capacity higher than the capacity limits set by the Government, an auction will be used to select the projects based on the bidding price per kWh.

- a) Feed-in-tariffs – for small installations with capacity below 4 MW for wind and 1 MW for other renewable energy sources) set by ANRE and issued under first come first served principle. The support is granted for 15 years during which the produced electricity is mandatory purchased by the central electricity supplier. The projects interested to benefit from feed in tariffs should apply to ANRE for confirmation of their status as eligible producer. Based on the Government decision of 2018, there have been 356MW allocated capacity for feed-in tariffs.
- b) Competitively set feed-in-tariffs (fixed price) for projects above 4MW for wind and 1MW for other technologies are envisaged under auction-based mechanism where the selected investors will receive a guaranteed fixed price for a period of 15 years. The generated electricity is mandatory purchased by the central electricity supplier. The selection procedure is based on the lowest price criterion, where the proposed price is below the ceiling price determined by ANRE; the proposed capacity is within the quota for the specific generation technology, and the investor commits to use new equipment, manufactured no more than 36 months before the commissioning of the

power plant. The selected investors have a term of 36 months to commission the power plant. The status of the eligible producer is not transferable/assignable to third entities.

According to the Government Decision no. 401 dated 8 December 2021, the capacity limits and maximal quotas until 2025 are approved, 165MW in total (105MW wind power plants and 60MW PV) allocated to auction procedures. The guaranteed fixed price, established during the tender process, cannot exceed the ceiling price of 1.5 lei/kWh for wind energy and 1.67 lei/kWh for solar energy, as set by the ANRE.

The support mechanism provides a possibility for conversion of the PPA under fixed price from a physically settled PPA to a CfD, upon the establishment of a liquid organised electricity market. The fixed price determined at the auction will serve as a strike price for financial settlement of the positive or negative difference between the market price and the fixed-strike price established at the auction.

The first tenders for the provision of large eligible wind and solar producer status were published in June 2024. There will be single tender procedure for all allocated capacities for 2024. Based on the public indicative map²³⁶, the submission and receipt of applications, technical and financial offers is expected to take place September- December 2024. Based on publicly available information, the Ministry of Energy will initiate a new national power system modelling exercise to determine the capacity of renewable energy under the support schemes for 2025 in line with its renewables target of 30% of the electricity mix by 2030.²³⁷

On the implementation side, there has been postponement in the organization of the first round of tenders for renewables, which has been on the government’s agenda since 2019. Under government decision in force, the capacity to be installed until 2025, that can benefit from both support schemes – fixed prices and FiT for small-scale projects, is limited to 120 MW in wind, 200 MW in solar, and 90 MW in non-intermittent sources. This is expected to contribute to the country’s recent commitment and draft NECP objective to reach a 30% target of renewable electricity by 2030.

4.5.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			

²³⁶ Ministry of Energy of the Republic of Moldova. Indicative timetable on the next steps for the organisation of the first tenders for the provision on large eligible wind and solar producer status. Retrived from: <https://energie.gov.md/en/content/indicative-timetable-next-steps-organisation-first-tenders-provision-large-eligible-wind-and>

²³⁷ Moldova Energy Ministry (2024). Moldova to launch first tenders for 60 MW of fixed-price solar. Retrived from: <https://www.pv-magazine.com/2024/01/31/moldova-to-launch-first-tenders-for-60-mw-of-fixed-price-solar/>

A1- Electricity market opening	No	/	Implement operational wholesale market rules to enable competition and participants on the wholesale market to be able to contract direct PPAs.
A2 – Incorporating of renewable PPAs in the regulatory framework	Yes	Renewable Energy Law	A Renewable Energy Law to be adopted in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.
		Electricity Law	Additionally, the Electricity Law should be amended to enable corporate consumers (including SMEs) to engage in PPAs. The law should also introduce the status of independent aggregators which will enable corporate consumers (SMEs) with relatively small load requirements to contract aggregated PPA. Additionally, the Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
B- Trading rules			
B1 – Regulation of redispatching regime for renewable electricity plants	Yes	Electricity Law	The Electricity Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It should also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements. Furthermore, the Electricity Law shall regulate the exemptions when non-market-based redispatching of generation can be implemented market-based in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.
B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	Electricity Law	The Electricity Law should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.
		Network code of TSO	The new Network code of TSO to be adopted shall incorporate methodology for curtailment compensation schemes in line with the

amendments to the Electricity Law.

C – Balancing rules

C1 – Establishment of the intraday market as a vital tool for market participants to balance their positions.	No	/	The establishment of intraday market is necessary in order the market participants to be able to balance their positions closer to real-time.
C2 – Implement operational balancing market	Yes	Balancing rules	Implement operational balancing market based on balance responsibility group model. The imbalance mechanism should provide the market participants incentive to balance their positions and be financially responsible for the imbalances.

4.5.3. XB PPAs assessment

4.5.3.1. XB PPAs

Renewable electricity producers, by holding of supply license are allowed to export and import electricity from/to Moldova. Currently, cross-border capacity is assigned daily in accordance with the agreement between the Moldovan and Romanian Transmission System Operators. Monthly and yearly allocations are not implemented due to current limitations on the MD/UA control block. The allocation of cross-border capacity is performed by neighbouring transmission system operators. On both MD-UA and MD-RO borders joint daily capacity allocations are performed on (D-1) basis on auction platforms managed by Transelectrica (on MD-RO) and Ukrenergo (on MD-UA).²³⁸

Physical cross-border PPAs may be feasible in the long run, through creating a competitive market and by implementation of the EnC acquis and regional coupling of the day-ahead, intraday and balancing markets. The Moldova's power grid is synchronised with the ENTSO-E continental Europe grid enabling Moldova to maintain electricity stability and trade with neighbouring countries. There are also under way projects for interconnection with Romania and improvement of the transmission network, elaborated in the above market section for Moldova.

²³⁸ ACER (2023), Progress of EU electricity wholesale market integration. Retrieved from https://www.acer.europa.eu/sites/default/files/documents/Publications/2023_MMR_Market_Integration.pdf

4.5.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Promote regional integration of the electricity market	Yes	Electricity Law Transmission Grid Code	TSO to adopt the network codes that transposes the rules for management of cross-border electricity flows and capacity allocation. Also, to implement coordinated capacity allocation of cross-border capacities with the neighbouring countries. To promote regional integration with the neighbouring countries based on market-based solutions for cross-border exchange. Market coupling will increase competition in terms of a better pricing and more stable supply options and reduce the reliance on a single supplier, currently being MGRES.

4.5.5. RES Projects assessment

There is no one-stop shop for coordinating all steps in licensing RES projects. Authorization of RES projects largely depends on the type and size of the generating facility. Large-scale projects face lengthy and complex permitting procedures as the activity for developing renewable energy projects falls under the same licensing procedure as any other infrastructural project. RES projects can be built and put into operation in accordance with Law no. 163/2010 regarding the authorization of the execution of construction works.

In Moldova, a simplified permitting process is in place for the power plants installed on private land for individual houses and for such projects there is no need for obtaining an urban planning certificate for the design or a construction permit.

For the other projects, prior to filing the request for obtaining a construction permit, an urban planning certificate for the design shall be obtained. The certificate is valid 24 months. The developer also shall obtain a grid connection permit by the grid operator.

Depending on how long the construction works last, the validity period of the construction permit varies. However, the developer is obliged to start with the building works within 6 months of its issuance. A construction permit will become invalid if construction works are not initiated within the set time limit. Based on the Law on Environmental Impact Assessment, there is no mandatory EIA for the development of renewable electricity projects. However, installations for electricity production with a capacity ranging from 5MW to 300MW; hydropower plants regarding of the capacity; and wind farms with structures taller than 20m are subject to a screening process to determine the need for an EIA. The screening process undergo specific selection criteria to assess whether a full EIA is necessary.

The environmental permit issued for such projects is valid for four years, with the possibility of a one-year extension. During this period, the investor must obtain all necessary permits for the development of the project.

In the case of power plants exceeding 20MW installed capacity, then it is also needed an approval to build new renewable energy power plant from the Government of Moldova under the Renewable Energy Law.

In terms of connection to the transmission/distribution grid, the operators apply the first-come-first-served principle. This provides virtual saturation of the grid and securing connection rights to the transmission grid is a significant concern for the development of large-scale RES projects. The TSO issues connection permits to RES projects without requiring financial guarantees or any other proof of financial capacity for development of the project, which in practice leads to reservation of network capacity for projects with uncertain development intentions. Consequently, investors with genuine commitment to proceed with development face higher costs for grid reinforcement to accommodate their projects.

4.5.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Renewable Energy Law	The Renewable Energy Law should streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 –Manage the high connection capacity demand through a queue management system	Yes	Network code of TSO	To prevent the virtual saturation of the grid due to slow-to-progress projects, the TSO should implement queue management system consisting of: Transparent disclosure of the connection conditions and the available capacity for consistent substations, giving location signals; Connection agreement should set specific milestones with deadlines for project progress; Projects failing to meet milestones would enter a remedy period during which developers should address delay; If milestone is not met, the connection agreement should be terminated The TSO should have authority to charge the project a termination fee. The TSO may require the project to provide a financial guarantee with the signing of the connection agreement for security of any termination event. As part of the milestones, the TSO should consider to shortening the timeframe for obtaining a construction permit for the connection point to two years. This duration allows investors sufficient time to gather the necessary technical documentation for permit acquisition. The duration of the permit-granting procedure shall be automatically extended for the duration of any judicial proceedings or ADR mechanisms encountered by the project during the permit-granting procedure.

4.5.7. Other applicable areas assessment

4.5.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any additional regulatory requirements (ex. authorisation requirements for financial instrument; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.5.7.2. Competition

The Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period (10, 15 years)

4.5.8. Other applicable areas recommendations

No recommendations in this section.

4.5.9. Sources

Abbreviation	Sources
Energy Law	Law on Energy No 174/2017
Electricity Law	Law on Electricity no. 107/2016
Renewable Energy Law	Law on the promotion of the renewable energy sources No. 10/2016
Law on Construction	Law no. 163/2010 regarding the authorization of the execution of construction works
Government Decision no. 401	Government Decision no. 401 of 1208/2021 on the Approval of Capacity Limits, Maximum Quotas, and Capacity Categories in the field of Electricity from Renewable Sources
Market rules	Decision No. 283/2020 of 07.08.2020 on the approval of the Electricity Market Rules
Regulation on guarantees of origin	Decision no. 376/2017 of 28.09.2017 on the approval of the Regulation on guarantees of origin for electricity produced from renewable energy sources
Law on Environmental Impact Assessment	Law on Environmental Impact Assessment No. LP86/2014

4.6. Montenegro

Montenegro tends to support and promote renewable energy in line with strategic documents outlining energy transition and achievement of renewable targets. In general, the legal and regulatory framework is set up to encourage further investments in the renewable sector, including the conclusion and execution of PPAs.

However, Montenegro should undertake certain activities in order to establish an integrated electricity market, including the implementation of the Electricity Integration Package.

4.6.1. Market design assessment

4.6.1.1. Access of renewable PPAs

As per the Energy Law, natural persons and legal entities have the ability to engage in PPAs and to purchase electricity directly from renewable electricity producers.

State-owned enterprises procure electricity through a regulated public procurement procedure. Arranging long-term PPAs may pose challenges for the state-owned enterprises under the Law on Public Procurement. Although there is no maximum duration term for a PPA specified in the Law on Public Procurement, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement plans, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

The current regulation does not impose restrictions or regulatory limitations on the type of technology or the capacity of the renewable electricity plant to be able to contract renewable PPAs.

4.6.1.2. Trading rules

The market participants eligible to contract PPAs (specifically the renewable electricity producers and the retail suppliers), are required to hold licenses for their activities. The renewable electricity producers need a license for production of electricity. A license is not needed for production of electricity in one or more energy facilities with a total approved power of up to 1 MW. In addition to the license for electricity production which is sufficient when contracting PPAs with retail suppliers or wholesale traders, the renewable electricity producers also need to have a supply license when contracting PPAs with final consumers who buy electricity for their own consumption and who do not have balancing responsibility. The electricity retail trading is considered energy activity for which the energy license is also needed, while the wholesale traders and the corporate off-takers are not required to obtain a specific license for the purposes of conclusion of PPAs.

The licensing rules are straightforward with no administrative barriers, and the licenses are issued within 30 days as of application.

Renewable electricity producers are not obliged to trade their generation on the organised markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the Regulatory Authority.

Based on the Energy Law, the Rulebook on the operation of the transmission system and the Rulebook on the operation of the distribution system, the TSO and the DSO are obliged to guarantee objective, transparent, and non-discriminatory priority access and dispatch for renewable electricity producers. However, the TSO and the DSO may significantly limit these priorities when necessary for network stability and security of supply.

4.6.1.3. Balancing rules

As per the Energy Law, all market participants have balance responsibility. Exceptions are provided for the renewable energy producers granted with support schemes. Namely, the law provides that such producers are members of a special balancing group, which is established by the renewable energy producer that first receives the status of privileged producer, and the balancing costs caused by them are covered by the market operator. The respective balancing costs are ultimately borne by the end consumers who are obliged to pay a fee for stimulating the production of electricity from renewable sources.

Market participants are obliged to provide a bank guarantee payable on first demand, without the right of objection, or another means of securing payment, in favour of the market operator and to conclude a contract on balance responsibility with the market operator and the TSO within 15 days of the date of delivery of the contract by the market operator.

Market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice. Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA.

An administrator of the balance market of Montenegro is the market operator, while the TSO manages the market in real time.

The imbalance settlement period is set to 1 hour and is significantly longer compared to the European target model of 15 minutes.

4.6.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

The Energy Law permits renewable electricity producers to obtain GOs, while the renewable electricity producers operating under support schemes are obliged to transfer the GOs to the market operator. Specific rules governing GOs issuance, transfer, and termination are addressed in a secondary regulation.

The Energy Law provides that the GOs can be traded bundled with the physical electricity output under a PPA or separately of the electricity.

Additionally, the Energy Law governs the possibility of recognition of GOs issued by other countries under conditions of reciprocity in accordance with ratified international agreements. Also, the law provides that foreign GOs are valid in Montenegro, if they are exchanged within the European association of which the market operator is a member, in accordance with the rules of that association.

Montenegro was part of the regional project initiated by the Energy Community Secretariat to support the CPs in the establishment of EU compatible electronic registry for GOs and a national electronic registry was created. As per the publicly available information, the market operator, as a designated issuing body, concluded an agreement with the service provider responsible to set-up the register in April 2024. The launch of the national electronic registry of GOs has been done from July 1st. The market operator, as designated issuing body, started operations in the national registry software. Residual mix has been done by the market operator from 2021.

The absence of GOs for renewable electricity producers creates obstacles for PPAs, as corporate buyers cannot verify their purchase of green electricity without them. COTEE, the market operator is the nominated body for issuance of GOs and maintenance of the GOs registry.

Montenegro is a member of the Association of Issuing Bodies (AIB), but it is not still connected to the AiB, HUB.

According to the Renewable Energy Directive, GOs to be issued in Montenegro will not be recognised for disclosure in the EU MSs unless there is an agreement between Montenegro the European Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in Montenegro, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.6.1.5. Support scheme

There is a moderate support scheme in place consisting of certain incentive measures for renewable electricity producers such as guaranteed purchase of electricity, incentive prices at which the electricity is purchased, period of validity of the guaranteed purchase of electricity, exemption from payment for system balancing services, priority dispatch of the electricity, etc. Such incentive measures are awarded in a competitive bidding process based on a clear, transparent and non-discriminatory criteria, except for the projects up to 1 MW that are entitled to such incentives by default.

The above measures are provided with the Energy Law. There is no adopted Renewable Energy Law that would implement and detailly regulate market-based support schemes.

At the time of preparation of this report, the Ministry of Energy and Mining has prepared a draft Law on use of energy from renewable sources, however the same is still not adopted. The aim of the draft is to transpose the Renewable Energy Directive (2018/2001). The findings in this report may undergo revisions in case of adoption of the proposed law.

4.6.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Introducing a state-backed guarantee scheme for SMEs	Yes	New Renewable Energy Law	The Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
B- Trading rules			
B1 – Regulation of redispatching regime for renewable electricity plants	Yes	New Renewable Energy Law	The new Renewable Energy Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It shall also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements.
C – Balancing rules			
C1 – Expanding the balance responsibility to all market participants	Yes	Energy Law	The balance responsibility shall be applicable to all market participants, with derogations permitted in specific circumstances as determined with the Electricity Regulation. Therefore, the preferential renewable electricity producers which balance responsibility is currently backed up by the market operator, shall be balance responsible on a market base as any other market participant.
C2 – Establishment of the intraday market as a vital tool for market participants to balance their positions	No	/	The establishment of intraday market is necessary in order the market participants to be able to balance their positions closer to real-time.
C3 – Shorten the Imbalance settlement period	Yes	Balancing rules	The Balancing rules should be amended to incorporate the application of imbalance settlement period of 15 minutes.
D – GOs			

D1 - Enable the operation of the GOs registry	No	/	No recommendation in this section.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing market-based support scheme	Yes	New Renewable Energy Law	The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Energy Law should abandon the non-market-based state support. New support scheme - 'two-way contract for difference' to be introduced. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the state. This approach is in line with the RED II.

4.6.3. XB PPAs assessment

4.6.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in Montenegro allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the “off-taker” party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs are the CPs themselves.

Regarding physical cross-border PPAs, renewable electricity producers in Montenegro have the right to sell electricity to market participants on the wholesale electricity market abroad. Also, there are no legal limitations for consumers to procure electricity from abroad from a renewable electricity producer.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering into long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed. Additionally, uncertainties surround the pricing of capacity allocation tariffs, which are determined annually by the TSO. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

As per the publicly available information, at the time of preparation of this report, a new Law on cross-border exchange of electricity and natural gas is prepared, but the same is still not adopted. The findings in this report may undergo revisions in case of adoption of the proposed law.

4.6.3.2. Market coupling and market liquidity

Montenegro has an operational day-ahead market since April 2023. The day - ahead market is not coupled with neighbouring markets of the CPs and M.S.s. The intra-day market is not established, however there is a regulatory framework in place for its establishment.

As per the publicly available information, Montenegro plans to couple its day-ahead electricity market with Italy in order to link its day-ahead electricity market to the single European energy market. The coupling is planned for 2026.

4.6.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighbouring markets based on explicit auctions.

- o For Bosnia and Hercegovina, Kosovo* and Albania the border auctions are organised through regional auction SEECAO.
- o For Serbia the auctions (yearly, monthly, daily, intraday) are organised bilaterally between the TSOs.

- o There is undersea interconnection with Italy that permits bidirectional electricity exchange between the two countries.

The capacity allocation applied by the TSO is regulated with the Law on cross-border exchange of electricity and natural gas.

There are separate allocation rules in place depending on the border.

Montenegro's bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. The Regulation was partially transposed through adoption of amendments to the Energy Law. Based on the publicly available data, the TSO has not submitted a proposal for a common coordinated capacity calculation methodology to the Regulatory Authority.

4.6.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Granting forward transmission rights with longer durations	Yes	Rules for allocation of available transmission capacities	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights at a first place for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	The Energy Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.
C – Cross-border capacity			
C1 – The TSO to apply the harmonised allocation rules	Yes	Energy Law Rules for allocation of available transmission capacities	The Energy Law should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package.

C2 – Providing targets for the TSO for available cross-zonal capacity	Yes	Energy Law Rules for the allocation of cross-border transmission capacities	The TSO shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside Montenegro bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the Energy Law and the Rules for the allocation of cross-border transmission capacities to provide minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

4.6.5. RES Projects assessment

4.6.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In Montenegro there are multiple authorities involved in the procedure for construction and development of the renewable electricity plants and there is no one-stop shop approach.

Power plants are built in accordance with the Law on Spatial Planning and Construction of Structures. Prior to the filing of the request for obtaining a construction permit, the Energy Law provides that if the power plant is to be with a capacity up to 1 MW, the renewable electricity producers should obtain energy permit from the Ministry of Energy. The renewable electricity producers must secure a construction permit within two years of receiving the permit, otherwise the permit ceases to exist. Certain projects may require an environmental impact assessment as well. As per the applicable regulations, power plants with a capacity of 300 MW or more, including the PV power plants, are required to prepare an EIA. It is specifically provided that for the power plants with a capacity less than 300 MW, for the hydroelectric power plants with a capacity exceeding 1 MW and for the wind power plants, a competent authority decides whether an EIA is needed.

Depending on the capacity of the renewable electricity plants, the renewable electricity producers for the plants with a capacity of 1 MW or more, which are considered as complex engineering projects, shall obtain a construction permit from the Ministry of Urban Planning, Urbanism and State Property, while the renewable electricity producers for the plants with a capacity of less than 1 MW, should obtain a construction permit from the respective municipality.

There is no systematic approach for acceleration of renewable energy projects by way of simplified permitting processes tailored to specific renewable technologies.

Renewable energy projects, regardless of their technology, can connect to either the distribution grid for projects up to 10MW or the transmission grid for projects exceeding 10MW in installed capacity. However, due to the fact that both grids currently experience demand that exceeds their available capacity, the Government of Montenegro announced certain projects for expanding the grid capacity.

4.6.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Adoption of Renewable Energy Law	The adoption of the draft Renewable Energy Law which should streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.

4.6.7. Other applicable areas assessment

4.6.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any particular additional regulatory requirements (ex. authorisation requirements for financial instruments; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.6.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.6.7.3. Competition

The Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.6.8. Other applicable areas recommendations

No recommendations in this section.

4.6.9. Sources

Abbreviation	Sources
Balancing rules	Rules on the operation of the balancing system published in the Official Gazette of Montenegro no.44/2017
Energy Law	Energy Law published in the Official Gazette of Montenegro no.5/2016 and its subsequent amendments
Law on cross-border exchange of electricity and natural gas	Law on cross-border exchange of electricity and natural gas published in the Official Gazette of Montenegro no.42/2016 and its subsequent amendments
Law on climate changes	Law on protection against the negative impacts of climate changes published in the Official Gazette of Montenegro no.73/2019
Law on Spatial Planning and Construction of Structures	Law on Spatial Planning and Construction of Structures published in the Official Gazette of Montenegro no.64/2017 and its subsequent amendments
Rulebook on the operation of the transmission system	Rulebook on the operation of the transmission system published in the Official Gazette of Montenegro no.149/2022
Rules for allocation of available transmission capacities	Rules for allocation of available transmission capacities from October 2011, published on the website of the TSO of Montenegro

4.7. North Macedonia

North Macedonia tends to support and promote renewable energy in line with strategic documents outlining energy transition and the achievement of renewable targets. However, the current regulations reserve the right of access to PPAs to utilities and large corporate consumers, while the small corporate players can access PPAs only by involving a utility.

Regulatory updates in North Macedonia are expected in the coming years, with a commitment to align its electricity regulations with the acquis communautaire as adapted and adopted by the Energy Community (EnC), giving signals of predictability to investors. Such updates should broaden opportunities for the wider business sector to engage in renewable PPAs.

4.7.1. Market design assessment

4.7.1.1. Access of renewable PPAs

Despite the absence of dedicated regulations for renewable PPAs, it can be concluded from the Energy Law and the Market Rules that participants in the wholesale market have the ability to engage in such agreements. Renewable electricity producers, regardless of project size or technology, have the right to sell their electricity to wholesale market participants, including retail suppliers, wholesale traders and consumers eligible for independent participation in the electricity market. Consumers eligible for independent participation in the electricity market are listed in the registry of market participants managed by MEMO and currently all listed entities are large industrial plants. The voltage level of the connection is a single criterion for consumers to qualify for independent participation in the electricity market. Specifically, consumers connected to the 110 kV or higher voltage grid operated by the TSO are eligible for independent participation.

Under the Energy Law, renewable electricity producers connected to the distribution grid, typically projects of up to 10 MW capacity (excluding those under FIT), can be aggregated into a virtual power plant. Managed by a virtual power producer, which can be an electricity producer or retail supplier, the virtual power plant aggregates the production of portfolio projects. It can manage their production for cost optimization and commercially integrate the output for participation in the wholesale market. There are no restrictions on the number of projects it can integrate, and the virtual power producer assumes balance responsibility for the aggregated projects.

Final customers or any other corporate consumers (like SMEs) who are not eligible for independent participation in the electricity market are unable to enter into a direct PPAs. Furthermore, the Energy Law does not recognize the possibility of aggregating the loads of multiple customers to facilitate access to the market and procure electricity from renewable projects. Also, the installation of smart meters would be necessary for the optimal operation of the independent aggregators, however the deployment of such smart meters in North Macedonia is progressing gradually and with slow intensity.

State-owned enterprises procure electricity through a regulated public procurement procedure. If a state-owned enterprise becomes a qualified consumer, arranging long-term PPAs may pose challenges under the Law on public procurement. Although there is no maximum duration term for a PPA specified in the Law on public procurement, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement programs, and the

contracting authority must allocate funds in the budget for the corresponding years covered by the contract. The current regulation does not impose restrictions or regulatory limitations on the type of technology or the capacity of the renewable electricity plant to be able to contract renewable PPAs.

Within the current regulatory framework, unlike the situation regarding physical PPAs which is subject to multiple constraints as detailed above, the implementation of a virtual PPA is feasible without the necessity of any regulatory intervention.

4.7.1.2. Trading rules

The market participants eligible to contract PPAs (specifically the renewable electricity producers, retail suppliers, wholesale traders), are required to hold respective licenses for their activities. The licensing rules are straightforward with no administrative barriers, and the licenses are issued within 30 days as of application.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the Regulatory Authority. Renewable electricity producers do not pay compensation for using the grid for dispatch of the produced electricity, they only pay for the electricity they withdraw from the system to optimize their production and costs.

Based on the Energy Law, the TSO and the DSO are obliged to guarantee objective, transparent, and non-discriminatory priority access and dispatch for renewable electricity producers. However, the TSO and the DSO may significantly limit these priorities when necessary for network stability and security of supply. The TSO and the DSO must notify the applied market-based mechanism to the Regulatory Authority. In respect of compensation for the curtailment, the Network Codes for Distribution and for Transmission specify that the TSO and DSO should apply market-based measures for restricting access and dispatching electricity, however there is no clear methodology provided to determine how the compensation is applied and determined.

4.7.1.3. Balancing rules

The renewable electricity producers (except the preferential renewable electricity producers granted with feed-in-tariffs for which the balance responsibility is assumed by MEMO), the retail suppliers, wholesale traders and the qualified consumers have balance responsibility.

The above market participants shall either be balance responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice (usually a utility). Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA. There is an established market practice where some wholesale traders and utilities act as intermediary players, providing balancing services. The balancing market in North Macedonia is functional on a market-based model. Procurement of balance capacity and balance energy is performed on a web-based platform operated by MEPSO, in a transparent and non-discriminatory manner through public auctions for capacity and energy.

According to the Balancing Rules, the settlement of activated balancing energy is based on the principle of Pay as Bid. There are price caps (price limits) for both upward and downward balancing energy (aFRR and mFRR). The price caps are related to the price at the day-ahead market. The imbalance settlement period is set to 1 hour and is significantly longer compared to the European target model of 15 minutes.

For the calculation of the imbalance of a balance responsible party, TSO applies the one single final position approach (single imbalance volume as a sum of its commercial trade schedules and internal commercial trade schedules). The price for imbalance settlement is calculated directly from the quantities and prices of the activated balancing energy products (aFRR, mFRR, RR). The applicable pricing method is a “single price” for positive and negative imbalances within an imbalance settlement period. The value of avoided activation of balancing energy is determined by the bid price, per direction, for balancing energy for frequency restoration process (aFRR) for the imbalance settlement period.

4.7.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

In North Macedonia, there are currently no domestic Energy Attribute Certificate schemes, and the country is not a member of the Association of Issuing Bodies (AIB). North Macedonia was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GOs. However, the direct agreement with the service provider responsible to set-up the register is not signed yet. Therefore, the launch of the national electronic registry of GOs is still pending. The absence of GOs for renewable electricity producers creates obstacles for PPAs, as corporate buyers cannot verify their purchase of green electricity without them.

The Energy Law permits renewable electricity producers (except the ones operating under support schemes) to obtain GOs. The specific rules governing GOs issuance, transfer, and termination are addressed in a secondary regulation, the Decree on GOs. MEMO is a nominated body for issuance of GOs and maintenance of the GOs registry.

The Energy Law provides that the GOs can be traded bundled with the physical electricity output under a PPA or separately of the electricity. The Rules for the Operation of the Organized Electricity Market establish the legal framework for GOs to be traded on the Organized Market operated by MEMO.

Additionally, the Energy law governs the possibility of recognition of GOs issued by a third country if they contain the elements provided with the Macedonian Decree on GOs necessary to inspect the validity of the GOs (time of issuance, time of validity etc).

According to the Renewable Energy Directive as applicable in the EU MSs, currently GOs to be issued in North Macedonia will not be recognised for disclosure in the EU MSs unless there is an agreement between North Macedonia and the European Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in North Macedonia, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.7.1.5. Support scheme

There is a moderate support scheme in place consisting of:

(i) support in the form of a fixed premium (FiP) available for wind power plants with an installed capacity of up to 50MW and photovoltaic power plants with an installed capacity of up to 30 MW. The renewable electricity producer awarded a FiP sells the electricity on the wholesale market and the FiP applies on top of the wholesale market price the producer achieves on the market. The wholesale market includes a buyer of last resort, chosen through a public tender by the Ministry of Economy. EDS is currently selected with a mandate until December 15, 2024.

The renewable electricity producers eligible for FiP are selected through public and competitive auction, with the actual FiP amount also determined through a competitive auction with negative bidding. The FiP are awarded to the investor who offers the smallest premium. The FiP has a tenor of 20 years for wind power plants and 15 years for photovoltaic power plants. Payments under the FiP are due after the commercial operation of the power plant. The Government adopts annual programs to determine which technologies will receive support and establish the maximum support rates. In its 2024 annual program for supporting RES projects, the Government has announced support exclusively for photovoltaic power plants with an installed capacity of up to 90 MW. The maximum fixed premium rate offered is EUR 15/MWh; and

(ii) feed-in tariffs (FiT) applied on a quota system – allocated on a first come, first served basis (available for small hydropower plants with capacity of up to 10MW with a tenor of 20 years; wind power plants with capacity of up to 50MW with a tenor of 20 years and biomass/biogas power plants with capacity of up to 1MW with a tenor of 15 years) where the entire electricity produced by a renewable electricity plant is purchased by MEMO at a predefined price. The tariff for the hydropower plants depends on the generation unit of each block and vary from €4,50/kWh to €12/kWh. For the wind power plants the tariff is €8,9/kWh, and €18/kWh for biomass/biogas power plants. The allocation quotas per technology were determined by a Government Resolution in 2019. As per the Regulatory Commission report until April 2024:

- o Small hydropower plants have no closed-end quota, with an installed capacity under FIT of 116MW.
- o Wind power plants have a quota of 160MW, with all quotas allocated.
- o Biomass power plants have a quota of 10MW, with a currently free quota of 6MW.
- o Biogas power plants have a quota of 20MW, with a currently free quota of 9MW.

Support schemes are awarded for integral power plants, meaning the renewable energy producer cannot have additional generation units within the supported plant and operate them independently outside of the scheme.

The presence of a strong support scheme for renewable electricity occasionally discourages the contracting of PPAs. Namely, the developers usually prioritize these options over entering PPAs with private entities.

4.7.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Incorporating of renewable PPAs in the regulatory framework	Yes	New Renewable Energy Law	A Renewable Energy Law to be adopted in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.
		Energy Law	Additionally, the Energy Law should be amended to enable corporate consumers to engage in PPAs, eliminating the restricted access currently limited to qualified corporate consumers. The law should also introduce the status of independent aggregators which will enable corporate consumers (SMEs) with relatively small load requirements to contract aggregated PPA.
			Additionally, the Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
B- Trading rules			
B1 – Regulation of redispatching regime for renewable electricity plants	Yes	Energy Law	The Energy Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It should also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements. Furthermore, the Energy Law shall regulate the exemptions when non-market-based redispatching of generation can be implemented, provided that North Macedonia fulfils the criteria for the exemption of market-based redispatching, in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	Energy Law	The Energy Law should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.
		Network code of TSO and DSO	Network code of TSO and DSO requires an amendment to incorporate methodology for curtailment compensation schemes in line with the amendments to the Energy Law.
C – Balancing rules			
C1 – Expanding the balance responsibility to all market participants	Yes	Market rules	The balance responsibility shall be applicable to all market participants, with derogations permitted in specific circumstances as determined with the Electricity Regulation. Therefore, the preferential renewable electricity producers granted with feed-in-tariffs which balance responsibility is currently backed up by MEMO, shall be balance responsible on a market base as any other market participant.
C2 – Establishment of the intraday market as a vital tool for market participants to balance their positions.	No	/	The establishment of intraday market is necessary in order the market participants to be able to balance their positions closer to real-time.
C3 – Revise the settlement mechanism for activated balancing energy	Yes	Balancing rules	The current Pay as Bid clearing method is a past practise on the European electricity market and this principle provides weak incentives, as opposed to marginal pricing. Therefore, the Balancing Rules should be amended to envisage the settlement of balancing energy for standard balancing products and specific balancing products to be based on marginal pricing (pay-as-cleared) in line with the EU Electricity Balancing Guideline (EB-GL) as adopted and adapted by Ministerial Council Decision 2022/03/MC-EnC. Additionally, the price limits introduced on balancing energy need to be reconsidered, as the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. prescribes that there shall be no technical price limits to balancing energy and imbalance prices.
C4 – Shorten the Imbalance settlement period	Yes	Balancing rules	The Balancing rules should be amended to incorporate the application of imbalance settlement period of 15 minutes.
C5- Imbalance price should reflect the real time value of energy	Yes	Balancing rules	Balancing energy prices are the main component for determining imbalance prices. The TSO should ensure that imposed maximum and minimum price limits for balancing energy promote market efficiency, protecting consumers from excessively high prices while incentivizing

BRPs to maintain balanced positions. These limits should also encourage participation by Balance Service Providers (BSPs) and maintain market liquidity.

If technical limits are unnecessary for balancing market efficiency, amendments to the Balancing Rules should allow imbalances to be settled at a price reflecting the real-time value of energy, aligning with the Electricity Regulation and Ministerial Council Decision 2022/03/MC-EnC.

D – GOs

D1- Adoption of the secondary legislation	Yes	New Decree on GOs	To necessary secondary legislation in order to regulate the process of issuance, trade and recognition of GOs in line with REDII and European standards.
D2- Removing the limits on supported RES project with FiP to receive Gos	Yes	Energy Law	Renewable electricity producers that receive FiP should be able to obtain GOs for their generated renewable electricity. The Government should consider the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding FiP for new projects.
D3- Enable the operation of the GOs registry	No	/	MEMO to put into operation the electronic registry for GOs.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing a two-way contract for difference.	Yes	Energy Law	The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Energy Law should abandon the feed in tariffs.
		Decree on support measures for production of electricity from renewable energy sources	New support scheme- ‘two-way contract for difference’ to be introduced. This is an investment support structured to provide the renewable electricity producer with minimum remuneration protection and a limit to excess remuneration. The renewable electricity producer sells the electricity in the wholesale market and settles the difference between the market price and the strike price agreed in advance with the public entity. Any revenues above the strike price are paid back to the state). This approach is in line with the RED II.

4.7.3. XB PPAs assessment

4.7.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in North Macedonia allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the "off-taker" party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs are the CPs themselves, as elaborated in the point 4.7.1.4.

Regarding physical cross-border PPAs, renewable electricity producers in North Macedonia have the right to sell electricity to market participants on the wholesale electricity market abroad. However, limitations exist for consumers, as the Energy Law specifies that qualified consumers can only procure electricity from abroad from a retail supplier or wholesale trader, but not directly from a renewable electricity producer.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering into long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed and the price is unpredictable, as being determined by capacity bids and prices during auctions. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

4.7.3.2. Market coupling and market liquidity

North Macedonia has an operational day-ahead market since May 2023. The day-ahead market is not coupled with neighbouring markets of the CPs and M.S.s. The intra-day market is not established however there is a regulatory framework in place for its establishment.

The Ministry of Economy prepared a draft Energy Law which transposes the EnC Electricity Integration Package, at the time of the report the draft law is still not submitted to Parliament for discussions and adoption. North Macedonia has signed a Memorandum of Understanding on coupling of day-ahead electricity markets of North Macedonia, Greece, Albania and Kosovo* in November 2023. Also, North Macedonia and Bulgaria have signed Memorandum of Understanding in 2018 for coupling of day-ahead markets.

4.7.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighbouring markets based on explicit auctions.

- o For the Kosovo* and Greece border there are yearly, monthly and daily auctions organised through SEECAO. On the MEPSO(MK)-KOSTT BORDER (Kosovo*) there is also an intraday auction organised bilaterally between the TSOs.

For the other markets, the auctions are organised bilaterally between the TSOs. On the MEPSO(MK)-ESO BORDER (BG) there are yearly, monthly, daily auctions. On the MEPSO (MK)-EMS BORDER (SRB) there are yearly, monthly, daily, intraday auctions. There are separate auction rules for each bidding border and each auction timeframe.

The capacity allocation methodology applied by the Macedonian TSO is regulated with the Rules for the allocation of cross-border transmission capacities adopted in 2019.

The TSO has not applied the harmonised allocation rules based on the Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation as adapted by Ministerial Council Decision 2022/03/MC-EnC.

North Macedonia's bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. Based on the publicly available data and the EnC Annual Implementation Report 2023, the TSO has not submitted a proposal for a common coordinated capacity calculation methodology to the Regulatory Authority. The TSO had not concluded agreements with neighboring EU TSOs (Bulgarian and Greece TSOs) as a basis for cooperation of the TSOs of MSs and CPs

Based on the Energy Law the TSO should make available to the participants of the electricity market the maximum available capacity of the interconnection lines. This should align with safety standards for both North Macedonia's electricity system and those of neighbouring CPs or MSs. However, the Energy Law does not set any targets for the TSO on making available cross-zonal capacity.

4.7.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Enable consumers to directly purchase electricity from renewable energy producers located abroad.	Yes	Energy Law	The existing clause in the Energy Law granting qualified consumers the right to procure electricity from abroad from a retail supplier or wholesale trader should be revised. This revision should extend this right to all consumers, whether natural or legal persons, allowing them to directly purchase electricity from a renewable electricity producer located on a territory of another CP or MS.
A2 – Granting forward transmission rights with longer durations	Yes	Rules for the allocation of cross-border transmission capacities	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights at a first place for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU 0 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	The Energy Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.
C – Cross-border capacity			

C1 – The TSO to apply the harmonised allocation rules	Yes	Energy Law Network code of TSO Rules for the allocation of cross-border transmission capacities	The Energy Law should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package.
C2 – The TSO to conclude agreements with the TSOs MSs	Yes	Energy Law	The Energy Law should be amended to regulate the obligation of the TSO to regulate the operations of the bidding zones with EU MSs with bilateral agreements. The TSO to conclude an agreement with the TSO of Bulgaria on the allocation platform to be used (regional or JAO) for forward capacity allocation auctions. Additionally, the TSO to sign cooperation agreements with the TSO of Bulgaria and Greece to govern bidding zone borders.
C3 – Providing targets for the TSO for available cross-zonal capacity	Yes	Energy Law Rules for the allocation of cross-border transmission capacities	The TSO shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside Macedonia bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the Energy Law and the Rules for the allocation of cross-border transmission capacities to the provide minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

4.7.5. RES Projects assessment

4.7.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

In North Macedonia, a simplified permitting process is in place for rooftop photovoltaic power plants with installed capacity of up to 1 MW. These projects do not require a construction permit for development. The technical documentation required for approval of the installation permit approval from the municipality is simplified compared to the standard documentation for construction permits.

However, the procedure for development and permitting of renewable electricity plants with an installed capacity of over 1MW is complex and lengthy as there are multiple authorities involved and there is no one-stop shop approach. There are no predefined zoning areas for renewable electricity plants and public consultation and stakeholder engagements are some of the components in the permitting process for renewable electricity plants.

There is no systematic approach for acceleration of renewable energy projects by way of simplified permitting processes tailored to specific renewable technologies. According to the Energy Law, there is a requirement for the Government to annually prepare an Indicative Plan for the development of renewable energy projects. This plan is intended to identify areas suitable for development of renewable electricity plants, considering factors such as land and network capacity in the chosen regions. However, as of now, such an indicative Plan has not been formally adopted.

Large-scale renewable energy projects (over 10MW) are required to obtain authorization from the Government for project development. Additionally, they must secure a construction permit within three years of receiving the authorization, otherwise the authorisation ceases to exist.

Renewable energy projects, regardless of their technology, can connect to either the distribution grid for projects up to 10MW or the transmission grid for projects exceeding 10MW in installed capacity. However, both grids currently experience demand that exceeds their available capacity.

Securing connection rights to the transmission grid is a significant concern for the development of large-scale RES projects. The TSO issues connection permits to RES projects without requiring financial guarantees or any other proof of financial capacity for development of the project, which in practice leads to reservation of network capacity for projects with uncertain development intentions. Consequently, investors with genuine commitment to proceed with development face higher costs for grid reinforcement to accommodate their projects. Moreover, investors holding connection permits from the TSO are entitled to obtain a construction permit for the connection point within 5 years and have an additional 10 years for actual construction. During such lengthy periods, the TSO reserves the network capacity for such projects, further complicating the allocation of grid resources to other projects or conditioning the connection with high costs for grid reinforcement.

4.7.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Adoption of Renewable Energy Law	The adoption of the draft Renewable Energy Law which should streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 – Adoption of the annual Indicative plan	No	/	The Government should adopt the annual Indicative plan as contemplated in the Energy Law. Such a plan, might help the investors of renewable electricity plants to choose adequate location for development of the projects and to save time for zoning procedures and uncertainties for grid connection.
A3 –Manage the high connection capacity demand through a queue management system	Yes	Network code of TSO	To prevent the virtual saturation of the grid due to slow-to-progress projects, the TSO should implement queue management system consisting of: - Transparent disclosure of the connection conditions and the available capacity for consistent substations, giving location signals; - Connection agreement should set specific milestones with deadlines for project progress; - Projects failing to meet milestones would enter a remedy period during which developers should address delay; - If milestone is not met, the connection agreement should be terminated - The TSO should have authority to charge the project a termination fee. - The TSO may require the project to provide a financial guarantee with the signing of the connection agreement for security of any termination event. As part of the milestones, the TSO should consider to shortening the timeframe for obtaining a construction permit for the connection point to two years. This duration allows investors sufficient time to gather the necessary technical documentation for permit acquisition. The duration

of the permit-granting procedure shall be automatically extended for the duration of any judicial proceedings or ADR mechanisms encountered by the project during the permit-granting procedure.

Law on
Construction

The construction permit validity for connection infrastructure to the transmission grid should be shortened from a maximum of 10 years to a maximum of 5 years.

4.7.7. Other applicable areas assessment

4.7.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any particular additional regulatory requirements (ex. authorisation requirements for financial instruments; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.7.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.7.7.3. Competition

The Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.7.8. Other applicable areas recommendations

No recommendations in this section.

Based on the CBAM, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PP. According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average emission factors by default. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

4.7.9. Sources

Abbreviation	Sources
Energy Law	Energy Law published in the Official Gazette of North Macedonia no.96/2018 and its subsequent amendments
Market rules	Market rules published in the Official Gazette of North Macedonia no. 234/2022 and its subsequent amendments
Balancing rules	Balancing rules published in the Official Gazette of North Macedonia no. 179/2019 and its subsequent amendments
Network code of TSO	Network code of TSO published in the Official Gazette of North Macedonia no. 4/2022
Network code of DSO	Network code of DSO published in the Official Gazette of North Macedonia no. 191/2019 and its subsequent amendments
Decree on support measures for production of electricity from renewable energy sources	Decree on support measures for production of electricity from renewable energy sources published in the Official Gazette of North Macedonia no. 29/2019 and its subsequent amendments
Rules for the allocation of cross-border transmission capacities	Rules for the allocation of cross-border transmission capacities published in the Official Gazette of North Macedonia no. 228/2019
Law on Construction	Law on Construction published in the Official Gazette of North Macedonia no.130/2009 and its subsequent amendments

4.8. Serbia

Serbia tends to support and promote renewable energy in line with strategic documents outlining energy transition and achievement of renewable targets. In general, the legal and regulatory framework is set up to encourage further investments in the renewable sector, including the conclusion and execution of PPAs.

However, Serbia should undertake certain activities, including the implementation of the Electricity Integration Package, in order for integration of electricity market with other markets of Energy Community CPs and EU.

4.8.1. Market design assessment

4.8.1.1. Access of renewable PPAs

As per the RES Law, natural persons and legal entities have the ability to engage in PPAs and to purchase electricity directly from renewable electricity producers.

The Energy Law recognises possibilities for market participation of multiple electricity consumers and multiple renewable electricity producers through aggregation of electricity consumption and generation from multiple power-generating facilities respectively to provide joint offers on the electricity market and be jointly operated in the electricity system. The electricity consumers as well as the renewable electricity producers can be aggregated and managed by an aggregator, which can be a legal entity or a natural person who provides services of aggregation of the consumption or the generation of electricity for the purpose of resale, purchase or auctions on the electricity market.

State-owned enterprises procure electricity through a regulated public procurement procedure. Arranging long-term PPAs may pose challenges for the state-owned enterprises under the Law on public procurement. Although there is no maximum duration term for a PPA specified in the Law on public procurement, the enterprise must budget funds for the PPA. Budgeting is conducted through annual procurement programs, and the contracting authority must allocate funds in the budget for the corresponding years covered by the contract.

The current regulation does not impose restrictions or regulatory limitations on the type of technology or the capacity of the renewable electricity plant to be able to contract renewable PPAs.

4.8.1.2. Trading rules

The market participants eligible to contract PPAs (specifically the renewable electricity producers, retail suppliers, wholesale traders), except the consumers, are required to hold licenses for their activities. The renewable electricity producers need a license for the production of electricity. There is a provided exception for the production of electricity in power plants with a total approved power of up to 1 MW, unless the same renewable electricity producer produces electricity in two or more energy power plants whose total approved power exceeds 1 MW, regardless of whether they are connected to the system via one or multiple connections. In addition to the license for electricity production which is sufficient when contracting PPAs with retail

suppliers or wholesale traders, the renewable electricity producers also need to have a supply license when contracting PPAs with final consumers who buy electricity for their own consumption. The electricity retail and wholesale trading are considered energy activities for which the energy license is needed, while the corporate off-takers are not required to obtain a specific license for conclusion and execution of a PPA. No distinction is made under the law based on whether the off-takers are residents or non-residents.

The licensing rules are straightforward with no administrative barriers, and the licenses are issued within 30 days as of application.

There are no obligations for renewable electricity producers for mandatory trade on the organized markets.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the Regulatory Authority.

Based on the RES Law, the TSO and the DSO are obliged to guarantee objective, transparent, and non-discriminatory priority access and dispatch for renewable electricity producers, specifically for the electricity produced in power plants with an approved power less than 400 kW, i.e. in. The 400 kW cap will be reduced to 200 kW for their power plants connected to the grid after 1 January 2026 with an approved power less than 200 kW, regardless of whether the renewable electricity producers are users of incentive mechanism. However, the TSO and the DSO may significantly limit these priorities when necessary for network stability and security of supply. The TSO and the DSO must notify the Regulatory Authority and the respective renewable electricity producers about the introduced limits, the undertaken measures as well as the measures that need to be undertaken to prevent possible future restrictions.

In respect of curtailment, the TSO and the DSO should apply market-based measures for restricting access and dispatching electricity.

4.8.1.3. Balancing rules

As per the Energy Law, all market participants have balance responsibility. Exception is provided with the RES Law regulating that the balance responsibility for the privileged renewable electricity producers granted with market premium is assumed by the guaranteed supplier. This exception will be in force until the end of six months from the date of merger of the organized intraday market of Serbia with the single European organized intraday market or at the end of 30 months from the date of establishment of the organized intraday market in Serbia, whichever period expires first. The guaranteed supplier also assumes the balance responsibility of the privileged renewable electricity producers granted with feed-in-tariffs (power plants with an approved power of 400 kW, i.e. from 1 January 2026, with an approved power of 200 kW) until the end of the incentive period.

The market participants shall either be balancing responsible parties or contractually delegate their balance responsibility to a balance responsible party of their choice. Each balance responsible party is financially responsible for its imbalances, which can affect the price certainty of the PPA. The balancing market in Serbia is functional on a market-based model.

The imbalance settlement period is set to 1 hour and is significantly longer compared to the European target model of 15 minutes.

4.8.1.4. GOs

GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity. GOs are crucial for PPAs as they enable industries and other consumers to demonstrate their consumption of renewable electricity.

The Serbian TSO has been assigned the role of a body for issuance of GOs in Serbia and maintenance of the GOs registry. The TSO is also a member of the Association of Issuing Bodies (AIB).

The RES Law permits renewable electricity producers (except the ones operating under support schemes) to obtain GOs and provides certain rules governing GOs issuance, transfer, and termination with indication that specific and detailed rules will be addressed in a secondary regulation. However, such secondary regulation is currently absent, creating a legal gap in the effective utilization of GOs.

The RES Law provides that the GOs can be traded bundled with the physical electricity output under a PPA or separately of the electricity. There is no secondary regulation adopted based on the RES Law regulating the trading of the GOs on the organized market.

Additionally, the RES Law governs the possibility of recognition of GOs issued by other countries under conditions of reciprocity in accordance with the ratified international agreements. The TSO is authorized to decide on the recognition of the respective GOs. Also, having in mind that the TSO is a member of the AIB, as per the law, the GOs issued in other countries will be valid in accordance with the rules of the respective association.

According to the Renewable Energy Directive as applicable in the EU MSs, currently GOs issued in Serbia are not recognised for disclosure in the EU MSs unless there is an agreement between Serbia and the European Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in Serbia, and only where there is direct import or export of energy.

On the 21st EnC Ministerial Council in December 2023, the European Commission presented an indicative roadmap for mutual recognition of GOs issued by CPs and EU MS. The Ministerial Council called on the European Commission to propose a decision for mutual recognition of GOs based on further discussions to be held at the EnC level.

4.8.1.5. Support scheme

There is a moderate support scheme in place consisting of:

(i) support in the form of a market premium available for hydro power plants with an approved capacity of up to 30 MW, biomass power plants, biogas power plants, wind power plants, photovoltaic power plants, geothermal power plants, biodegradable waste power plants, landfill gas power plants, gas-fired power plant from the wastewater treatment plant and power plants that uses other renewable energy sources. The renewable electricity producer awarded a market premium sells the electricity on the market. The market premium is determined in euro cents per kilowatt hour and its payment depends on the amount of the selling price. Namely, the guaranteed supplier shall reimburse the privileged producer the difference between the allocated market premium and the selling price if the selling price is lower than the allocated market premium, while the privileged producer is obliged to reimburse the

guaranteed supplier the difference between the selling price and the allocated market premium if the selling price is higher than the amount of the market premium.

The renewable electricity producers eligible for market premium are selected through public and competitive auction, with the actual market premium amount also determined through a competitive auction. The market premium has a tenor of 15 years as of the day of the first payment of the market premium. Payments under the market premium are made on a monthly basis for the electricity supplied to the electric power system. The Government adopts resolutions to determine which technologies will receive support and establish the maximum support rates. In June 2023, the Government approved a three-year auction plan 2023 - 2025 with a total capacity of 1 300 MW. An inaugural auction was held in June 2023 for wind (400 MW - maximum purchase price 105 EUR/MWh) and solar (50 MW - maximum purchase price 90 EUR/MWh) power plants.; and

(ii) feed-in tariffs (FiT) applied on a quota system – allocated through public and competitive auctions same as for the market premium (available for demonstration projects, power plants with capacity of up to 500 kW; and wind power plants with capacity of up to 3 MW, all with a tenor of 15 years) where the entire electricity produced by a renewable electricity plant is purchased by the guaranteed supplier at a predefined price.

Support schemes may be awarded just for part of the capacity of the power plants, meaning the renewable energy producers can have additional generation units and operate them independently outside of the scheme.

The presence of a strong support scheme for renewable electricity occasionally discourages the contracting of PPAs. Namely, the developers usually prioritize these options over entering PPAs with private entities

4.8.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A - Access of renewable PPAs			
A1 – Introducing a state-backed guarantee scheme for SMEs	Yes	RES Law	The Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements.
B - Trading rules			
B1 – Regulation of redispatching regime for renewable electricity plants	Yes	RES Law	The RES Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It shall also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements.
C – Balancing rules			
C1 – Expanding the balance responsibility to all market participants	Yes	RES Law	The balance responsibility shall be applicable to all market participants, with derogations permitted in specific circumstances as determined with the Electricity Regulation. Therefore, the preferential renewable electricity producers granted with market premium and feed-in- tariffs which balance responsibility is currently backed up by the guaranteed supplier, shall be balance responsible on a market base as any other market participant.
C2 – Shorten the Imbalance settlement period	Yes	Market rules	The Market rules should be amended to incorporate the application of imbalance settlement period of 15 minutes.
D – GOs			
D1- Adoption of the secondary legislation	Yes	New Decree on GOs	Secondary legislation needs to be adopted in order to regulate the process of issuance, trade and recognition of GOs in line with REDII and European standards.

D2 - Removing the limits on RES project under supported schemes to receive GOs	Yes	RES Law	Renewable electricity producers under supported schemes should be able to obtain GOs for their generated renewable electricity. The Government should consider the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding incentives for new projects.

E – Support scheme

E1 – Phasing out non-market-based state support	Yes	RES Law	The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the RES Law should abandon the feed in tariffs.

4.8.3. XB PPAs assessment

4.8.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in Serbia allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the “off-taker” party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs are the CPs themselves.

Regarding physical cross-border PPAs, renewable electricity producers in Serbia have the right to sell electricity to market participants on the wholesale electricity market abroad. Also, there are no legal limitations for consumers to procure electricity from abroad from a renewable electricity producer.

Facilitating physical XB PPAs presents challenges due to the lack of established practices for allocating transmission rights with a tenure of 5 years or more. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, potentially involving transit markets. However, transmission rights are typically allocated on an annual basis through explicit auctions, with a maximum tenure of one year. This creates uncertainties for parties entering into long-term XB PPAs, as the allocation of transmission rights in subsequent years is not guaranteed. Additionally, uncertainties surround the pricing of capacity allocation tariffs, which are determined annually by the TSO. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

4.8.3.2. Market coupling and market liquidity

Serbia has an operational day-ahead market since 2016, while the intraday electricity market has been established in July 2023. SEEPEX is the nominated electricity market operator (NEMO) that is responsible for coupling the day-ahead and the intraday electricity markets with the neighbouring organized electricity markets.

Serbia, Slovenia and Hungary signed a partnership agreement to merge their power electricity exchanges under Adex Group, owned by their transmission system operators (EMS, ELES and MAVIR) and EPEX Spot.

There are plans for coupling the Serbian market with the markets of Bulgaria and Croatia, as well as with Albania, Italy and Montenegro.

4.8.3.3. Cross-border capacity

The cross-border capacity allocation is operational with the neighbouring markets, except for Kosovo*.

- o For Croatia, Hungary and Bulgaria border auctions (yearly, monthly, daily) are organised through the Joint Allocation Office S.A. (JAO), while the intraday auctions are organised by the TSO of Serbia.
- o For North Macedonia, Bosnia and Hercegovina, Montenegro, and Romania the auctions (yearly, monthly, daily, intraday) are organised bilaterally between the TSOs.

There are separate auction rules for each bidding border and each auction time frame.

The right to use cross-border transmission capacities is granted in accordance with agreed technical criteria for the operation of connected transmission systems and the Rules on the allocation of cross-border transmission capacities from 2017, adopted by the TSO with an approval of the Regulatory Authority.

The TSO has not applied the harmonised allocation rules based on the Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation as adapted by Ministerial Council Decision 2022/03/MC-EnC.

Serbia's bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. Based on the publicly available data, the TSO has not submitted a proposal for a common coordinated capacity calculation methodology to the Regulatory Authority.

Based on the Energy Law the TSO should make available to the participants of the electricity market the maximum available capacity of the interconnection lines. This should align with safety standards for both Serbia's electricity system and those of neighbouring CPs or MSs. However, the Energy Law does not set any targets for the TSO on making available cross-zonal capacity.

4.8.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			
A1 – Granting forward transmission rights with longer durations	Yes	Rules for the allocation of cross-border transmission capacities	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights at a first place for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Energy Law	The Energy Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.
C – Cross-border capacity			
C1 – The TSO to apply the harmonised allocation rules	Yes	Energy Law Rules on operation of the transmission system	The Energy Law should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package.

		Rules on the allocation of cross-border transmission capacities	
C2 – Providing targets for the TSO for available cross-zonal capacity	Yes	Energy Law	The TSO shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside Serbian bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the Energy Law and the Rules on the allocation of cross-border transmission capacities to provide minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.
		Rules on the allocation of cross-border transmission capacities	

4.8.5. RES Projects assessment

4.8.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

There are multiple authorities involved in the procedure for construction and development of the renewable electricity plants and there is no one-stop shop approach. There are no predefined zoning areas for renewable electricity plants and public consultation and stakeholder engagements are some of the components in the permitting process for renewable electricity plants.

In Serbia, a simplified permitting process is in place for photovoltaic modules on rooftops built on the same parcel plot as the main structure and not connected to the distribution grid. These projects do not require a construction permit for development.

If the power plant is to be with a capacity of 1 MW or more, prior to the filing of the request for obtaining a construction permit, the renewable electricity producers should first obtain energy permit from the Ministry of Energy. The renewable electricity producers must secure a construction permit within three years of receiving the energy permit, otherwise the permit ceases to exist. There is no need for obtaining such a permit for the power plants with capacity of less than 1 MW.

As per the environmental regulation, depending on the power of the power plants, it may be necessary for an environmental impact assessment to be prepared by the renewable electricity producers and approved by a competent authority. As per the applicable regulation, power plants with a capacity of 50 MW or more, including the PV power plants, are required to prepare an EIA. It is specifically provided that for the power plants with a capacity ranging from 1 MW to 50 MW, for the hydroelectric power plants with a capacity exceeding 2 MW and for the wind power plants with a capacity exceeding 10 MW, a competent authority decides whether an EIA is needed.

Power plants are built in accordance with the Law on Planning and Construction. Depending on the capacity of the renewable electricity plants, the renewable electricity producers for the plants with a capacity of 10 MW or more, shall obtain a construction permit from the Ministry of Construction, Transport and Infrastructure or from the autonomous province, while the renewable electricity producers for the plants with a capacity of less than 10 MW, should obtain a construction permit from the respective municipality.

There is no systematic approach for acceleration of renewable energy projects by way of simplified permitting processes tailored to specific renewable technologies.

Renewable energy projects, regardless of their technology, can connect to either the distribution grid for projects up to 10MW or the transmission grid for projects exceeding 10MW in installed capacity. However, both grids currently experience demand that exceeds their available capacity. The RES Law provides a mechanism that to a certain extent address the grid overloaded and congestion, allowing the DSO to give grid connection agreements for up to 80% of the capacity of the substation. This limit applies for substations with a capacity up to 16 MW.

Also, as per the RES Law, the distribution system operator must limit the connected renewable power plants to 80% of the capacity of the substation at the point of delivery of electricity to the transmission system, if the total power that is transmitted from the distribution system into the transmission system in the substation is up to 16 MW. Securing connection rights to the transmission grid is a significant concern for the development of large-scale RES projects. The TSO issues connection permits to RES projects requiring an on-demand financial guarantee for development of the projects which should be delivered to the TSO within 60 days of the delivery of the connection study. As per the applicable bylaw, the guarantee should be in the amount determined proportionally to the capacity of the power plant (25,000 EUR per MW). Moreover, the investors who have concluded a connection contract with the TSO (this contract must be concluded within 60 days as of the delivery of the guarantee), are entitled to obtain a connection approval within 3 years as of the conclusion of the connection contract. During such lengthy periods, the TSO reserves the network capacity for such projects, further complicating the allocation of grid resources to other projects or conditioning the connection with high costs for grid reinforcement.

4.8.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	RES Law	The adoption of the amendments to the RES Law which should streamline and simplify the permit-granting procedure for RES projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.

4.8.7. Other applicable areas assessment

4.8.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA would be possible without any particular additional regulatory requirements (ex. authorisation requirements for financial instrument; reporting requirements etc.). Given the lack of specific regulation and practice, however, some regulatory challenges remain mostly in the accounting treatment of the virtual PPAs.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.8.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.8.7.3. Competition

The Competition law does not pose any restrictions on the consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years)

4.8.8. Other applicable areas recommendations

No recommendations in this section.

Serbia has not established a national carbon pricing mechanism in line with EU ETS to internalize the cost of carbon emissions. Serbia set up the legal base for MRVA package as adapted and adopted by Ministerial Council Decision 2022/05/MC-EnC of 15 December 2022 in its Law on Climate Change in 2021 and the three secondary acts in 2023 related to the types of activities and GHGs to be subject to the MRVA, to the verification and accreditation of verifiers of reports on GHG emissions and to the monitoring and reporting of GHG emissions. Based on the CBAM, the companies of third countries affected by the CBAM (producers of carbon intensive goods) would be able to declare actual indirect emissions in the production process (instead of default values) if they have concluded a renewable PPA. According to the CBAM guidance, in the first tier, self-generation and directly connected renewable electricity sources are accepted for exemption of indirect emission application. In this tier physical PPAs are also considered as eligible. If the company cannot relate to consumption from actual renewable sources, companies should use country or regional average emission factors by default. However, this indicates that using market-based instruments such as GOs for declaring renewable energy sources is not accepted.

4.8.9. Sources

Abbreviation	Sources
Decree on market premium and feed in tariff	Decree on market premium and feed in tariff published in the Official Gazette of Serbia no.112/2021 and its subsequent amendments
Energy Law	Energy Law published in the Official Gazette of Serbia no.145/2014 and its subsequent amendments
Law on Climate Change	Law on Climate Change published in the Official Gazette of Serbia no.26/2021
Law on Planning and Construction	Law on planning and construction published in the Official Gazette of Serbia no.72/2009 and its subsequent amendments
Law on Public Procurement	Law on public procurement published in the Official Gazette of Serbia no.91/2019
Market rules	Market rules dated 28 November 2022, published on the website of the Serbian TSO
RES Law	Law on the Use of Renewable Energy Sources published in the Official Gazette of Serbia no.40/2021 and its subsequent amendments
Rules on the allocation of cross-border transmission capacities	Rules on the allocation of cross-border transmission capacities dated 29 November 2017, published on the website of the Serbian TSO
Rules on operation of the transmission system	Rules on operation of the transmission system dated 7 November 2023, published on the website of the Serbian TSO

4.9. Ukraine

Despite the Russian attacks on the Ukrainian energy infrastructure, Ukraine has created favourable conditions for the development of green energy in recent years.

Regulatory updates in Ukraine are expected in the coming years, related with the transposition of the new electricity integration package, are expected to send strong message to investors. The adoption of the secondary legislation should increase the interest of the business sector to engage in renewable PPAs.

On 10 June 2023, the Law on Amendments to Certain Laws of Ukraine on Prevention of Abuse in Wholesale Energy Markets was adopted ("**Law on REMIT**"). The Law implements EU Regulation (EU) No 1227/2011 on Wholesale Energy Market Integrity and Transparency (REMIT), introducing rules and practices aimed at preventing abuse in the energy market, as well as introducing amendments regarding the cross-border capacity allocations.

On June 30, 2023, the Ukrainian Parliament adopted the Law on Amendments to Certain Laws of Ukraine on the Restoration and Green Transformation of the Energy System of Ukraine (the "**Green Transformation Law**"). The legislation introduces changes to the regulation of "green" auctions, Guarantees of Origin ("**GoOs**"), and Contracts for Differences ("**CfD**"), as well as have introduced new support instruments, such as the market premium mechanism and the self-consumption mechanism. The law also eliminates the regulatory obstacles for the conclusion of Corporate Power Purchase Agreements ("**PPAs**").

The transposition of the Electricity Integration Package and related legislations like the Law on REMIT, alongside ongoing efforts for regulatory compliance, bring Ukraine closer to integration with the European energy market. However, further steps are required to fully realize this integration, including the formal approval of critical primary and secondary legislations, which will create positive environment for renewable PPAs.

4.9.1. Market design assessment

4.9.1.1. Access of renewable PPAs

In Ukraine the renewable electricity producers can conclude bilateral contracts under freely negotiated conditions, where the prices, volumes, delivery times and other conditions are agreed between producers and buyers.

The Green Transformation Law removed significant regulatory restriction for the PPAs, especially by removing provisions allowing the regulator to limit the maximal duration (of 12 months) of the PPAs executed by the renewable electricity producers, amending the regulation of virtual PPA, and creating the legal framework for implementation of GOs.

As of 1 January 2019, the supply of electricity to consumers is carried out at freely negotiated prices, except for households, small non-household consumers (with capacities of up to 50 kW) and some other categories of consumers listed in the law, which have the right to be supplied by a universal service supplier at regulated prices. Consequently, it can be concluded that Ukraine's retail electricity market is substantially liberalised, and all consumers

have the right to choose suppliers at unregulated prices. Non-household consumers with capacities above 50 kW are not entitled to universal service supply and must purchase electricity at freely negotiated prices in the commercial segment. The supply of electricity at freely negotiated prices is arranged through contracts drawn up by suppliers based on a model contract set out in the Retail Market Rules. However, the prices, payment methods and termination procedures can be freely agreed between suppliers and customers.

In respect of Virtual PPAs, the Green Transformation Law, among others, introduced several amendments that creates framework for implementing a service by renewable electricity producers to ensure electricity price stability through an agreement concluded between them and a consumer. In substance, such framework allows for CfD services between the producer and a consumer without the need for actual exchange of electricity. Only non-supported renewable electricity producers are eligible for such contracts. The term of the contract must be at least 1 year and is not subject to an approval by the regulator or any other authority and may be concluded at any time during the commissioning or operation of the RES system. The Transmission System Operator (TSO) should be notified within 5 days of the conclusion of such a contract, without thereby disclosing any confidential information on the terms and conditions of the contract.

These amendments allow renewable electricity producers to find counterparties for long-term PPAs and Virtual PPAs even at the project development stage.

Irrespective of project size or technology, renewable electricity producers can sell their electricity to wholesale market participants, including retail suppliers, wholesale traders and qualified consumers and aggregators (electricity consumers with a total minimum consumption capacity of their installations of 600 GWh per year, and/or consumers who have acquired (intend to acquire) the status of an electricity market participant). Accordingly, there are no legal restrictions for a non-supported renewable electricity producer to directly conclude PPAs with the market participants on the wholesale market. In accordance with the Green Transformation Law, the aggregators operate in the electricity market as a single electrical installation. Aggregation activities are carried out based on agreement on participation in the aggregated group, where the essential terms are determined with the Market Rules. Aggregators combine consumers and small electricity producers (with capacities up to 20 MW) into a kind of virtual power plant that can buy and sell electricity and provide other services in the electricity market.

Under the Law on Electricity Market, there is a possibility of direct transmission of energy from a renewable electricity producer to its premises/neighboring subsidiaries and to other consumers via direct line (private wires), following the regulatory approval for construction and operation of such direct line. Such legislation effectively promotes behind-the-wire, on-site, near-site PPAs.

State-owned enterprises procure electricity through a regulated public procurement procedure. A state-owned enterprise arranging long-term PPAs may pose challenges under the Law on Public Procurement. Although there is no maximum duration term for a PPA specified in the Law on Public Procurement, the enterprise must budget funds for the PPA.

4.9.1.2. Trading rules

The market participants are required to hold respective licenses for their activities. The licensing rules are straightforward with no administrative barriers. Furthermore, with a Decision of the NEURC from 4 October 2023, all participants on the wholesale electricity market are required to be registered as a wholesale electricity market participants and acquire ECRB code, latest by 1 April 2024.

Under the applicable laws, renewable electricity producers are allowed to sell electricity directly on the day-ahead market (“DAM”), intraday market (“IDM”), bilateral and balancing (“BM”) markets. Most bilateral agreements are concluded on the platform operated by the Ukrainian Energy Exchange (“UEEX”), however there is no mandatory obligation for renewable electricity producers to sell electricity under bilateral contracts at electronic auctions. There is no limit for the maximum duration of bilateral contracts for renewable electricity producers. Renewable electricity producers can enter CfD not only with consumers but also with electricity suppliers or traders.

Spot markets consist of the DAM and the IDM where the prices are formed according to market principles. The pricing principle for the DAM is marginal pricing based on the balance of total demand and supply. For the IDM, the pricing principle is pay-as-bid. In the event of a substantial price fluctuation, the National Energy and Utilities Regulatory Commission (“NEURC”) was empowered to set price caps (temporary minimum and/or maximum price limits) on the DAM, the IDM, and the BM. However, NEURC prepared a draft amendment of the decision for cancelation of the price caps on the DAM and IDM markets as of 29 April 2024, thus minimizing the regulatory impact on the electricity market and ensuring its competitive operation and liberalization. The EnC Secretariat evaluated the amendments proposed by NEURC as a positive step. It should be noted however that the price cap in the BM of ~EUR 195/MWh remains in force.

Charges applied by grid operators for access to grids, including charges for connection to the grids and the charges for the use of grids are public, transparent and approved by the NEURC.

In accordance with the legislation, the TSO and the DSO are obliged to guarantee objective, transparent, and non-discriminatory priority access and dispatch for renewable electricity producers. However, the TSO and the DSO may significantly limit these priorities when necessary for network stability and security of supply. The TSO and the DSO must notify the applied market-based mechanism to NEURC. In respect of compensation for the curtailment, the Electricity Market Law provides that the cost of electricity which has not been delivered due to execution of the TSO’s dispatch commands to reduce load shall be compensated at the rate of the awarded FiT, or at an auction price. The only exception could be situations in which commands are given in the event of network constraints due to force majeure circumstances. However, there is no clear methodology provided to determine how the compensation is applied and determined for non-supported renewable electricity producers.

4.9.1.3. Balancing rules

The Ukrainian BM began operating on 1 July 2019, at the same time as the DAM and the IDM. It is organised by the Ukrenergo and functions as a daily auction in which market participants offer balancing energy to the TSO based on their marginal costs. The TSO acts as the single buyer on the BM. On the supply side, balancing service providers (“BSPs”) offer balancing services to the TSO. In principle, the actual power generation and consumption of market participants should equal their planned generation and consumption, or schedule. In cases of deviations, market participants are financially responsible

for their imbalances towards Ukrenergo. To this end, each market participant must either become a balancing responsible party (“BRP”) or join a balancing group. In the latter case, the financial responsibility for the group’s aggregated imbalance resides with the group BRP. For renewable electricity producers under the feed-in-tariff (“FiT”), the GB formed a balancing group and assumed responsibility for balancing the entire portfolio. However, as of 2021, renewable electricity producers under the green tariff are obliged to bear a share of 10% of imbalance costs they produced. It is foreseen that the share is going to increase every following year by 10% so in 2030, renewable electricity producers will be fully responsible for their imbalances.

BRPs are market participants with a financial responsibility for their individual imbalances.

Based on the need for balancing, the TSO procures balancing capacity from BSPs. Depending on the system imbalances, it activates capacity and receives balancing energy. The final phase of trading on the BM is the balance settlement. BSPs are remunerated for the balancing services they provide, while the BRPs bear the costs of their imbalances.

BSPs are required to offer positive and negative energy to Ukrenergo for each settlement period of the trading day, which starts at midnight Kyiv time. The settlement period, the basic time unit of the balancing market, consists of a block of 15 minutes. Offers for each settlement period can be submitted up to 45 minutes before its start (BM gate closure).

For each settlement period, Ukrenergo determines the overall positive or negative balance of the system and establishes the market price based on the offers received from BSPs. In cases of deficits in the system, the highest accepted offer (for upward balancing energy) determines the market price. In cases of surpluses, the lowest accepted offer (for downward balancing energy) determines the market price. Prices for balancing energy are set in UAH/MWh and must be greater than zero.

In addition to buying balancing energy, Ukrenergo also procures ancillary services for regulating the network, which ensures the frequency remains at 50 Hertz and that the system can be restarted in cases of partial outages or complete shutdowns. Only units certified by the TSO can provide these ancillary services (Ukrhydroenergo, DTEK, Kharkiv CHP-5, and Energoatom).

The TSO has the right to issue dispatch instructions to decrease load for renewable electricity producers under the green tariff only if all available offers (bids) from other BSPs for the decrease of their load have been accepted by the TSO, except for cases of issuing such instructions under system constraints which are the result of force majeure circumstances.

4.9.1.4. GOs

The Green Transformation Law sets the new rules related with the GOs as a crucial enabler for PPAs as they provide industries and other consumers possibility to demonstrate their consumption of renewable electricity.

Under the law, GOs are certificates issued to renewable electricity producers to certify the green nature of their electricity. These certificates are subsequently transferred to the purchaser of renewable electricity.

In Ukraine, there are currently no domestic Energy Attribute Certificate schemes, and the country is not a member of the Association of Issuing Bodies (AIB). Ukraine was part of the regional project initiated by the Energy Community Secretariat to support the CPs in establishment of EU compatible electronic registry for GoOs. Ukraine has signed agreement for GoOs registry implementation, however the launch of the national electronic registry of GoOs is still pending, but based on publicly available information it is expected that the registry will become fully operational in June or July 2024. The absence of GoOs for renewable electricity producers creates obstacles for PPAs, as corporate buyers cannot verify their purchase of green electricity without them.

The legislation permits renewable electricity producers (except the ones operating under support schemes) and consumers with self-consumption to obtain GOs for renewable produced electricity. NEURC is responsible for issuing, circulating, and retiring GOs, as well as for maintaining the registry.

Under the law, GOs are issued for a volume of 1 MWh, where the circulation of an issued GOs is limited to 12 months as of the issuance and the validity is limited to 18 months from the date of producing the electricity volume for which the guarantee is issued.

The law provides that the GOs can be traded bundled with the physical electricity output under a PPA or separately of the electricity. Under the law, the Market Operator is entitled to approve the rules for the sale of GOs on its platform, ensure the operation of such a trading platform, and set the price of services for organising trading in GOs on its trading platform. To confirm that the electricity sold by the renewable electricity producer under such a contract is generated from RES, the parties may include conditions for the transfer of guarantees of origin of electricity. The parties must inform the NEURC about the conclusion of the contract. NEURC, in turn, updates the relevant information in the register of electricity facilities and generating units of consumers using alternative energy sources for electricity production.

Additionally, the legislation governs the possibility of recognition of GOs issued by a third country. Recognition of GOs produced outside Ukraine, as well as termination of Ukrainian GOs outside of Ukraine, will be carried out based on international treaties. If the NEURC does not recognize a GOs produced in a country of the European Energy Community, it must inform the ECS.

Renewable electricity producers entitled to GOs are subject to inspections by the NEURC. Generation installations of the consumer are subject to inspections by the respective system operator. In case of inaccuracy of data submitted to the registry, the respective RES installations are excluded from the Registry; registration of the installation in the Registry can be repeated after a six-to-36-month period (depending on the percentage of non-compliant electricity in the total volume of registered GOs).

In respect of the renewable electricity producers operating under support schemes - those GOs automatically transfer to the GB, and GOs of prosumers with the green tariff automatically transfers to the respective universal services supplier that buys electricity from them at the established green tariff. The GB and universal services suppliers are entitled to sell GOs and use respective proceeds for payments for electricity to renewable electricity producers.

According to the Renewable Energy Directive as applicable in the EU MSs, currently GOs to be issued in Ukraine will not be recognized for disclosure in the EU MSs unless the conclusion of an agreement between Ukraine the European Union on mutual recognition of GOs issued in the Union and compatible GOs systems established in Ukraine, and only where there is direct import or export of energy.

4.9.1.5. Support scheme

In Ukraine there is a strong support scheme in place.

The "green" FiT model, which was initially adopted to support renewable energy, ultimately proved unsustainable due to its lack of market pricing. In accordance with the model, the renewable electricity producers sell their output to the GB at the applicable FiT and the GB resells it on the wholesale market (through electronic auction on the DAM or the IDM). The renewable electricity producer signed contracts with the GB and became members of the BG of the GB, which is the party responsible for the balance for such producers and is obliged to buy all the electricity released by such producers.

The Green Transformation Law introduced the Feed-in-Premium (FiP) mechanism as a new support mechanism for renewable electricity producer who either have a FiT tariff or have acquired support through an auction. Under this mechanism, GB will pay renewable electricity producers the difference between the FiT tariff or auction price and the reference price. The renewable electricity producers eligible for FiP are selected through public and competitive auction, with the actual FiP amount also determined through a competitive auction, in line with Article 4 of REDII.

The FiP secured that the renewable electricity producers will sell their produced electricity on the organized market or with bilateral agreements. Consequently, the renewable PPAs are compatible with the FiP support scheme (opposite to FiT). Namely, the renewable electricity producers awarded with the FiT can only enter into a PPA with the GB and are not allowed to engage in a bilateral long-term PPA with consumers.

Furthermore, the law clarified that the switch of the FiT beneficiaries to FiP beneficiaries would not result in the amendment of FiT levels of the concerned renewable electricity producer in case they later decided to return to the FiT scheme. Namely, renewable electricity producers with the FiT may exit GB's balancing group (subject to 20-day prior notice), suspend the agreement for selling electricity with the GB and execute the FiP Agreement based on the standard form to be adopted by the NEURC for the term of the FiP. Alternatively, electricity producers may also terminate the PPA and later it may re-execute the PPA.

The law envisaged auctions as of 1 July 2023 for a market-based mechanism and limit the application of the existing FiT tariff to small producers (below 500 kW of installed capacity).

Under the FiP scheme, the successful bidder is offered a contract with the state-owned offtaker, the GB, who then pays the service to the bidder in the amount of difference between the established FiT/auction price and the larger of the average index prices in the day-ahead market or regulated bilateral contracts market, as determined by the law.

Additionally, the law shortens the commissioning period for auction winners producing electricity from solar energy from 2 years to 18 months from the date of entering the FiP service contract. For other RES projects, the commissioning period remains unchanged at 36 months from the date of the corresponding contract. Furthermore, the support duration for auction winners has been reduced from 20 to 12 years.

To receive support through the FiP mechanism, renewable electricity producers must enter the corresponding contract with GB, the standard form of which is approved by the NEURC. Additionally, renewable electricity producers with a FiT tariff must exit GB's balancing group.

The presence of a strong support scheme for renewable electricity occasionally discourages the contracting of PPAs. Namely, the developers usually prioritize these options over entering PPAs with private entities.

4.9.2. Market design recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Access of renewable PPAs			
A1 – Incorporating of renewable PPAs in the regulatory framework	Yes	New Renewable Energy Law	A Renewable Energy Law to be adopted in line with the RED II as adapted and adopted by Ministerial Council Decision 2021/14/MC-EnC will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis.
		Electricity Market Law	The Electricity Market Law should be amended to enable corporate SME consumers to engage in PPAs, eliminating the restricted access currently limited to qualified corporate consumers.
			The Government can introduce a state-backed guarantee scheme for SMEs to leverage the risk of off-taker default, which is commonly associated with the SMEs in the PPA arrangements. Such possibility could significantly contribute to de-risking renewable PPAs via credit guarantees or insurances supported by public financial resources. Such a measure would be in line with the EU Commission Recommendation from 18 May 2022.
		TBD	Adoption of guidelines for producers and consumers related with the renewable PPA. The guidelines could provide a standardized PPA templates, including flexible contracting for SMEs, specific guidance for contract termination fees for small enterprises, etc. (In line with Art. 12 of the Electricity Directive).
			Encouraging the state-owned producers to engage in signing “sleeving contracts” in case of renewable PPAs for the additional electricity needed by the corporate consumer. If there is no interest from the commercial suppliers to engage in such “sleeving” arrangements, initially the state-

owned producers could undertake such practice.

Recognising long-term renewable PPA in the public procurement legislation through auction/tendering process. Such amendments could increase the interest of state-owned entities to engage in renewable PPA.

Introduction of non-solicited Public Private Partnership in the Law on Public-Private Partnership for renewable projects. Such possibility could significantly increase the interest of the investors for development of renewable projects on state-owned property (state-owned lands, offshore/onshore wind farms, rooftop PVs on state/municipality buildings, etc).

B- Trading rules

B1 – Regulation of redispatching regime for renewable electricity plants	Yes	Electricity Market Law	The Electricity Market Law shall provide comprehensive rules for implementation of the market-based mechanisms for redispatching and the financial compensation. It should also establish a system for greater transparency regarding the activated redispatching mechanisms, indicators on the incurred costs, the duration of redispatching, congested network elements. Furthermore, the Electricity Market Law shall regulate the exemptions when non-market-based redispatching of generation can be implemented, especially for the non-supported renewable electricity producers.
B2 – Regulation of the financial compensation in case of curtailment of renewable energy plants	Yes	Electricity Market Law	The Electricity Market Law should regulate the elements to be considered in calculating the financial compensation of non-market based redispatched generation.
		Network code of TSO and DSO	Network code of TSO and DSO requires an amendment to incorporate methodology for curtailment compensation schemes in line with the amendments to the Electricity Market Law.

C – Balancing rules

C1 – Remove the price cap on the BM	Yes	Resolution on marginal prices in the day-ahead market, intraday market and balancing market	The price limits introduced on balancing energy need to be reconsidered, as the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. prescribes that there shall be no technical price limits to balancing energy and imbalance prices.

D – GOs

D1- Adoption of the secondary legislation	Yes	New Decree on GOs	A necessary secondary legislation in order to regulate the process of issuance, trade and recognition of GOs in line with REDII and European standards.
D2- Removing the limits on supported RES project with FiP to receive Gos	Yes	Green Transformation Law	Renewable electricity producers that receive FiP should be able to obtain GOs for their generated renewable electricity. The Cabinet of Ministers should consider the market value of the GO and accurately reflect it in the support scheme during the tendering procedure for awarding FiP for new projects.
D3- Enable the operation of the GOs registry	No	/	NEURC to put into operation the electronic registry for GOs.

E – Support scheme

E1 – Phasing out non-market-based state support and introducing a FiP (two-way CfD).	Yes	Green Transformation Law	The strong non-market-based state support schemes mean a lack of incentive for developers to sign PPAs. Therefore, the recommendations are that the Green Transformation Law should abandon the FiT even for small-scale installations (below 500 KW).

4.9.3. XB PPAs assessment

4.9.3.1. XB PPAs

Cross-border PPAs are already possible with virtual PPAs. The current regulation in Ukraine allows the renewable electricity to be unbundled from the GOs, allowing free transfer of the GOs to the “off-taker” party in the virtual PPA. However, the important step for effective execution of GOs in XB PPAs is the mutual recognition of GOs between the EU and CPs are the CPs themselves.

Regarding physical cross-border PPAs, renewable electricity producers in Ukraine have the right to sell electricity to market participants on the wholesale electricity market abroad. However, the cross-border physical PPAs (as allowed with amendments in Ukrainian regulation) are hard to facilitate because the transmission capacity allocation on all interconnectors with the neighbouring countries is done on an annual basis on explicit auctions (no practice of allocation timeframes of 10-15 years). The auctions are conducted by the TSOs to allocate free capacity for short-term, medium-term, and long-term periods, ensuring compliance with safety standards and operational commitments. Daily auctions allocate 30% of available interstate network capacity, monthly auctions allocate 35% and annual auctions allocate 35%, ensuring compliance with safety standards and joint operation agreements as mandated by legal requirements, which are way below compared with the EU target of 70%.

This imposes challenges for the physical XB PPAs. Parties involved in XB PPAs must secure transmission rights from the plant location to the off-taker location, with uncertain transmission rights in subsequent years. Additionally, uncertainties surround the pricing of capacity allocation tariffs, which are determined annually by the TSOs. Addressing these challenges requires establishing mechanisms for allocating transmission rights with longer tenures, facilitating the smooth execution of XB PPAs in the electricity market.

4.9.3.2. Market coupling and market liquidity

Ukraine has an operational DAM and IDM markets since July 2019. The spot markets are not coupled with neighbouring markets of the CPs and M.S.s. On December 16, 2022, state-owned “Market Operator” received consent from all European market operators and transmission system operators to become an observer in the NEMO Committee.

The adoption of the draft legislation that transposes the Electricity Integration Package is important and it is a precondition for the coupling of the spot markets with neighbouring markets of the CPs and M.S.s.

Currently, the Market Operator (that conducts spot markets in Ukraine), together with the TSO Ukrenergo, are preparing to unite the spot markets with the respective European markets. The relevant legislation has been prepared and is expected to be adopted by the Parliament. After this, the relevant agreements with the European market operators and transmission system operators will be signed that will boost the process.

4.9.3.3. Cross-border capacity

The auctions for access to the transmission capacity of the cross-border interconnection between the TSO of Ukraine and the TSOs of neighbouring countries are held separately. This results in higher transmission costs and no guarantees for securing the transmission capacity.

The Electricity Market Law specifies that all available transmission capacity of cross-border crossings shall be proposed for allocation subject to compliance with the operational safety standards. The TSO shall define the available transmission capacity using the methodology approved by the NEURC upon consultations with the EnC Secretariat and published on the official website of the TSO.

The capacity allocation methodology applied by the Ukrainian TSO is regulated with the Methodology for determining the available capacity of interstate crossings, approved by NEURC (“Methodology”). In 2023, the TSO prepared draft amendments to the Methodology, where in addition to the already applied method of electrical models, introduces the method of energy regimes.

In the EnC Secretariat’s opinion, the newly added method of energy regimes does not improve the existing mechanism for calculating the amount of available capacity in relation to security of supply and is not compliant with the obligation of the TSO stemming from the Energy Community acquis in force. Namely, the method of energy regimes potentially undermines the maximization of cross-border capacity which the TSO is obliged to make available for exchange of energy (import/export/transit), complying with safety standards of secure network operation as required by Article 16 of Regulation (EU) 714/2009. Furthermore, the methodology does not allow for capacity in both directions to be available at the same time and disregards the possibilities of netting flows in opposite directions as required by Article 16 of the Regulation (EC) 714/2009.

Ukraine’s bidding zone borders are part of the Shadow SEE CCR as established with the Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC. Based on the publicly available data and the EnC Annual Implementation Report 2023, the TSO has not submitted a proposal for a common coordinated capacity calculation methodology to the Regulatory Authority.

For the moment, the country has made progress towards the implementation of joint capacity allocation. The rules for long-term and daily allocation with Romanian transmission system operator Transelectrica were put in place, and daily auctions started on 2 November 2023 via Ukrenergo’s allocation platform. The daily rules for joint allocation on the interconnectors with Hungary, Slovakia and Poland were consulted by JAO and approved by the Ukrainian regulator - NEURC and auctions started in January 2024. Rules for joint capacity allocation on the interconnection with Moldova are still pending.

The new rules for the Moldova-Ukraine border will be immediately effective, having been endorsed by NEURC on 30 January 2024. The commencement date for these allocations will be determined by the transmission system operators of concerned countries.

4.9.4. XB PPAs recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- XB PPAs			

A1 – Granting forward transmission rights with longer durations	Yes	Methodology for determining the available capacity of interstate crossings	Although this is not required under the FCA Guideline and only relevant in relation to physical cross-border PPAs, TSO should issue forward transmission rights at a first place for at least up to 5 years ahead to start matching the contract duration of the shortest PPAs. However, this recommendation needs further analysis because the duration of the transmission right is dependent on the technical condition of the transmission grid of the involved neighbouring electricity market. Additionally, the involved neighbouring electricity markets should harmonise with the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC on offering long-term transmission rights.
B – Market coupling and market liquidity			
B1 – Harmonisation with the EnC Electricity Integration Package	Yes	Electricity Market Law	The Electricity Market Law should be amended to transpose the EnC Electricity Integration Package as this is a precondition to enable market coupling with the neighbouring CPs and MSs.
C – Cross-border capacity			
C1 – The TSO to apply the harmonised allocation rules	Yes	Electricity Market Law Network code of TSO Rules for the allocation of cross-border transmission capacities	The Electricity Market Law should transpose the EU Regulation (EU) 2016/1719 establishing a guidelines on forward capacity allocation and the EU Regulation (EU) 2015/1222 establishing a guidelines on capacity allocation and congestion management as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC, both part of the Electricity Integration Package. The Capacity Allocation and Congestion Management (CACM) was already due in 2023.

C2 – Providing targets for the TSO for available cross-zonal capacity	Yes	Electricity Market Law Rules for the allocation of cross-border transmission capacities	The TSO shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside Ukraine bidding zone or as a means of managing flows resulting from transactions internal to bidding zone. In relation to this, the Electricity Market Law and the Rules for the allocation of cross-border transmission capacities to the provide minimum level of 70% available capacity for cross-zonal trade in line with the Electricity Regulation as adapted and adopted by Ministerial Council Decision 2022/03/MC-EnC.

4.9.5. RES Projects assessment

4.9.5.1. Complexity and lengths of the licensing procedure for renewable energy plants

The regulatory framework for development of RES projects and the certainty of such framework are important for the development of new PPA-backed RES-generation projects, where the PPA is important for the long-term financing of the asset. It is then essential for both parties involved in the PPA that the project progresses and becomes operational as anticipated, without regulatory surprises or sudden changes in regulations.

On 4 September 2018, the Ukrainian parliament passed law No. 2517-VIII On Amendments to Certain Legislative Acts of Ukraine on the Investment Attractiveness of the Construction of Renewable Energy Facilities (the “RE Law”), which simplifies the process of building renewable energy facilities.

Under the RE Law, at the design stage, all construction facilities in Ukraine are classified in 3 categories of consequences with different requirements for each of them: facilities with insignificant (CC1), medium (CC2) and significant (CC3) consequences. According to the Law, wind farms can be assigned to CC1 consequences category, provided there is a positive expert opinion of the relevant authority in charge of environmental impact assessment.

Pursuant to the RE Law, in case of CC1 project, there is an exemption from project environmental assessment, there are simpler authorization procedures of construction works and commissioning and contractors without a relevant license are allowed to perform construction works.

Notwithstanding the above, facilities can still be classified as facilities with CC2 and CC3 consequences based on other requirements for categories of consequences established by the law. These types of facilities require expert examination of the design documentation, obtaining of a construction permit, as well as a commissioning certificate.

Securing connection rights to the transmission grid is a significant concern for the development of large-scale RES projects. On 15 July 2021, the Ukrainian parliament adopted law “On Amendments to Certain Legislative Acts of Ukraine on Simplification of Connection to Electric Networks”, which was created to resolve existing complications for the development of grid-connection design, obtaining various approvals, access to information on the technical capacity of the distribution grids, environmental impact assessment and for other issues arising while obtaining access to electrical grids. The law prohibits unjustified rejection of the application for grid connections and introduction of a “single window” to simplify interaction with state and bodies and other involved entities in the application procedure. For the period of martial law, a separate procedure for the temporary connection to the distribution networks is applied. This procedure suspends some provisions of the distribution grid code.

In accordance with the Law 2046-IX, enacted on February 15, 2022, under specific circumstances, permits renewable energy producers to install power batteries without the need for a license. The primary objective of this law was to incentivize energy producers to deploy their battery storage facilities, addressing issues related to imbalances in the system.

4.9.6. RES Projects recommendations

Recommendation	Law intervention	Laws identifier	Comments
A- Licensing procedure for renewable energy plants			
A1 – Simplify and streamline the permitting process for renewable energy plants	Yes	Amendments of the RE Law	Amendments of the RE Law which should streamline and simplify the permit-granting procedure for renewable projects. A scheme for organisation and main principles of the permit-granting procedure is provided with the RED III. Although RED III is not part of the EnC acquis, the CP can use some of the guidelines to streamline the procedure for perming of renewable electricity.
A2 – Critical review of the legislation related with the development of renewable projects and adoption of amendments (where necessary) to accelerate and shorten the development of renewable projects	Yes	/	In response to rising energy prices and dependence on Russian fossil fuels, the EU Commission issued its Communication “REPowerEU. Among other, the Commission issued Recommendations on speeding up permit-granting procedures for renewable energy projects and facilitating Power Purchase Agreements, and the Guidance to the Member States on good practices to speed up permit-granting procedures for Renewable Energy Projects. Some of the key recommendations are: establishing clearly defined, accelerated and as short as possible deadlines for all the steps required for the granting of permits to build and operate renewable energy projects, establishing binding maximum deadlines for all relevant stages of the environmental impact assessment procedure, creation of a single unified application process for the entire administrative permit application and granting process, introduction of fully digital permit-granting procedures and e-communication, identification of renewable go-to areas, removing any unjustified administrative or market barriers to corporate purchase agreements of renewable energy especially for SMEs, etc.
A3 –Manage the high connection capacity demand through a queue management system	Yes	Transmission System Code	To prevent the virtual saturation of the grid due to slow-to-progress projects, the TSO should implement queue management system consisting of: - Transparent disclosure of the connection conditions and the available capacity for consistent substations, giving location signals - renewable go-to areas; - Projects failing to meet milestones would enter a remedy period during which developers should address delay; - If milestone is not met, the connection agreement should be terminated. - The TSO should have authority to charge the project a termination fee.

- The TSO may require the project to provide a financial guarantee with the signing of the connection agreement for security of any termination event.

Long-term grid planning by the TSO and the DSOs. In respect of the capacity constraints for the renewable projects, it is essential for the TSO and the DSOs to undergo through a systematic and organized long-term grid planning process. Accordingly, the investments in the grid, the defining of the renewable go-to areas, etc. should be made in accordance with such long-term plan.

4.9.7. Other applicable areas assessment

4.9.7.1. Derivative instrument procedures for virtual PPAs

Under the current regulatory framework, a virtual PPA is possible without any particular additional regulatory requirements. Under the Green Transformation Law, CfD services between the producer and a consumer without the need for actual exchange of electricity are explicitly allowed. Only renewable electricity producers outside the state support system are eligible for such contracts. The term of the contract must be at least 1 year and is not subject of any approval by the regulator or any other authority and may be concluded at any time during the commissioning or operation of the RES system. The TSO should be notified within 5 days of the conclusion of such a contract, but no confidential information on the terms and conditions of the contract should be disclosed.

For a virtual PPA, for companies reporting under IFRS derivative accounting may be required to record the contract on the company's balance sheet at fair value with respect to the prevailing power prices. However, the financial reporting standards are not perceived as an obstacle for uptake of PPAs.

4.9.7.2. Contractual limitations

There are no regulatory limitations related to the terms and conditions of the renewable PPAs, including any limitation for entering a long-term PPA agreements (limitation in time), strict rules on the elements of a PPA, strict statutory form of the PPA etc.

4.9.7.3. Competition

The Competition law does not pose any restrictions on large corporate consumers exclusively committing to a single source of electricity for most of their demand over an extended period of time (10, 15 years).

4.9.8. Other applicable areas recommendations

No recommendations in this section.

4.9.9. Sources

Abbreviation	Sources
Law on REMIT	Law on Amendments to Certain Laws of Ukraine on Prevention of Abuse in Wholesale Energy Markets, No. 3141-IX
Green Transformation Law	Law on Amendments to Certain Laws of Ukraine on the Restoration and Green Transformation of the Energy System, No. 3220-IX
Electricity Market Law	Electricity Market Law No. 4493
RE Law	Law on Amendments to Certain Legislative Acts of Ukraine On the Investment Attractiveness of the Construction of Renewable Energy Facilities No. 2517-VIII
Tax Code	Tax Code of Ukraine No. 2755-VI
Methodology	Methodology for determining the available capacity of interstate crossings No 893
Market rules	Market rules, NEURC Resolution No 307
Transmission System Code	Transmission System Code, NEURC Resolution 309
Distribution Network Code	Distribution Network Code, NEURC Resolution No 310

5. PPA related challenges, recommendations, and conclusion

5.1. Albania

As discussed in Chapter 3, Albania's key issues include an insufficient supply of electricity from renewable energy sources (excluding hydro), which significantly affects corporate Power Purchase Agreements (PPAs). Although electricity prices are relatively stable, they remain low, limiting the attractiveness of utility PPAs for investors. Additionally, there is a notable gap in the strategic approach to scaling up non-hydro RE capacities and a lack of clarity in steering services, which reduces efficiency. The underdeveloped wholesale market and inadequate incentive mechanisms further exacerbate the situation, particularly for virtual and physical PPAs. Despite having a fully operational Guarantees of Origin (GO) registry, the sector is hindered by a lack of disclosed sales revenues, impeding the effective implementation of GOs. Addressing these multifaceted issues requires a robust and strategic framework to enhance investment stability and foster sustainable growth in Albania's renewable energy landscape. Figure below represents detailed roadblocks and improvement recommendations.

Figure 104 Key roadblocks and improvement recommendations in Albania

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total HV/MV electricity consumption in 2022 was 697 GWh, while RES (including hydro) supply was 7,002 GWh. Oversupply of existing RES (majority hydro) is strong competition for wind / solar corporate PPAs	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
	HV/MV electricity consumption CAGR (2018-2022)	Decreasing electricity consumption of 8.2% in HV segment, while MV segment increased 5.6%. Overall decreasing HV/MV consumption indicates lower industrial activity and potential. This represents lower addressable market for corporate offtake, however PPA is still possible	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
RES supply	Historical and future RES growth trend	Albania is dominated by hydro generated electricity (99% in 2022). In last 5 years there was a steady growth of solar production at CAGR 31.2% (still small absolute amount of 50 GWh in 2022). NECP does not provide an updated perspective on wind and solar share in RE electricity production by 2030. Small share of non-hydro RES power generation limits (0.7% in 2022) supply potential for PPA contracts Similar situation in electricity generation capacities in Albania, with hydro (95% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a major growth of RES (excluding hydro) installed capacities at CAGR 11.9% (still small absolute amount of 0.02 GW in 2022). NECP does not provide information on RES share in total electricity generation capacities in 2040 (0.9% in 2022)	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	The retail non-household price didn't change significantly throughout the observed period (2022 & 2023) at the average of 66 €/MWh. Compared to HUPX average daily base load price on DAM for the same period (2022 & 2023) that amounted to 189 €/MWh, retail non-household prices were on average 123 €/MWh lower In April 2023, the wholesale DAM managed by ALPEX was introduced, with a daily average market clearing price of 101 €/MWh (April-December 2023), 4 €/MWh and 32 €/MWh higher from both the daily baseload price on HUPX (April-December 2023) and the retail non-household price in 2023	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	Data not available	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
	PPP and/or RES offtake provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Albania	Corporate PPA		Define strategy and role of utility PPA / CIDs in and ensure capability building of key stakeholders
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	The liquidity of Albania's power exchange (spot churn rate of 0.11 in 2023) is significantly below the benchmark (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78). Day-Ahead (DA) trading is in place, while Intraday (ID) trading is still not operational	Virtual PPA		Engage in market coupling with EU and neighboring countries and introduce ID trading to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Albania has fully operational Guarantees of Origin (GOs) registry	All PPA types		n/a
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	Inability for RES producers to enter into direct PPAs with final consumers	Physical PPA		The current regulation in Albania only allows for final consumers to be supplied by licensed retail suppliers and not directly by RES producers. The Energy Law and Market Rules should be amended in a manner that would allow for direct PPAs between producers and consumers to be entered. If observed in isolated manner, this would be avoided via sleeving or virtual PPA where there is no physical supply. However, since there is no clarity on sleeving product and Route-to-Market, this is a rather disabling factor
	GOs framework and mutual recognition	Lack of disclosure rules prevent the full implementation of GOs system. Recognition in Albania of GOs issued in other CPs is possible. GOs issued in Albania are not recognized for disclosure in the EU MSs unless there is an agreement with the European Union and where there is direct import or export of electricity	All PPA types		With the participation in the EnC regional GOs system, Albania uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	Transmission rights are allocated with a maximum tenure of one year. Furthermore, market coupling with the neighboring CPs and MSs is not completed. This creates uncertainty over the longer tenor physical PPA cross border agreements	Physical PPA		Transposition and implementation of the EnC Electricity Integration Package must be completed
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.2. Bosnia and Herzegovina

The primary challenge in Bosnia and Herzegovina is the insufficient supply of electricity from renewable energy sources (excluding hydro), significantly affecting virtual, physical, corporate, and utility Power Purchase Agreements (PPAs), which highlights the urgent need for expanding RE projects and upgrading existing infrastructure. While electricity prices in the country are relatively stable, they remain low, which moderately impacts utility PPAs by making investment less attractive. Additionally, the limited availability of supply options and inadequate incentive mechanisms pose significant barriers to the growth of virtual, physical, and corporate PPAs. The underdeveloped wholesale market, characterized by a lack of B2B products, presents high-impact challenges, especially for large-scale energy consumers and producers. The legal and regulatory uncertainty further exacerbates these issues, necessitating robust regulatory frameworks to enhance investment stability and protection. Addressing these challenges is crucial for fostering a sustainable and resilient renewable energy sector in Bosnia and Herzegovina. Figure below represents detailed roadblocks and improvement recommendations.

Figure 106 Key roadblocks and improvement recommendations in Bosnia and Herzegovina

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total HV/MV electricity consumption in 2022 was 3,645 GWh, while RES (including hydro) supply was 5,386 GWh. Oversupply of existing RES (majority hydro) is strong competition for wind / solar corporate PPAs	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
	HV/MV electricity consumption CAGR (2018-2022)	Decreasing electricity consumption at 18.9% in HV segment, while MV was around 0.4%. Overall decreasing HV/MV consumption at 5% indicates lower PPA potential. This represents lower addressable market for corporate offtake, however PPA is still possible	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
RES supply	Historical and future RES growth trend	BIH is dominated by thermal (64% in 2022) and hydro (32% in 2022) generated electricity. In the last 5 years there was a substantial growth of RES (excluding hydro) electricity generation at CAGR 40.8% (still small absolute amount of 521 GWh in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation, which is expected to constitute 17% (2,943 GWh) of total electricity generation in 2030 (vs. 4% in 2022). Similar situation in electricity generation capacities in BIH, with thermal (44% in 2022) and hydro (49% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a steady growth of RES (excluding hydro) installed capacities at CAGR 35.8% (still small absolute amount of 0.24 GW in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation capacities, which are expected to constitute 33% (2.12 GW) of total electricity generation capacities in 2030 (vs. 5% in 2022). Strong non-hydro RES growth projected in NECP signals potential market for all PPA types	All PPA types	n/a	
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	Strong government intervention in retail (non-household) electricity prices. The retail non-household prices increased by 82% from 2019 to 2023, and amounted to an average of 53 €/MWh (2019-2023), which is still 63 €/MWh lower from HUPX average daily baseload price on DAM (2019-2023) that amounted to 116 €/MWh, which is not favorable for PPA	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	No clearly announced RE incentives, therefore it is challenging to access the capacity for PPA utilization	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
	PPP and/or RES offtake provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Bosnia and Herzegovina. However, national power utilities facilitate RES offtake for renewable energy assets through the aggregation of distributed resources in 'virtual power plants,' as well as through direct purchase agreements for electricity produced by large RE facilities (e.g. WPP Jelovača and SPP Petrijik)	Corporate PPA		Define strategy and role of utility PPA / CfDs in and ensure capability building of key stakeholders
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	Power exchange is not existent, therefore, DA and ID is not operational, and spot churn rate cannot be assessed	Virtual PPA		Engage in market coupling with EU and neighboring countries and introduce power exchange to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Bosnia and Herzegovina is a multi-entity country and does not have a unified GOs registry. Only Republika Srpska has a fully operational GOs registry, while other two entities do not a fully operational GOs registry. Having a mature and functional GOs market is strong pre-requisite for healthy PPA market	All PPA types		Establish a fully operational GOs registry across all entities
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	Natural persons and legal entities (corporate consumers) are not allowed to conclude corporate PPA directly with RES producers	Physical PPA		Open access to corporate consumers to engage in PPA. The state can consider implementation of a state-backed guarantee scheme to reduce the risk of default for corporate consumers in PPA
	GOs framework and mutual recognition	Absence of necessary secondary legislation for operation of the GOs registry in FBiH and lack of disclosure and residual mix rules. FBiH-RS-Bročko District's RES Laws recognize issued GOs from third countries on the basis of reciprocity. GOs to be issued in BIH will not be recognized for disclosure in the EU MSs unless there is an agreement with the European Union, a compatible GOs system and where there is direct import or export of electricity	All PPA types		With the participation in the EnC regional GOs system, BIH uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	BIH has not launched a wholesale electricity market through day-ahead or intra-day markets. Transmission rights are allocated with a maximum tenure of one year. Market coupling with the neighboring CPs and MSs is not completed. This creates uncertainty over the longer tenure physical PPA cross border agreements	Physical PPA		State and entity level energy regulation has to be updated to incorporate EnC Electricity Integration Package in order to enable market coupling with MSs and CPs
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.3. Georgia

Georgia's renewable energy sector is facing several critical issues. A significant concern is the insufficient supply of electricity from renewable energy sources (excluding hydro), which has a substantial impact on virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This high-impact challenge underscores the urgent need for the expansion of RE projects and the enhancement of existing infrastructure to meet growing demand. Additionally, electricity prices in Georgia are low but stable, which moderately affects utility PPAs. To attract more investment in renewable energy, it is essential to implement dynamic pricing mechanisms that accurately reflect the actual costs of energy production, thereby making the sector more appealing to investors.

Moreover, Georgia struggles with limited supply options and insufficient incentive mechanisms, which heavily impact the effectiveness of virtual, physical, and corporate PPAs. To address this, it is crucial for Georgia to diversify its supply options by introducing virtual and physical PPAs and to establish robust incentive mechanisms like feed-in premiums or renewable energy certificates. The underdeveloped wholesale market, characterized by limited B2B products, presents a significant barrier, particularly for large-scale energy consumers and producers. Therefore, developing comprehensive market products, such as long-term contracts, spot market trading, and sophisticated financial instruments, is necessary. Furthermore, the lack of legal and regulatory certainty poses a considerable challenge across all types of PPAs, highlighting the need for stronger regulatory frameworks to ensure investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 107 Key roadblocks and improvement recommendations in Georgia

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate/utility)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total direct customer electricity consumption in 2022 was 3,783 GWh, while RES (including hydro) supply was 10,858 GWh. Oversupply of existing RES (majority hydro) is strong competition for wind / solar corporate PPAs	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
	HV/MV electricity consumption CAGR (2018-2022)	Increasing electricity consumption of 20.5% in direct consumer segment (granted a status of large consumers since 2021), which indicates demand and room for PPA utilization	Corporate PPA		n/a
RES supply	Historical and future RES growth trend	Georgia is dominated by hydro (76% in 2022) generated electricity. In the last 5 years there was a minor growth of RES (excluding hydro) electricity generation at CAGR 0.8% (small absolute amount of 87 GWh in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation, which is expected to constitute 32% (6,834 GWh) of total electricity generation in 2040 (vs. 1% in 2022). Similar situation in electricity generation capacities in Georgia, with hydro (74% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years RES (excluding hydro) installed capacities remained consistent, without any growth (small absolute amount of 0.02 GW in 2022). NECP projects a major increase in RES (excluding hydro) electricity generation capacities, which are expected to constitute 33% (2.62 GW) of total electricity generation capacities in 2030 (vs. 0.4% in 2022). Strong non-hydro RES growth projected in NECP signals potential market for all PPA types	All PPA types		n/a
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	Retail (non-household) electricity prices increased by 122% from 2019 to 2023, and amounted to an average of 59 €/MWh (2019-2023), which is still 57 €/MWh lower from HUPX average daily baseload price on DAM (2019-2023) that amounted to 116 €/MWh, which is not favorable for PPA	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	Investments are structured around FIT and CIDs. The gap between current state, announced RE incentives and RES targets is 2.2 GW, what is potentially available PPA capacity	All PPA types		n/a
	PPP and/or RES offtake provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Georgia	Corporate PPA		Define strategy and role of utility PPA / CIDs in and ensure capability building of key stakeholders
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	Power exchange is not existent, therefore, DA and ID is not operational, and spot churn rate cannot be assessed	Virtual PPA		Stimulate DA/ID trading to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Georgia has a fully operational Guarantees of Origin (GOs) registry	All PPA types		n/a
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	Segments of the wholesale market are not operational. Restrictions on the corporates (SME) to contact renewable PPAs unless they are large consumers and meet specific consumption criteria	Physical PPA		Initiate the operation of the wholesale market segments. Open access for corporate consumers (SME) to engage in PPAs, including through aggregation. Implement a state-backed guarantee scheme to reduce the risk of SME defaults in PPAs
	GOs framework and mutual recognition	There is a consistent framework for issuance and transfer of GOs. However, there is absence of disclosure rules. Recognition in Georgia of GOs issued in other CPs and MSs depends on reciprocity and mutual agreements. GOs issued in Georgia are not recognized for disclosure in the EU MSs unless there is an agreement with the European Union, and where there is direct import or export of electricity	All PPA types		With the participation in the EnC regional GOs system, Georgia uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	There is no coordinated capacity allocation of cross-border capacities with neighboring countries, except bilateral cross-border capacity allocation on the interconnectors with Türkiye	Physical PPA		To promote regional integration with the neighboring countries based on market-based solutions for cross-border exchange through international agreements
	CBAM	CBAM's impact on Georgia would be indirect, mainly influencing energy-intensive industries that export goods to the EU, rather than electricity exports specifically.	All PPA types		Georgian industries exporting to the EU may face pressure to shift to renewable energy to avoid CBAM-related costs. To ensure renewable PPAs are recognized under CBAM, transparent carbon intensity reporting, national legislative adjustments, and clear verification mechanisms are needed.

Source: PwC Analysis

5.4. Kosovo*

Kosovo*'s renewable energy sector is confronted with numerous challenges. A primary concern is the insufficient supply of electricity from renewable energy sources (excluding hydro), which greatly impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This high-impact issue underscores the need for a swift deployment of new renewable energy projects and significant improvements to existing infrastructure. Although electricity prices in Kosovo* are relatively stable, their low levels moderately affect utility PPAs. Therefore, implementing dynamic pricing mechanisms that reflect the actual costs of energy production is essential to attract more investment in renewable energy.

Additionally, Kosovo* faces substantial hurdles due to limited supply options and insufficient incentive mechanisms, which severely impact virtual, physical, and corporate PPAs. To remedy this, it is imperative to introduce a variety of supply options such as virtual and physical PPAs, and to establish strong incentive mechanisms like feed-in premiums or renewable energy certificates to foster market growth. The wholesale market is underdeveloped, with limited B2B products, presenting a high-impact challenge for large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and advanced financial instruments, is crucial. Furthermore, the lack of legal and regulatory certainty poses a significant challenge across all types of PPAs, highlighting the necessity for robust regulatory frameworks to enhance investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 108 Key roadblocks and improvement recommendations in Kosovo*

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate/utility)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total HV/MV electricity consumption in 2022 was 610 GWh, while RES (including hydro) supply was 637 GWh. Consumption and supply are on similar levels, which does not indicate robust market potential for wind and solar corporate PPAs	Corporate PPA		Increase RE supply through the installation of new capacities to provide high voltage/medium voltage customers with renewable energy
	HV/MV electricity consumption CAGR (2018-2022)	Decreasing electricity consumption of 20.6% for HV segment, while MV is increasing 6.4%. Overall decreasing HV/MV consumption indicates lower industrial activity and potential. This represents lower addressable market for corporate offtake, however PPA is still possible	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
RES supply	Historical and future RES growth trend	Kosovo* is dominated by thermal (90% in 2022) generated electricity. In the last 5 years there was a major growth of RES (excluding hydro) electricity generation at CAGR 92.1% (still small absolute amount of 433 GWh in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation, which is expected to amount to 5,269 GWh in 2040, but there is no information on RES share on total electricity generation in 2040 (7% in 2022). Similar situation in electricity generation capacities in Kosovo*, with thermal (82% in 2022) and dominance in total electricity generation capacities in 2022. In the last 5 years there was a steady growth of RES (excluding hydro) installed capacities at CAGR 38.2% (still small absolute amount of 0.15 GW in 2022). NECP projects a major increase in RES (excluding hydro) electricity generation capacities, which are expected to constitute 70% (2.84 GW) of total electricity generation capacities in 2040 (vs. 9% in 2022). Strong non-hydro RES growth projected in NECP signals potential market for all PPA types	All PPA types	n/a	
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	The retail non-household prices increased only by 30% from 2019 to 2023, and amounted to an average of 37 €/MWh (2019-2023), which is 79 €/MWh lower from HUPX average daily base load price on DAM (2019-2023) that amounted to 116 €/MWh In 2024, the wholesale DAM managed by ALPEX was introduced, achieving a daily average market clearing price of 69 €/MWh (February-April 2024)	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	Investments are structured around FIT. The gap between current state, announced RE incentives and RES targets is 0.62 GW (according to WEM scenario provided in NECP) or 0.72 GW (according to WAM scenario provided in NECP), what is potentially available PPA capacity	All PPA types		n/a
	PPP and/or RES offtake provided by national power utility for large scale RE assets	There is an announced PPA utility deal (solar project Rahovica) with KOSTT for tenure of 15 years	Corporate PPA		Depending on closure of Rahovica deal, encourage utilities to structure public-private partnerships to build market confidence
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	DA is existent, while ID is still not functional. Liquidity of the power exchange was not possible to assess due to opening of DAM in 2024	Virtual PPA		Engage in market coupling with neighboring countries and introduce ID trading to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Kosovo* has established a GOs registry, however it is not fully operational yet. Having a mature and functional GOs market is strong prerequisite for healthy PPA market	All PPA types		Finalize implementation of a fully operational GOs registry
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	Consumers cannot enter PPAs directly with renewable energy producers	Physical PPA		Incorporation of renewable PPAs into the regulatory framework by adopting amendments on the Law on Renewables and Law on Energy that will incorporate and define the renewable PPAs as contracts under which a natural or legal person agrees to purchase renewable energy directly from a renewable electricity producer on a market basis
	GOs framework and mutual recognition	The secondary regulation on GOs has not been adopted yet as well as there is lack of disclosure rules. Recognition in Kosovo* of GOs issued in other CPs is possible. GOs to be issued in Kosovo* will not be recognized for disclosure in the EU MSs unless there is an agreement with the European Union, a compatible GOs system and where there is direct import or export of electricity	All PPA types		With the participation in the EnC regional GOs system, Kosovo* uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	Market coupling with the neighboring CPs and MSs is not completed. This creates uncertainty over the longer tenor physical PPA cross border agreements	Physical PPA		Transposition the EnC Electricity Integration Package should be completed as this is a precondition to enable market coupling with the neighboring CPs and MSs
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.5. Moldova

Moldova's renewable energy sector faces significant challenges, as detailed in the attached table. One major issue is the insufficient supply of electricity from renewable energy sources (excluding hydro), which heavily impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This issue, marked with a high impact, necessitates the rapid deployment of new renewable energy projects and improvements to the existing infrastructure. Additionally, the table highlights that current electricity prices in Moldova are relatively stable but low, moderately affecting utility PPAs. To encourage investment in renewable energy, it is essential to implement dynamic pricing mechanisms that accurately reflect the true costs of energy production.

Furthermore, Moldova's market is hindered by a limited variety of supply options and inadequate incentive mechanisms, which heavily impact virtual, physical, and corporate PPAs. To overcome this, Moldova should introduce diverse supply options like virtual and physical PPAs and establish strong incentive mechanisms such as feed-in premiums or renewable energy certificates to boost market growth. The underdeveloped wholesale market, characterized by limited B2B products, presents a significant challenge, especially for large-scale energy consumers and producers. It is crucial to develop comprehensive market products, including long-term contracts, spot market trading, and advanced financial instruments. Finally, the lack of legal and regulatory certainty, identified as high impact, necessitates robust regulatory frameworks to enhance investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 109 Key roadblocks and improvement recommendations in Moldova

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate/utility)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total non-household electricity consumption in 2022 was 2,323 GWh, while RES (including hydro) supply was 240 GWh, which is a positive indicator for RES investors	Corporate PPA		Promote the installation of RE supply, and benefits of corporate PPA to attract RE investors by providing strong demand signals to supply non-household customers with renewable energy
	HV/MV electricity consumption CAGR (2018-2022)	Slightly increasing electricity consumption of 1.1% for non household segment, which indicates demand and room for PPA utilization	Corporate PPA		n/a
RES supply	Historical and future RES growth trend	Moldova is dominated by thermal (72% in 2022) generated electricity. In the last 5 years there was a substantial growth of RES (excluding hydro) electricity generation at CAGR 39.8% (still small absolute amount of 196 GWh in 2022). NECP projects a mild increase in RES (excluding hydro) electricity generation, which is expected to amount to 820 GWh in 2040, but there is no information on RES share on total electricity generation in 2040 (23% in 2022) Similar situation in electricity generation capacities in Moldova, with thermal (73% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a significant growth of RES (excluding hydro) installed capacities at CAGR 40.2% (still small absolute amount of 0.14 GW in 2022). NECP projects a light increase in RES (excluding hydro) electricity generation capacities, which are expected to amount to 0.45 GW in 2040, but there is no information on RES share in total electricity generation capacities in 2040 (25% in 2022)	All PPA types		The projected capacity for RES (excl. hydro) is insufficient, with supply heavily dependent on MGRES coal power plant. To transition supply to RES, there is a need to significantly increase installations of wind and solar capacities
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	Retail (non-household) electricity prices are primarily regulated by the government, however, in 2023 the difference between the retail (non-household) electricity prices and DAM proxy (HUPX) significantly decreased, and amounted to 22 €/MWh in favor of DAM proxy (HUPX). When observing the average of the whole 2019-2023 time frame, the retail non-household prices increased by 37%, and amounted to an average of 62 €/MWh (2019-2023), which is still 54 €/MWh lower from HUPX average daily base load price on DAM (2019-2023) that amounted to 116 €/MWh, which is not favorable for PPA	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	There is no gap between current RES capacity, announced RES capacities supported by government schemes and RES targets (WEM scenario)	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
	PPP and/or RES offtake provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Moldova	Corporate PPA		Define strategy and role of utility PPA / CIDs in and ensure capability building of key stakeholders
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	Power exchange is not existent, therefore, DA and ID is not operational, and spot churn rate cannot be assessed	Virtual PPA		Engage in market coupling with EU and neighboring countries and introduce power exchange to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Moldova does not have an established Guarantees of Origin (GOs) registry. Having a mature and functional GOs market is strong pre-requisite for healthy PPA market	All PPA types		Establish an operational GOs system
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	Corporate consumers are not allowed to conclude corporate PPA directly with RES producers. Also, currently, only the renewable producers (Eligible Renewable Developers) can contract PPA with the Central Electricity Supplier (this is a PPA under a support scheme)	Physical PPA		Adoption of legislation that would enable corporate consumers to engage in PPA. Additionally, to introduce the independent aggregators who can aggregate the load and the demand side to enable aggregated PPAs
	GOs framework and mutual recognition	There is a primary legislative framework on GOs in place, however there is still a legislative aspect to be addressed for a full operation of the GOs system. Recognition in Moldova of GOs issued in other CPs or MSS is possible under a recognition procedure performed by ANRE. GOs to be issued in Moldova will not be recognized for disclosure in the EU MSS unless there is an agreement with the European Union, a compatible GOs system and where there is direct import or export of electricity	All PPA types		To complete the regulatory framework for issuance and transfer of GOs and to adopt the disclosure rules and the calculation of the residual energy mix necessary for the full implementation of the GOs system
	Cross border market integration	There is no coordinated capacity allocation of cross-border capacities with neighboring countries. This creates uncertainty over the longer tenor physical PPA cross border agreements	Physical PPA		To promote regional integration with the neighboring countries based on market-based solutions for cross-border exchange through international agreements
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSS could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.6. Montenegro

Montenegro's renewable energy sector faces significant challenges, as outlined in the attached table. One of the primary issues is the insufficient supply of electricity from renewable energy sources (excluding hydro), which heavily impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This issue, marked with a high impact, necessitates the rapid deployment of new renewable energy projects and the enhancement of existing infrastructure. Additionally, the table highlights that electricity prices in Montenegro are relatively low but stable, moderately affecting utility PPAs. To attract investment in renewable energy, it is essential to implement dynamic pricing mechanisms that accurately reflect the true costs of energy production.

Another critical challenge is the limited availability of supply options and insufficient incentive mechanisms, which significantly impact virtual, physical, and corporate PPAs. To address this, Montenegro should introduce innovative supply options like virtual and physical PPAs and establish robust incentive mechanisms such as feed-in premiums or renewable energy certificates to stimulate market growth. The underdeveloped wholesale market, with limited B2B products, presents a high-impact issue, particularly affecting large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and sophisticated financial instruments, is crucial. Lastly, the lack of legal and regulatory certainty poses a high impact on all types of PPAs, emphasizing the need for transposition of EnC Electricity Integration Package. Figure below represents detailed roadblocks and improvement recommendations.

Figure 105 Key roadblocks and improvement recommendations in Montenegro

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate/utility)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total HV/MV electricity consumption in 2022 was 248 GWh, while RES (including hydro) supply was 1,780 GWh. Oversupply of existing RES (majority hydro) is strong competition for wind / solar corporate PPAs	Corporate PPA		Educate oftakers on opportunities and benefits of corporate PPA
	HV/MV electricity consumption CAGR (2018-2022)	Decreasing electricity consumption of 32.7% for HV segment, while MV segment decreased by 1.9%. Overall decreasing HV/MV consumption indicates lower industrial activity and potential. This represents lower addressable market for corporate offtake, however PPA is still possible	Corporate PPA		Educate oftakers on opportunities and benefits of corporate PPA
RES supply	Historical and future RES growth trend	Montenegro is dominated by thermal (45% in 2022) and hydro (45% in 2022) generated electricity. In the last 5 years there was a mild growth of RES (excluding hydro) electricity generation at CAGR 19.1% (still small absolute amount of 327 GWh in 2022). There is no NECP available to assess potential RES electricity generation growth, however, The Energy Development Strategy of Montenegro until 2030 projects a modest increase in RES (excluding hydro) electricity generation, which is expected to constitute 12% (676 GWh) of total electricity generation in 2030 (vs. 10% in 2022) Similar situation in electricity generation capacities in Montenegro, with hydro (67% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a modest growth of RES (excluding hydro) installed capacities at CAGR 14.3% (small absolute amount of 0.12 GW or 12% out of total installed capacities in 2022). As Montenegro is finalizing its NECP, and The Energy Development Strategy of Montenegro does not provide expected installed RES capacities until 2030, there is information on RES installed capacities projections	All PPA types		Define policies to incentivize non-hydro RES installed capacity growth
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	The retail non-household price remained flat throughout the observed period (2019-2020 & 2022-2023) at the average of 38 €/MWh, showing no significant fluctuations. Compared to HUPX average daily base load price on DAM for the same period (2019-2020 & 2022-2023) that amounted to 117 €/MWh, retail non-household prices were on average 79 €/MWh lower In 2023, the wholesale DAM managed by MEPX was introduced, with a daily base load price of 98 €/MWh, 0.5 €/MWh higher from the daily base load price on HUPX for the same period, and 56 €/MWh above the retail non-household price in 2023	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	There is no NECP available. No clearly announced RE incentives, therefore it is challenging to access the capacity for PPA utilization	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
	PPP and/or RES offtake provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Montenegro	Corporate PPA		Define strategy and role of utility PPA / CIDs in and ensure capability building of key stakeholders
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	DA is existent, while ID is still not functional. Liquidity of the Montenegrin power exchange (spot churn rate of 0.10 in 2023) was far below the benchmark (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78)	Virtual PPA		Engage in market coupling with EU and neighboring countries and introduce ID trading to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for oftaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity oftaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Montenegro has established a GOs registry, however it is not fully operational yet. Having a mature and functional GOs market is strong pre-requisite for healthy PPA market	All PPA types		Finalize implementation of a fully operational GOs registry
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME)	PPA can be concluded between the renewable electricity producers and consumers	Physical PPA		n/a
	GOs framework and mutual recognition	Montenegro has a regulatory framework that governs the issuance, transfer, and operation of the GOs registry. GOs issued in third countries are recognized in Montenegro based on reciprocity and those exchanged within a European association of which the market operator is a member. GOs issued in Montenegro will not be recognized for disclosure in EU Member States unless there is an agreement with the European Union, a compatible GOs system, and direct electricity import or export	All PPA types		With the participation in the EnC regional GOs system, Montenegro uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	Transmission rights are allocated with a maximum tenure of one year. Market coupling with the neighboring CPs and MSs is not completed. This creates uncertainty over the longer tenor physical PPA cross border agreements	Physical PPA		Transposition of the EnC Electricity Integration Package should be completed
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based oftaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		The transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.7. North Macedonia

North Macedonia's renewable energy sector faces several challenges as outlined. One of the primary issues is the insufficient supply of electricity from renewable energy sources (excluding hydro), which significantly impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This issue, marked with a high impact, necessitates the rapid deployment of new renewable energy projects and the enhancement of existing infrastructure. Additionally, the table highlights that electricity prices in North Macedonia are relatively low but stable, moderately affecting utility PPAs. To attract investment in renewable energy, it is essential to implement dynamic pricing mechanisms that accurately reflect the true costs of energy production.

Another critical challenge is the limited availability of supply options and insufficient incentive mechanisms, which significantly impact virtual, physical, and corporate PPAs. To address this, North Macedonia should introduce innovative supply options like virtual and physical PPAs and establish robust incentive mechanisms such as renewable energy certificates to stimulate market growth. The underdeveloped wholesale market, with limited B2B products, presents a high-impact issue, particularly affecting large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and sophisticated financial instruments, is crucial. Lastly, the lack of legal and regulatory certainty poses a high impact on all types of PPAs, emphasizing the need for strengthened regulatory frameworks to provide greater investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 111 Key roadblocks and improvement recommendations in North Macedonia

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total HV/MV electricity consumption in 2022 was 1,845 GWh, while RES (including hydro) supply was 1,633 GWh, which is a positive indicator for RES investors	Corporate PPA		Promote the installation of RE supply, and benefits of corporate PPA to attract RE investors by providing strong demand signals to supply non-household customers with renewable energy
	HV/MV electricity consumption CAGR (2018-2022)	Decreasing electricity consumption of 8.1% for HV segment, while MV segment decreased by 0.9%. Overall decreasing HV/MV consumption indicates lower industrial activity and potential. This represents lower addressable market for corporate offtake	Corporate PPA		Educate offtakers on opportunities and benefits of corporate PPA
RES supply	Historical and future RES growth trend	North Macedonia is dominated by thermal (71% in 2022) and hydro (25% in 2022) generated electricity. In the last 5 years there was a modest growth of RES (excluding hydro) electricity generation at CAGR 7.9% (still small absolute amount of 236 GWh in 2022). North Macedonian NECP does not provide sufficient data for clear RES electricity generation projections, but the same can be found in The Strategy for Energy Development of North Macedonia until 2040, which projects a major increase in RES (excluding hydro) electricity generation that is expected to constitute 42% (3,703 GWh) of total electricity generation in 2040 (vs. 4% in 2022) Similar situation in electricity generation capacities in North Macedonia, with thermal (58% in 2022) and hydro (32% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a substantial growth of RES (excluding hydro) installed capacities at CAGR 38.3% (still small absolute amount of 0.23 GW in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation capacities, which are expected to constitute 55% (2.17 GW) of total electricity generation capacities in 2040 (vs. 10% in 2022). Strong non-hydro RES growth projected in NECP signals potential market for all PPA types	All PPA types	n/a	
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	The retail non-household price severely fluctuated throughout the observed period (2019 to 2023), increasing by 92%, and with an average (2019-2023) of 112 €/MWh they were lower from HUPX average daily baseload price on DAM (2019-2023) of 116 €/MWh by 4 €/MWh In 2023, the wholesale DAM managed by MEMO was introduced, with an average daily baseload price of 99 €/MWh, 3 €/MWh higher than the daily baseload price on HUPX (May-December 2023 period) and 22 €/MWh lower from the retail non-household price in 2023	All PPA types	n/a	
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	Investments are structured around FIT and FiP. The gap between current state, announced RE incentives and RES targets is 1.17 GW what is potentially available PPA capacity	All PPA types	n/a	
	PPP and/or RES offtake provided by national power utility for large scale RE assets	There are four announced utility PPAs in North Macedonia. Utility PPA offtake might reduce available volumes for corporate PPA	Corporate PPA		Consider limiting utility PPA up to 5 years to avoid market closure
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	DA is existent, while ID is still not functional. Liquidity of the North Macedonian power exchange (spot churn rate of 0.05 in 2023) lowest compared to all assessed CPs, and far below the benchmark (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78)	Virtual PPA		Engage in market coupling with EU and neighboring countries and introduce ID trading to increase market liquidity
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	North Macedonia does not have an established Guarantees of Origin (GOs) registry. Having a mature and functional GOs market is strong pre-requisite for healthy PPA market	All PPA types		Establish an operational GOs registry
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME)	Restrictions on the corporates to contract renewable PPAs unless they are large consumers connected on the 110KV transmission network	Physical PPA		Open access for corporate consumers (SME) to engage in PPAs, including through aggregation. Implement a state-backed guarantee
	GOs framework and mutual recognition	North Macedonia is not part of the Energy Community regional GOs system. Recognition in North Macedonia of GOs issued in other CPs and MSs depends on reciprocity and mutual agreements. GOs to be issued in North Macedonia will not be recognized for disclosure in the EU MSs unless there is an agreement with the European Union, a compatible GOs system and where there is direct import or export of electricity	All PPA types		North Macedonia's participation in the EnC regional GOs system would open up the opportunity for GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	Transmission rights are allocated with a maximum tenure of one year. Market coupling with the neighboring CPs and MSs is not completed.	Physical PPA		Transposition of the EnC Electricity Integration Package should be completed
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.8. Serbia

Serbia's renewable energy sector faces the least challenges among the analyzed countries, as detailed in the attached table. One of the primary issues is the insufficient supply of electricity from renewable energy sources (excluding hydro), which impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs) to a medium degree. This necessitates the enhancement of RE channels and the deployment of new renewable energy projects. Additionally, the table indicates that electricity prices in Serbia are relatively stable but low, moderately affecting utility PPAs. To encourage investment in renewable energy, it is crucial to implement dynamic pricing mechanisms that accurately reflect the true costs of energy production.

Another notable aspect is the limited availability of supply options and insufficient incentive mechanisms, which have a noticeable impact on virtual, physical, and corporate PPAs. To address this, Serbia should introduce innovative supply options such as virtual and physical PPAs and continue promoting robust incentive mechanisms like feed-in premiums or renewable energy certificates to stimulate market growth. The wholesale market in Serbia, although more developed than in some regions, still faces issues with limited B2B products, presenting a medium impact challenge for large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and sophisticated financial instruments, is essential. Lastly, while the lack of legal and regulatory certainty poses some challenges across all types of PPAs, Serbia's situation is comparatively better, emphasizing the need for continued strengthening of regulatory frameworks to provide greater investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 112 Key roadblocks and improvement recommendations in Serbia

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate/utility)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Solid total HV/MV electricity consumption in 2022 was 11,167 GWh, while RES supply was 10,422 GWh, which is a positive indicator for RES investors	Corporate PPA		Promote the installation of RE supply, and benefits of corporate PPA to attract RE investors by providing strong demand signals to supply non-household customers with renewable energy
	HV/MV electricity consumption CAGR (2018-2022)	Increasing electricity consumption of 3.9% for HV segment, while MV segment increased by 2.8%	Corporate PPA		n/a
RES supply	Historical and future RES growth trend	Serbia is dominated by thermal (68% in 2022) and hydro (28% in 2022) generated electricity. In the last 5 years there was a substantial growth of RES (excluding hydro) electricity generation at CAGR 58.4% (still small absolute amount of 1,202 GWh in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation, which is expected to constitute 40% (18,580 GWh) of total electricity generation in 2040 (vs. 4% in 2022) Similar situation in electricity generation capacities in Serbia, with thermal (58% in 2022) and hydro (36% in 2022) dominance in total electricity generation capacities in 2022. In the last 5 years there was a steady growth of RES (excluding hydro) installed capacities at CAGR 14.3% (still small absolute amount of 0.46 GW in 2022). NECP projects a notable increase in RES (excluding hydro) electricity generation capacities, which are expected to constitute 32% (3.5 GW) of total electricity generation capacities in 2030 (vs. 5% in 2022), and amount to 10.48 GW in 2040	All PPA types		Ensure that announced RES (excluding hydro) government-incentivized installations are completed as projected in the NECP
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	Retail (non-household) electricity price increased by 107% from 2019 to 2023, and amounted to an average of 65 €/MWh (2019-2023), which is 51 €/MWh lower from SEEPEX average daily base load price on DAM (2019-2023) that amounted to 116 €/MWh. However, retail (non-household) electricity price in 2023 exceeded SEEPEX average daily base load price on DAM by 1 €/MWh	All PPA types		The retail market should be "liberalized", i.e. governmental interventions should be phased out to foster the adoption of liberalized market mechanisms. Retail prices should be based on Wholesale plus margin logic. To attract more investors, they should be able to achieve a "healthy" margin, which can be slightly above wholesale levels. Competitive pricing is crucial, and non-household retail prices below wholesale levels hinder PPA market growth
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	Investments are structured around FIP, FIT, and CIDs. The gap between current state, announced RE incentives and RES targets is 6.92 GW what is potentially available PPA capacity	All PPA types		n/a
	PPP and/or RES offtake provided by national power utility for large scale RE assets	EPS has implemented utility PPA and even more announced. Utility PPA offtake might reduce available volumes for corporate PPA	Corporate PPA		Consider limiting utility PPA tenor to avoid market closure
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	DA and ID existent and functional. Liquidity of the power exchange (spot churn rate of 0.16 in 2023) is second best among assessed CPs, but below the SEE benchmark (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78)	Virtual PPA		n/a
	Existence of Route-to-Market product for RE developer and spot/forward product for offtaker	Given that Serbia has an operational power exchange (SEEPEX) and has successfully signed utility PPAs (i.e. wind power PPA by Avgo), it is reasonable to assume that both spot and forward products are available in the market	Virtual PPA		Start building offtaker confidence by clearly signaling access to spot to potential investors
	"Sleeving" service from electricity supplier to both electricity offtaker and RE asset	Given that Serbia has an established power exchange (SEEPEX) and has signed utility PPAs, it is reasonable to assume that the sleeving option is available in the market	Physical PPA		Clearly communicate to the market availability of sleeving option and connected conditions
	GOs registry existence and functioning	Serbia has a fully operational and functioning Guarantees of Origin (GOs) registry	All PPA types		n/a
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	PPA is defined in the applicable legislation	Physical PPA		n/a
	GOs framework and mutual recognition	Serbia is not part of the Energy Community regional GOs system. Serbia has adopted disclosure rules and publishes its national residual mix.	All PPA types		Serbia's participation in the EnC regional GOs system would open up the opportunity for GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC.
	Cross border market integration	Transmission rights are allocated with a maximum tenure of one year. Market coupling with the neighboring CPs and MSs is not completed. This	Physical PPA		Transposition of the EnC Electricity Integration Package should be completed
	CBAM	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based offtaker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.9. Ukraine

Ukraine's renewable energy sector faces various challenges, as outlined in the attached table. One of the key issues is the insufficient supply of electricity from renewable energy sources (excluding hydro), which significantly impacts virtual, physical, corporate, and utility Power Purchase Agreements (PPAs). This issue, marked with a high impact, necessitates the enhancement of RE channels and the deployment of new renewable energy projects. Additionally, the current electricity prices (2020) in Ukraine are low, moderately affecting utility PPAs. Implementing dynamic pricing mechanisms that accurately reflect the true costs of energy production is crucial to encourage investment in renewable energy.

The historical and projected growth trends of renewable energy sources (RES) indicate positive progress and significant future potential for renewable energy development in the country. However, Ukraine is going through challenging times due to the ongoing conflict, which is impacting the development of the RE sector. Another significant challenge is the limited availability of supply options and insufficient incentive mechanisms, which have a noticeable impact on virtual, physical, and corporate PPAs. To address this, Ukraine should introduce innovative supply options such as virtual and physical PPAs and continue establishing robust incentive mechanisms like feed-in premiums or renewable energy certificates to stimulate market growth. The wholesale market in Ukraine, although more developed than in some regions, still faces issues with limited B2B products, presenting a high-impact challenge for large-scale energy consumers and producers. Developing comprehensive market products, including long-term contracts, spot market trading, and sophisticated financial instruments, is essential. Lastly, the lack of legal and regulatory certainty poses a significant challenge across all types of PPAs, highlighting the need for strengthened regulatory frameworks to provide greater investment stability and protection. Figure below represents detailed roadblocks and improvement recommendations.

Figure 113 Key roadblocks and improvement recommendations in Ukraine

Driver	Key indicator	Outcome	PPA type impact (virtual/physical/corporate)	Impact	Improvement recommendation
RES demand	HV/MV electricity consumption size vs. RE supply	Total non-household electricity consumption in 2022 was 85,369 GWh, while RES (including nuclear energy and hydro) supply was 106,692 GWh, while RES (including hydro) supply without nuclear energy is 20,486 GWh. Oversupply of existing RES (majority nuclear) is strong competition for wind / solar corporate PPAs	Corporate PPA		Educate off-takers on opportunities and benefits of corporate PPA
	HV/MV electricity consumption CAGR (2018-2022)	Increased electricity consumption of 6.8% for non-household segment from 2020-2021	Corporate PPA		n/a
RES supply	Historical and future RES growth trend	Ukraine is dominated by nuclear (55% in 2021) generated electricity. In the last 4 years (2018-2021) for which the data was available due to the martial law in the country, there was a substantial growth of RES (excluding hydro) electricity generation at CAGR 51.4% (still small absolute amount of 10,153 GWh in 2021). Ukraine's Draft NECP projects a notable increase in RES (including hydro) electricity generation, which is expected to constitute 25% of total electricity generation in 2030 (vs. 13% in 2021) Similar situation in electricity generation capacities in Ukraine, with nuclear (25% in January 2022) and thermal (39% in January 2022) dominance in total electricity generation capacities in January 2022. In the last 2 years (2020-January 2022) there was a steady growth of RES (excluding hydro) installed capacities at CAGR 11.6% (still small absolute amount of 8.31 GW in 2022). Ukraine's Draft NECP projects a notable increase in RES (excluding hydro) electricity generation capacities, which are expected to amount to 18.68 GW in 2030 (vs. 8.31 GW in January 2022). Strong non-hydro RES growth projected in NECP signals potential market for all PPA types	All PPA types		n/a
Electricity prices	Retail (non-household) electricity prices vs. wholesale electricity prices	Due to the data limitation, retail (non-household) electricity prices are analyzed only for 2020. In 2020, retail (non-household) electricity price amounted to 50 €/MWh and was higher from both DAM and ID monthly weighted average prices (2020) in the IPS trading zone in Ukraine by 18 €/MWh On the other hand, over 2022-2023 period, monthly average index base load price on DAM in IPS trading zone in Ukraine amounted to 75 €/MWh, which is 114 €/MWh below the HUPX average daily base load price on DAM (2022-2023) of 189 €/MWh	All PPA types		n/a
Supply options and incentive mechanisms	RE incentive higher or lower than announced RES targets	No clearly defined RE incentives, and there is a lack of needed data within the Draft NECP necessary to assess potential RES targets vs. RE incentives	All PPA types		Through INECP increase clarity on various RES technologies targets for 2030 and 2040 and ways how to achieve that to stimulate PPA market
	PPP and/or RES off-take provided by national power utility for large scale RE assets	No publicly disclosed utility PPA deals have been reported in Ukraine	Corporate PPA		Educate and define the strategy and role of utility PPA / CIDs them in upcoming period
Power wholesale market maturity & B2B product	Wholesale market existence (DA/ID) and liquidity (spot churn rate vs. benchmark)	DA and ID existent and functional. Liquidity of the Ukrainian power exchange (spot churn rate of 0.19 in 2023) is the most superior compared to assessed CPs, but below SEE benchmark (CROPEX, HUPX, and IBEX spot churn rate benchmark of 0.78)	Virtual PPA		n/a
	Existence of Route-to-Market product for RE developer and spot/forward product for off-taker	No clarity on spot/forward product offering what creates limitation for implementation of certain PPA products	Virtual PPA		Implement Route-to-Market and other relevant B2B electricity supply products
	"Sleeving" service from electricity supplier to both electricity off-taker and RE asset	No clarity on sleeving service provision what increases uncertainty regarding the implementability of physical PPA product	Physical PPA		National legislation (and national power utility policies) and market design to encourage sleeving service offering
	GOs registry existence and functioning	Ukraine has established a GOs registry, however it is not fully operational yet. Having a mature and functional GOs market is strong pre-requisite for healthy PPA market	All PPA types		Finalize implementation of a fully operational GOs registry
Legal and regulatory certainty	Access to PPAs - Eligible party for PPA contracting (i.e. SME final consumer vs. utility and/or traders)	PPA is not defined in the applicable legislation	Physical PPA		Adoption of legislation that would define the PPA as a standard contract on the market
	GOs framework and mutual recognition	The Green Transformation Law sets the rules related with the issuance and trade of GOs. Recognition of GOs produced outside Ukraine, as well as acceptance of Ukrainian GOs outside of Ukraine, will be carried out based on international treaties. There is absence of disclosure rules	All PPA types		With the participation in the EnC regional GOs system, Ukraine uses the opportunity of GOs trading with other CPs in line with EU standards. Additionally, it is essential for the EU to recognize EnC GOs within its framework to enhance the implementation and attractiveness of cross-border PPAs with EnC CPs.
	Cross border market integration	CBAM will increase electricity costs for CPs exporting to the EU, as non-compliance with EU carbon pricing mechanisms will result in additional carbon charges on the electricity exports. Cross-border PPAs between CPs and EU MSs could be directly affected. EU based off-taker may seek contract adjustments to account for these carbon costs, leading to more complex negotiations and potentially reducing the attractiveness and financial viability of such agreements.	All PPA types		It is crucial for the CP to introduce carbon pricing framework in line with EU ETS. Additionally, the transposition of the Electricity Integration Package and implementation of market coupling would be of high importance for the exemption of CBAM for the electricity transactions. This harmonization can lead to a more stable and predictable PPA market, encouraging long-term investments.

Source: PwC Analysis

5.10. cPPA viability in Contracting Parties

cPPA adoption in Contracting Parties faces common obstacles, yet it can be achieved, depending on local supplier commitment and developer's risk profile.

On the figure below, corporate PPA viability across different business models and regional market under low-risk preference was assessed. By analyzing virtual and physical agreements, as well as in-country versus cross border options, the assessment indicated challenges and opportunities in signing corporate PPA. This assessment should help in making informed decisions in the transitioning to clean energy.

Figure 114 cPPA viability per business model assuming low risk preference

cPPA type	Business model									
In country corporate PPA	Virtual	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract	PX is liquid assumed supplier could provide access to spot / forward products for physical delivery	Lack of liquid PX could use regional PX but could bring basis risk on PPA & supply contract
	Physical	Utility PPA announced, but for corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability	Utility PPA announced, but for corporates conditional on power utility sleeving service availability	Utility PPA signed, but for corporates conditional on power utility sleeving service availability	For corporates conditional on power utility sleeving service availability
Cross border corporate PPA	Virtual	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX	Conditional on local supplier offering spot price on external electricity PX
	Physical	Risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA	Risk of renewal of interconnection capacity each year in long-term PPA	Risk of renewal of interconnection capacity each year in long-term PPA	Conditional on local utility offering sleeving service. There is a risk of renewal of interconnection capacity each year in long-term PPA

■ Fostering ■ Hindering ■ Disabling ■ Neutral

Source: Renewable Power Purchase Agreements in the Energy Community, PwC Analysis

6. Appendix

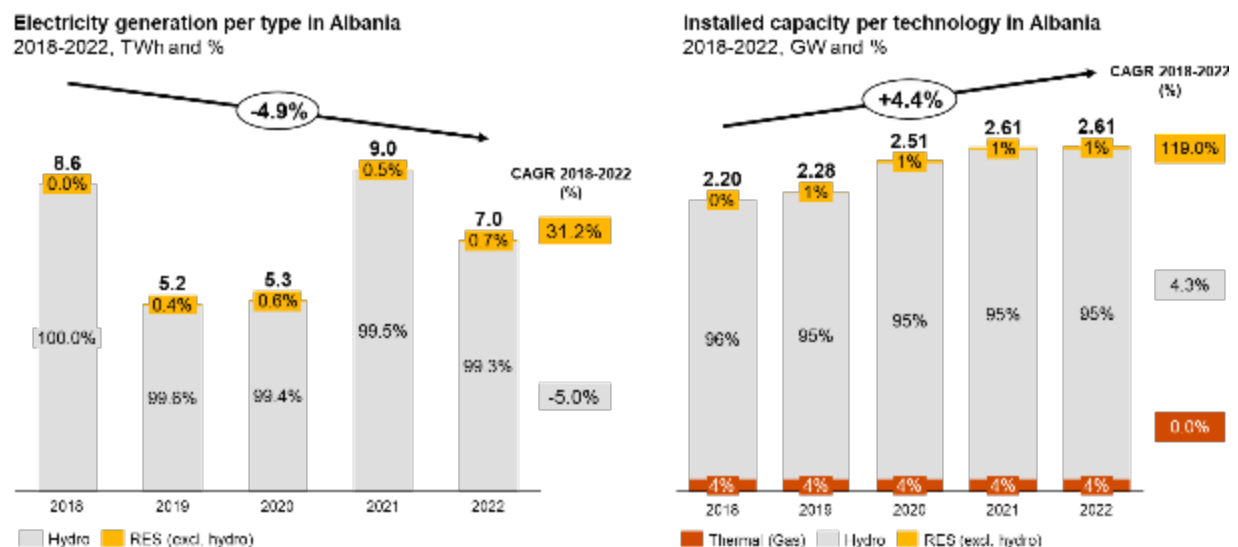
6.1. Albania

Supply

The following text and figures contain information on electricity supply in Albania. It covers electricity generation, installed capacity and the key differences between the development scenarios.

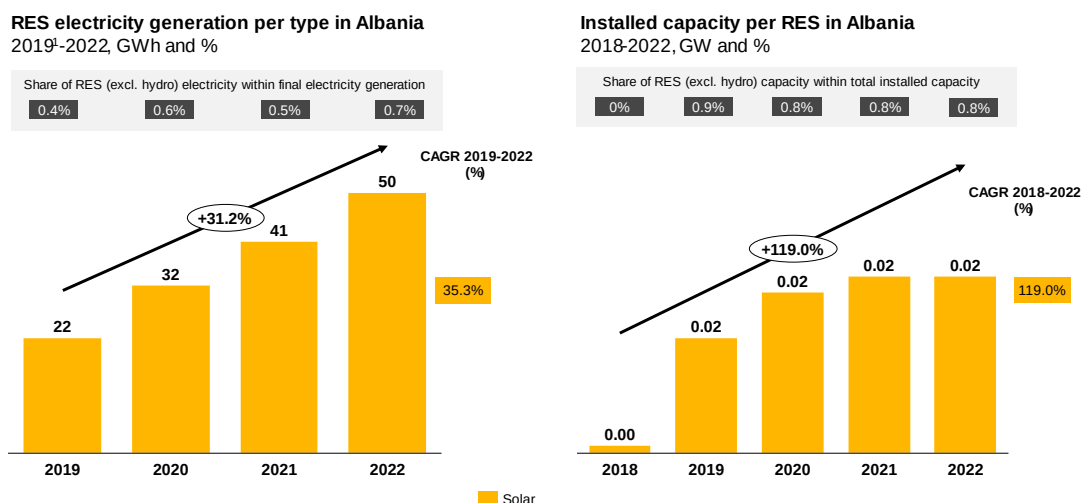
Generation & installed capacity

Figure 115 Overview of electricity generation and installed capacity in Albania



Source: ERE Annual Reports, PwC Analysis

Figure 116 Overview of RES electricity generation and installed capacity in Albania



Note: 1) Solar generated electricity in Albania emerged in 2019

Source: ERE Annual Reports, PwC Analysis

Development scenarios – key differences

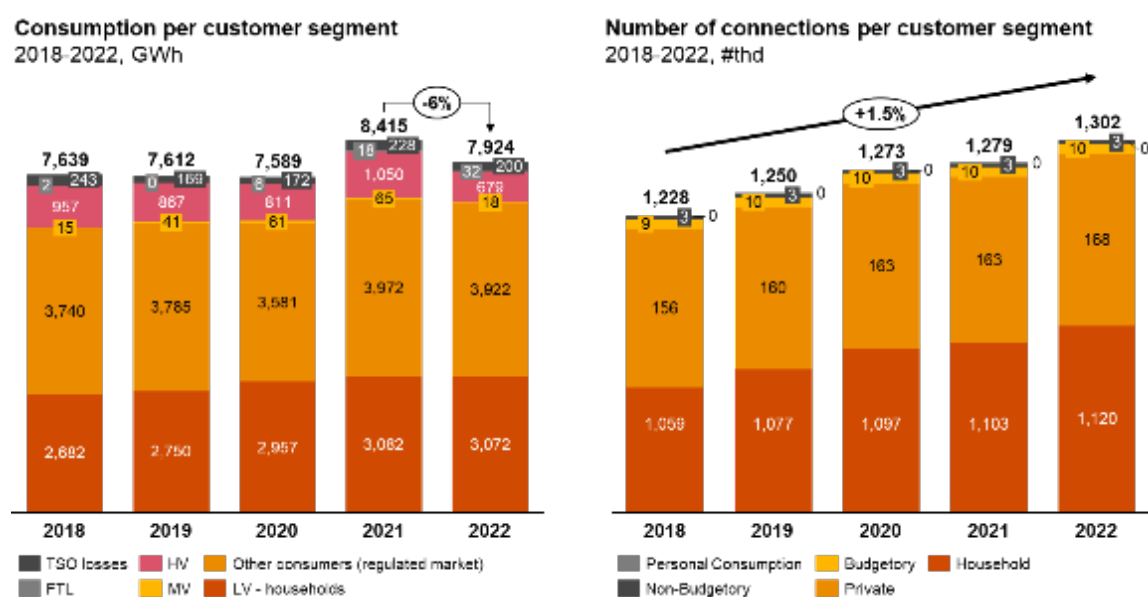
There is no sufficient data available.

Demand

The following text and figures contain information on electricity demand in Albania. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

Consumption per customer segment and number of connections per customer segment

Figure 117 Consumption per customer segment & Number of connections per customer segment

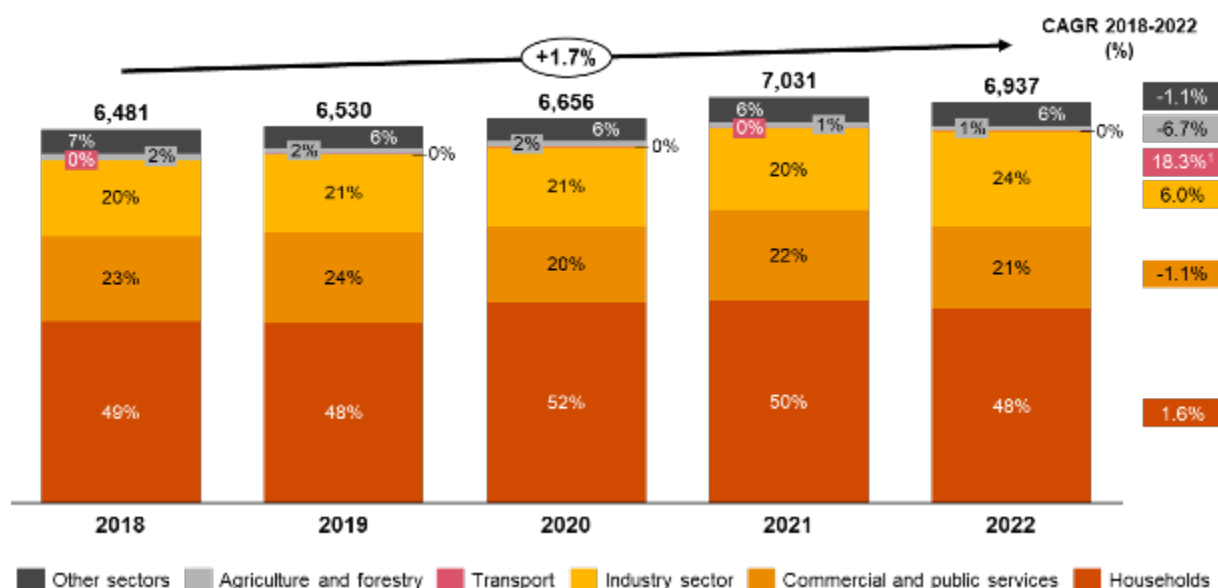


Source: ERE Annual reports, PwC analysis

Consumption by sectors and industry sector consumption

Figure 118 Overview of electricity consumption by sectors in Albania

Electricity consumption by sectors in Albania 2018-2022, GWh and %



Note 1) CAGR 2019-2022

Source: Eurostat, PwC analysis

Review of the electricity consumption within Albania's industry sector, based on Eurostat data, indicates that in 2022, the Iron and Steel sub-sector was the largest consumer, representing 21% (342 GWh) of the sector's total electricity use. The Food, Beverages, and Tobacco sub-sector also had a significant share, accounting for 15% (247 GWh) of the total consumption. Additionally, the Non-ferrous Metals sub-sector, which experienced growth from 90 GWh in 2018 to 197 GWh in 2022, constituted 12% of the industry's electricity consumption in 2022.

List of industrial companies with highest revenue

Figure 119 Overview of selected companies by revenue in Albania with corresponding energy costs

Country	Company	Sub-sector	Revenue 2021/2022 mil. EUR	Share of energy costs in total expenses
	Kastrati Group Sh.a.	Petroleum/Natural gas	786	N/A
	Info-Telecom Sh.p.k.	Telecommunication	389	0,01%
	Gega Oil Group Sh.a.	Petroleum/Natural gas	373	N/A
	Kurum International Sh.a.	Iron and steel	745	N/A
	Trans Adriatic Pipeline Ag Albania - Dege E Shoqerise Se Huaj	Construction	312	N/A
	Inter Distribution Services Sh.p.k.	Wholesale/Retail	148	N/A
	Agna Sh.a.	Wholesale/Retail	140	0,16%
	Philip Morris Albania Sh.p.k.	Food, beverages and tobacco	115	0,42%
	Tenet Sh.a.	Petroleum/Natural gas	83	0,02%

Legend: 2021 (pink), 2022 (dark red)

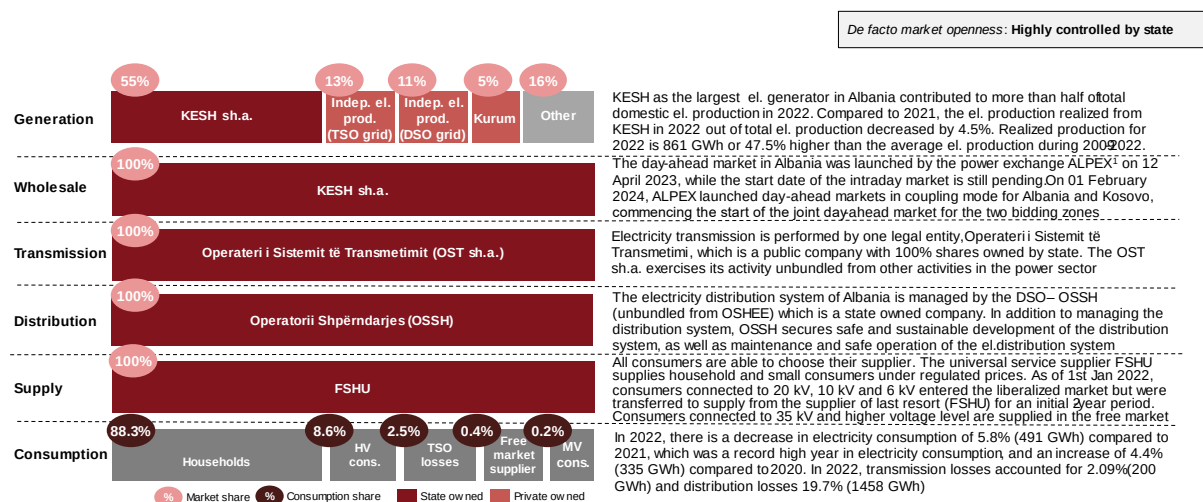
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Albania. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 120 Overview of electricity market structure in Albania 2022



Note: 1) ALPEX - a joint venture company owned by the TSOs of Albania (OST) and Kosovo* (KOSTT)

Source: ERE 2022 Annual Report, EnC Implementation Report 2022 & 2023, ALPEX web page, PwC Analysis

RES projects

Figure 121 Overview of RES developers with corresponding projects in Albania

Developer	Project	Technology	Capacity	Output	Expected COD
Vitalia	Karavasta		140 MW	n/a	2024
	Spitalla		100 MW	n/a	Planned
CWP Global (GE Vernova – partner)	Kukes		190 MW	n/a	2026
Statkraft	Banja Floating Solar Plant		2 MW	2.6 GWh/year	Operational since 2021
Fortis Energy Electric	Vlora		130 MW	n/a	Planned
	Vau Dejes II		100 MW	n/a	Planned
	Klos		100 MW	n/a	Planned
	Erseke		75 MW	n/a	Planned
	Devi		55 MW	n/a	Planned
	Bashkim II		55 MW	n/a	Planned
	Bashkim I		45 MW	n/a	Planned
	Fortis VIG		25 MW	n/a	Planned
	Bashkim III		22 MW	n/a	Planned
	Bidays		20 MW	n/a	Planned
	Acrabanius Wind		12 MW	n/a	Planned
	Gentius Wind		12 MW	n/a	Planned
	Clausal Wind		12 MW	n/a	Planned
	Vescleve Wind		12 MW	n/a	Planned

Source: Balkan Green Energy News, Spitalla Solar web page, Power Technology web page, SeeNews, PwC Analysis

RES projects financing options

In Albania, one example of financing is Belshi solar power plant, which is set for completion in 2026. WBIF (Western Balkan Investment Framework) has given a EUR 9.6 million grant,

and besides that, EBRD approved a loan for another EUR 30 million²³⁹. Additionally, EBRD is providing a loan at the amount of EUR 33 million to Karavasta Solar LLC, owned by a French company Voltaia, to enable them in building Karavasta solar plant, which is expected to have 140 MW in capacity.

Cross-border electricity exchange

In Albania, in a period from 2018 to 2023, total imports of electricity peaked in 2019 at 4.95 TWh. In the same year Albania exported 2.54 TWh of electricity, which also made this year the one in which Albania had the biggest net import of electricity. Coming 2023, Albania was in a much different position becoming a net exporter of electricity with the net exports being 0.82 TWh.

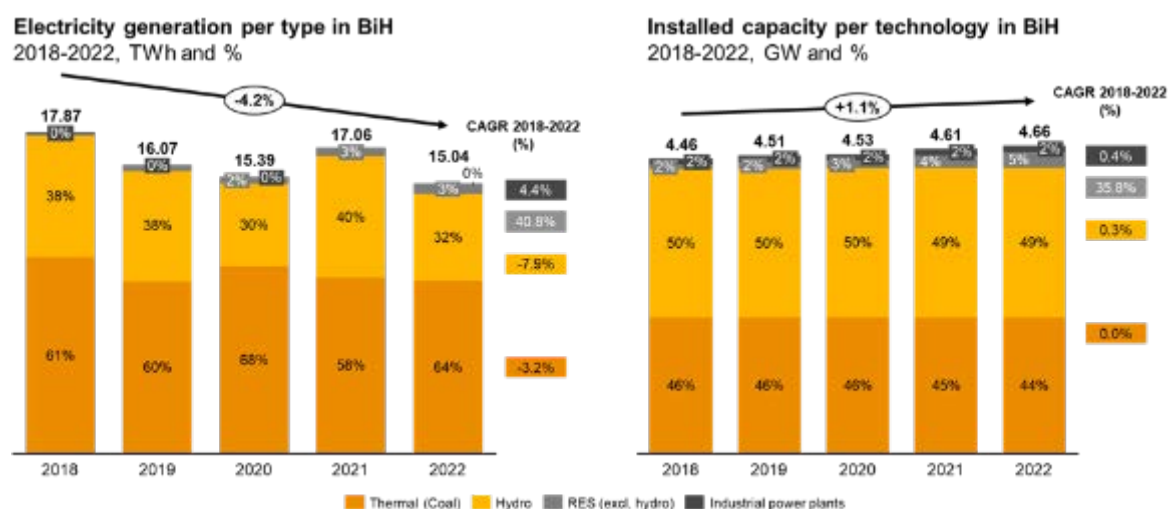
6.2. Bosnia and Herzegovina

Supply

The following text and figures contain information on electricity supply in Bosnia and Herzegovina. It covers electricity generation, installed capacity and the key differences between the development scenarios.

Generation & installed capacity

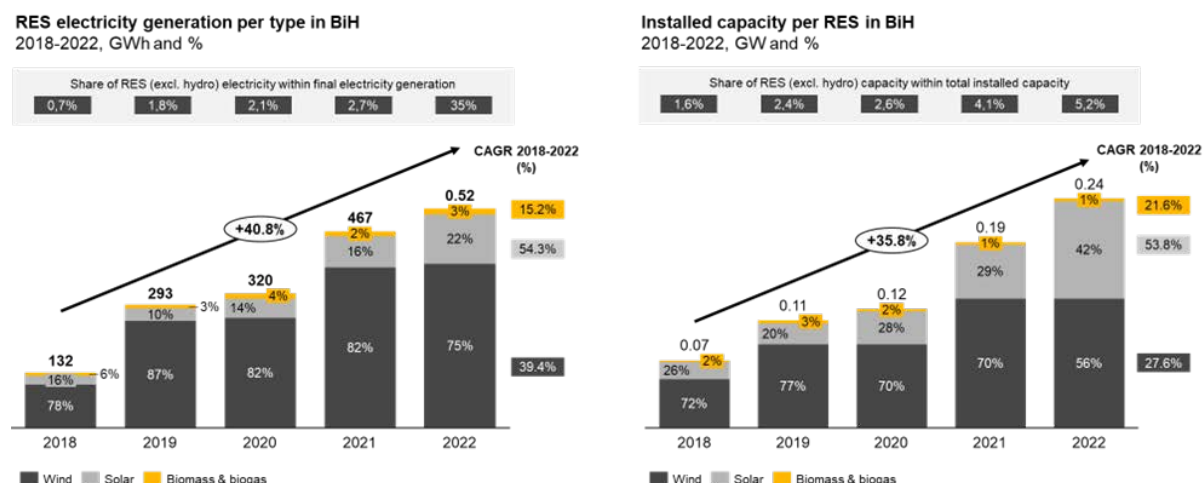
Figure 122 Overview of electricity generation and installed capacity in Bosnia and Herzegovina



Source: DERK, RERS and FERK Annual Reports, PwC Analysis

²³⁹ Balkan Green Energy News. (2023 December 14th). BiH TransCo VSR. Retrieved from <https://balkangreenenergynews.com/eu-approves-renewable-energy-projects-in-bih-albania-of-eur-333-million-in-total/>

Figure 123 Overview of RES electricity generation and installed capacity in Bosnia and Herzegovina



Source: DERK Annual Reports, PwC Analysis

Development scenarios – key differences

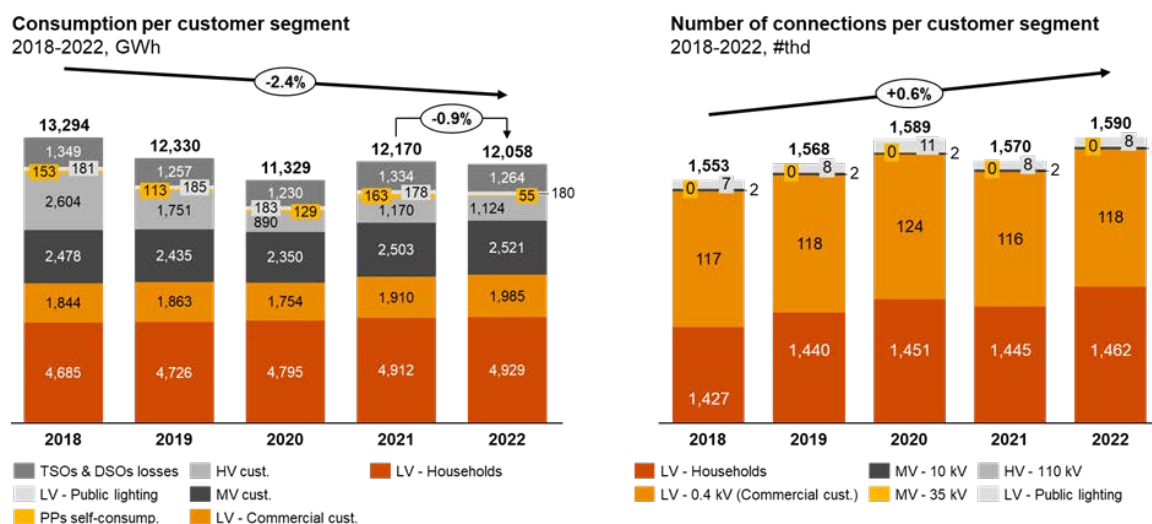
There is no sufficient data available.

Demand

The following text and figures contain information on electricity demand in Bosnia and Herzegovina. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

Consumption per customer segment & number of connections per customer segment

Figure 124 Consumption per customer segment & Number of connections per customer segment



Note: LV – Low Voltage, MV – Medium Voltage, HV – High Voltage

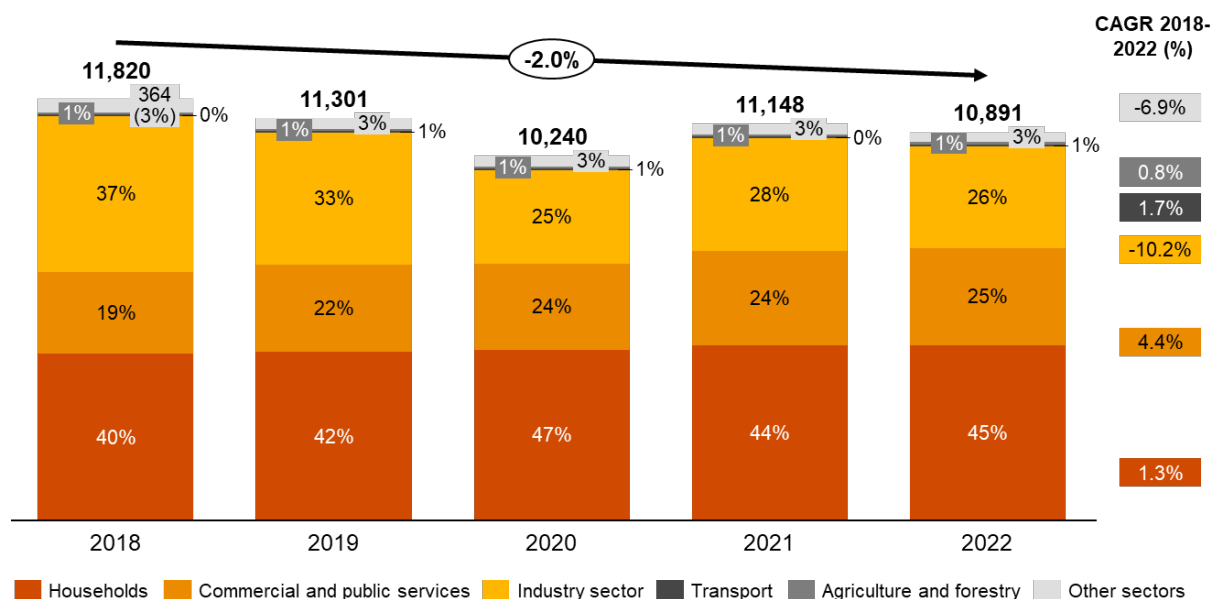
Source: SERC Annual Reports, PwC Analysis

Consumption by sectors and industry sector consumption

Figure 125 Overview of electricity consumption by sectors in Bosnia and Herzegovina

Electricity consumption by sectors in Bosnia and Herzegovina

2018-2022, GWh and %



Source: Eurostat, PwC analysis

In 2022, the Iron and Steel sub-sector was the largest electricity consumer in Bosnia and Herzegovina's industry sector, accounting for 25% (723 GWh) of the total consumption. The Non-ferrous Metals sub-sector experienced the most significant decline, decreasing from a 41% share (1,784 GWh) in 2018 to a 10% share (279 GWh) in 2022. Additionally, the Food, Beverages, and Tobacco sub-sector maintained a substantial share, representing 10% (278 GWh) of the industry sector's total electricity consumption in 2022.

List of industrial companies with highest revenue

Figure 126 Overview of selected companies by revenue in Bosnia and Herzegovina with corresponding energy costs

Country	Company	Sub-sector	Revenue 2022 mil. EUR	Share of energy costs in total expenses
	Bingo d.o.o.	Wholesale/Retail	838	1,33%
	Holdina d.o.o.	Petroleum/Natural gas	812	0,06%
	Arcelormittal Zenica d.o.o.	Iron and steel	538	35,06%
	Aluminij Industries d.o.o.	Iron and steel	512	4,04%
	Optima Grupa d.o.o.	Petroleum/Natural gas	471	0,01%
	Hifa-Oil d.o.o.	Petroleum/Natural gas	418	0,33%
	G-Petrol d.o.o.	Petroleum/Natural gas	398	0,13%
	Boreas d.o.o.	Food, beverages and tobacco	335	0,57%
	Telekom Srpske AD Banja Luka	Telecommunications	238	2,25%

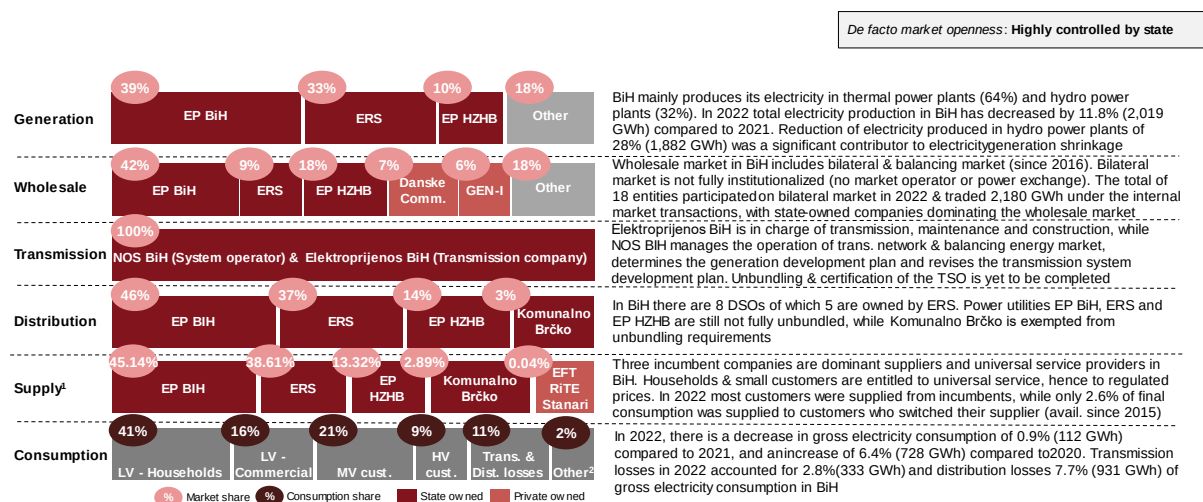
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Bosnia and Herzegovina. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 127 Overview of electricity market structure in Bosnia and Herzegovina 2022



Note: 1) Energy withdrawn from the transmission network in 2022 per supplier; 2) Other: LV - Public lighting and Power plants self-consumption

Source: SERC, RERS and FERK Annual Reports (2018-2022); NOS BiH & Elektroprijenos BiH web page; EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 128 Overview of RES developers with corresponding projects in Bosnia and Herzegovina

Developer	Project	Technology	Capacity	Output	Expected COD
Energokul	VP Energokul		200 MW	n/a	2027
Wpd	Čadijlj		138 MW	n/a	2024
ENPRODE	Široka Draga		125 MW	403 GWh/year	Planned
SoliTek	Sokolac		100 MW	n/a	2025
Powerchina ¹	Ivovik		84 MW	236 GWh/year	2024
Energy 3	Pločno		80 MW	192 GWh/year	2026
Greenstat (GP Toming – partner)	Petnjik		50 MW	65 GWh/year	Operational
FL Wind	Jelovača		36 MW	110 GWh/year	Operational

Source: Power Technology web page, Greenstat web page, Herceg.biz web page, Balkan Green Energy News, Powerchina web page, PwC Analysis

RES projects financing options

EBRD has provided financing in a few projects in Bosnia and Herzegovina. For example, in 2023, EBRD has provided a loan of up to EUR 15.58 million²⁴⁰ for the purpose of financing the installation of variable shunt reactors in the transmission system which will solve the issues of high voltages in the system and increase the system's reliability. Furthermore, EBRD approved a loan to public electricity generation utility JP Elektroprivreda Bosne i Hercegovine d.d. Sarajevo for the development, construction and operation of two adjacent solar photovoltaic plants in Gracanica²⁴¹, which will help them further their decarbonization agenda.

Cross-border electricity exchange

The total import of electricity in Bosnia and Herzegovina in 2018 was 2.31 TWh, after which it surged to 4.28 TWh in 2020 and decreased again in 2023 to 3.54 TWh. Total export followed a similar trend as total import amounted to 5.3 TWh in 2023. During the observed period, from 2018 to 2023, Bosnia and Herzegovina was a net exporter of electricity with a peak in 2021 at 2.76 TWh.

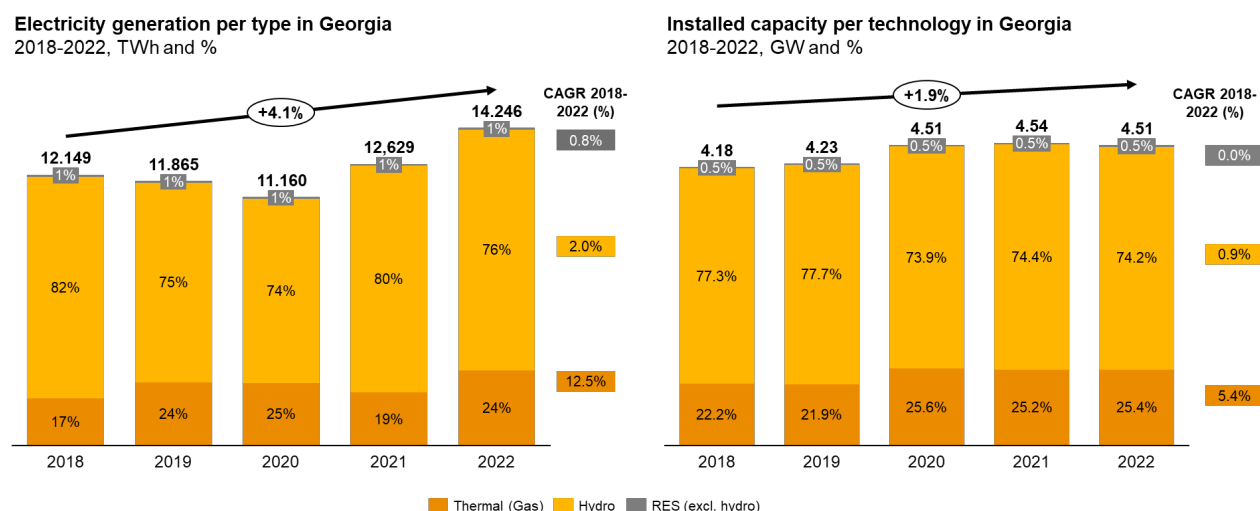
6.3. Georgia

Supply

The following text and figures contain information on electricity supply in Georgia. It covers electricity generation, installed capacity and the key differences between the development scenarios.

Generation & installed capacity

Figure 129 Overview of electricity generation and installed capacity in Georgia

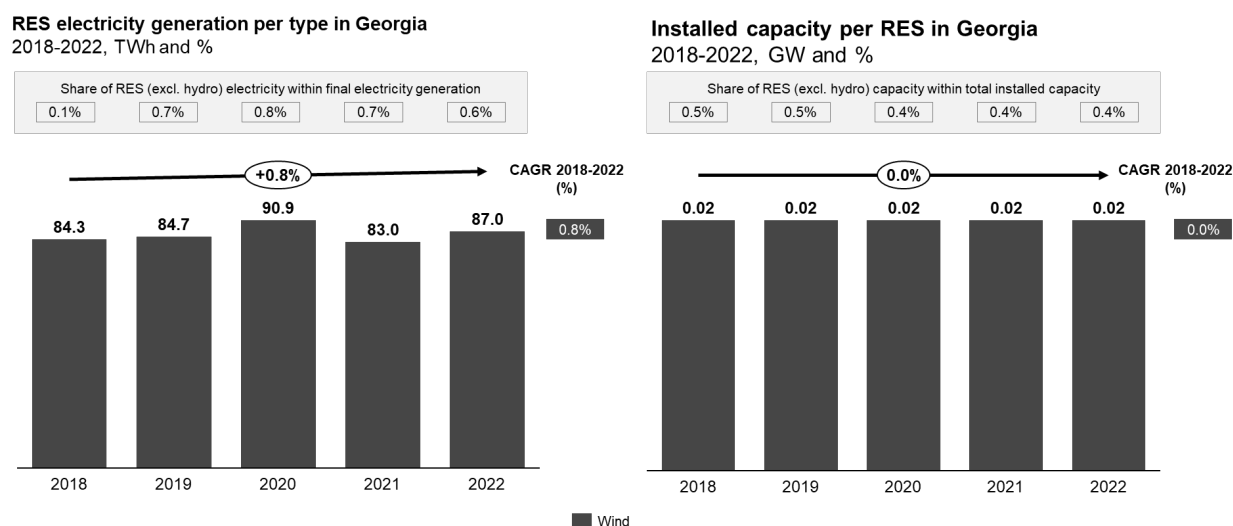


Source: GNERC Annual Reports, PwC Analysis

²⁴⁰ The European Bank for Reconstruction and Development. (2023 January 9th). BiH TransCo VSR. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/53896.html>

²⁴¹ The European Bank for Reconstruction and Development. (2023, February 1st). EPBiH Gracanica SPP. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/53198.html>

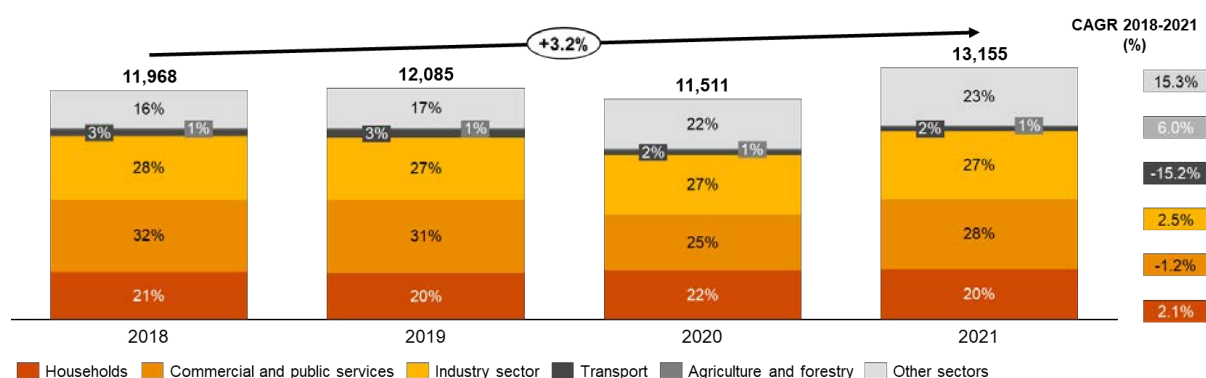
Figure 130 Overview of RES electricity generation and installed capacity in Georgia



Source: GNERC Annual Reports, PwC Analysis

Figure 131 Overview of electricity consumption by sectors in Georgia

Electricity consumption by sectors in Georgia 2018-2021, GWh and %

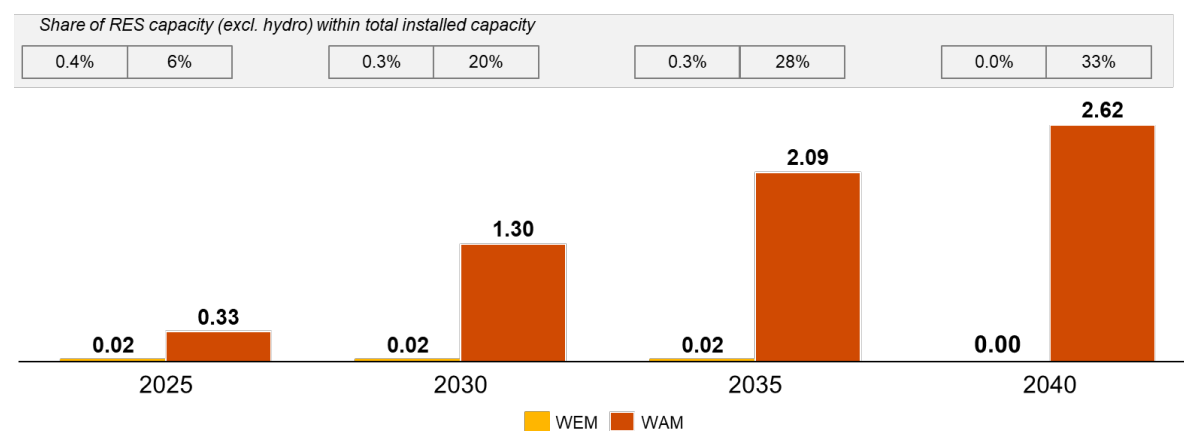


Source: Eurostat, PwC analysis

Development scenarios – key differences

Figure 132 Installed capacity per RES in Georgia

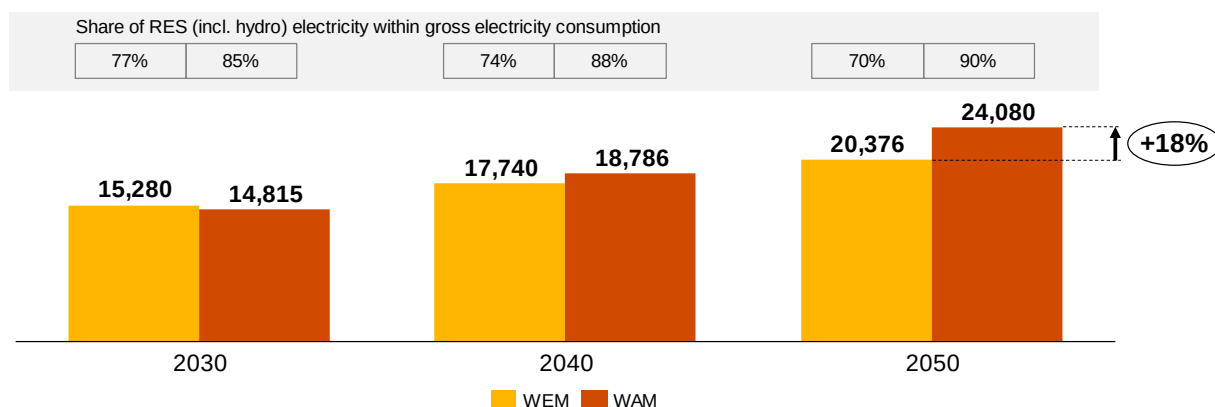
Installed capacity per RES in Georgia, 2025-2040, GW and %



Source: Georgia's NECP, PwC analysis

Figure 133 RES electricity consumption in Georgia

RES electricity consumption in Georgia, 2030-2050, GWh and %



Source: Georgia's NECP, PwC analysis

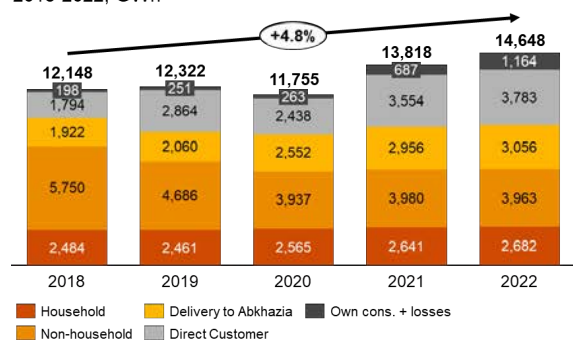
Demand

The following text and figures contain information on electricity demand in Georgia. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

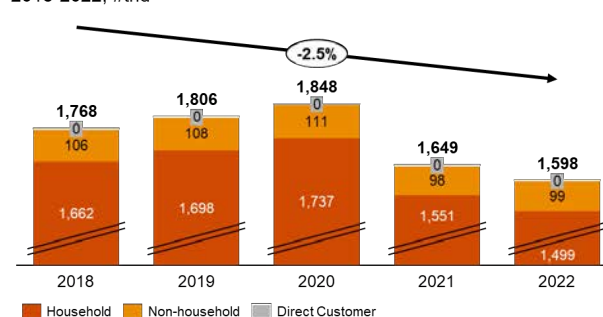
Consumption per customer segment & number of connections per customer segment

Figure 134 Consumption per customer segment & Number of connections per customer segment

Consumption per customer segment 2018-2022, GWh



Number of customers per customer segment 2018-2022, #thd

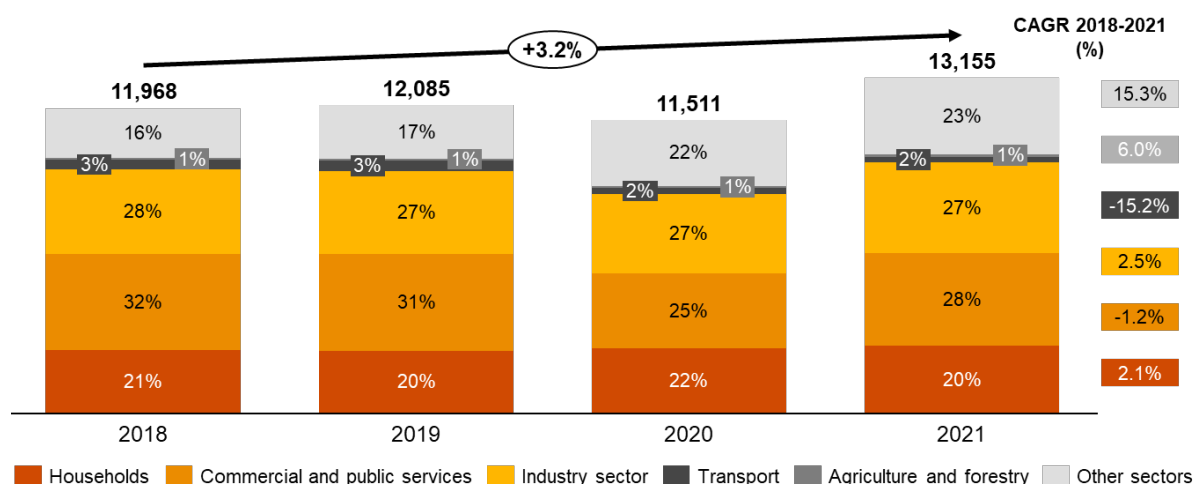


Source: GNERC Annual Reports, PwC Analysis

Consumption by sectors and industry sector consumption

Figure 135 Overview of electricity consumption by sectors in Georgia

Electricity consumption by sectors in Georgia 2018-2021, GWh and %



Source: Eurostat, PwC analysis

In 2021, the Iron and Steel sub-sector dominated electricity consumption within Georgia's industry sectors, accounting for a substantial 56% share (1,998 GWh). Other significant contributors included the Non-metallic Minerals sub-sector with a 9% share (323 GWh), the Chemical and Petrochemical sub-sector with an 8% share (287 GWh), and the Food, Beverages, and Tobacco sub-sector, also with an 8% share (269 GWh).

List of industrial companies with highest revenue

Figure 136 Overview of selected companies by revenue in Georgia with corresponding energy costs

Country	Company	Sub-sector	Revenue 2021/2022 mil. EUR	Share of energy costs in total expenses
	Georgian International Energy Corporation LLC	Petroleum/Natural gas	1,368	x
	Socar Georgia Gas LLC	Petroleum/Natural gas	1,131	x
	Wissol Petroleum Georgia Jsc	Petroleum/Natural gas	645	x
	Tbilisi Energy Ltd	Petroleum/Natural gas	704	x
	PSP Pharma LLC	Wholesale/Retail	553	x
	Bank Of Georgia Jsc	Banking	498	x
	Rustavi Azoti Jsc	Agriculture	397	x
	Rustavi Steel LLC	Iron and steel	265	x

Legend: 2021 (light red), 2022 (dark red)

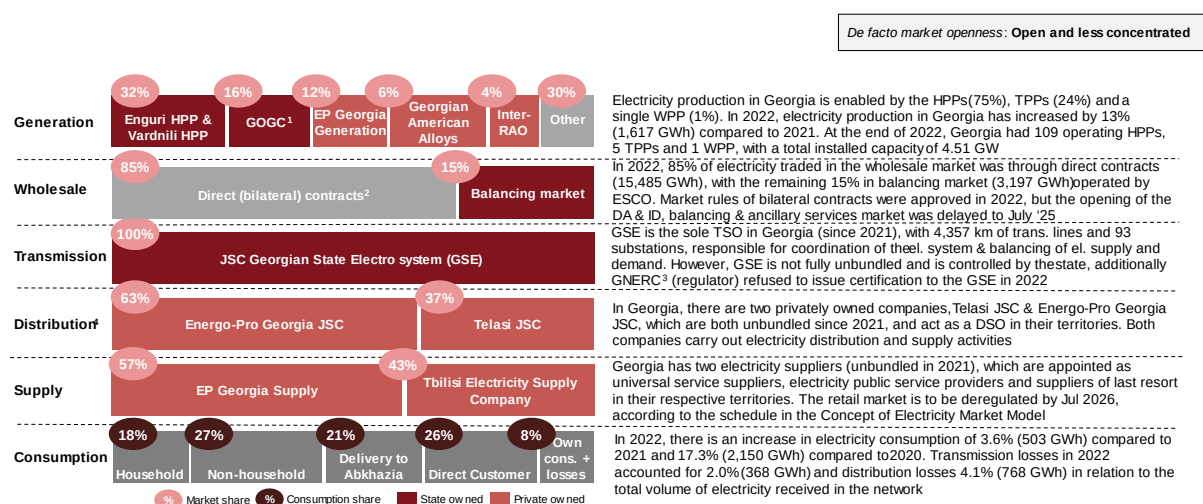
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Georgia. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 137 Overview of electricity market structure in Georgia 2022



Note: 1) GOGC - Georgian Oil and Gas Corporation, 2) Information (volume/price/origin) on direct contracts is unavailable due to the B2B nature of the bilateral agreements, 3) Georgian National Energy and Water Supply Regulatory Commission, 4) Distribution for 2021

Source: GNERC & ESCO Annual Reports, Transparency International publication, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 138 Overview of RES developers with corresponding projects in Georgia

Developer	Project	Technology	Capacity	Output	Expected COD
Infinite Energy	Imereti WPP		100 MW	n/a	Planned
Masdar	Akhali Samgor		96 MW	n/a	Planned
Calik Enerji	Nigoza Wind Energy		50 MW	n/a	2024
Quartli Wind Farm LTD	Quartli Wind Farm		20 MW	85 GWh/year	Operational since 2016

Source: Infinite Energy web page, Georgian Energy Development Fund, Wind Power web page, Triodos Investment management fund web page, European Union External Action web page, Calik Enerji web page, PwC Analysis

RES projects financing options

The European Bank for Reconstruction and Development (EBRD) has invested a total of EUR 133.2 million in the Enguri Hydropower Plant (HPP) in Georgia since 1998. The initial investment was EUR 36.6 million, with the most recent being a EUR 28 million loan in 2023 aimed at enhancing plant safety and reliability²⁴². Furthermore, EBRD has financed the development and construction of the Kheledula HPP in 2018, through a EUR 28 million loan to Kheledula LLC²⁴³.

Cross-border electricity exchange

²⁴² The European Bank for Reconstruction and Development. (2023 September 28th). Enguri HPP – Safety Upgrade. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/54948.html>

²⁴³ The European Bank for Reconstruction and Development. (2018 September 25th). Kheledula HPP. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/kheledula-hpp.html>

Data on Georgia cross-border electricity exchanges is only available for the period after 2021. From 2021 to 2023 Georgia changed from a net importer at 0.48 TWh in 2021, to a net exporter at 0.84 TWh in 2023. In comparison to 2021, total imports and total exports in 2023 more than doubled. Total imports increased from 2.01 TWh in 2021 to 4.14 TWh in 2023, while total exports increased from 1.53 TWh in 2021 to 4.98 TWh in 2023.

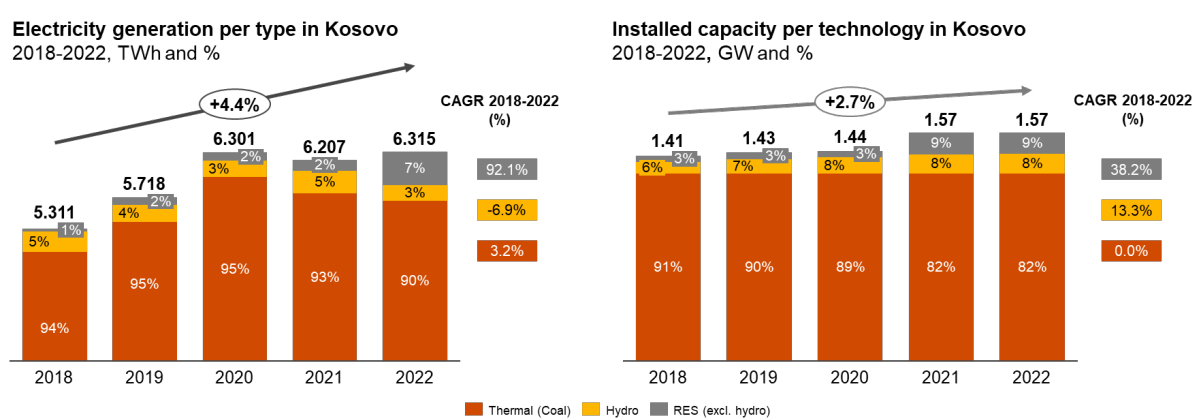
6.4. Kosovo*

Supply

The following text and figures contain information on electricity supply in Kosovo*. It covers electricity generation, installed capacity and the key differences between the development scenarios.

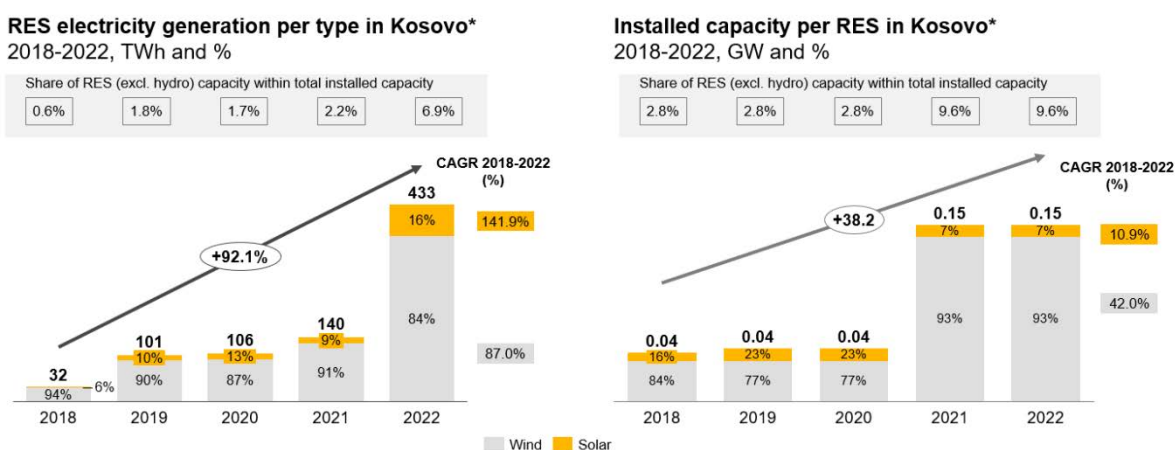
Generation & installed capacity

Figure 139 Overview of electricity generation and installed capacity in Kosovo*



Source: ERO Annual Reports, PwC Analysis

Figure 140 Overview of RES electricity generation and installed capacity in Kosovo*

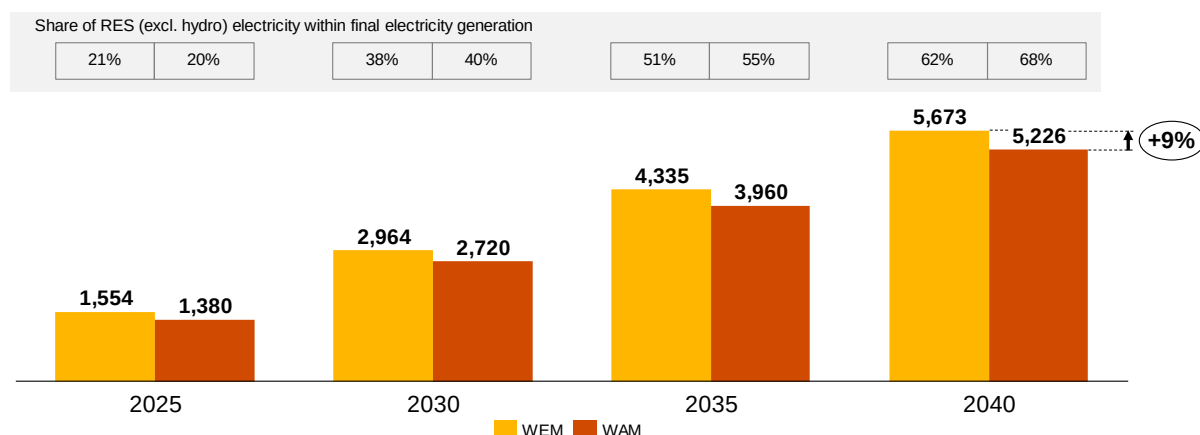


Source: ERO Annual Reports, PwC Analysis

Development scenarios – key differences

Figure 141 Electricity generation per RES in Kosovo*

Electricity generation per RES in Kosovo*, 2025-2040, GWh and %



Source: Kosovo's* NECP, PwC Analysis

Demand

The following text and figures contain information on electricity demand in Kosovo*. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

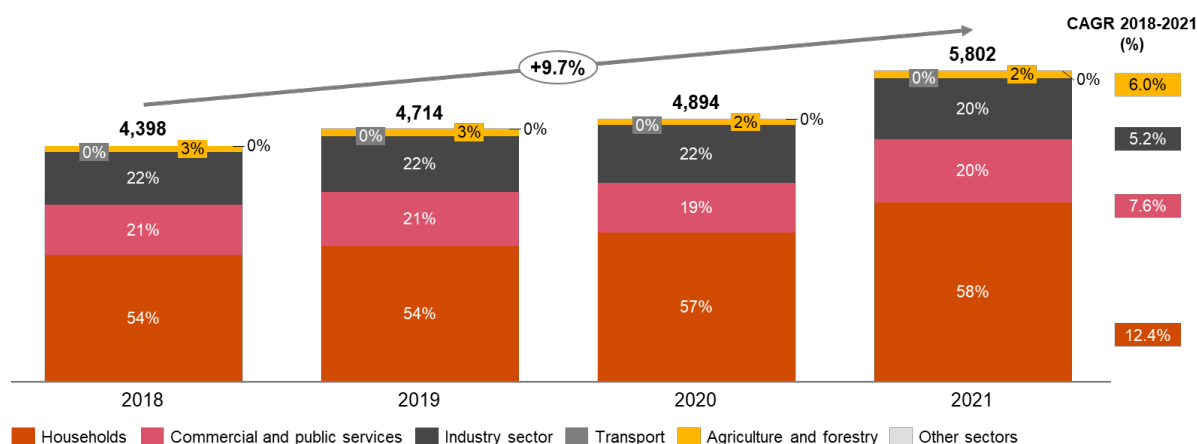
Consumption per customer segment & number of connections per customer segment

There is no data available for the number of connections per customer segment.

Consumption by sectors and industry sector consumption

Figure 142 Overview of electricity consumption by sectors in Kosovo*

Electricity consumption by sectors in Kosovo 2018-2021, GWh and %



Source: Eurostat, PwC analysis

According to Eurostat, a detailed analysis of electricity consumption in North Macedonia's industry sector reveals that the Iron and Steel sub-sector was the largest consumer in 2021, accounting for 43% (491 GWh) of the total consumption. This sub-sector also saw a 14.26% increase in consumption from 2018 to 2022. Another significant contributor was the Food, Beverages, and Tobacco sub-sector, which accounted for 34% (390 GWh) of the industry's total electricity consumption.

List of industrial companies with highest revenue

Figure 143 Overview of selected companies by revenue in Kosovo* with corresponding energy costs

Country	Company	Sub-sector	Revenue 2022 mil. EUR	Share of energy costs in total expenses
	ELKOS	Food, beverages and tobacco	239	x
	VIVA FRESH	Food, beverages and tobacco	224	x
	Neptun	Electronics & appliances	72	x
	Migros	Food, beverages and tobacco	56	1,98%
	Albi Commerce	Wholesale/Retail	26	x

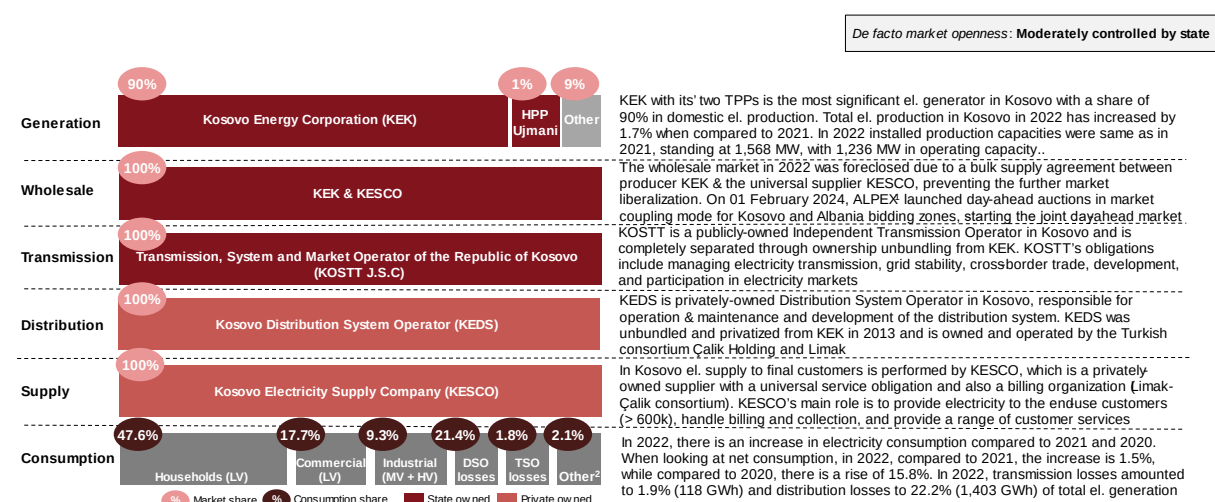
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Kosovo*. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 144 Overview of electricity market structure in Kosovo* 2022



Note: 1) ALPEX - a joint venture company owned by the TSOs of Albania (OST) and Kosovo* (KOSTT), 2) Other consists of Public lighting (0.6%) and KEK consumption (1.5%)

Source: ERO Annual Reports (2018-2022), EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 145 Overview of RES developers with corresponding projects in Kosovo*

Developer	Project	Technology	Capacity	Output	Expected COD
Solar Energy Group Europe	Gjakova		150 MW	n/a	Construction expected to start in 2024
SOWI Kosovo (Enlight Renewable Energy & Notus Energy – partners)	Bajgora		102.6 MW	320 GWh/year	Operational since 2021
Upwind International AG	Budakova		46 MW	110 GWh/year	Operational since 2022
Guris Holding CO	Kitka WPP		32 MW	95 GWh/year	Operational since 2018

Source: Balkan Green Energy News web page, Power Technology web page, PwC Analysis

RES projects financing options

The European Investment Bank (EIB) has contributed EUR 33 million towards a EUR 107 million photovoltaic plant project in Kosovo* that is being built as a part of Solar4Kosovo project. The remaining funds consist of a EUR 32 million grant from the EU's Western Balkans Investment Framework and a EUR 29 million loan from the KfW Development Bank²⁴⁴. In addition, the European Bank for Reconstruction and Development (EBRD) has provided a EUR 55 million loan for the construction of the Bajgora wind farm²⁴⁵.

Cross-border electricity exchange

In the period from 2018 to 2023, Kosovo* was predominantly a net exporter country regarding electricity with the exception of 2021, when Kosovo* was a net exporter at 0.08 TWh in net electricity exported. In the observed period, Kosovo's* net imports of electricity peaked only a year before in 2020 when their net imports were 3.98 TWh. In the same year, the total imports of electricity peaked too at 4.6 TWh.

6.5. Moldova

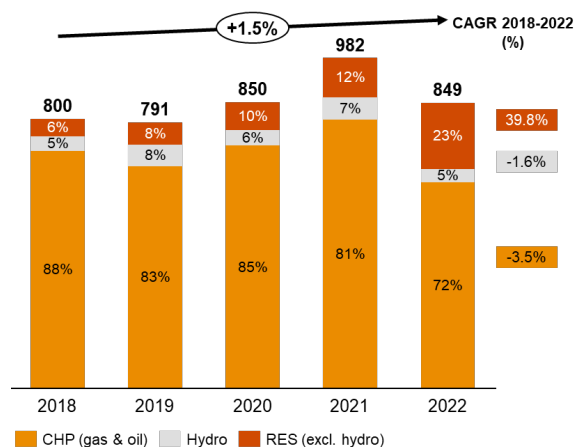
Supply

The following text and figures contain information on electricity supply in Moldova. It covers electricity generation, installed capacity and the key differences between the development scenarios.

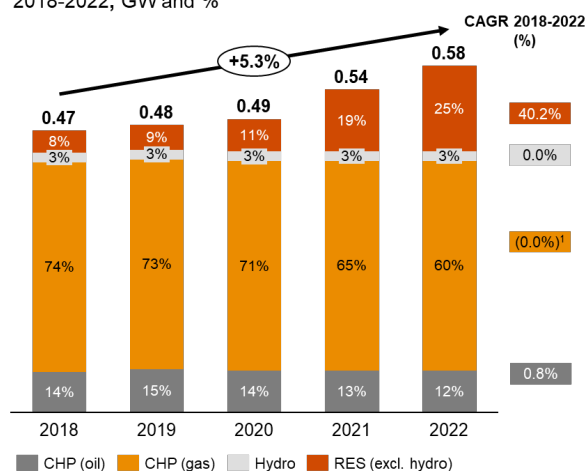
Generation & installed capacity

Figure 146 Overview of electricity generation and installed capacity in Moldova

Electricity generation per type in Moldova
2018-2022, TWh and %



Installed capacity per technology in Moldova
2018-2022, GW and %



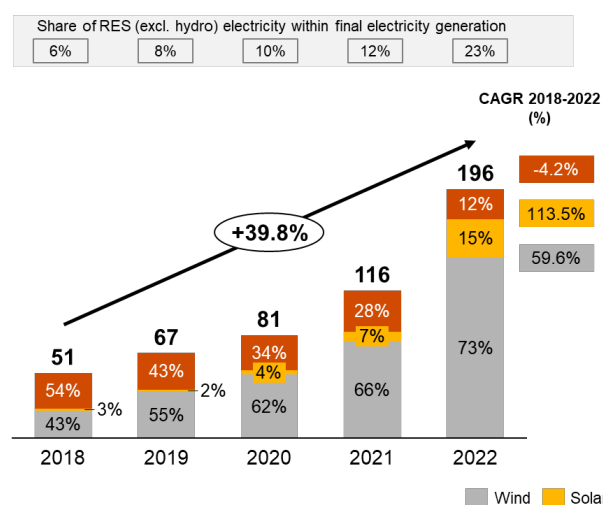
Source: ANRE Annual Reports, PwC Analysis

²⁴⁴ Balkan Green Energy News. (2024 March 24th). Kosovo* receives financing for 120 MW solar power plant on coal ash dump. Retrieved from <https://balkangreenenergynews.com/kosovo-receives-financing-for-120-mw-solar-power-plant-on-coal-ash-dump/>

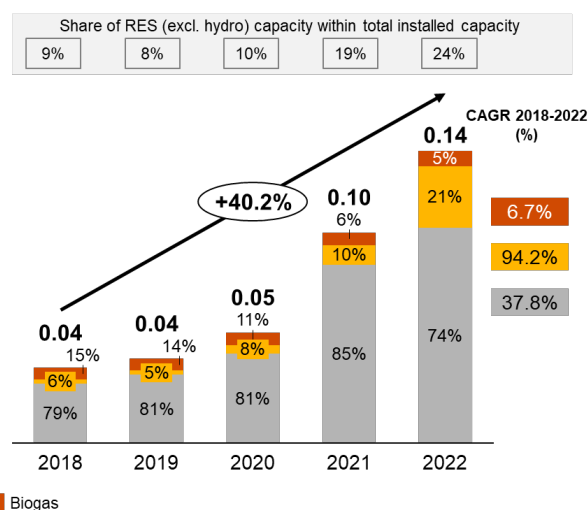
²⁴⁵ The European Bank for Reconstruction and Development. (2019 June 19th). Bajgora Wind. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/50423.html>

Figure 147 Overview of RES electricity generation and installed capacity in Moldova

RES electricity generation per type in Moldova
2018-2022, GWh and %



Installed capacity per RES in Moldova
2018-2022, GW and %

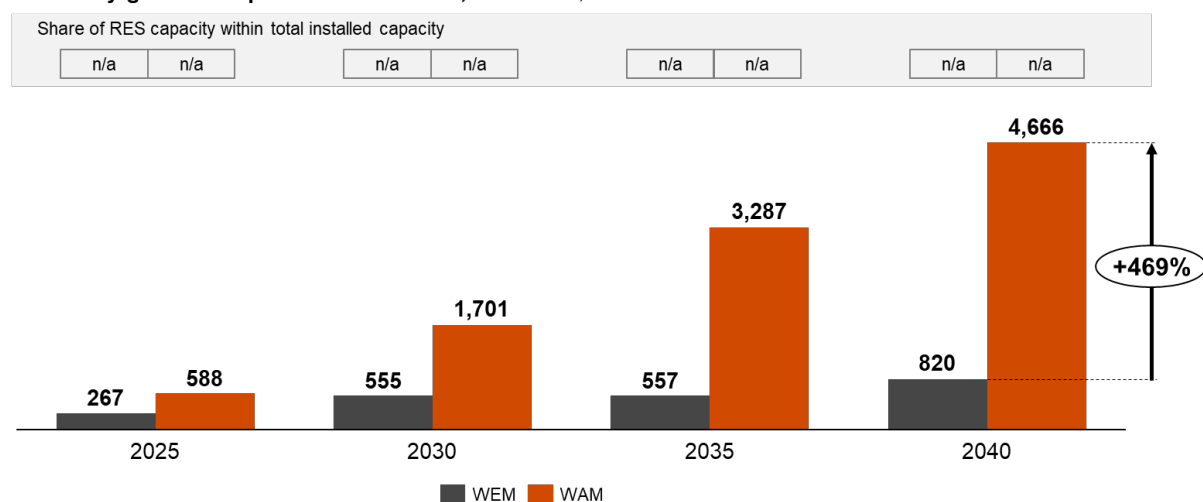


Source: ANRE Annual Reports, IEA Publications, PwC Analysis

Development scenarios – key differences

Figure 148 Electricity generation per RES in Moldova

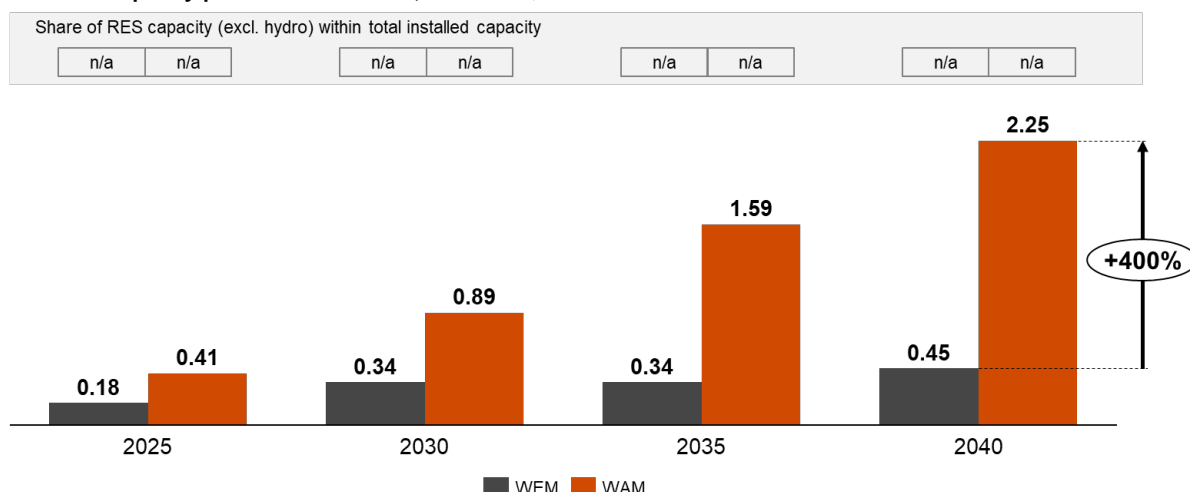
Electricity generation per RES in Moldova, 2025-2040, GWh and %



Source: Moldova's NECP, PwC Analysis

Figure 149 Installed capacity per RES in Moldova

Installed capacity per RES in Moldova, 2025-2040, GW and %



Source: Moldova's NECP, PwC Analysis

Demand

The following text and figures contain information on electricity demand in Moldova. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

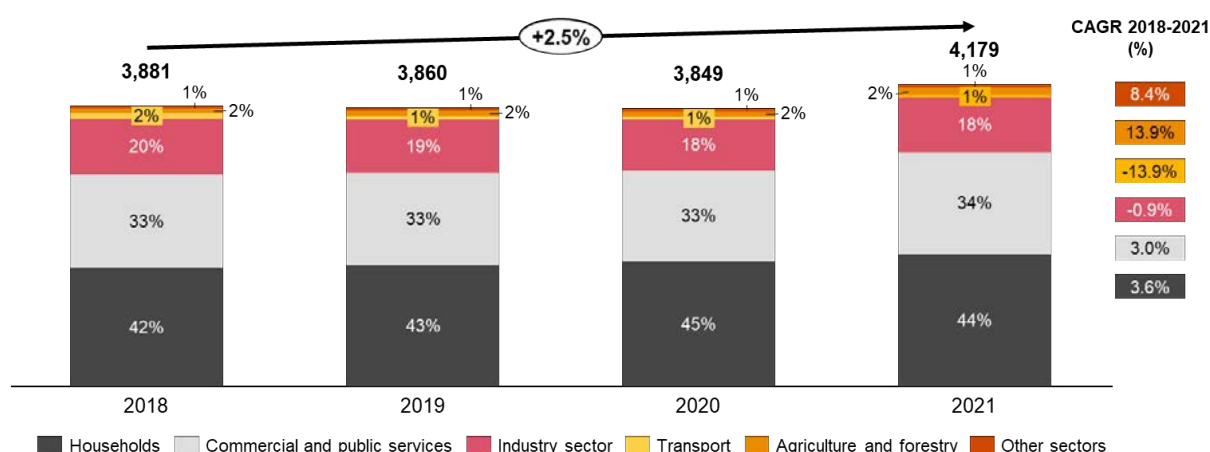
Consumption per customer segment & number of connections per customer segment

There is no data available for the number of connections per customer segment.

Consumption by sectors and industry sector consumption

Figure 150 Overview of electricity consumption by sectors in Moldova

Electricity consumption by sectors in Moldova 2018-2021, GWh and %



Source: Eurostat, PwC analysis

Moldova's industry sector shows that the two largest sub-sectors in terms of electricity consumption are Food, Beverages, and Tobacco, which accounts for 46% (344 GWh), and Non-metallic Minerals, which comprises 23% (174 GWh). The Chemical and Petrochemical sub-sector experienced a decline in its absolute electricity consumption, dropping from 42 GWh in 2018 to 34 GWh in 2021, although it consistently represented 5% of the total electricity consumption in the industry sector during this period.

List of industrial companies with highest revenue

Figure 151 Overview of selected companies by revenue in Moldova with corresponding energy costs

Country	Company	Sub-sector	Revenue 2019-2022 mil. EUR	Share of energy costs in total expenses
	Moldovagaz SA	Petroleum/Natural gas	832	N/A
	Floarea Soarelui SA	Food, beverages and tobacco	391	N/A
	Intreprinderea Mixta Rompetrol Moldova S.A.	Petroleum/Natural gas	189	N/A
	Moldretail Group S.R.L.	Wholesale/Retail	185	N/A
	Intreprinderea Mixta Orange Moldova S.A.	Telecommunications	161	N/A
	Banca Comerciala Moldova- Agroindbank SA	Banking	138	N/A
	Dita Estfarm S.R.L.	Pharmaceuticals	106	N/A
	Petrom Moldova SRL	Petroleum/Natural gas	263	N/A
	Intreprinderea Cu Capital Strain Metro Cash & Carry Moldova S.R.L.	Wholesale/Retail	105	N/A

■ 2019
 ■ 2020
 ■ 2021
 ■ 2022

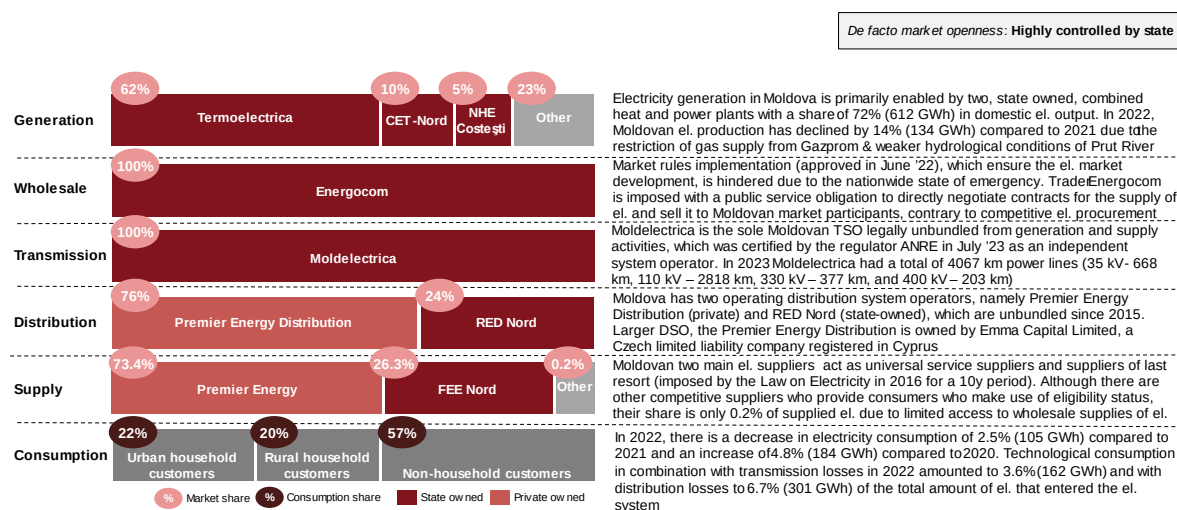
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Moldova. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 152 Overview of electricity market structure in Kosovo* 2022



Source: ANRE Annual Reports (2018-2022), IEA Publications, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 153 Overview of RES developers with corresponding projects in Moldova

Developer	Project	Technology	Capacity	Output	Expected COD
flyRen Energy Group	Bulboaca Solar PV Park		28 MW	n/a	2026
Powerchina	Criuleni PV park		2.86 MW	n/a	Operational
SENS	Bacioi village		1 MW	n/a	Operational

Source: Power Technology web page, SENS web page, Powerchina web page, PwC Analysis

RES projects financing options

In Moldova, EBRD has secured a EUR 28 million loan to ICS Premier Energy Distribution S.A. to help them finance their program from 2022 to 2025. The European Investment Bank (EIB) will also contribute an equal amount to co-finance the project²⁴⁶. EBRD also provided a loan to the Republic of Moldova in the amount of EUR 32 million for the construction and improvement of the electricity transmission lines in the country²⁴⁷.

Cross-border electricity exchange

Looking at Moldova, there is only data available from 2020. When observing the period from 2020 to 2023 Moldova was a net importer of electricity. Its total imports peaked in 2023 at 0.46 TWh. Total exports peaked in the same year at 0,32 TWh.

6.6. Montenegro

Supply

The following text and figures contain information on electricity supply in Montenegro. It covers electricity generation, installed capacity and the key differences between the development scenarios.

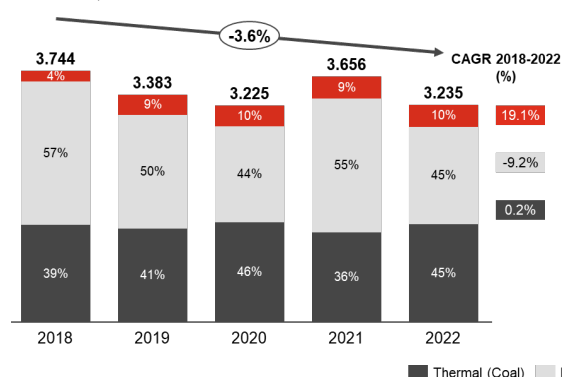
²⁴⁶ The European Bank for Reconstruction and Development. (2022 September 13th). Chisinau Premier Energy Distribution Upgrade. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/53191.html>

²⁴⁷ The European Bank for Reconstruction and Development. (2023 October 2nd). Moldova Romania Power Interconnection Phase II. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/54567.html>

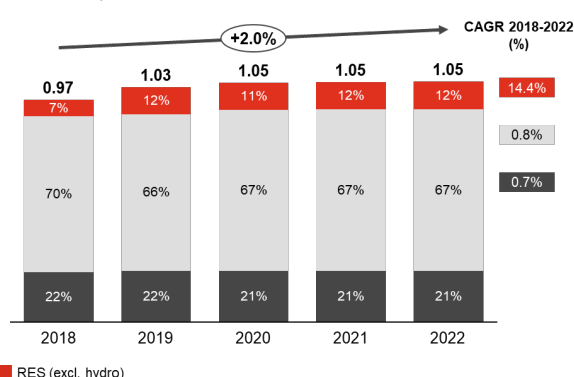
Generation & installed capacity

Figure 154 Overview of electricity generation and installed capacity in Montenegro

Electricity generation per type in Montenegro
2018-2022, TWh and %



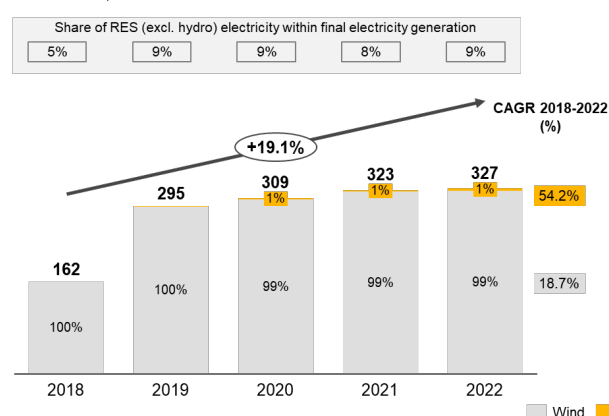
Installed capacity per technology in Montenegro
2018-2022, GW and %



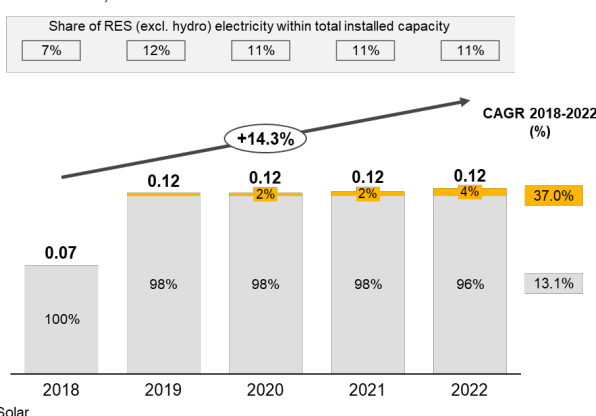
Source: REGAGEN Annual Reports (2018-2022), PwC analysis

Figure 155 Overview of RES electricity generation and installed capacity in Montenegro

RES electricity generation per type in Montenegro
2018-2022, TWh and %



Installed capacity per RES in Montenegro
2018-2022, GW and %



Source: REGAGEN Annual Reports (2018-2022), PwC analysis

Development scenarios – key differences

There is no sufficient data available.

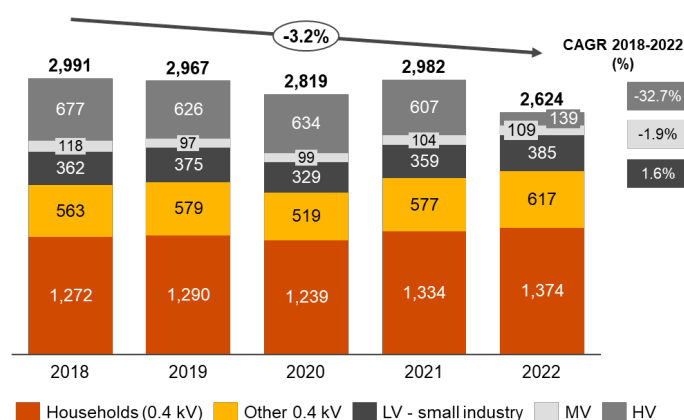
Demand

The following text and figures contain information on electricity demand in Montenegro. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

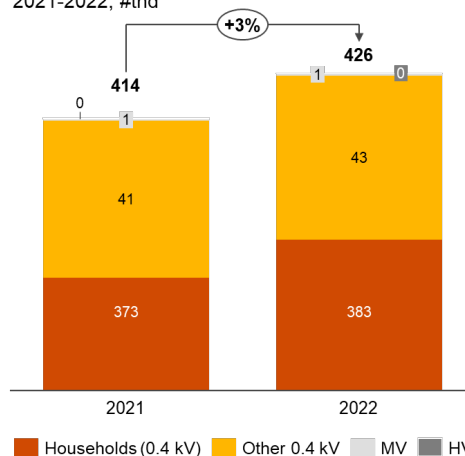
Consumption per customer segment & number of connections per customer segment

Figure 156 Consumption per customer segment & Number of connections per customer segment

Net consumption per customer segment
2018-2022, GWh



Number of customers per customer segment
2021-2022, #thd



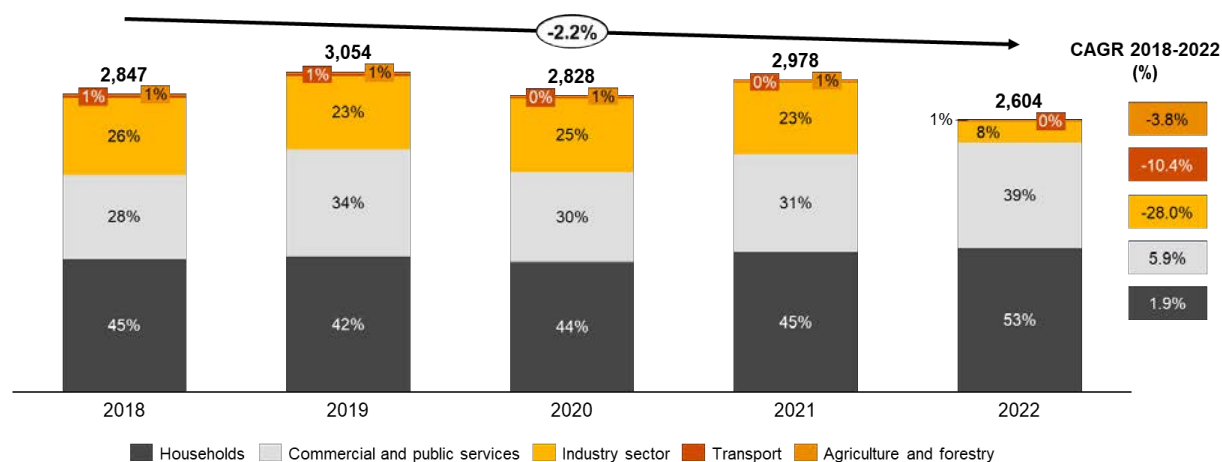
Note: LV – Low Voltage, MV – Medium Voltage, HV – High Voltage

Source: REGAGEN Annual Reports, PwC analysis

Consumption by sectors and industry sector consumption

Figure 157 Overview of electricity consumption by sectors in Montenegro

Electricity consumption by sectors in Montenegro 2018-2022, GWh and %



Source: Eurostat, PwC analysis

Electricity consumption within the Industry sectors in Montenegro in 2022 is dominated by the Non-ferrous metals sub-sector with a share of 39% (77.5 GWh), which also implies a shrinkage of 86% in consumed electricity (492.7 GWh) compared to 2021 results. Another major contributor within the Industrial sector is Food, beverages and tobacco sub-sector with 24% share (48.3 GWh) in 2022. The remaining sub-sector with a two-digit share in total electricity consumption within Industry sector is a Wood and wood products sub-sector at 10% share (19.5 GWh) in 2022.

List of industrial companies with highest revenue

Figure 158 Overview of selected companies by revenue in Montenegro with corresponding energy costs

Country	Company	Sub-sector	Revenue 2022 mil. EUR	Share of energy costs in total expenses
	Jugopetrol A.D.	Petroleum/Natural gas	315	0,23%
	Voli Trade d.o.o.	Wholesale/Retail	312	1,48%
	Hard Discount Lakovic d.o.o.	Wholesale/Retail	197	1,05%
	Uniprom d.o.o.	Transportation	170	2,73%
	Mercator-CG d.o.o.	Wholesale/Retail	146	1,71%
	INA – Crna Gora d.o.o.	Petroleum/Natural gas	122	0,15%
	Montefarm Ustanova	Wholesale/Retail	113	0,16%
	Glosarij d.o.o.	Wholesale/Retail	113	0,23%
	Domaca trgovina d.o.o.	Wholesale/Retail	101	1,64%

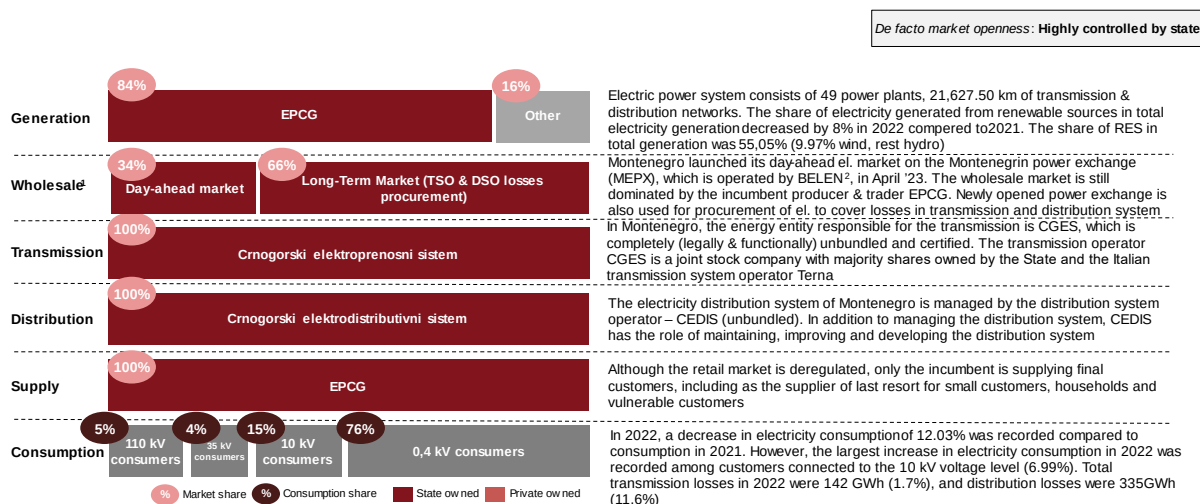
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Montenegro. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 159 Overview of electricity market structure in Montenegro 2022



Note: 1) Expressed as a share in traded volume on the Montenegrin power exchange, 2) BELEN - Berza električne energije

Source: REGAGEN 2022 Annual Report, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 160 Overview of RES developers with corresponding projects in Montenegro

Developer	Project	Technology	Capacity	Output	Expected COD
Somsol	Somina		240 MW	n/a	Planned
Sunrise Europe	Šavnik		220 MW	264 GWh/year	Planned
BSD Montis	Solar Park Vuča		123.6 MW	219.9 GWh/year	Planned
Alcazar Energy	Bijela Wind Farm		118 MW	333 GWh/year	Construction expected to start in 2025
Quair Energy	Rudine		50 MW	n/a	Planned
Čevo Solar	Čevo		4.42 MW	6 GWh/year	Operational

Source: Čevo Solar web page, BSD Mont web page, Balkan Green Energy News, Alcazar Energy web page, Qair Energy web page, PwC Analysis

RES projects financing options

In Montenegro, EBRD has financed multiple energy related project. In more detail, in 2022, EBRD has provided a loan to Elektroprivreda Crne Gore AD Niksic in the amount of EUR 82 million for the acquisition, development, construction and commissioning of the Gvozd Windfarm²⁴⁸. Additionally, EBRD has in 2014 provided a loan of up to EUR 47.5 million to finance the construction of a wind power plant at Krnovo.²⁴⁹

Cross-border electricity exchange

In Montenegro, in the period from 2018 to 2022, both total exports and total imports have been steadily rising. Total imports went from 2.6 TWh in 2018 to 5.3 TWh in 2022. However, in 2023 total imports experienced a sharp decrease to 4.55 TWh, while total exports had an increase to 7.09 TWh. For the duration of the observed period, Montenegro was a net exporter of electricity, which saw a sharp increase from 1.38 TWh in 2022 to 2.54 in 2023.

6.7. North Macedonia

Supply

The following text and figures contain information on electricity supply in North Macedonia. It covers electricity generation, installed capacity and the key differences between the development scenarios.

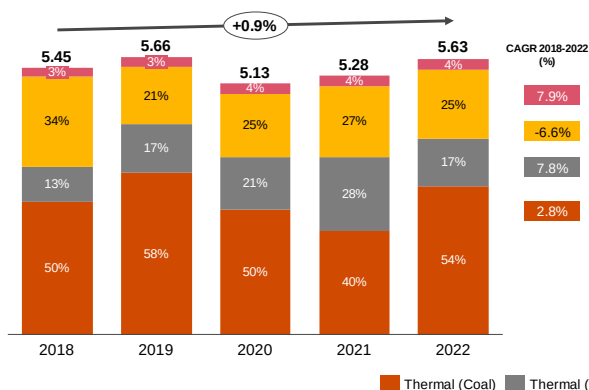
²⁴⁸ The European Bank for Reconstruction and Development. (2022 June 10th). Gvozd Windfarm. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/50427.html>

²⁴⁹ The European Bank for Reconstruction and Development. (2014 December 17th). Krnovo Wind Farm. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/krnovo-wind-farm.html>

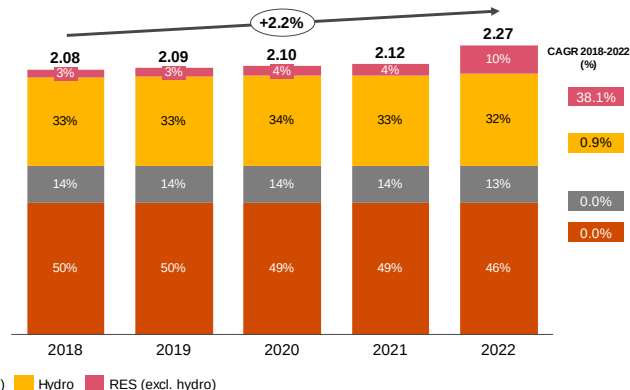
Generation & installed capacity

Figure 161 Overview of electricity generation and installed capacity in North Macedonia

Electricity generation per type in North Macedonia
2018-2022, TWh and %



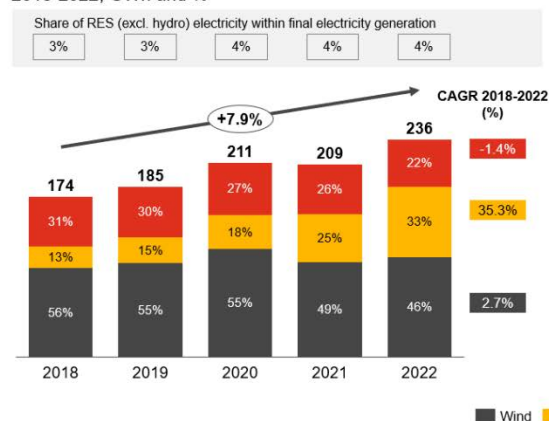
Installed capacity per technology in North Macedonia
2018-2022, GW and %



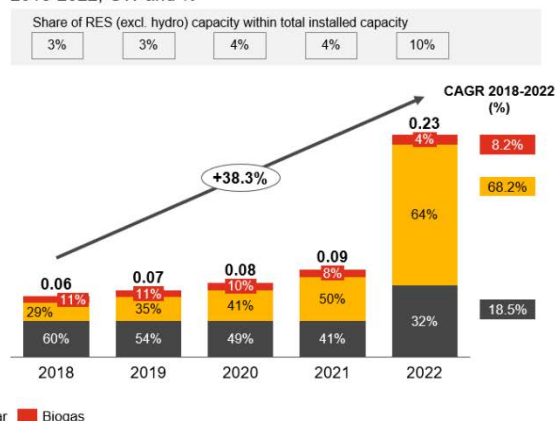
Source: ERC Annual Reports (2018-2022), PwC analysis

Figure 162 Overview of RES electricity generation and installed capacity in North Macedonia

RES electricity generation per type in North Macedonia
2018-2022, GWh and %



Installed capacity per RES in North Macedonia
2018-2022, GW and %

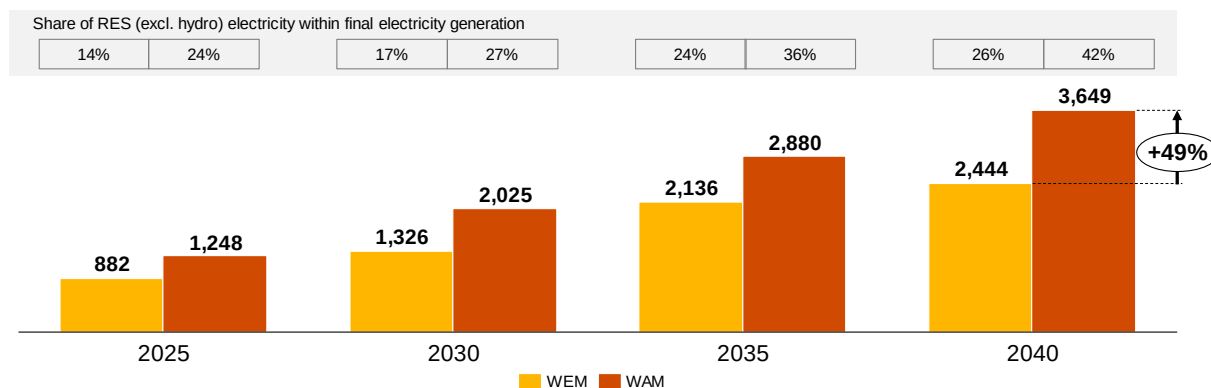


Source: ERC Annual Reports (2018-2022), PwC analysis

Development scenarios – key differences

Figure 163 RES electricity generation per RES in North Macedonia

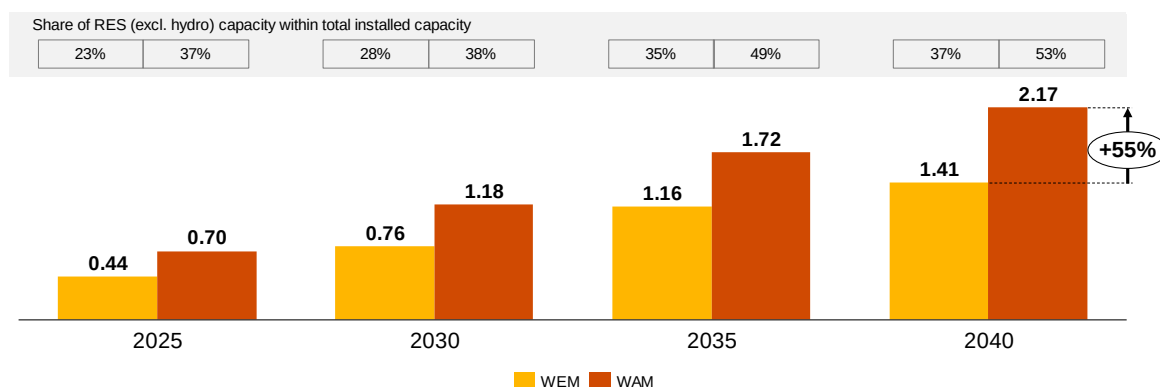
RES electricity generation per RES in North Macedonia 2025-2040, GWh and %



Source: The Strategy for Energy Development of MK until 2040

Figure 164 Installed capacity per RES in North Macedonia

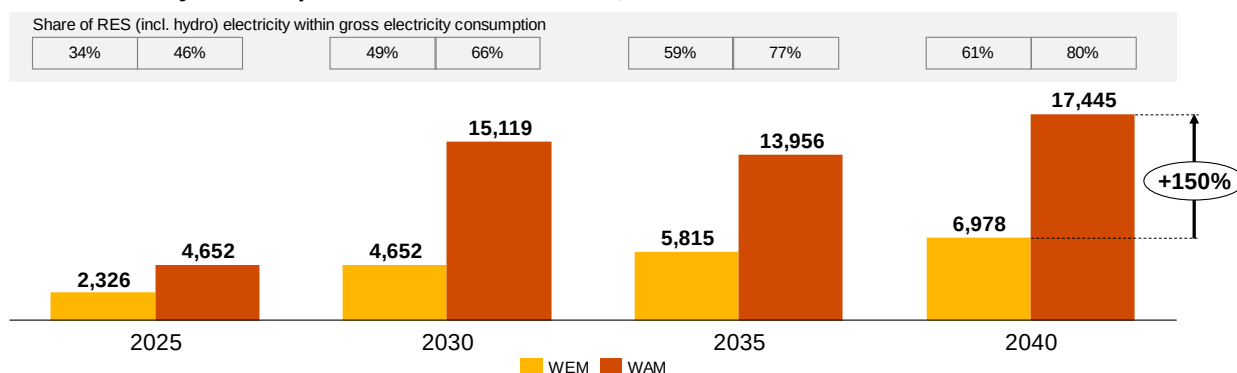
Installed capacity per RES in North Macedonia 2025-2040, GW and %



Source: The Strategy for Energy Development of MK until 2040

Figure 165 RES electricity consumption in North Macedonia

RES electricity consumption in North Macedonia, 2025-2040, GW and %



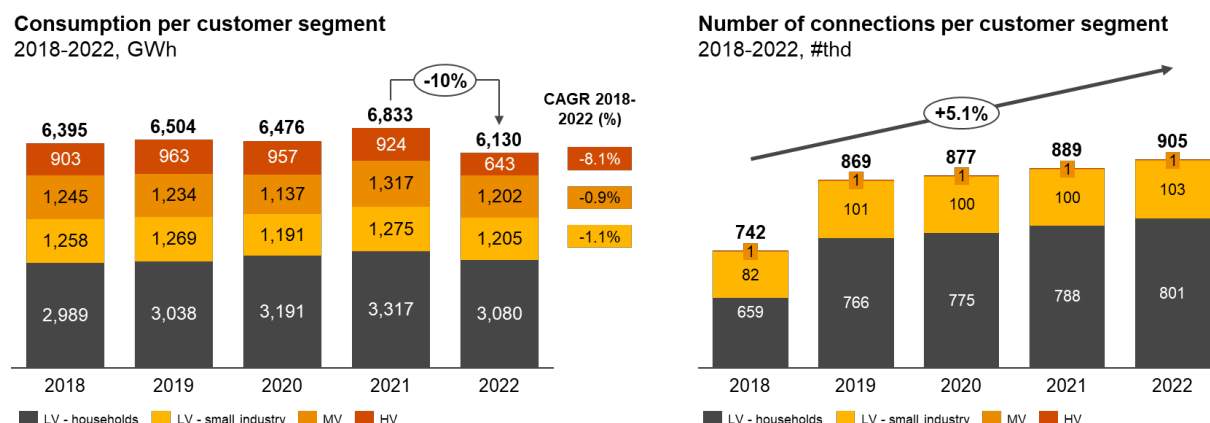
Source: North Macedonia's NECP, PwC analysis

Demand

The following text and figures contain information on electricity demand in north Macedonia. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

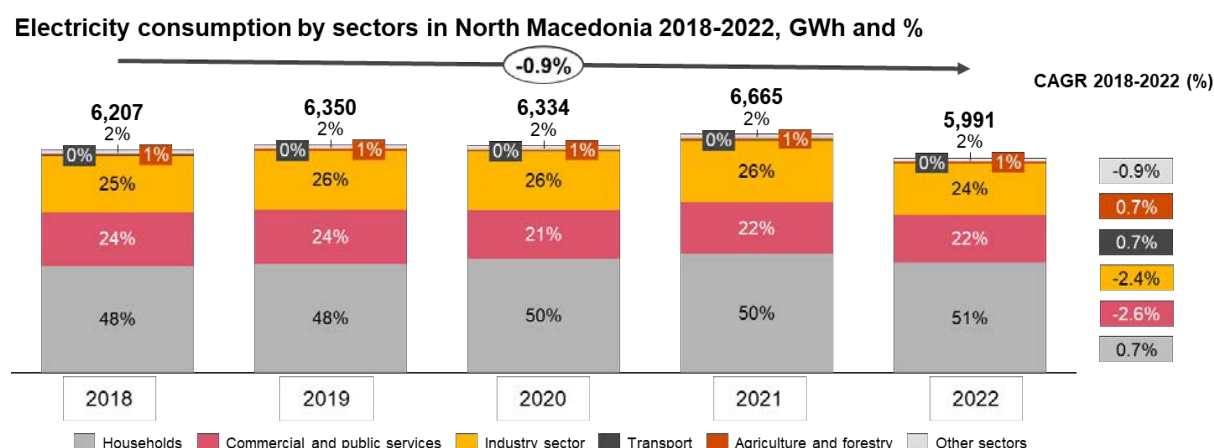
Consumption per customer segment & number of connections per customer segment

Figure 166 Consumption per customer segment & Number of connections per customer segment



Consumption by sectors and industry sector consumption

Figure 167 Overview of electricity consumption by sectors in North Macedonia



According to Eurostat, a detailed analysis of electricity consumption in North Macedonia's industry sector for 2022 shows that the Iron and Steel sub-sector was the largest consumer, accounting for 35% (500 GWh) of the total consumption. Other significant sub-sectors included Food, Beverages, and Tobacco, which accounted for 13% (179 GWh), Mining and Quarrying at 9% (121 GWh), and Non-metallic Minerals at 10% (137 GWh) of the industry's total electricity consumption.

List of industrial companies with highest revenue

Figure 168 Overview of selected companies by revenue in North Macedonia with corresponding energy costs

Country	Company	Sub-sector	Revenue 2022 mil. EUR	Share of energy costs in total expenses
	Okta AD	Petroleum/Natural gas	974	0,10%
	Makpetrol AD	Petroleum/Natural gas	614	0,62%
	Kromberg & Schubert Makedonija BT DOOEL	Automotive	248	N/A
	Alkaloid AD Skopje	Pharmaceuticals	232	3,17%
	Kam d.o.o.	Wholesale/Retail	230	N/A
	Makedonski Telekom AD Skopje	Telecommunication	192	N/A
	Makstil AD Skopje	Iron and steel	184	41,20%
	A1 Makedonija D.O.O.E.L.	Telecommunication	149	N/A
	Liberti AD Skopje	Iron and steel	144	8,89%

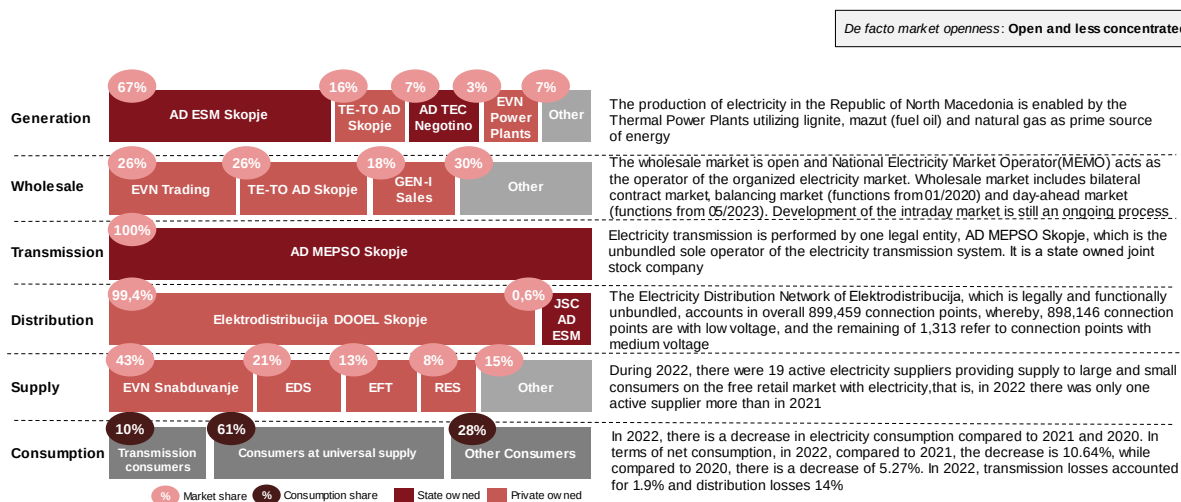
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in North Macedonia. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 169 Overview of electricity market structure in North Macedonia 2022



Source: ERC 2022 Annual Report, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 170 Overview of RES developers with corresponding projects in North Macedonia

Developer	Project	Technology	Capacity	Output	Expected COD
Fortis Energy Electric	Oslomej		80 MW	120 GWh/year	First half of 2024
Solarpro Holding	Oslomej PPV		65 MW	n/a	n/a
BNB Kompani	Bogoslovec WPP		36 MW	n/a	Operational since 2023
GEN-I	Amzabegov PPV		17 MW	25 GWh/year	Operational since 2022

Source: GEN-I web page, Solarpro Holding web page, Fortis Energy Electric web page, Wind Park Bogoslovec, PwC Analysis

RES projects financing options

An example of wind park project Bogoslovec financed by the OeEB contributing with 10 million euros towards the construction and operation of the project, as part of a larger credit facility of 51 million euros arranged by the Erste Group. Other financial institutions involved in the financing include Sparkasse Bank Makedonija AD Skopje, Komercijalna Banka AD Skopje, and NLB Banka AD Skopje. Additionally, the Green for Growth Fund, in which OeEB has a stake, is providing additional equity to the project company.

Cross-border electricity exchange

In North Macedonia, both the total electricity import and the net electricity import have increased over the period from 2.43 TWh electricity import in 2018 to 2.94 TWh electricity import in 2021 when North Macedonia was finished a year as an electricity import country with net position of 2.58 TWh in imported electricity. During the same period, total exports fluctuated with a peak in 2020 being 1.01 TWh and the bottom of 0.36 TWh in 2021. However, in 2023, there was a sharp rise in both total import of electricity and total export in electricity to 7.23 TWh and 7.08 TWh respectively. During the observed period, from 2018 to 2023, North Macedonia has been a net importer of electricity, in 2018 net imports being 1.92 TWh and in 2023 net imports were 0.15 TWh.

6.8. Serbia

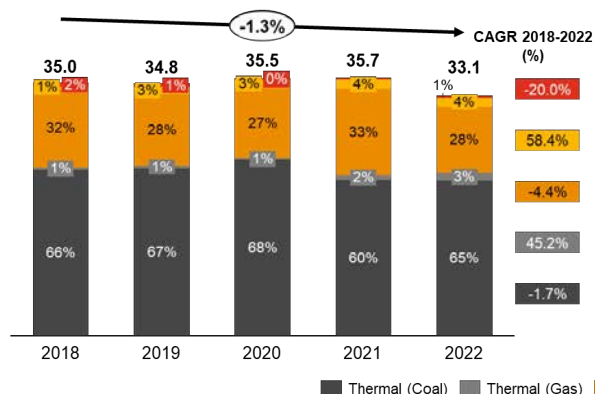
Supply

The following text and figures contain information on electricity supply in Serbia. It covers electricity generation, installed capacity and the key differences between the development scenarios.

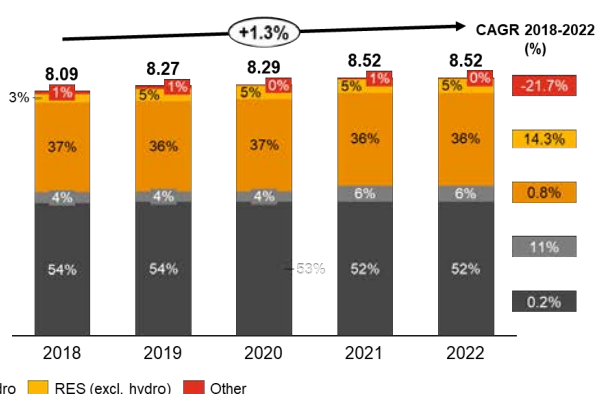
Generation & installed capacity

Figure 171 Overview of electricity generation and installed capacity in Serbia

Electricity generation per type in Serbia
2018-2022, TWh and %



Installed capacity per technology in Serbia
2018-2022, GW and %

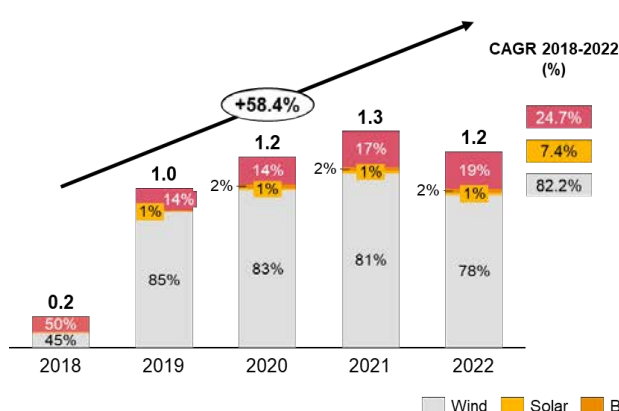


Source: AERS Annual Reports (2018-2022), PwC analysis

Figure 172 Overview of RES electricity generation and installed capacity in Serbia

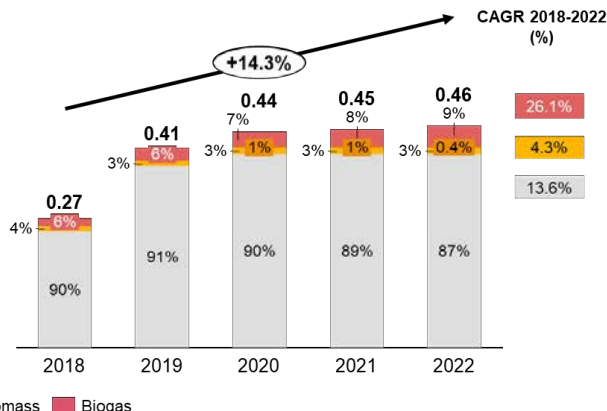
RES electricity generation per type in Serbia
2018-2022, TWh and %

Share of RES (excl. hydro) electricity within final electricity generation



Installed capacity per RES in Serbia
2018-2022, GW and %

Share of RES (excl. hydro) capacity within total installed capacity

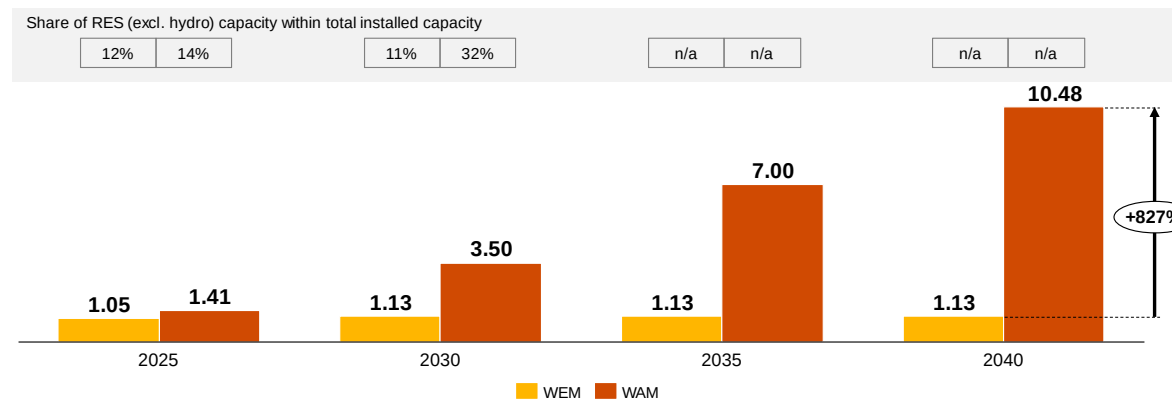


Source: AERS Annual Reports (2018-2022), PwC analysis

Development scenarios – key differences

Figure 173 Installed capacity per RES in Serbia

Installed capacity per RES in Serbia, 2022-2040, GW and %



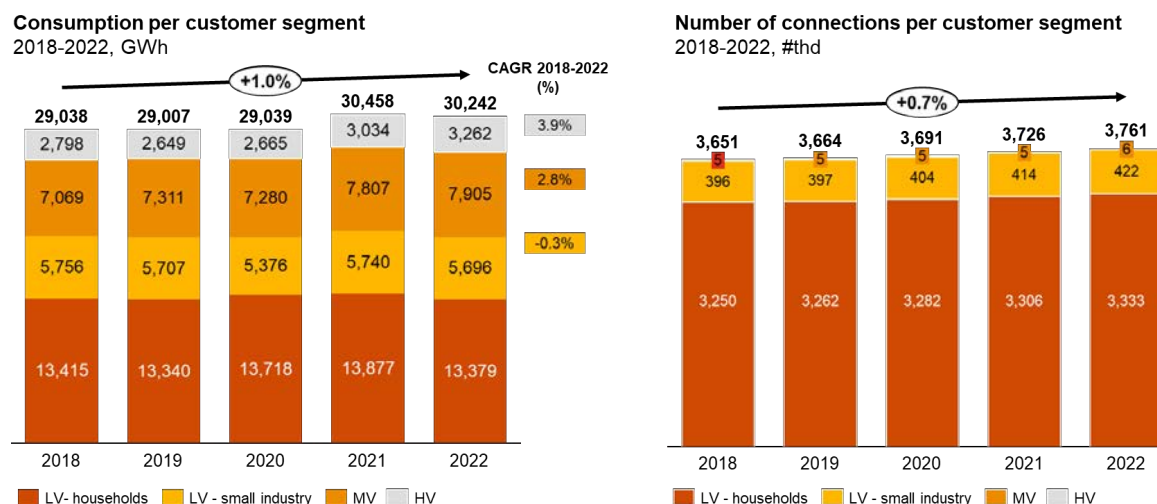
Source: Serbian INECP, PwC analysis

Demand

The following text and figures contain information on electricity demand in Serbia. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

Consumption per customer segment & number of connections per customer segment

Figure 174 Consumption per customer segment & Number of connections per customer segment

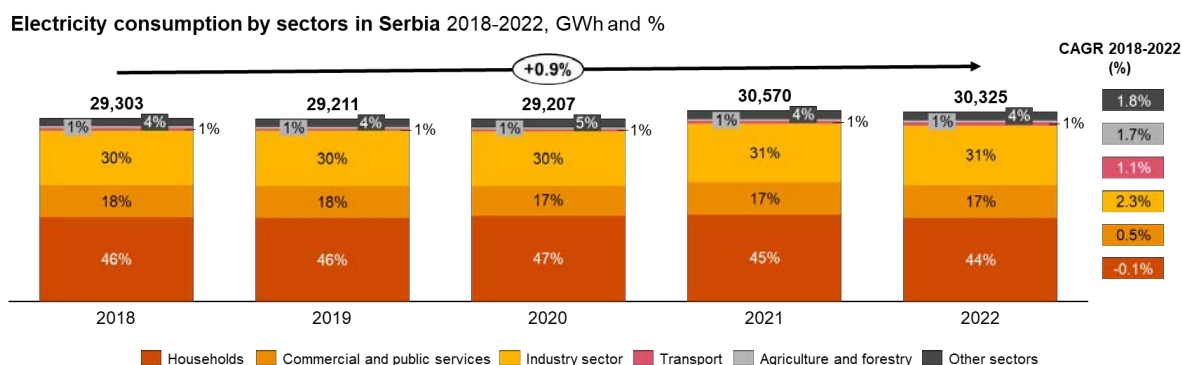


Note: LV – Low Voltage, MV – Medium Voltage, HV – High Voltage

Source: AERS annual report, PwC analysis

Consumption by sectors and industry sector consumption

Figure 175 Overview of electricity consumption by sectors in Serbia



Source: Eurostat, PwC analysis

In Serbia, the main contributors to the overall electricity consumption within the industrial sector in 2022 were the Food, Beverages, and Tobacco sub-sector with a 17% share (1,583 GWh), the Iron and Steel sub-sector with a 16% share (1,483 GWh), and the Chemical and Petrochemical sub-sector with a 12% share (1,126 GWh). Between 2018 and 2021, the Iron and Steel sub-sector saw an increase in electricity consumption by 12% (162 GWh) compared to 2018 and 19% (245 GWh) compared to 2020. In contrast, the electricity consumption of the Food, Beverages, and Tobacco sub-sector in 2021 remained nearly the same as in 2020 but declined by 3% (42 GWh) compared to 2018. The Chemical and Petrochemical sub-sector also experienced a decline of 6% (81 GWh) in 2021 relative to 2018 but rose by 11% (122 GWh) compared to 2020.

List of industrial companies with highest revenue

Figure 176 Overview of selected companies by revenue in Serbia with corresponding energy costs

Country	Company	Sub-sector	Revenue 2022 mil. EUR	Share of energy costs in total expenses
	Naftna Industrija Srbije AD	Petroleum/Natural gas	4,317	2,10%
	JP Srbijagas	Petroleum/Natural gas	1,928	0,08%
	Delhaize Serbia DOO	Wholesale/Retail	1,172	2,00%
	Tigar Tyres DOO	Rubber/Rubber Products	1,151	1,41%
	HBIS Group Serbia Iron & Steel DOO	Iron and steel	1,112	9,37%
	YugoRosGaz AD	Petroleum/Natural Gas	1,074	N/A
	Serbia Zijin Mining DOO	Non-Ferrous Metal	1,040	2,66%
	Lidl Srbija Kd	Wholesale/Retail	802	0,76%
	Telekom Srbija AD	Telecommunications	125	1,99%

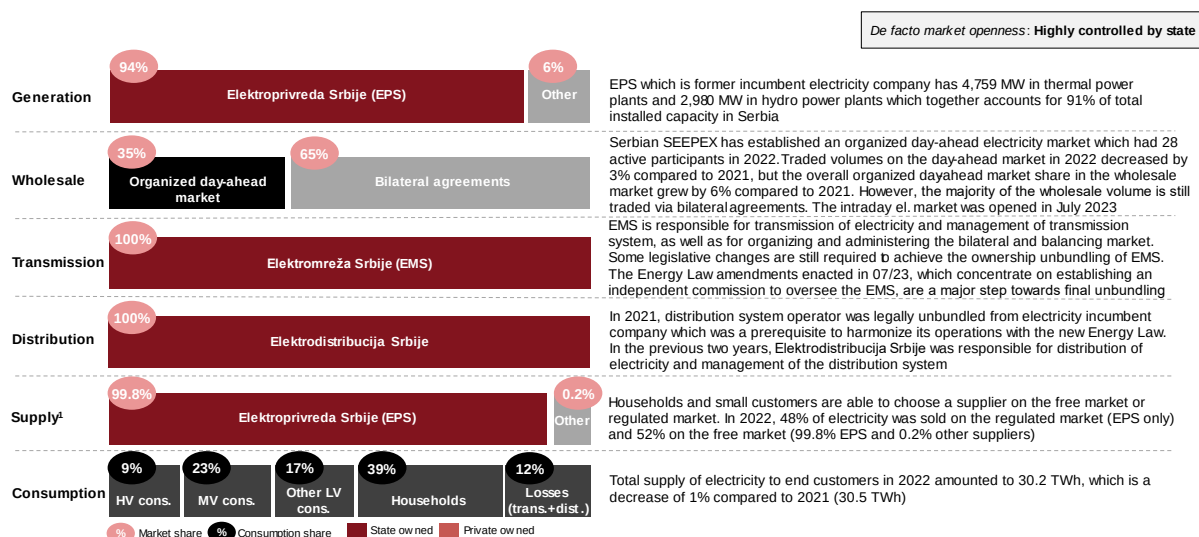
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Serbia. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 177 Overview of electricity market structure in Serbia 2022



Note: 1) Supply of customers on the free market

Source: AERS Annual Report 2022, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 178 Overview of RES developers with corresponding projects in Serbia

Developer	Project	Technology	Capacity	Output	Expected COD
MK Group (Fintel Energija)	Košava Phase 1		69 MW	n/a	Operational
	Kula Wind Farm		9.9 MW	n/a	Operational
	La Piccolina		6.6 MW	n/a	Operational
Elicio	South Banat WPP		200 MW	570 GWh/year	TBD
	Malibunar WPP		8 MW	n/a	Operational
Crni Vrh Power	WPP Crni Vrh		150 MW	n/a	TBD
Fortis Energy	Gornjak WPP		194.4 MW	n/a	TBD
	Vranje WPP		194.4 MW	n/a	TBD
	Juhor WPP		144 MW	n/a	TBD
MK Group (Fintel Energija)	Agrosolar Kula		660 MW	n/a	2026
MT-KOMEX	DeLasol		9.9 MW	n/a	Operational
Fortis Energy	Noticaj 1 PVV		135 MW	n/a	TBD
	Noticaj 2 PVV		135 MW	n/a	TBD
	Mali Zam PVV		120 MW	n/a	TBD
	Bingula PVV		110 MW	n/a	TBD
MK Group	Biogas Plant Vrbas		3 MW	28 GWh/year	Operational since 2024
Fortis Energy	Dolovo Biogas		2.4 MW	n/a	Operational

Source: Fintel Energija web page, MT-KOMEX web page, Elicio web page, Fortis Energy web page, Fortis Energy Portfolio for 2024, Renewable Energy Magazine web page, PwC Analysis

RES projects financing options

First corporate PPA deal in Serbia, more precisely Axpo Group and IVICOM Energy long-term wind power PPA (Krivača wind farm) has a total project worth of EUR 165 million, while the financing of EUR 155 million²⁵⁰ for the wind farm involves a consortium of banks, including Erste Group Bank AG and Erste Bank a.d. Novi Sad (referred to jointly as Erste), Raiffeisen Bank International AG and Raiffeisen banka a.d. Beograd (referred to jointly as Raiffeisen), NLB d. d. and NLB Komercijalna banka a.d. Beograd (referred to jointly as NLB), along with Oesterreichische Entwicklungsbank A.G (OeEB).

Elektroprivreda Srbije signed several PPA arrangements in Serbia, one of which was Čibuk 1 wind farm which was an investment worth EUR 300 million²⁵¹. EBRD provided EUR 107.7 million of which EUR 55 million was syndicated to Erste Bank, the Green Growth Fund, UniCredit and Banca Intesa and in parallel, the World Bank's International Finance Corporation also provided EUR 107.7 million.

Another project EPS signed was Pupin wind farm, which requires an investment worth EUR 163.6 million²⁵². EUR 91.4 million²⁵³ will be financed by EBRD together with Erste Group

²⁵⁰ karanovic/partners web page, (April 2023). Karanović & Partners Wins Two Deal of the Year Awards. Retrieved from <https://www.karanovicpartners.com/news/karanovic-partners-wins-two-deal-of-the-year-awards/>

²⁵¹ The EBRD web page, (October 2019). Čibuk windfarm starts producing clean energy for Serbia. Retrieved from <https://www.ebrd.com/news/2019/ibuk-windfarm-starts-producing-clean-energy-for-serbia.html>

²⁵² Enlight energy web page. Retrieved from <https://enlightenergy.co.il/project/pupin/>

²⁵³ The EBRD web page, (2023 December 15). Pupin WPP. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/54562.html>

Bank AG and its local bank Erste Bank a.d. Novi Sad, who will each secure a EUR 45.7 million loan.

In another project, signed between Slovenian energy developer Rudis as a producer and PLC Interenergo as a buyer of produced electricity, Nova Ljubljanska Banka (NLB) provided 75% of the EUR 15.5²⁵⁴ million investment, while Rudis invested the remaining funds themselves.

Cross-border electricity exchange

The total import of electricity in Serbia in 2018 was 17.29 TWh, and it climbed to 17.91 TWh in 2020. In 2023 total import of electricity was 17.62 TWh, which indicates a growth of 1.9% from 2018 to 2023. Total export of electricity was 16.74 TWh in 2018 and had a sharp rise to 18.75 in 2020. After that, in 2022 it experienced a sharp decline to 13.55 TWh, after which it recovered in 2023 to 19.75. Although Serbia was predominantly a net importer of electricity during the observed period, with peak net import of 2.81 TWh in 2022, it has turned into a net exporter in 2023 due to a sharp increase of total export of electricity, with a net export of 2.13 TWh.

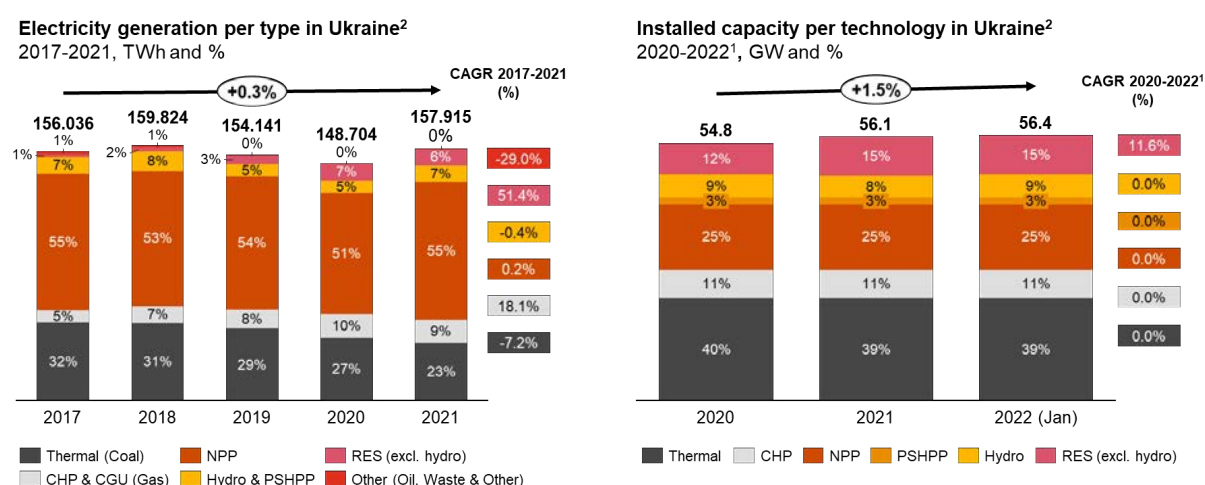
6.9. Ukraine

Supply

The following text and figures contain information on electricity supply in Ukraine. It covers electricity generation, installed capacity and the key differences between the development scenarios.

Generation & installed capacity

Figure 179 Overview of electricity generation and installed capacity in Ukraine



Note: 1) Without the Crimean power system (PS) and non-controlled part of the Donbas PS

Source: NEURC Annual Reports, OECD Market Study, IEA Publications, Energy Map web page, PwC Analysis

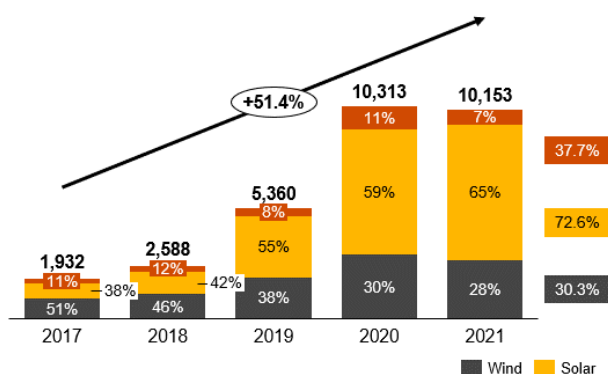
²⁵⁴ Balkan Green Energy News, (2023 November 1). Serbia gets new wind farm after four years. Retrieved from <https://balkangreenenergynews.com/serbia-gets-new-wind-farm-after-four-years/>

Figure 180 Overview of RES electricity generation and installed capacity in Ukraine

RES electricity generation per type in Ukraine¹ 2017-2021, GWh and %

Share of RES (excl. hydro) electricity within final electricity generation

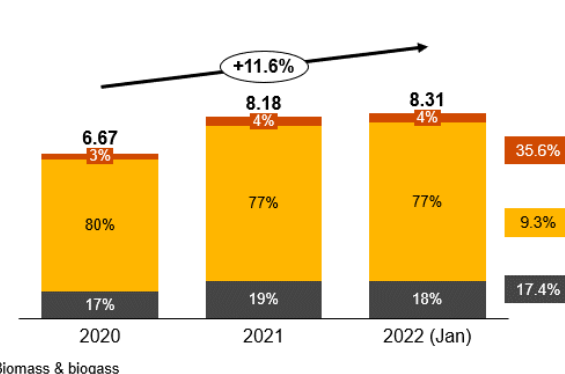
1%	2%	3%	7%	6%



Installed capacity per RES in Ukraine¹ 2020-2022, GW and %

Share of RES (incl. hydro) electricity within gross electricity consumption

12%	15%	15%



Note: 1) Without the Crimean power system (PS) and non-controlled part of the Donbas PS

Source: NEURC Annual Reports, OECD Market Study, IEA Publications, Energy Map web page, PwC Analysis

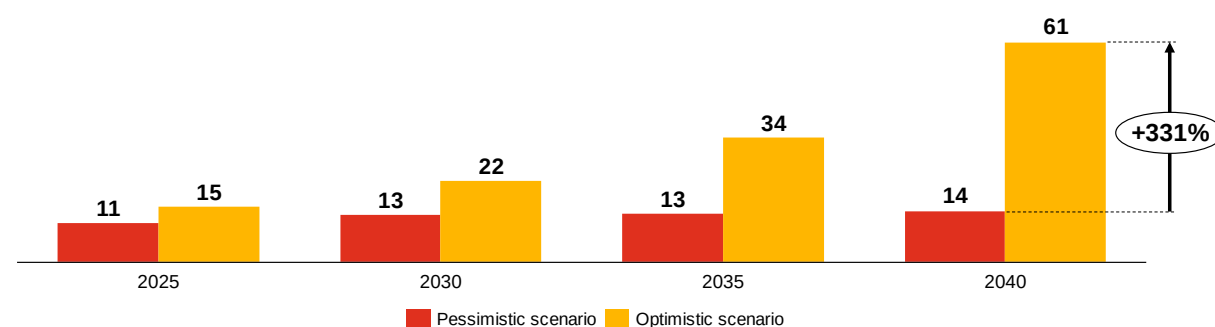
Development scenarios – key differences

Figure 181 Installed capacity per RES in Ukraine

Installed capacity per RES in Ukraine, 2025-2040, GW and %

Share of RES (excl. hydro) capacity within total installed capacity

21%	26%	26%	34%	27%	43%	28%	56%



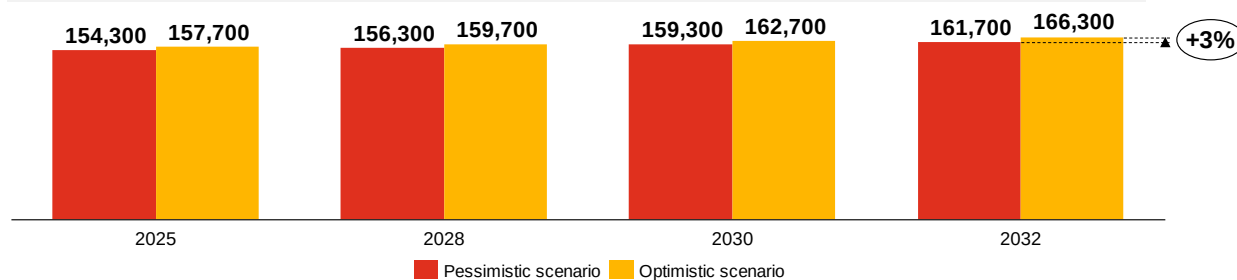
Source: Ukraine recovery plan, PwC Analysis

Figure 182 RES electricity consumption in Ukraine

RES electricity consumption in Ukraine, 2025-2032, GWh and %

Share of RES electricity within gross electricity consumption

n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a



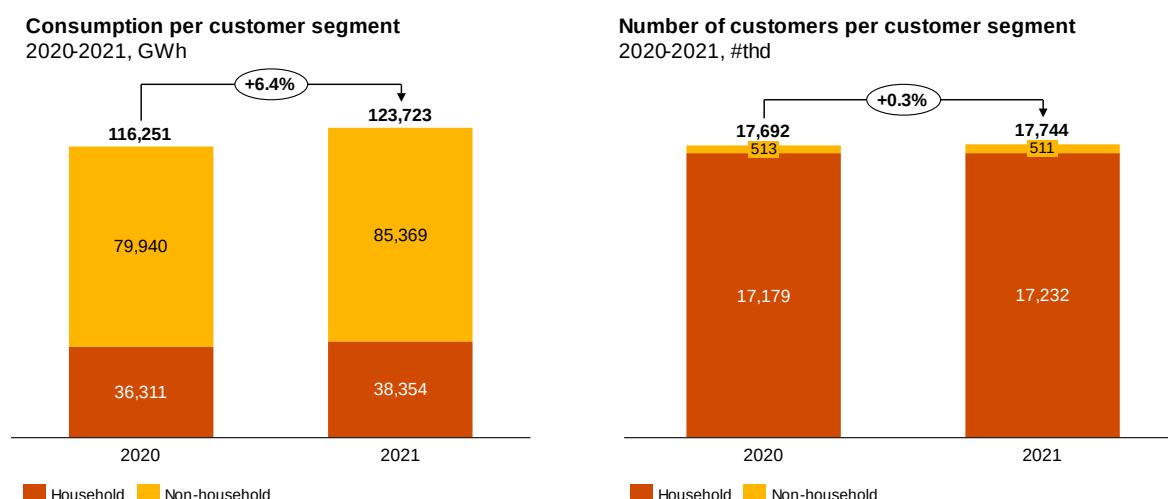
Source: Ukraine recovery plan, PwC Analysis

Demand

The following text and figures contain information on electricity demand in Ukraine. It consists of three parts, namely consumption per customer segment & number of connections per customer segment, consumptions by sector & industry sector consumption, and lastly a list of industrial companies with highest revenue.

Consumption per customer segment & number of connections per customer segment

Figure 183 Consumption per customer segment & number of connections per customer segment

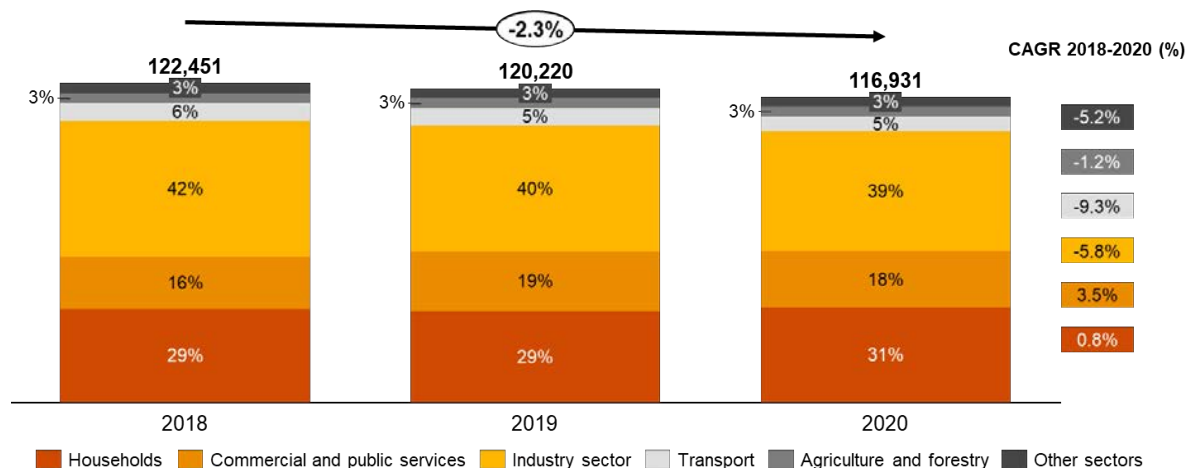


Source: SERC Annual Reports, PwC Analysis

Consumption by sectors and industry sector consumption

Figure 184 Overview of electricity consumption by sectors in Ukraine

Electricity consumption by sectors in Ukraine 2018-2020, GWh and %



Source: Eurostat, PwC analysis

Taking a closer look at the Ukrainian Industry sector, it can be observed that the biggest contributor to electricity consumption is Iron and steel sub-sector, which contributed 33% of the Industry sector's electricity consumption in 2020. Besides that, there are two other significant contributors to the total electricity consumption inside the Industry sector, namely Mining and quarrying (21%, 9,588 GWh) and Food, beverages and tobacco (10%, 4,588 GWh).

List of industrial companies with highest revenue

Figure 185 Overview of selected companies by revenue in Ukraine with corresponding energy costs

Country	Company	Sub-sector	Revenue 2020 mil. EUR	Share of energy costs in total expenses
	National JSC Naftogaz of Ukraine	Petroleum/Natural gas	8,532	x
	ATB-Market TOV	Wholesale/Retail	3,590	x
	Illich Iron and Works of Mariupol PrAT	Iron and steel	2,231	x
	Ukrainian Railway PAT	Transport	2,161	x
	Kernel-Trade TOV	Food, beverages and tobacco	1,988	x
	ArcelorMittal Kryvyi Rih PAT	Iron and steel	1,831	x
	Gas Transmission System Operator of Ukraine TOV	Petroleum/Natural Gas	1,811	x
	UkrGasVydobuvannya AT	Petroleum/Natural Gas	1,645	x
	Tedis Ukraine TOV	Wholesale/Retail	1,580	x

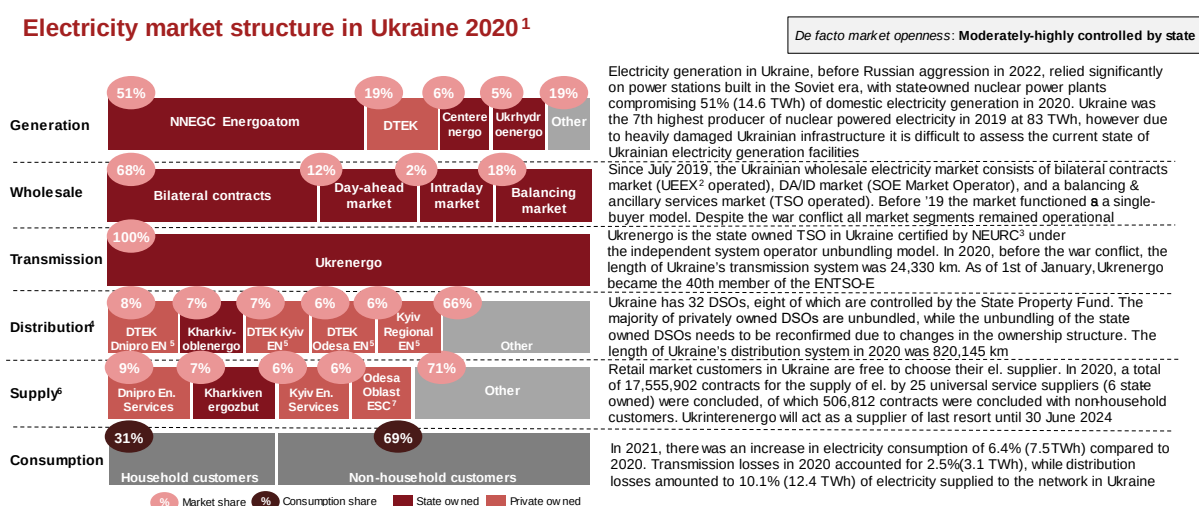
Source: EMIS, PwC analysis

Key stakeholders and market interaction

The following text and figures contain information about key stakeholders and market interaction in Ukraine. It covers the following topics: market structure, RES projects, RES projects financing options and cross-border electricity exchange.

Market structure

Figure 186 Overview of electricity market structure in Ukraine 2022



Note: 1) Due to the war conflict in Ukraine, latest available data for the comprehensive market overview is for the year 2020, 2) UEEX - Ukrainian Energy Exchange, 3) NEURC- National Energy and Utilities Regulatory Commission, 4) Expressed as a number of concluded customer contracts for electricity distribution/supply services, 5) EN - Electric Networks, 6) Expressed as a number of el. supply contracts by universal service suppliers in 2020, 7) ESC - Energy Supply Company

Source: NEURC Annual Reports, OECD Market Study, IEA Publications, Energy Map web page, EnC Implementation Report 2022 & 2023, PwC Analysis

RES projects

Figure 187 Overview of RES developers with corresponding projects in Ukraine

Developer	Project	Technology	Capacity	Output	Expected COD
DTEK Renewables	Pokrovskaya		323 MW	400 GWh/year	Operational since 2019
	Nikopol Solar PV		246 MW	290 GWh/year	Operational since 2019
Alleans Renewables	Progressovka PV		100 MW	132 GWh/year	Operational since 2021
Activ Solar	Perovo Solar PV Park		100 MW	132 GWh/year	Operational since 2011
Green Genius	Modus Ukraine Solar Project		33 MW	36 GWh/year	Operational
	Ivano-Frankivsk Solar PV Park		13 MW	14 GWh/year	Operational since 2019
SK Solar	Tarasivtsi		58 MW	n/a	Operational since 2019
	Enerhopark Yavoriv -1		36 MW	n/a	Operational since 2018
	Enerhopark Yavoriv -2		35 MW	n/a	Operational since 2019
Eren	Libreville Solar PV Park		50 MW	n/a	2025
SPP Development Ukraine	n/a		69 MW	n/a	Operational
	n/a		33 MW	n/a	Operational
	n/a		8.9 MW	n/a	Operational
Wind Parks of Ukraine	Wind Park Novoazovskiy		57 MW	n/a	Operational since 2011
	Wind Park Ochakovskiy		57 MW	n/a	Operational since 2020
	Wind Park Prichernomorskiy		42 MW	n/a	Operational since 2020
	Wind Park Kerchenskiy		25 MW	n/a	Operational since 2013
	Wind Park Vetroenergoprom		30 MW	n/a	Operational since 2013
Fairwind	Orlovka		98 MW	n/a	Operational since 2019
SPP Development Ukraine	n/a		152 MW	n/a	Started construction in 2023
	n/a		74 MW	n/a	Expected to start construction in 2024
	n/a		61 MW	n/a	Expected to start construction in 2024

Source: Power Technology web page, Fair Wind web page, SPP Development Ukraine web page, Green Genius web page, Power Technology web page, Wind Parks of Ukraine web page, PwC Analysis

RES projects financing options

In Ukraine, EBRD has provided a loan to the National Energy Company Ukrenergo. The EUR 149 million loan has been provided in 2019, however EUR 147 million of it has been repurposed to secure the reliability of the network in the context of the Russian-Ukrainian war²⁵⁵. In addition, EBRD has in 2019 provided a EUR 7 million loan Energopark Yavoriv LLC with the purpose of the development, construction and operation of the second phase of the Yavoriv solar PV project²⁵⁶.

Cross-border electricity exchange

In the period from 2018 to 2022 Ukraine has been a net exporter of electricity, but at a decreasing rate. In 2018 net exports were 3.83 TWh, coming to 2022 when net exports decreased to 1.05 TWh. In 2023 Ukraine turned to a net importer of electricity at 0.44 TWh of net imported electricity. Ukraine export of electricity peaked in 2018 at 3.83 TWh and their total imports peaked in 2020 at 2.07 TWh.

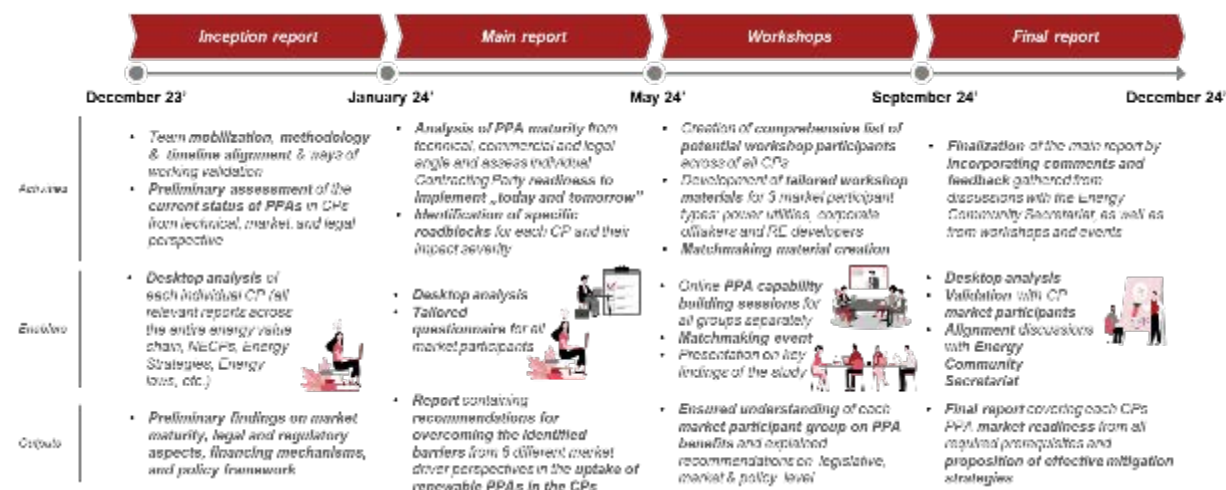
²⁵⁵ The European Bank for Reconstruction and Development. (2019 March 25th). Ukrenergo Transmission Network Modernisation. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/ukrenergo-transmission-network-modernisation.html>

²⁵⁶ The European Bank for Reconstruction and Development. (2019 April 29th). USELF: Yavoriv-2 Solar. Retrieved from <https://www.ebrd.com/work-with-us/projects/psd/uself-yavoriv2-solar.html>

6.10.Key activities and outputs of the Renewable PPAs in the Energy Community

PPA readiness in each Contracting Party was assessed via detailed desktop analysis, workshops and validation discussions were performed during a 1-year period.

Figure 188 Key activities and outputs of the Renewable PPAs in the Energy Community



Source: Renewable Power Purchase Agreements in the Energy Community, PwC Analysis

End of the report

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