

**Ministry of Economy and Sustainable Development of Georgia**

**The Preventive Action Plan of Unified Gas Supply  
System of Georgia**

**2025 - 2028**

**Georgian Gas Transportation Company LLC**

**2024**

The Prevention Action Plan has been developed by the Ministry of Economy and Sustainable Development of Georgia, based on the Risk Assessment report prepared by the Georgian Gas Transportation Company.

The plan was created by an independent consultant engaged under the USAID program "Energy Security of Georgia," in collaboration with the GGTC working group. It was developed in close cooperation with stakeholders and coordinated by representatives from relevant departments of the Ministry.

During the preparation of the Prevention Action Plan, the group actively communicated with stakeholders, including the management and specialists of the Georgian Natural Gas Transmission Network Owner LLC, JSC Georgian State Electrosystem, thermal power plants, direct consumers, and distribution companies. Consultations with interested parties were conducted through the analysis of specialized seminars, the distribution of questionnaires, and the review of responses received.

The organization and management of seminars, meetings, and other related activities were handled by representatives of the USAID program Securing Georgia's Energy Future.

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## Abbreviation

LT LEDS- Long-term Low Emission Development Strategy of Georgia

HVTL- High-Voltage Transmission Line

ESCO - Electricity System Operator

TPP - Thermal Power Plant;

CCPP - Combined Cycle Power Plant;

₾ - GEL

MW - Megawatt;

mln - Million;

bln - Billion;

TSO - Transmission System Owner (of the Natural Gas Network)

MoESD - Ministry of Economy and Sustainable Development of Georgia;

GGTC - Georgian Gas Transportation Company;

GNERC - Georgian National Energy and Water Supply Regulatory Commission;

GSE - Georgian State Electrosystem;

SCP - South Caucasus Pipeline;

GOGC - Georgian Oil and Gas Corporation;

FOUO - For Official Use Only;

SOCAR - State Oil Company of the Azerbaijan Republic;

"Old" TPPs - Steam turbine thermal power plants built during the Soviet era.

NSCP - North-South Caucasus Main Gas Pipelines;

BP - British Petroleum Company;

CNG - Compressed Natural Gas;

CPC - Caspian Pipeline Consortium;

DN - Nominal Diameter (of a pipeline);

EBRD - European Bank for Reconstruction and Development;

EnC - Energy Community;

NECP - National Energy and Climate Plan;

EU - European Union;

EU4Energy - "European Union for Energy" Project;

EC - European Commission;

ExC/SwM - Gas Long-Term Demand Forecasting Scenarios;

GENEX - Georgian Energy Exchange;

L - Pipeline Length;

LNG - Liquefied Natural Gas;

LPG - Liquefied Petroleum Gas;

ISO - International Organization for Standardization;

MCC - Millennium Challenge Corporation;

MS - Metering Station;

NECP - National Energy and Climate Plan of Georgia;

P - Gas Pressure in the Pipeline;

PAP - Preventive Action Plan;

PIMS - Pipeline Integrity Management System;

PMI - Energy Community Project of Mutual Interest;

SCADA - Supervisory Control and Data Acquisition System;

TSO (GOGS) - Transmission System Owner of Georgia's Natural Gas System;

UNDP - United Nations Development Programme;

USEA/JSET - United States Energy Association's "Just and Secure Energy Transition Program";

USAID - United States Agency for International Development;

°C - Degree Celsius;

\$ - US dollars;

$\Sigma Q$  - Total Pipeline Capacity.

## Introduction

The Preventive Action Plan for the secure delivery of natural gas is a crucial component in safeguarding the country's energy security. The document is intended to identify the threats, risks, and challenges posed to the unified gas supply system by natural and human factors, and outline measures for its mitigation and prevention.

The Prevention Action Plan was developed by a working group assembled for consultancy services funded under the USAID program <sup>1</sup>"Securing Georgia's Energy Future," <sup>2</sup>based on the results of the Risk Assessment Report drafted by Georgian Gas Transportation Company LLC (GGTC) at the request of the Ministry of Economy and Sustainable Development of Georgia. The plan was developed in close collaboration with relevant stakeholders and was coordinated by representatives from the respective departments of the Ministry. Its preparation incorporated the recommendations and guidelines provided by experts from the Joint Research Centre within the Commission.

During the development of the document, the identified risks related to the operation of natural gas production, supply, consumption, cross-border transmission, and the exploitation of transmission and distribution networks and equipment were thoroughly discussed. Specific measures were outlined, detailing the responsible entities for its implementation, the supporting agencies or organizations if necessary, and the estimated timeframe for executing each measure.

The purpose of the **Preventive Action Plan** is to establish coordinated and effective measures to mitigate the risk to the safe delivery of gas within the country, caused by natural, human, or other factors, through the combined efforts of Georgian energy sector agencies and organizations. The plan fully complies with the requirements and standards of both Georgian and international law.

**The objective of the Preventive Action Plan** is to address the potential risks to Georgia's Gas Supply System and vulnerable infrastructure identified in the risk assessment document developed by GGTC (these risks include the threats of floods and flash floods, landslides and mudflows, earthquakes, as well as dangers associated with technological processes or unstable geopolitical situations, among others), prevention.

The Preventive Action Plan offers a wide range of measures—projects and initiatives—to various state agencies and companies within Georgia's natural gas sector, as well as private companies and a broad spectrum of consumers. The Ministry of Economy and Sustainable Development of Georgia (hereinafter referred to as the "Ministry"), as the competent authority for ensuring and overseeing supply security, will monitor the implementation of these measures.<sup>3</sup>

Until now, Georgia has not had a unified, formalized plan for the prevention/mitigation of risks to the secure supply of natural gas. Typically, responses to crises and emergency situations in the gas sector at the national and sectoral levels have been handled through immediate actions by state agencies,

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<sup>1</sup> Risk Assessment Report, GTCG, March, 2024

<sup>2</sup> *Securing Georgia's Energy Future Program, Task Order Number 72011421F00002 signed between USAID/Georgia and Deloitte Consulting LLP*

<sup>3</sup> Articles 132(1) and 143 of the Law of Georgia "On Energy and Water Supply"

municipalities, and energy companies. However, this approach does not always allow for the timely implementation of economically justified and effective measures.

The proposed Preventive Action Plan regulates the coordination of risk management in potential crisis and emergency situations and ensures readiness for timely responses to potential adverse impacts.

### **Legislative and Methodological Foundations for the Preparation of the Plan**

The Prevention Action Plan for risks in the natural gas sector is based on the Law of Georgia on Energy and Water Supply,<sup>4</sup> the Rules on Security of Natural Gas Supply, and the requirements of the adapted version of the EU Regulation 2017/1938 Concerning Measures to Safeguard the Security of Gas Supply as Amended by Regulation with regard to Gas Storage.

During the preparation of the document, a sample Preventive Action Plan aligned with the requirements of EU Regulation 2017/1938, recommended by the Ministry of Economy and Sustainable Development of Georgia, was used. Additionally, materials from the training session Methods for Implementing EU Regulation 2017/1938, organized with the support of the Energy Community<sup>5</sup>, the ISO-3100 international risk management standard, and other methodological and advisory guidelines were also referenced.

According to Article 132 of the Law of Georgia on Energy and Water Supply (Competences Related to the Security of Electricity and Natural Gas Supply), ensuring the security of natural gas supply falls under the competence of the ministry responsible for energy. For this purpose, the ministry approves the Rules on Security of Natural Gas Supply, which regulate the roles and responsibilities of energy enterprises, market participants, system users, and consumers in achieving the minimum level and standard of natural gas supply security. Accordingly, the Ministry of Economy and **Sustainable Development of Georgia is the competent authority responsible** for developing the Preventive Action Plan and is mandated to formulate a strategy for responding to emergency situations in the electricity and natural gas sectors.

According to Article 139 (Measures to Safeguard the Security of Natural Gas Supply) of the same law, the Ministry, in cooperation with the GNERC and other competent state authorities, develops natural gas supply security standards and oversees the security of natural gas supply.

The safety standards for natural gas supply, along with other pertinent issues, should include:

- a) The identification of protected customers;
- b) The tools used by the natural gas enterprise and the measures taken to ensure the supply of natural gas to the protected customer in at least the cases specified by the supply standards (details are provided below);
- c) Identification of natural gas enterprises as provided for in subparagraph "b";
- d) Identification of groups that present significant risks to the security of natural gas supply (including risk assessment);

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<sup>4</sup> Article 139(1.e) of the Law of Georgia "On Energy and Water Supply"

<sup>5</sup> Training on methods for the implementation of the EC Regulation (EU) 2017/1938 on Security of Gas Supply and other related Regulations, Vienna, Austria, April 24-25, 2023

- e) Measures to mitigate risks identified in accordance with subparagraph "d", including modelling potential scenarios of natural gas delivery delays, particularly during periods of high demand, in the event of the withdrawal of key infrastructure or the disruption of natural gas supply/sources;
- f) The content of the report developed by the natural gas enterprise on the security of natural gas supply;
- g) The obligations imposed on natural gas enterprises and other relevant authorities, including those related to the safe operation of the natural gas system.

Additionally, the Ministry, in consultation with natural gas enterprises, organizations representing the interests of residential and industrial natural gas consumers, and the Commission, will develop a plan outlining the measures to be implemented to mitigate or eliminate the consequences of natural gas supply disruptions (Article 140, Emergency Plan in the Natural Gas Sector).

The procedures for ensuring the security of natural gas supply in Georgia are defined by the Rules on Security of Natural Gas Supply, which essentially transpose Regulation (EU) 2017/1938 into the country's legislation. The primary aim of the rules is to establish the necessary conditions for assessing the risks of unplanned natural gas disruptions and, based on the findings, to prevent and manage crisis situations, ensure a minimum level of supply security, and achieve the required standards.

The Rules outline the roles and responsibilities of state institutions and agencies, natural gas enterprises, market participants, system users, and consumers to ensure crisis prevention, preparedness, and management within the natural gas sector.

According to the Rules, a "**preventive**" measure is one that aims to mitigate risks related to gas supply, prevent the occurrence of an emergency or other situations that could potentially threaten the secure supply of gas. "**Protected Customers**" refers to residential consumers and small enterprises connected to the gas distribution system, as well as essential social service institutions connected to either the distribution or transmission system. These include services related to healthcare, primary social support, emergency assistance, security, education, or public administration).<sup>6</sup> Additionally, in emergency situations, at the request of the electricity or gas transmission system operator, the Ministry may prioritize the supply of gas to certain gas-fired thermal power plants over certain categories of protected customers, provided that the relevant conditions are met.

Article 5 of the current Rules defines the "**Infrastructure Standard.**" According to the definition, in the event of a failure of the most critical gas infrastructure, the remaining infrastructure capacity must be sufficient to meet the total gas demand in the country on a day of exceptionally high demand, which, based on statistical probability, occurs once every 20 years. The capacity of the remaining gas system infrastructure is calculated according to the "N-1" criterion (details provided below).

The obligation to ensure that the remaining gas system infrastructure can meet full demand will be considered fulfilled if the preventive action plan confirms that, based on the remaining capacity

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<sup>6</sup> The consumption of small enterprises and essential social service institutions classified as protected customers must not exceed 20% of the total natural gas consumption in Georgia.

determined by the "N-1" criterion, the transmission system operator is capable of adequately and promptly compensating for any gas supply disruptions through the implementation of appropriate market measures<sup>7</sup>.

Article 6 of the Rules defines the Natural Gas Supply Standard and outlines the necessary measures to ensure its implementation. The Supply Standard requires traders/suppliers to secure sufficient gas resources to meet the demand of protected customers in situations covered by the three standards described above. The measures to fulfill these standards may include:

- a) Entering into purchase and sale agreements for additional volumes of natural gas;
- b) Including provisions in supply contracts with other (non-protected) customers that allow for the reduction or cessation of gas supply to ensure the security of supply for protected customers;
- c) Implementing other measures agreed upon with the Ministry (including the use of infrastructure located outside Georgia).

The Ministry, in consultation with the Crisis Management Council in the natural gas sector, will prepare and publish on its official website a list of natural gas enterprises (traders/suppliers) that must implement the necessary measures to ensure gas supply to protected customers as specified by the Supply Standard(s). In this process, the Ministry will primarily consider the enterprises' ability to fulfill the public service obligations imposed on them, as well as those outlined in Article 9 of the Law of Georgia on Energy and Water Supply.

Energy enterprises responsible for providing public services must ensure, within the specific framework defined by law and in accordance with established requirements:

- a) The security of supply;
- b) The supply of natural gas at a pre-determined and/or agreed-upon quality;
- c) The application of tariffs or fees determined under regulated conditions in specified cases.
- d) The protection of the environment and the improvement of energy efficiency.
- e) The protection of human health, life, and property;
- f) The protection of consumer rights.

The conditions and procedures for imposing public service obligations do not apply to energy activities carried out as a public service under specific conditions, namely: on the transmission of natural gas - by the transmission system operator, and on the distribution of natural gas - by the distribution system operator.

The Rules define the content of the preventive action plan and the rules for its development. Its main purpose is to develop measures to avoid or mitigate identified risks and to determine the effectiveness of these measures after they have been implemented. The regulations also establish the timelines for implementing the recommended measures and the natural gas enterprises involved in its execution.

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<sup>7</sup> As an exception, Georgia is not obligated, but will make efforts, to fulfill the obligations set forth by the Infrastructure Standard. The exception remains in effect until the country has: a) At least one interconnector with other Contracting Parties of the Energy Community; and

b) A gas storage facility of sufficient capacity or an LNG facility with equivalent functionality within its territory.

The details of the mandatory aspects of the action plan and possible preventive measures are discussed below. In general, it is essential that preventive measures are based on market principles and are determined by its impact on the functioning of the natural gas market, the environment, and consumers. Additionally, the plan should not impose an excessive burden on natural gas enterprises and should minimize any negative effects on the market's operation. The measures for ensuring gas supply security outlined in the preventive action plan must be clearly defined, transparent, proportionate, and non-discriminatory, and it should be subject to review. These measures should not undermine competition or the efficient functioning of the unified gas market, nor should they pose a threat to the gas supply security of other contracting parties within the Energy Community.

The timeframe for implementing the preventive action plan and the measures outlined within it is set at 4 years (2025-2028) or a shorter timeframe, depending on the prevailing circumstances. The action plan identifies the responsible and interested parties for implementing the selected measures, along with the timelines for completion and potential funding sources<sup>8</sup>. In general, the regulations are applied without limiting the general provisions defined by the Law of Georgia on Public Safety, which pertain to the implementation of appropriate measures during the threat of a critical situation and/or throughout the continuous process of managing its key stages (emergency prevention, emergency preparedness, emergency response, and recovery work). These regulations take into account the specific requirements of the natural gas sector, necessitating compatibility with national disaster management legislation, especially in cases, where the anticipated threats could potentially lead to a disaster of national scale. Specifically, the preventive action plan must take into account the key requirements of the Law of Georgia on National Security Policy Planning and Coordination, the Law of Georgia on Public Safety, and the Law of Georgia on the State of Emergency.

According to the Law of Georgia on National Security Policy Planning and Coordination the Office of the State Security and Crisis Management Council is responsible for coordinating the development of national-level conceptual documents. Within this mandate, one of the primary focuses is planning measures to prevent threats, risks, and challenges associated with national-scale crisis situations.

The Law of Georgia on Civil Security outlines a comprehensive set of protective and security measures in the country, which includes aspects of implementing emergency prevention, mitigating the consequences of emergencies, and, consequently, reducing risk. The law defines both the primary measures for responding to emergencies and the competencies of state agencies in preventing emergencies, assessing emergency risks, and mitigating the consequences of emergencies. The law establishes a unified system for emergency management. This system operates at the national, autonomous, regional, local, and facility levels.

The Law of Georgia on the State of Emergency defines the regime triggered by various types of disasters and outlines a set of special measures aimed at the swift normalization of the situation and the restoration of legality and public order.

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<sup>8</sup> The identification of potential funding sources for infrastructure projects, according to existing regulations, is part of the ten-year infrastructure development plan prepared by the transmission system operator, which requires the approval of the Georgian National Energy and Water Supply Regulatory Commission (GNERC) for its ratification.

## 1. Natural Gas System

### 1.1. Overall Gas Consumption, Demand Forecast, and Peak Consumption

Natural gas is the most extensively consumed primary energy resource in Georgia. According to GEOSTAT data from 2022, natural gas accounted for 50.35% of the total domestic energy supply and 41.82% of final energy consumption<sup>9</sup>.

**Table 1 Georgia's Energy Balance, 2022 (1000 Tonne of Oil Equivalent - TOE)**

	Gas	Total	%
Production	12,5	1 271,7	
Import	2 872,9	4 969,5	
<b>Internal supply</b>	<b>2 885,5</b>	<b>5 730,8</b>	<b>50,35</b>
Transformation	636,7	636,7	
Losses	77,9	176,9	
<b>Final consumption</b>	<b>2 170,9</b>	<b>5 190,8</b>	<b>41,82</b>

According to GNERC data, in 2022, a total of 5,690 million m<sup>3</sup> of natural gas was supplied to Georgia's natural gas system, with approximately 45% transited to Armenia. Additionally, 19,771.7 million m<sup>3</sup> of natural gas from Azerbaijan's Shah Deniz field was transported through Georgia via the South Caucasus Pipeline system to Turkey and EU countries.

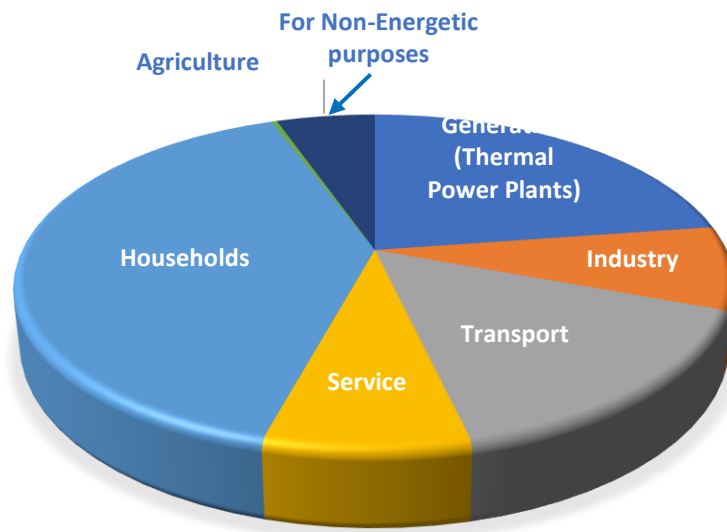
The main consumers of natural gas in Georgia are the residential sector (40.1% of total consumption) and thermal power plants (22.7%), along with the transportation, industrial, and service sectors.

Residential sector consumption increased by approximately 10% compared to 2021. This rise is primarily attributed to the connection of new settlements to the system as part of the government's gasification program, which has significantly reduced the use of biofuels and waste. Additionally, the increase is linked to consumers adopting more efficient and comfortable heating systems.

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<sup>9</sup>Georgia's Energy Balance, 2022, National Statistics Office of Georgia, 2023 Statistical Publication

Chart 1 Natural Gas Consumption by Consumer Categories 2022 (%)



In 2022 and 2023, Georgia's demand for natural gas amounted to 3,057 million cubic meters and 3,015 million cubic meters, respectively (see the chart). Analysis shows that gas consumption/demand over the past 15-20 years has followed an increasing trend, driven by general economic growth and improvements in living conditions (with the exception of periods of recession following the 2008 war, the global financial crisis, and the COVID pandemic).

The process of gasification in populated areas continues, resulting in a total number of retail consumers reaching 1,488,014 (including 1,426,978 households and 61,036 non-residential consumers). In 2022, 43,398 new users were added to the sector. Between 2023 and 2027, it is planned that distribution companies will add an additional 265 million investment in GEL<sup>10</sup>, which will be used both for connecting new users (according to the government plan, by the end of 2024, almost 93% of the country's population will have access to natural gas)<sup>11</sup>, and for upgrading the existing network and enhancing operational reliability.

Natural gas consumption by residential users varies both between urban and rural areas and among different regions. The average annual natural gas consumption per residential user in small towns and villages significantly lags behind that of urban areas. This is because, in many regions, wood is still widely used for heating buildings wherever it is available. According to data from the GNERC, the average annual natural gas consumption per household user in Tbilisi is 1,317 m<sup>3</sup>, in regional cities it is 1,096 m<sup>3</sup>, and in rural areas, it is 856 m<sup>3</sup>. By region, the highest consumption is observed in Mtskheta-Mtianeti and Samtskhe-Javakheti<sup>12</sup>, while the lowest consumption is noted in Racha-Lechkhumi and Guria. Additionally, it is essential to consider that in some high-altitude regions of Georgia, it is more advisable to develop decentralized energy systems based on autonomous energy sources rather than constructing

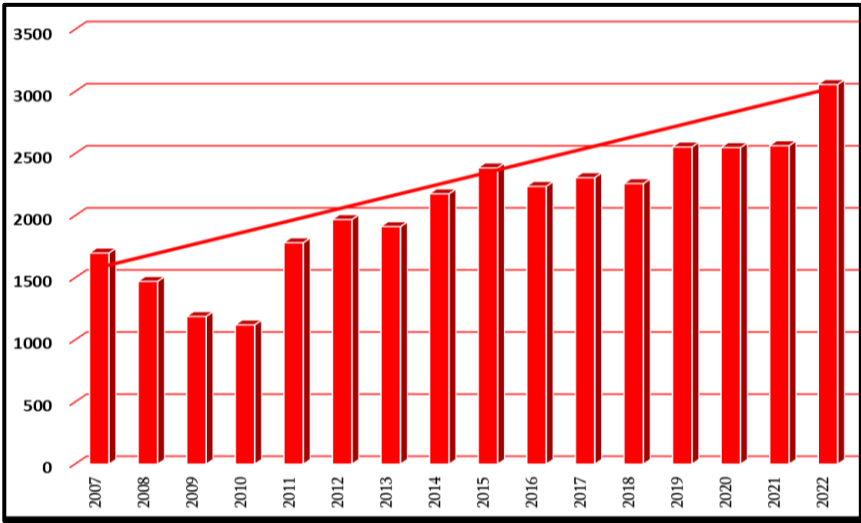
<sup>10</sup> A 265 million GEL investment will be made in the natural gas sector, EnergyNews, July 12, 2023.

<sup>11</sup> By 2024, nearly 93% of the population will be gasified, according to the report from the Prime Minister of Georgia, June 30, 2023.

<sup>12</sup> This is primarily due to the harsh climatic conditions

expensive and economically unviable pipelines. This approach should primarily utilize local renewable energy sources.

Chart 2 dynamics of gas demand in million M3<sup>3</sup>/ per year <sup>13</sup>



The sharp increase in gas consumption in 2022 (approximately 19% annually, compared to an average of 5% from 2007 to 2021) is primarily attributed to the high demand on thermal power plants. Gas consumption at these plants rose by 35-40% compared to previous years. Additionally, the amount of electricity generated by gas-fired thermal power plants increased from 2,840.4 million kWh in 2019 to 3,446.5 million kWh in 2023, representing a 21.13% growth. This increase is linked to the energy deficit in Turkey and the high electricity prices on the international market, driven by the Russia-Ukraine war, which created favorable conditions for export.

A significant rise in gas consumption was also noted in the commercial sector. Alongside the post-pandemic economic recovery, this was mainly related to the increased electricity demand from cryptocurrency producers, including unregulated ones.

<sup>13</sup>Taimuraz Gochtitashvili, "Oil and Gas Exploration, Transportation, Processing, and Use", Tbilisi, 2024

Chart 3 Gas consumption by sector, mln. M<sup>3</sup>/per<sup>3</sup>/per year

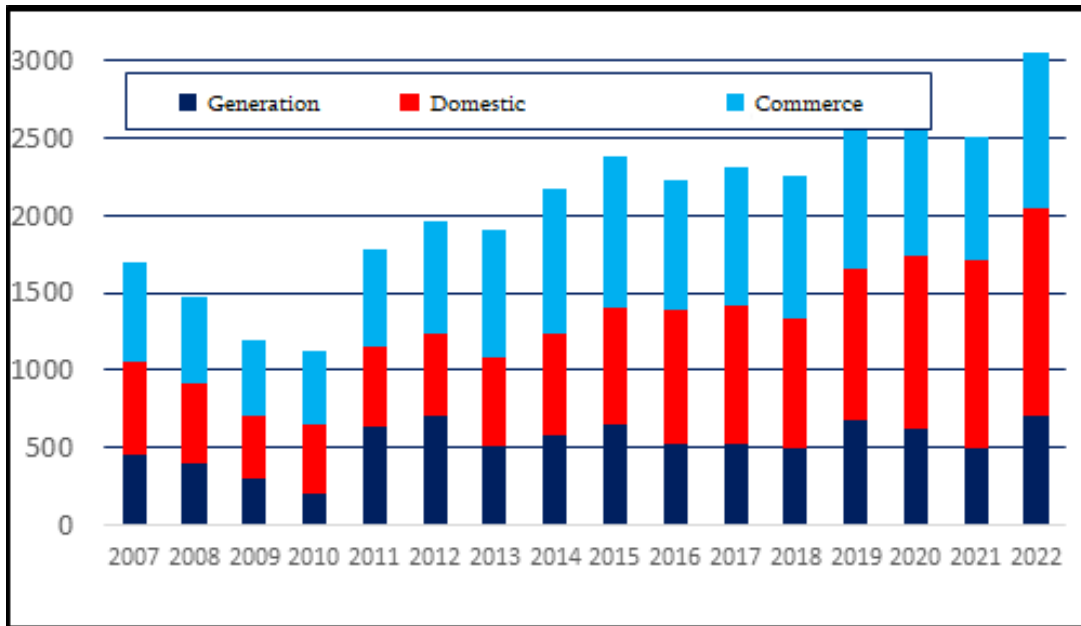
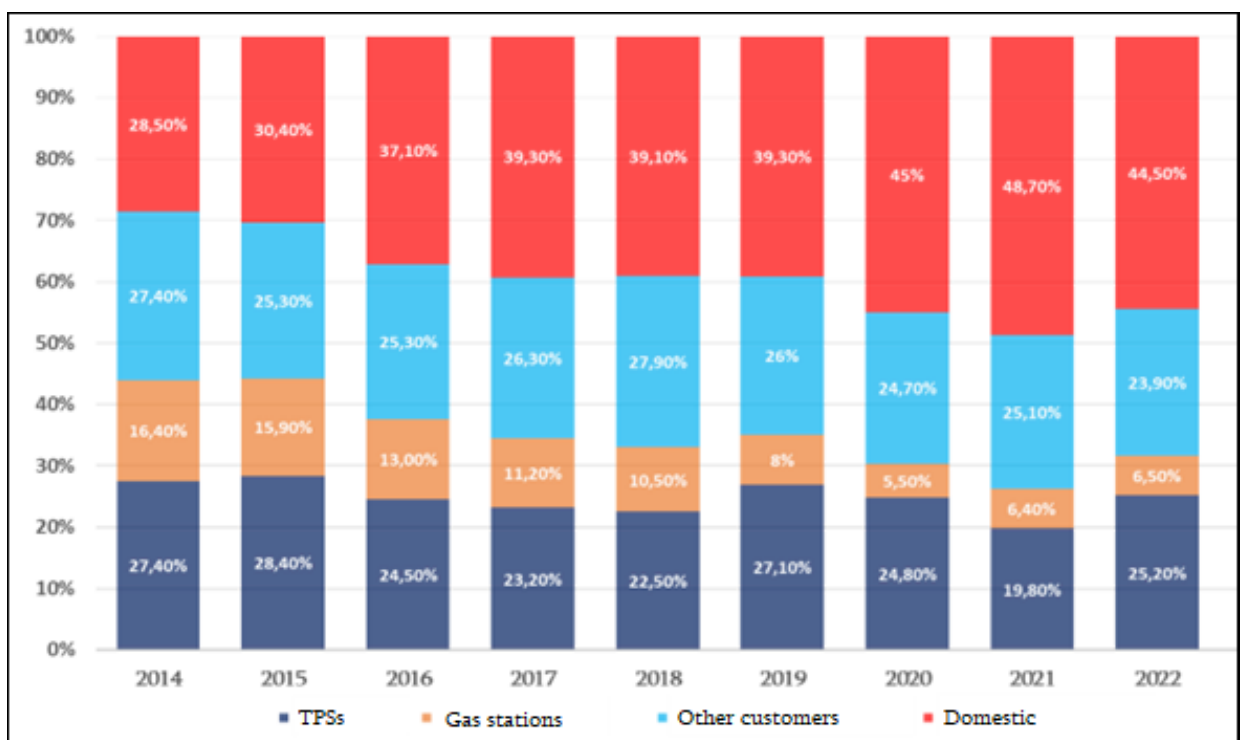


Chart 4 Percentage of gas consumption by consumer categories.



An analysis of the long-term dynamics of gas demand by CNG (compressed natural gas) stations shows that a peak in natural gas use in road transport was recorded in 2015, followed by a significant decrease in consumption in this sector. Among the causes for this were the increase in natural gas prices in the commercial sector and competition from alternative fuels, including liquefied petroleum gas (LPG), as well as the growth of hybrid and electric vehicles. The growing trend of importing electric vehicles,

which currently dominate globally, is becoming a significant factor in promoting natural gas consumption and environmental protection in Georgia.

The table provides the annual final gas consumption figures by consumer categories for recent years.

**Table 2 Natural Gas Consumption, 2020-2023 (mln m<sup>3</sup>/y)<sup>14</sup>**

	2020	2021	2022	2023
Electricity Generation	614.3	495.7	754.5	765.3
Residential	1123.6	1221.3	1335,9	1340,1
Commercial sector	811,1	791,3	966,4	909,8
<b>Total Consumption</b>	<b>2548,9</b>	<b>2564,2</b>	<b>3056,8</b>	<b>3015,2</b>

For gas supply security, it is crucial to closely monitor gas consumption levels during peak load periods.

**Table 3 Consumption During Peak Periods by Consumer Categories, 2023**

		Distribution	Direct users	TPSs	Secured users	Total
On a day of peak consumption	1000 0 <sup>3</sup>	11 587	1 511	6 303	11 165	19 401
	%	59,7%	7,8%	32,5%	57,5%	100%
Average of 30 days of peak consumption	1000 0 <sup>3</sup>	10 539	1 528	6 025	10 155	18 091
	%	58,3%	8,4%	33,3%	56,1%	100%
Average of 7 days of peak consumption	1000 0 <sup>3</sup>	11 283	1 504	6 228	10 873	19 015
	%	59,3%	7,9%	32,8%	57,2%	100%

Notably, statistical data from 2020-2023 indicates that protected consumers consumed approximately 57.5% of the total gas distributed by distribution companies.

As the analysis shows, during peak consumption days, 7-day periods, and 30-day periods, the volume of gas demanded by protected consumers accounts for 57.2% of the total consumption, averaging around 10.1 million m<sup>3</sup> per day.

<sup>14</sup> Source: GOGC statistical data

**Table 4 Percentage Share of Protected Consumers in Gas Supplied by Distribution Companies in 2023**

2023	Data of metering systems Subtracting generation	Secured users	%
West direction	558 221 668	387 165 587	0,69
After Kutaisi to Sokhumi	52 033 963	34 777 415	0,67
From Kutaisi to Sokhumi	110 772 572	74 035 947	0,67
Kobuleti branch line	146 291 106	97 775 112	0,67
Borjomi-Bakuriani	55 278 730	36 946 087	0,67
South direction	84 825 462	56 693 939	0,67
Kakheti direction	119 630 619	79 956 311	0,67
North direction	38 712 185	25 873 673	0,67
Central	1 448 830 141	1 040 533 323	0,72
<b>Total</b>	<b>2 250 220 074</b>	<b>1 590 239 498</b>	<b>0,71</b>

## 1.2. Sources of Gas Import

Currently, the primary volumes of gas supply are provided through several independent contracts with foreign sources (including SOCAR and the Shah Deniz International Consortium from Azerbaijan, as well as Gazprom Export and Gazprom Schweiz from Russia).

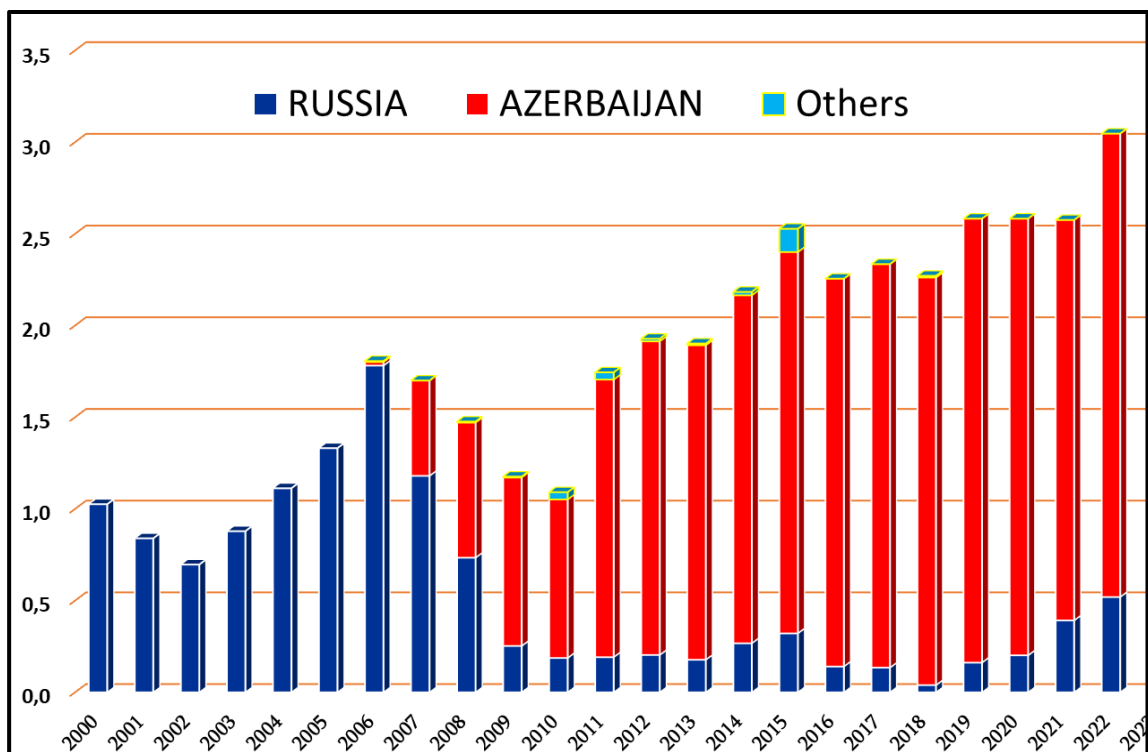
Azerbaijan is the primary gas supplier in the local market. In 2023, the total volume of natural gas exported from Azerbaijan to Georgia accounted for approximately 80% of the gas consumed in the country. Gas from Azerbaijan's Shah Deniz field is supplied to Georgia via the South Caucasus Pipeline (SCP).

In accordance with the territorial ownership agreement and the gas purchase and sale agreement signed between the participants of the South Caucasus Pipeline project and the Government of Georgia, Georgia has the right to purchase up to 5% of the volume of gas transported through the transit pipeline. The contract is valid until October 2068. The total volumes of optional gas have significantly increased following the completion of Phase II of the Shah Deniz field development and the commencement of supplemental gas supplies to Turkey and European markets. According to the forecast, its volume is expected to increase to 1.5 billion cubic meters by 2027.

According to the supplemental gas purchase and sale agreement, the additional volumes of natural gas to be supplied from the Shah Deniz field (up to 500 million cubic meters per year) and its prices are established through 2026. In 2023, 508.8 million cubic meters of gas from the Shah Deniz field were supplied under the Supplemental Gas Agreement.

The prices specified in the offshore and Supplemental Gas Agreements are significantly lower than the regional market prices for natural gas.

Chart 5 Natural Gas Imports by Country Billion m<sup>3</sup>/ per year<sup>15</sup>



In accordance with the memorandum signed with the Government of Georgia, the State Oil Company of Azerbaijan SOCAR will ensure the supply of gas to fully meet the demands of residential sector and TPPs. The gas supply terms for the Georgian market have been agreed upon in the gas purchase and sale contracts signed with SOCAR, which are set to expire in December 2030. The terms of the gas purchase and sale contract signed with SOCAR are subject to periodic review. The currently effective terms of the agreement remain in force until 2026.

The entire volume of natural gas supplied from Azerbaijani sources (collectively referred to as Georgian Gas) is primarily intended to meet the needs of residential consumers and thermal generation, which constitute the so-called Social Consumers of the regulated segment of the market. Additionally, SOCAR supplies gas at market prices to meet the demands of Georgia's commercial sector (including industry). In addition, Russian gas is also imported, primarily by GOGC.

After the 2008 Russia-Georgia military conflict, the import of gas from Russia has been maximally restricted. However, since the onset of the Russia-Ukraine war, there has been a noted increase in the share of Russian gas in the overall balance. This trend is primarily due to Azerbaijan's limited capacity to meet Georgia's significantly increased demand for natural gas, on the one hand, and Azerbaijan's commitment to the European Union<sup>16</sup>, on the other hand, to maximize transit volumes westward. As a

<sup>15</sup>Taimuraz Gochtitashvili, "Oil and Gas Exploration, Transportation, Processing, and Use", Tbilisi, 2024

<sup>16</sup>This includes redirecting Georgia's share of Shah Deniz gas through SOCAR's infrastructure by freeing up capacity in the South Caucasus Pipeline. However, SOCAR's infrastructure is unable to fully meet the country's total demand during peak winter consumption periods.

result, the share of Russian gas in the overall balance nearly tripled in 2022-2023 compared to the pre-pandemic period.

Natural gas is supplied to residential consumers in the so-called Social Sector at a tariff regulated by GNERC, while thermal power plants receive gas at a preferential tariff established by the memorandum and corresponding contracts signed between the government and SOCAR. For all other consumers, retail and wholesale prices are deregulated, and gas is supplied at publicly offered prices and conditions.

In 2023, approximately 99.5% of Georgia's natural gas demand was met through imports, including the following: From the State Oil Company of Azerbaijan “SOCAR” - 1,081.0 mln cubic meters ; From the Shah Deniz field via the South Caucasus Pipeline (SCP) - additional and optional gas - 1,376.25 mln cubic meters; From the Russian Federation - 596.04 mln cubic meters Local suppliers provided the system with 15.8 million cubic meters of gas.

**Table 5 Natural Gas Supply, 2020-2023 (mln m<sup>3</sup>/per year)<sup>17</sup>**

	2020	2021	2022	2023
Socar	1442,3	1156,7	1410,8	1081,0
Shah Deniz, optional	391,1	517,2	637,6	867,5
Shah Deniz, additional	508,9	509,0	508,8	508,8
Russia	204,0	396,8	519,8	596,04
Other	27,5	15,2	13,7	15,8
<b>Total supply</b>	<b>2573,9</b>	<b>2594,9</b>	<b>3090,7</b>	<b>3069,1</b>

The local system is supplied with gas through several receiving points (see chart):

- The technical capacity of the 1,200 mm pipeline in the North-South main gas pipeline system, which transports gas from Russia (Point 1 on the chart), is 25 million cubic meters per day on the segment from the border to Saguramo. The actual capacity has been practically confirmed at 21.6 million cubic meters, (according to data from GOGC for 2023/2024).
- The technical capacity of the Saguramo receiving node (Point 1a) on the North-South main gas pipeline is 15 million cubic meters per day, while the maximum actual volume received has been 11.1 million cubic meters per day.
- A node (Point 5) is installed on the 1,000 mm Russian gas transit pipeline within Georgian territory, near the Red Bridge cross-border metering station, to redirect Russian gas intended for Armenia into Georgia's internal pipeline system. The capacity of the node is 3.14 million cubic meters per day. Receiving gas through this node automatically implies a reduction in the volume of gas intended for delivery to Armenia. Therefore, considering its capacity in general risk assessments is

<sup>17</sup> Source: GOGC statistical data

not appropriate. However, this node could be used to supply gas from Russia to Georgia if, for any reason, the operation of the Saguramo receiving node becomes impossible<sup>18</sup>;

- The potential technical capacity of the Kazakhi-Saguramo pipeline's receiving node (Point 2), which brings gas from Azerbaijan, is 15 million cubic meters per day. The maximum actual capacity recorded is 10.7 million cubic meters per day. The node serves to supply gas to Georgia under a long-term agreement with the State Oil Company of Azerbaijan. Additionally, according to an agreement reached at the request of the Azerbaijani side, this route can also be used to supply a portion of Shah Deniz gas, in order to free up capacity in the SCP (South Caucasus Pipeline) and maximize the volumes of gas delivered to the European market.<sup>19</sup>;
- At the Azerbaijan-Georgia border, the South Caucasus Pipeline (Point 7) delivers Azerbaijani gas from the Shah Deniz field, intended for both transit and the local market. The total capacity of the South Caucasus Pipeline system is currently approximately 65 million cubic meters per day. Through the receiving node connecting the SCP to Georgia's main gas pipeline system (Point 3 on the chart) and a 12 km interconnection, it is technically possible to receive up to 5.7 million cubic meters of gas per day (although the analysis considers its design capacity of 5.5 million cubic meters per day). The maximum actual capacity recorded during peak consumption in January 2023 was approximately 5.1 million cubic meters per day. Transit gas from the Shah Deniz field is delivered to the Turkish and European markets via the Vale metering station at the Georgia-Turkey border (Point 8).
- The volume of gas received from the connection points to the local producers' network (Point 4) depends on its extraction, with an average daily supply potential of approximately 0.05 million m<sup>3</sup>/d<sup>20</sup>.

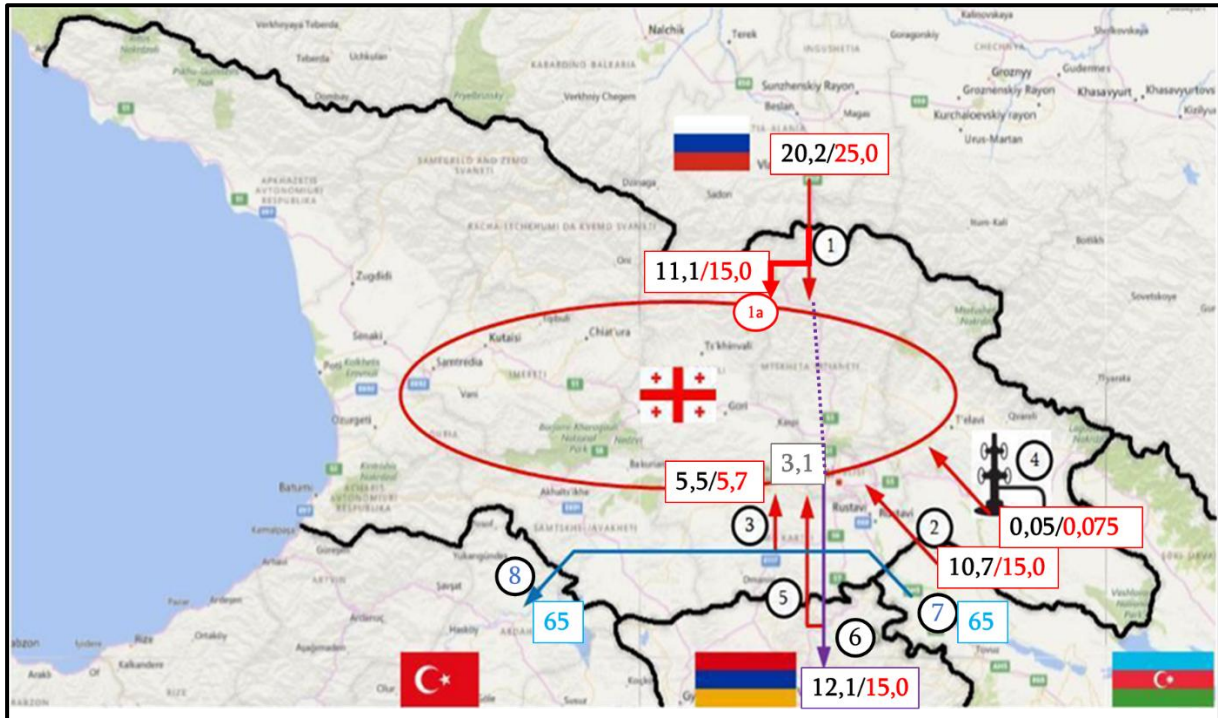
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<sup>18</sup> In general, this node is used to redirect Russian gas intended for Armenia to the Georgian market based on a commercial agreement.

<sup>19</sup> The agreement remains in force until the expiration of the additional gas contract signed with the consortium.

<sup>20</sup> The maximum supply in 2023 reached 0.073 million cubic meters per day.

Chart 6 Actual and Technically Possible Capacity of Major Cross-Border Gas Supply Points, mln m<sup>3</sup>/d<sup>21</sup>



In addition to the gas receiving nodes, a border delivery node is arranged on the Saguramo-Armenia 1,000 mm pipeline (Point 6 on the diagram), with a maximum actual recorded capacity of 12.1 mln m<sup>3</sup>/d, while technical capacity is 15 million m<sup>3</sup>/d. During the peak consumption period of January-February 2023, the pipeline's average load was 10.5 million cubic meters per day, fluctuating between 9.56 and 11.52 million cubic meters per day. Accordingly, in critical situations, the capacity available to Georgia for receiving Russian gas is approximately 13 to 14.5 m<sup>3</sup>/d provided that the mandatory volume of gas to be delivered to Armenia via transit is not reduced during this time.

During the peak consumption period, the primary supplier remained the Azerbaijan company SOCAR, which provided the market with an average of 9.41 million cubic meters of gas per day (with a maximum supply of 10.72 million m<sup>3</sup>/d). The average volume of gas supplied from Russia was 5.61 million m<sup>3</sup>/d, while technical capacity is 7.7 million m<sup>3</sup>/d.

Table 6 Gas Supply During Peak Consumption <sup>22</sup> from Various Sources

		Local production	Socar	Shah Deniz	Russia	Total
Supply on a day of peak consumption	1000 8 <sup>3</sup>	44	9 347	2 580	7 793	19 764
	%	0,2%	47,3%	13,1%	39,4%	100%
Supply on the average day of 30-day peak consumption	1000 8 <sup>3</sup>	38	9 529	1 724	6 989	18 280
	%	0,2%	52,1%	9,4%	38,2%	100%
Supply on the average day of 7-day peak consumption	1000 8 <sup>3</sup>	40	9 452	1 924	7 770	19 187
	%	0,2%	52,1%	9,4%	38,2%	100%

<sup>21</sup> source: Analysis Conducted by the Consultant Based on Publicly Available Information

<sup>22</sup> This refers to the time periods defined by supply standards, specifically the 1-day, 7-day, and 30-day peak consumption periods.

Natural gas distribution in Georgia is handled by 18 gas distribution companies, with three major licensees dominating the market: LLC "Tbilisi Energy," LLC "SOCAR Georgia Gas," and JSC "Sakorggazi" are the three major licensees (distributing 90% of the total gas demand in 2022).

### 1.3. Description of Gas Supply Infrastructure and System Operation

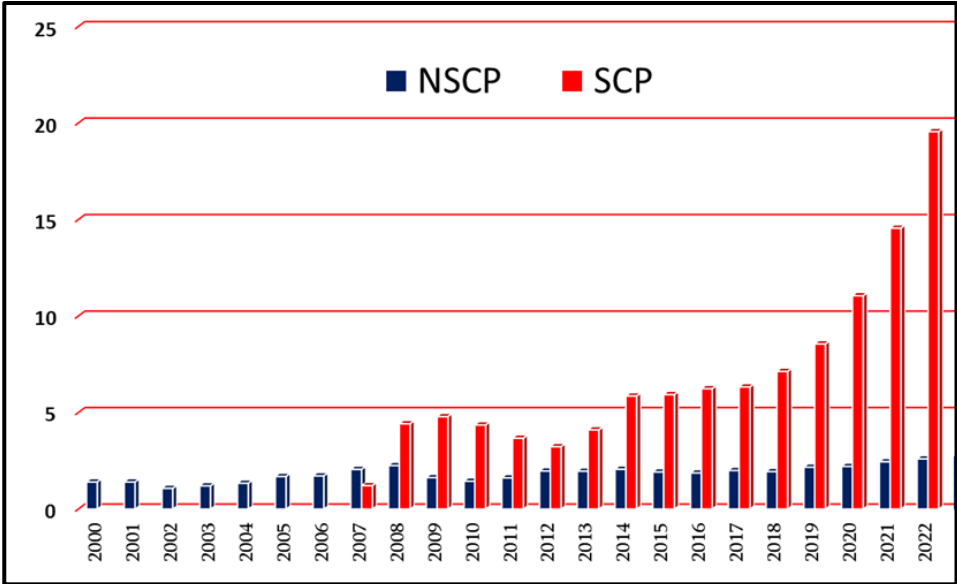
The chart shows the layout of the main gas pipelines and related facilities located within the territory of Georgia. It consists of the domestic gas supply infrastructure and transit pipelines, along with flow management, control, and metering nodes.

The transit corridor located within the country is one of the most attractive supply routes for hydrocarbons from Azerbaijan and Central Asian countries to international markets. This corridor facilitates the transportation of natural gas, oil, and petroleum products through pipelines, as well as by rail and maritime ports.

The main gas pipelines facilitate the transit of natural gas towards Turkey, Europe, and Armenia<sup>23</sup>. The actual transit volume carried by the SCP pipeline in 2022 amounted to approximately 19.8 billion cubic meters. A significant increase in the transit of Azerbaijani gas is planned for 2025-2030, reaching up to 25-30 billion cubic meters per year.

North-South Caucasus Main Gas Pipelines (NSCMP) system facilitates the transit of Russian gas to Armenia. The pipeline's load is significantly lower compared to its actual capacity<sup>24</sup> (in 2022, approximately 2.7 billion cubic meters of Russian gas were transported via transit to Armenia).

**Chart 7 Natural Gas Transit, Billion m<sup>3</sup>/year**

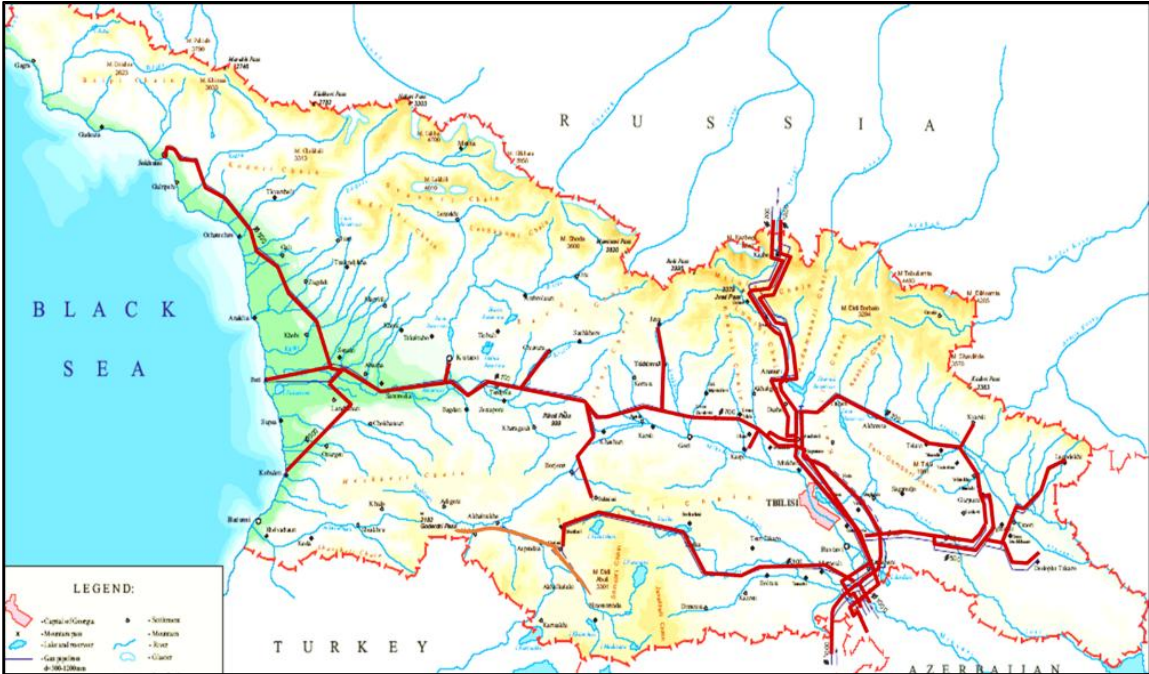


<sup>23</sup> An alternative source of oil and gas transit is Georgian Railway, which connects the oil terminals of Azerbaijan to the Caspian Sea (Baku, Sangachali, Duban) Georgian Black Sea oil terminals (Batumi, Kulevi and Poti).

<sup>24</sup> Approximately 8 billion m<sup>3</sup>/y

The total length of Georgia's main gas pipelines is approximately 2,000 km. Construction began in 1959 and intensified during the 1970s and 1980s. In the early years of the country's independence, following the collapse of the centralized Soviet economy, infrastructure construction virtually came to a halt. Intensive work on the construction and rehabilitation of main gas pipelines resumed in 2007.

**Chart 8 Main Gas Pipelines of Georgia**



The ongoing construction, rehabilitation, and development of gas pipelines primarily aim to increase the system's capacity, operational flexibility, and reliability by incorporating new, high-capacity segments and interconnections.

The operation of the natural gas transportation system in Georgia is carried out by GGTC - a state-owned enterprise and licensed natural gas transporter. At the same time, the owner of the main gas pipelines and related equipment and facilities is the subsidiary of GOGC the Georgian Natural Gas Transmission Network Owner LLC. According to the lease agreement between the operator and the owner, GOGC independently manages the operation and technical maintenance of the main gas pipeline system, while the construction of new pipelines and major rehabilitation works are carried out by the system owner. According to the Law on Energy and Water Supply, the development plans for the natural gas transportation (transmission) network must be prepared by GGTC after its licensing as a System Independent Operator (ISO)<sup>25</sup> and submitted to the regulatory commission for approval.

For the purpose of supplying Georgia's domestic market, the primary pipeline system serving the East-West and North-South Caucasus regions is composed of major branches and directional pipelines. The

<sup>25</sup> During the transitional period, before the operator is granted ISO status, the preparation and implementation of construction and rehabilitation plans for the main gas pipelines remain the responsibility of GOGC( see Government of Georgia Decree #129, March 25, 2021)

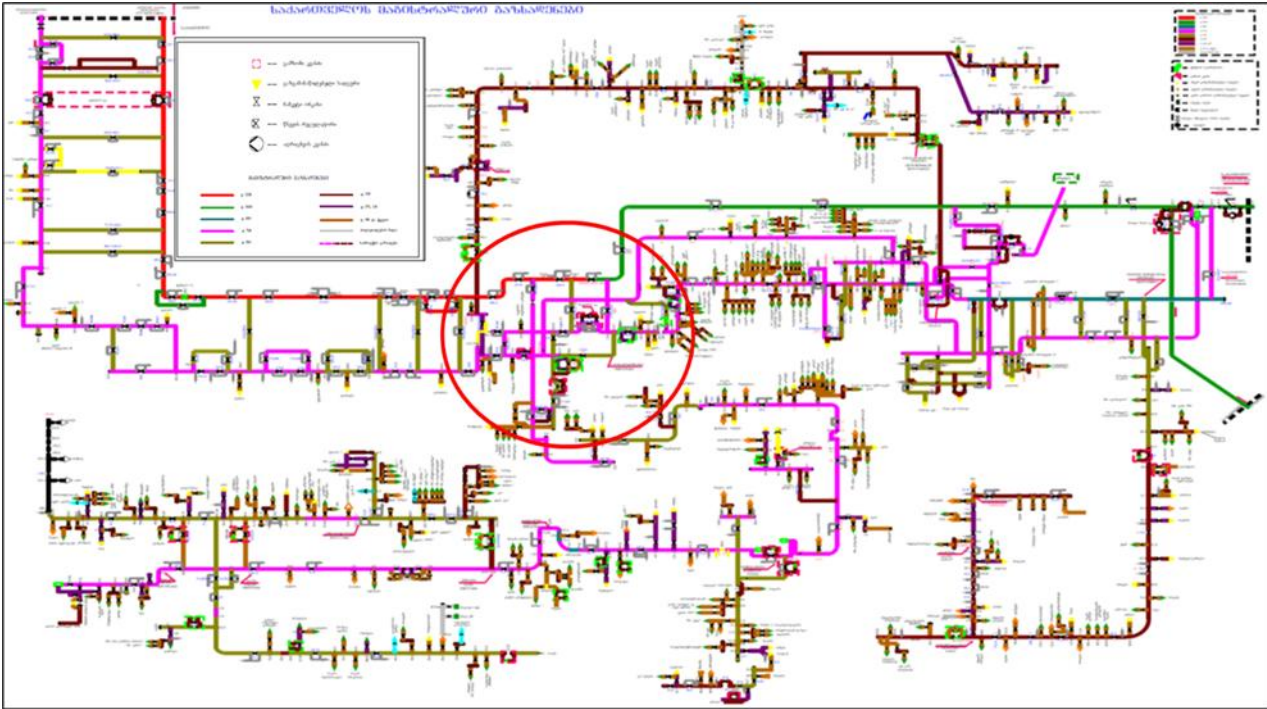
unified gas supply system also includes distribution pipelines, gas distribution stations, and gas metering units, as well as currently inactive compressor stations.

The primary components of the main gas pipeline system are:

- The North-South main gas pipeline system, which runs from the northern Russia-Georgia border, extending southward to the Georgia-Azerbaijan and Georgia-Armenia borders.
- The East-West main gas pipeline system, which facilitates gas supply from the Georgia-Azerbaijan border in the east to the western regions of the country.
- The main gas pipeline systems are connected to major branches serving the Kakheti and southern regions, as well as several terminals (in direction of Poti, Abkhazia, and the Autonomous Republic of Adjara).
- At the Saguramo node, various main gas pipelines converge, allowing for the distribution of natural gas across the entire country.

The East-West main gas pipeline can be conditionally divided into two sections: from the southeastern border of Georgia to the center, and from the center to Sukhumi, with branches extending toward Adjara and Poti

**Chart 9 Simplified Layout of Georgia's Main Gas Pipeline System**



***The North-South Main Gas Pipeline System***

The system integrates the “North-South Caucasus” and “Vladikavkaz-Tbilisi” parallel pipelines, along with the “Kazakhi-Saguramo” pipeline. The system receives gas from a metering station located on Russian territory through the 1200 mm “North-South Caucasus” main pipeline.

The North-South main gas pipeline system begins on Georgian territory at the Russian border, (at an elevation of approximately 1,380 meters above sea level). The initial sections, located in the Tergi River valley, cross several mountain rivers and a highly unstable hydrological gorge prone to flash floods. The pipeline traverses the Jvari Pass (at an altitude of approximately 2,430 meters), then continues southeast along the riverbeds of the Aragvi and Mtkvari rivers, extending to the Georgia-Azerbaijan border. The sections of the pipeline in the Aragvi Valley are situated in challenging terrain, passing through landslide-prone and avalanche-risk areas, as well as unstable geological formations. To protect the pipelines in this section of the route, several pipeline-carrying tunnels have been constructed.

Certain sections of the 1000 mm diameter pipeline along the Mtkvari River are situated in areas characterized by high moisture levels, intensive agricultural activities, and exceptionally aggressive soil conditions. Furthermore, the North-South main gas pipeline system is not equipped with operational electrochemical protection systems, which results in accelerated corrosion and wear of the pipelines.

**The Georgia segment of the “North-South Caucasus” pipeline** (D=1200<sup>26</sup> mm, L≈133 km, P<sub>0</sub>=55 bar) is constructed between 1988 and 1994. At various points, the pipeline passes through eight tunnels with a total length of 4.6 km. Currently, the pipeline is primarily used for the transit of Russian gas to Armenia.

**The Georgia segment of the “Kazakhi-Saguramo” pipeline** (D=1000 mm, L=90 km, P<sub>0</sub>=55 bar) was constructed in 1980. It is an extension of the “North-South Caucasus” pipeline, running from Saguramo to the borders of Azerbaijan and Armenia. On Georgian territory, the pipeline spans approximately 90 km, with an additional 11.5 km branch directed towards the Armenian border. The pipeline is used for the transit of Russian gas towards Armenia. It is connected to the Tsiteli Khidi and Khrami metering stations, which are used to measure the volumes of gas supplied to Armenia and incoming gas from Azerbaijan, respectively. In Saguramo, it connects to the “Vladikavkaz-Tbilisi” pipeline, through which Russian gas is periodically received.

**The Georgia segment of the “Vladikavkaz-Tbilisi” pipeline** (D=720/529 ∅, L=166 km, P<sub>0</sub>=55 bar) was completed in 1966, though various sections have undergone periodic rehabilitation and renovations. Four sections of the route, with a total length of approximately 1.3 km, are located within tunnels. The pipeline primarily consists of 700 mm diameter pipes. The pipeline is currently primarily used to supply gas to cities and settlements located in the northern region. Additionally, it is connected by 500 mm diameter connecting lines to sections running parallel to the “North-South Caucasus” pipeline, and in emergency situations, it can serve as a substitute for the main 1200 mm transit pipeline.

The pipeline is connected to the Gveleti and Saguramo gas metering stations, and includes an inactive compressor station (at kilometer 186.7). At the 155.7 km mark of the pipeline, there is an insertion point for the 300 mm, 50.7 km long “Rustavi-Telavi-Zhinvali” section, which supplies the Kakheti branch.

### **The East-West Main Gas Pipeline System**

The East-West Main Gas Pipeline System group, from **the southeastern border to the center** includes: the “Karadagi-Tbilisi,” “Azerbaijan Border-Gardabani,” “Gardabani-Navtlughi,” and “Navtlughi-

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<sup>26</sup> The document specifies the nominal diameters of the pipeline

Saguramo” pipelines, as well as the connecting branches “Area 72-Rustavi,” the “Kakheti Direction,” and the “Southern Direction” linked to the South Caucasus Pipeline.

The Georgia segment of the **“Karadagi-Tbilisi”** (D=500/800 mm, L=46 km, P<sub>0</sub>=55 bar) consists of parallel lines. Construction of its first phase began in 1959. The "Karadagi-Tbilisi" pipeline is connected to a branch of the South Georgia main gas pipeline, which supplies the Kvemo Kartli and Samtskhe-Javakheti regions.

In 2017, the construction of a new 700 mm section from the Azerbaijan border to Gardabani was completed, ensuring the supply of Azerbaijani (owned by SOCAR) gas to the Georgian market.

**„Gardabani-Navtlugi“** (D=700 mm; L=30,2 km, P<sub>0</sub>=55 bar) and **„Navtlugi-Saguramo“** (D=700 mm; L=50,6 km, P<sub>0</sub>=55 bar) sections, with a total length of 80.8 km, were constructed between 2007 and 2010. The pipelines facilitate the delivery of Azerbaijani gas, owned by SOCAR, to the Georgian market. The gas is transported to the border via the Azerbaijani section of the “Kazakhi-Saguramo” pipeline. The Gardabani-Navtlugi pipeline replaced the 500 mm sections of the “Karadagi-Tbilisi” pipeline, while the Navtlugi-Saguramo pipeline runs parallel to the section of the “Vladikavkaz-Tbilisi” pipeline located in densely populated urban areas, this significantly enhanced the reliability of the main gas pipeline operations, improved public safety, and increased the system's capacity.

**The connecting section to the South Caucasus Pipeline** (D=762 mm, L=12,5 km, P<sub>0</sub>=55 bar) was constructed in 2006 to supply gas to the market as provided by optional and supplemental gas purchase agreements from the South Caucasus Pipeline.

The construction of the **Kakheti Direction** (Rustavi-Telavi-Zhinvali) **pipeline** (D=200/300/500 mm, L=212,9 km, P<sub>0</sub>=25/55 bar) was primarily carried out between 1970 and 1987 years. It is connected to the "Gardabani-Navtlugi" pipeline, and to the "Karadagi-Tbilisi" pipeline at the 486 km mark by the 300 mm, 25 km long "Rustavi-Sagarejo" section constructed in 2014. This connection restored the circular gas supply system for the region. (The second supplier is the 300 mm, 50.7 km long "Rustavi-Telavi-Zhinvali" section from Zhinvali to Akhmeta, connected to the "Vladikavkaz-Tbilisi" main pipeline).

The pipeline has several internal regional branches, among which the main ones are: Sagarejo, Kiziki, Kvareli, Gulgula-Napareuli, Akhmeta, and Tianeti.

The **Southern Direction** (Tsiteli Khidi-Tsalka-Akhalkalaki) **pipeline** (D=300/500 mm, L=195,6 km, P<sub>0</sub>=12/25/55 bar) is connected to the "Karadagi-Tbilisi" pipeline.

The construction of the pipeline and its branches took place during the 1980s and between 2008 and 2017. The main pipeline supplies natural gas to residential and commercial consumers in the municipalities of Marneuli, Bolnisi, Dmanisi, Tsalka, Aspindza, Akhalkalaki, Ninotsminda, Akhaltsikhe, and Adigeni.

At the 182 km mark, the pipeline is connected to the Aspindza-Akhaltsikhe-Ude-Adigeni-Goderdzi branch, which consists of the Koteliya-Aspindza, Aspindza-Akhaltsikhe, Akhaltsikhe-Ude, and Akhaltsikhe-Goderdzi sections. The approximately 30 km section connecting Akhaltsikhe to the Goderdzi Pass supplies natural gas to the highland resorts of Adjara and the consumers in the Khulo district.

**The East-West Main Gas Pipeline System's Center-Sukhumi group** includes: the "Saguramo-Kutaisi," "Kutaisi-Sukhumi," and its parallel "Zestaponi-Poti" main pipelines, along with its branches (including the main ones: Tskhinvali, Bakuriani, Adjara, and Sukhumi), are part of the group.

**"Saguramo-Kutaisi" main gas pipeline** (D=500/700/800 mm, L=212,5 km, P<sub>0</sub>=55 bar) begins at the Saguramo metering station. The pipeline is designed to supply natural gas to the Mtskheta-Mtianeti, Shida Kartli, Samtskhe-Javakheti (Borjomi-Bakuriani zone), Tskhinvali, and Imereti regions. Its construction began in 1967 and continued until 1975. The pipeline's nominal diameter is primarily 700 mm, (although some sections still retain 500 mm segments. The replacement of these segments is planned to be completed by 2025). In certain areas, the pipeline is composed of parallel segments, including newly constructed sections as well as the original ones. At the 98 km mark, one of the most significant branches, the "Gomi-Khashuri-Bakuriani" branch, connects to the pipeline, providing gas supply to the Borjomi-Bakuriani resort and recreational zone. The pipeline also has branches connected to Akhgori, Kaspi, Gori, Tskhinvali-Java, Sachkhere, Chiatura, Zestaponi, and Kutaisi.

Parallel to the "Saguramo-Kutaisi" main gas pipeline, there are newly constructed and ongoing construction sections of the 700 mm pipelines: Gori-Kareli-Khashuri, Khashuri-Zestaponi, and Zestaponi-Kutaisi.

**The "Kutaisi-Sukhumi" main gas pipeline** (D=500/700 mm, L=212 km, P<sub>0</sub>=55 bar) is a continuation of the "Saguramo-Kutaisi" pipeline, with construction completed in 1986. It is intended for supplying natural gas to the regions of Western Georgia. At the 51 km mark of the pipeline, the 500 mm Adjara branch begins, which supplies natural gas to the Guria and Adjara regions.

**"Kutaisi-Poti" main gas pipeline** (D=700 mm, L=128,7 km, P<sub>0</sub>=55 bar) includes the newly constructed Kutaisi-Abasha, Abasha-Senaki, and Senaki-Poti sections. It is located parallel to the existing 500 mm "Kutaisi-Sukhumi" gas pipeline, with part of it rerouted to the left bank of the Rioni River. The "old" and newly constructed pipelines are interconnected by several connectors near Kutaisi, Abasha, and Senaki. The pipeline also includes existing and under-construction branches for the Adjara region.

Table 7 Main Gas Pipelines of Georgia

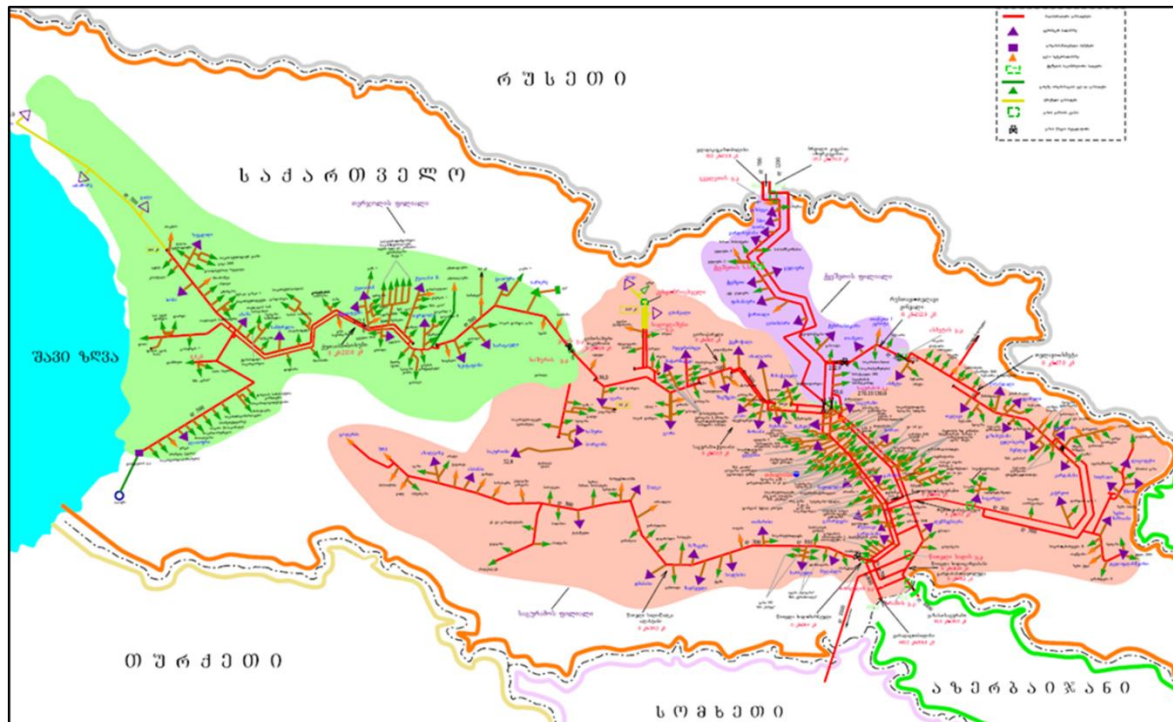
Gas station name	Gas pipeline		Exploitation year
	Area (km)	Length	
Nothern Caucasus-South Caucasus	133,65	1220	1988-1994
Gazakh-Saguramo	89,46	1020	1980
Gardabani-Navtlugi	30,2	714	2007
Qaradag-Tbilisi	64,98	820-720	1968-1970-1984-2000
Navtlugi-Saguramo	52,2	720	2008-2011
Vladikavkaz-Tbilisi	195,192	720-529	1963-1979-1986-1989
Saguramo-Kutaisi	225,64	720-529	1972-1983
Kutaisi-Sokhumi (together with Kobuleti branch line)	201,978	720-529	1986-1989-2006
Rustavi-Telavi-Zhinvali	290,5	325-529	1970-1987-1992
Tsiteli Khidi-Tsalka-Akhalkalaki	173,10	325-219	1979-1990-2007
Aspindza-Akhaltzikhe-Vale-Ude	73,024	325-2019	2007-2012
Tsiteli Khidi-Marneuli	26,90	529-325	2015
Gomi-Khashuri-Bakuriani	58,98	529-325	1972-1975-1989
Gori-Kareli	44,14	720	2016
Zestafoni-Kutaisi	23,4	720	2014
Kutaisi-Abasha	47,0	720	2014
Abasha-Senaki	29,0	720	2014
Senaki-Poti	29,562	720	2009
Rustavi-Sagarejo	25,2	325	2014
Tsiteli Khidi-Gardabani	18,76	720	2018
Telavi-Akhmeta	27,00	325	2018
Adigeni-Goderdzi	33,00	325	2019
Kobuleti branch line	61	500	2024
Natakhtari-Tsilkan-Ksani	17,6	700	2023
Lekhura-Svaneti	20,6	700	2024

In addition to the main gas pipelines, the unified natural gas transmission system includes metering stations at transboundary points and at the starting points of major branches, as well as pipeline cleaning and diagnostic equipment launch/receiving stations and cathodic protection stations against electrochemical corrosion. All newly constructed sections (since 2007) of the East-West main gas pipelines and its branches are equipped with these stations. As for the North-South main gas pipeline system, for over 30 years, neither pipeline cleaning and diagnostic systems nor cathodic protection systems have been operational. This has negatively impacted the pipelines' operational durability (details provided below). **The effective operation of electrochemical protection systems for the pipelines could become a viable method for extending its operational lifespan.**

### Natural Gas Distribution

As of today, Georgia's unified gas supply system encompasses approximately 37,000 km of distribution pipelines, along with more than one hundred primary gas distribution stations and metering units (refer to the chart).

Chart 10 Locations of Gas Distribution Stations



Among the gas distribution companies operating in Georgia, the dominant players—LLC Tbilisi Energy, LLC SOCAR Georgia Gas, and JSC Sakorggaz—distributed up to 90% of the total gas demand in 2022. By the end of 2022, Tbilisi Energy served 36% of total consumers, operating 16% (5,300 km) of the country’s distribution network. In contrast, SOCAR Georgia Gas and Sakorggaz, which operate in the regions, controlled 77% of the total distribution network (18,900 km and 6,600 km, respectively) and served 55% (820,000) of consumers<sup>27</sup>. The remaining 132,000 consumers were supplied by smaller distribution companies, which managed a total of 2,400 km of distribution networks.

### Natural Gas Market

On September 2, 2021, the Government of Georgia approved the Natural Gas Market Model Concept through Resolution No. 447. This concept aims to establish a free natural gas market, where participants will benefit from equal, non-discriminatory conditions and transparent, competitively determined pricing, providing consumers with the opportunity for free choice. Nevertheless, the target model does not exclude the possibility of defining, imposing, and implementing a public service obligation for a limited period, based on the general economic interest.

Pursuant to the Natural Gas Market Model Concept and the decision made by the Ministry in 2023, the function of the natural gas exchange was assigned to the electricity exchange operator company, JSC Georgian Energy Exchange (GENEX). At this stage, the relevant legal procedures have been completed and the necessary work to operationalize the natural gas exchange is planned to begin in the near future.

<sup>27</sup> GNERC’s 2022 activity report, Tbilisi, 2023

To regulate relationships in the retail natural gas market, GNERC approved the Retail Natural Gas Market Rules on December 28, 2021, through Resolution No. 60. These rules reflect European best practices for regulating relationships between natural gas suppliers and consumers.

Equally important is the incorporation of the European Commission Regulation No. 312/2014, which concerns network codes for gas balancing in transmission networks, into Georgian legislation. This was one of the obligations under the Energy Community framework. To fulfil this, on September 9, 2020, GNERC approved Resolution No. 48, amending Resolution No. 22 of August 31, 2018, titled on the Approval of Natural Gas Network Rules, thereby adopting the Natural Gas Balancing Network Rules.

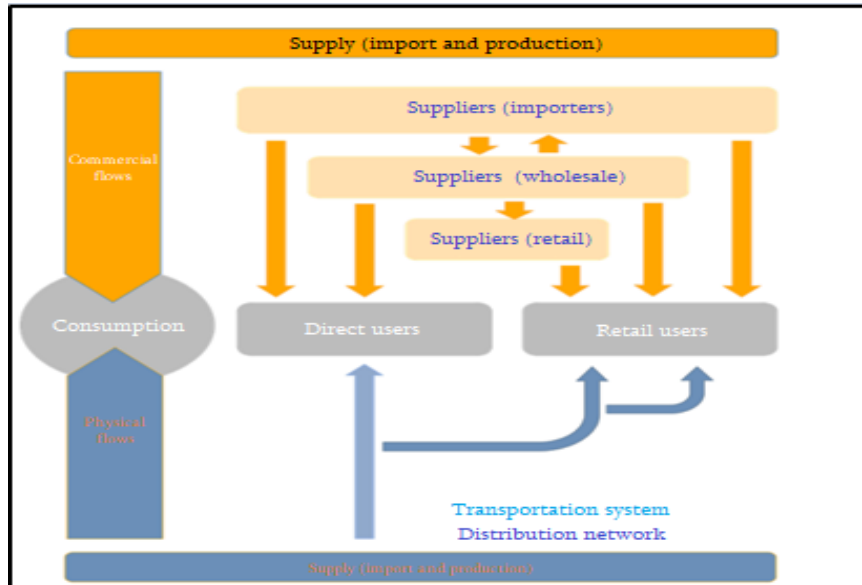
Additionally, on March 30, 2021, GNERC approved Resolution No. 7, on the Approval of Energy Market Monitoring and Reporting Rules. These rules incorporate into Georgian legislation the requirements and principles of the European Parliament and Council Regulation No. 1227/2011 (EC) on Wholesale Energy Market Integrity and Transparency, as adapted by the Energy Community Ministerial Council Decision No. D/2018/10/MC-EnC.

In August 2021, Georgia submitted the Natural Gas Security of Supply Statement to the Energy Community Secretariat, as required by the Energy Community Treaty.

Currently, the natural gas market in Georgia includes both retail and wholesale segments. An organized natural gas market is not yet operational, and transactions in the wholesale market are conducted through bilateral agreements. Suppliers import natural gas (or purchase small volumes of domestically produced gas) and sell it to other suppliers or directly to consumers. At the retail level, suppliers deliver natural gas directly to end consumers. This does not preclude a single supplier from operating in both market segments.

According to GNERC, the most desirable model for organizing natural gas markets in Georgia is a competitive market similar to that of the European Union. Such markets are among the most efficient and liquid, promoting modern natural gas trading models. Moreover, implementing this model aligns with Energy Community requirements and will facilitate Georgia's integration into Euro-Atlantic economic structures.

Chart 11 Structure of the Natural Gas Market <sup>28</sup>

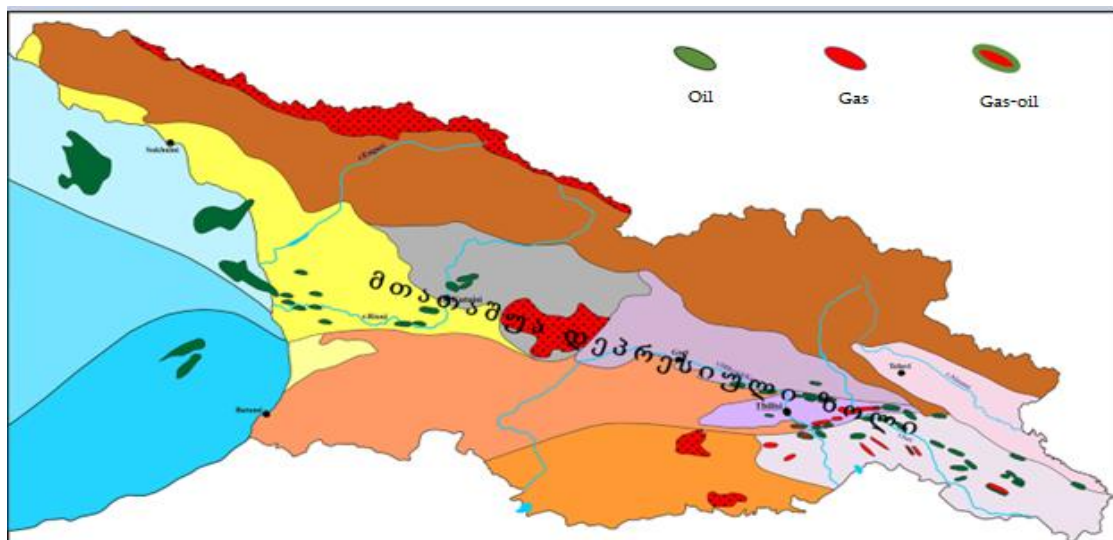


#### 1.4. Domestic Gas Production

##### Estimated Reserves and Resources

Based on the results of exploration conducted across Georgian territory, it has been determined that nearly the entire intermountain depression zone of the country, from Kakheti to the Kolkheti lowland, including the shelf extension within the Black Sea, is considered oil and gas prospective to varying degrees. As of today, the distribution of explored structures across tectonic zones is illustrated in Chart 12.

Chart 12 Intermountain Depression Zone and Explored Structures



<sup>28</sup>GNERC 2022 Activity Report, Tbilisi, 2023

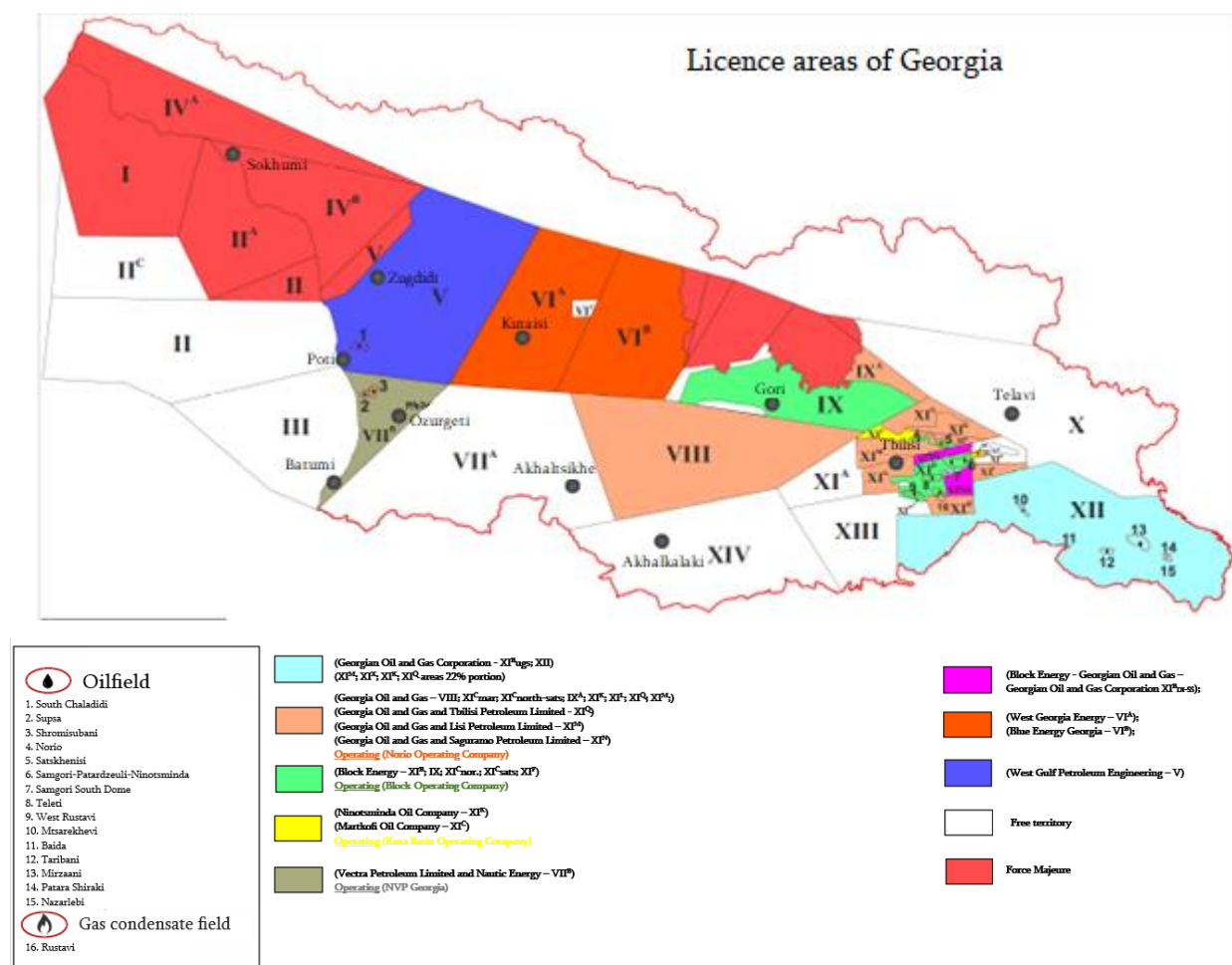
Information on the estimated reserves and contingent resources of oil, dissolved gas in oil, and free gas, as of January 1, 2023, across discovered fields and structures, is provided in the table below.

**Table 8 Resources of Dissolved (Associated) Gas in Oil and Free Gas**

	Reserve		
	1P	2P	3P
Dissolved Gas in Oil, mln m <sup>3</sup>	240,37	585,23	2738,30
Free gas, mln m <sup>3</sup>	3679,76	4812,03	6091,08
Contingent Resource			
	1C	2C	3C
Dissolved Gas in Oil, mln m <sup>3</sup>	5053,57	10719,9	24628,96
Free gas, mln m <sup>3</sup>	9719,8	22496,4	47712,0
Prospective Resource			
	L	M(B)	H
Dissolved Gas in Oil, mln m <sup>3</sup>	9294,0	46745,2	85130,0
Free gas, mln m <sup>3</sup>	140582,1	308730,8	589095,8

Chart 13 illustrates the oil and gas exploration and production license blocks, existing fields, and operator/investor companies currently operating in Georgia.

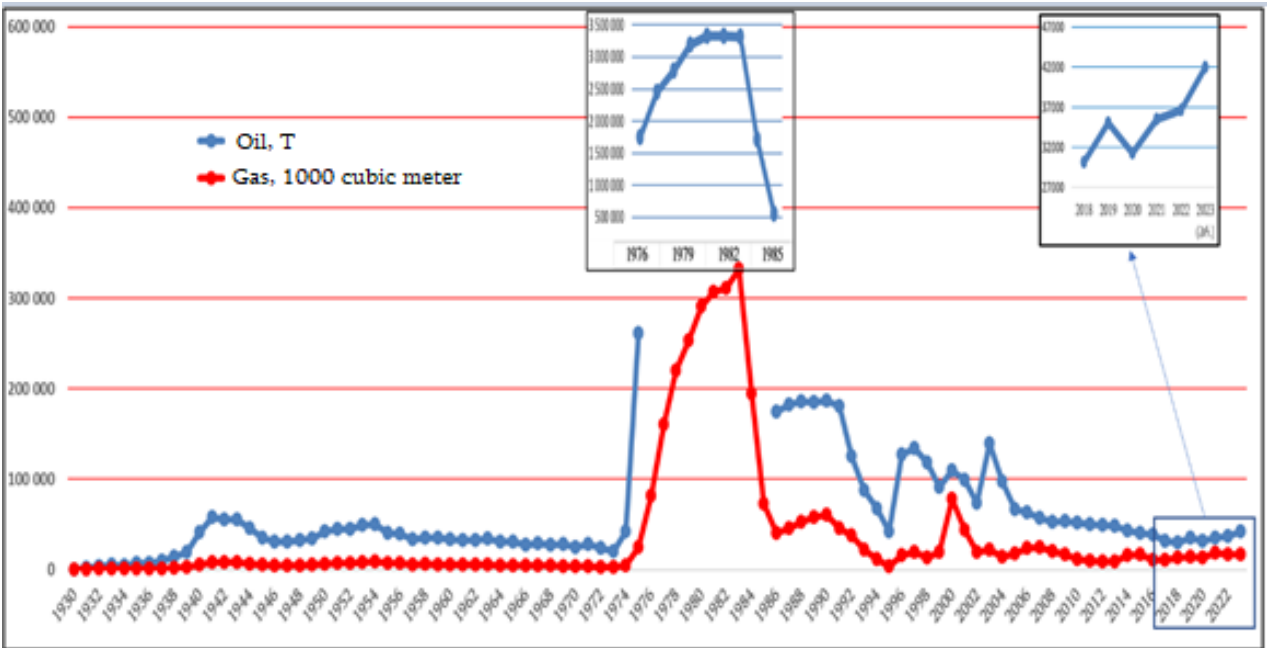
**Chart 13 License blocks**



Statistical analysis shows that oil and gas production in Georgia increased significantly from 1975, reaching its peak in 1981-1983, with an average of 3.3 million tons of oil and 332 million m<sup>3</sup> of gas produced annually. However, production sharply declined thereafter, partly due to the depletion of fields and, from the early 1990s, due to the collapse of centrally managed economic mechanisms following the dissolution of the Soviet Union.

In the second half of the 1990s, the introduction of progressive regulatory legislation for the oil and gas sector in independent Georgia created favorable conditions for attracting new investors and implementing modern production technologies in existing fields. This led to a substantial increase in oil and gas production, although the growth was short-lived. As it turned out, most contractor companies, with few exceptions, focused primarily on exploiting the reserves of existing fields—some of which have been in operation since the 1930s and are now nearing depletion—while investing little in costly and high-risk exploration activities to discover new fields

**Chart 14 Oil and Gas Production in Georgia, 1930-2023.**



In recent years, the total gas production figures have consistently fluctuated within the range of 13-18 million cubic meters. Since the start of production up until 2023, approximately 3.37 billion cubic meters of gas have been extracted in Georgia. According to available data, the maximum daily production volume from local sources in recent years reached 0.072 million m<sup>3</sup>/day, which represents 0.86% of the average annual consumption and 0.42% of the average consumption during peak periods.

The table provides the volumes of gas production and the quantities of commercial gas delivered to the network over the past few years.

**Table 9 Gas Production and Delivery to the Network, million m<sup>3</sup>/year**

	2020	2021	2022	2023
<b>Gas Production</b>	10,9	18,7	16,7	17,6
<b>From Final Consumption</b>	0,42	0,72	0,54	0,57
<b>Commercial Gas Delivery</b>	8,3	15,2	13,7	15,8
<b>From Final Consumption</b>	0,32	0,59	0,44	0,51

In recent years, exploration activities aimed at discovering new fields have been relatively intensified. Plans for the coming years also include a significant increase in investments in oil exploration and production activities. Specifically, there are plans to promote the intensification of geological exploration activities in the country’s oil and gas prospective areas, including the Black Sea shelf, to conduct large-scale geophysical surveys <sup>29</sup>.

According to expert assessments based on reasonable assumptions, even if the more pessimistic resource estimates for prospective fields are only partially confirmed, gas production from local fields is expected to increase significantly in the near future. If annual production rises to just 1% of proven reserves (1P and 2P categories), the share of domestically supplied gas could exceed 3% of the country's current total consumption

**1.5. Supply Security**

Analysis of risk assessment results indicates that unplanned supply disruptions in Georgia's natural gas sector may stem from threats and challenges related to political, commercial, technological, or natural disaster factors. These disruptions pose significant risks to the natural gas supply system, increasing the vulnerability of its critical infrastructure.

From a gas supply security perspective, protecting infrastructure—where operational disruption could jeopardize regional or national security, as well as the economy, public health, and well-being—is of utmost importance. In addition to protection against kinetic impacts or cyberattacks, systems containing critical infrastructure must demonstrate high resilience. This means they must be prepared to quickly adapt to changing conditions, with the ability to withstand and/or rapidly recover from unplanned disruptions, whether caused by targeted attacks, accidents, natural hazards, or incidents.

For detailed information on the **challenges related to supply security**, please refer to the annex

**1.6. The Role of Gas in Electricity Generation**

In Georgia, the majority of electricity demand is met by local generation facilities—hydropower and thermal power plants. The portion of demand not balanced by local production is covered by imports.

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<sup>29</sup> source: State Agency of Oil and Gas

The share of hydropower plants in total production varies according to the seasons. The average share reaches its maximum in May-July (over 98%) and its minimum (approximately 46-53%) during the December-February period.

Accordingly, the share of thermal power plants and imports is lowest in spring and summer and highest in winter.

Electricity consumption in Georgia has increased annually over the past 10 years, reaching 14.8 billion kWh in 2022. The rate of energy consumption growth in the country significantly exceeds the increase in production capacity (as of 2022, approximately 31% of domestic supply was balanced by imports)<sup>30</sup>. This trend in recent years indicates a decline in the indicators of the country's energy independence and energy security. According to the forecast in Georgia's Ten-Year Transmission Network Development Plan, the country's total consumption is expected to exceed 20 billion kWh by 2033 (a minimum increase of 25%). Without the implementation of appropriate measures, this will further exacerbate the situation.

The most effective and practically irreplaceable way to reduce Georgia's energy dependence is through the development of the electricity sector based on the utilization of its own renewable energy resources, by constructing new hydropower, wind, and solar generation plants.

Georgia is physically connected to all four neighboring countries (by land borders) for electricity exchange: Armenia, Russia, Turkey, and Azerbaijan through interconnecting lines. At the same time, a project is planned to implement a submarine electric transmission and digital communication line (cable) connecting Georgia to Europe via the Black Sea (route: Georgia-Romania). This will enable electricity exchange and trade with Europe. The implementation of this project could also serve as a foundation for establishing Georgia as a regional hub for electricity trade.

Georgia's electricity generation sector includes five gas-fired thermal power plants:

- Tbilisres's 3rd and 4th steam turbine units with a total installed capacity of 272 MW (130 MW and 142 MW respectively). Tbilisres units have been in operation since 1963.
- The 9th steam turbine unit, owned by LLC "Mtkvari Energy," with an installed capacity of 300 MW. The unit has been in operation since 1991.
- The gas turbine owned by LLC GPower with an installed capacity of 110 MW. The gas turbine has been in operation since 2006.
- Gardabani Combined Cycle Gas Thermal Power Plant (LLC "Gardabani Thermal Power Plant," a subsidiary of GOGC) with a total installed capacity of 230 MW (2x 75 MW gas turbines and an 80 MW steam turbine), which has been in operation since 2015;
- Gardabani Combined Cycle Gas Thermal Power Plant 2 (LLC "Gardabani Thermal Power Plant 2," a subsidiary of GOGC) with a total installed capacity of 255 MW (two 84 MW gas turbines and an 87 MW steam turbine), which has been in operation since 2020.

The total installed <sup>31</sup>, (design) capacity of the gas-fired thermal power plants (TPPs) is 1,167 MW. However, based on actual loads in recent years, the maximum combined capacity of the thermal power

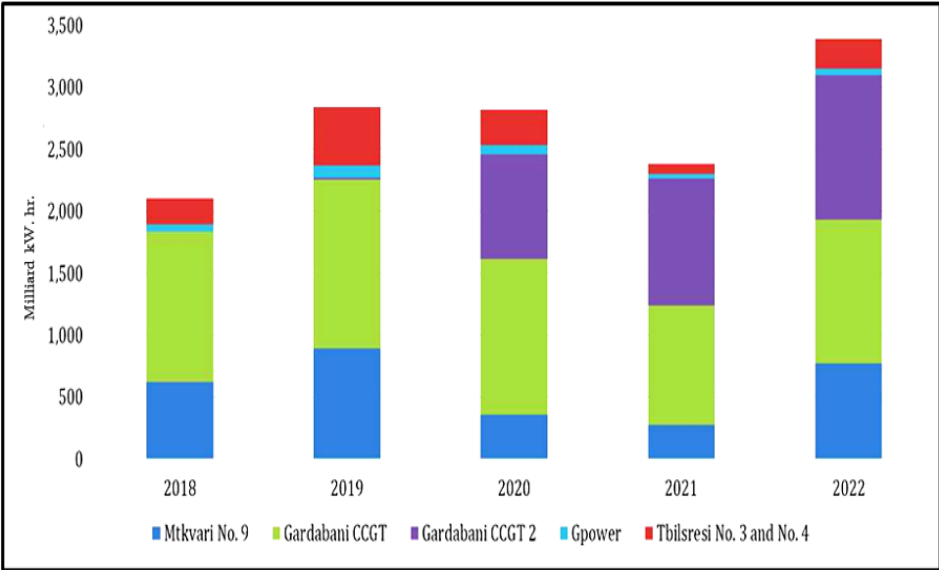
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<sup>30</sup> Georgia's Energy Balance, 2022, National Statistics Office of Georgia, December 2023

<sup>31</sup> GSE, Data from the Power System

generation facilities is approximately 1050 MW. The implementation of a new combined cycle gas thermal power plant project with a capacity of approximately 400 MW is planned.

**Chart 15 Electricity Generation by Gas-Fired Thermal Power Plants** <sup>32</sup>



The table provides GSE data on the actual efficiency of various types of gas-fired generation facilities.<sup>33</sup>

**Table 10 Actual Efficiency of Thermal Power Plants (TPPs)**

Thermal Power Plants (TPP) type	GJ/MWh	*Gas Consumption, m <sup>3</sup> /kWh
Steam Turbine	10,1 (155%)	0,297-0,31 <sup>34</sup> -
Gas Turbine	9,6 (146%)	0,29
Gas Turbine Combined Cycle	6,54 <sup>35</sup> (100%)	0,2-0,203

Analysis shows that due to inefficient operational conditions, such as frequent startups and shutdowns (which are atypical for base load generation units), operation at partial load, and other factors, it is not possible to fully realize the design potential of combined cycle TPPs in terms of minimizing gas consumption.<sup>36</sup> The maximum recorded efficiency of these units, compared to the actual efficiency of other generation facilities, offers the potential for 70-80% gas savings, rather than the actual average of 50%.

It is noteworthy that the Law on Energy Independence, initiated by the Government of Georgia and approved by Parliament on June 27, 2024, stipulates that by December 31, 2030, the annual production

<sup>32</sup> GSE, Annual Electricity Balance Data  
<sup>33</sup> Projections of Natural Gas Annual and Peak Demand in Georgia Through 2050, Report, Energy Institute Hrvoje Požar, September 2023  
<sup>34</sup> 9th Unit and 3rd/4th Units, respectively  
<sup>35</sup> in order to determine operational parameters during the performance test the actual value of the coefficient was recorded as 6.27 GJ/MWh.  
<sup>36</sup> The nominal efficiency of the Gardabani 2 Combined Cycle Gas Turbine TPP is 56%, while the maximum efficiency actually recorded, according to the operator, exceeds 57%.

of renewable electricity must quantitatively exceed the amount of electricity consumed domestically. The law is based on the National Energy and Climate Integrated Plan of Georgia.<sup>37</sup> According to the scenario intended for the realization of the NECP, by 2030, local generation facilities with a total installed capacity of 1944 MW, based on the utilization of renewable resources, will be operational in the country (this includes 237 MW of run-of-river hydropower plants, 430 MW of regulating hydropower plants, 547 MW of solar, and 730 MW of wind plants).<sup>38</sup> As a result, the use of natural gas for meeting domestic electricity demand will be significantly reduced. It is essential to note that the target indicators of the long-term gas consumption forecast used in the preparation of the Preventive Action Plan (see annex) were developed based on the projections, scenarios, and assumptions outlined in the NECP.

## 1.7. Gas Consumption Forecast

### 1.7.1 Introduction

Research Work Completed within the USEA/JSET Program Funded by USAID: „Within the report prepared as part of the study titled "Annual and Peak Natural Gas Demand Forecast in Georgia for the Period Until 2050"<sup>39</sup> the annual and peak natural gas demand forecasts up to 2050 were determined, considering various scenarios of the country's economic growth and technological progress. For the forecasting, the internationally recognized LEAP methodology was used, which takes into account the future development trends of the country and is not dependent on historical consumption figures. This approach eliminates the potential influence of time-related instability in growth rates, which is characteristic of transition economies, on the accuracy of the forecast.

The forecast also takes into account the impact of **planned energy efficiency measures<sup>40</sup> and the development of renewable energy on the final consumption of gas**

The aspects of economic development based on energy efficiency measures and the utilization of local renewable resources are thoroughly assessed in Georgia's Low Emission Development Long-Term Concept, which was created with the support of the European Union and the United Nations Development Programme (GLEDLTC)<sup>41</sup>. The key target indicators from the Climate Change Strategy and Long-Term Concept are also reflected in the National Energy and Climate Integrated Plan, approved by a resolution of the Georgian Parliament.

As noted by the Low Emission Development Long-Term Concept (LEDDC), Georgia, as a contracting party to the Energy Community, has defined its economic development strategy through joint

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<sup>37</sup> The Georgia Energy Policy and the National Energy and Climate Integrated Plan of Georgia were developed with the support of USAID, UNDP and the Danish International Development Agency (Danida) and were approved by the Georgian Parliament's resolution on June 27, 2024.

<sup>38</sup> What Energy Facilities Should Be Built by 2030 According to the "National Energy Integrated Plan"? bp.ge/news, 30.05.2024, <https://bp.ge/news/energetika/ra-energetikuli-obieqtobi-unda-ashendes-2030-tslamde-energetikis-erovnuli-integrirbuli-gegmis-detalebi>

<sup>39</sup> Projections of Natural Gas Annual and Peak Demand in Georgia Through 2050, "JUST AND SECURE ENERGY TRANSITION PROGRAM" (USEA/USAID), Final Report, November, 2023 (Updated in May, 2024)

<sup>40</sup> Georgia's Climate Change Strategy 2030, Government of Georgia, 2021.

<sup>41</sup> Georgia's Low Emission Development Long-Term Concept, Tbilisi, 2023.

consultations with the Energy Community, the European Commission, and the Government of Georgia, with the aim of achieving the greenhouse gas reduction target by 2030. By the decision of the Energy Community Ministerial Council on December 15, 2022, this target has been integrated into the "Governance Regulation" and will be reflected as an updated commitment in the revised Nationally Determined Contribution (NDC) document in 2025. The European Commission's recommendation on "The Preparation of National Energy and Climate Integrated Plans by Energy Community Contracting Parties" and the "General Policy Guidelines for Energy Community Parties Regarding 2030 Targets" have also been taken into account.

The preparation of documents associated with national sustainable development goals, including the NECP, was based on the Law of Georgia "On Energy and Water Supply," specifically Article 7, Paragraph 2, Subparagraph "a," which stipulates the development of a "long-term strategy" by the state. Additionally, the process considered the Georgian Parliament's resolution "On the Main Directions of State Policy in the Energy Sector of Georgia," as well as the Georgian laws "On the Promotion of the Generation and Use of Energy from Renewable Sources," "On Energy Efficiency," "On Energy Labeling," and "On the Energy Performance of Buildings."

Based on the current policy documents, the NECP assessed scenarios for the country's economic development: The "Without Measures" (baseline scenario) and two packages of emission reduction measures were developed: The "With Existing Measures" (scenario with planned measures, in accordance with government-approved strategies and plans) and the "With Additional Measures" (scenario with measures that are not currently planned but include potential additional actions to achieve sustainable development goals).

### 1.7.2. Impact of Energy Efficiency Measures on Gas Consumption<sup>42</sup>

Significant savings in gas consumption can be achieved through the implementation of energy efficiency measures and the development of energy based on the utilization of local renewable resources.

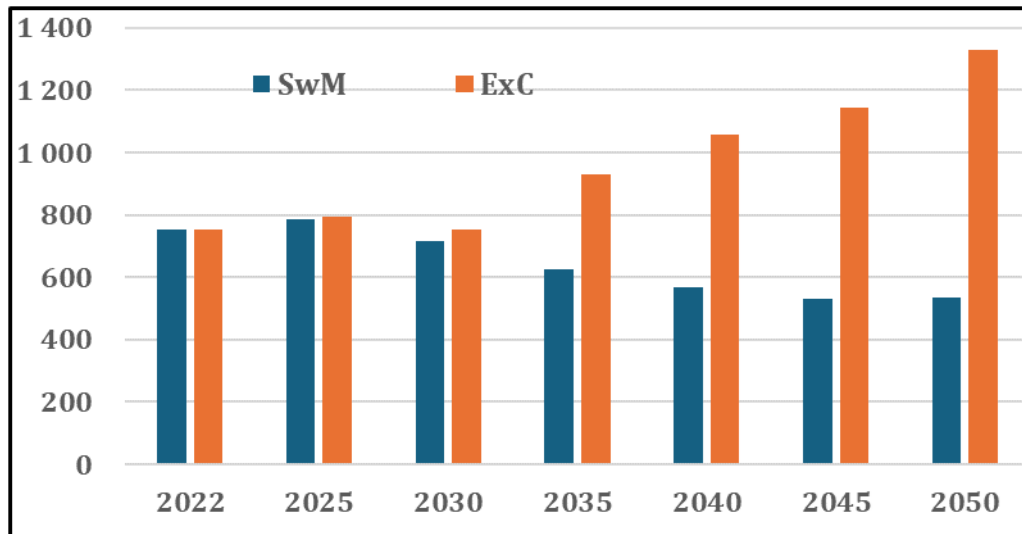
The diagram presents the projected savings in gas consumption for electricity generation through the further implementation of energy efficiency measures and generation based on the utilization of local renewable resources. These projections are reflected in the National Energy and Climate Integrated Plan and have been considered in the preparation of the long-term gas usage forecast in the power sector<sup>43</sup>.

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<sup>42</sup> Georgia's Low Emission Development Long-Term Concept, Tbilisi, 2023

<sup>43</sup> Projections of Natural Gas Annual and Peak Demand in Georgia Through 2050, "JUST AND SECURE ENERGY TRANSITION PROGRAM" (USEA/USAID), Final Report, November, 2023 (updated in May, 2024)

**Chart 16 Projected Gas Consumption in the Power Sector under Different Development Scenarios**



As the analysis indicates, the implementation of the considered energy efficiency measures and the corresponding renewable energy scenario (SwM) would allow for an average annual savings of 375 million cubic meters of natural gas compared to the conservative, extreme gas consumption scenario (ExC). The effect is particularly striking during the period when additional new combined cycle thermal power plants (CCTPPs) are constructed, the operation of Tbilisi TPP's "old" energy blocks is halted, and energy generation facilities based on local renewable energy sources are brought into operation. During this period, the potential for average annual gas savings is estimated to be 550 million cubic meters.

**Chart 17 Impact of Renewable Energy Resources and Various Gas-Saving (mln m<sup>3</sup>/year) Energy Efficiency Measures in the Power Sector**

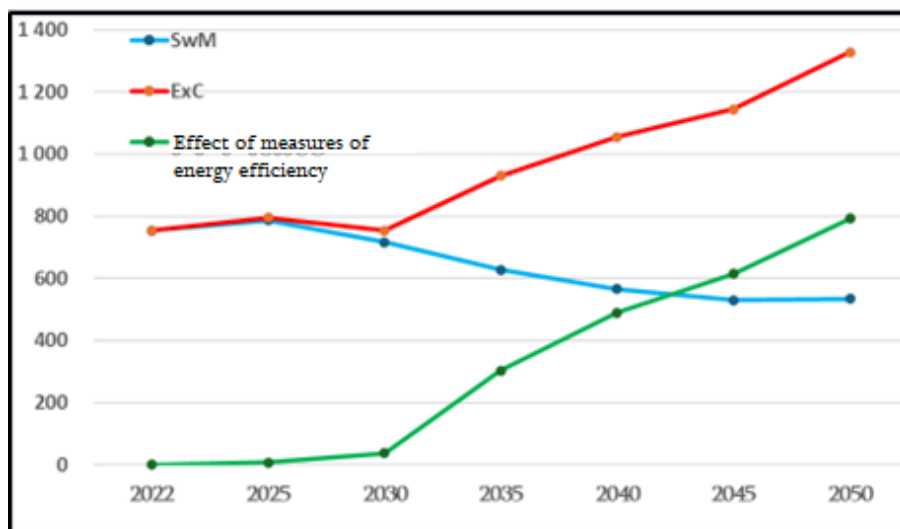
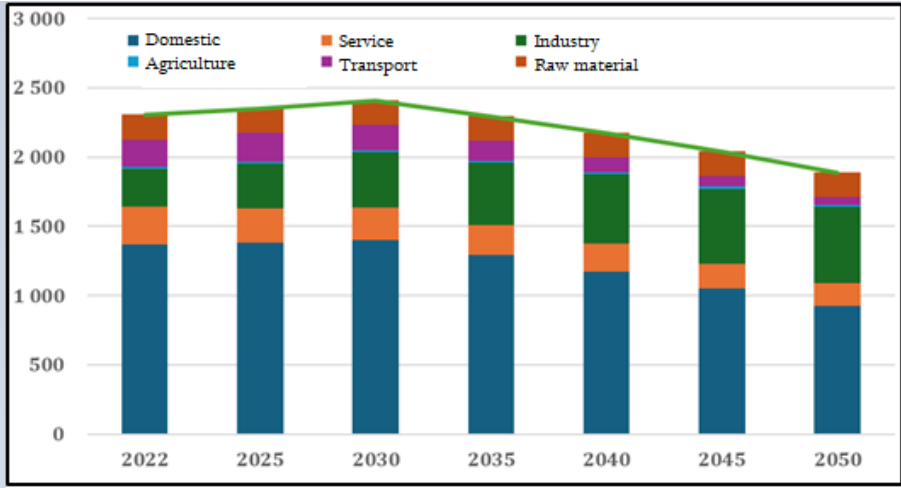


Chart 18 illustrates the long-term projected natural gas consumption figures in various sectors of the country's economy (excluding the power sector) and the household sector, taking into account the impact of planned energy efficiency measures.<sup>44</sup>

**Chart 18 Projected Natural Gas Consumption Until 2050, million m<sup>3</sup>/y**



The analysis shows that:

- Significant reductions in gas consumption are observed in the residential, services, and transportation sectors;
- Gas consumption changes only slightly in the agriculture and industrial (used as a raw material) sectors.
- Gas consumption nearly doubles in the industrial sector, which is correlated with the realization of the country's economic development and welfare improvement plans.

In the residential and services sectors, the savings in natural gas consumption, compared to the baseline year of 2022, are primarily associated with advancements in building heating and cooling system technologies, energy-efficient insulation, and the use of energy-saving, high-efficiency lighting, tools, and appliances in households, administrative institutions, and the service sector. According to the Department of Energy Efficiency and Renewable Energy Policy and Sustainable Development of the Ministry of Economy and Sustainable Development,<sup>45</sup> under the legislative amendment that came into effect in 2023, existing and newly constructed public administrative buildings (ministries, schools, kindergartens, state institutions, etc. the use of energy-efficient materials for the exterior and interior facade treatment allows for a reduction in energy consumption by 35% or more. This regulation applies to private sector buildings constructed after July 1, 2023.

<sup>44</sup> Projections of Natural Gas Annual and Peak Demand in Georgia Through 2050, "JUST AND SECURE ENERGY TRANSITION PROGRAM" (USEA/USAID), Final Report, November, 2023 (updated in May, 2024)

<sup>45</sup> Marita Arabidze We Must Reduce the Consumption of Imported Gas in Heating and Hot Water Supply, ImediNews.ge, 30.03.2024, <https://imedinews.ge/ge/ekonomika/331058/>

The savings in the transportation sector are primarily related to the renewal of the vehicle fleet and the increasing trend of using electric and hybrid vehicles. Additionally, a significant reduction in losses from gas distribution and transmission networks is planned, for which the following measures are provided:

- Rehabilitation, development, and equipping of distribution networks with modern regulation, control, and metering technologies to ensure that losses are brought in line with regulatory standards;
- Replacement of existing low-pressure steel pipes with plastic pipes (low-pressure steel pipes are subject to intense corrosion, whereas polyethylene pipes do not face corrosion-related issues).
- Equipping the country's internal transmission system with Supervisory Control and Data Acquisition (SCADA) and Pipeline Integrity Management Systems (PIMS), as well as, restoring the anti-corrosion protection systems for those parts of the transmission infrastructure built during the Soviet era that have been operating without such protection for over three decades<sup>46</sup>. The implementation of these measures will significantly reduce natural gas losses.
- The South Caucasus Transit Pipeline is owned by a consortium led by BP and SOCAR, which has declared its "ambition to become a 'net zero' (emissions) company by 2050, or sooner."

**Table 11 Sectoral Consumption**

	2022	2025	2030	2035	2040	2045	2050
Household	1371	1378	1399	1290	1173	1050	924
Service	269	252	235	217	200	182	164
Transport	199	210	185	144	108	79	56

Total natural gas consumption (excluding the power sector) will peak by 2030, increasing by approximately 4-5% compared to the 2022 baseline. If the planned energy efficiency measures are implemented, the country's gas demand is expected to decrease by approximately 6% by 2040 and by 18% by 2050.

**1.7.3. Renewable Energy Resources<sup>47</sup>**

Georgia is rich in renewable energy resources, **particularly hydro resources**. The estimated technical potential of the rivers is 50-60 billion kWh.

Currently, there are approximately 100 operational hydropower plants (HPPs) in the country, of which 7 are large regulating HPPs, 19 are seasonally regulated HPPs, and the remaining are small HPPs.

Georgia has significant **wind energy** potential, which can generate approximately 8-10 billion kWh of electricity annually. The most suitable locations for building wind power plants have been identified, where up to 4 billion kWh of electricity can be generated annually.

<sup>46</sup> All main pipelines constructed since 2007 are equipped with effective anti-corrosion protection systems. During its years of operation, not a single instance of corrosive damage has been recorded.

<sup>47</sup> Georgia's Low Emission Development Long-Term Concept, Tbilisi, 2023

Currently, there is only one operational wind power plant in Georgia, with an installed capacity of 20.7 MW and an average annual generation of approximately 90 million (about 0.8% of the country's total domestic electricity production). As of 2022, a Memorandum of Understanding has been signed for the construction of 18 wind power plants, with a total installed capacity of 1,160 MW and an annual generation of 4,480 GWh.

Georgia's territory is considered a favorable and economically viable location for harnessing **solar energy**. Most regions experience 250-280 sunny days per year (6,000-6,780 hours of sunlight). The solar energy potential varies by region, ranging from 1,250 to 1,800 kWh/m<sup>2</sup>.

Two main technologies are primarily used to harness solar energy in Georgia: solar collectors, which are used for water heating, and solar photovoltaic (PV) panels, which are increasingly being deployed for electricity generation, particularly through micro-capacity power plants connected to the grid via 'net metering.' Since the introduction of the 'net metering' system, the installed capacity of helio-systems operating under this scheme has reached approximately 77 MW. According to the Ministry of Economy and Sustainable Development of Georgia, as of 2022, six Memorandums of Understanding have been signed for the construction of solar power plants with a total installed capacity of 93 MW and an annual generation of 132 GWh.

The potential of the country's **geothermal waters and biomass resources** is also of significant importance for future energy development.

In recent years, following the introduction of additional support schemes by the government to promote the development of renewable energy resources, investor interest in new wind, hydro, and solar generation projects has significantly increased. Notably, in December 2022, a new renewable energy support scheme was introduced, based on the principle of a Contract for Difference (CFD), also known as the 'variable premium.' This scheme involves conducting capacity auctions in multiple lots based on Contracts for Difference (CFDs).<sup>48</sup>:

- For hydropower plant projects - 950 MW;
- For wind power plant projects - 250 MW;
- For solar power plant projects - 250 MW;
- For other renewable energy projects (hydrogen, biogas, biomass, geothermal, etc.) – 50 MW.

The second capacity auction was announced on January 8, 2024. Under the auction, applications were accepted for 300 MW of regulating hydropower plants, 125 MW each of wind and solar power plants, and 10 MW of power plants operating on other renewable energy sources.

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<sup>48</sup> To compensate for price differentials, investors are required to sell electricity on organized markets (day-ahead and intraday markets), while ESCO will reimburse them for any difference between the market price and the price established in the CFD contract

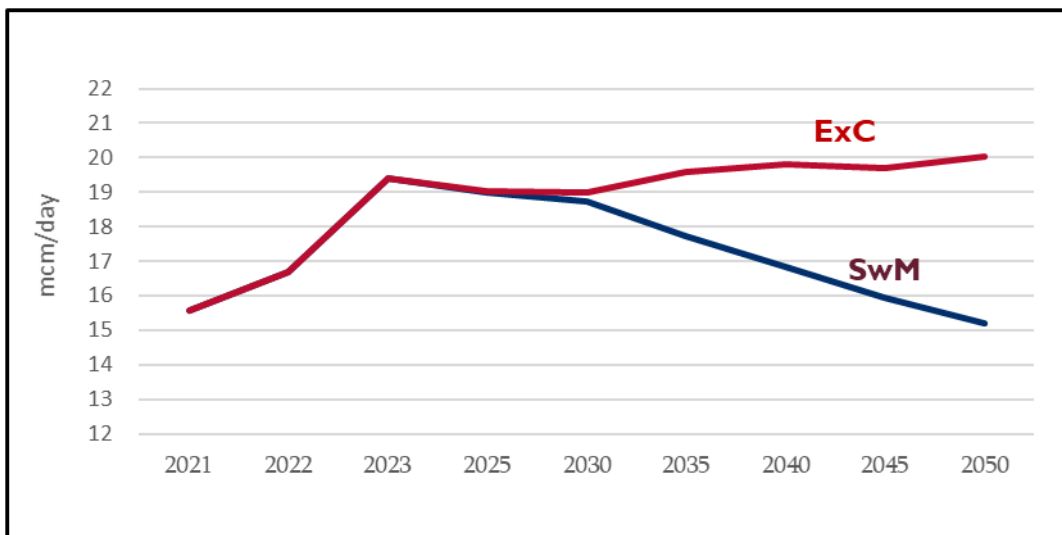
### 1.7.4. Total and Peak Gas Consumption Forecast

The analysis of the long-term gas demand forecast under <sup>49</sup> various scenarios of the country's energy development shows that by 2050, gas consumption in Georgia could vary between 2.2 and 7.2 billion cubic meters per year. Following a detailed analysis of the total final consumption scenarios, priority was given to the optimistic "Scenario with Measures" (SwM)<sup>50</sup>, which aligns with Georgia's energy policy and the target indicators of the National Energy and Climate Plan.

It is also recommended to consider the conservative sub-scenario of total gas consumption, referred to as the Extreme Consumption (ExC) scenario. This scenario is based on the current actual trends in the development of renewable energy (implying moderate growth at rates close to historical trends) and its outcomes may be considered critically extreme in terms of meeting forecasted demand and ensuring guaranteed energy security<sup>51</sup>.

The chart shows the historical and forecasted gas consumption parameters according to the selected scenarios.

**Chart 19 Long-Term Gas Consumption Forecast, million m<sup>3</sup>/y**



As the analysis indicates, under the projected gas consumption conditions, the realization of the Extreme Consumption scenario could pose a significant risk to the guaranteed supply of the market. This is because the Supplemental Gas Agreement from the SCP is set to expire after 2026, and the long-term contract with SOCAR is due to expire in 2030. This issue necessitates particular attention, given that Azerbaijan is currently focused on meeting its commitment to double gas supplies to the European Union

<sup>49</sup> Projections of Natural Gas Annual and Peak Demand in Georgia Through 2050, "JUST AND SECURE ENERGY TRANSITION PROGRAM" (USEA/USAID), Final Report, November, 2023 (updated in May, 2024)

<sup>50</sup> The selected scenarios have been agreed upon with the relevant departments of the Ministry of Economy and Sustainable Development of Georgia and are recommended for use in determining the forecast parameters for gas consumption during the period from 2025 to 2050.

<sup>51</sup> For risk assessment purposes, the forecast recommended by the GOGC has been used, which, for the target 4-year period of the document, approximately mirrors the parameters of the Extreme Consumption sub-scenario (with a deviation of about 3%)

(to 20 billion m<sup>3</sup>/y) starting in 2027. It is unlikely that Azerbaijan will extend the contract terms with Georgia without a request from the Georgian side.

Additionally, it is recommended to consider the results of the peak daily gas consumption forecast. The forecasting methodology used is adapted and reinforced by actual historical data. It considers the proportional relationship between peak consumption and total consumption, as well as the historical trend of consumption inequality.

**Table 12 Projected Indicators of Total Annual Gas Consumption mln m<sup>3</sup>/y) and Peak Daily Consumption (mln m<sup>3</sup>/d)**

	Consumption	2023	2025	2030	2035	2040	2045	2050
<b>SwM</b>	Total	3 015	3 111	3 071	2 904	2 755	2 612	2 488
	Peak of day	19,4	19,0	18,7	17,7	16,8	15,9	15,2
<b>ExC</b>	Total	3 015	3 119	3 108	3 207	3 245	3 227	3 280
	Peak of day	19,4	19,0	19,0	19,6	19,8	19,7	20,0

As the analysis indicates, in the event of the realization of the SwM scenario, which takes into account the measures outlined in the National Energy and Climate Integrated Plan, as well as the low-emission economic development goals declared by the Georgian government, the risk of a potential gas shortage during peak consumption periods is significantly reduced in the long term.

## 2. Summary of Risk Assessment

The Risk Assessment Report has been prepared by LLC Georgian Gas Transportation Company and takes into account the following:

- (EC) 2017/1938 Regulation requirements;
- The requirements of Georgian legislation;
- The recommendations of the Energy Community;
- ISO 31000, Risk Management;
- The presentation materials provided during the training.

Based on the general assessment of the document, it can be noted that a significant amount of work has been accomplished, both in terms of system/market description and in identifying and comprehensively evaluating potential risk scenarios, resulting in noteworthy outcomes.

The presented Risk Assessment Document includes:

1. The significance of natural gas for the country's energy sector;
2. The country's dependence on natural gas imports;
3. Key definitions, such as:
  - „*Protected Consumers*“ - residential consumers, small and medium-sized businesses, essential social services;
  - „*Competent Authority*“ - Ministry of Economy and Sustainable Development of Georgia.
    1. The natural gas market of Georgia is described, specifically:
      - The structure of Georgia's natural gas market is outlined;

- The existing long-term and short-term gas supply contracts are described, including its durations and other important details;
  - The sources of imports are described, categorized by country and type of ownership;
  - The macroeconomic demand and supply profile is described;
  - The results of gas demand forecasting are provided.
2. Characterized by the transmission infrastructure and gas flows, specifically:
- The natural gas supply chain is described in detail;
  - A map of the transmission network and the key parameters of the pipelines are provided;
  - Cross-border entry points and its parameters, as well as reverse flow capabilities, are described;
  - The potential of local production is described;
  - The commercial details of the supply chain are described;
  - The system's compliance with the N-1 criterion has been assessed.
3. The details of the regulatory legislation and institutional framework of the natural gas sector have been discussed, specifically:
- The regulatory framework, institutions, and regulations defining the relationships between stakeholders have been described.
  - The general legislative foundations related to the secure supply of gas have been discussed.

The main part of the document is dedicated to the identification and analysis of risks. Specifically:

- Risks have been identified: Sources and causes of origin, such as: Geopolitical reasons; production decrease/failure; infrastructure malfunction; shutdowns due to technical issues or the need for maintenance work; seasonal/periodic consumption imbalances; natural/climatic events, etc.
- The types of effects of harmful impact have been determined.

In the risk analysis process, both the probability and the impact effect have been assessed:

- The primary method chosen for probability assessment is based on the evaluations grounded in the experience, knowledge, and skills of the personnel working on risk analysis, taking into account the available information. The potential deficiency in personnel knowledge or experience has been compensated by well-reasoned expert evaluations.
- A six-level scale has been used for assessing the probability of risk:
  1. Almost impossible (rare) probability;
  2. Very low (unlikely) probability;
  3. Low (less likely) probability;
  4. Moderate (possible) probability;
  5. High (probable) probability;
  6. Almost certain (very high) probability.

- Quantitative and qualitative indicators of potential loss have been used to assess the impact effect, with appropriate scales selected. Each criterion can vary from 1 to 5 using the following gradation<sup>52</sup>:
  1. Insignificant
  2. Minor;
  3. Significant
  4. Critical;
  5. Catastrophic effect<sup>53</sup>.
- The risk assessment matrix, obtained by multiplying the numerical values of probability and impact, evaluates the quantity of unsupplied gas during peak demand in the country's gas supply system, financial losses, and service quality. It effectively represents the sector-specific risk impact;
- For national assessment purposes, the initial evaluation values are multiplied by a factor that accounts for the potential impact of the risk occurrence on the thermal generation sector, using a coefficient that determines the severity of the impact. The 4-point evaluation system considers the following levels of potential disruption to gas supply affecting the operation of thermal power plants: 1. Complete cessation of gas supply; 2. Reduction in gas supply; 3. Potential reduction in gas supply; 4. No reduction in gas supply.
- To assess the regional impact of a risk occurrence, a 4-point system is also used, which considers the following levels of impact on neighboring countries' systems due to disruptions in gas transit: 1. Creates a crisis related to the disruption; 2. Exacerbates the crisis; 3. May exacerbate the crisis; 4. Does not affect the neighboring country's system.

Thus, the maximum number of impact-determining combinations is 25 (5\*5) for an occurrence probability of 6, and accordingly, the risk assessment matrix includes 150 cells (25\*6).

Each cell in the matrix corresponds to a number obtained by multiplying the cumulative impact criteria score by the corresponding probability value. For example, a risk with a cumulative impact criteria score of 25 (where each impact criterion, the first and second, has a value of 5) and a probable probability of 5 will fall into the cell where these two values intersect—in the second column from the left in the matrix's top row. This cell will correspond to the number 125. The final result of any risk assessment will be placed in the matrix according to this same principle.

For grading the assessment scale a statistical method has been used, specifically the Excel formula "percentile.exc," which determines the scale boundaries by distributing the actual data across equal intervals. In constructing the risk assessment matrix, the 80th, 60th, 40th, and 20th percentiles were used, which determined the impact assessments ranging from insignificant to catastrophic. The threshold values of the intervals, used to assess the risks included in the matrix, were derived similarly to the matrix prepared for Georgia's electricity sector, taking into account international experience and the specific characteristics of the country's natural gas sector.

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<sup>52</sup> Detailed information about the gradation scales based on the quantitative indicators of impact effects is provided in the appendix 'Impact Assessment Scales.xlsx-Excel' of the report 'Risk Assessment,' SGTK, May 2024.

<sup>53</sup>An effect that could lead to a potential catastrophe or significant material loss, possibly requiring the declaration of an emergency and the mobilization of all available resources, including external forces.

The risk assessment matrix, considering the possible conditions of the current period, is presented in the tables.

**Table 13 Sub-scenario 1 - Inaction**

Duration + volume of unsupplied gas in an hour (m3)	Economic impact + cumulative effect	≥0,9	0,5 - 0,9	0,2 - 0,5	0,1 - 0,2	0,02 - 0,1	<0,02
		Almost inevitable	High	Average	Low	Very low	Almost impossible
		6	5	4	3	2	1
5	5				1	1	
5	4			1	2	3	1
4	5						
4	4				1		2
3	5						
5	3						
4	3					1	
3	4	1		1	1	3	1
5	2						
2	5						
3	3				1	1	
4	2						
2	4						
3	2	1					
2	3				1		
1	5						
5	1						
4	1						
1	4						
2	2		1				
3	1						
1	3						
2	1						
1	2						
1	1						

Table 14 Sub-scenario 2 - Historical

Duration + volume of un-supplied gas in an hour (m3)	Economic impact + qualitative criteria	≥0,9	0,5 - 0,9	0,2 - 0,5	0,1 - 0,2	0,02 - 0,1	≤0,02
		Almost inevitable	High	Average	Low	Very low	Almost impossible
		6	5	4	3	2	1
5	5						
5	4					1	1
4	5						
4	4				3	2	1
3	5						
5	3						
4	3				1		
3	4	1			1	2	1
5	2						
2	5						
3	3				1		1
4	2						
2	4						
3	2	1					
2	3				1		
1	5						
5	1						
4	1						
1	4						
2	2		1				
3	1						
1	3						
2	1						
1	2			1		2	
1	1			1		2	

Table 15 Sub-scenario 3 - Maximum Supply

Duration + volume of un-supplied gas in an hour (m3)	Economic impact + qualitative criteria	≥0,9	0,5 - 0,9	0,2 - 0,5	0,1 - 0,2	0,02 - 0,1	<0,02
		Almost inevitable	High	Average	Low	Very low	Almost impossible
		6	5	4	3	2	1
5	5						
5	4						
4	5						
4	4				1	1	
3	5						
5	3						
4	3						
3	4	1			1	2	1
5	2						
2	5						
3	3				1		
4	2						
2	4						
3	2	1					1
2	3				1		
1	5						
5	1						
4	1						
1	4						
2	2		1				
3	1						
1	3						
2	1						
1	2				1	1	
1	1			2	2	5	2

Overall, based on the summary of the risk assessment document's findings, the following general conclusions can be drawn:

- The basic requirements for the form and content of the document have been met, particularly in terms of describing the system/market and identifying and comprehensively assessing the potential scenarios related to risks;
- Significant results have been obtained that are essential for the preparation of a preventive action plan and an emergency response plan;
- It has been determined that the potential for gas reception and distribution across the country has been significantly improved due to the work carried out on networks and nodes, as well as the expansion of contractual relations with neighboring countries;
- Particular attention is required for the protection and implementation of rehabilitation projects for critical infrastructure nodes and segments, including the most vulnerable sections of the CSMS (Compressor Station and Main Gas Pipeline) system;
- It is essential to fully exploit the potential of local gas production;
- The continuation/renewal of existing contracts with Azerbaijan is deemed indispensable;
- The implementation of the NECP (National Energy and Climate Plan) developed by the Government of Georgia will lead to a significant reduction in gas demand in the electricity, residential, and transportation sectors; If the energy efficiency and renewable energy development measures outlined in the plan, along with effective demand-side preventive actions, are properly planned and implemented, potential issues related to the guaranteed supply of gas could be significantly improved.

### 3. Infrastructure Standard

“Chapter XXXIV of the Law of Georgia on "Energy and Water Supply" - "Security of Natural Gas Supply" - essentially mirrors the core principles of the corresponding European legislation (**Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply**). The provisions and template, EU4Energy (The European Union for Georgia) or calculating the N-1 formula, as reflected in the **Natural Gas Supply Security Rules** prepared with the assistance of experts from the Energy Community under the EU4Energy project have also been taken into account.

The N-1 formula is used to assess whether the gas infrastructure<sup>54</sup> of a given territory has sufficient<sup>55</sup> technical capacity to meet its total gas demand in the event of a disruption in the operation of one of the largest gas infrastructures on a day of exceptionally high gas demand, which statistically occurs once in

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<sup>54</sup> "Assessment Area" refers to the geographical territory for which the N-1 formula is calculated

<sup>55</sup> "Gas Infrastructure" includes the gas transmission network, including interconnectors, as well as production (extraction) facilities, liquefied natural gas (LNG) facilities, and storage facilities connected to the assessment area. If multiple gas infrastructures are connected to a common supply or transportation-distribution infrastructure and cannot operate separately, they must be considered as a single gas infrastructure

20 years. Compliance with the standard is considered met if the value calculated using the N-1 formula is equal to or greater than 100%.

$$N - 1 [\%] = \frac{EP + P + S + LNG - I}{Dm} \times 100, N - 1 \geq 100\%$$

where: EP represents the total technically available capacity of all cross-border entry points, measured in million cubic meters per day. For the calculation of EP, a detailed list of the entry points must be provided, along with the individual capacity of each;

S - represents the maximum technical capability for gas withdrawal from storage, indicating the total maximum daily withdrawal volume from the gas storage facilities that can be delivered to the entry points of the assessment area, taking into account its respective physical characteristics, measured in million m<sup>3</sup>/day;

P - represents the maximum total gas production from local fields that can be delivered <sup>56]</sup> to the entry points of the assessment area, measured in million m<sup>3</sup>/day;

LNG - The technical capacity of a liquefied natural gas (LNG) facility refers to the maximum daily withdrawal capability from LNG equipment within the reporting area, taking into account critical elements such as unloading, auxiliary services, temporary LNG storage, and regasification. It also includes the technical capacity for system entry (send-out), measured in million m<sup>3</sup>/day;

I - Denotes the technical capacity of the highest capacity gas infrastructure with the greatest throughput capability for delivery within the reporting area, measured in million m<sup>3</sup>/day;

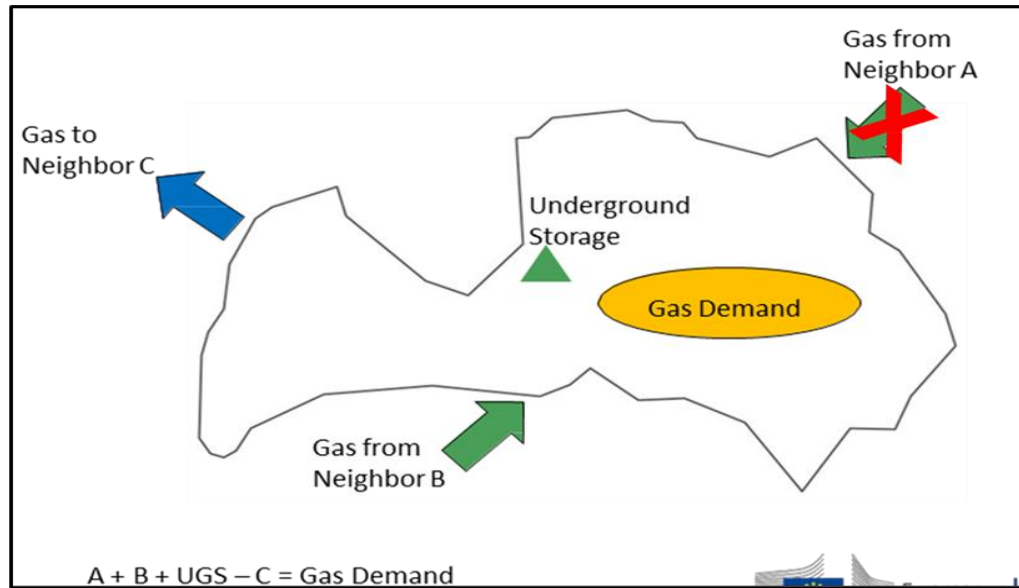
Dm - The total gas demand on a particularly high-demand day, which statistically occurs once every 20 years, measured in million m<sup>3</sup>/day.

In the case of a transit country, the value of EP is adjusted to account for the volume of gas that must be delivered to a neighboring country. For example, the South Caucasus Pipeline located on Georgian territory is primarily intended for the delivery of Azerbaijani gas to the Turkish and European markets. Its technical capacity is approximately 65 million m<sup>3</sup>/day, however, no more than 5.5 m<sup>3</sup>/day is available for Georgia.

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<sup>56]</sup>In this section of the report, the conditional notations used are taken from the relevant regulation and do not correspond to the definitions provided in the "Abbreviations" section.

Chart 20 Reporting Scheme for EP in a Transit Country



The N-1 formula, incorporating demand management measures, will take the following form:

$$N - 1 [\%] = \frac{EP + P + S + LNG - I}{Dm - De} \times 100, N - 1 \geq 100\%$$

Where D represents the portion of total gas demand that, in the event of a gas supply disruption, can be managed through market-based demand management measures to meet the (N-1) criterion, measured in million m<sup>3</sup>/day.

The table presents the maximum historically recorded and technical capacities of all entry points, measured in million m<sup>3</sup>/day (Georgia does not have cross-border bidirectional capacities for gas reversal from neighboring non-producing countries—see details in the section "System Description").

Table 16 Historical and Potential Maximum Technical Reception of Natural Gas by Entry Points

		Historical Maximum	Technical Maximum
1	Russia-Georgia Border	21,6	25,0
2	Saguramo Receiving Node	11,1	15,0
3	Receiving Node from SCP	5,5	5,7
4	Azerbaijan-Georgia Border	10,7	15,0
5	Local Fields	0,07 <sup>57</sup>	0,075
	<b>Total (EP=2+3+4+5)</b>	<b>27,37</b>	<b>35,71</b>

As the analysis of the table data shows, the highest-capacity infrastructure is the North-South Caucasus Main Gas Pipeline connecting Russia and Georgia, with a technical capacity of 25 million m<sup>3</sup>/day at the national border. However, according to GOGC data, the maximum throughput capacity of the Saguramo

<sup>57</sup> For the report, a value of 0,05 mln m<sup>3</sup>/day, has been used, which, according to available information, represents the maximum production potential of local fields.. Additionally, the capacity of the receiving node from the SCP has been considered at 5.5 million m<sup>3</sup>/day, which represents the maximum actual potential supply.

receiving node is 15 mln m<sup>3</sup>/day, while the maximum volume of Russian gas received is 11,1<sup>58</sup> mln m<sup>3</sup>/day. Additionally, the infrastructure supplying Azerbaijani gas under the SOCAR contract is notable for its high throughput capacity. The historically recorded and technically possible maximum of this infrastructure is characterized by parameters that are nearly identical to those of the Russian gas receiving node at Saguramo. Considering this, the compliance with the infrastructure standard has been assessed separately for each case of these infrastructures failing.

For the calculation of Dm for the years 2025-2044, the peak consumption day value from 2023 has been used—Dm = 19.4 million m<sup>3</sup>/day, which represents the highest daily consumption recorded in the past 20 years. For the years 2045-2050, the Dm values have been calculated based on the projected peak consumption figures for the corresponding years (19,1 mln m<sup>3</sup>/day for the SwM scenario and 19,7 mln m<sup>3</sup>/day for ExC scenario, respectively).

**Information about recommended demand-side management measures**, that can be used to mitigate the impact of gas supply disruptions is provided below.

- In the short and medium term, as mitigating measures on the demand side that will help meet the N-1 criterion, it is recommended to maximize the load on existing hydroelectric power plants (HPPs), combined heat and power plants (CHPs), and gas combined cycle thermal power plants (CCGTs). Additionally, the temporary suspension of operation for "older," less efficient thermal power plants (TPPs) is advised. The introduction or activation of "interruptible contracts," as well as non-market demand management measures, such as increasing electricity imports and temporarily restricting gas transit volumes, are also recommended.
- In the long term, the following measures are recommended:
  - ✓ Implementation of the national energy savings and energy efficiency plans as outlined in the National Energy and Climate Plan (NECP);
  - ✓ Maximal utilization of local renewable resources (hydro, wind, solar, geothermal, biomass);
  - ✓ Gradual replacement of "older," less efficient thermal power plants with combined cycle thermal power plants;
  - ✓ Implementation of gas storage projects (if necessary);<sup>59</sup>

As the analysis shows, during the peak consumption period in 2023, generation facilities were supplied with an average of 5.75 million m<sup>3</sup>/day of gas. If only a portion of these generation facilities had been operational during that period, and the less efficient thermal power plants had been shut down, daily gas supply could have been reduced to approximately 2.2 million m<sup>3</sup>. The resulting electricity deficit could have been covered through imports, which is relatively straightforward to implement given the existence of technical exchange capabilities with all neighboring countries and agreements on mutual assistance during crises. For example, during the crisis in March 2021, caused by an unforeseen

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<sup>58</sup> According to GOGC data, the current recorded volume of Russian gas received is 13 million m<sup>3</sup>/day. The report takes into account a more conservative figure from the previous period.

<sup>59</sup> Under specific conditions, it is also recommended to develop distributed generation and supply systems ("energy islands") to prevent the "domino" effect.

suspension of gas supply from Russia, the average daily electricity import amounted to 19.4 million kWh/day. The actual technical capacity of the cross-border transmission lines connecting with neighboring countries significantly exceeds this amount, with a large portion either used for transit or remaining unused. However, the ability to carry out emergency imports depends, among other factors, on the available reserve capacity that the neighboring country has at that time.

During the two-month peak gas consumption period of January-February 2023, the average daily electricity import was approximately 7.7 million kWh, while the average daily electricity generation by thermal power plants was 11.2 million kWh. This means that the potential capacity for additional electricity imports, as recorded in March 2021, exceeds the average daily volume of imported electricity during peak consumption by 11.7 million kWh (19.4 - 7.7 million kWh). For further details, please refer to the annex). Furthermore, the actually recorded reserve for additional imports is greater than the total electricity generated by all thermal power plants (TPPs) during the peak consumption period (11,7>11,2).

**Table 17 Monthly gas consumption figures by thermal power plants during the peak consumption periods of 2023-2024<sup>60</sup>**

Gas consumption Million m3/month	2023 year			2024 year			Historical maximum, 1000 m3/d.n.
	January	February	March	January	February	March	
Mtkvari Energy	50 099,636	44 157,522	1 854,919	18 526,2	14 340,2	9 932,3	3 392,6
Tbilisresi	54 071,705	41 722,950	-	8 728,7	15 289,2	10 231,0	
GePower	8 244,510	10 160,358	1 850,499	2 650,4	1 698,3	-	-
Gardabani TPS	32 957,372	29 702,294	28 604,316	30 811,9	27 441,4	31 583,8	2 179,6
Gardabani TPS 2	33 019,914	30 298,162	8 201,512	33 092,4	18 684,4	31 290,9	
<b>Total TPSs</b>	<b>178 393,137</b>	<b>156 041,286</b>	<b>40 511,246</b>	<b>93 809,5</b>	<b>77 453,5</b>	<b>83 038,0</b>	-

**Table 18 Electricity generation figures for thermal power plants during the peak consumption periods of 2023-2024:**

El. energy generation, million kW.hr/month	January	February	March	January	February	March
Mtkvari Energy	181,8	158,7	8,5	65,8	50,8	37,9
Tbilisresi	178,6	138,6	-	25,9	54,0	33,8
GePower	29,0	36,3	6,4	8,9	5,8	-
Gardabani TPS	168,9	152,7	149,1	156,6	136,0	159,8
Gardabani TPS 2	170,1	156,5	44,3	170,5	95,5	163,7
<b>Total TPSs</b>	<b>728,4</b>	<b>642,8</b>	<b>208,3</b>	<b>427,8</b>	<b>342,0</b>	<b>395,2</b>

According to research by the organization "Galt & Taggart"<sup>61</sup> (based on data from ESCO and GSE) in 2023, the average price of commercial electricity imports ranged from 7.0 to 7.5 US cents per kWh. In contrast, the price of electricity generated at thermal power plants, under the condition of gas being supplied at the regulated price of \$143/1000 m<sup>3</sup> ranged from 3.3 US cents per kWh for combined cycle gas turbine plants to 5.4 US cents per kWh for steam turbine plants (like Tbilisresi). Accordingly, the

<sup>60</sup> The historical maximum daily gas consumption for individual thermal power plants is as follows: Mtkvari Energy - 1,648.3 thousand cubic meters Tbilisresi - 1,744.3 thousand cubic meters Gardabani TPP - 1,102.7 thousand cubic meters Gardabani TPP 2 - 1,076.8 m<sup>3</sup>

<sup>61</sup> source: Georgian Business Consulting, Tbilisi (GBC), 28.07.2023

difference between the cost of imported electricity and the electricity generated by "older" steam turbine thermal power plants averaged 1.85 US cents per kWh.

Replacing the electricity generated by local, low-efficiency steam turbine thermal power plants with imported electricity during the peak consumption period of 2023 would have required approximately 11 million kWh of additional daily electricity imports. The cost of these imports would have been around \$801,704 per day, compared to the commercial value of locally generated electricity, which was approximately \$597,131/day (see Table 19). Accordingly, the cost of electricity supplied to the grid would have increased by approximately \$204,573 per day. At the same time, the negative balance of locally generated energy amounts to approximately \$151,907 per day (considering only the expenses for gas purchases)<sup>62</sup>, which effectively represents the magnitude of the loss calculated on a national scale<sup>63</sup>. By comparing these figures, it is determined that replacing the generation of "older" thermal power plants with imports during peak consumption periods would result in additional daily costs of approximately \$52,666 (204,573 - 151,907) .

**Table 19 Results of the calculation of the negative financial impact of replacing electricity generated by local "older" thermal power plants with imports**

January, 2023	Average gas consumption, 1000 m3/d.n.	El. energy transmission on a busbar, kW.hr/d.n.	Expenditure soc. gas, \$/d.n.	Expenditure commerc. gas, \$/d.n.	Price of el. energy, \$/d.n.	Price of el. energy commerc. import, \$/d.n.	Financial loss in el. energy supply, \$/d.n.	National financial effect, \$/d.n.
Mtkvari Energy	1 616	5 597 963	25 6 753	360 172	302 290	405 852	- 103 562	- 57 882
Tbilisresi	1 745	5 460 026	277 207	388 866	294 841	395 852	- 101 010	- 94 024
"Old" TPs in total	3 361	11 057 988	533 960	749 038	597 131	801 704	- 204 573	- 151 907

Moreover, it is crucial to consider the much more significant losses (approximately \$9.5 million per day) that the national economy could potentially suffer if gas supply to the market were disrupted due to shortages. According to the regulations approved by GNERC (Georgian National Energy and Water Supply Regulatory Commission), the economic value of undelivered gas is estimated at 8 GEL per m<sup>3</sup>)<sup>64</sup> Additionally, if the electricity deficit were not compensated for by imports, the financial impact would be even more severe.

It is noteworthy that in 2023, the regulated price of the so-called "social gas" supplied to electricity generation facilities was \$143/1000 m<sup>3</sup> However, from January 1, 2024, this price increased to \$210/1000 m<sup>3</sup> which has accordingly impacted the price of electricity generated by local thermal power plants and, consequently, its production levels. As expected, the regulation of gas prices had a significant impact on the economic performance of "Mtkvari Energy" and Tbilisresi. The estimated cost of producing one kilowatt-hour (kWh) of electricity at these facilities increased to approximately 7,3<sup>65</sup> cents. Accordingly,

<sup>62</sup> The gas supplied through long-term contracts from the SCP (South Caucasus Pipeline) and SOCAR is insufficient to meet particularly high demand, requiring the purchase of additional volumes at commercial prices, which averaged \$200,6/1000m<sup>3</sup> in 2023

<sup>63</sup> Considering the costs of gas transportation and the full operational expenses of thermal power plants, the calculated magnitude of the negative national balance would increase significantly

<sup>64</sup> Annex: Investment Evaluation Guidelines for the Natural Gas Sector: Methodology for Economic Analysis of Investment Projects in the Natural Gas Transmission Network Resolution #36, GNERC, Tbilisi, July 29, 2021

<sup>65</sup> The figure requires verification for accuracy

for the peak consumption period in 2024, the estimated cost of electricity generated by the "older" thermal power plants nearly equaled the actual cost of commercial electricity imports.

In addition to the **non-market** demand management measures for the short and **medium** term, it is also possible to implement the gradual disconnection of local consumers based on justified prioritization or the partial reduction of transit volumes intended for Armenia. This would only be done under conditions of absolute necessity and with prior agreement from the consumers and the receiving country of the transit flow)<sup>66</sup>.

The tables below present the results of the calculations for compliance with the infrastructure standard, including scenarios, where market-based and non-market demand management measures are implemented. Additionally, It is essential to consider that for the short and medium term, the parameters have been derived from the peak consumption forecasts provided by GOGC, while for the long term the parameters have been established based on the extreme consumption (ExC) or energy-saving measures (SwM) scenarios outlined in the research conducted under the USEA/JSET program: from the report "Forecast of Annual and Peak Natural Gas Demand in Georgia until 2050."

It is also necessary to note that **Georgia is temporarily exempt from the obligation defined by the N-1 formula until a direct connection is established with another contracting party of the Energy Community and the required gas storage facility is constructed.**

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<sup>66</sup> Such a restriction, agreed upon with the receiving party, effectively equates to the implementation of the regional solidarity principle provided for in the existing legislation, This approach is recommended in situations where more than 20% of the total natural gas supply is at risk, and managing the situation at the national level becomes less feasible

Table 20 Calculation Results for the Long-Term Forecast under the ExC Scenario

	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Peak day unsupplied // surplus gas volume	N -1, %
N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia							
<b>2023</b>	<b>19 401 330</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>3 178 330</b>	<b>83,6%</b>
<b>2024</b>	<b>19 247 531</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>3 024 531</b>	<b>84,3%</b>
2025	19 401 330	0	10 723 000	5 500 000	0,05	3 178 330	83,6%
2030	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2035	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2040	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2045	19 700 000	0	10 723 000	5 500 000	0,07	3 477 000	82,4%
2050	19 700 000	0	10 723 000	5 500 000	0,07	3 477 000	82,4%
N1, scenario 2: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 11.1 mln.m3							
<b>2023</b>	<b>19 401 330</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>2 801 330</b>	<b>85,6%</b>
<b>2024</b>	<b>19 247 531</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>2 647 531</b>	<b>86,2%</b>
2025	19 401 330	11 100 000	0	5 500 000	0,05	2 801 330	85,6%
2030	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2035	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2040	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2045	19 700 000	11 100 000	0	5 500 000	0,07	3 100 000	84,3%
2050	19 700 000	11 100 000	0	5 500 000	0,07	3 100 000	84,3%
N1, scenario 3: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 15 mln.m3							
<b>2023</b>	<b>19 401 330</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>1 098 670</b>	<b>105,7%</b>
<b>2024</b>	<b>19 247 531</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>1 252 469</b>	<b>106,5%</b>
2025	19 401 330	15 000 000	0	5 500 000	0,05	1 098 670	105,7%
2030	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2035	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2040	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2045	19 700 000	15 000 000	0	5 500 000	0,07	800 000	104,1%
2050	19 700 000	15 000 000	0	5 500 000	0,07	800 000	104,1%
N1, scenario 4: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 20.2 mln.m3							
<b>2023</b>	<b>19 401 330</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>6 298 670</b>	<b>132,5%</b>
<b>2024</b>	<b>19 247 531</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>6 452 469</b>	<b>133,5%</b>
2025	19 401 330	20 200 000	0	5 500 000	0,05	6 298 670	132,5%
2030	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2035	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2040	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2045	19 700 000	20 200 000	0	5 500 000	0,07	6 000 000	130,5%
2050	19 700 000	20 200 000	0	5 500 000	0,07	6 000 000	130,5%

Note: The tables show that the 3rd and 4th scenarios take into account the implementation of non-market demand management measures, specifically the partial or complete restriction of Russian gas transit to Armenia.

Table 21 Calculation Results for the Long-Term Forecast under the ExC Scenario, Considering Temporary Suspension of "Older" TPP Operations or Restriction of Russian Gas Transit to Armenia

	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Peak day unsupplied // surplus gas volume	N -1, %
N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia and suspension of "Older" TPPs							
2023	19 401 330	0	10 723 000	5 500 000	0,05	- 214 251	101,1%
2024	19 247 531	0	10 723 000	5 500 000	0,05	- 368 050	101,9%
2025	19 401 330	0	10 723 000	5 500 000	0,05	- 214 251	101,1%
2030	19 401 330	0	10 723 000	5 500 000	0,07	- 214 251	101,1%
2035	19 401 330	0	10 723 000	5 500 000	0,07	- 214 251	101,1%
2040	19 401 330	0	10 723 000	5 500 000	0,07	- 214 251	101,1%
2045	19 700 000	0	10 723 000	5 500 000	0,07	84 419	99,6%
2050	19 700 000	0	10 723 000	5 500 000	0,07	84 419	99,6%
N1, scenario 2: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 11.1 mln.m3 from Russia and suspension of "Older" TPPs							
2023	19 401 330	11 100 000	0	5 500 000	0,05	- 591 251	103,0%
2024	19 247 531	11 100 000	0	5 500 000	0,05	- 745 050	103,9%
2025	19 401 330	11 100 000	0	5 500 000	0,05	- 591 251	103,0%
2030	19 401 330	11 100 000	0	5 500 000	0,07	- 591 251	103,0%
2035	19 401 330	11 100 000	0	5 500 000	0,07	- 591 251	103,0%
2040	19 401 330	11 100 000	0	5 500 000	0,07	- 591 251	103,0%
2045	19 700 000	11 100 000	0	5 500 000	0,07	- 292 581	101,5%
2050	19 700 000	11 100 000	0	5 500 000	0,07	- 292 581	101,5%
N1, scenario 3: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 15 mln.m3 from Russia and restriction of transit in Armenia up to 5.2 mln.m3							
2023	19 401 330	15 000 000	0	5 500 000	0,05	- 1 098 670	123,1%
2024	19 247 531	15 000 000	0	5 500 000	0,05	- 1 252 469	124,1%
2025	19 401 330	15 000 000	0	5 500 000	0,05	- 1 098 670	123,1%
2030	19 401 330	15 000 000	0	5 500 000	0,07	- 1 098 670	123,1%
2035	19 401 330	15 000 000	0	5 500 000	0,07	- 1 098 670	123,1%
2040	19 401 330	15 000 000	0	5 500 000	0,07	- 1 098 670	123,1%
2045	19 700 000	15 000 000	0	5 500 000	0,07	- 800 000	121,3%
2050	19 700 000	15 000 000	0	5 500 000	0,07	- 800 000	121,3%
N1, scenario 4: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 20.2 mln.m3 from Russia, suspension of "Older" TPPs and suspension of transit in Armenia							
2023	19 401 330	20 200 000	0	5 500 000	0,05	- 9 691 251	150,0%
2024	19 247 531	20 200 000	0	5 500 000	0,05	- 9 845 050	151,1%
2025	19 401 330	20 200 000	0	5 500 000	0,05	- 9 691 251	150,0%
2030	19 401 330	20 200 000	0	5 500 000	0,07	- 9 691 251	150,0%
2035	19 401 330	20 200 000	0	5 500 000	0,07	- 9 691 251	150,0%
2040	19 401 330	20 200 000	0	5 500 000	0,07	- 9 691 251	150,0%
2045	19 700 000	20 200 000	0	5 500 000	0,07	- 9 392 581	147,7%
2050	19 700 000	20 200 000	0	5 500 000	0,07	- 9 392 581	147,7%

Table 22 Calculation Results for the Long-Term Forecast under the ExC Scenario, Considering the Temporary Suspension of "Older" TPP Operations and One Combined Cycle Gas Turbine TPP in Gardabani

	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Surplus gas reserve	N - 1 %
N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia and suspension of "Older" TPPs and Gardabani 1 TPP							
<b>2023</b>	<b>19 401 330</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 316 993</b>	<b>106,8%</b>
<b>2024</b>	<b>19 247 531</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 470 792</b>	<b>107,6%</b>
2025	19 401 330	0	10 723 000	5 500 000	0,05	- 1 316 993	106,8%
2030	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2035	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2040	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2045	19 700 000	0	10 723 000	5 500 000	0,07	- 1 018 323	105,2%
2050	19 700 000	0	10 723 000	5 500 000	0,07	- 1 018 323	105,2%
N1, scenario 2: disabling Garakh-Saguramo gas pipeline coming from Azerbaijan, supply 11.1 mln.m3 from Russia and suspension of "Older" TPPs and Gardabani 1 TPP							
<b>2023</b>	<b>19 401 330</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 693 993</b>	<b>108,7%</b>
<b>2024</b>	<b>19 247 531</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 847 792</b>	<b>109,6%</b>
2025	19 401 330	11 100 000	0	5 500 000	0,05	- 1 693 993	108,7%
2030	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2035	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2040	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2045	19 700 000	11 100 000	0	5 500 000	0,07	- 1 395 323	107,1%
2050	19 700 000	11 100 000	0	5 500 000	0,07	- 1 395 323	107,1%
N1, scenario 3: disabling Garakh-Saguramo gas pipeline coming from Azerbaijan, supply 15 mln.m3 from Russia, suspension of "Older" TPPs and Gardabani 1 TPP and restriction of transit in Armenia up to 5.2 mln.m3							
<b>2023</b>	<b>19 401 330</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 5 593 993</b>	<b>128,8%</b>
<b>2024</b>	<b>19 247 531</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 5 747 792</b>	<b>129,9%</b>
2025	19 401 330	15 000 000	0	5 500 000	0,05	- 5 593 993	128,8%
2030	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2035	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2040	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2045	19 700 000	15 000 000	0	5 500 000	0,07	- 5 295 323	126,9%
2050	19 700 000	15 000 000	0	5 500 000	0,07	- 5 295 323	126,9%
N1, scenario 4: disabling Garakh-Saguramo gas pipeline coming from Azerbaijan, supply 20.2 mln.m3 from Russia, suspension of "Older" TPPs and Gardabani 1 TPP and suspension of transit in Armenia							
<b>2023</b>	<b>19 401 330</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 10 793 993</b>	<b>155,6%</b>
<b>2024</b>	<b>19 247 531</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 10 947 792</b>	<b>156,9%</b>
2025	19 401 330	20 200 000	0	5 500 000	0,05	- 10 793 993	155,6%
2030	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2035	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2040	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2045	19 700 000	20 200 000	0	5 500 000	0,07	- 10 495 323	153,3%
2050	19 700 000	20 200 000	0	5 500 000	0,07	- 10 495 323	153,3%

Table 23 Calculation Results for the Long-Term Forecast under the SwM Scenario

	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Peak day unsupplied // surplus gas volume	N -1 %
N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia							
2023	19 401 330	0	10 723 000	5 500 000	0,05	3 178 330	83,6%
2024	19 247 531	0	10 723 000	5 500 000	0,05	3 024 531	84,3%
2025	19 401 330	0	10 723 000	5 500 000	0,05	3 178 330	83,6%
2030	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2035	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2040	19 401 330	0	10 723 000	5 500 000	0,07	3 178 330	83,6%
2045	19 100 000	0	10 723 000	5 500 000	0,07	2 877 000	84,9%
2050	19 100 000	0	10 723 000	5 500 000	0,07	2 877 000	84,9%
N1, scenario 2: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 11.1 mln.m3							
2023	19 401 330	11 100 000	0	5 500 000	0,05	2 801 330	85,6%
2024	19 247 531	11 100 000	0	5 500 000	0,05	2 647 531	86,2%
2025	19 401 330	11 100 000	0	5 500 000	0,05	2 801 330	85,6%
2030	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2035	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2040	19 401 330	11 100 000	0	5 500 000	0,07	2 801 330	85,6%
2045	19 100 000	11 100 000	0	5 500 000	0,07	2 500 000	86,9%
2050	19 100 000	11 100 000	0	5 500 000	0,07	2 500 000	86,9%
N1, scenario 3: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 15 mln.m3							
2023	19 401 330	15 000 000	0	5 500 000	0,05	1 098 670	105,7%
2024	19 247 531	15 000 000	0	5 500 000	0,05	1 252 469	106,5%
2025	19 401 330	15 000 000	0	5 500 000	0,05	1 098 670	105,7%
2030	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2035	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2040	19 401 330	15 000 000	0	5 500 000	0,07	1 098 670	105,7%
2045	19 100 000	15 000 000	0	5 500 000	0,07	1 400 000	107,3%
2050	19 100 000	15 000 000	0	5 500 000	0,07	1 400 000	107,3%
N1, scenario 4: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, from Russia 20.2 mln.m3							
2023	19 401 330	20 200 000	0	5 500 000	0,05	6 298 670	132,5%
2024	19 247 531	20 200 000	0	5 500 000	0,05	6 452 469	133,5%
2025	19 401 330	20 200 000	0	5 500 000	0,05	6 298 670	132,5%
2030	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2035	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2040	19 401 330	20 200 000	0	5 500 000	0,07	6 298 670	132,5%
2045	19 100 000	20 200 000	0	5 500 000	0,07	6 600 000	134,6%
2050	19 100 000	20 200 000	0	5 500 000	0,07	6 600 000	134,6%

Table 24 Calculation Results for the Long-Term Forecast under the SwM Scenario, Considering the Temporary Suspension of "Older" (Steam Turbine) TPP Operations or Restriction of Russian Gas Imports to Armenia

N1, scenario 3: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 15 mln.m3 from Russia and restriction of transit in Armenia up to 5.2 mln.m3								
Year	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Peak day surplus gas reserve	N -1 %	
2023	19 401 330	15 000 000	0	5 500 000	0,05	-	1 098 670	105,7%
2024	19 247 531	15 000 000	0	5 500 000	0,05	-	1 252 469	106,5%
2025	19 401 330	15 000 000	0	5 500 000	0,05	-	1 098 670	105,7%
2030	19 401 330	15 000 000	0	5 500 000	0,07	-	1 098 670	105,7%
2035	19 401 330	15 000 000	0	5 500 000	0,07	-	1 098 670	105,7%
2040	19 401 330	15 000 000	0	5 500 000	0,07	-	1 098 670	105,7%
2045	19 100 000	15 000 000	0	5 500 000	0,07	-	1 400 000	107,3%
2050	19 100 000	15 000 000	0	5 500 000	0,07	-	1 400 000	107,3%
N1, scenario 4: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 20.2 mln.m3 from Russia, suspension of "Older" TPPs and suspension of transit in Armenia								
2023	19 401 330	20 200 000	0	5 500 000	0,05	-	9 691 251	150,0%
2024	19 247 531	20 200 000	0	5 500 000	0,05	-	9 845 050	151,1%
2025	19 401 330	20 200 000	0	5 500 000	0,05	-	9 691 251	150,0%
2030	19 401 330	20 200 000	0	5 500 000	0,07	-	9 691 251	150,0%
2035	19 401 330	20 200 000	0	5 500 000	0,07	-	9 691 251	150,0%
2040	19 401 330	20 200 000	0	5 500 000	0,07	-	9 691 251	150,0%
2045	19 100 000	20 200 000	0	5 500 000	0,07	-	9 992 581	152,3%
2050	19 100 000	20 200 000	0	5 500 000	0,07	-	9 992 581	152,3%
N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia and suspension of "Older" TPPs								
2023	19 401 330	0	10 723 000	5 500 000	0,05	-	214 251	101,1%
2024	19 247 531	0	10 723 000	5 500 000	0,05	-	368 050	101,9%
2025	19 401 330	0	10 723 000	5 500 000	0,05	-	214 251	101,1%
2030	19 401 330	0	10 723 000	5 500 000	0,07	-	214 251	101,1%
2035	19 401 330	0	10 723 000	5 500 000	0,07	-	214 251	101,1%
2040	19 401 330	0	10 723 000	5 500 000	0,07	-	214 251	101,1%
2045	19 100 000	0	10 723 000	5 500 000	0,07	-	515 581	102,7%
2050	19 100 000	0	10 723 000	5 500 000	0,07	-	515 581	102,7%
N1, scenario 2: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 11.1 mln.m3 from Russia and suspension of "Older" TPPs								
2023	19 401 330	11 100 000	0	5 500 000	0,05	-	591 251	103,0%
2024	19 247 531	11 100 000	0	5 500 000	0,05	-	745 050	103,9%
2025	19 401 330	11 100 000	0	5 500 000	0,05	-	591 251	103,0%
2030	19 401 330	11 100 000	0	5 500 000	0,07	-	591 251	103,0%
2035	19 401 330	11 100 000	0	5 500 000	0,07	-	591 251	103,0%
2040	19 401 330	11 100 000	0	5 500 000	0,07	-	591 251	103,0%
2045	19 100 000	11 100 000	0	5 500 000	0,07	-	892 581	104,7%
2050	19 100 000	11 100 000	0	5 500 000	0,07	-	892 581	104,7%

Table 25 Calculation Results for the Long-Term Forecast under the SwM Scenario, Considering the Temporary Suspension of "Older" TPP Operations and One Combined Cycle Gas Turbine TPP in Gardabani

	Peak consumption in a day	Russia	Azerbaijan	Shah Deniz	Production	Peak day surplus gas reserve	N - 1 %
<b>N1, scenario 1: disabling 1200 mm gas pipeline coming from Russia and suspension of "Older" TPPs and Gardabani 1 TPP</b>							
<b>2023</b>	<b>19 401 330</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 316 993</b>	<b>106,8%</b>
<b>2024</b>	<b>19 247 531</b>	<b>0</b>	<b>10 723 000</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 470 792</b>	<b>107,6%</b>
2025	19 401 330	0	10 723 000	5 500 000	0,05	- 1 316 993	106,8%
2030	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2035	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2040	19 401 330	0	10 723 000	5 500 000	0,07	- 1 316 993	106,8%
2045	19 100 000	0	10 723 000	5 500 000	0,07	- 1 618 323	108,5%
2050	19 100 000	0	10 723 000	5 500 000	0,07	- 1 618 323	108,5%
<b>N1, scenario 2: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 11.1 mln.m3 from Russia and suspension of "Older" TPPs and Gardabani 1 TPP</b>							
<b>2023</b>	<b>19 401 330</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 693 993</b>	<b>108,7%</b>
<b>2024</b>	<b>19 247 531</b>	<b>11 100 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 1 847 792</b>	<b>109,6%</b>
2025	19 401 330	11 100 000	0	5 500 000	0,05	- 1 693 993	108,7%
2030	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2035	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2040	19 401 330	11 100 000	0	5 500 000	0,07	- 1 693 993	108,7%
2045	19 100 000	11 100 000	0	5 500 000	0,07	- 1 995 323	110,4%
2050	19 100 000	11 100 000	0	5 500 000	0,07	- 1 995 323	110,4%
<b>N1, scenario 3: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 15 mln.m3 from Russia, suspension of "Older" TPPs and Gardabani 1 TPP and restriction of transit in Armenia up to 5.2 mln.m3</b>							
<b>2023</b>	<b>19 401 330</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 5 593 993</b>	<b>128,8%</b>
<b>2024</b>	<b>19 247 531</b>	<b>15 000 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 5 747 792</b>	<b>129,9%</b>
2025	19 401 330	15 000 000	0	5 500 000	0,05	- 5 593 993	128,8%
2030	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2035	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2040	19 401 330	15 000 000	0	5 500 000	0,07	- 5 593 993	128,8%
2045	19 100 000	15 000 000	0	5 500 000	0,07	- 5 895 323	130,9%
2050	19 100 000	15 000 000	0	5 500 000	0,07	- 5 895 323	130,9%
<b>N1, scenario 4: disabling Gazakh-Saguramo gas pipeline coming from Azerbaijan, supply 20.2 mln.m3 from Russia, suspension of "Older" TPPs and Gardabani 1 TPP and suspension of transit in Armenia</b>							
<b>2023</b>	<b>19 401 330</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 10 793 993</b>	<b>155,6%</b>
<b>2024</b>	<b>19 247 531</b>	<b>20 200 000</b>	<b>0</b>	<b>5 500 000</b>	<b>0,05</b>	<b>- 10 947 792</b>	<b>156,9%</b>
2025	19 401 330	20 200 000	0	5 500 000	0,05	- 10 793 993	155,6%
2030	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2035	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2040	19 401 330	20 200 000	0	5 500 000	0,07	- 10 793 993	155,6%
2045	19 100 000	20 200 000	0	5 500 000	0,07	- 11 095 323	158,1%
2050	19 100 000	20 200 000	0	5 500 000	0,07	- 11 095 323	158,1%

The analysis of the results presented in Tables 17-22 shows that during the peak gas consumption period:

- If the most powerful infrastructure, the North-South Caucasus Main Gas Pipeline supplying Russian gas, as well as the Azerbaijan-Georgia cross-border infrastructure, were to experience disruptions while operating at its historically recorded maximum capacities (11.1 and 10.723 million m<sup>3</sup>/day,

respectively), Georgia would not meet the N-1 criterion requirements. This shortfall occurs both in the current period and when considering medium- and long-term gas consumption forecasts (see Tables 17 and 20, Scenarios 1 and 2). The portion of the total gas demand that fully meets the N-1 criterion, through the implementation of mitigation measures on the demand side, varies between (*De*), 2,5- 3,178 mln m<sup>3</sup>/ per day.

- In the event of disruptions in the Azerbaijan-Georgia border infrastructure, if the technical capacity of the gas receiving node from the Russian gas supply pipeline is fully utilized, (15 mln m<sup>3</sup>/day), the N-1 criterion requirements are met (see Tables 17 and 20, Scenario 3). Similarly, the criterion requirements will be fully met in the event of disruptions in the Russian gas receiving infrastructure if the technical capacity of the Azerbaijan-Georgia border infrastructure is fully utilized—15 mln m<sup>3</sup>/day (calculation results are not shown in the table due to the similarity with the previous case).
- Under the implementation of demand-side management measures, specifically the temporary suspension of operation of 'old,' low-efficiency power plants and meeting demand with supplemental imported electricity, or limiting Armenian transit to 5,2<sup>67</sup> mln m<sup>3</sup>/day the infrastructure standard requirements are met in the current, medium, and long-term (up to 2045) periods, under any operating regime of the remaining infrastructure. (See tables 18 and 21). The gas deficit required to meet the N-1 criterion, under the ExC consumption scenario after 2045, amounts to approximately 84,400 cubic meters per day.
- Under the comprehensive implementation of all considered demand-side management measures, specifically the temporary suspension of operation of 'old,' low-efficiency power plants and one of the gas combined cycle plants, along with meeting demand with additional imported electricity, and limiting Armenian transit to 5,2 mln m<sup>3</sup>/day the infrastructure standard requirements are met in the current, medium, and long-term periods and under any operating regime of the remaining infrastructure. As the analysis shows, the comprehensive implementation of demand-side management measures, as well as the need for a complete suspension of transit through Armenia (see Scenario 4 in Tables 17-22), is likely never to occur under any conditions.

#### 4. Compliance with the supply standard

##### Protected consumers and legislative requirements

According to Article XXXIV (Natural Gas Supply Security) of the Law of Georgia on Energy and Water Supply, various measures for natural gas supply security are required, including compliance with the supply standard.

According to the supply standard, natural gas traders/suppliers are obligated to undertake necessary measures to ensure sufficient natural gas resources to meet the demands of protected consumers, in cases specified by law.

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<sup>67</sup> The maximum transit volume (5,2 mln m<sup>3</sup>/day) in this case is determined by subtracting the volume accounted for in the gas scenario left in Georgia (15 mln m<sup>3</sup>/day), from the historically recorded maximum throughput of the Russian gas supply infrastructure (21.6 mln m<sup>3</sup>/day)

Article 139 of the law, which incorporates the core elements of relevant European regulations<sup>68</sup> stipulates the necessity of ensuring natural gas supply to protected consumers in at least the following cases:

1. In the case of extreme temperatures occurring during a 7-day peak period, which statistically occurs once every 20 years;
2. In the case of exceptionally high natural gas demand over a period of at least 30 days, which statistically occurs once every 20 years;
3. In the case of the largest gas infrastructure being out of service for a period of at least 30 days under normal winter conditions.

Furthermore, according to the mentioned regulation and the Rules for Natural Gas Supply Security,<sup>69</sup> natural gas companies may be obligated to implement necessary measures to ensure gas supply to protected consumers for a period exceeding 30 calendar days, or additional obligations may be defined for gas supply security only after a risk assessment and fulfillment of the following conditions outlined in the preventive action plan:

- 1) Measures must be clearly defined, transparent, proportionate, non-discriminatory, and verifiable;
- 2) Measures should not hinder competition or the effective functioning of the gas market.

After the expiration of the specified periods for ensuring natural gas supply to protected consumers, or under more severe conditions than those specified, the ministry and natural gas companies will make every effort to maintain gas supply to the maximum extent, particularly for protected consumers.

#### **Protected consumers category**

1. According to the definition, protected consumers are defined as:
  - a) residential consumers connected to the gas distribution system;
  - b) small-sized enterprises connected to the gas distribution system;
  - c) primary social-purpose enterprises, institutions, and organizations connected to the gas transmission or distribution system, such as<sup>69</sup>:
    - Government administrative bodies, including ministries and its subordinate agencies;
    - Penitentiary system;
    - Healthcare system;
    - Shelters (including orphanages);
    - Bread factories;
    - Zoo;
    - Railway system;
    - Airports;

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<sup>68</sup> Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010

<sup>69</sup> Source: Rules on Security of Natural Gas Supply, which establish the legislative framework for the transposition and implementation of the requirements outlined in Regulation (EU) 2017/1938 of October 25, 2017, on "Measures to Ensure the Security of Gas Supply" as well as those adopted and adapted by the decision of the Energy Community Ministerial Council

- Ports;
- Water supply and wastewater treatment service providers;
- Telecommunications facilities;
- Educational institutions (higher education institutions, schools, kindergartens, etc.);

Natural gas consumption by protected consumers specified in subparagraphs (b) and (c) of paragraph 1 of this Article should not exceed 20% of the total natural gas consumption in Georgia.

According to the requirements of the Rules on Security of Natural Gas Supply and Regulation (EU) 2017/1938, in emergency situations and upon the request of the electricity or gas transmission system operator, the Ministry may prioritize the supply of gas to certain combined heat and power plants over specific categories of protected consumers. However, in such cases, it must be justified that the disconnection of specific combined heat and power plants in emergency situations would cause significant harm to the functioning of the electricity system or that its operation is crucial for gas production and transportation.

Additionally, according to the aforementioned rules, each system operator must prepare a list of protected consumers whose gas equipment is connected to its networks, along with information on the volumes of gas they use. Furthermore, *system operators update the list of protected consumers every (two) months.*

The table shows the consumption indicators (m<sup>3</sup>), of protected consumers prepared by the Georgian Gas Transportation Company, established based on a reconciliation of 2023 data <sup>70</sup> from gas measurement nodes and information obtained from customer surveys, along with the results of critical analysis (for detailed analysis, see: Risk Assessment Report, GGT, March 2024).

**Table 26 Consumption of protected consumers by main directions and branches of the transmission gas pipelines m<sup>3</sup>**

Directions/branches	consumption, m <sup>3</sup>
<b>Western direction</b>	<b>387165587</b>
<b>Southern branch</b>	<b>56693939</b>
<b>Kakheti branch</b>	<b>79 956 311</b>
<b>Northern direction</b>	<b>25 873 673</b>
<b>Central region</b>	<b>1 040 533 323</b>
<b>Total</b>	<b>1 590 239 498</b>

The analysis indicates that the proportion of protected consumers accounts for approximately 53% of the total gas supply recorded by its servicing metering nodes over the course of one year, and around 58% during peak consumption days.

The results of the assessment of compliance with delivery standards are presented in Tables 24-28.

<sup>70</sup> Data from nodes that individually serve power plants and large industrial enterprises are not included

Table 27 Assessment of the 7-day peak consumption and supply potential for protected consumers (Supply Standard 1).<sup>71</sup> and for all gas consumers

<b>Expanded standard of supply 1, All customers, forecast of the GGTC</b>			
	7-day peak consumption	Potential of supply	Surplus gas reserve
<b>2023</b>	<b>133 187 995</b>	<b>191 450 000</b>	<b>- 58 262 005</b>
<b>2024</b>	<b>132 781 497</b>	<b>191 450 000</b>	<b>- 58 668 503</b>
2025	136 863 505	<b>191 450 000</b>	<b>- 54 586 495</b>
2026	140 052 198	<b>191 450 000</b>	<b>- 51 397 802</b>
2027	143 226 655	<b>181 650 000</b>	<b>- 38 423 345</b>
2028	146 011 930	<b>181 650 000</b>	<b>- 35 638 070</b>
<b>Supply standard 1, secured customers, ExC scenario</b>			
	7-day peak consumption	Potential of supply	Surplus gas reserve
<b>2023</b>	<b>64 968 120</b>	<b>191 450 000</b>	<b>-126 481 880</b>
<b>2024</b>	<b>67 696 781</b>	<b>191 450 000</b>	<b>-123 753 219</b>
2025	<b>70 540 046</b>	<b>191 450 000</b>	<b>-120 909 954</b>
2026	<b>73 502 728</b>	<b>191 450 000</b>	<b>-117 947 272</b>
2027	<b>76 589 842</b>	<b>181 650 000</b>	<b>-105 060 158</b>
2028	<b>79 806 616</b>	<b>181 650 000</b>	<b>-101 843 384</b>
<b>2030</b>	<b>68 109 654</b>	<b>181 650 000</b>	<b>-113 540 346</b>
<b>2035</b>	<b>69 467 106</b>	<b>106 750 000</b>	<b>- 37 282 894</b>
2040	<b>69 596 388</b>	<b>106 750 000</b>	<b>- 37 153 612</b>
2045	<b>68 626 778</b>	<b>106 750 000</b>	<b>- 38 123 222</b>
2050	<b>69 273 184</b>	<b>106 750 000</b>	<b>- 37 476 816</b>

<sup>71</sup> Supply Standard 1 has been assessed only for the extreme high consumption forecast (ExC) scenario, as the projected consumption for the scenario with measures (SwM) is significantly reduced

Table 28 Assessment of the 30-day peak consumption and supply potential for protected consumers (Supply Standard 2) and for all gas consumers

Expanded standard of supply 2, All customers, forecast of the GGTC		
30-day peak consumption	Potential of supply	Surplus gas reserve
<b>542 988 006</b>	<b>820 500 000</b>	- <b>277 511 994</b>
<b>549 901 942</b>	<b>820 500 000</b>	- <b>270 598 058</b>
566 807 187	<b>820 500 000</b>	- <b>253 692 813</b>
580 012 858	<b>820 500 000</b>	- <b>240 487 142</b>
593 159 568	<b>778 500 000</b>	- <b>185 340 432</b>
604 694 518	<b>778 500 000</b>	- <b>173 805 482</b>
Supply standard 2, Secured customers, ExC scenario		
30-day peak consumption	Potential of supply	Surplus gas reserve
<b>251 754 000</b>	<b>820 500 000</b>	- <b>568 746 000</b>
<b>268 902 050</b>	<b>820 500 000</b>	- <b>551 597 950</b>
<b>277 168 715</b>	<b>820 500 000</b>	- <b>543 331 285</b>
<b>283 626 288</b>	<b>820 500 000</b>	- <b>536 873 712</b>
<b>290 055 029</b>	<b>778 500 000</b>	- <b>488 444 971</b>
<b>295 695 619</b>	<b>778 500 000</b>	- <b>482 804 381</b>
<b>263 927 565</b>	<b>778 500 000</b>	- <b>514 572 435</b>
<b>269 189 672</b>	<b>457 500 000</b>	- <b>188 310 328</b>
<b>269 688 717</b>	<b>457 500 000</b>	- <b>187 811 283</b>
<b>265 931 444</b>	<b>457 500 000</b>	- <b>191 568 556</b>
<b>268 436 293</b>	<b>457 500 000</b>	- <b>189 063 707</b>

Table 29 Assessment of the 30-day winter baseline consumption and supply potential for all gas consumers (Supply Standard 3)

	30-day basic consumption in winter by all customers	NSCP (North-South Caucasus Pipeline)	Gazakh-Saguramo	SCP (South Caucasus Pipeline)	Internal production	Surplus gas reserve
Expanded standard of supply 3 (disabling 1200 mm gas pipeline coming from Russia, 10.7 mln m3/d.n. gas supply through Gazakh-Saguramo gas pipeline)						
<b>2023</b>	<b>361 614 771</b>	<b>0</b>	<b>321 690 000</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 125 075 228,88</b>
<b>2024</b>	<b>381 448 000</b>	<b>0</b>	<b>321 690 000</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 105 242 000,48</b>
2025	393 174 585	0	321 690 000	165 000 000	0	- 93 515 415,23
2026	402 334 903	0	321 690 000	165 000 000	0	- 84 355 097,02
2027	411 454 322	0	321 690 000	123 904 110	0	- 34 139 788,05
2028	419 455 719	0	321 690 000	123 904 110	0	- 26 138 390,74
Expanded standard of supply 3 (disabling Gazakh-Saguramo pipeline, 11.1 mln m3/d.n. gas supply from Russia)						
<b>2023</b>	<b>361 614 771</b>	<b>333 000 000</b>	<b>0</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 136 385 228,88</b>
<b>2024</b>	<b>381 448 000</b>	<b>333 000 000</b>	<b>0</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 116 552 000,48</b>
2025	393 174 585	333 000 000	0	165 000 000	0,05	- 104 825 415,23
2026	402 334 903	333 000 000	0	165 000 000	0,05	- 95 665 097,02
2027	411 454 322	333 000 000	0	123 904 110	0,05	- 45 449 788,05
2028	419 455 719	333 000 000	0	123 904 110	0,05	- 37 448 390,74
Expanded standard of supply 3 (disabling Gazakh-Saguramo pipeline, 15 mln m3/d.n. gas supply from Russia)						
<b>2023</b>	<b>361 614 771</b>	<b>450 000 000</b>	<b>0</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 253 385 228,88</b>
<b>2024</b>	<b>381 448 000</b>	<b>450 000 000</b>	<b>0</b>	<b>165 000 000</b>	<b>0,05</b>	<b>- 233 552 000,48</b>
2025	393 174 585	450 000 000	0	165 000 000	0,05	- 221 825 415,23
2026	402 334 903	450 000 000	0	165 000 000	0,05	- 212 665 097,02
2027	411 454 322	450 000 000	0	123 904 110	0,05	- 162 449 788,05
2028	419 455 719	450 000 000	0	123 904 110	0,05	- 154 448 390,74

Table 30 Assessment of the 30-day winter baseline consumption and supply potential for protected gas consumers (Supply Standard 3)

	30-day consumption in winter by secured customers	NSCP (North-South Caucasus Pipeline)	Gazakh-Saguramo	SCP (South Caucasus Pipeline)	Internal production	Surplus gas reserve
Supply standard 3 (disabling 1200 mm gas pipeline coming from Russia, 10.7 mln m3/d.n. gas supply through Gazakh-Saguramo gas pipeline)						
2023	176 829 623	0	321 690 000	165 000 000	0,05	- 309 860 377
2024	186 528 072	0	321 690 000	165 000 000	0,05	- 300 161 928
2025	192 262 372	0	321 690 000	165 000 000	0,05	- 294 427 628
2026	196 741 768	0	321 690 000	165 000 000	0,05	- 289 948 232
2027	201 201 163	0	321 690 000	123 904 110	0,05	- 244 392 946
2028	205 113 847	0	321 690 000	123 904 110	0,05	- 240 480 263
Supply standard 3 (disabling Gazakh-Saguramo gas pipeline, 11.1 mln m3/d.n. gas supply from Russia)						
2023	176 829 623	333 000 000	0	165 000 000	0,05	- 321 170 377
2024	186 528 072	333 000 000	0	165 000 000	0,05	- 311 471 928
2025	192 262 372	333 000 000	0	165 000 000	0,05	- 305 737 628
2026	196 741 768	333 000 000	0	165 000 000	0,05	- 301 258 232
2027	201 201 163	333 000 000	0	123 904 110	0,05	- 255 702 946
2028	205 113 847	333 000 000	0	123 904 110	0,05	- 251 790 263
Supply standard 3 (disabling Gazakh-Saguramo pipeline, 15 mln m3/d.n. gas supply from Russia)						
2023	176 829 623	450 000 000	0	165 000 000	0,05	- 438 170 377
2024	186 528 072	450 000 000	0	165 000 000	0,05	- 428 471 928
2025	192 262 372	450 000 000	0	165 000 000	0,05	- 422 737 628
2026	196 741 768	450 000 000	0	165 000 000	0,05	- 418 258 232
2027	201 201 163	450 000 000	0	123 904 110	0,05	- 372 702 946
2028	205 113 847	450 000 000	0	123 904 110	0,05	- 368 790 263

Table 31 Assessment of the 30-day winter baseline consumption and supply potential for protected gas consumers (Supply Standard 3) in the event that the contract with "SOCAR" is not extended beyond 2030

	ExC scenario, 30-day consumption in winter by secured customers	NSCP (North-South Caucasus Pipeline)	Gazakh-Saguramo in case of termination of the Socar Contract	SCP (South Caucasus Pipeline)	Internal production	Surplus gas reserve
Supply standard 3 (disabling 1200 mm gas pipeline coming from Russia, 10.7 mln m3/d.n. gas supply through Gazakh-Saguramo gas pipeline until 2031)						
<b>2023</b>	176 829 623	0	321 690 000	165 000 000	0,05	- 309 860 377
<b>2024</b>	186 528 072	0	321 690 000	165 000 000	0,05	- 300 161 928
2025	192 262 372	0	321 690 000	165 000 000	0,05	- 294 427 628
<b>2030</b>	188 159 693	0	321 690 000	123 904 110	<b>0,05</b>	- 257 434 416
<b>2035</b>	191 909 792	0	0	123 904 110	<b>0,05</b>	<b>68 005 682</b>
2040	192 266 944	0	0	123 904 110	<b>0,05</b>	<b>68 362 834</b>
2045	189 588 302	0	0	123 904 110	<b>0,05</b>	<b>65 684 192</b>
2050	191 374 063	0	0	123 904 110	<b>0,05</b>	<b>67 469 954</b>
	SwM scenario, 30-day consumption in winter by secured customers	NSCP (North-South Caucasus Pipeline)	Gazakh-Saguramo in case of termination of the Socar Contract	SCP (South Caucasus Pipeline)	Internal production	Surplus gas reserve
Supply standard 3 (disabling 1200 mm gas pipeline coming from Russia, 10.7 mln m3/d.n. gas supply through Gazakh-Saguramo gas pipeline until 2031)						
<b>2023</b>	176 829 623	0	321 690 000	123 904 110	0,05	- 268 764 487
<b>2024</b>	186 528 072	0	321 690 000	123 904 110	0,05	- 259 066 038
2025	192 262 372	0	321 690 000	123 904 110	0,05	- 253 331 738
<b>2030</b>	185 957 255	0	321 690 000	123 904 110	<b>0,05</b>	- 259 636 855
<b>2035</b>	173 873 605	0	0	123 904 110	<b>0,05</b>	<b>49 969 495</b>
2040	163 099 513	0	0	123 904 110	<b>0,05</b>	<b>39 195 403</b>
2045	152 980 200	0	0	123 904 110	<b>0,05</b>	<b>29 076 090</b>
2050	144 170 445	0	0	123 904 110	<b>0,05</b>	<b>20 266 335</b>

The analysis of the results presented in Tables 24-28 shows that:

- Supply Standard 1 is met for the short, medium, and long-term forecast periods. The requirements of Supply Standard 1 are also met for all consumers in the country. (See table 24)<sup>72</sup>;
- The conditions required by Supply Standard 2 are also met with a significant reserve, both for protected consumers and for all consumers in the country. (See Table 25);
- Supply Standard 3 is met even in the event of a supply disruption from both Russia and Azerbaijan (See Table 26 - Supply Standard 3 for all consumers in the country, and Table 27 - Supply Standard 3 for protected consumers);
- Supply Standard 3 cannot be met in the long term in the event of a disruption in Russian gas supply if the contract with Azerbaijani "SOCAR" is not extended (see Table 28), or if other measures to address the potential gas deficit are not planned and implemented. It is worth noting

<sup>72</sup> The assessment takes into account the suspension of the additional gas contract after 2026 and the potential suspension of the SOCAR contract after 2030

that the potential deficit is minimal (a maximum 2,26 mln m<sup>3</sup>/day) and can be mitigated through the implementation of demand-side management measures.

## 5. Preventive measures

When preparing preventive measures, it is generally advisable to consider the potential for refining both supply-side and demand-side aspects. In this specific case, considering the characteristics of Georgia's gas supply system, this document primarily focuses on the most significant factors that have the potential to reduce the probability of risks and/or mitigate its impact. These factors include, for example, increasing the capacity of certain network nodes during peak consumption and/or in the event of major cross-border infrastructure failures, extending the duration of existing long-term contracts, collaborating with neighboring countries' network operators, and mutual assistance based on the principle of solidarity.

In the process of developing preventive measures for all risks identified in the risk assessment document, certain assumptions and clarifications have been made to ensure the document's clear and unambiguous interpretation.

1. Three main sub-scenarios of event development <sup>73</sup>, have been considered, among which:
  - The first sub-scenario, the inaction scenario, describes a situation where, during a critical period, the system continues to operate under the influence of other elements and external factors in a normal mode;
  - The second, baseline sub-scenario, considers the total historical supply recorded independently by each receiving node in cases, where other system elements and external factors were activated to mitigate negative effects;
  - The third, maximum supply sub-scenario, describes a situation, where other system elements and mitigating external factors are forcefully activated, operating in a potentially achievable maximum load mode;
  - The preventive measures scenario describes the outcomes of re-evaluating the risks considered in the third sub-scenario. Additionally, some measures have been considered<sup>74</sup>, that would ensure the full utilization of the infrastructure's maximum capacity potential (for details, see the appendix);
2. The key technical parameters of cross-border and domestic infrastructure, details of contractual relationships, and other initial data used for the selection of assessments and preventive measures are based on information available as of the beginning of March 2024. This includes limited distribution information intended for official use only (OU) (see Bibliography, sources 3; 8; 11; 18; 21-26);

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<sup>73</sup> An additional scenario has been considered, which involves re-evaluating the risks after the implementation of the recommended preventive measures

<sup>74</sup> These measures primarily involve reviewing and improving the vulnerable aspects of contractual relationships with suppliers and neighboring countries' system operators, as well as maximizing the potential of the domestic transmission system with minimal costs

3. The structure used in the preventive measures plan differs from the assessment structure used in the risk assessment report, specifically:
  - a) The sectoral assessment corresponds to the initial assessment in the risk assessment document;
  - b) The national assessment includes sectoral effects and impacts on thermal power plants.
  - c) The regional assessment considers only the impact component on the neighboring country.
4. In the risk assessment process, the primary impact of the identified risks, i.e., the sectoral assessment/classification, has been conducted with consideration of the scale of the impact.
5. To determine the risk on a national scale, the initial assessment is adjusted by taking into account the impact on the country's electric power sector, specifically on thermal power plants.
6. To assess the regional dimension of the risk,<sup>75</sup> the possible negative impact of a crisis in Georgia's gas sector on the functioning of neighboring countries' gas supply systems is determined by applying the appropriate adjustment factor.
7. Preventive/mitigating measures are categorized based on time and implementation complexity:
  - Short-term (1 year after the document's approval and implementation) - easily executable and low-cost measures, primarily focused on the rational management of coordinated supply issues with neighboring countries' systems and measures to reduce the load on infrastructure;
  - Medium-term (the 3 years following the short-term period) - involves supply diversification and the establishment of interconnections with neighboring systems to fully leverage the potential of short-term measures. This typically requires the active involvement of at least two countries;
  - Long-term (from the end of the medium-term period until 2050) - measures aimed at enhancing the country's energy security and independence, as well as increasing system flexibility. These measures require significant capital expenditures and an increase in operational costs;
  - Ongoing - measures that are closely linked to the core principles of the country's security and energy policy;
8. The technical feasibility of the key infrastructure and gas storage projects recommended in this preventive action plan, which involve significant capital expenditures, must be studied. The appropriateness of its funding should be confirmed within the preparation of the 10-year transmission system development plan, based on calculations determined by the relevant methodology and procedures.

The tables below provide a summary of the impact achieved as a result of the preventive measures<sup>76</sup>. Detailed information on the nature and probability of the identified risks, as well as the impact of the baseline and post-preventive measures, is provided in the appendix.

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<sup>75</sup> It is worth noting that regional-scale preventive measures, according to European legislation, involve impact assessments on Energy Community signatories or EU member states. However, in Georgia's case, due to its geographical location, this is not relevant. Therefore, in the impact assessment, Energy Community and EU member states are replaced with neighboring countries.

<sup>76</sup> For detailed information on the nature and probability of the identified risks, as well as the initial impact, see "Natural Gas Supply Risk Assessment Document, GOGC, 2024."

**Table 32 Preventive Measures Related to Political Risks**

Initial Event	Event Category	Measures and Implementation Timeline for Political Risks	Responsible for Implementation
<b>1. Attack by a Foreign State</b>	Market	<p><b><i>As a short- or medium-term mitigating measure</i></b> it is recommended to restore/reconstruct the currently inactive 700 mm collector pipeline that connects the 1200 mm North Caucasus-South Caucasus pipeline with the 700 mm western pipeline. This is to ensure its proper operation.</p>	GOGC/TSO
	Other Measures	<p><b><i>As a medium-term mitigating measure</i></b> it is recommended to strengthen the protection of critical infrastructure (nodes) either by utilizing the operator company's own additional resources or by procuring services from the Strategic Pipeline Protection Department within the Ministry of Internal Affairs.</p>	GOGC
	Market/Other Measures	<p><b><i>As a long-term preventive measure,</i></b> infrastructure modernization has been planned. Additionally, if necessary, the selection and construction of gas storage facilities or equipment will be undertaken. The modernization includes the restoration/modernization of the existing interconnecting collectors between the North-South main gas pipeline system and the East-West main gas pipeline system. To select means for balancing the seasonal and operational imbalances in gas demand, the following are being considered: The development of an underground gas storage facility, liquefied natural gas (LNG) or compressed natural gas (CNG) storage, or gas mutual assistance projects with neighboring countries and Energy Community member states, among other options. As a result, after the implementation of the recommended preventive measures, the impact of the risk occurrence will be significantly reduced (to a minimal level).</p>	GGTC/TSO/GOGC
	Other Measures	<p><b><i>As an ongoing preventive measure</i></b> as an ongoing preventive measure, it is essential to ensure the enhancement of Georgia's defense capabilities, including the security of energy infrastructure.</p>	Government of Georgia
<b>2. Problem of State Border Demarcation and Delimitation</b>	Other Measures	<p><b><i>As a Medium- and Long-Term Preventive measure</i></b> the recommended action plan, following the mitigation of the political crisis with Russia to some extent, includes the renewal of damaged pipeline insulation and the installation of anti-corrosion protection systems. These tasks are to be carried out through jointly planned and coordinated efforts with the supplier (Russian "Gazprom") and the Border Department. As a result, the likelihood of an emergency situation arising will be reduced to 1, and the impact will become negligible.</p>	GGTC/TSO/GOGC
<b>3. War or Civil Unrest in the Supplier Country</b>	Market/Other Measures	<p><b><i>Long-Term Preventive Action Plan</i></b> the plan includes increasing the capacity of the receiving point from SCP or establishing an additional receiving point. This will be done in coordination with the operator (SOCAR) on technical issues and by coordinating commercial matters for the temporary redirection of "SOCAR gas" into the South Caucasus Pipeline during the crisis period. During the same period, it is also possible to consider the selection and construction/installation of gas reserve equipment/facilities, which will be related to the results of</p>	GGTC/TSO/GOGC

		the USEA-funded ongoing project 'Balancing Gas Consumption Inequality in Georgia to Support the Georgian Oil and Gas Corporation.	
<b>4. War or Civil Unrest in the Supplier Country</b>	Market	Given the recent successful peace processes between Azerbaijan and Armenia, and also considering that the actual outcome of an attack on the SCP is equivalent to an attack on the international market's supply infrastructure, the probability of the reassessed risk occurrence has been reduced to 1 for the current period. Despite this, for preventive purposes, it is advisable to reach a preliminary agreement with Gazprom Armenia regarding leaving a portion of the Russian gas intended for Armenia in Georgia during the crisis period.	GGTC/GOGC /Ministry
<b>5.Terrorism</b>	Market/Non-Market	<b><i>Short-Term Preventive Measures</i></b> It includes agreements with neighboring countries for mutual assistance during a crisis, as well as ensuring increased imports of electricity during the crisis period to replace gas-powered systems.	GGTC/GOGC /GSE
	Market	<b><i>In the medium term</i></b> , it is recommended to modernize infrastructure to ensure physical gas reverse flow from neighboring countries and/or to ensure virtual gas reverse flow from Turkey or EU countries through the existing gas receiving point at SCP or by its modernization.	GGTC/TSO/GOGC
	Market	<b><i>For the Long Term</i></b> it is recommended to plan joint measures with Gazprom Armenia (in the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovian) underground gas storage or from Iran (via swap). The implementation of the planned measures significantly reduces the impact effect at both the sectoral and national levels.	GGTC/GOGC /Ministry
<b>16.Gradual Occupation</b>	Other Measures	<b><i>As a medium-term mitigating measure</i></b> it is recommended that the operating company, either through its own resources or by procuring services (using the forces of the Strategic Pipelines Protection Department within the Ministry of Internal Affairs), carry out reconnaissance and security measures on the specified section of the gas pipeline.	GOGC

**Table 33 Preventive Measures Related to Technological Risks**

<b>Initial Event</b>	<b>Event Category</b>	<b>Measures and Implementation Period for Technological Risks</b>	<b>Responsible for Implementation</b>
<b>8.Cyber Attack</b>	Other Measures	In this case, the risk of the specified cyber attack is classified as minimal at both the sectoral and national levels, and it does not impact the supply of gas to power plants or neighboring countries. Despite this, it is recommended to ensure the continuous and reliable functioning of communication through the GOGC by the transmission network operator, to enable rapid response in case of an incident with the South Caucasus Pipeline operator.	GGTC/GOGC

9. Unplanned Technological Disruption of Supply	Market	<b>For the short term measure</b> it is recommended to ensure compliance with the conditions specified in the contract with SOCAR, which includes providing supplemental gas supplies if necessary to meet the demands of 'social sector' customers (households and power generation facilities);	GOGC/Ministry/ GGTC
	Non-market	During a potential crisis <b><i>in the medium term</i></b> if necessary, it is additionally considered to restrict gas supplies to low-efficiency 'old' gas-powered systems and to utilize the possibility of importing additional volumes of electricity.	GGTC/GSE/TPPs
	Market	<b><i>In the long term</i></b> it is possible to select and implement a project for the construction/installation of gas storage facilities/equipment, as well as to implement a new gas CCGT (Combined Cycle Gas Turbine) project to replace the 'old' steam turbine generation facilities.	Ministry/GOGC/ GGTC/TSO
	Market	<b><i>The plan for ongoing preventive action</i></b> includes ensuring the achievement of target indicators for the development of the gas sector as defined by Georgia's National Energy and Climate Plan, through the utilization of renewable energy sources and the implementation of energy efficiency measures, which will significantly reduce gas demand.	Ministry/GNERC
Unplanned Technological Interruption of Supply	Other Measures	<b><i>In the short term</i></b> to reach an agreement with 'SOCAR' regarding the fulfillment of the conditions outlined in the existing contract during the period of interruption in the supply of Russian gas. This implies the provision of supplemental gas, if necessary, to meet the demand of the so-called "social sector" consumers.	Ministry/GGTC/ GOGC
	Non-market	During a potential crisis <b><i>in the medium term</i></b> if necessary, it is additionally considered to restrict gas supplies to low-efficiency 'old' gas-powered systems and to utilize the possibility of importing additional volumes of electricity.	GGTC/GSE/TPPs
	Market	<b><i>In the long term</i></b> it is possible to select and implement a project for the construction/installation of gas storage facilities/equipment, as well as to implement a new gas CCGT (Combined Cycle Gas Turbine) project to replace the 'old' steam turbine generation facilities.	Ministry/GOGC/ GGTC/TSO
	Market	<b><i>The plan for ongoing preventive action</i></b> includes ensuring the achievement of target indicators for the development of the gas sector as defined by Georgia's National Energy and Climate Plan, through the utilization of renewable energy sources and the implementation of energy efficiency measures, which will significantly reduce gas demand	Ministry/GNERC
Unplanned Technological Interruption of Supply	Market	<b><i>In the short- and medium-term</i></b> it is recommended to reach an agreement with "SOCAR" regarding the fulfillment of the conditions outlined in the existing contract to provide supplemental gas in any critical	Ministry/GGTC/ GOGC

		situation in the event of a gas shortage, in order to meet the demand of the so-called 'social sector' consumers,	
	Non-market	During a potential crisis <b><i>in the medium term</i></b> if necessary, it is additionally considered to restrict gas supplies to low-efficiency 'old' gas-powered systems and to utilize the possibility of importing supplemental volumes of electricity.	GGTC/GSE/TPPs
	Market	<b><i>In the long term</i></b> it is possible to select and implement a project for the construction/installation of gas storage facilities/equipment, as well as to implement a new gas CCGT (Combined Cycle Gas Turbine) project to replace the 'old' steam turbine generation facilities.	Ministry/GOGC/ GGTC/TSO
	Market	<b><i>The plan for ongoing preventive action</i></b> includes ensuring the achievement of the target indicators for the development of the gas sector as defined by Georgia's National Energy and Climate Plan through the utilization of renewable energy sources and the implementation of energy efficiency measures, which will significantly reduce gas demand. Additionally, it includes the implementation of measures to ensure reverse flow of gas reserves from neighboring countries.	Ministry/GNERC / GGTC/GOGC
Pipeline Age and Corrosion	Other Measures	<b><i>Short-term preventive measures</i></b> include increasing the frequency of gas leak detection and monitoring for potential corrosion spots by the operating company, especially on aging gas pipelines that are operating without corrosion protection systems.	GGTC
	Other Measures	<b><i>In the medium- and long-term</i></b> it is recommended to replace sections of pipelines with exhausted technical resources and advanced age on the Azerbaijan-Georgia connecting gas pipelines. These sections should be equipped with systems for protecting the pipelines from electrochemical corrosion.	GOGC/TSO
	Other Measures	<b><i>In the long term</i></b> it is advisable to equip the entire system with pipelines that are fitted with electrochemical corrosion protection systems.	GOGC/TSO
17. Cyberattack	Other Measures	<b><i>In the medium term</i></b> it is recommended to implement an independent backup communication system operating on a separate frequency to ensure uninterrupted communication with operators and branches in a crisis situation.	GGTC
	Other Measures	<b><i>In the long term</i></b> it is recommended to establish an additional, independent node for managing the gas supply system to ensure the guaranteed continuity of the unified system's functionality in the event of a cyberattack.	GGTC
18. Pipeline Age and Corrosion	Other Measures	<b><i>In the medium term</i></b> it is recommended to design the existing 500 mm section of the Kutaisi-Sukhumi pipeline from the 24.0 km mark to the 109.8 km mark in stages, with its construction to be included in the 10-year plan for the development of transmission infrastructure.	GGTC/TSO

	Market	<i><b><u>In the long-term perspective</u></b></i> the connection of the Poti branch to Anaklia, via Kulevi, using an approximately 28 km long collector is also being considered, which would ensure looped supply to consumers in the Samegrelo region.	GGTC/TSO
19. excavation, earthworks, etc Associated risks	Other Measures	<i><b><u>In the short and medium term</u></b></i> it is recommended that the operating company strengthen the measures for the protection and security of pipeline safety zones.	GGTC
	Other Measures	<i><b><u>Ongoing measures</u></b></i> include awareness-raising activities for relevant municipal personnel and local residents, ensuring the full implementation of the obligation to place markers along the pipeline route, tightening control over illegal construction in pipeline protection zones, and so on.	Ministry/GGTC/ Local Municipality
20. Pipeline Age and Corrosion	Other Measures	<i><b><u>In the short term</u></b></i> it is essential to complete the construction of the ongoing (Lekhura-Sveneti) and planned (Saguramo-Natakhtari) 700 mm pipeline projects	GOGC/TSO
	Market	<i><b><u>In the medium term</u></b></i> it is recommended to redirect the main gas transport flow to a new pipeline and to establish connecting collectors between the parallel 700 mm and 500 mm gas pipelines.	GGTC/TSO
	Other Measures	<i><b><u>In the long term</u></b></i> it may also be considered to establish gas storage facilities in the territory of Western Georgia.	GGTC/TSO
21. The Difficulty of Implementing Proper Maintenance	Other Measures	<i><b><u>In the short and medium term</u></b></i> it is recommended that the operating company strengthen the protection of pipeline safety zones and ensure the timely execution of preventive clearing work. For prevention purposes, it is also recommended to implement appropriate measures, such as placing additional warning signs near pipeline protection zones and other similar actions.	GGTC/Local Municipalities/T SO
	Market	<i><b><u>In the long term</u></b></i> the gas transmission infrastructure development plan includes the implementation of the Tabatskuri-Bakuriani project	GGTC/TSO

**Table 34 Preventive Measures Related to Natural Risks**

Initial Event	Event Category	Measures and Implementation Period for Risks Related to Natural Events	Responsible for Implementation
13. Mudslide	Other Measures	<i><b><u>In the short and medium term</u></b></i> no measures are planned, as the cause of the risk has been eliminated. Despite this, it is advisable for the operating company to ensure continuous monitoring to guarantee the reliable functioning of complex engineering structures	GGTC
	Other Measures	<i><b><u>As an ongoing preventive measure over time</u></b></i> it is recommended that the operating company maintain continuous cooperation with the National Environmental Agency and ensure the procurement of	GGTC

		services for receiving automated notifications about environmental conditions	
14. Landslide	Other Measures	<b><i>As an ongoing preventive measure over time</i></b> As an ongoing preventive measure over time, it is recommended that the operating company maintain continuous cooperation with the National Environmental Agency and ensure the procurement of services for receiving automated notifications about environmental conditions	GGTC
15. Rockfall and rockslide	Other Measures	<b><i>As an ongoing preventive measure over time</i></b> it is recommended that PSP (Pipeline System Protection) ensure continuous monitoring and the proactive execution of preventive maintenance work. If necessary, this should include conducting clearing operations in the pipeline protection and safety zones.	GGTC
22. Earthquake	Market	<b><i>In the long term</i></b> it is recommended to implement the Tabatskuri-Bakuriani branch project, which will ensure looped supply for the Khashuri-Bakuriani branch from the southern branch (or vice versa)	GGTC/TSO
23. Flood	Other Measures	<b><i>For the short-term preventive measures plan</i></b> it is recommended 1. During the design phase of the 'Khashuri-Zestafoni' project pipeline, to construct the overpass on the Kvirila River using either an aerial cable-stayed method or horizontal drilling method, (taking into account the topographical conditions and economic feasibility); 2. Completion of the ongoing Kobuleti (Adjara) branch project	GGTC/GOGC
		<b><i>For the medium term, it is recommended:</i></b>	GGTC
	Other Measures	1. Completion of the Khashuri-Zestafoni pipeline construction project;	GGTC/TSO/GOGC
	Market	2. Interconnection of the existing and under-construction Kobuleti branches;	GGTC/TSO/GOGC
	Other Measures	3. Preparation of a project for the crossing over the Gubistskali River using the horizontal drilling method;	GGTC/TSO/GOGC
	Other Measures	4. Ensuring the proper functioning of the existing collectors for the 700 mm and 500 mm pipelines on the Abasha-Senaki section, with the installation of additional collectors if necessary;	GGTC/TSO
	Other Measures	5. Continuous monitoring and, if necessary, the execution of bank protection work in the area surrounding the aerial crossing over the Liakhvi River	GGTC
		<b><i>In the long term, it is recommended:</i></b>	
	Other Measures	1. Construction of the crossing over the Gubistskali River using the horizontal drilling method;	GGTC/TSO
Other Measures	2. Analysis of the results of long-term monitoring and, if necessary, the construction of an aerial cable-stayed or underground crossing over the Liakhvi River.	GGTC/TSO	

	Market	3. Construction of the second gas intake point at the MS (Measurement Station) and implementation of the Vale-Vani connecting pipeline project, which will ensure a looped supply for consumers in Western Georgia. Additionally, together with the planned Tabatskuri-Bakuriani branch project, it will also secure looped supply for consumers in the Saguramo-Khashuri-Bakuriani and Southern branches.	TSO/GOGC/GGTC
	Other Measures	<i>As an ongoing risk prevention measure</i> , continuous monitoring and, if necessary, bank protection/realignment work is planned at the crossing of the existing Kobuleti branch over the Supsa River.	GGTC/GOGC/TSO

**Table 35 Preventive Measures Related to Commercial Risks**

Initial Event	Event Category	Measures/(Implementation Period) for Commercial Risks	Responsible for Implementation
<b>6. Breach/Termination of Contractual Agreements.</b>	Market/Non-Market	<i>Short-term preventive measures</i> include agreements with neighboring countries on mutual assistance during a crisis, as well as ensuring the import of increased volumes of electricity to replace gas-fired power plants during a crisis.	GGTC/GSE/GOGC
	Market	<i>In the medium term</i> it is recommended to modernize the infrastructure to ensure the physical reverse flow of gas from neighboring countries and/or to ensure the virtual reverse flow of gas from Turkey or EU countries through the existing gas intake point at the MS (Measurement Station) or through its modernization.	GGTC/TSO/GOGC
	Market	<i>In the long term</i> it is recommended to plan joint measures with 'Gazprom Armenia' (within the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovyan) underground gas storage or from Iran (via swap arrangements).	GGTC/Ministry/GOGC
<b>7. Breach/Termination of Contractual Agreements</b>	Market	<i>A short-term preventive measure</i> includes agreements with 'Gazprom' and 'Gazprom Armenia' regarding the supply of supplemental gas during a crisis and/or retaining a portion of the gas intended for transit to Armenia.	GGTC/GOGC
	Market	<i>In the medium term</i> , it is recommended to secure a Supplemental Gas Agreement with Azerbaijan from the Shah Deniz field and to extend the validity of the existing long-term contract with SOCAR beyond 2026 and 2030, respectively.	GOGC/Ministry

	Market	<b><i>In the long term</i></b> In the long term, it is recommended to plan joint measures with 'Gazprom Armenia' (within the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovyan) underground gas storage or from Iran (via swap arrangements).	GGTC/Ministry/GOG C
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**Table 36 Risk Assessment Matrix at the National Level in Case of Implementation of Planned Preventive Measures**

Duration + volume of unsupplied gas in an hour (m3)	Economic impact + qualitative criteria	Total impact	≥0.9	0.5 - 0.9	0.2 - 0.5	0.1 - 0.2	0.02 - 0.1	<0.02
			Almost inevitable	High	Average	Low	Very low	Almost impossible
			6	5	4	3	2	1
5	5	25						
5	4	20						
4	5	20						
4	4	16						
3	5	15						
5	3	15						
4	3	12						11,16
3	4	12						
5	2	10						
2	5	10						
3	3	9						
4	2	8						
2	4	8						
3	2	6						24
2	3	6					25	
1	5	5						
5	1	5						
4	1	4						
1	4	4						
2	2	4				23	18, 19	
3	1	3						
1	3	3						1
2	1	2						
1	2	2				5		12
1	1	1			9	6, 10	3, 8, 14, 17	2, 4, 7, 13, 15, 20, 21, 22

**Table 37 The Comprehensive Effect of Implementing Preventive Measures<sup>77</sup>**

N <sup>(1)</sup>	Impact on the Internal Gas Market and Consumers	Impact on the Economy and Environment
1	Ensures the stability of market operations and guarantees the supply of gas to customers in the Western and Northern regions,	thereby reducing the negative impact on the economy by approximately <b>≈102 mln GEL</b>
2	It ensures the uninterrupted operation of the Russian gas supply infrastructure and will facilitate the guaranteed supply of Russian gas to the country's consumers.	It ensures the elimination of significant negative environmental impacts, including those outside the pipeline safety and protection zones.
3	It ensures the replacement of infrastructure that is at risk or damaged during a crisis, as well as the guaranteed supply to consumers in the event of a crisis caused by political instability in the supplier country	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant

<sup>77</sup> (1). The column 'N' provides the numbering used in the risk assessment document and the list of preventive measures

4	It provides for the allocation of a portion of transit volumes to the local market during a crisis, ensuring a guaranteed gas supply to consumers in the event of a crisis caused by political instability in the supplier country	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
5	In the event of a potential crisis caused by a terrorist attack, it provides for the uninterrupted supply of gas to the market through reverse flows from neighboring countries or from a backup storage facility. It also includes an increase in electricity imports to address the shortfall in gas demand. As a result, the comprehensive set of short-, medium-, and long-term measures will ensure the guaranteed energy supply to the country's consumers.	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
6	Preventive measures will ensure the guaranteed supply to the market through alternative gas sources or from backup storage, as well as through increased electricity imports. As a result, all consumers in the country will be guaranteed a gas supply, regardless of any crisis caused by commercial events	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
7	Preventive measures include ensuring the guaranteed functioning of the market by extending the duration of long-term contracts, thereby achieving a guaranteed gas supply for all consumers in the country, regardless of any crisis caused by commercial events	The guaranteed functioning of the market is ensured, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
8	The recommended continuous and reliable communication between market participants, specifically between infrastructure operator companies in Georgia and neighboring countries, will ensure the sustainability of market operations and guarantee the supply of gas to all consumers in the country.	The sustainable functioning of the market is ensured, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
9	The recommended measures will ensure the guaranteed functioning of the market during potential gas shortages by ensuring the unconditional fulfillment of contractual obligations and, more broadly, by reducing gas consumption for electricity generation through the use of renewable resources and replacing low-efficiency gas-fired plants with modern combined-cycle power plants (CCPPs). The implementation of these measures will ensure the guaranteed gas supply to all consumers in the country	The guaranteed functioning of the market is ensured, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
10	The recommended measures will ensure the guaranteed functioning of the market during potential gas shortages by ensuring the unconditional fulfillment of contractual obligations and, more broadly, by reducing gas consumption for electricity generation through the use of renewable resources and replacing low-efficiency gas-fired plants with	The guaranteed functioning of the market is ensured, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant

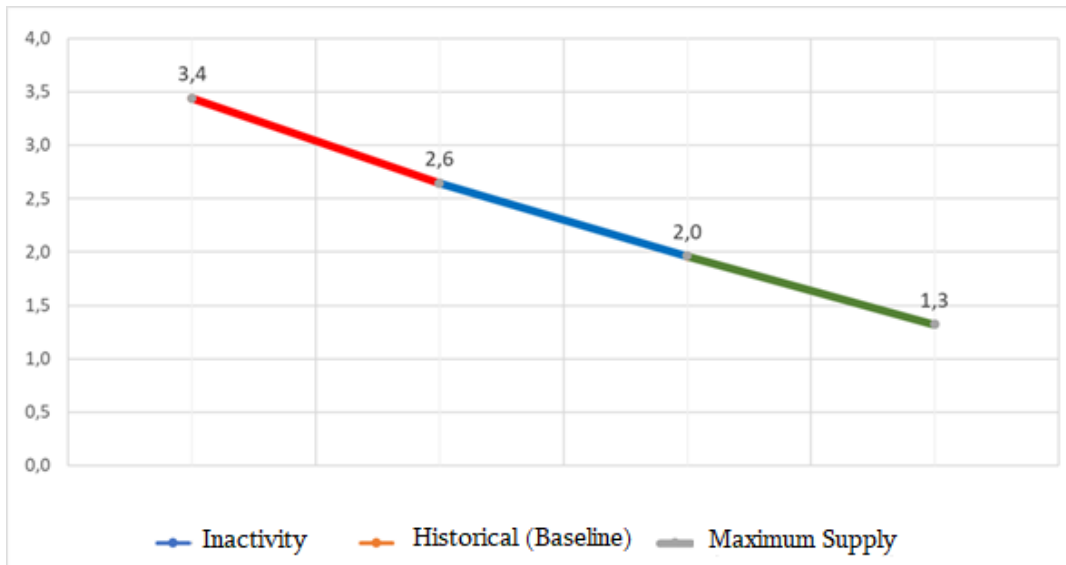
	modern combined-cycle power plants (CCPPs). The implementation of these measures will ensure the guaranteed gas supply to all consumers in the country	
11	The recommended measures will ensure the guaranteed functioning of the market during potential gas shortages by ensuring the unconditional fulfillment of contractual obligations and, more broadly, by reducing gas consumption for electricity generation through the use of renewable resources and replacing low-efficiency gas-fired plants with modern combined-cycle power plants (CCPPs). The implementation of these measures will ensure the guaranteed gas supply to all consumers in the country	The guaranteed functioning of the market is ensured, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
12	The recommended measures will ensure the guaranteed gas supply to the market through the rehabilitation or renewal of at-risk infrastructure, thereby fulfilling the commitment to provide consumers with a reliable gas supply without risk	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
13	It includes provisions for the market's timely response to anticipated or ongoing crises, ensuring that consumers are prepared for potential disruptions in gas supply during crisis situations related to natural events.	The timely response of the market to anticipated threats is ensured, with an overall positive impact. A direct quantitative assessment of the economic or environmental impact is not relevant
14	It includes provisions for the market's timely response to anticipated or ongoing crises, ensuring that consumers are prepared for potential disruptions in gas supply during crisis situations related to natural events.	The timely response of the market to anticipated threats is ensured, with an overall positive impact. A direct quantitative assessment of the economic or environmental impact is not relevant
15	It includes provisions for the market's timely response to anticipated or ongoing crises, ensuring that consumers are prepared for potential disruptions in gas supply during crisis situations related to natural events.	Provisions are made to ensure the market's timely response to anticipated threats, with an overall positive impact. A direct quantitative assessment of the economic or environmental impact is not relevant
16	It ensures the uninterrupted functioning of the market through enhanced protection of at-risk infrastructure, guaranteeing the gas supply to the country's consumers	It includes provisions for ensuring guaranteed gas supply, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
17	The recommended use of independent communication channels between the operator company's structures will ensure the uninterrupted gas supply to the market and guarantee the gas supply to the country's consumers	It will reduce the negative economic impact by approximately <b>≈92 mln GEL</b> and eliminate significant negative environmental effects, including those outside the pipeline safety and protection zones

18	It ensures the guaranteed gas supply to one of the key segments of the local market through the renewal of existing infrastructure and the construction of new facilities. As a result, the guaranteed gas supply to consumers in the regions of Western Georgia will be achieved	Provisions are made to ensure the guaranteed gas supply to the country's regions, with an overall positive impact on the economy and the environment. A direct quantitative assessment of the economic or environmental impact is not relevant
19	The uninterrupted gas supply to the market is ensured through effective infrastructure protection and preventive measures. To achieve this result, provisions are made to raise awareness among local municipal employees and consumers about the regulations for conducting economic activities within pipeline protection zones and to ensure its unconditional adherence.	thereby reducing the negative impact on the economy by approximately <b>≈19.5 mln GEL</b>
20	It ensures the guaranteed gas supply to the significant western segment of the market, providing reliable gas supply to approximately 1.5 million residents and commercial consumers connected to the western distribution network	It will reduce the negative impact on the Western Georgia economic region by approximately <b>≈87,9 mln GEL</b> and eliminate significant negative environmental effects, including those outside the pipeline safety and protection zones
21	It facilitates the smooth functioning of the market and ensures the uninterrupted gas supply to consumers	It will reduce the negative economic impact by approximately <b>≈33 mln GEL</b> and eliminate significant negative environmental effects, including those outside the pipeline safety and protection zones
22	It ensures the reliability of operations for one segment of the market through the organization of ring-based gas supply. As a result, the guaranteed gas supply to consumers in the important Borjomi-Bakuriani resort and recreational zone will be achieved, as well as its preparedness for potential disruptions in gas supply during crisis situations related to natural events	It will reduce the negative economic impact by approximately <b>≈67 mln GEL</b> and eliminate significant negative environmental effects, including those outside the pipeline safety and protection zones
23	It ensures the guaranteed gas supply to the significant western segment of the market, providing reliable gas supply to approximately 1.5 million residents and commercial consumers connected to the western distribution network	It will reduce the negative economic impact by approximately <b>≈75,4 mln GEL</b> and decrease the significant negative environmental effects to a localized, limited area

**Table 38 Modification of the Risk Assessment Matrix for the Current Period in the Scenarios of Inaction, Historical (Baseline) and Maximum Supply, and Implementation of Planned Preventive Measures**

	Negligible	Insignificant	Significant	Critical	Catastrophic
Inactivity	0	1	19	5	0
Historic (Baseline)	5	3	16	1	0
Maximum supply	12	3	9	1	0
Preventive Measures	17	8	0	0	0

**Chart 21 The Impact of Preventive Measures on the Variability of the Conditional Indicator of Crisis Severity**



As the analysis shows, the implementation of the planned preventive measures significantly mitigates the negative impact of the risks. Specifically, in the event of the implementation of the planned preventive measures, using a 5-point evaluation system:

- Taking into account the historically recorded maximum supply from gas receiving points, there is a risk at the national level of 1 critical and 16 significant damaging effects occurring;
- The system has the potential to significantly mitigate the impact of risks by fully leveraging the technical capacity of cross-border receiving points, provided that appropriate agreements are established with transmission system operators and importing companies in neighboring countries. As the analysis shows, in such a case, the proportion of risks that trigger less damaging, minor, and insignificant effects has increased to 53% of the total, compared to 32% in the baseline scenario;
- In the event of the implementation of the measures outlined in the preventive action plan, all identified risks will shift into the category of less damaging effects.

To oversee the implementation of preventive measures and regularly address issues related to supply security, it is recommended to establish a dedicated working group. This group should convene under the ministry's leadership as necessary, but no less than once every 6 months.

## 6. Other Measures and Obligations

Measures that are not linked to the implementation of infrastructure projects or other investment-heavy activities play a significant role in risk prevention and, more broadly, in ensuring the security of gas supply. The table outlines various measures, detailing not only the responsibilities of system operator companies but also those of other enterprises, organizations, and government agencies tasked with ensuring a reliable gas supply. The mentioned activities are primarily ongoing in nature.

**Table 39 Measures Impacting the Assurance of Gas Supply Security**

<i>Event</i>	<i>Time of Realization</i>	<i>Responsible for Execution</i>
Strengthening the Security of the Central (Saguramo) Node of the Transmission System	Medium-Term	GGTC
Strengthening the Security of the Central (Saguramo) Node of the Transmission System and the Main Gas Pipelines Located Near the Temporarily Occupied Tskhinvali Region	Medium-Term/Ongoing	GGTC /MIA Strategic Pipeline Protection Department
Agreements with Neighboring Countries' System Operators on Mutual Assistance During a Crisis	Medium-Term	GGTC/GOGC
Ensuring an Increase in Electricity Imports During a Crisis to Replace Gas-Fired Thermal Power Plants.	Short-Term Ongoing/Continuous	GSE
Planning Joint Measures with "Gazprom Armenia" (within the framework of Intergovernmental Economic Cooperation) Regarding Gas Supply from Armenia's Underground Gas Storage or Iran	Long-Term	Ministry
Extending the Term of the Existing Long-Term Contract with "Socar" and Contracting Supplemental gas from SCM or Initiating New Supply Contracts.	Medium-Term	Ministry/GOGC
Ensuring the Achievement of Gas Sector Development Targets Defined by Georgia's Energy Policy and the National Energy and Climate Plan through the Utilization of Renewable Energy Sources and the Implementation of Energy Efficiency Measures	Ongoing/Continuous	Ministry
Continuing the Integration Process with the Energy Community and Other European Economic Structures	Ongoing/Continuous	Ministry
Facilitating Measures for the Diversification of Natural Gas Supply, Including the Initiation of LNG Swap Contracts with EU Countries and Turkey Along the Route of the Southern Gas Corridor Pipelines	Long-Term	Ministry/GOGC
Refining Legislation Against Third Parties, Whether Physical or Legal Entities, that Damage Infrastructure. Informational-Preventive and Awareness-Raising Actions	Medium-Term/Ongoing	Ministry/Local Municipalities/GGTC

Assessment of the appropriateness of introducing 'continuous' and 'intermittent' gas supply contracts, and, if necessary, determination of legislative and fiscal issues	Medium-Term	GNERC/GGTC
Establishment of a service for the permanent acquisition of information and creation of a database for monitoring climate and proactive response to anticipated natural disasters	Medium-Term/Ongoing	GOGC

## 7. Infrastructure projects

### 7.1. Initial identification of projects

Effective planning and execution of rehabilitation and modernization efforts for the main sections and individual branches of the main gas pipeline system are crucial for improving the system's operational flexibility and reliability. This will ensure the seamless and efficient distribution of projected gas volumes throughout the entire country.

Infrastructure projects can be conditionally categorized into four main categories based on its nature and purpose:

- Projects aimed at ensuring the country's unified gas supply system through diversified gas supplies and enhancing system reliability;
- Projects aimed at ensuring guaranteed gas supply to all regions of the country and developing industrial-economic zones;
- Rehabilitation projects aimed at enhancing the operational Long-term resilience and technological reliability of specific sections and equipment of the main gas pipeline;
- Rehabilitation projects aimed at enhancing the systemic reliability of transportation infrastructure.

For the prioritized allocation of infrastructure projects over time, the following criteria are primarily considered:

1. Infrastructure that has sustained damage and is currently non-operational, necessitating urgent restoration, or infrastructure, the continued operation of which poses a risk due to inadequate technical reliability;
2. Infrastructure with insufficient throughput capacity that cannot ensure guaranteed gas supply during forecast peak loads, or infrastructure with inadequate flexibility (in terms of operational recovery after a failure);
3. Infrastructure designated for new development or rehabilitation-reconstruction, evaluated based on its potential impact on national energy security and economic growth;
4. The potential impact quality of infrastructure on ensuring international energy security and on the natural and social environment.

The table presents a list of pre-selected projects, for the rehabilitation/construction of main gas pipelines based on the analysis.

**Table 40 Identified Ongoing and Potentially Implementable Projects<sup>78</sup>**

Project	Current Status	Designation (Priority)	Estimated Implementation Period	Source of Funding
Branch of Kobuleti	Construction	2	Short-term	GOGC/TNO
Lekhura-Sveneti	Construction	2	Short-term	GOGC/TNO
Aragvi Air Crossing	Project	2.3	Middle-term	GOGC/TNO
Kashuri-Zestaponi	Project	1.2	Middle-term	GOGC/TNO
Akhalsikhe-Ude	Project	2	Middle-term	GOGC/TNO
SCP-Gardabani TPPs	Concept	3	Long-Term	TPPs/GGTC
Tabatskuri-Bakuriani	Concept	3	Long-Term	TNO
SCP II Receiving Point	Concept	3	Long-Term	TNO
Vale-Vani	Concept	3	Long-Term	Concerned Party

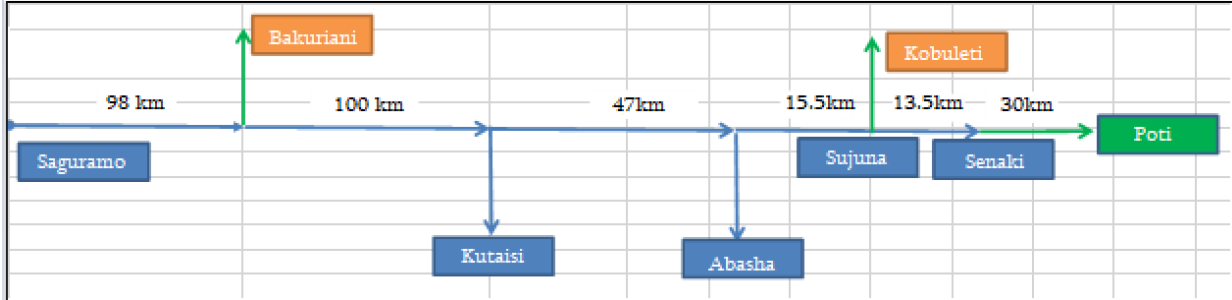
Based on a preliminary assessment, the projects prioritized for implementation in the short- and medium-term primarily include the rehabilitation of sections of the Western Route Main Gas Pipeline with insufficient throughput capacity. In the long-term perspective, the focus will be on the construction of interconnections between various branches and directions of Georgia's main gas pipelines, including the redundancy of sections located in mountainous regions that are difficult to access in adverse weather conditions, where rapid rehabilitation is challenging in the event of a potential accident.

Based on the conducted hydraulic calculations, challenges associated with the distribution of natural gas have been identified for certain critical supply routes and branches. Specifically, analysis conducted based on the results of hydraulic modeling, projected peak loads, and the age and condition of the pipelines has determined that, to meet the forecasted peak demand for the years 2030 and 2035 in Western Georgia **using the existing infrastructure along the Western (Saguramo) route**, as well as the Chorchana to Western Georgia route, the required pressure at the beginning of the pipeline exceeds the available pressure levels. Specifically, as of today, the maximum pressure recorded at the Saguramo node during peak consumption is approximately 24 atm. Due to the unfavorable condition of the existing pipelines, including the 500 mm pipelines and the aging 700 mm Chorchana-Zestaponi section, which spans 70 km and is over 40 years old, it is not possible to supply gas at the required pressure. Accordingly, the replacement of all existing 500 mm pipelines along the Saguramo-Chorchana section of the Western Route Central Mainline, as well as the "old" 700 mm Chorchana (Khashuri)-Zestaponi pipelines, with new 700 mm pipelines that have increased pressure and throughput capacity, has been planned and is currently underway. This will ensure guaranteed gas supply to the most distant and, consequently, most

<sup>78</sup> The table does not display conceptual infrastructure projects currently under review

vulnerable consumers from the cross-border reception points, both within the 4-year cycle stipulated by the PAP and in the long-term perspective.

**Chart 22 Scheme for Hydraulic Modeling of the Western Route Gas Pipelines<sup>79</sup>**



**Table 41 Results of Hydraulic Calculations for Gas Supply via the Planned (DN700) Pipelines in the Western Direction (up to Poti), Considering the Projected Peak Demand for 2035 (Forecasted Extreme Consumption ExC Scenario)**

Name of area	DN, mm	L, km	P <sub>init.</sub> , Bar	P <sub>last.</sub> , Bar	ΣQ <sub>Max.</sub> , M3/d.n.
Saguramo-Khashuri (+Bakuriani)	DN700	98	21,9	16,6	4 092 083
Khashuri-Kutaisi	DN700	100	16,6	12,9	
Kutaisi-Abasha	DN700	47	12,9	12,1	
Abasha-Sujuna (+Kobuleti)	DN700	15,5	12,1	12,0	
Sujuna-Senaki-Poti	DN700	43,5	12,0	12,0	

**Adjara Branch and Poti Direction**

As of today, gas is supplied to Adjara via the Sujuna-Kobuleti branch, which has a diameter of 500 mm and a length of 62 km (67 km in total up to the Adjara border). Its construction was completed in 1990. The pipeline begins in the village of Sujuna in the Abasha Municipality and terminates south of the village of Ochkhamuri in the Kobuleti Municipality (at kilometer 67). The condition of the existing pipelines at several locations (including sections prone to landslides near the village of Sameba, areas situated in swampy floodplains, and the crossing of the Supsa River, among others) highly increases the expectancy of a critical situation arising, leading to the potential risk of an emergency gas supply interruption for Adjara, a region distinguished by its growing economic and tourism infrastructure.

The construction of a new gas pipeline on the Adjara branch, with a route modification and using a 500 mm diameter, is currently underway. Based on the 2022 data from distribution companies, the projected total peak consumption for subscribers connected to the Adjara branch, including those in the Adjara and Guria regions, is approximately 1 mln m<sup>3</sup>/per day. Based on the analysis of the preliminary studies and hydraulic calculation results, it has been determined that upon completion of the project, guaranteed

<sup>79</sup>It is assumed that each delivery point indicated on the scheme receives the total demand of all consumers upstream of that point.. The percentage distribution by points has been determined based on the actual data from 2023, with minor adjustments.

gas supply to Adjara will be ensured at the required pressure (minimum 12 bar in Salibauri) with consideration of long-term consumption forecasts.<sup>80</sup>.

**Table 42 Results of Hydraulic Calculations for Gas Supply via the Planned (DN700) Western Route Pipeline and the Under-Construction (DN500) Kobuleti Branch, Considering the Projected Peak Demand for 2035.**

Name of area	DN, mm	L, km	P <sub>Init.</sub> , Bar	P <sub>Last.</sub> , Bar	ΣQ <sub>Max.</sub> , m <sup>3</sup> /d.n.
Saguramo-Khashuri (+Bakuriani)	DN700	98	24.0	19.3	4 092 083
Khashuri-Kutaisi	DN700	100	19.3	16.2	
Kutaisi-Abasha-Sujuna	DN700	62.5	16.2	15.4	
Sujuna-Kobuleti	DN500	60.5	15.4	13.8	
Kobuleti-Salibauri	DN400	24	13.8	12.0	

**Table 43 Summary of Hydraulic Calculation Results for Gas Supply Parameters in the Western Direction up to Poti, Considering Long-Term Projected Peak Consumption.**

Year	Scenario ExC			Scenario SwM		
	P <sub>1</sub> , bar	P <sub>2</sub> , bar	Q <sub>peak</sub> , mlnm <sup>3</sup> /per day	P <sub>1</sub> , bar	P <sub>2</sub> , bar	Q <sub>peak</sub> , mlnm <sup>3</sup> /per day
2030	21.2	12	3.91	20.5	12	3.73
2035	21.9	12	4.09	21.0	12	3.85

As the analysis of the calculation results indicates, the East-West main gas pipeline system, following the implementation of the planned and under-construction section projects, will reliably ensure peak consumption for the most vulnerable consumers in the Western direction over the long term. This will be achieved by maintaining the minimum design pressure (P<sub>2</sub>=12 bar) at the terminal points of the pipelines (Batumi and Poti), with the starting pressure (P<sub>1</sub>) being lower than the pressure actually recorded at the Saguramo node, as well as the pressure recorded at the starting point of the Kobuleti branch near the village of Sujuna.

## 7.2. Assessments Considering Peak Consumption

One of the key foundations for infrastructure planning is the supply-demand forecast. For the development of planned infrastructure projects, gas volumes have been determined based on the projected consumption parameters according to the SwM and ExC scenarios (details provided below).

<sup>80</sup> It is noteworthy that a significant portion of gas supply to consumers in the Guria Municipality will continue to be provided through the "old" pipeline, which will allow for more favorable operating conditions for the new pipeline under construction.

To select pipeline parameters for specific routes and major branches of the internal transportation system, existing consumption trends have been utilized, taking into account peak loads across the country's regions.

The design parameters for the cross-border pipelines have been taken from the drawing: "Actual and Technically Feasible Throughput Capacity of the Major Cross-Border Gas Supply Points".

Analysis of the actual statistical data from system operations and the results of forecasting indicates that, to meet the projected peak demand:

- The throughput capacity of the North-South Main Gas Pipeline system will be sufficient to accommodate long-term projected loads, provided that systematic monitoring of specific sections of the Kazakhi-Saguramo pipeline is conducted and timely rehabilitation is carried out as needed to bring its technical condition closer to design specifications;
- The total maximum throughput capacity of the new 700 mm pipeline from the Azerbaijan border to Saguramo, along with the parallel 700/800 mm pipeline, is sufficient to transport the gas required for the Western and Northern directions at the necessary pressure and volume. However, this also requires ensuring an adequate supply of gas from Azerbaijan.
- After the completion of the planned rehabilitation and reconstruction program in the Saguramo-Western direction by 2030, which involves fully equipping the route with 700 mm nominal diameter pipelines and maintaining the minimum pressure of 12 bar required for industrial enterprises in the Poti industrial zone and the Batumi receiving point (near Salibauri), the excess pressure at Saguramo is projected to equal approximately 22-24 bar. This pressure level can be maintained using the existing infrastructure. At the same time, the Chorchana (Khashuri)-Zestaponi section, located in a mountainous pass with rugged terrain and harsh climatic conditions (heavy snowfall), was constructed in 1974-75. Considering historical experience, the sharp decline in the technological reliability<sup>81</sup>, of pipelines over 45 years old, and the very high likelihood of failure, as well as the difficulties in executing rapid repairs in case of an emergency, it has been deemed advisable to prioritize the implementation of the project for this mountainous section. This priority also includes the replacement of the 500 mm sections from Saguramo to Natakhtari and Lekhura to Sveneti with new 700 mm pipelines.
- Due to the high likelihood of a critical failure of the existing Gomi-Khashuri-Bakuriani gas pipeline and the challenges in meeting long-term peak demand under restricted pressure conditions in the degraded pipelines upon restoration, it is advisable to consider its modernization or ensure an alternative supply route. The implementation of the alternative supply route, through the new Tabatskuri-Bakuriani gas pipeline project, will eliminate issues related to pressure limitations, ensure uninterrupted gas supply in the event of existing infrastructure failure, and significantly improve gas supply to the Borjomi-Bakuriani recreational zone. The implementation of the Bakuriani-Tabatskuri project also enables the temporary emergency supply of gas to central (or southern) regions of Georgia in a critical situation, through

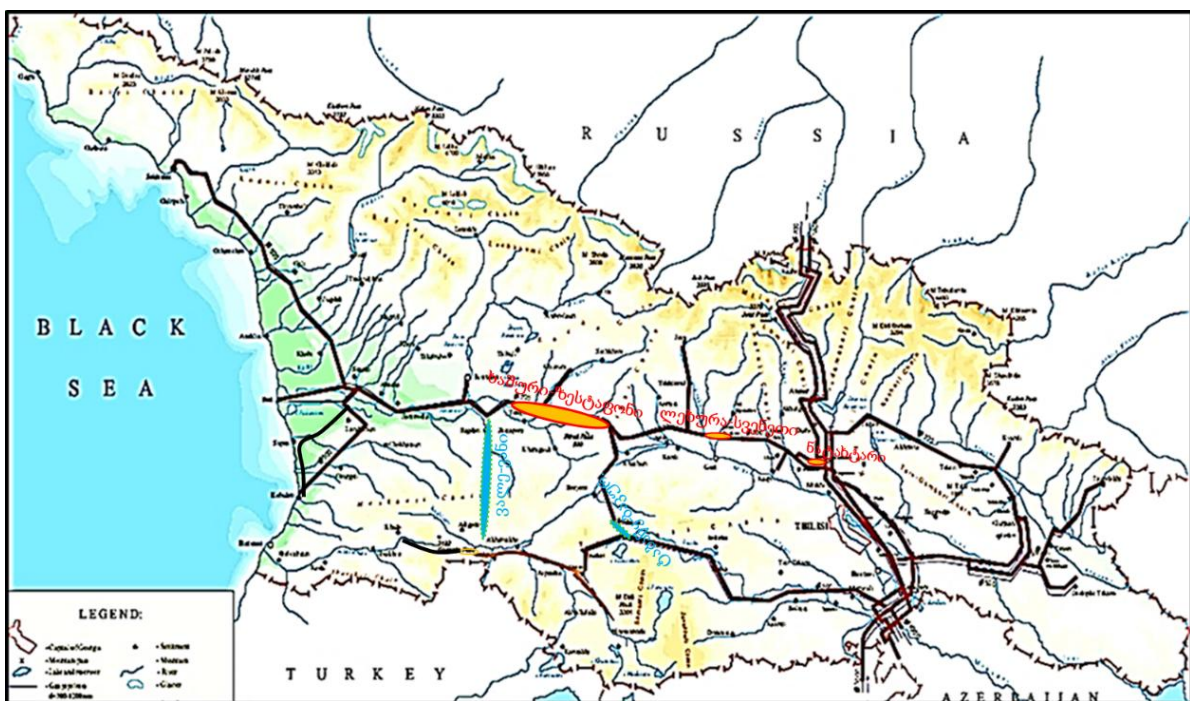
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<sup>81</sup> Sources: Gas Pipeline Incidents, 1970-2013, EGIG, 2015 (Primary Source); Teimuraz Gochitashvili, Oil and Gas Sector of Georgia in the Transition period, Tbilisi, "Meridiani", 2020

a contingency scheme. This would involve connecting the 160 km "Red Bridge-Tsalka-Akhaltsikhe" pipeline from the South Georgia gas supply system to the 90 km Saguramo-Kutaisi main gas pipeline from the East-West main gas pipeline system (at the Gomi-Khashuri-Bakuriani branch connection point), or vice versa.

- To ensure the supply to the Southern Branch, including the mountainous regions of Adjara, during long-term projected peak demand, it is advisable to replace the 200 mm Akhaltsikhe-Ude pipeline, which is currently designed with distribution network parameters, with a<sup>82</sup> 300 mm 16 km long main pipeline.
- Ensuring peak throughput capacity in the Kakheti and Northern directions during the assessment period is feasible using the existing pipelines without changing the nominal diameter. Only localized restoration work may be required on these pipelines.

**Chart 23 Critical Sections of the Main Gas Pipeline System and Identified Prospective Projects**



### 7.3. Ongoing, Planned, and Future Projects

*In the short and medium term*, priority investment infrastructure projects include the rehabilitation of critical sections of the East-West Main Gas Pipeline and the complete upgrade to 700 mm diameter pipelines. This will ensure guaranteed gas supply to the population, commercial sector, and industry in the western and central regions of the country, including consideration of the development prospects for emerging industrial zones and the Black Sea coastal recreational area. Additionally, during the construction of new pipelines or the reconstruction of existing ones, the focus has been on utilizing high-pressure pipelines (with a design pressure of up to 55 bar) wherever possible. This approach ensures an increase in the system's throughput capacity proportional to the pressure increase, without significantly

<sup>82</sup> Above-Ground Pipeline Sections Are Located in Populated Areas

altering costs, and aligns with the best international practices in modern pipeline construction. Additionally, all newly constructed sections are equipped with anti-corrosion protection systems for the pipeline walls, which will significantly extend its operational lifespan.

The rehabilitation and development work on the East-West gas pipelines is prioritized and distributed as follows:

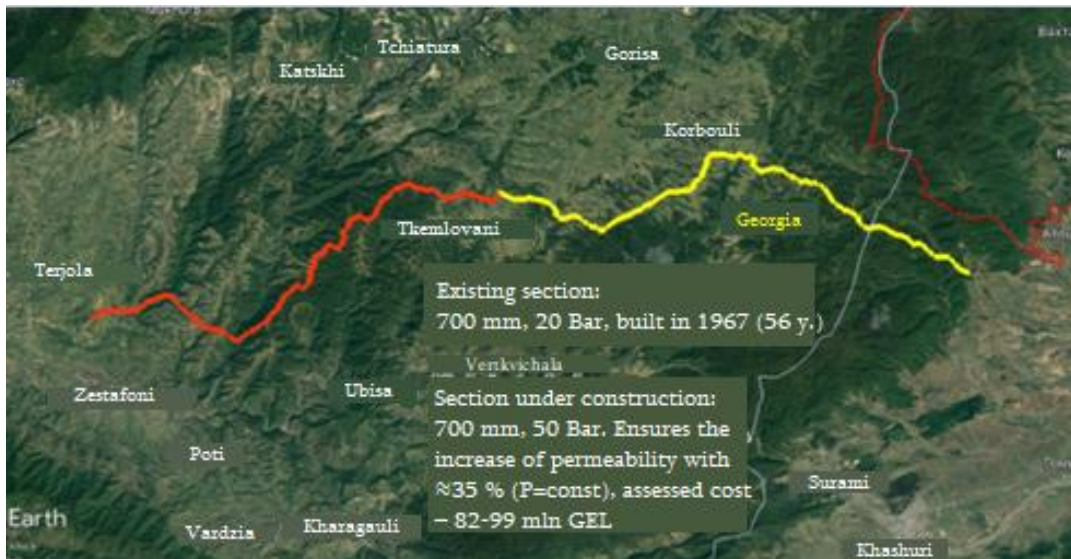
- Lekhura-Sveneti section, 20.6 km in length, scheduled for 2024;
- Natakhtari aerial crossing over the Aragvi River, 2.9 km in length, scheduled for 2025.
- Khashuri (Chorchana)-Zestaponi section, approximately 70 km in length, scheduled for 2025-2027.



Figure 1 Reconstruction of the Saguramo-Natakhtari aerial crossing, 2.9 km in length



Figure 2 the Lekhura-Sveneti section

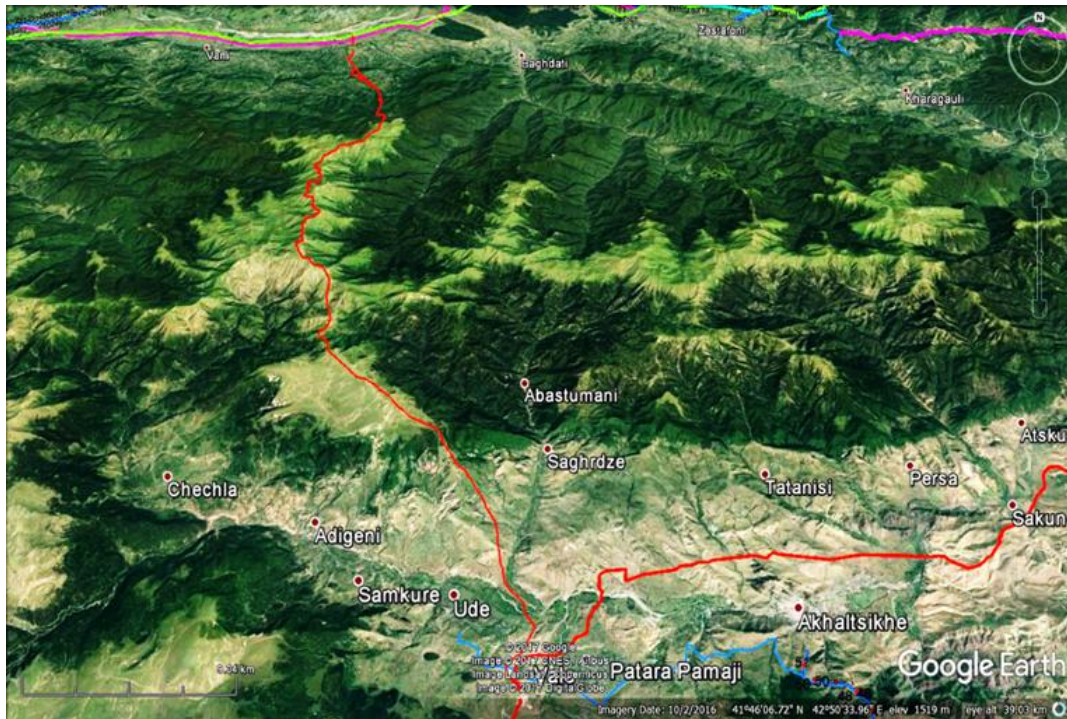


**Figure 3 Khashuri-Zestaponi Mountain Pass Section**

*The long-term infrastructure* development plan primarily includes the construction of several interconnectors (collectors), including, the Vale-Vani and Tabatskuri-Bakuriani main pipelines and the second gas reception point. The implementation of these projects will effectively complete the transformation of the dead-end architecture of the gas supply system in Western and Southern Georgia, as well as the Borjomi-Bakuriani recreational zone, into a ring-shaped supply system with a significantly higher level of security. The ring-shaped supply scheme allows for the redirection of gas flows from any supplier to any major consumer or distribution company during critical situations.

***"Vale-Vani" main gas pipeline***

One of the potential options for meeting the total demand of all potential consumers in the regions of Western Georgia, including prospective high-tech industrial projects, is the establishment of a second off-take point in Vale to receive gas from the South Caucasus Pipeline and its connection to the existing main pipeline system. The starting point of the pipeline is conditionally defined as the pressure regulation and metering station of the South Caucasus Pipeline system located near the town of Vale at the Georgia-Turkey border in the Akhaltsikhe district (Area 80, according to the South Caucasus Pipeline system project specifications). The endpoint is located in the vicinity of the village of Amagleba in the Vani Municipality. The proposed pipeline route will pass through the Adigeni and Vani districts, primarily traversing mountainous and foothill areas, as well as river terraces.



**Figure 4** The route of the proposed Vale-Vani pipeline.

The implementation of the project will enable the rational distribution of gas flows through the country's main gas pipelines, particularly as gas flows through Georgia's territory have significantly increased following the completion of the second stage of the Shah Deniz field development. Consequently, the volumes of gas purchased under the optional gas agreement related to transit have also increased. According to the current forecast, the volumes of gas supplied from the SCP are expected to reach 1,5-1,6 billion m<sup>3</sup>/year. Receiving this volume of gas through the currently existing Area 72 receiving point, which also handles the supply of gas from Azerbaijan owned by SOCAR, into the internal main gas pipelines is not practical and could create significant technical challenges in supplying consumers in the central and western regions of the country.

The implementation of the project will effectively introduce a new supply source into the country's gas supply system. With further development, this will ensure a ring-shaped gas supply within the system, significantly enhancing operational reliability. It will also improve the ability to meet the infrastructure and supply standards mandated by legislation. Furthermore, the feasibility of establishing a second off-take point on the South Caucasus Pipeline will also be linked to the implementation of prospective international transit projects, including the Black Sea LNG project,<sup>83</sup> as well as the actual pace of industrial development in Western Georgia and the growth of the Adjara resort and recreational zone.

As the analysis indicates, to accommodate the projected increase in demand from existing residential and commercial consumers, as well as the construction of new large industrial facilities in the region, the

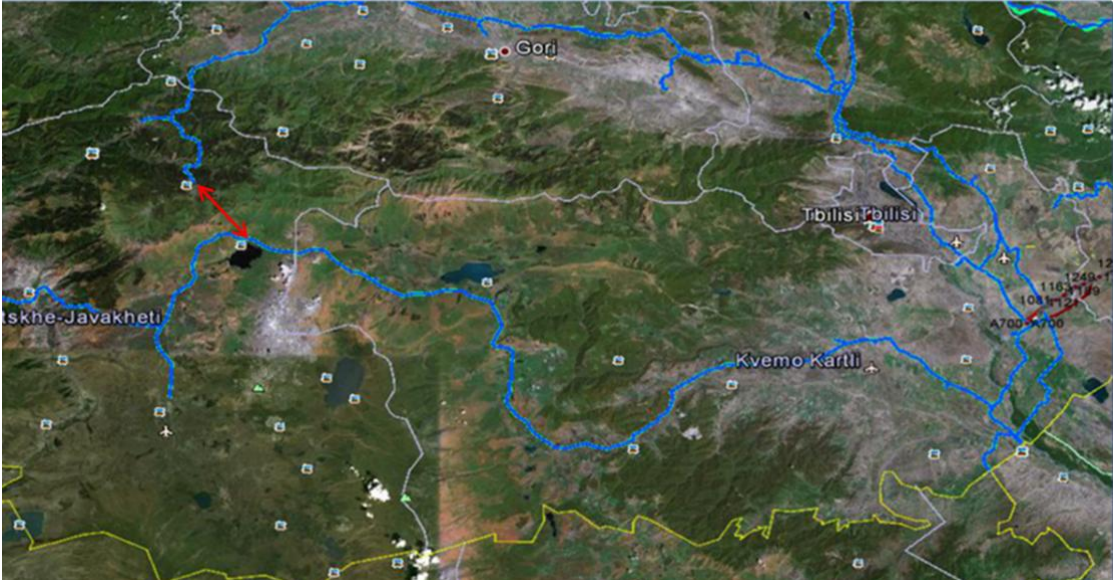
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<sup>83</sup> The project envisages the construction of a liquefied natural gas (LNG) export terminal in Poti (or another Black Sea port) and the delivery of LNG to Constanța, Romania, for further distribution to Southeastern European countries using the existing infrastructure. The possibility of constructing a new chemical plant is also being considered, with its production primarily intended for export

construction of a 500 mm diameter Vale-Vani pipeline operating at a design pressure of 55 bar will be sufficient.<sup>84</sup> For an LNG terminal with an additional capacity of up to 8 billion  $\text{m}^3/\text{year}$ , meeting the projected demand will require increasing the initial pipeline pressure to 75 bar and equipping the Vale-Vani project section with 700 mm diameter pipelines.

***Tabatskuri-Bakuriani Collector***

One of the primary purposes of the Tabatskuri-Bakuriani collector, which connects the Southern branch of the main pipelines with the western and central regions of the country, is to ensure guaranteed gas supply to the Borjomi-Bakuriani resort and recreational zone through a ring-shaped gas delivery system. Additionally, the project's implementation enables the critical supply of natural gas to the central (or southern) regions of Georgia through a temporary, emergency scheme, connecting the "Red Bridge-Tsalka-Akhaltzikhe" gas pipeline system, spanning 160 km, to the main gas pipelines of the central regions of the country or vice versa. The pipeline's design pressure is 55 bar, with a diameter of 300 mm and a length of approximately 18 km.



**Figure 5 Tabatskuri-Bakuriani Collector Scheme**

The long-term infrastructure development plan also includes the implementation of a project for high-pressure gas supply to Gardabani's TPPs via a pipeline connecting the South Caucasian pipeline with Georgia's main gas pipeline system. The project includes the construction of a 12 km long connecting pipeline with a nominal diameter of 762 mm and a new collector approximately 5 km in length for the Gardabani TPPs. This will facilitate the receipt of gas with a pressure of 38-42 bar from the South Caucasian pipeline's Area 72 pressure regulating and measurement node, thus significantly reducing operational costs associated with the gas turbine compressor station.

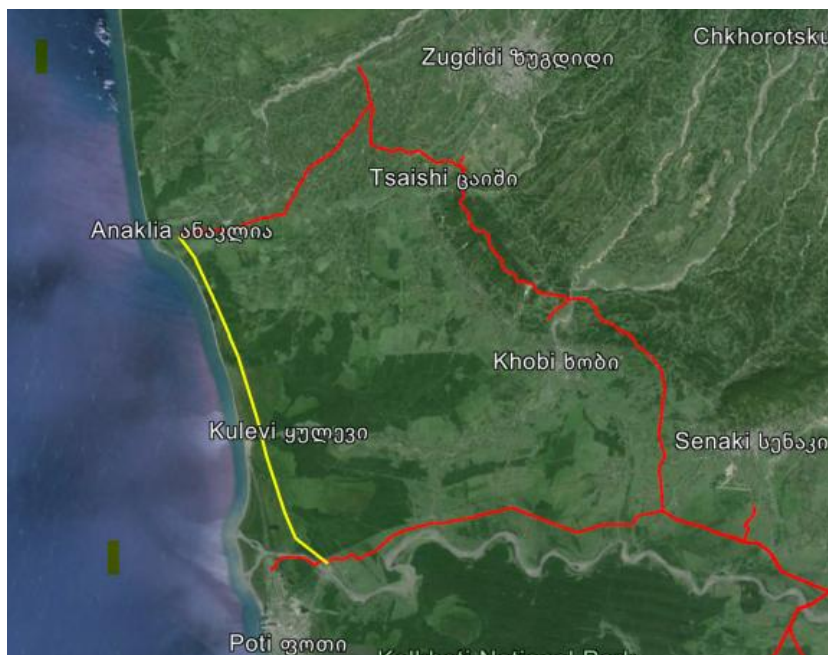
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<sup>84</sup> More detailed information on the potential throughput capacity of the pipeline and its corresponding technical parameters is provided in the document: Ten-Year Development Plan for Georgia's Natural Gas Transmission Network, 2019-2028, GOGC, 2018.



**Figure 6 Pipeline connecting the Gardabani TPPs to the SCP.**

In perspective, the potential connection of the Poti branch to Anaklia via Khulevi, using an approximately 28 km long collector, can also be considered. This would ensure a looped supply network for consumers in the Samegrelo region.



**Figure 7 Poti-Khulevi-Anaklia collector scheme**

The implementation of the restoration and development plans for Georgia's main gas pipeline system ***will lay the foundation for transforming the country's gas supply system from a dead-end architecture to a highly reliable circular (looped) supply network.*** This will allow for the redirection of gas flows in critical situations, ensuring guaranteed gas supply to any consumer and significantly enhancing the operational scope and technological reliability of Georgia's unified gas supply system.

## Southern branch

As the results of the hydraulic calculations indicate, the existing pipeline system of the Southern Branch ensures the guaranteed supply of gas to Georgia (specifically to the municipalities of Marneuli, Tetrtskaro, Bolnisi, Dmanisi, Tsalka, Akhalkalaki, Ninotsminda, Aspindza, Akhaltsikhe, and Adigeni) and to Adjara (specifically to the resort areas in Khulo Municipality, including Beshumi and Goderdzi) during the forecasted peak consumption period in the long term (up to 2035). The diagram presents the hydraulic modeling calculation scheme of the Southern Branch under the forecasted peak consumption conditions for the year 2030.

Chart 24 Calculation scheme

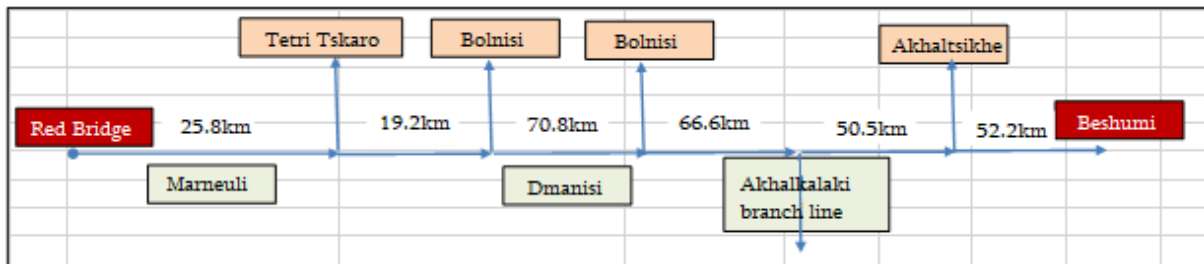


Table 44 Results of the hydraulic calculation for the Southern Branch

Name of area	DN, mm	L, km	P <sub>init.</sub> , Bar	P <sub>last.</sub> , Bar	ΣQ <sub>Max.</sub> , m <sup>3</sup> /d.n.
Marneuli-Tetrtskaro	DN500	25,8	16,6	16,5	523 157
Tetrtskaro-Bolnisi	DN300	19,2	16,5	15,8	
Bolnisi-Tsalka	DN300	70,8	15,8	13,9	
Tsalka-Akhalkalaki branch-line	DN300	66,6	13,9	12,2	
Akhalkalaki branch-line - Akhaltsikhe	DN300	50,5	12,2	12,0	
Akhalsikhe-Ude-Adigeni-Beshumi	DN200	19,3	12,0	12,0	
	DN300	32,9	12,0	12,0	

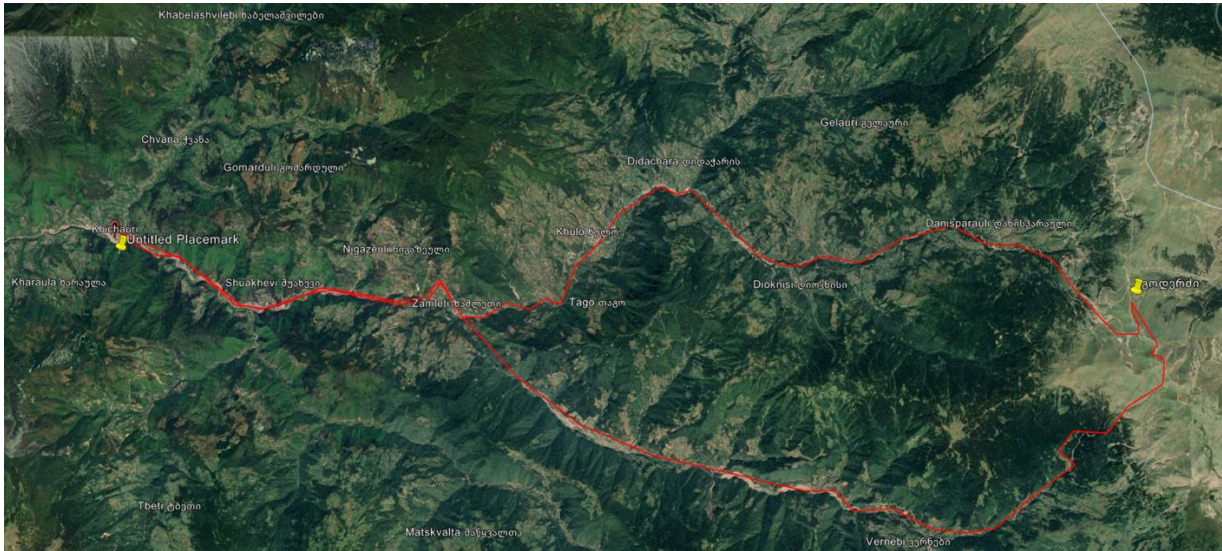
Additionally, the 22 km section of the Southern Branch from Akhaltsikhe to Ude, which includes segments with reduced diameter, is subject to reconstruction. This section extends to connect with a 300 mm main pipeline leading to the Goderdzi Pass, starting from 19.3 km. The section is located within populated areas, disregarding safety requirements. Additionally, in the long term, it is possible to supply gas to the consumers of Khulo and Shuakhevi municipalities in the mountainous Adjara region via an approximately 50 km, 150 mm<sup>85</sup> diameter pipeline connecting Goderdzi to Khichauri (Shuakhevi Municipality). As a result, gas access will be available to the consumers of Khulo and Shuakhevi municipalities, and the opportunity will be created to transition the entire Adjara region from a dead-end to a ring supply scheme. This is particularly important during winter peak consumption conditions when it becomes challenging to guarantee gas supply through the low-pressure distribution pipeline installed from the Salibauri gas receiving station of the Kobuleti branch to Khichauri. The reconstruction

<sup>85</sup> The diameter has been selected considering the required capacity and the need to minimize costs

of the Akhaltsikhe-Ude section involves changing the route and diameter. The estimated cost of the project for the new 16 km long and 300 mm diameter gas pipeline is approximately 6 mln ₾-GEL.

**Table 45 Results of the Hydraulic Calculation for the Southern Branch After the Construction of the Beshumi-Shuakhevi Pipeline**

District name	DN, mm	L, km	P <sub>Init.</sub> , bar	P <sub>Fin.</sub> , bar	ΣQ <sub>max.</sub> , m <sup>3</sup> /day
Marneuli-Tetritskaro	DN500	25.8	19.0	18.8	557,632
Tetritskaro-Bolnisi	DN300	19.2	18.8	18.1	
Bolnisi-Tsalka	DN300	70.8	18.1	16.0	
Tsalka-Akhalkalaki branch	DN300	66.6	16.0	14.0	
Akhalkalaki branch-Akhaltzikhe	DN300	50.5	14.0	13.6	
Akhaltzikhe-Beshumi-Khulo-Shuakhevi	DN300	16	13.6	13.6	
	DN300	32.9	13.6	13.6	
	DN150	50	13.6	12.0	



**Figure 8 Proposed Routes for the Goderdzi-Khichauri Project Section (Length approximately 45-50 km, Pipe Diameter 150 mm)**

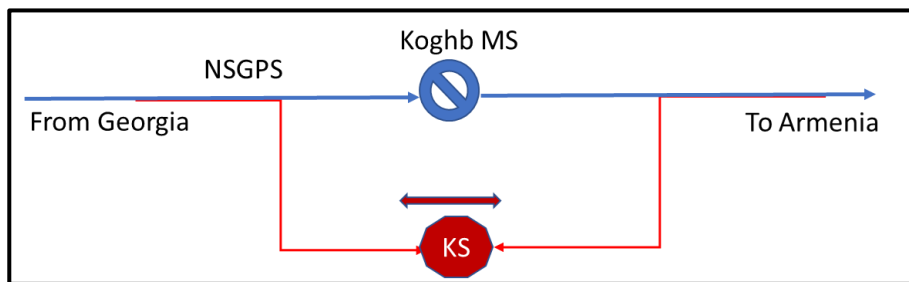
**Transboundary Pipelines and Infrastructure**

The two countries sharing land borders with Georgia—Armenia and Turkey—are net importers of natural gas and, like Georgia, require diversification of supply sources and routes. Additionally, both of these countries currently hold observer status within the Energy Community of Europe and are prospective candidates for membership. They will benefit from the assistance provided to partner countries of the Energy Community, in line with the principle of solidarity. Accordingly, connecting Georgia's internal main gas pipeline system with cross-border interconnectors to the systems of Armenia and Turkey will enable the organized reverse flow of gas, allowing for the provision of emergency assistance to partner countries in critical situations.

### a) Armenia-Georgia Interconnector

The priority option is considered to be the installation of a looping system around the border receiving-measuring node in Armenia, along with a bidirectional compressor station with a capacity of approximately 4 mln m<sup>3</sup>/day. The implementation of the project will significantly increase the capacity of the North-South Main Pipeline in the direction from Georgia to Armenia under normal operating conditions. Additionally, in the event of a gas shortage crisis in the Georgian domestic market, the project will enable the supply of gas from Armenia (from the reserves of the Abovyan underground gas storage or via transit from Iran).

Chart 25 Compressor Station Scheme



The gas supply from Georgia to Armenia will be carried out through the existing 1000 mm pipeline, with increased capacity provided by the compressor station operating in reverse mode. This setup will also facilitate the delivery of Azerbaijani gas via Georgia in the event of a gas shortage in the Armenian market. In the event of a shortage in the Georgian market, the compressor station will operate in reverse mode.

An alternative option involves the construction of a new interconnector with a total length of approximately 20 km (including 11.45 km on Georgian territory), intended to connect the Red Bridge (Georgia) and Koghb (Armenia) measuring stations. Based on the existing capabilities and intended purpose, the pipeline's design diameter could range from 300 to 500 mm, with a capacity of 1-4 million m<sup>3</sup>/day. The estimated construction cost is approximately \$9-12 million.

### b) Turkey-Georgia Interconnector

The interconnector project, with a total length of approximately 80 km (including about 3-5 km within Georgian territory), envisions the connection of a second receiving point and measuring node in Vale (Georgia) to the measuring station in Ardahan (Turkey). Based on the existing capabilities and intended purpose, the pipeline's design diameter could be up to 400 mm (16 inches), with a capacity of 1-2.5 million m<sup>3</sup>/day. The estimated construction cost is approximately \$33 million. The pipeline's design technological parameters and investment cost will be finalized during the preparation of the project's feasibility study.

The backup option for the project envisions connecting the Turkish city of Hanak to the Vale measuring node with a main pipeline approximately 50 km in length, which would reduce the investment cost by 40%.

Georgia is connected to **Russia** by the 1200 mm North-South Caucasus main gas pipeline and the 700 mm Vladikavkaz-Tbilisi main gas pipeline. However, the latter was not restored following the 2006 terrorist attack due to a unilateral decision by Russia, and currently, the country operates only the North-South Caucasus pipeline, which serves a transit function. Its technical capacity is fully sufficient to meet the long-term forecasted demand. Additionally, to ensure the guaranteed flow of gas and maintain a high level of service quality through the pipeline, it is essential to conduct periodic rehabilitation work on the mainline. This includes repair and reinforcement work on pipeline tunnels<sup>86</sup> in the Tergi River Gorge, maintenance of pipeline cleaning stations (in Devdoraki and Saguramo), restoration of anti-corrosion protection systems, and other related tasks.

The maximum pressure of gas supplied **from Azerbaijan through SOCAR's pipeline system** is limited at the border, which somewhat complicates the delivery of the required gas volumes during winter peak consumption periods. To ensure the forecasted gas volumes specified in the contractual obligations, several alternative technical solutions for increasing capacity can be evaluated, leading to a final decision. Among these, priority could be given to the installation of a new compressor station or the reconstruction and modernization of the existing one (Agdash), aimed at enhancing the capacity of the Azerbaijani section of the system.

The estimated cost of installing a compressor station with a capacity of approximately 7-10 MW, aimed at increasing the pressure of the gas supplied at the border by approximately 25-40%, is \$15-20 million (This estimate is based on a rough approximation using European data sources and may be subject to significant deviation).

Additionally, it is necessary to ensure the parallel operation of the existing 800/700 mm Karadaghi-Tbilisi and 700 mm Border-Gardabani-Natliugi-Saguramo pipelines during peak load periods. In such a case, the total capacity of the pipelines located on the Azerbaijan border to Saguramo segment would nearly double, with minimal pressure losses.

### **Rehabilitation Works in Georgia's Temporarily Occupied Regions**

Rehabilitation works are planned to be carried out in Georgia's temporarily occupied regions, following the resolution of the political conflict. The implementation of these projects, in addition to providing economic benefits, will also contribute to addressing significant social and political challenges and will facilitate the reintegration of these regions into Georgia's economic space.<sup>87</sup>

Additionally, the restoration of the 110 km long, 500 mm diameter Zugdidi-Sukhumi main gas pipeline (with branches: in Gali - D=325 mm, L=3.4 km, in Ochamchire - D=529 mm, L=1.5 km, and in Sukhumi - D=529 mm, L=0.5 km) will enable the supply of affordable and easy-to-use fuel resources to the gasified

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<sup>86</sup> For detailed information on the results of the pipeline tunnel condition assessment, please refer to the report titled "Preliminary Study Results of the Technical Condition of the North-South Caucasus Main Gas Pipeline at Tunnel #1 Located on the Russia-Georgia Border," GOGC, 2017, available in the corporation's electronic archive (SharedFolder (\\datasrv) (X:) General Directorate - Department of Strategic Planning and Projects

<sup>87</sup> The presented plan does not include the funding considerations for the planned restoration works in the temporarily occupied territories

towns and districts of Abkhazia. This will also promote the rational distribution of electricity generated by the Enguri Hydroelectric Power Station between consumers<sup>88</sup> in Abkhazia and the rest of Georgia.

### **SCADA system**

The gas pipelines are planned to be equipped with a modern Supervisory Control and Data Acquisition system (SCADA). It is essential to highlight the current operational characteristics of Georgia's main gas pipelines, where many segments are operating under non-design regime parameters. Consequently, the maintenance of these pipelines using a high-tech control system will be practically unfeasible until the infrastructure is fully upgraded. Accordingly, before planning the project to equip the system with SCADA, it is essential to conduct a preliminary technical analysis to determine the practical feasibility of its implementation and identify the optimal configuration.

## **7.4. Alternative Gas Reserve Projects**

Under winter peak consumption conditions the country does not have the ability to independently compensate for gas shortages arising from the unplanned disruption of supply from any major source, which could lead to the risk of a critical situation<sup>89</sup>.

To prevent significant disruptions in the supply of heating and electricity to consumers, it is recommended to consider various means and/or methods of gas reserves.

A strategic underground gas storage facility is considered one of the most effective means of gas reserves. A feasibility study for an underground gas storage project has been developed based on the depleted oil reservoir in the Samgori South Dome or the active gas-oil field in Ninotsminda<sup>90</sup>.

The development of the underground gas storage project is currently on hold due to several key reasons:

- To combat the COVID-19 pandemic, the Georgian government decided to redirect €120 million from the loan allocated by the German KfW for the construction of the gas storage facility to the state budget to address social and healthcare-related issues.
- Preliminary studies revealed the complex geological structure of the reservoir and the surrounding subsurface, which, if the existing project is implemented, poses a significant risk due to the high safety concerns associated with induced seismicity.
- The required construction cost under the existing project is nearly twice the average cost of implementing similar projects. The chances of securing a new multimillion-euro loan (approximately up to €400 million) to finance the gas storage project are practically zero.

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<sup>88</sup> This refers to the partial replacement of the traditionally supplied electricity in Abkhazia with natural gas

<sup>89</sup> Samgori South Dome Underground Gas Storage, Feasibility Study Report, Task 10: Final report and recommendation for next step, GEOSTOCK Entrepose, April, 2016

<sup>90</sup> Samgori South Dome Underground Gas Storage, Feasibility Study Report, Task 10: Final report and recommendation for next step, GEOSTOCK Entrepose, April, 2016

At the same time, efforts have begun to identify an alternative system/structure/method with more cost-effective and flexible technological parameters for creating a gas reserve. To this end, with funding from the United States Agency for International Development work has commenced on the project "Balancing Gas Consumption Imbalances in Georgia to Support the Georgian Oil and Gas Corporation" under the "Fair and Secure Energy Transition Program" (JSET, #7200AACA0028). The primary goal of the project is to develop recommendations for selecting methods and means of natural gas reserves to ensure the balancing of seasonal and operational imbalances in gas demand. The plan includes determining the feasibility of supplying natural gas from alternative sources to cover the anticipated supply deficit due to trends in demand and the expiration of existing contracts. Additionally, it involves selecting alternative means to balance seasonal and operational imbalances in gas demand, including: The implementation of an underground gas storage facility, the establishment of liquefied natural gas (LNG) or compressed natural gas (CNG) storage facilities, or the initiation of gas mutual assistance projects with neighboring and Energy Community countries, to balance peak demand.

Projects associated with liquefied or compressed gas include:

- The construction of a small-scale LNG storage and regasification facility on Georgia's Black Sea coast, which will be connected to the BS LNG project, if it is realized<sup>91</sup>;
- The construction of a receiving and regasification (or decompression) terminal for liquefied (or compressed) gas on Georgia's Black Sea coast, which will receive products from Turkey's Marmara Ereğlisi LNG terminal (or CNG facility) using small-tonnage maritime vessels (barges);
- The construction of a complex of small-scale facilities for the production, storage, and decompression (regasification) of compressed (or liquefied) gas, which will be supplied with raw materials from Georgia's main gas pipeline system.
- An LNG-to-pipeline gas (swap) agreement with a country connected to the Southern Gas Corridor, which involves a virtual reverse flow of gas from the West towards Georgia. The concept involves supplying LNG to receiving terminals in Turkey (Marmara Ereğlisi), Greece (Revithoussa), or Italy (Livorno) with financing from Georgia. In exchange, Georgia would receive pipeline gas from the partner country's share of natural gas transported via the South Caucasus Pipeline.

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The Black Sea Energy Project, initiated by Azerbaijan, envisions delivering additional volumes of gas from Caspian fields to the European market. This involves constructing a liquefaction facility on Georgia's Black Sea coast, transporting the produced LNG by tankers to Romania, and utilizing existing infrastructure for its further distribution to Southeastern European countries, including Ukraine and Moldova. The project is actively supported by Romania, Hungary, and Georgia, alongside Azerbaijan



Figure 9 The Concept of the Virtual Reverse Flow Project for Natural Gas

The feasibility of natural gas reserves is also being considered, including projects for the construction of underground gas storage facilities for traditional, strategic, seasonal cycles or small-scale, operational balancing purposes. These projects are based on repurposed parameters at the depleted Ninotsminda gas-oil field and the Samgori South Dome oil field<sup>92</sup>.

Projects for the modernization of infrastructure connecting with neighboring countries will also be explored, with the aim of receiving potential assistance during crisis situations based on and within the framework of the principle of solidarity,<sup>93</sup> through transit pipelines or existing interconnections with neighboring countries.

## 8. Public Service Obligations

The Law of Georgia "On Energy and Water Supply" requires the establishment of conditions for the implementation of Public Service Obligations in the electricity and natural gas sectors, as well as ensuring the protection of the interests of end consumers (Article 2: Objectives of the Law).

Energy enterprises that provide public services must ensure:

- a) The security of supply;
- b) Supply with a predefined and/or agreed-upon quality.
- c) The application of tariffs or fees established in accordance with regulated conditions.
- d) The protection of the environment and the improvement of energy efficiency.
- e) The protection of human health, life, and property;

<sup>92</sup> The technical-economic feasibility studies for the construction of underground gas storage facilities at the Ninotsminda and Samgori South Dome fields were prepared in 2012 and 2016 by "Ramboll" and "Geostock Enterprise," respectively.

<sup>93</sup> See: Mutual support clause for emergency situation, referring to possibility having access to the transit flows on predefined and negotiated terms

f) the protection of consumer rights.

The right to receive natural gas as a public service is granted to household consumers, small enterprises, and those thermal power plants that serve as a source of guaranteed capacity.

Within a distribution service area, a consumer may be provided with public supply services by only one supplier that has been assigned the public supply obligation. The supplier sets the price for the provision of natural gas as a public service in a transparent and non-discriminatory manner. The price of public service must be fair, market-based, and comparable<sup>94</sup>.

The Commission will develop and approve the rules governing the activities of the natural gas public service provider, which regulate the provider's operations, rights and obligations, and other issues related to the supply of natural gas as a public service.

The public service provider must

- ensure the supply of natural gas as a public service to those end consumers that are entitled to receive such service;
- Take measures to ensure the safe, reliable, and specified quality supply of natural gas to end consumers that are entitled to public service.
- Take measures to establish the most reasonable prices for public service.

It is permissible to designate a natural gas supplier as a supplier of last resort as part of a public obligation (generally, the supplier of last resort for natural gas is selected by the Government of Georgia through an open tender process).

If, due to the planned or unplanned cessation of market activities by the natural gas supplier, or due to a gross violation of obligations, the end consumer loses access to natural gas, the supplier of last resort will ensure the supply of natural gas to such an end consumer without requiring a special request from the consumer.

Upon receiving notification from the Commission, transmission and distribution system operators are required, within the legally prescribed timeframe, to provide the supplier of last resort with the necessary information regarding the consumers eligible for last resort supply.

The supplier of last resort may provide supply to the end consumer for a period not exceeding 3 calendar months. If the end consumer is unable to sign a supply contract with a new provider within this period, the relevant system operator will terminate its natural gas supply.

The Commission approves the rules for the supply of last resort, including the supply tariff based on the methodology approved by the Commission, and ensures that this tariff is higher than the average market price of natural gas supplied under normal conditions to the same category of consumers.

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<sup>94</sup>Based on the objectives of public service, the Commission is also authorized to determine the price of natural gas for end consumers served by the public service provider, in accordance with the methodology approved by the Commission. The Commission must ensure that the supply of natural gas to end consumers at a regulated public service price is carried out only when necessary and as a temporary measure.

The supplier of last resort must ensure the separate maintenance of financial accounting and financial reporting related to the activities of this supply.

The supply contract between the supplier of last resort and the end consumer is considered concluded, in accordance with the established rules, from the day natural gas supply begins to the consumer, regardless of whether a corresponding request from the consumer existed.

The supplier of last resort is authorized to request the relevant system operator to terminate the natural gas supply to a consumer due to the consumer's unfulfilled obligations.

A draft resolution of the Government of Georgia on imposing public service obligations for gas supply has been prepared with the assistance of the Energy Community, taking into account the Law of Georgia "On Energy and Water Supply," the "Natural Gas Market Model Concept" approved by Government Decree No. 447 of 2021, and the country's international obligations<sup>95</sup>.

The document defines the scope and timelines of specific obligations imposed on suppliers to satisfy public interests, particularly to ensure the stability, adequate quality, and accessibility of natural gas supply, as well as to protect household consumers and thermal power plants with guaranteed capacity status from price fluctuations during the transitional phase, until a fully competitive natural gas market is established.

## 9. Consultations with Concerned Parties

One of the most important principles in preparing a preventive action plan and an emergency response plan is the maximum participation of interested parties in consultations during the information-gathering and decision-preparation stages (to take all possible nuances into account) as well as during the review and approval stages of the drafted document.

The coordination of the communication process with interested parties regarding the preventive plan is the responsibility of the Transmission System Operator (GGTC), in conjunction with the relevant structural unit of the Ministry.

Considering the specifics of the country's natural gas supply system, the primary concerned parties have been identified as large distribution companies and major consumers connected to the transportation network.

Relevant questionnaires were prepared and sent to the interested parties. The results of the responses received are compiled in the relevant tables in the annex, and the analysis of these results has determined the following:

- **Gas Distribution Companies** Have Developed a Plan for the Sequence of Gas Supply Restrictions. Specifically, nearly all companies that responded to the relevant question have proposed the following sequence for restricting consumers:

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<sup>95</sup> Government of Georgia, Resolution „On Imposing Specific Obligations on Suppliers for Ensuring Natural Gas Supply as a Public Service Obligation“ (project), EU4Georgia, Energy community, Tbilisi, 2021

- Autogas refueling stations;
  - Large non-household consumers;
  - Small commercial enterprises;
  - Households;
  - Educational institutions;
  - Healthcare facilities
  - Bakeries<sup>96</sup>
- Several enterprises/consumers connected to the distribution companies' networks have been identified whose equipment, buildings, etc., could suffer irreversible damage if gas supply is unexpectedly restricted or interrupted.
  - Most distribution companies' networks either lack or do not possess adequate information regarding connected enterprises or consumers for whom maintaining a minimum level of gas supply is critical. It is recommended that gas distribution companies develop emergency response plans to address scenarios involving gas supply interruptions or significant reductions.
  - Disconnecting some direct consumers from the network or significantly restricting gas supply without prior notice could cause damage to essential equipment and infrastructure.
  - In the event of unavoidable gas supply restrictions, the total minimum consumption for these consumers, with prior notice, does not exceed, 250 000 m<sup>3</sup>/day however, this issue requires further investigation;
  - The unacceptable daily revenue loss for large industrial enterprises, in the event of forced gas shutdown/restriction, is significantly reduced with prior notice;
  - Interrupting the gas supply to Tbilisi Transport Company“ will complicate transportation services in the capital.
  - The interruption of gas supply to thermal power plants will not cause damage to essential equipment and infrastructure. The minimum volume of gas that must be supplied to thermal power plants during unplanned operational shutdowns in winter does not exceed several dozen cubic meters per hour.

## 10. Other Issues

Some measures that could potentially impact the security of gas supply and fall under the competence of the national government are not discussed in detail in this preventive action plan. Such measures include actions:

- and projects related to the diversification of the country's gas supply;<sup>97</sup>

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<sup>96</sup> It is considered that gas supply to strategically important facilities related to national security and government bodies should not be interrupted

<sup>97</sup> According to the Vice Prime Minister of Georgia and the Minister of Economy and Sustainable Development, during the visit of the Georgian government delegation to Turkey (May 2024) The signed Memorandum of Understanding includes cooperation in the energy sector, which envisions ambitious new projects for electricity and gas supply. According to the

- Renewable energy and energy efficiency projects and measures outlined in Georgia's Energy Policy and the National Integrated Energy and Climate Plan also include the gradual replacement of existing low-efficiency power generation facilities with modern, high-efficiency combined cycle gas turbine thermal power plants. The implementation of these projects and measures will significantly reduce the demand for natural gas and, consequently, the potential damaging impact of risk occurrences;
- Planning issues for joint actions to be discussed within the framework of intergovernmental economic cooperation, including the possibility of mutual assistance with neighboring countries in the event of a gas supply crisis.

As noted, the involvement of interested parties in the preparation of the preventive action plan can significantly enhance the effectiveness, adaptability, and feasibility of implementation of the recommended measures.

Based on consultations with interested parties, substantial changes have been incorporated into the draft plan. specifically:

- Prerequisites have been established for determining the prioritization of direct consumers in the event of a potential gas shortage, to set the order of supply and/or determine the minimum volume of gas to be supplied.
- The consideration of introducing so-called "interruptible (and non-interruptible) supply" contracts has become relevant. Such contracts would allow for balancing the issue of compensation resulting from interrupted gas supply.<sup>98</sup>
- Additionally, the issue of aligning and harmonizing the energy supply for "protected customers" in the electricity and gas sectors needs to be considered.

The issues discussed in this section of the document will be analyzed in greater detail during the preparation of the emergency management plan.

## 11. Regional Cooperation

Legislation defines the cooperation between Georgia and the contracting parties of the Energy Community, including the objectives and conditions of cross-border measures, to ensure mutual assistance in potential crisis situations. According to Article 133 of the Law of Georgia "On Energy and Water Supply," regional solidarity is regarded as a model for such cooperation.

To protect the security of supply in domestic energy markets and to promote regional and bilateral solidarity, authorized state bodies cooperate in cases that cause or may potentially cause, in the short

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Vice Prime Minister's statement, efforts will focus on increasing the direct supply of renewable energy, the construction of the Black Sea underwater power transmission line, and exploring the potential for gas supply from Turkmenistan to Turkey via Georgia

<sup>98</sup>International experience shows that the losses that a supplier might incur from providing gas at a relatively lower cost to enterprises operating under interruptible contracts can be effectively compensated through a price premium imposed on gas supplied to enterprises operating under non-interruptible contracts

term, a large-scale interruption of natural gas,<sup>99</sup> affecting both Georgia and other contracting parties of the Energy Community. In such cases, cooperation may include:

- (a) Coordination of measures provided by legislation concerning the security of electricity and natural gas supply;
- (b) Identification and, if necessary, development and upgrading of electricity and/or natural gas interconnections, including establishing the capability for bidirectional flow in natural gas interconnections;
- (c) Conditions and practical forms of mutual assistance.

As of today, Georgia does not share a common border with any contracting party of the Energy Community or any EU member state, which significantly complicates the implementation of the principle of solidarity. An exception is the organization of a so-called "virtual reverse flow" of gas, where an EU member state or a contracting party of the Energy Community connected to a pipeline within the Southern Gas Corridor passing through Georgia agrees, in an exceptional situation, to leave part of its share of natural gas for Georgia, which would receive it through the receiving node of the South Caucasus Pipeline. Instead of this gas, the partner country (company) will be supplied with an equivalent amount of liquefied natural gas (LNG) on its territory, taking into account the bonus, or will be reimbursed for the corresponding additional expenses.

Negotiations have been initiated with the Greek company DEPA under the initiative of GOGC, regarding the implementation of a similar project through the Revithoussa terminal and the Southern Gas Corridor pipelines. Materials agreed upon with the partner in advance (Memorandum of Understanding and General EFET Agreement) have been submitted to the Government of Georgia for review and decision-making. Notably, the LNG 'Swap' project <sup>100</sup> has been granted the status of a Project of Mutual Interest (PMI) by the Energy Community. However, its implementation was delayed due to the recession caused by the COVID-19 pandemic."

Considering the isolated geographical layout from the parties of the Energy Community, the law also recommends the advisability of implementing the principle of solidarity based on appropriate agreements with the competent authorities of neighboring countries (which are not signatories of the Energy Community). Specifically, the preventive measures include the possibility of diverting Russian gas, which is destined for Armenia, from the North-South Caucasus transit pipeline located on Georgian territory, to address a potential deficit arising during peak consumption periods. It is advisable to deepen cooperation with the transmission system operators of neighboring countries during a crisis period, with the aim of mutual assistance based on the principle of solidarity.

It is recommended to establish a similar agreement with Turkey to facilitate the diversion of a portion of the gas allocated to Turkey from the South Caucasus Pipeline in the event of a crisis.

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<sup>99</sup> When Over 20% of the Total Natural Gas Supply is at Risk and Management at the National Level is Less Feasible

<sup>100</sup> Gas 29, SCP GE Offtake, Assessment for the identification of candidate Projects of Energy Community Interest (PECI) and candidate projects for Mutual Interest (PMI), Final report, 2020

Notably, Armenia and Turkey have underground gas storage facilities as well as diversified supply sources (from Iran and Russia, respectively), which facilitates the seamless compensation of temporarily diverted volumes of gas.

In the long term, to realize the principle of regional solidarity and taking into account mutual interests, the preventive action plan includes the possibility of operating the infrastructure connecting with Armenia and Turkey in reverse mode, following the implementation of relevant modernization/development projects (details are provided in Section 7: 'Infrastructure Projects').

## Annexes

### Annex 1. Challenges Related to Supply Security

#### 1.1. Challenges Related to Political, Technological, Commercial, and Natural Events<sup>101</sup>

The main risks and threats to the security of natural gas supply in Georgia are related to:

- Impact of climate change and extreme natural events (earthquakes, landslides, avalanches, floods, extreme temperatures, droughts, fires) on energy infrastructure;
- Technological issues (internal system and external threats, such as disruptions in extraction at the deposit, malfunctions or insufficient capacity of transit and transportation systems, etc.);
- Incompatibility of infrastructure with standards and operational parameters (pipeline age, corrosion, insufficient capacity of specific sections and critical nodes, lack of reserve lines and nodes, etc.);
- Political instability and terrorist attacks (occupation, blockade, sabotage, risky investments by unfriendly forces/countries, kinetic attacks on infrastructure during military conflicts or diversions, vandalism, property damage, etc.);
- Seasonal and operational imbalances in supply (lack of reserves, difficulties in supply diversification, etc.);
- Vulnerability of supply contracts (commercial disputes, expiration of contracts, inability to ensure contractually defined volumes in the supplier or transit country, etc.);
- Cybersecurity and technological connectivity vulnerabilities.

In recent years, there have been several instances in Georgia of unplanned disruptions in gas supply, during which the volume of gas supplied from various sources was unexpectedly halted for periods ranging from one to three weeks, or decreased by at least 20% of the total supply<sup>102</sup>. As a result, the country suffered significant financial losses, millions of cubic meters of gas were released into the atmosphere, gas transit was halted, and the mandatory minimum requirements for gas supply security—such as infrastructure (N-1 formula) and supply standards—were not met.

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<sup>101</sup> Official Use Information

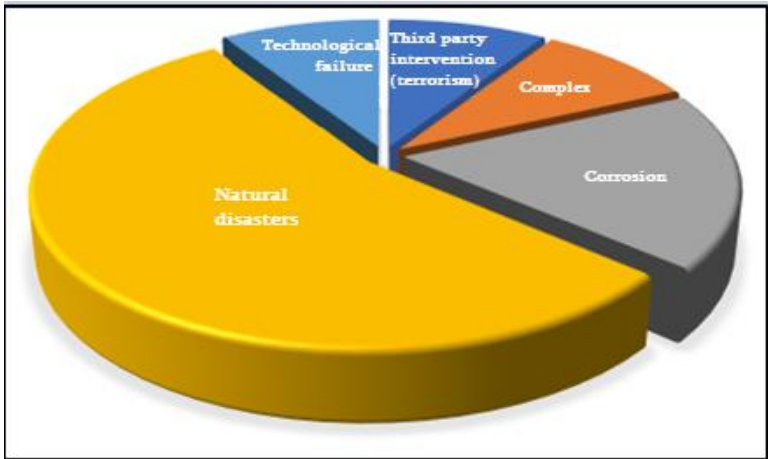
<sup>102</sup> „The Georgian Law on 'Energy and Water Supply' stipulates that a large-scale disruption in supply is defined as the cessation of more than 20% of the total gas supply from third countries

**Table 46 Natural gas losses during infrastructure failures**

Place of accident	Accident nature	Result
Meneso, 224.5 km – North-South Main Gas Pipeline, 1200 mm	Ripping up caused by a landslide	5.8 mln m <sup>3</sup> gas emission, ceasing supply and transit
Meneso, 132.0 km – North-South Main Gas Pipeline, 700 mm	Ripping up caused by a landslide	4.5 mln m <sup>3</sup> gas emission, ceasing of supply and transit
Lemshveniera, 61 km – Gazakh-Saguramo, 1000 mm	Fire caused by a leakage	2.8 mln m <sup>3</sup> gas emission, ceasing supply and transit
Mtskheta, 122.0 km - North-South Main Gas Pipeline, 1000 mm	Ripping up caused by a landslide	4.7 mln m <sup>3</sup> gas emission, ceasing supply and transit
Goristsikhe, 78 km – Vladikavkaz-Tbilisi, 700 mm	Ripping up caused by a landslide	3.5 mln m <sup>3</sup> gas emission, ceasing supply
Kesalo, 55 km - Gazakh-Saguramo, 1000 mm	Pipeline corrosion	3.6 mln m <sup>3</sup> gas emission, ceasing supply and transit
Georgia-Russia border - North-South Main Gas Pipeline, 1200 mm; 55.5 km - Vladikavkaz-Tbilisi, 700 mm	Ripping up two lines of the pipeline caused by an explosion	Fully ceasing supply and transit from Russia. Approximately 40.5 Mm <sup>3</sup> planned volume of gas was not supplied to Georgia and approximately 150 Mm <sup>3</sup> gas was not supplied to Armenia through transit
Naniani, 233 km - North-South Main Gas Pipeline, 1200 mm	Ripping up caused by a landslide	2.4 mln m <sup>3</sup> gas emission, ceasing transit
Stepantsminda, 66 km - Vladikavkaz-Tbilisi, 700 mm	Damage caused by an avalanche	Damage to an approximately 350m-length section and failure of the entire pipeline
Devdarak, 143.1 km - North-South Main Gas Pipeline, 1200 mm; 55.5 km - Vladikavkaz-Tbilisi, 700 mm	Ripping up caused by a raging torrent	0.5 mln m <sup>3</sup> gas emission, ceasing transit for 5 days
North-South Main Gas Pipeline, Georgia-Russia border	Prophylactic works not planned preliminarily	Ceasing gas supply from Russia, which caused the work of the el-energy system in an emergency mode

Significantly, many of the accidents involving Georgia's main gas pipelines appear to be related to natural disasters or corrosive damage caused by prolonged pipeline use.

**Chart 26 Distribution of Gas Supply Disruptions by Cause, %**



**Climate Change and Extreme Natural Events**

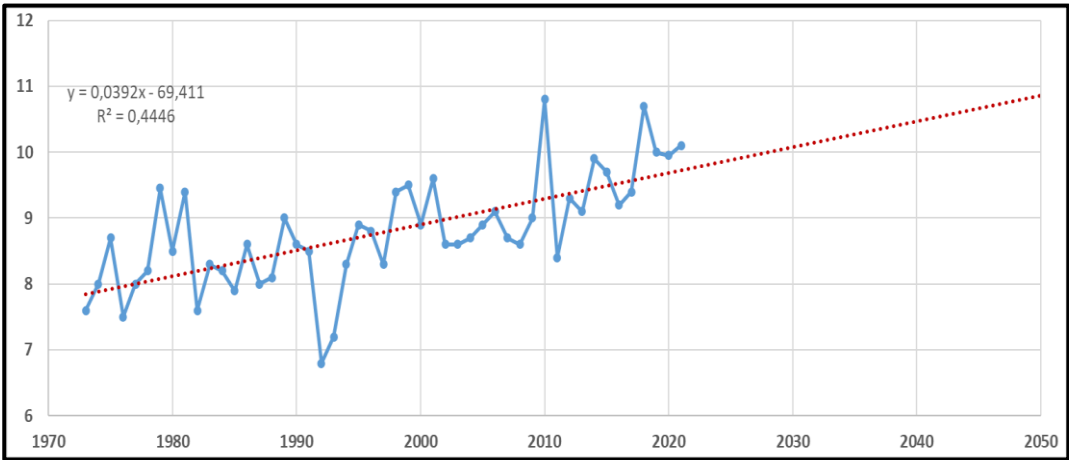
Georgia's climate, which is bounded by mountain ranges and the Black Sea coastline and features significant variations in elevation from sea level to high mountain peaks, is characterized by its contrast and diversity. Influenced by the Black Sea, western Georgia features a humid subtropical climate, while the regions of eastern Georgia experience a range of climates from moderately humid to dry subtropical.

The temperature across the country ranges from -41°C to +43°C, depending on the region's geographical location, the season, and the elevation above sea level.

The frequency of disasters related to extreme natural events in Georgia, as well as globally, has notably increased in recent years due to the effects of global warming, which have manifested in significant changes in the country's climate.

Analysis of statistical data from climate observations shows that, compared to the 1970s-1990s, the average annual atmospheric temperature in Georgia has increased by approximately 1,7°C. Forecasts predict that by 2050, it will rise by an additional 1,2-1,3°C.<sup>103</sup>

**Chart 27 Actual Changes in Average Temperature in Georgia from 1973 to 2021 and Projected Forecast up to 2050**



Research shows that the glaciers in Georgia are melting intensively.<sup>104</sup> The Eastern Caucasus stands out for its particularly high melting rate, where the area of glaciers decreases by approximately 1% annually. Other anomalous events recorded in Georgia that are likely associated with global climate change include: Frequent and intense floods and torrential rains, landslides and mudslides in mountainous areas, increased risk of forest fires and desertification of arable land due to more frequent 'heatwaves' and rising average temperatures, etc.

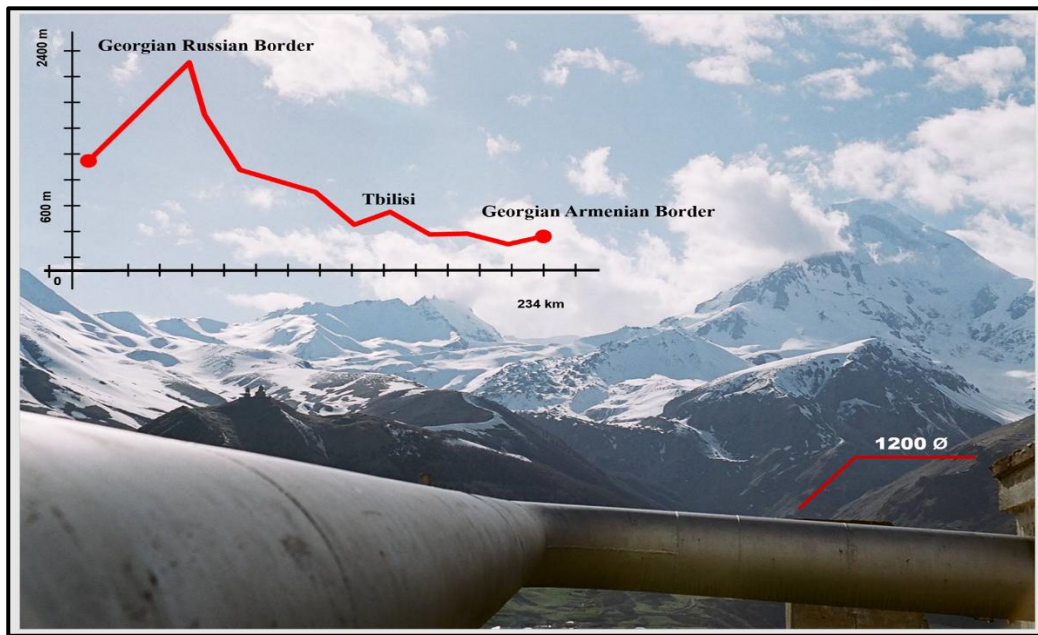
It has been established that, in recent years, the number of natural hydrometeorological events in Georgia has increased by an average of 15%, while the number of natural geological events has increased by an average of 58%. Consequently, the damage caused by natural disasters has also increased, with the damage amounting to 389 million GEL in just one year<sup>105</sup>.

In highland regions where a significant portion of the main gas pipelines is located, the first snow arrives in September, and winter-like weather often lasts until April. Temperatures are very low in December, January, and February. During heavy snowfall in winter, significant problems arise in the operation of energy infrastructure, including gas pipelines.

<sup>103</sup> Giorgi Ichkitidze, Shota Mestvirishvili, 'Rehabilitation of Gas Pipeline Networks Considering Global Warming,' STU, Tbilisi, 2023

<sup>104</sup> Glaciers of the Greater Caucasus, Scientific Website: <https://glaciologygeorgia.wordpress.com/>

<sup>105</sup> National Disaster Risk Reduction Strategy of Georgia, 2017-2020, Tbilisi, 2017



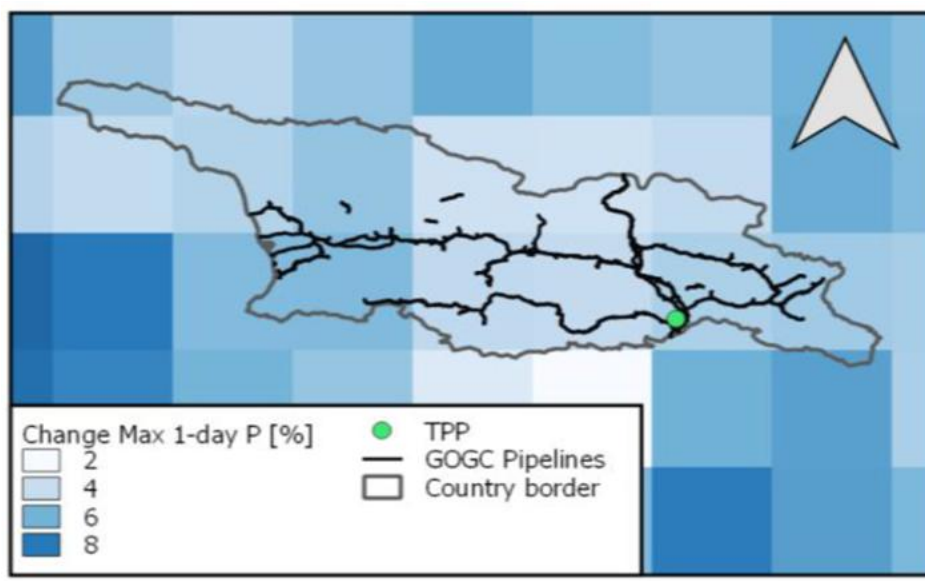
**Figure 10**

The high-altitude sections of the North-South main gas pipeline, located at 2350 meters above sea level, and the pipeline's complex profile are prone to frequent landslides, avalanches, and torrential floods.

Significant factors disrupting the proper operation of energy infrastructure include intense precipitation and storm (heavy) rains, which lead to floods and torrential downpours. These, in turn, are major causes of landslides and damage to energy infrastructure. The rivers on the southern slopes of the Caucasus are particularly notable for the risks associated with storm precipitation and flash floods. It is noteworthy that, prior to 1995, the average recurrence of intense flash floods was observed once every 5-6 years. However, between 1995 and 2013, this frequency nearly doubled<sup>106</sup>. As modeling results indicate, the trend of increasing recurrence of flash floods caused by storm precipitation is expected to become even more pronounced in the foreseeable future. According to the forecast, the number of days with storm precipitation in certain regions of Western Georgia—specifically in Imereti, Guria, and Adjara, where major pipelines are located—could reach up to six per year between 2035 and 2050. The number of storm precipitation days is expected to increase to four in the areas covered by the gas pipeline network in the Kakheti region.

<sup>106</sup> National Disaster Risk Reduction Strategy of Georgia, 2017-2020, Tbilisi. 2017

Chart 28 Forecast of increased storm precipitation in the event of a 1.5-2°C rise in temperature<sup>107</sup>



The increase in precipitation (including storm precipitation) in Georgia contributes to the development of exogenous natural geological processes, primarily landslides and debris flows. This poses a significant threat to the population and the country's economy, including critical energy infrastructure.

Historical experience shows that the cyclical nature of landslide and debris flow processes in Georgia traditionally occurred every 3-5 years and 8-11 years, (depending on the specific geological and climatic conditions of different regions). However, since the 90s of XX century, these processes have intensified and are now observed almost annually, with the intervals between extreme events significantly shortened. As a result, an increasing amount of critical energy infrastructure, including vulnerable sections of gas pipeline systems, is now falling within the negative impact zones of landslide and debris flow processes. The annual damage caused by debris flows in the country averages several tens of millions of GEL, and under conditions of extreme activation, it could exceed 100 million GEL.

The tributaries of the Tergi River in the Dariali Gorge (Devdoraki and Kuro) are particularly notable for the high risk of debris flows, where significant gas supply facilities for the country are located. The primary triggers for debris flows are the collapse of ice and rock avalanches during the pulsating dynamics of glaciers (in the form of so-called glacial debris flow transformations) and storm precipitation (heavy rains) coinciding with extreme temperature increases, which result in the transport of large volumes of solid material from the transit zone. The volumes of debris flows can vary widely, ranging from several thousand to 10 million m<sup>3</sup>. The Devdoraki Gorge, a left tributary of the Tergi River, is characterized by particularly dangerous events. Periodic debris flows in this area can completely or partially erode or damage the 'North-South' main gas pipelines with diameters of 700 mm and 1200 mm, high-voltage power transmission lines, and the Dariali Hydropower Plant.

<sup>107</sup> source: IPCC, 2022



**Figure 11 Sections of the main gas pipelines damaged by debris flows triggered by storm precipitation in the Devdoraki Gorge <sup>108</sup> (May, 2014)**

Natural hazards also include snow avalanches, the frequency and intensity of which, have notably increased, particularly in recent years. Snow avalanches cause significant damage to human activities and settlements, potentially leading to loss of life, road blockages, transportation paralysis, and the disruption of power transmission towers and gas pipelines, among other impacts. Notably, a snow avalanche impacted the 66th km mark of the Vladikavkaz-Tbilisi 700 mm main gas pipeline near Stepantsminda, damaging a section approximately 350 meters in length and rendering the entire pipeline inoperative.

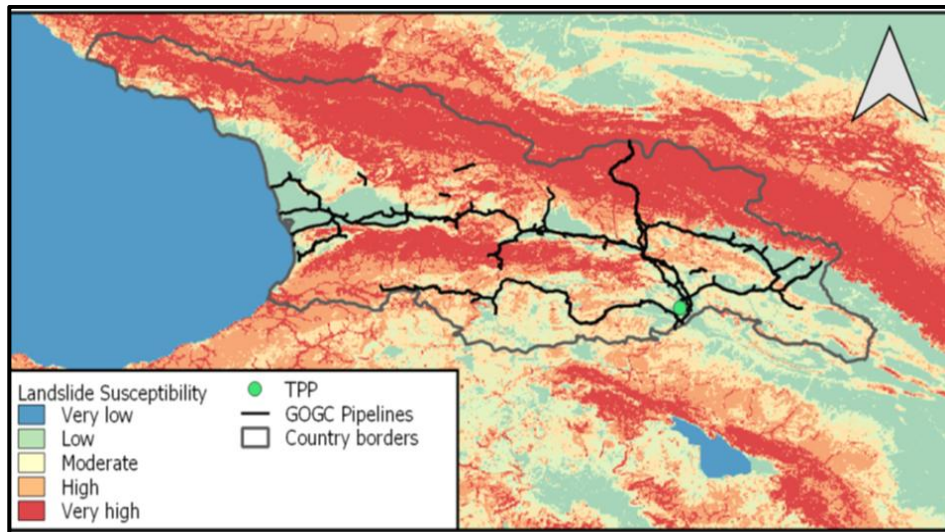
Additionally, the territory of Georgia is located within a seismically active intercontinental region. Over the past 100 years, approximately fifteen earthquakes with magnitudes ranging from six to nine have been recorded in various regions of Georgia. Most of these events have resulted in both loss of life and material damage, including significant failures in energy infrastructure. Compensating for the damage, including the restoration of disrupted infrastructure, requires significant time and substantial expenses<sup>109</sup>.

The seismic zoning map of Georgia shows that significant portions of the North-South main gas pipeline system and the Southern branch pipelines are located in zones of very high and high seismic activity, which poses a substantial risk to its safe operation.

<sup>108</sup> High-voltage power transmission lines and the Dariali Hydropower Plant were also rendered inoperative

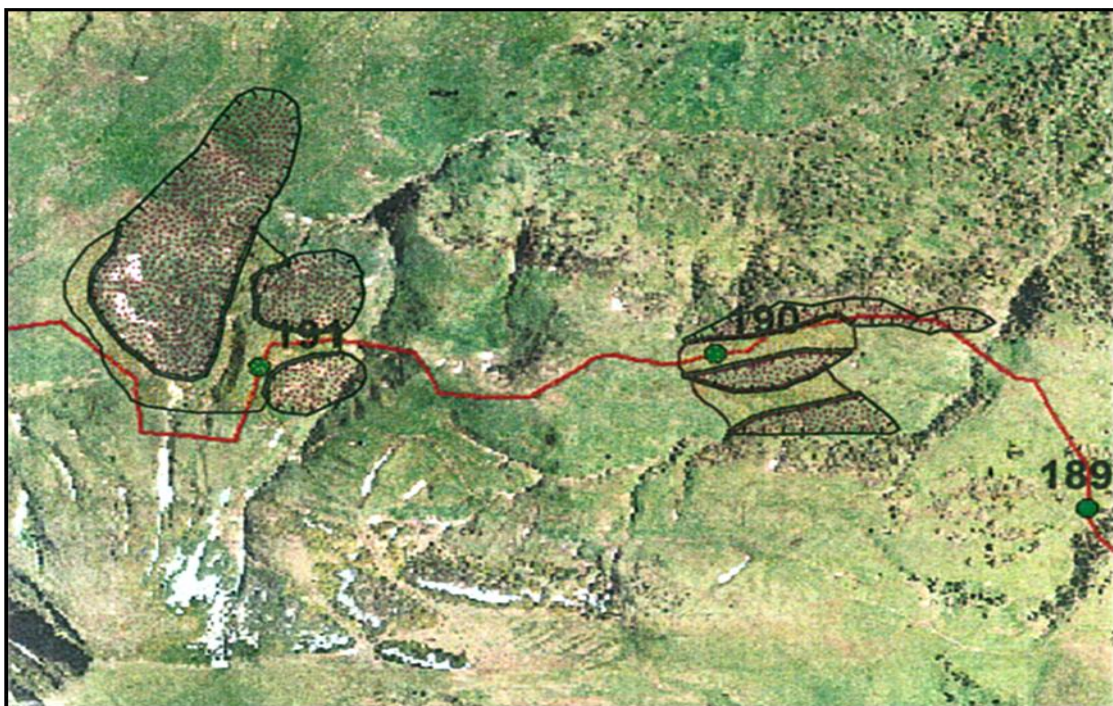
<sup>109</sup> The April 25, 2002, Tbilisi earthquake was classified as a low-magnitude event (Mw=4.5), yet due to building collapses, 7 people lost their lives, and schools and residential buildings were damaged. The earthquake had an intensity of 6-7 on the MSK scale, with a recorded maximum ground acceleration of 0.11g.

**Chart 29 Seismic Zoning of the Territory of Georgia**



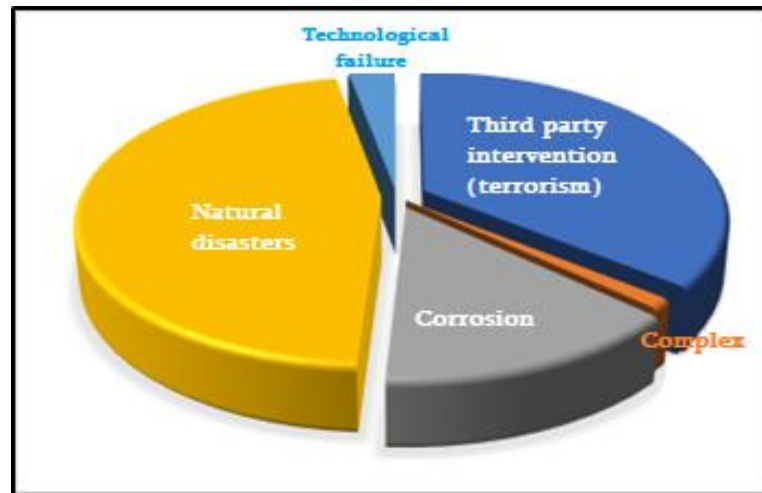
The high frequency of pipeline damage within the operational corridor—approximately 55% of the total—due to landslides and ground displacement caused by various factors is related to the challenges of constructing and operating pipelines in the mountainous terrain of the country.

**Chart 30 Placement of the Transit Gas Pipeline in Landslide-Prone Areas**



Costs associated with interruptions in gas supply due to natural events account for approximately 46% of the total unforeseen expenses.

Chart 31 Costs Associated with Emergency Interruptions in Gas Supply by Primary Causes



From the list of significant damages to Georgia's main gas pipelines, it is evident that 7 out of 11 incidents are related to natural events. Additionally, significant damage caused by natural events is primarily observed in the mountainous regions along, **the North-South Caucasus and Vladikavkaz-Tbilisi main gas pipelines** particularly in the sections located in the Aragvi and Tergi river gorges. Accordingly, the primary task should be the planning of preventive measures to protect these sections and ensure rapid restoration in the event of damage.

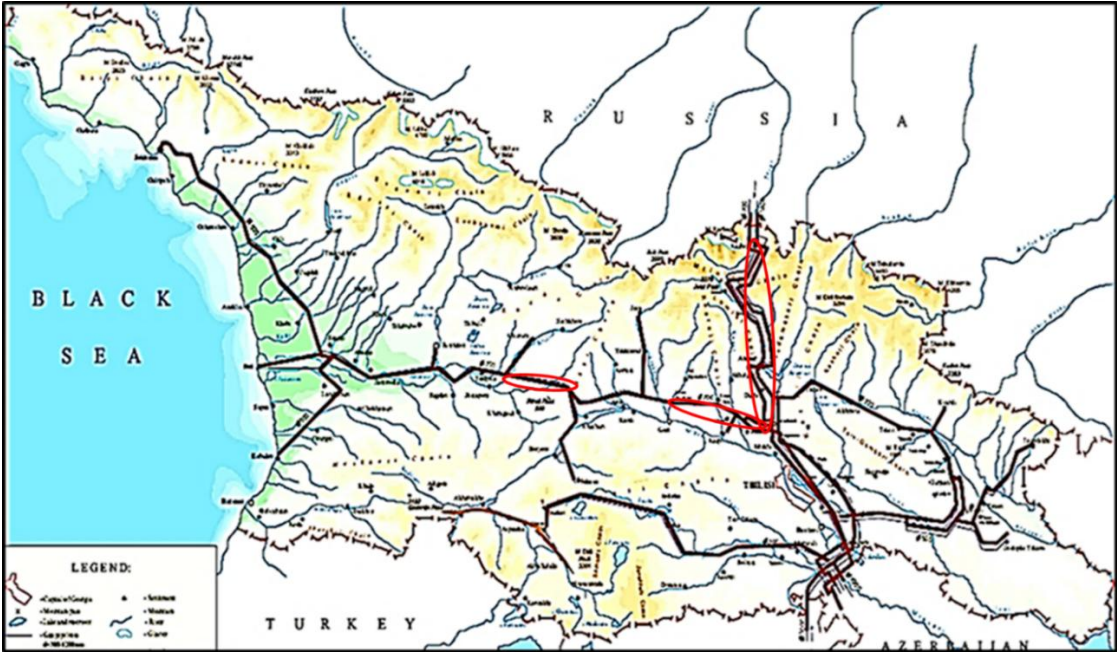
The Khashuri-Zestafoni section of the main gas pipeline system **particularly the mountain pass area is also considered critical**. It is situated in mountainous terrain and operates under challenging conditions (the pipeline is subjected to mechanical impact from rivers and eroded slopes, **operates without cathodic protection**, etc.). The pipeline route crosses deeply incised V-shaped river valleys, dry ravines, well-defined erosional features, karst areas, slopes prone to landslide processes, and already established landslide bodies.



Figure 12 Key Sections of the Mountain Pass Pipeline

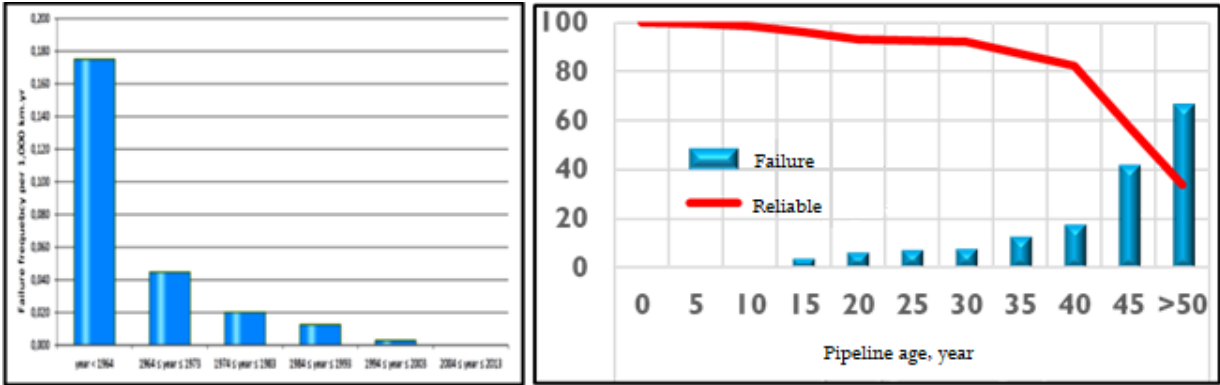
The failure of the mountain pass and hard-to-reach sections of the Khashuri-Zestafoni pipeline during heavy snowfall in winter could lead to prolonged interruptions in gas supply to consumers in Western Georgia.

Chart 32 Critical Sections of Georgia's Main Gas Pipeline System<sup>110</sup>



Among the identified risks causing interruptions in gas supply, the age of the deteriorated pipelines (length of operation), is noteworthy as it is a **key factor contributing to its corrosive damage** - leading to an increase in failure frequency and a reduction in operational reliability. The diagram presents the results of long-term observations on European main gas pipelines, showing the probability of failures depending on its age.

Chart 33 Relationship Between Failures/Operational Reliability and Pipeline Age<sup>111</sup>



<sup>110</sup> The diagram also indicates the section containing the 500 mm pipelines from the Saguramo node across the Aragvi River and the Lekhura-Sveneti line, which is considered critical due to insufficient capacity

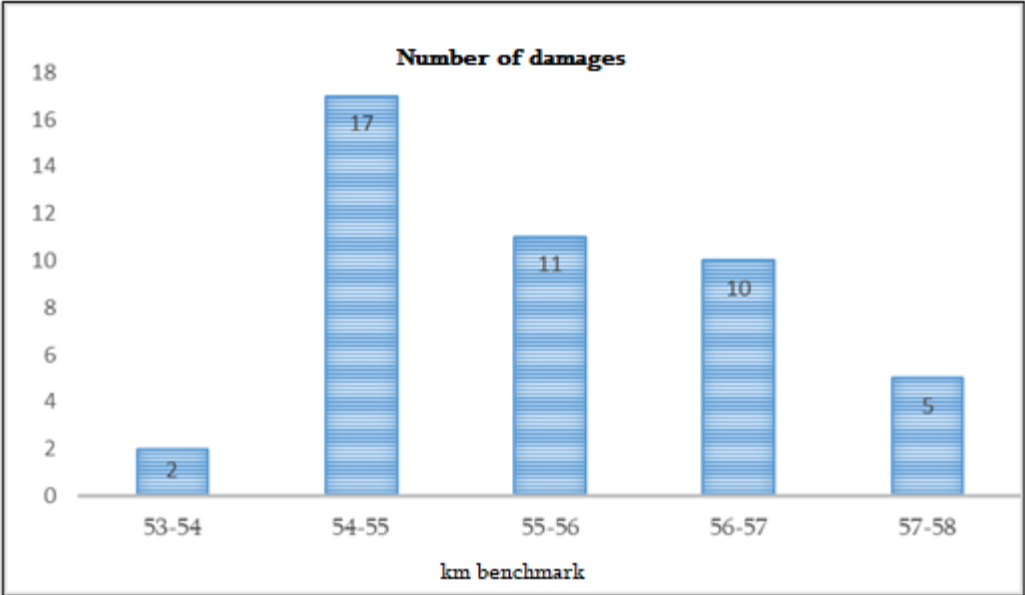
<sup>111</sup> Source of Statistical Data: Gas Pipeline Incidents, 1970-2013, EGIG, February, 2015

The analysis of the interpreted research results shows that during the initial 10-15 years of operation, pipeline reliability remains virtually unchanged, with minor failures likely attributable to subjective factors (such as human error). Failures in pipelines aged 20-25 years are relatively more frequent, accounting for approximately 7% of the total failures. Intensive failures in main pipelines are observed starting from the age of 30 years: For pipelines aged 30-40 years, its share of failures exceeds 25%, while for those aged 50 years and older, it surpasses 66%.

Approximately 6% of Georgia's main gas pipelines were built 50 years ago, and about 64% of the existing pipelines are 30 years old or older, placing them in potentially high-risk sections considering the corrosion factor. Accordingly, **replacing them with new pipelines or constructing parallel sections is a crucial task for enhancing the overall reliability of the transportation system.**

The 89.3 km long 'Kazakh-Saguramo' pipeline, part of the North-South main gas pipeline system, is particularly notable for its age and extensive corrosive damage. The diagram shows the recorded number of corrosive damages on the 'Kazakh-Saguramo' gas pipeline in the section between the 53 km and 58 km markers<sup>112</sup>.

**Chart 34 Corrosive Damage on the Kazakh-Saguramo Gas Pipeline**



The table provides information on significant pipeline failures related to the breakdown of sections damaged by corrosive wear.

**Table 47**

Date	Accident place	Accident nature	Result
20.08.1996	Lemshveniera, 61 km - Gazakh-Saguramo, 1000 mm	Fire caused by a leakage	2.8 mln. m <sup>3</sup> gas emission, ceasing supply and transit
28.01.2003	Kesalo, 55 km - Gazakh-Saguramo, 1000 mm	Pipeline corrosion	3.6 mln. m <sup>3</sup> gas emission, ceasing supply and transit

<sup>112</sup> Currently, the section has been fully rehabilitated

Overall, it should be noted that despite the high frequency of corrosive damage, the resulting losses are relatively minor. This has been achieved through the installation of **corrosion protection systems**, on newly constructed pipelines, and more recently, by using high-quality steel pipelines with increased wall thickness. Additionally, continuous monitoring of pipeline conditions allows for the early detection of corroded sections before the pipeline wall is fully compromised, ensuring the prevention of potential failures.

A severe gas shortage could arise in the event of an unplanned interruption (or significant reduction) in supply from any major source during peak winter demand. To address the shortage and avoid significant complications, it may become necessary to implement special, urgent measures to ensure the heating and electricity supply to consumers

Given the damaging potential of an unplanned supply disruption, the cessation of gas supply from the Russian Federation is considered particularly vulnerable for Georgia. This risk is associated with Russia's political ambitions and the challenges related to the occupation of part of our country. Russia is known for repeatedly using energy resources as a political instrument. Historical experience confirms that such actions have been used multiple times against Georgia.<sup>113</sup> For example, before the escalation of political relations between Russia and Georgia, which followed Georgia's aspiration to integrate into Euro-Atlantic structures, the price of gas in Georgia fluctuated approximately within the range of regional prices<sup>114</sup>.

#### 2006/2007 Prices on European and Regional Markets

- Central Europe – \$(230-280)/1000 m<sup>3</sup>
- Turkey– \$120(SCP) /1000 m<sup>3</sup>
- Armenia (Russian gas)- \$110/1000 m<sup>3</sup>
- Azerbaijan(Russian gas) - \$110/1000 m<sup>3</sup>
- Georgian(Russian gas) - \$110/1000 m<sup>3</sup> (2006)
- Georgian(Russian gas) - \$235/1000 m<sup>3</sup> (2007)
- Georgia (Azerb. Gas- Azerigaz) - \$120/1000 m<sup>3</sup>
- Georgia (Azerb. Gas- AGSC) - \$150/1000 m<sup>3</sup>
- Georgia (SCP) – \$(50-62)/1000 m<sup>3</sup>

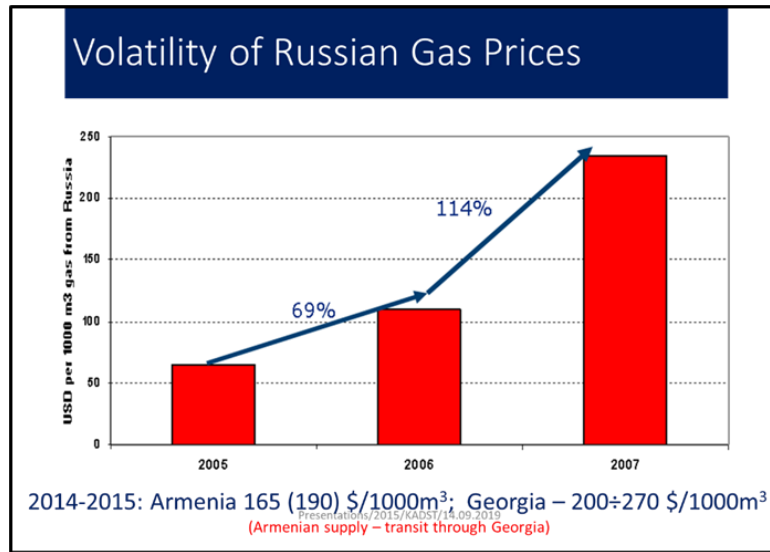
Starting in 2007, discriminatory pricing against Georgia was introduced—see the diagram— whereby gas transiting through Georgia to neighboring Armenia was supplied at a lower price (a policy that continued until recent years).

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<sup>113</sup> As NATO Advanced Research Workshop “Security of NG Supply through Transit Countries” noted „*Technical risks to energy security at present are outweighed by POLITICAL and COMMERCIAL risks, which constitute the main challenge to the security of the (South Caucasus) region*”

<sup>114</sup> Gas supplied by Azerigaz from Azerbaijan - \$120/1000 m<sup>3</sup> (presumably Russian gas); Gas supplied by AGSC from Azerbaijan (\$150/1000 m<sup>3</sup> (presumably Iranian gas)

Chart 35 Fluctuations in the Price of Russian Gas from 2005 to 2007, \$/1000 m<sup>3</sup>



The dramatic increase in the price of Russian gas in Georgia coincided with the 2006 gas crisis, when in January, the supply of electricity and natural gas from Russia was halted. This was caused by explosions that successively rendered inoperative the high-voltage power transmission line and the 1200 mm and 700 mm gas pipelines connecting Georgia to Russia. It is essential to emphasize that at that time, Russia was the sole supplier of natural gas and the primary source of imported electricity.

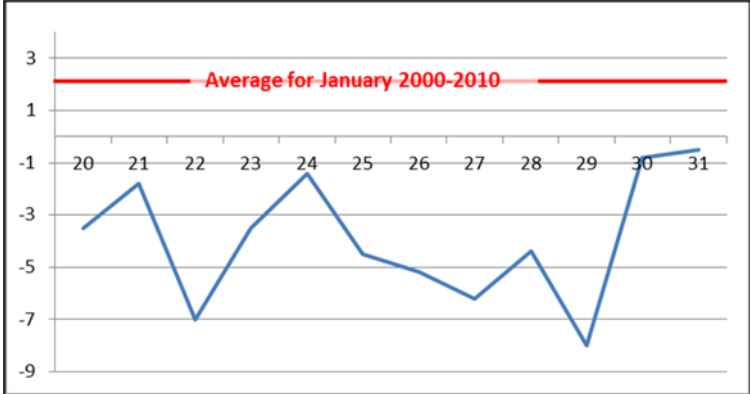


Figure 13 Damaged Section of the Vladikavkaz-Tbilisi 700 mm Gas Pipeline on Russian Territory

In the second half of January 2006, peak gas consumption was recorded in Georgia, which was related to an unusually cold winter—air temperatures dropped below - 5 degrees Celsius in the lowlands and down to minus 20 degrees Celsius in the mountains. In Tbilisi, during the period from January 22 to 29, the average air temperature was around - 5°C<sup>0</sup> (the multi-year average temperature is approximately 1,5°C), with a minimum temperature reaching - 8°C . Mountainous regions without gas, as well as Tbilisi, Kutaisi, and major industrial cities, were supplied with liquid fuel and firewood. Firewood supplied from the regions was distributed to the population free of charge. Emergency headquarters were established

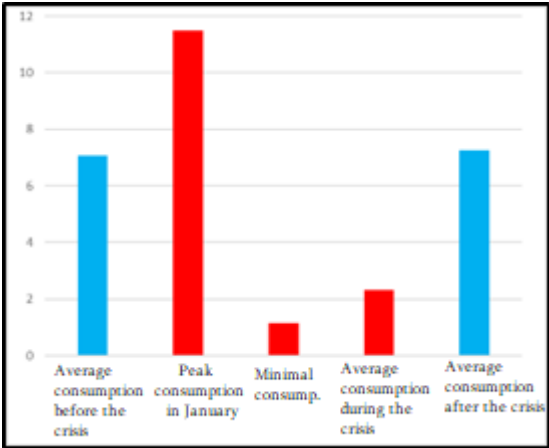
in response to the crisis. The population stood in lines for hours for bread, oil, and firewood<sup>115</sup>. To meet the sharply increased demand for oil, in addition to gas stations, it was also sold from mobile tankers (In Tbilisi, at the 'Lukoil' stations, oil was sold at a subsidized price of 60 tetri, while the market price was 1.50 tetri).

**Chart 36 Temperature variability during the period from January 20 to 31, 2006, 0°C.**



The severity of the energy crisis had a particularly acute impact on the production of bread product. Most bread factories began using diesel fuel instead of natural gas, the price of which was nearly five times higher than that of gas. As a result, the cost of 1 kg of bread increased by 2 to 2.5 times.

**Chart 37 Gas consumption dynamics in January-February 2006**



During the crisis period, Georgia received approximately 40.5 million m<sup>3</sup> less gas than would have been the case under normal conditions.

The deficit caused by the disruption in gas supplies from Russia was partially offset by the use of network gas and gas supplied from Azerbaijan and Iran. At the same time, transit to Armenia was interrupted,

<sup>115</sup> How Putin froze Georgia in January 2006, by JimshER Rekhviashvili, Radio Tavisupleba, October 25, 2022

which resulted in a 10% loss of the replacement cost of the supplied gas. The estimated damage to Georgia during the crisis period amounted to approximately 26,5 mln €<sup>116</sup>, which includes:

- ✓ Additional expenses for the gas received from Azerbaijan,
- ✓ and Iran to cover the deficit, and losses resulting from
- ✓ the non-delivery of transit volumes."

It is also noteworthy that attacks on transit pipelines caused both direct economic and reputational damage, specifically tarnishing the image of the energy corridor uncontrolled by Russia and complicating the development of new transit projects.

According to experts' assessments **the probability of the recurrence of the event remains high**. Furthermore, based on reasonable assumptions, it can be concluded that the terrorist attack was deliberately carried out during the peak gas consumption period to cause maximum damage. In the future, the possibility of terrorist attacks on critical infrastructure during peak periods of gas and electricity consumption must be thoroughly assessed, indicating the need to limit excessive dependence on gas supplied from Russia.

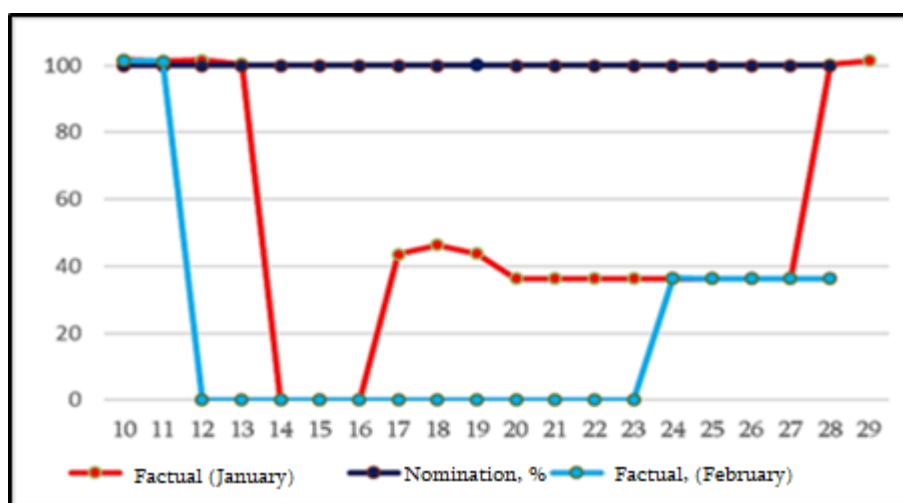
**Technological issues**, which are periodically recorded for various reasons, primarily related to technological irregularities or the need for preventive maintenance at offshore extraction fields or transportation infrastructure, cause disruptions in supply.

The chart shows the planned and actual gas supply schedules (in %) during the winter peak consumption period (January-February) with disruptions in the exploitation of Azerbaijan's offshore Shah Deniz field. It appears that during the 31-day winter season, gas supply was completely interrupted for 15 days, while only 40% of the planned volume was provided for 16 days. Despite this, due to the relatively small share of Shah Deniz gas in the overall balance, the shortfall was filled without complications by gas supplied from another source in Azerbaijan (owned by SOCAR), without negatively impacting the functioning of the local market.

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<sup>116</sup> The damage caused by the undelivered gas on the local market excluding the value of the gas dispersed into the atmosphere on the Russian territory and the harmful ecological effects

Chart 38 Planned and actual gas supply schedules (in %) during the disruption of the exploitation of Azerbaijan's offshore Shah Deniz field



A different situation arises when unplanned supply disruptions are recorded from major gas suppliers during the winter season. For example, the unplanned interruption of gas supplies from the Russian Federation in March-April 2021 caused significant disruptions in providing the required volume of gas to the country's consumers.

Table 48 Significant Disruptions in Gas Supply Due to Technological Factors from 2010 to 2023

Time	Season	Reason	Gas pipeline	Result	Effect
14/08-05/09	Summer	Technological irregularities occurring at the field	SCP	100% of the volumes stipulated in the contracts Decrease	Shortfall was covered by another source
15/05-25/05	Summer	Planned preventive maintenance work	SCP	100% interruption of transit	Not reflected On the functioning of the local market
03/08-24/08	Summer	Undefined	SCP	100% reduction of the volumes stipulated in the contracts	Shortfall was covered by another source
14/01-27/01; 12/02-23/02	Winter	Technological irregularities at the field	SCP	80% of the volumes stipulated in the contracts Decrease	Shortfall was covered by another source
16/03-06/04	Winter	Unplanned preventive maintenance work	NSCP	Complete disruption of Russian gas supply (including transit)	Significant damage due to the stoppage of thermal power plants and increased import of electricity

The analysis of the reviewed information indicates that the detrimental impact of supply chain disruptions related to technological delays is contingent upon the timing of its occurrence and the capacity of the supplier source. For example, supply disruptions from the Shah Deniz field do not cause significant system concerns, whether they occur during the peak winter demand period or the summer season, as the shortfall is compensated by supplemental gas supplied from alternative sources.

**A different situation arises in the event of an unplanned disruption in gas supply from Russia during the winter season,** when the country's thermal power generation facilities are operating at maximum capacity and the demand for transit volumes designated for Armenia is also elevated.

#### **Risks associated with contractual agreements with foreign state-owned enterprises.**

The security of gas supply is significantly influenced by the management of contractual relationships with foreign importing companies, alongside the proper functioning of infrastructure. This becomes particularly important when long-term supply contracts are nearing expiration.

As is well known, Georgia meets approximately 99.5% of its gas demand through imports. The primary gas suppliers are state-owned companies from foreign countries. Namely, the Azerbaijani "SOCAR" and the Russian "Gazprom." Consequently, a significant challenge to the country's energy security is the threat posed by the vulnerability of supply contracts. This vulnerability may be associated with politically unreliable partnerships, contract durations, the inability to guarantee volumes specified in the contracts, commercial disputes, and other related issues.

The challenges related to political instability in relations with Russia include the consequences of the occupation of approximately 20% of Georgia's territory.<sup>117</sup>

Before the de facto occupation of Abkhazia and the Tskhinvali region by Russia, gas was supplied to local residents and commercial customers in these areas.

- Abkhazia was supplied through the 110 km long, 500 mm diameter Zugdidi-Sukhumi main gas pipeline, with several branches: The branches extended to Gali (325 mm, 3.4 km), Ochamchire (529 mm, 1.5 km), and Sukhumi (529 mm, 0.5 km).
- The Tskhinvali region was supplied by a 219 mm diameter pipeline with a total length of 21.3 km.

Currently, Abkhazia does not receive any gas supply, and the region primarily relies on electricity as its main energy resource, including for heating and hot water supply. This has a negative impact on Georgia's overall energy balance. If infrastructure rehabilitation projects are implemented in Georgia's temporarily occupied regions, following the resolution of the conflict, it will be possible to supply affordable and easily accessible fuel resources to the gasified cities and districts of Abkhazia. In addition

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<sup>117</sup> In July 2008, prior to the start of Russia's military aggression, a cyberattack was carried out on the Turkish segment of the BTC pipeline. Similarly, in July 2015, a terrorist attack targeted a segment of the BTC transit oil pipeline located in Turkey. However, these incidents did not impact gas supplies to Georgia

to economic benefits, this could also provide opportunities to address significant social and political challenges.<sup>118</sup>

Long-term contracts with the Azerbaijani state-owned company "SOCAR" are less vulnerable to risks associated with contractual uncertainties. The most recent review of the terms outlined in the memorandum and contract occurred in 2020, primarily focusing on the clarification of technical matters. The fundamental agreements outlined in the initial documents have remained unchanged to this day, and no significant alterations are expected in the future. It is noteworthy that disagreements over technical or commercial issues have never led to a disruption in gas supply or distribution from Azerbaijan.

The scale of the impact from risks associated with contractual agreements depends on the timing of the supply disruption. Specifically, a critical or severe (detrimental) impact may result from a supply disruption during the peak consumption period of the three winter months. The historical development of events demonstrates that the suspension of agreements with "SOCAR" is virtually impossible, as these agreements have ensured the guaranteed supply of protected consumers in the country from 2009 to the present. Moreover, the price of Azerbaijani gas has consistently been lower than the market value of gas in other non-producing countries in the region and in the Energy Community countries.

Additionally, Georgia serves as the primary transit country for Azerbaijani energy resources (oil, gas, electricity), and disregarding this partnership could severely destabilize Azerbaijan's economy, which heavily relies on the multi-billion revenues generated from energy exports. Furthermore, "SOCAR" generates significant commercial revenues through its positioning in the Georgian market, primarily via its subsidiary companies that distribute gas and petroleum products.

Consequently, Georgia should consider the advisability of maintaining or improving the terms of its contractual relationships with Azerbaijani "SOCAR," ensuring the protection of mutual interests. This requires ongoing efforts to strengthen the existing positive strategic cooperation and proactive preparation for the next review of contract terms, scheduled for 2025.

## 1.2. Challenges related to supply inconsistencies

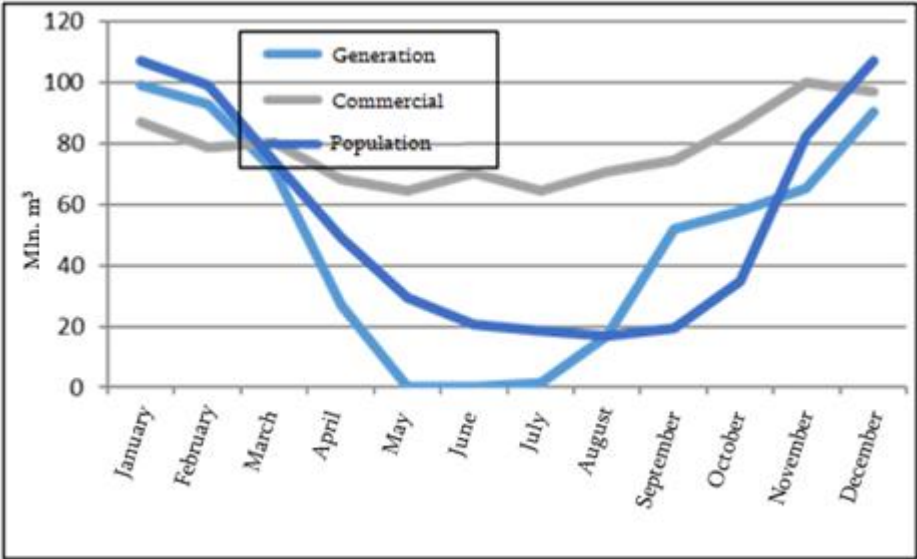
In Georgia, gas consumption is characterized by a significant seasonal disparity. During the winter months, the country consumes approximately three times more natural gas than in the summer. Seasonality is more pronounced in the consumption patterns of the residential sector and thermal power plants.

In the residential sector and among other segments of users that utilize gas for heating, consumption disparities are directly linked to climatic conditions, particularly the transition to intensive heating during the winter season.

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<sup>118</sup> The annexed Tskhinvali region currently receives gas from the Russian Federation through a pipeline constructed in blatant violation of Georgian law.

Chart 39 Seasonal Variability of Gas Consumption by Sector

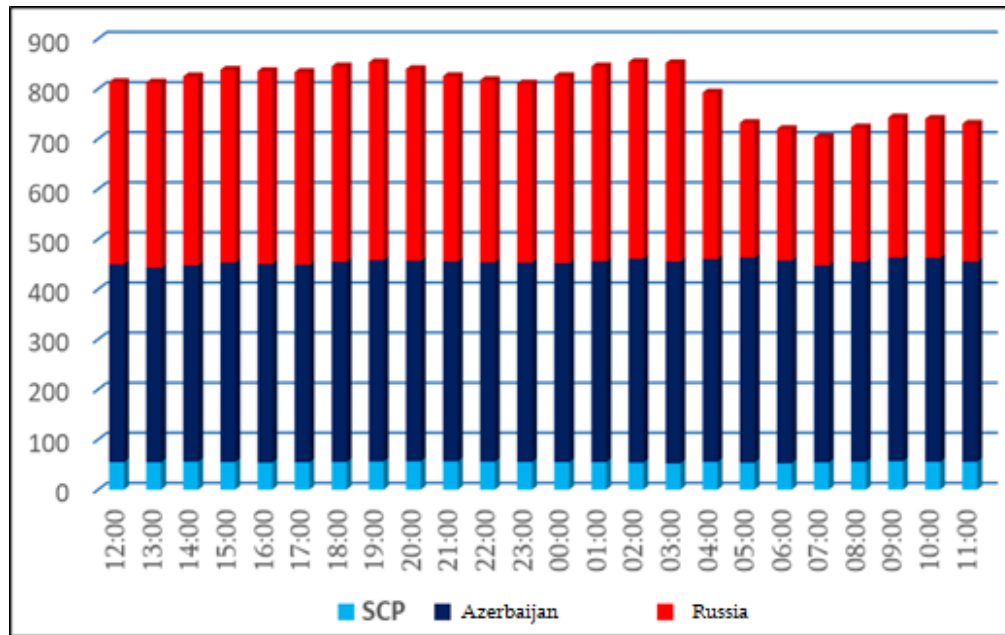


The disparity in gas consumption for electricity production is driven by the necessity to increase the share of thermal power plants primarily during the winter months. This is due to a significant reduction in hydropower generation caused by lower water levels during this period.

In the event of an unplanned supply disruption from any major source during the peak winter consumption period, under conditions of intense gas usage, there is a risk of developing a critical situation. For example, recent years' experience shows that during the peak consumption periods of January, February, and December, when it becomes challenging to fully meet demand through long-term contracts, supplemental gas volumes are sourced from Russia at market-based commercial prices. These prices are significantly higher than the rates set for the residential sector and for gas used in electricity generation (the "social sector").

The chart shows the proportional distribution of gas received from the main supply sources during the peak consumption period in 2023.

Chart 40 Supply Sources During the Peak Gas Consumption Period of 2023, 1000 m<sup>3</sup>/h



Consequently, a significant challenge to Georgia's energy security is the recent trend of increasing Russian gas share in the overall balance. The trend of increasing dependency on Russian gas reaches particularly high levels during periods of peak gas consumption. In January 2023, during peak consumption, the share of Russian gas in the total balance exceeded 40–45% while Azerbaijani imports decreased. This indicates that the volume of Russian gas could surpass 10 million m<sup>3</sup> on peak consumption days.

Currently, the issue of winter season deficits has been resolved based on the memorandum and corresponding contract signed with "SOCAR."<sup>119</sup> However, in the future, balancing the demand-supply disparity between winter and summer periods may become significantly more challenging. This is particularly true when, starting in 2027, the supplemental gas supply from the SCP ceases creating a persistent need for securing supplemental gas during the winter months to meet the country's demand.

Consequently, it is essential to take measures to address potential gas shortages during critical situations, such as unplanned supply disruptions (during the winter season's peak consumption days). Demand balancing could be ensured through gas reserves or by securing potential assistance based on and within the framework of solidarity principles.<sup>120</sup> This could involve drawing from transit pipelines or utilizing interconnections, with neighboring countries, including the possibility of operating in reverse mode with Turkey and Armenia.

<sup>119</sup> Due to the limited capacity of the infrastructure connecting Georgia to Azerbaijan, "SOCAR" sometimes fulfills its obligations using gas supplied from Russia

<sup>120</sup> See: mutual support clause for emergency situation, referring to possibility having access to the transit flows on predefined and negotiated terms

## Annex 2 Brief Description of Identified Risks and Key Outcomes of Preventive

### Measures<sup>121</sup>

#### 1. Initial event: Attack by a Foreign State

The risk considers a potential terrorist attack on the country's critical energy infrastructure, specifically the Saguramo metering and distribution hub, which would result in the disruption of gas supply to parts of Georgia: this disruption would affect Inner Kartli (partially), Western Georgia, and Adjara. Additionally, the Mtskheta-Mtianeti-Borjomi-Bakuriani line would be shut down, along with a significant portion of consumers in the Kakheti region and those in the northern direction.

As a short- to medium-term mitigating measure, it is recommended to restore/rehabilitate the currently inactive 700 mm collector pipeline that connects the 1200 mm North Caucasus-South Caucasus pipeline (at km 267.0 near the village of Misaktsieli) and the 700 mm pipeline in the western direction (at km 3.0 near the village of Natakhtari).<sup>122</sup> This restoration would ensure the pipeline's reliable operation. As a result, the possibility is created to supply Russian gas in the western direction, bypassing the Saguramo hub, thereby reducing the sector-wide impact from a level 3 to a level 1.

As a medium-term mitigating measure, it is recommended to enhance the protection of the Saguramo hub using additional resources from the operating company (such as implementing video monitoring and/or other modern surveillance systems) or by procuring services from the Strategic Pipeline Protection Department within the Ministry of Internal Affairs. This department is responsible for the protection of critical infrastructure, including main gas pipelines, thermal power plants (TPPs), and hydroelectric power stations (HPPs), which are listed as objects of special importance and strategic significance, requiring specialized protective measures. As a result<sup>123</sup>, the probability of the risk occurrence could be significantly reduced—from a level 2 to a level 1, according to expert assessments<sup>124</sup>;

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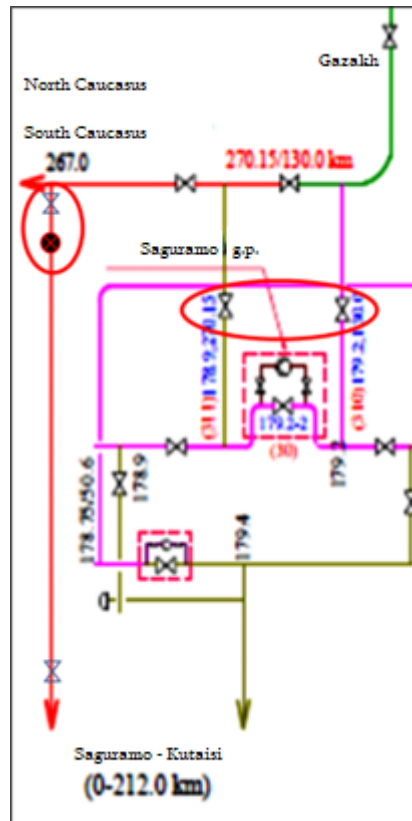
<sup>121</sup> Official Use Information

<sup>122</sup> The reconstruction should also include the installation of a metering hub.

<sup>123</sup> "The Law of Georgia on the Engineering-Geodetic Control and Security of Objects of Special Importance and Strategic Significance"

<sup>124</sup> The assessment is based on the extensive experience of the Strategic Pipeline Protection Department, during which no significant incidents have been recorded at any of the protected facilities

Chart 41 700 mm collector and the #310 and #311 connecting valves

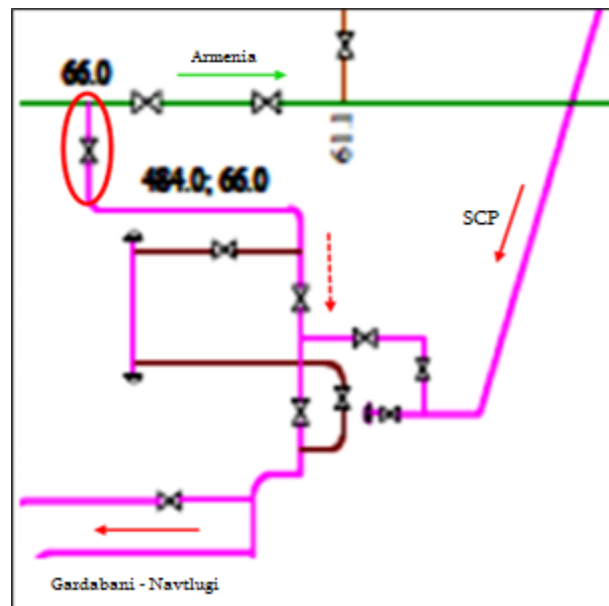


To enhance the sustainability of the transit function, long-term preventive measures include the modernization of infrastructure and, if necessary, the selection and construction of facilities/equipment for gas reserves. The modernization involves the restoration/modernization of the existing interconnecting collectors between the North-South and East-West main gas pipeline systems. This includes the restoration/modernization of the collector that connects the Kazakhi-Saguramo pipeline at km 66.0 (km 304.0) and the Karadagi-Tbilisi main gas pipeline at km 484.0, equipped with the 700 mm #304 valve. Additionally, it involves the reconstruction of collectors equipped with the #310 and #311 valves (including equipping them with remotely controlled valves and positioning them as far as possible from the metering hub). This would enable the rapid redistribution of gas flows during emergency situations and ensure virtually uninterrupted transit.

As a result, following the implementation of the recommended preventive measures, the impact of the risk occurrence will be significantly reduced (to a minimal level). Despite this, work has commenced to identify methods and means/methods for gas reserves as a long-term solution. To this end, with funding from the United States Agency for International Development (USAID) under the "Fair and Secure Energy Transition Program" (JSET, #7200AACA0028), work is underway on the project "Balancing Gas Consumption Disparities in Georgia." The plan includes selecting alternative methods to balance the seasonal and operational disparities in gas demand, such as the development of an underground gas storage facility, the establishment of liquefied natural gas (LNG) or compressed natural gas (CNG) storage, or the implementation of gas mutual assistance projects with neighboring and Energy Community countries,

among other options. Additionally, the plan involves promoting measures to diversify natural gas supply, including initiating LNG swap contracts with European Union countries and Turkey.

Chart 42 Collector at Valve #304



As an ongoing preventive measure, it is essential to focus on strengthening Georgia's defense capabilities, including ensuring the security of its energy infrastructure<sup>125</sup>.

## 2. Initial event: The problem of the demarcation and delimitation of state borders

The risk involves the potential damage to pipelines located in a tunnel within the buffer zone on the Russian border due to corrosive processes. Due to issues related to the delimitation of the border with Russia, preventive maintenance of the pipeline is currently and foreseeably in the short term practically impossible. This creates a risk of leakage, where the concentration of natural gas in the tunnel could reach a critical level, potentially leading to an explosion.

After a potential easing of the political crisis with Russia, the recommended medium- to long-term preventive action plan includes renewing the damaged insulation coating of the pipelines and installing an anti-corrosion protection system. These tasks would be carried out through coordinated efforts with the supplier (Russian "Gazprom") and in collaboration with the Border Department. As a result, the likelihood of an emergency situation arising will be reduced to 1, and the impact will become negligible.

## 3. Initial event: War or Civil Unrest in the Supplier Country

The risk considers the potential shutdown of the Kazakhi-Saguramo pipeline during a one-month period of baseline winter consumption.

The recommended long-term preventive action plan includes increasing the capacity of the receiving point from the SCP (South Caucasus Pipeline) or establishing an additional receiving point. This would

<sup>125</sup> The preventive measures for the risk outlined in this section are beyond the control of the operating company and other gas market participants and depend on the political course chosen by the country's highest legislative and executive authorities

be done in coordination with the operator (SOCAR), with technical issues being agreed upon and commercial matters coordinated for the temporary redirection of "SOCAR gas" into the South Caucasus Pipeline during the crisis period.

In the long term, consideration may also be given to selecting and constructing/installing facilities or equipment for gas reserves. This would be linked to the outcomes of the ongoing project, "Balancing Gas Consumption Disparities in Georgia to Support the Georgian Oil and Gas Corporation," funded by USEA.<sup>126</sup>

#### **4. Initial event: War or Civil Unrest in the Supplier Country**

The risk considers the potential shutdown of the South Caucasus and Kazakhi-Saguramo pipelines for a one-month period of baseline winter consumption as a result of attacks on the pipelines in the wake of an escalated conflict between Azerbaijan and Armenia.

Based on a further assessment of the risk, in light of the recent successful peace processes between Azerbaijan and Armenia, and importantly, considering that an attack on the SCP (South Caucasus Pipeline) would be equivalent to an attack on infrastructure supplying the international market, the probability of this risk occurring has been reduced to level 1. Despite this, as a preventive measure, it is advisable to reach a preliminary agreement with "Gazprom Armenia" regarding the retention of a portion of Russian gas intended for Armenia in Georgia during a crisis period.

#### **5. Initial event: Terrorisms**

This high-probability risk (considering historical experience) involves the potential failure of the 1200 mm North-South Caucasus main gas pipeline on Russian territory.

Short-term preventive measures include agreements with neighboring countries for mutual assistance during a crisis, as well as securing increased electricity imports to replace gas-fired thermal power plants (TPPs) during the crisis period.

In the medium term, it is recommended to modernize infrastructure to enable physical gas reverse flows from neighboring countries and/or to ensure virtual reverse flows from Turkey or EU countries via the SCP (South Caucasus Pipeline) through the existing receiving point or by upgrading it. The feasibility and advisability of implementing these measures are planned to be evaluated within the framework of the ongoing USAID-funded project, "Assess the Balancing of Gas Consumption Disparity of Georgia in Support of the Georgian Oil and Gas Corporation." This evaluation will be conducted in coordination with the operators of neighboring countries' transportation systems, after which final investment decisions may be made.

For the long term, it is recommended to plan joint actions with "Gazprom Armenia" (within the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovyan) underground gas storage or from Iran (via swap arrangements).

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<sup>126</sup> USAID The ongoing project, "Assess the Balancing of Gas Consumption Disparity of Georgia in Support of the Georgian Oil and Gas Corporation," funded by USEA and scheduled for completion in the 3rd quarter of 2024, aims to determine the necessity, technical feasibility, and economic viability of implementing a gas reserves project in Georgia

The implementation of the planned measures will significantly reduce the impact at both sectoral and national levels. At the same time, it will become impossible to supply Russian gas to Armenia, which could potentially exacerbate the crisis in the neighboring country.<sup>127</sup>

#### **6. Initial event: Contractual Agreement Breach/Termination**

The scenario considers the unexpected termination/suspension of the gas supply contract with Gazprom during the winter peak consumption period.

Short-term preventive measures include agreements with friendly neighboring countries for mutual assistance during a crisis, as well as securing increased electricity imports to replace gas-fired thermal power plants (TPPs) during the crisis period.

In the medium term, it is recommended to modernize infrastructure to enable physical gas reverse flows from neighboring countries and/or to ensure virtual reverse flows from Turkey or EU countries via the SCP (South Caucasus Pipeline) through the existing receiving point or by upgrading it.

For the long term, it is recommended to plan joint actions with "Gazprom Armenia" (within the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovyan) underground gas storage facility or from Iran (via swap arrangements).

#### **7. Initial event: Contractual Agreement Breach/Termination**

The scenario considers the unexpected termination or suspension of the gas supply contract with SOCAR during the winter peak consumption period.

A short-term preventive measure includes reaching agreements with "Gazprom" and "Gazprom Armenia" for the supply of supplemental gas during a crisis period and/or retaining a portion of the gas intended for transit to Armenia within Georgia.

In the medium term, it is recommended to secure a supplemental gas supply contract with Azerbaijan from the Shah Deniz field and to ensure the extension of the existing long-term contract with SOCAR beyond 2026 and 2030, respectively.

For the long term, it is recommended to plan joint actions with "Gazprom Armenia" (within the framework of intergovernmental economic cooperation) regarding the supply of gas from Armenia's (Abovyan) underground gas storage or from Iran (via swap arrangements).

The implementation of the planned measures will significantly reduce the impact at both sectoral and national levels. This risk will not impact regional transit operations.

#### **8. Initial event: Cyberattack**

A cyberattack on the control hubs of the South Caucasus Pipeline, located on the territory of Azerbaijan or Georgia, has been considered.

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<sup>127</sup> The occurrence of this risk could worsen the crisis in Armenia due to the interruption of Russian gas transit. However, It is essential to note that Armenia has the capability to replace Russian gas with imports from Iran or with gas from its own Abovyan underground storage facility.

It is known that the central (Sangachali) and regional control systems of the South Caucasus Pipeline are duplicated, allowing them to function independently if necessary. Despite this, if the management and control system of the SCP's receiving point is disabled, the capacity of the remaining receiving points is sufficient to fully meet demand. Consequently, at both the sectoral and national levels, the risk is classified as minimal, and it does not impact the supply of gas to thermal power plants or neighboring countries.

Despite this, it is recommended to ensure the continuous and reliable operation of communication between the transmission network operator and the SCP operator company via the SCADA system. This will enable rapid response in the event of an incident.

#### **9. Initial event: Unplanned Technological Disruption (or Significant Delay) in Supply**

An unplanned disruption in gas supply from the Shah Deniz offshore field is considered, potentially caused by technological irregularities, unplanned maintenance work, and/or severely deteriorated climatic conditions in the Caspian Sea.

For the short term, it is recommended to ensure coordination with "SOCAR," which operates both the Azerbaijani ("SOCAR gas") supply infrastructure and the SCP, to fulfill the conditions of the existing contract. This includes, if necessary, the provision of supplemental gas to meet the demand of "social sector" consumers (the residential sector and electricity generation facilities).

In the event of a potential crisis, if necessary, additional measures could include restricting gas supply to low-efficiency "old" gas-fired thermal power plants and utilizing the option to import additional volumes of electricity.

In the long term, consideration may be given to implementing a project for selecting, constructing, and installing gas reserve facilities/equipment. Additionally, the realization of a new Combined Cycle Gas Turbine (CCGT) project could be pursued to replace the "old" steam turbine generation facilities.

The ongoing preventive action plan includes ensuring the achievement of gas sector development targets as outlined in Georgia's National Energy and Climate Plan. This will be accomplished through the deployment of renewable energy sources and the implementation of energy efficiency measures, leading to a significant reduction in demand for imported gas.

The implementation of the planned preventive measures will ensure a substantial reduction in the impact of the risk at both sectoral and national levels, while also having no effect on transit operations.

#### **10. Initial event: Unplanned Technological Disruptions in Supply**

The scenario considers an unplanned disruption in gas supply on the 1200 mm North-South Caucasus main pipeline due to a technological irregularity or unplanned maintenance work on Russian territory.

It is recommended to reach an agreement with "SOCAR," which operates both the Azerbaijani ("SOCAR gas") supply infrastructure and the SCP, to ensure the fulfillment of the conditions outlined in the existing contract during the period of Russian gas supply disruption. This would involve, if necessary, the provision of supplemental gas to meet the demand of "social sector" consumers (the residential sector and electricity generation facilities).

It is recommended to increase electricity imports, if necessary, during the crisis period to replace the low-efficiency "old" gas-fired thermal power plants.

In the long term, consideration may be given to implementing a project for selecting, constructing, and installing gas reserve facilities/equipment. Additionally, a new Combined Cycle Gas Turbine (CCGT) project could be pursued to replace the "old" steam turbine generation facilities.

The ongoing preventive action plan includes ensuring the achievement of gas sector development targets as outlined in Georgia's National Energy and Climate Plan. This will be accomplished through the deployment of renewable energy sources and the implementation of energy efficiency measures, leading to a significant reduction in demand for imported gas.

The implementation of the planned preventive measures will ensure a substantial reduction in the impact of the risk at both sectoral and national levels. However, it may exacerbate the crisis at the regional level due to the disruption of Russian gas supplies to Armenia.

#### **11. Initial event: Unplanned Technological Disruption in Supply**

The scenario considers an unplanned disruption in gas supply on the 1200 mm North-South Caucasus main pipeline due to a technological irregularity or unplanned maintenance work on Russian territory. Simultaneously, it also considers a disruption at the Shah Deniz offshore field caused by technological irregularities, unplanned maintenance, and/or severely deteriorated climatic conditions in the Caspian Sea.

It is recommended to reach an agreement with "SOCAR," which operates both the Azerbaijani ("SOCAR gas") supply infrastructure and the SCP, to ensure the fulfillment of contract conditions in any critical situation. This includes the provision of supplemental gas to meet the demand of "social sector" consumers (residential sector and electricity generation facilities) in case of a gas shortage. Additionally, if necessary, increasing electricity imports during a crisis period to replace low-efficiency "old" gas-fired thermal power plants should also be considered.

In the long term, it is planned to select, construct, and install gas reserve facilities/equipment. Additionally, the realization of a new Combined Cycle Gas Turbine (CCGT) project is considered to replace the "old" steam turbine generation facilities.

The ongoing preventive action plan includes ensuring the achievement of gas sector development targets as outlined in the National Energy and Climate Plan. This will be accomplished through the deployment of renewable energy sources and the implementation of energy efficiency measures. Additionally, it involves implementing measures to secure reverse flows from neighboring countries or to ensure gas reserves.

The implementation of the planned preventive measures will ensure a substantial reduction in the impact of the risk at both sectoral and national levels. The impact on transit operations will remain.

## **12. Initial event: Pipeline Age and Corrosion**

The scenario considers the temporary disruption of the Kazakhi-Saguramo pipeline supplying gas from Azerbaijan to Georgia, due to corrosion in the aging (technically exhausted) pipelines, and as a result, the temporary cessation of the receiving point's operations.

Short-term preventive measures include increasing the frequency of gas leak detection and monitoring for potential corrosion sites by the operating company, especially on older pipelines that operate without corrosion protection systems.

For the medium term, it is recommended to replace sections of the Azerbaijan-Georgia connecting pipelines that have exhausted its technical resources and are of advanced age. These new sections should be equipped with systems for protection against electrochemical corrosion. Additionally, it is recommended to implement measures that would allow for increased supply from alternative sources in the event that the risk materializes. This includes planning joint actions with "Gazprom Armenia" (within the framework of intergovernmental economic cooperation) for gas supply from Armenia's Abovyan underground gas storage facility or from Iran (via swap arrangements).

In the long term, it is advisable to equip the entire system with pipelines that are protected against electrochemical corrosion. This is necessary because the soil potential in sections built before 2007, due to low-quality pipeline insulation, largely fails to meet the required standards. As a result, the gradual replacement of these sections in its entirety is essential.

## **13. Initial event: Mudslide**

The scenario considers the disruption of the 1200 mm North-South Caucasus pipeline located in historically landslide-prone areas (such as the Devdoraki or Kuro Valley).

The proposed preventive action plan does not include the implementation of additional measures involving capital or significant operational expenditures. This is because, following the construction of aerial cable crossings for the pipelines over the Devdoraki and Kuro Valleys, the probability of the risk occurring has been effectively reduced to zero.

Despite this, it is advisable for the operating company to ensure continuous monitoring to guarantee the reliable functioning of these complex engineering structures.

For prevention and to avoid potential damage, it is recommended that the Transmission System Operator (TSO) collaborates with the National Environmental Agency and arranges for the procurement of services to receive automatic notifications regarding environmental conditions (an ongoing measure over time).

## **14. Initial event: Landslide**

The scenario considers the disruption of the 1200 mm North-South Caucasus pipeline located in historically landslide-prone areas (such as near the villages of Toti, Meneso, Dusheti, and the outskirts of Tbilisi).

The proposed preventive action plan does not include the implementation of additional measures involving capital or significant operational expenditures.

For the purpose of prevention and avoiding potential damage, it is recommended that the Transmission System Operator (TSO) collaborates with the National Environmental Agency and arranges for the procurement of services to receive automatic notifications regarding environmental conditions.

#### **15. Initial event: Rockfall and Landslide**

The scenario considers the disruption of the 1200 mm North-South Caucasus pipeline located in historically rockfall and landslide-prone areas (such as near the villages of Gveleti and Kobi).

The proposed preventive action plan does not consider the need for additional measures involving capital or significant operational expenditures.

For preventive purposes, it is recommended that the Transmission System Operator (TSO) ensure continuous monitoring and proactive execution of preventive maintenance work. Additionally, if necessary, the TSO should carry out clearing operations within the pipeline's protection and safety zones.

#### **16. Initial event: Gradual Occupation**

The risk of an explosion on the Saguramo-Kutaisi main pipeline near the temporarily occupied territory (along the so-called "South Ossetia" administrative border) has been assessed.

As an ongoing mitigating measure, it is recommended that the operating company, either with its own resources or by procuring services (from the Strategic Pipeline Protection Department within the Ministry of Internal Affairs), carry out surveillance and security measures along the specified section of the pipeline. It is essential to note that, according to current legislation, main gas pipelines are included in the list of objects of special importance and strategic significance, requiring the implementation of specialized protective measures.

As a result, the probability of the risk occurring can be significantly mitigated (reduced to level 1, according to expert assessments).

The integration of Georgia into Euro-Atlantic economic and political structures is considered a fundamental measure for reducing the risk.

#### **17. Initial event: Cyberattack**

The scenario considers the risk of the operational control shield of Georgia's main gas pipeline system failing and the paralysis of the mobile communication system.

In the medium term, it is recommended to implement a backup communication system operating on an independent, dedicated frequency to ensure uninterrupted communication with operators and branches during a crisis situation.

For the long term, it is recommended to establish an additional, independent control hub for the gas supply system to ensure the continued operational capability of the overall system in the event of a cyberattack.

## **18. Initial event: Pipeline Age and Corrosion**

The temporary interruption in the operation of the Kutaisi-Sukhumi main gas pipeline due to corrosion in the deteriorated sections has been reviewed.

In the medium term, it is recommended to design the existing 500 mm section of the Kutaisi-Sukhumi pipeline from the 24.0 km mark to the 109.8 km mark in a phased manner: in the first phase, the Senaki-Zugdidi section (km markers 64.7-109.8) should be addressed, followed by the section located between km markers 24.0-64.7 (the majority of which has been in operation since 1986 without anti-corrosion protection). The construction of this section will be included in the 10-year development plan for transmission infrastructure.

In the long term, there is also consideration for connecting the Poti branch to Anaklia via a collector pipeline approximately 28 km in length, passing through Kulevi. This will ensure looped supply for consumers in the Samegrelo region.

## **19. Initial event: Involving excavation, earthworks, and related activities. Resulting damages**

The risk of damage to the gas pipeline by a third party during construction, agricultural, and/or quarrying activities related to mining operations has been assessed.

It is recommended that the operating company strengthen measures for the protection of pipelines and safety zones.

To prevent incidents, ongoing measures also include awareness-raising activities for relevant municipal staff and the local population, ensuring the full implementation of the obligation to place markers along the pipeline route, tightening control over illegal construction within pipeline protection zones, and similar actions.

As a result, the probability of risk occurrence will be significantly reduced (expert assessment estimates it at up to 2), thereby decreasing the potential for damaging effects.

## **20. Initial event: Pipeline Age and Corrosion**

The temporary interruption in the operation of the western main gas pipeline due to corrosion in the deteriorated 500 mm sections of the Saguramo-Chorchana segment has been reviewed.

To mitigate the probability of risk occurrence and prevent the spread of negative impacts, it is essential to complete the construction of the 700 mm pipelines currently under construction (Lekhura-Sveneti) and those planned (Saguramo-Natakhtari) in the shortest possible timeframe (see details 7. in the Infrastructure Projects section).

In the medium term, it is recommended to redirect the primary gas flow to the new pipeline and establish connecting collectors between the parallel 700 mm and 500 mm pipelines.

According to the assessment, the implementation of the planned measures will reduce the risk probability from 3 to 1.

In the long term, the possibility of establishing gas reserves in the western region of Georgia may also be considered, contingent upon the necessity and feasibility being determined through a comprehensive techno-economic analysis.

**21. Initial event: The Difficulty of Implementing Proper Maintenance**

The risk of pipeline damage, gas leakage, and explosion has been assessed for the forested sections along the Borjomi-Bakuriani branch, the branch feeding from Zhinvali towards Kakheti, and the 1200 mm North Caucasus-South Caucasus main gas pipeline.



**Figure 14 Kakheti Branch. Sections located in areas covered by forest and shrubland (prior to the completion of clearing work)**



**Figure 15 Borjomi-Bakuriani Branch. Sections located in areas covered by forest and shrubland (prior to the completion of clearing work)**

As an ongoing measure, it is recommended that the operating company strengthen the protection of pipeline safety zones and ensure the timely execution of preventive clearing operations. Additionally,

as a preventive measure, the ministry should consider the advisability of refining legislation to hold accountable the physical and legal entities responsible for causing fires that damage main gas pipelines.

As a preventive measure, it is also recommended to implement actions such as installing additional warning signs near pipeline protection zones and other similar measures. The implementation of the Tabatskuri-Bakuriani project, as outlined in long-term infrastructure plans, will also contribute to risk reduction.

According to the assessment, the implementation of the planned measures will reduce the risk probability from 3 to 1.

## **22. Initial event: Earthquake**

The subsidence and damage of a 1 km section of the southern branch gas pipeline due to a high-intensity, destructive earthquake in Samtskhe-Javakheti has been reviewed.

In the long term, it is recommended to implement the Tabatskuri-Bakuriani branch project, which will ensure looped supply for the Khashuri-Bakuriani branch from the southern branch (or vice versa), significantly enhancing operational reliability and flexibility.

## **23. Initial event: Flood**

The risk of pipeline damage in the western Georgia region due to flooding has been reviewed. specifically:

1. Damage to the 700 mm Saguramo-Kutaisi gas pipeline in the western direction near Zestaponi due to flooding of the Kvirila River has been reviewed.
2. Damage to the Kobuleti branch gas pipeline at the overpass of the Supsa River has been reviewed.
3. Damage to the Senaki-Sukhumi section of the gas pipeline due to flooding of the Gubistskali River has been reviewed.
4. Damage to the 700 mm and 500 mm Saguramo-Kutaisi gas pipelines due to flooding of the Rioni River has been reviewed.
5. Damage to the aerial crossing of the Saguramo-Kutaisi gas pipeline due to flooding of the Liakhvi River has been reviewed.

As part of the short-term preventive measures plan, it is recommended to:

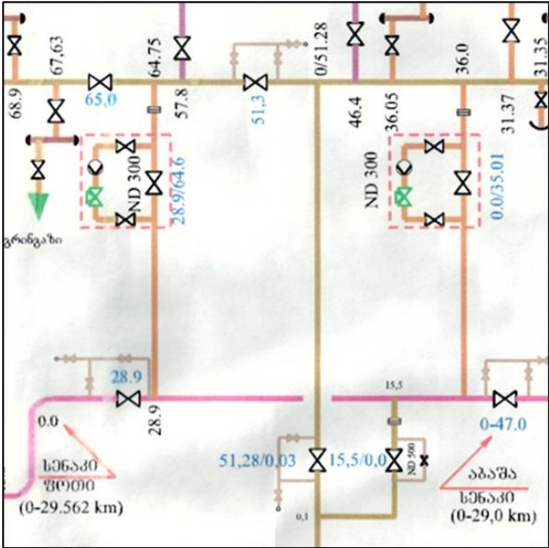
1. During the design phase of the "Khashuri-Zestaponi" pipeline project, as outlined in the "Ten-Year Transmission System Development Plan," it is recommended to construct the overpass on the Kvirila River using either an aerial cable-stayed or horizontal directional drilling method, considering the topographical conditions and economic feasibility;
2. Complete the ongoing construction of the Kobuleti (Adjara) branch project.

For the medium term, it is recommended:

1. Complete the construction of the "Khashuri-Zestaponi" pipeline project by implementing the structural solutions specified in the design.

2. Interconnect the existing and under-construction Kobuleti branches to enable flow reversal if needed.
3. Prepare a project for the river crossing over the Gubistskali River using the horizontal directional drilling method as part of the "Ten-Year Transmission System Development Plan";
4. Ensure the proper functioning of the existing collectors (near Kvishanchala village and Sujuna village) on the 700 mm and 500 mm pipelines in the Abasha-Senaki section. Additionally, install extra collectors, if necessary, such as after the completion of the new Kobuleti branch project (see chart), to facilitate flow redirection and/or reversal. This will significantly reduce the area affected by the negative impact of any potential risks;
5. Conduct continuous monitoring and, if necessary, perform bank reinforcement work in the area surrounding the aerial crossing of the Liakhvi River, primarily along the left bank of the river.

**Chart 43 The existing collectors on the Abasha-Senaki section.**



In the long term, the following measures are recommended:

1. Construction of the river crossing over the Gubistskali River using the horizontal directional drilling method;
- 2.a) Analyze the results of long-term monitoring, and if necessary, construct an aerial cable-stayed or underground crossing over the Liakhvi River;
- 2.b) Establish the second gas reception point at the SCP and implement the Vale-Vani connecting pipeline project, which will ensure looped supply for consumers in western Georgia. Together with the planned Tabatskuri-Bakuriani branch project, this will also provide looped supply for consumers in the Saguramo-Khashuri-Bakuriani and Southern branches.

For ongoing risk prevention, continuous monitoring is planned at the Supsa River crossing of the existing Kobuleti branch. If necessary, bank reinforcement or relocation works will be carried out<sup>128</sup>.

The implementation of the recommended measures will reduce both the probability of risk occurrence and the impact severity (to 3 and 2, respectively, according to the established classification).

#### **24. Initial event: Cyberattack + Unplanned Technological Disruption of Supply**

The risk associated with a cyberattack on the control panel of the South Caucasus pipeline located in Azerbaijan or Georgia, combined with a simultaneous technological malfunction, leading to the unplanned disruption of Russian gas supply through the 1200 mm North-South Caucasus pipeline, has been analyzed.

In the short term, an effective risk mitigation measure to soften the damaging impact of such an event is to ensure an increase in electricity imports during the crisis period, in order to replace gas-fired thermal power plants (TPPs).

For the medium term, it is recommended:

- Ensure the virtual reverse flow of gas from Turkey or EU countries through the existing gas reception point at the SCP or through its modernization;
- Restrict gas supply to low-efficiency "old" power generation facilities during the crisis period and ensure the import of additional electricity volumes.

Long-term preventive measures include:

- Selection and installation of gas storage facilities/equipment;
- Implementation of a new Combined Cycle Gas Turbine (CCGT) project to replace the "old" steam turbine generation facilities.
- Infrastructure modernization to enable the physical reverse flow of gas from Turkey.

The ongoing preventive action plan includes ensuring the achievement of target indicators for the development of the gas sector as defined by Georgia's energy policy and the National Energy and Climate Plan. This will be accomplished through the adoption of renewable energy sources and the implementation of energy efficiency measures. As a result, the damaging impact of the risk will be reduced from significant to minor at both the sectoral and national levels. The occurrence of this risk could exacerbate the crisis at the regional level, as the supply of Russian gas to Armenia would be interrupted. However, it is essential to note that Armenia has the capability to replace Russian gas with imports from Iran or by utilizing gas from its own Abovyan underground storage facility.

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<sup>128</sup>Ongoing measures also include the restoration and rehabilitation of infrastructure identified as critical by the operating company during annual inspections. For the current period, such works include: The area adjacent to the aerial crossing over the Kvirila River at the 9th km of the "Zestaponi-Kutaisi" main gas pipeline, the area near the aerial crossing over the Tskhenistskali River at the 34th km of the "Kutaisi-Sukhumi" main gas pipeline, and bank reinforcement work at the 23.5 km mark of the existing Kobuleti branch.

## 25. Initial event: Excavation Work + Flooding

The simultaneous damage to the southern direction gas pipeline by a third party during excavation work and the damage to pipelines in the western Georgia direction due to flooding has been reviewed, specifically:

1. Damage to the 700 mm Saguramo pipeline in the western direction near Zestaponi due to flooding of the Kvirila River.
2. Damage to the Kobuleti branch gas pipeline due to flooding of the Supsa River.
3. Damage to the Senaki-Sukhumi direction pipeline due to flooding of the Gubistskali River.
4. Damage to the 700 mm and 500 mm Saguramo-Kutaisi gas pipelines due to flooding of the Rioni River.
5. Damage to the Saguramo-Kutaisi gas pipeline at the aerial crossing over the Liakhvi River due to flooding of the Liakhvi River.

As part of the short-term preventive measures plan, it is recommended to:

1. During the design phase of the "Khashuri-Zestaponi" pipeline project, as outlined in the "Ten-Year Transmission System Development Plan," it is recommended to construct the overpass on the Kvirila River using either an aerial cable-stayed or horizontal directional drilling method, considering the topographical conditions and economic feasibility;
2. Complete the ongoing construction of the Kobuleti (Adjara) branch project.

For the medium term, it is recommended to:

1. Complete the construction of the "Khashuri-Zestaponi" pipeline project by implementing the structural solutions specified in the design.
2. Interconnect the existing and under-construction Kobuleti branches to enable flow reversal if needed.
3. Prepare a project for the river overpass on the Gubistskali River using the horizontal directional drilling method as part of the "Ten-Year Transmission System Development Plan."
4. Interconnect the 700 mm and 500 mm pipelines using collectors to facilitate flow redirection and/or reversal if necessary.
5. Conduct continuous monitoring and, if necessary, perform bank reinforcement work in the area surrounding the aerial crossing of the Liakhvi River, primarily along the left bank of the river.

In the long term, the following measures are recommended:

1. Construct the river crossing over the Gubistskali River using the horizontal directional drilling method, in accordance with the terrain profile;
2. Analyze the results of long-term monitoring, and if necessary, construct an aerial cable-stayed crossing over the Liakhvi River;
3. Establish a second gas reception point at the SCP and implement the Vale-Vani connecting pipeline project. This will ensure looped supply for consumers in western Georgia and, together with the planned Tabatskuri-Bakuriani branch project, will also provide looped supply for consumers in the Saguramo-Khashuri-Bakuriani and Southern branches.

To prevent ongoing risks over time, continuous monitoring is planned at the Supsa River crossing of the existing Kobuleti branch. If necessary, bank reinforcement or realignment works will be carried out.

Ongoing measures also include awareness-raising activities for local government employees, as well as the increased engagement of the GGTC (Georgian Gas Transportation Company) within the framework of its legally established responsibilities.

It is recommended that the operating company strengthen measures for the protection of pipelines and safety zones. Additionally, to prevent incidents, the ministry should consider the advisability of refining legislation aimed at preventing damage to main gas pipelines by third parties.

If the preventive action plan's recommended measures are implemented, the damaging impact of this combined risk will be reduced from significant to minor at both the sectoral and national levels. The potential occurrence of this risk does not affect the impact at the regional scale.

**Table 49 Qualitative Risk Assessment Matrix Post-Preventive Measures Implementation**

Duration + volume of unsupplied gas in an hour (m3)	Economic impact + qualitative criteria	≥0,9	0,5 - 0,9	0,2 - 0,5	0,1 - 0,2	0,02 - 0,1	<0,02
		Almost inevitable	High	Average	Low	Very low	Almost impossible
		6	5	4	3	2	1
5	5	6	5	4	3	2	1
5	4	6	5	4	3	2	1
4	5	6	5	4	3	2	1
4	4	6	5	4	3	2	1
3	5	6	5	4	3	2	1
5	3	6	5	4	3	2	1
4	3	6	5	4	3	2	1
3	4	6	5	4	3	2	1
5	2	6	5	4	3	2	1
2	5	6	5	4	3	2	1
3	3	6	5	4	3	2	1
4	2	6	5	4	3	2	1
2	4	6	5	4	3	2	1
3	2	6	5	4	3	2	1
2	3	6	5	4	3	2	1
1	5	6	5	4	3	2	1
5	1	6	5	4	3	2	1
4	1	6	5	4	3	2	1
1	4	6	5	4	3	2	1
2	2	6	5	4	3	2	1
3	1	6	5	4	3	2	1
1	3	6	5	4	3	2	1
2	1	6	5	4	3	2	1
1	2	6	5	4	3	2	1
1	1	6	5	4	3	2	1

Table 50 Comparative Risk Assessment Matrix for the Baseline Scenario (Maximum Historical Supply from Each Receiving Point) and the Post-Implementation Scenario of Recommended Preventive Measures

Table 50

#	Sub-scenario N2 (basic)						
	Probability	Impact	Evaluation	Impact	Evaluation	Impact	Evaluation
		Sectoral scale	Sectoral effect	National scale	National effect	Regional scale	Regional effect
1	2	3	Significant	3	Significant	1	No impact
2	2	3	Significant	3	Significant	3	Will aggravate the crisis
3	2	1	Insignificant	1	Insignificant	1	No impact
4	2	3	Significant	3	Significant	1	No impact
5	3	3	Significant	4	Critical	3	Will aggravate the crisis
6	3	3	Significant	4	Critical	1	No impact
7	1	3	Significant	3	Significant	1	No impact
8	2	1	Insignificant	1	Insignificant	1	No impact
9	4	1	Insignificant	1	Insignificant	1	No impact
10	3	3	Significant	3	Significant	3	Will aggravate the crisis
11	2	3	Significant	4	Critical	3	Will aggravate the crisis
12	1	2	Less significant	2	Less significant	1	No impact
13	2	1	Insignificant	1	Insignificant	1	No impact
14	4	2	Less significant	2	Less significant	1	No impact
15	2	1	Insignificant	1	Insignificant	2	May aggravate the crisis
16	3	3	Significant	3	Significant	1	No impact
17	2	3	Significant	3	Significant	2	May aggravate the crisis
18	5	3	Significant	3	Significant	1	No impact
19	6	3	Significant	3	Significant	1	No impact
20	3	3	Significant	3	Significant	1	No impact
21	3	3	Significant	3	Significant	1	No impact
22	1	2	Less significant	2	Less significant	1	No impact
23	6	4	Critical	4	Critical	1	No impact

Probability Σ(PAP)	Sub-scenario after PAP realization					
	Impact	Evaluation	Impact	Evaluation	Impact	Evaluation
	Sectoral scale	Sectoral effect	National scale	National effect	Regional scale	Regional effect
1	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	3	Will aggravate the crisis
2	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	3	Will aggravate the crisis
3	2	Less significant	2	Less significant	3	Will aggravate the crisis
3	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	3	Will aggravate the crisis
2	1	Insignificant	1	Insignificant	1	No impact
4	1	Insignificant	1	Insignificant	1	No impact
3	1	Insignificant	1	Insignificant	3	Will aggravate the crisis
1	2	Less significant	2	Less significant	3	Will aggravate the crisis
1	1	Insignificant	1	Insignificant	3	Will aggravate the crisis
1	1	Insignificant	1	Insignificant	1	No impact
2	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	1	No impact
1	2	Less significant	2	Less significant	1	No impact
2	1	Insignificant	1	Insignificant	1	No impact
2	2	Less significant	2	Less significant	1	No impact
2	2	Less significant	2	Less significant	1	No impact
1	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	1	No impact
1	1	Insignificant	1	Insignificant	1	No impact
3	2	Less significant	2	Less significant	1	No impact
1	2	Less significant	2	Less significant	3	Will aggravate the crisis
2	2	Less significant	2	Less significant	1	No impact

### Annex 3. Results of Consultations with Concerned Parties

Please Review the Attached Excel File

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<sup>129</sup> A reference to the sources used in the preparation of the report is provided in the footnote on the relevant page for each instance, including repeated citations. In the final bibliography, a list of these sources is provided in the order in which they appear in the text.

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