The background is a dark blue image of the Earth from space, showing the continents. Overlaid on the Earth are numerous glowing blue lines that represent energy transmission or a network. These lines are curved and intersect, creating a complex web of connections across the globe.

**DISTRIBUTED GENERATION FOR SELF-
CONSUMPTION
KEY ASPECTS AND RECOMMENDATIONS OF
GOOD PRACTICE**

Dalibor Muratović

Self-consumption – Key aspects

- **Clear definitions**
- **Technology and capacity criteria**
- **Self-consumption schemes**
- **Value of excess energy**
- **Grid costs recovery and cross subsidization**
- **VAT and other public taxes**
- **Imbalance settlement**
- **Grid Connection**

Self-consumption - Definitions

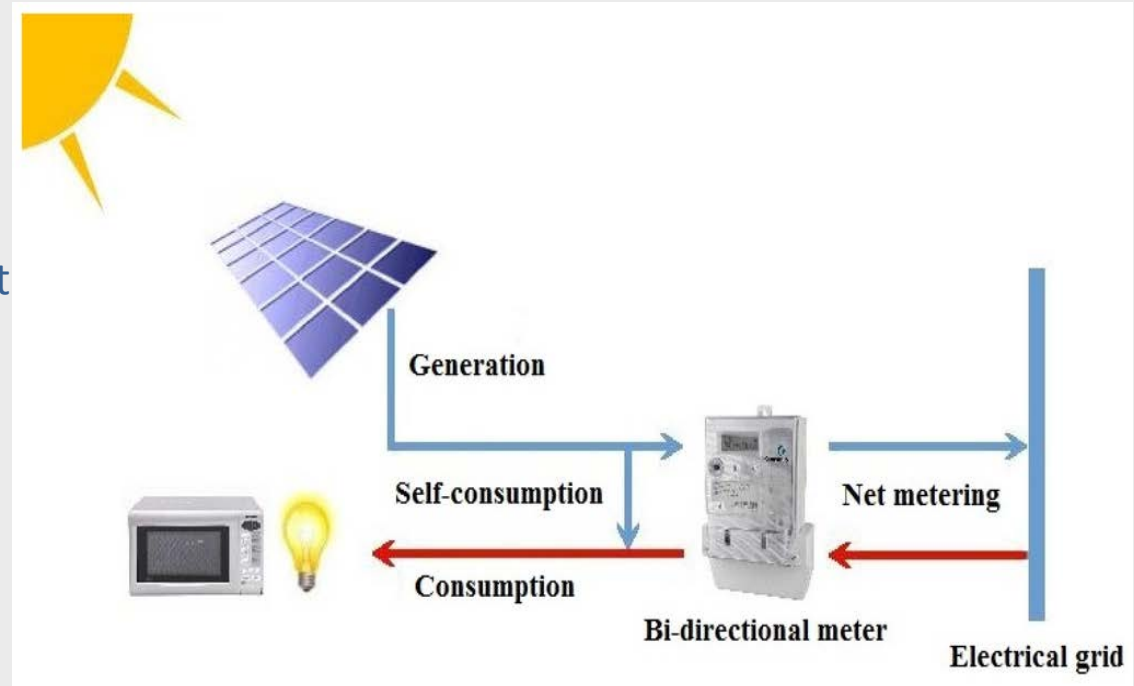
- **“Self-consumption”** is a possibility for any electricity consumer to connect to the DG system, with a capacity corresponding to his/her consumption, to his/her own system or to the grid, for his/her own or for on-site consumption, while receiving remuneration for the non-consumed electricity which is fed into to the grid.
- **“Net metering”** is a regulatory framework under which the excess electricity injected into the grid can be used at a later time to offset consumption during times when onsite renewable generation is absent or not sufficient, where the value of excess energy is equal to the retail electricity price.
- **“Net billing”** is a special form of net metering scheme with the difference that the value of excess energy is lower than the retail electricity price.

Neologism **“prosumer”** refers to an electricity customer that produces part of its electricity needs from his/her own power plant and uses distribution network to inject excess production and withdraw electricity when self-production is not sufficient to meet own needs.



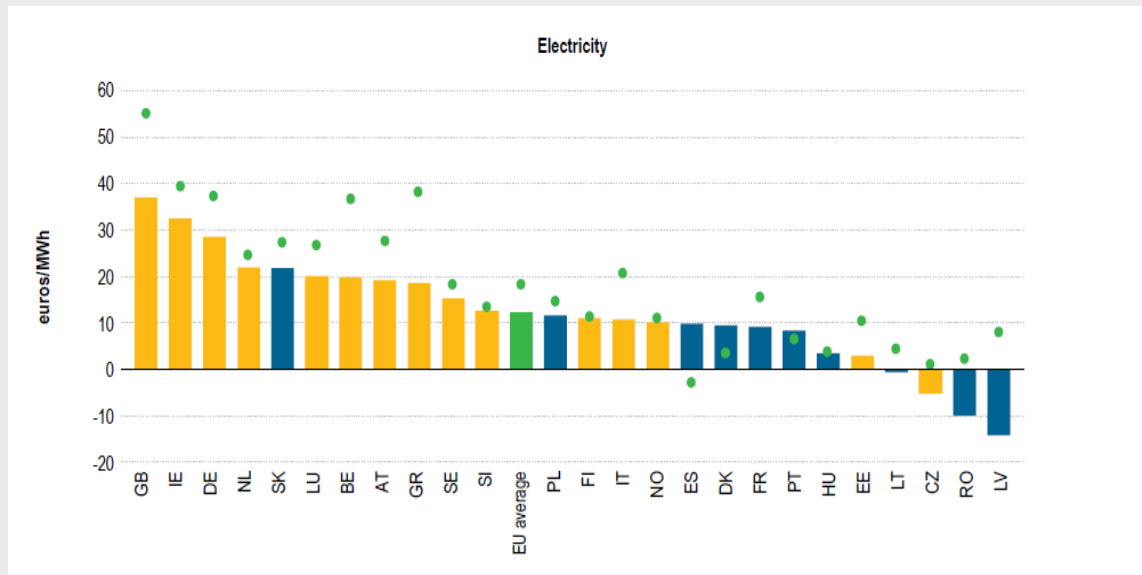
Self-consumption schemes

- Commercial arrangement
- Net metering
- Net billing



Value of excess energy

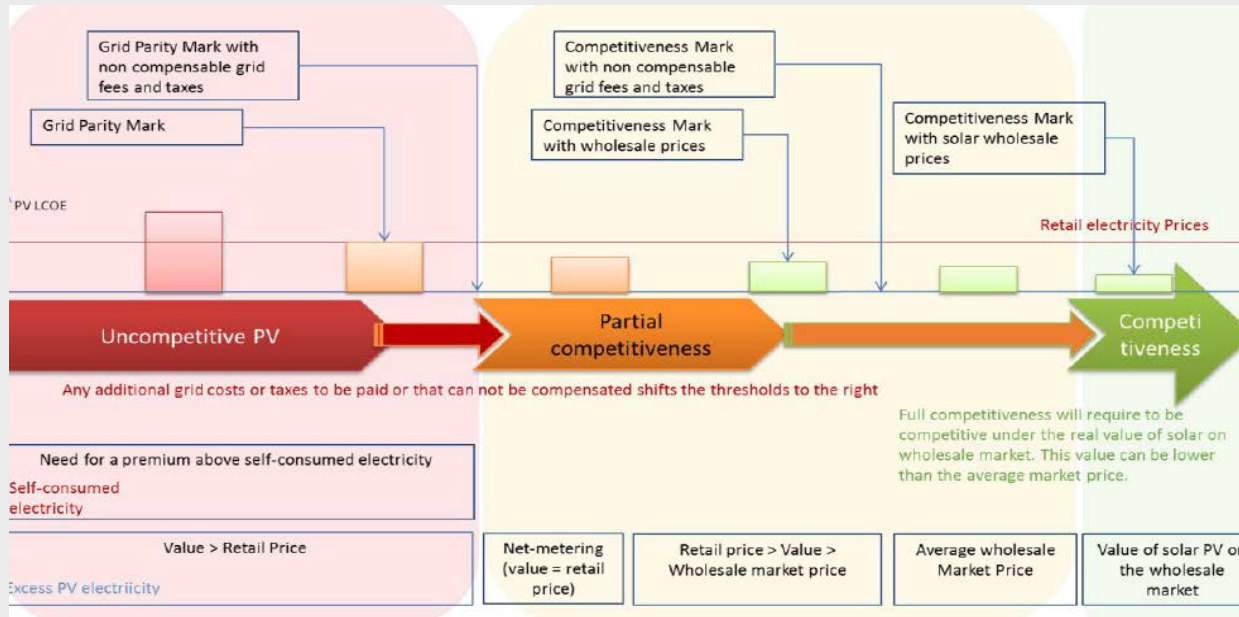
1. Feed in tariff
2. Wholesale electricity price
3. Wholesale electricity price adjusted for supplier's costs
4. Spot market electricity price
5. Spot market PV electricity price
6. Avoided costs of grid electricity
7. Retail electricity price
8. No value



Source: Agency for the Cooperation of Energy Regulators
Average mark-ups between the energy component and wholesale electricity prices (2008-2015)

Grid parity

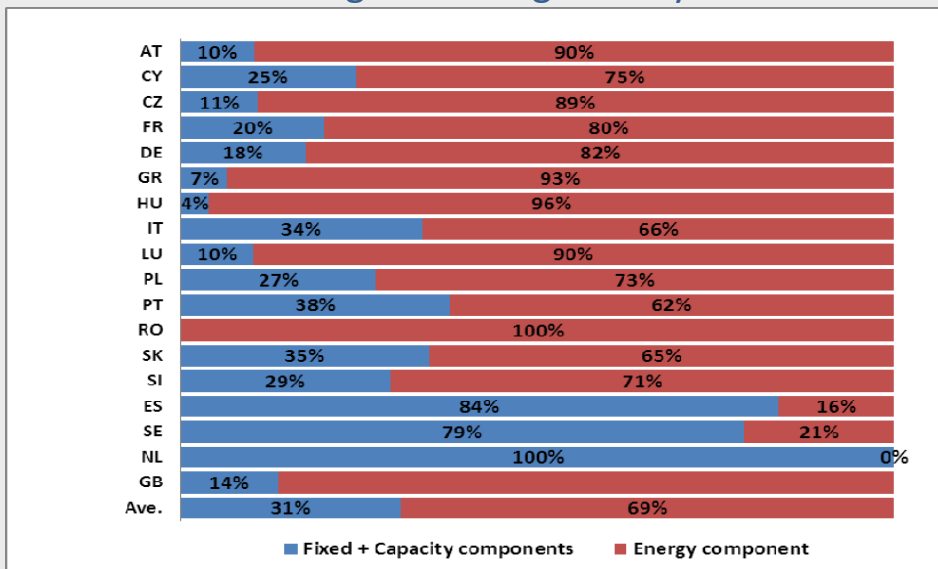
- Grid parity - LCOE of self-generated electricity equal to the retail electricity price
- Grid parity is a milestone, but not the guarantee for competitiveness
 - Non compensable grid costs and taxes
 - Excess energy valuation



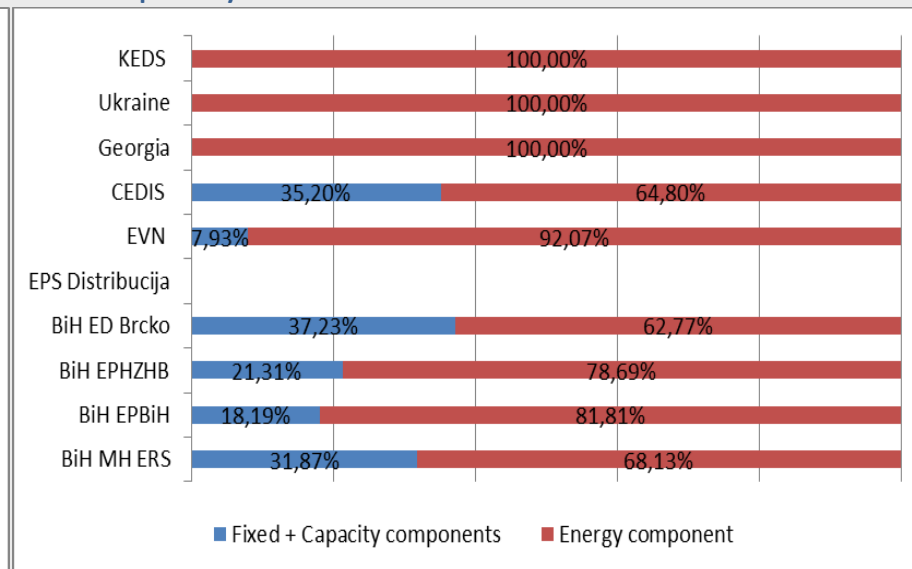
Source: International Energy Agency
DG PV Parity levels

Grid costs

- Grid costs mainly driven by the system capacity
- Distribution grids are still dimensioned as if there is no self-consumption
- Cross subsidization among consumers' categories caused by self-consumption
- DSO cost recovery
- Volumetric grid tariffs generally used instead of the capacity based tariffs



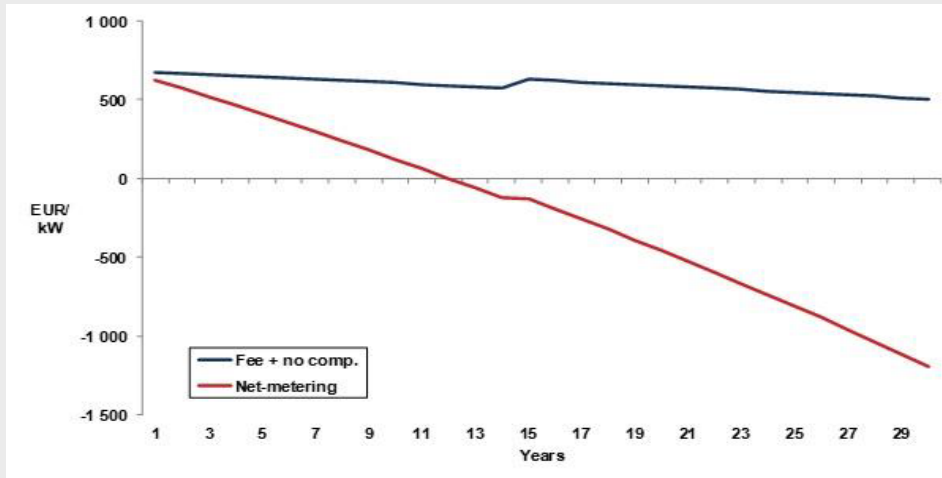
Source: European Commission, Directorate General for Energy
Distribution Tariff component weight in Households (EU)



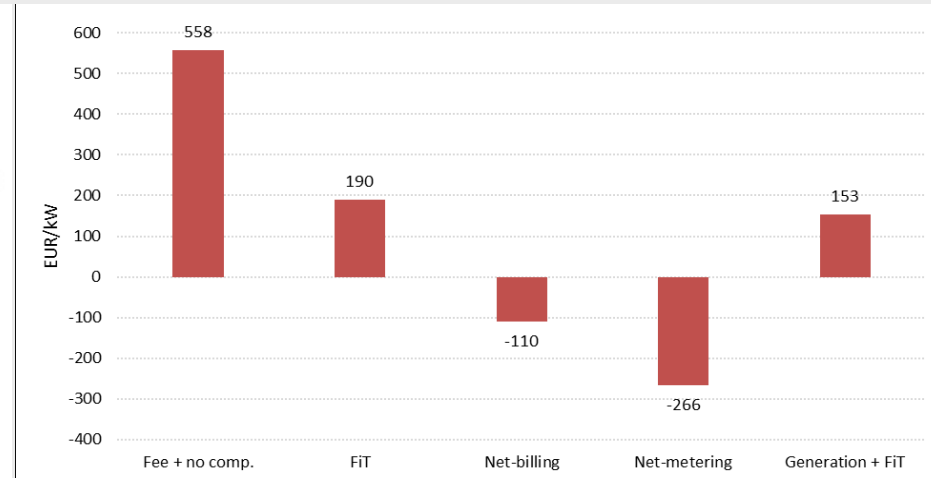
Source: Energy Community Secretariat database
Distribution Tariff component weight in the Energy Community

VAT and other public taxes

- Impact on the public tax authorities
 - Initial taxes raised in the year of installation
 - VAT not charged on netted consumption
 - Other taxes to be included in analyses
 - Economic analyses - simplified - does not include a number of benefits regarding the GHG emissions, energy security, health and wellbeing, energy affordability, job creation etc.
- VAT on consumption of non-taxable persons



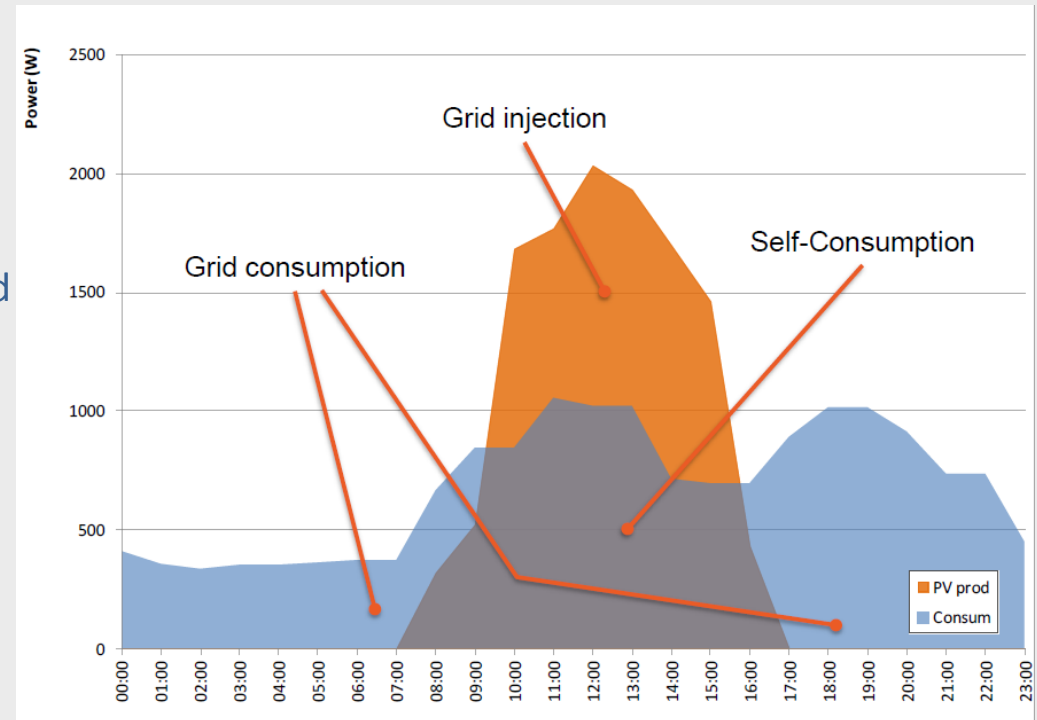
Source: International Renewable Agency
Accumulated cash flows for the public tax authority



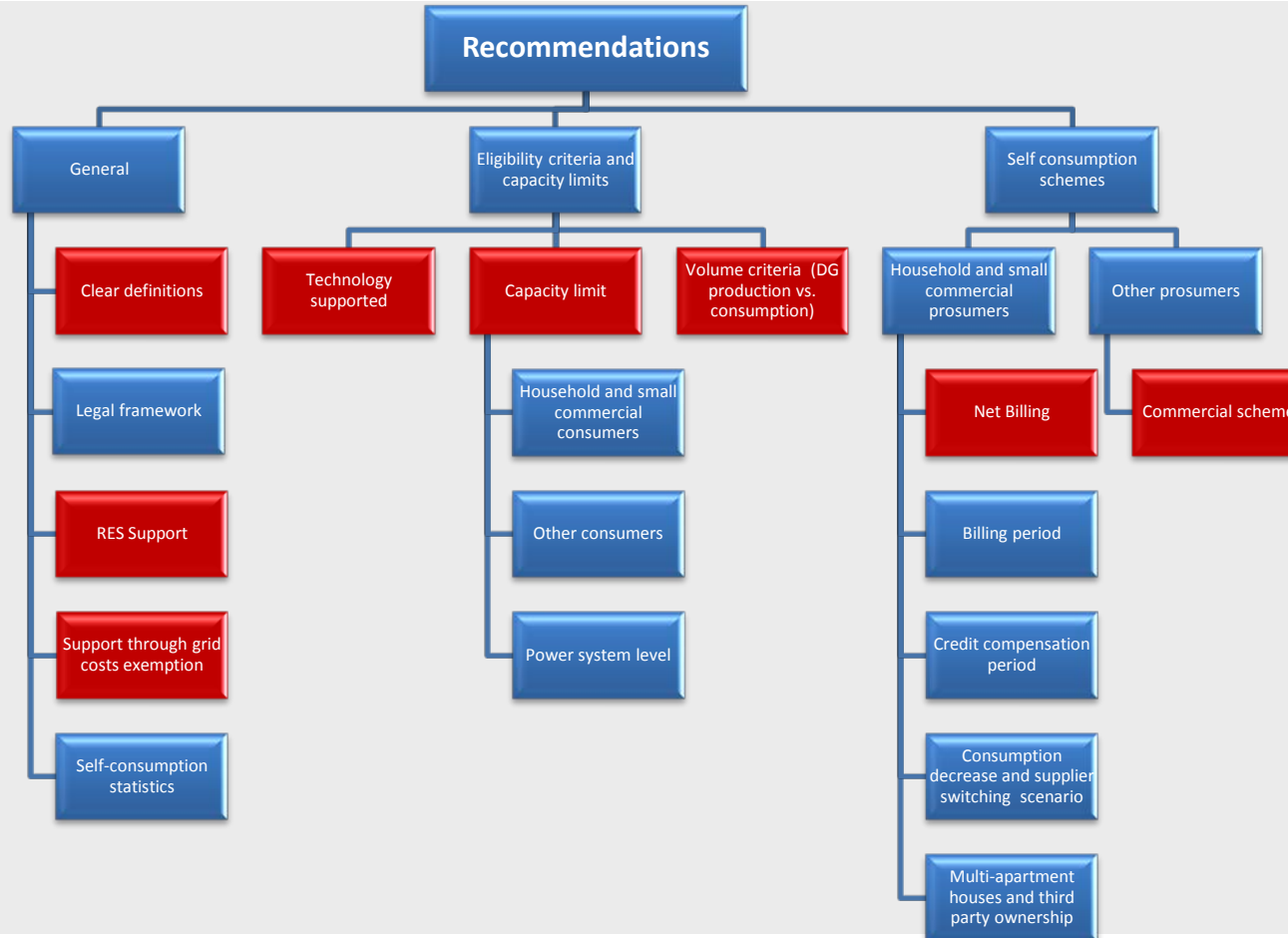
Source: International Renewable Agency
NPV per installed kW for the public tax authority

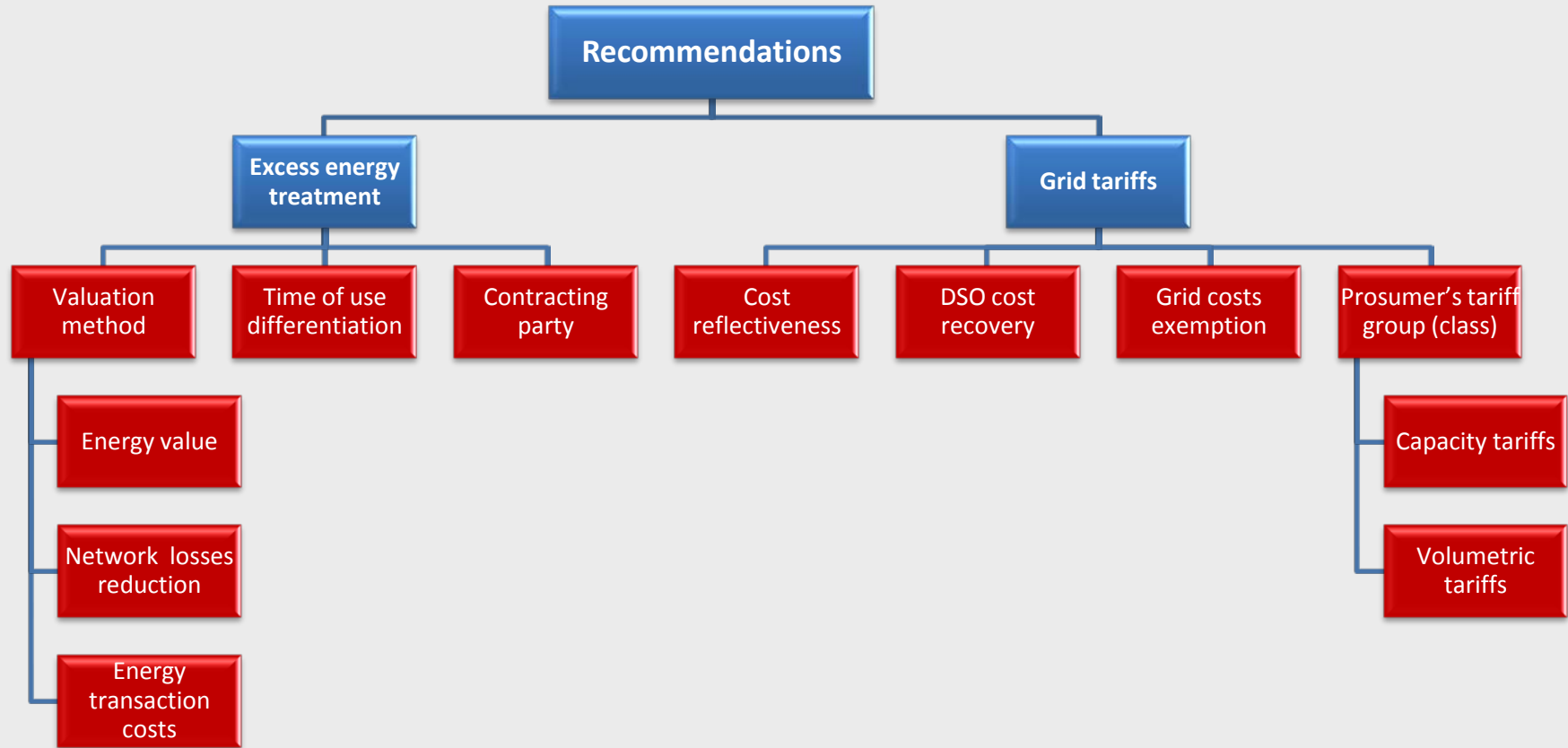
Imbalance settlement and Grid connection

- Household and small commercial consumers generally modeled by standardized load profiles
- Load profile altered by Self-consumption
- Network code on requirements for grid connection of generators
- "Type A" DG units
- Two electricity meters needed in self consumption installations

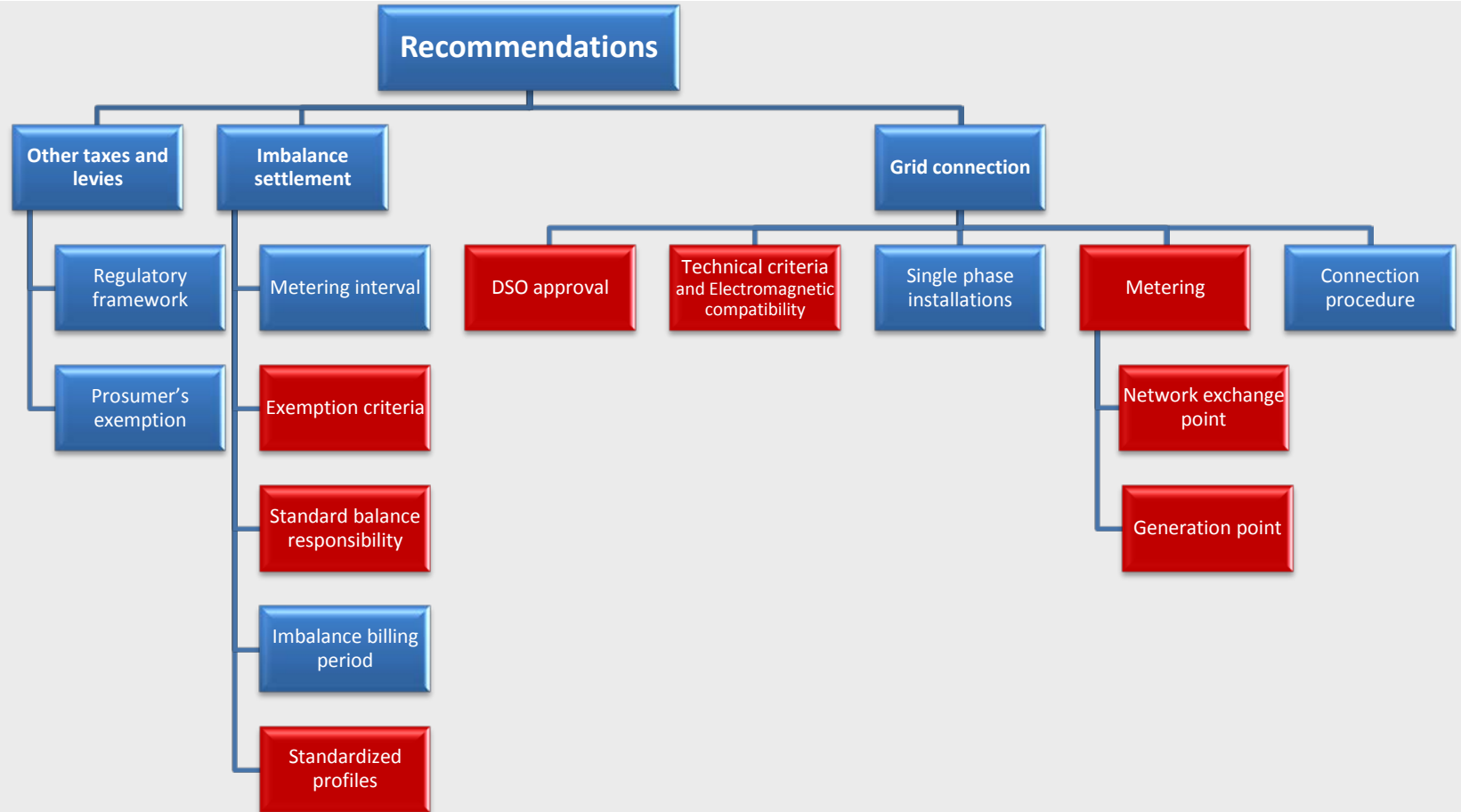


Prosumer's daily profile





Recommendations Set#3



The background is a satellite-style image of the Earth at night, showing city lights. Overlaid on this are numerous glowing blue lines that curve and intersect across the globe, representing a global energy network or data flow.

*Thank you
for your attention!*

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2	Eligibility criteria and capacity limits	
2.2	Capacity limit Other consumers	General capacity limits should not be applied, maximum rated capacity should be determined on a case-by-case basis, corresponding to the consumer's annual consumption in the previous year as the dimensioning criteria and also using constraints if raised from grid connection criteria.
2.3	DG production vs. consumption	DG's annual production should be lower than consumer's consumption in the preceding year.
2.4	Capacity limit at the power system level	It may be appropriate to set the total capacity limit at the power system level, particularly if the prosumers are entirely or partly exempted from paying grid costs and/or other taxes and levies.
3	Self consumption schemes	
3.1	Household and small commercial prosumers	Net billing scheme should be applied, whereupon the net value of the supplied energy decreased by a value of the injected energy is to be invoiced by supplier. Any remaining surplus of the injected energy during the billing period should be credited in monetary units for the next billing period.

3	Self consumption schemes	
3.2	Other prosumers	For other prosumers with larger self-consumption installations, ordinary commercial schemes should be applied with separate invoicing of the delivered and injected electricity performed by supplier and prosumer respectively.
4	<u>Excess energy treatment</u>	
4.1	Valuation method	Valuation should be based on the energy market value paid by consumer (energy component of the retail electricity price), taking into account supplier's (or other corporate body) energy transaction costs and benefits related to the distribution losses reduction.
4.2	Time of use differentiation	It should be applied for excess energy valuation provided that supplier includes time of use retail price differentiation.
4.3	Contracting party	Prosumer's supplier is by default in charge for purchasing the excess energy from households and small commercial prosumers. For other prosumers, supplier or other corporate body should be obliged to purchase the excess energy at the predefined conditions.

5	<u>Grid tariffs</u>	
5.1	Cost reflectiveness	Prosumers should pay grid costs as the other non-producing consumers of the same category.
5.2	DSO cost recovery	DSO risk on cost recovery should be mitigated by properly designed capacity tariffs to be paid by prosumers.
5.3	Prosumer's tariff group (or consumer class)	Specific prosumer's tariff groups (or consumer class) should be introduced corresponding to the consumer's groups of the same category.
5.4	Grid tariffs for prosumers	Prosumers should be charged for fixed grid costs through capacity tariffs for prosumer's tariff group. Volumetric grid tariffs for prosumer's tariff group should reflect the variable network and system costs.
5.5	Grid costs exemption	For the self-consumed electricity, prosumer should be exempted from payment of variable network and system costs.
5.6	Prosumer's revenue and investment recovery	Prosumer's revenue should equal the sum of electricity bill savings (as a result of self-consumption) and income from excess energy sale under the given conditions. Bill savings include the energy component of the retail electricity price, volumetric grid tariffs, taxes and levies for which exemption on the self-consumption is granted and VAT.