

Sveučilište u Rijeci - Tehnički fakultet,  
Rijeka, 12-14.06.2024

# ANALYSIS OF THE ENERGY SECTOR IN KOSOVO\*

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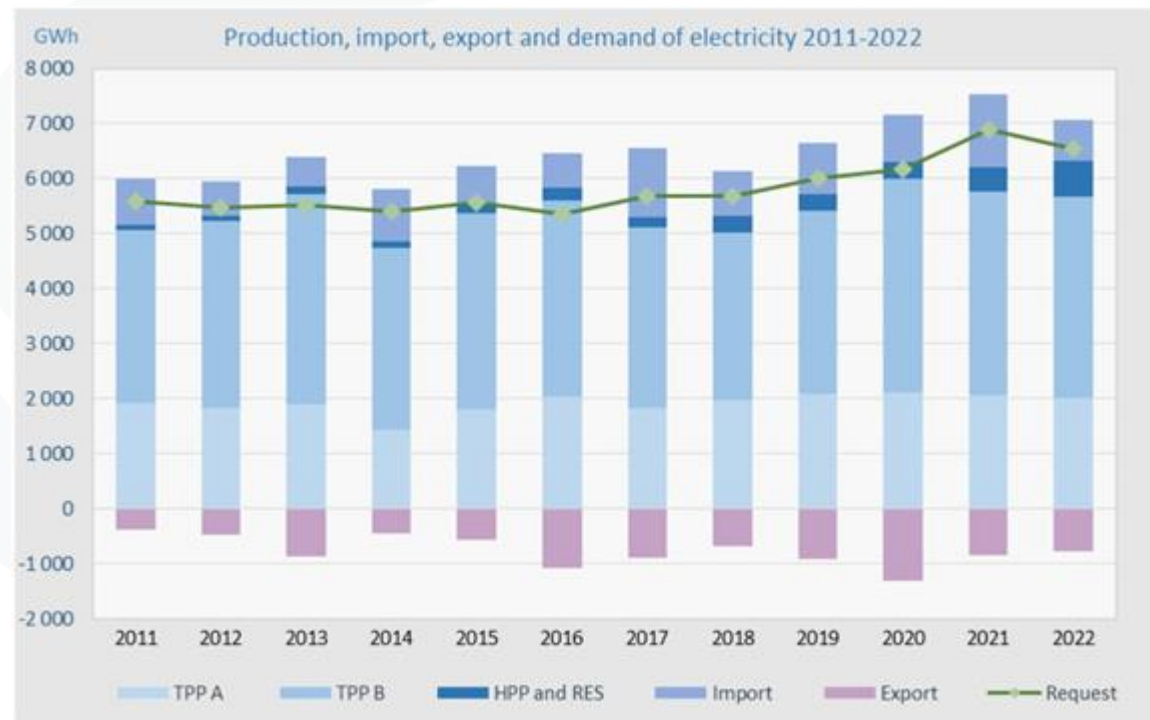
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# Characteristics of the energy sector

- The energy system in Kosovo\* consists of electricity production, electricity transmission and electricity distribution.
- It is mainly designed to produce basic electricity, which is based on lignite as raw material, but not for covering the maximum loads and balancing the system.
- During 2022 in Kosovo\* there are no new production capacities.
- The installed production capacities are 1,236 MW, including production capacities from Renewable energy sources (RES).
- Thermal power plants (TPP) with lignite make up about 77.69% , while the rest consists of hydropower plant (HPP) Gazivode and other RES (hydropower plants, solar panels and wind power plants) with 22.31%.
- Most of the consumption is covered by local production, but due to the age of the thermal power plants and the lack of flexibility to adapt to the demand in different periods, especially at peak times, the need for imports.

# Characteristics of the energy sector

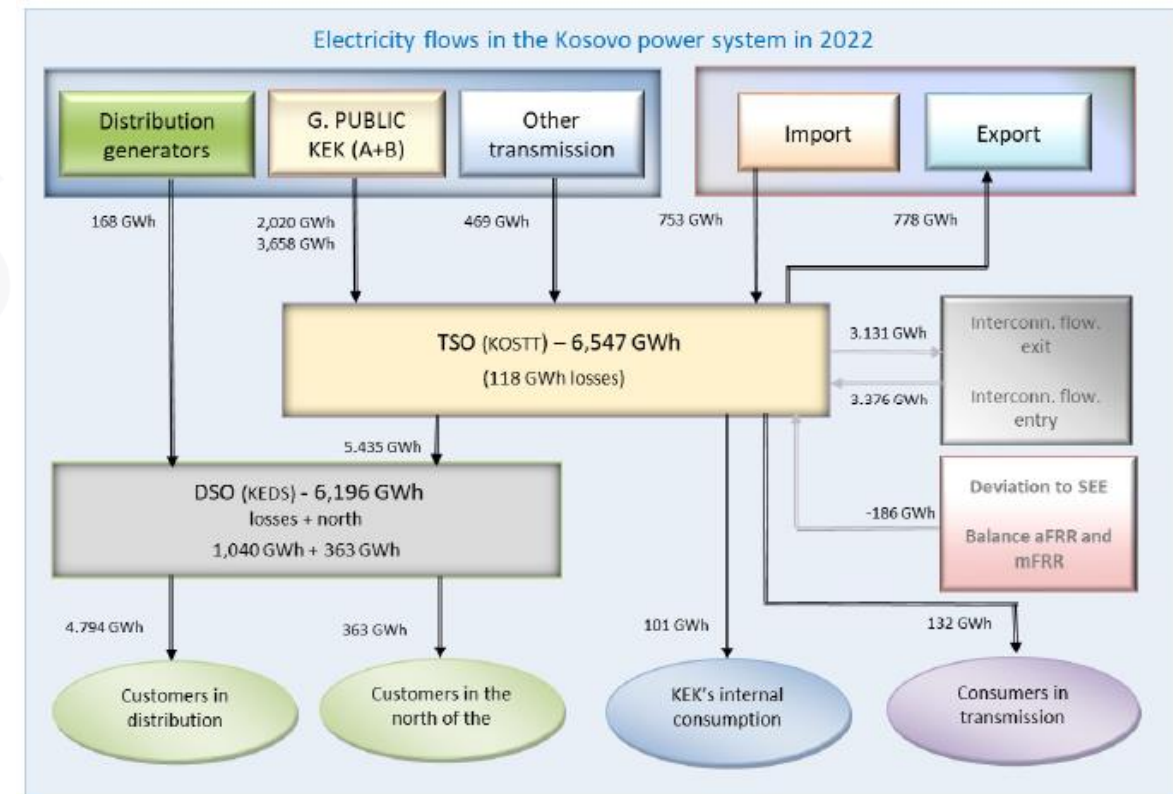
- Energy production, import and demand 2011-2022.



# Electricity market

- In Kosovo\*, there is still no organized one-day-ahead or intraday market.
- Electricity trading is mainly carried out through bilateral contracts between producers and suppliers (traders).
- Taking into account the old age of thermal power plants, the lack of regulating generators, Kosovo's\* power system does not have the flexibility to adjust to demand, especially high demand in peak time, therefore the need for electricity imports.
- From the overall electricity demand at the country level, 6,547 GWh (including transmission and distribution losses), most of it is covered by domestic generation, and the rest is covered by electricity imports.

- Electricity flows in the system in 2022.



# Electricity production

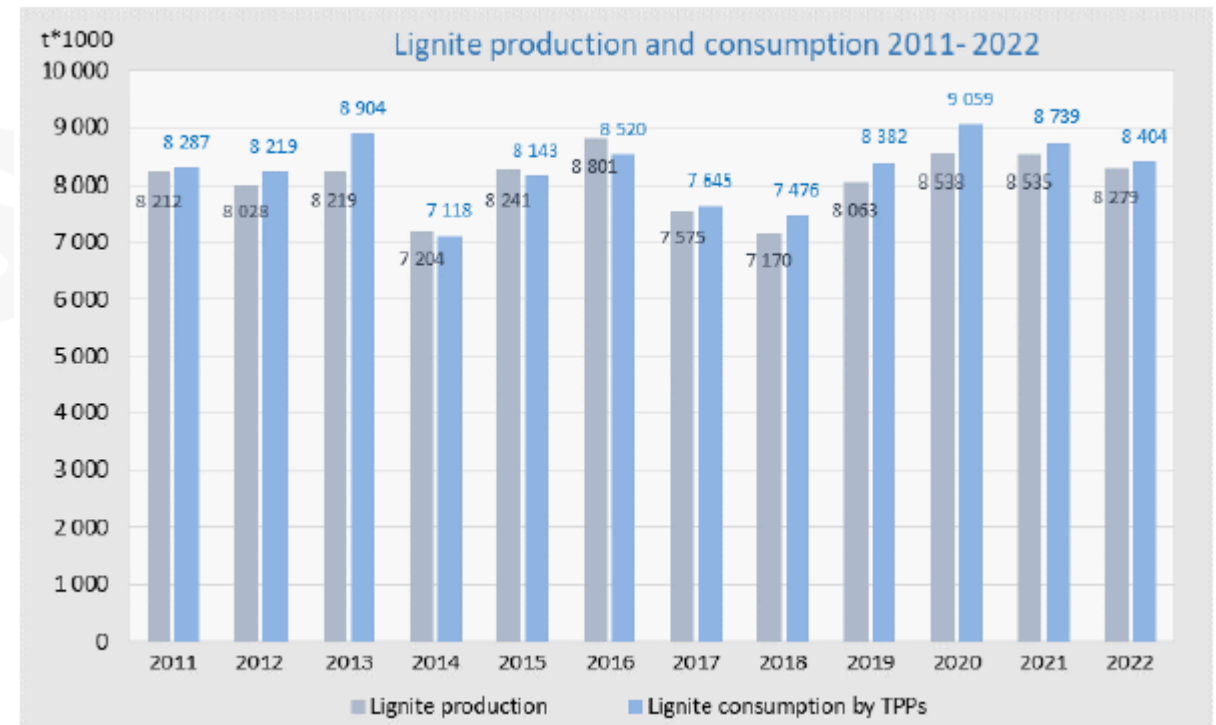
- Domestic production is not sufficient to cover the maximum load in Kosovo's\* electric power system.
- This lack of energy to meet the national demand is covered by electricity imports.
- The total operational capacity of generators in Kosovo\* is 1,236 MW, while the maximum load in 2022 was 1,429 MW, so the ratio of adequacy of generation to the maximum load is 86.5%.
- Maximum and minimum loads in 2022:

| Load    | Jan  | Feb  | Mar  | Apr  | May | Jun | Jul | Aug | Sep | Oct | Nov  | Dec  |
|---------|------|------|------|------|-----|-----|-----|-----|-----|-----|------|------|
| 2022    | MWh  | MWh  | MWh  | MWh  | MWh | MWh | MWh | MWh | MWh | MWh | MWh  | MWh  |
| Maximal | 1429 | 1291 | 1311 | 1077 | 857 | 721 | 768 | 764 | 699 | 879 | 1135 | 1372 |
| Minimal | 715  | 562  | 486  | 369  | 294 | 306 | 337 | 332 | 325 | 350 | 413  | 782  |

# Electricity production

- In recent years there has been an increase in production capacity from RES such as: water energy, wind energy, solar energy, but the energy produced by lignite as a primary source of energy still continues to dominate in Kosovo\*.
- Environmental impact remains a problem due to the emission of greenhouse gases and other pollutants.
- Lignite production in 2022 was 8.28 million tons, while consumption 8.40 million tons. These quantities are almost the same compared to 2021.

- Lignite production and consumption 2011 – 2022.



# Electricity production

- Generation capacities in Kosovo\* power system

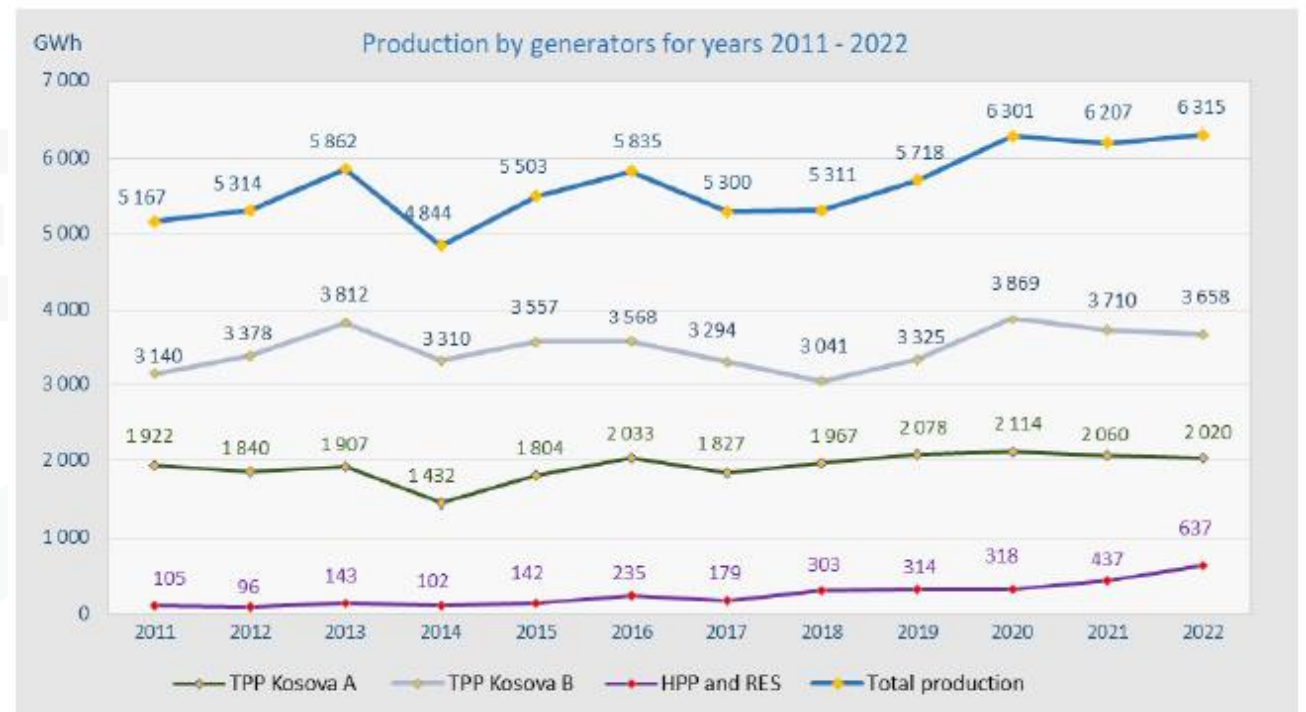
| Production units                       | Unit capacity (MW) |                 |         | Entry in operation |
|--|--------------------|-----------------|---------|--------------------|
|  | Installed          | net             | Min/max |                    |
| TPP Kosovo A1                          | 65                 | Not operational |         | 1962               |
| TPP Kosovo A2                          | 125                | Not operational |         | 1964               |
| TPP Kosovo A3                          | 200                | 144             | 100-130 | 1970               |
| TPP Kosovo A4                          | 200                | 144             | 100-130 | 1974               |
| TPP Kosovo A5                          | 210                | 144             | 100-135 | 1975               |
| TPP Kosovo A                           | 610                | 432             |         |                    |
| TPP Kosovo B1                          | 339                | 264             | 180-260 | 1983               |
| TPP Kosovo B2                          | 339                | 264             | 180-260 | 1984               |
| TPP Kosovo B                           | 678                | 528             |         |                    |
| HPP Gazivode/Ujmani                    | 35.00              | 32.00           |         | 1981               |
| HPP Lumbardhi I                        | 8.08               | 8.00            |         | (1957)<br>2006     |
| HPP Dikanci                            | 4.02               | 3.34            |         | (1957)<br>2013     |
| HPP Radaveci                           | 1.00               | 0.90            |         | (1934)<br>2010     |
| HPP Burimi                             | 0.95               | 0.85            |         | (1948)<br>2011     |
| Lumbardhi II                           | 6.20               | 6.20            |         | 2020               |
| Total HPP (outside the support scheme) | 55.25              | 51.29           |         |                    |
| EGU Belaja                             | 8.06               | 8.06            |         | 2016               |
| EGU Deçani                             | 9.81               | 9.81            |         | 2016               |
| HPP Hydrol ine-Albaniku III            | 4.27               | 4.27            |         | 2016               |
| HPP Brod II                            | 4.80               | 4.80            |         | 2015               |
| HPP Restel ica 1&2                     | 2.28               | 2.28            |         | 2016               |
| HPP Brodi III                          | 4.70               | 4.70            |         | 2016               |

|                                       |          |          |  |      |
|---------------------------------------|----------|----------|--|------|
| HPP Brezovica                         | 2.10     | 2.10     |  | 2017 |
| HPP Orqusha                           | 4.00     | 4.00     |  | 2021 |
| HPP Lepenci 3                         | 10.00    | 10.00    |  | 2019 |
| HPP Dil i com                         | 0.31     | 0.31     |  | 2020 |
| HPP Hydrol ine-Albaniku II            | 3.55     | 3.55     |  | 2020 |
| HPP ECO Energji                       | 1.00     | 1.00     |  | 2020 |
| HPP Hidrol ine-Albaniku IV            | 1.12     | 1.12     |  | 2021 |
| HPP Restel ica 3                      | 2.35     | 2.35     |  | 2021 |
| HPP Brod I                            | 2.48     | 2.48     |  | 2021 |
| HPP Sharri                            | 6.45     | 6.45     |  | 2021 |
| HPP                                   | 4.60     | 4.60     |  | 2021 |
| HPP Shterpca                          | 5.30     | 5.30     |  | 2021 |
| Wind Power                            | 1.35     | 1.35     |  | 2010 |
| Air Energy-Kitka                      | 32.40    | 32.40    |  | 2018 |
| SOWI Kosovo                           | 103.41   | 103.41   |  | 2021 |
| PV LedLight Technology                | 0.10     | 0.10     |  | 2015 |
| PV ONIX SPA                           | 0.50     | 0.50     |  | 2016 |
| PV Birra Pec                          | 3.00     | 3.00     |  | 2018 |
| PV Frigo Food Kosovo                  | 3.00     | 3.00     |  | 2018 |
| PV El ing                             | 0.40     | 0.40     |  | 2019 |
| PV SGE                                | 3.00     | 3.00     |  | 2019 |
| Total HPP (inside the Support Scheme) | 224,34   | 224,34   |  |      |
| Total                                 | 1 567,59 | 1 235,63 |  |      |

# Electricity production

- The total production of electricity in 2022 was 6,315 GWh, while in 2021 it was 6,207 GWh.
- It means that there is an increase of 1.7%.
- The production of RES connected to the transmission network in 2022 was 469.4 MWh and is higher by 57.8% compared to 2021.
- The production of RES connected to the distribution network was 167.8 MWh, and it is 20.2% higher compared to 2021.

- Production of electricity in 2011 – 2022.





# Electricity production - RES

- Production of RES connected to distribution system in 2022.

| RES in distribution       | Installation capacity | Production     | Participation in production |
|---------------------------|-----------------------|----------------|-----------------------------|
|                           | MW                    | MWh            | %                           |
| Hydroline                 | 4,58                  | 17 258         | 10,28                       |
| Dikanci                   | 4,02                  | 9 607          | 5,73                        |
| Radavci                   | 1,00                  | 3 207          | 1,91                        |
| Burimi                    | 0,95                  | 1 241          | 0,74                        |
| Eurokos-JH                | 4,80                  | 42 167         | 25,13                       |
| HPP Brezovica             | 2,10                  | 144            | 0,09                        |
| HPP Orqusha               | 4,00                  | 118            | 0,07                        |
| HPP Lepenci 3             | 9,99                  | 0              | 0,00                        |
| HPP Eko Energji           | 1,00                  | 638            | 0,38                        |
| HPP Dilli com             | 0,31                  | 10 233         | 6,10                        |
| Wind                      | 1,35                  | 646            | 0,39                        |
| Solar-C                   | 0,10                  | 15 102         | 9,00                        |
| Solar-Feti                | 0,10                  | 29 226         | 17,42                       |
| Solar Onix                | 0,50                  | 4 020          | 2,40                        |
| Solar Birra Pec           | 3,00                  | 1 425          | 0,85                        |
| Solar Food Fridge         | 3,00                  | 1 220          | 0,73                        |
| Solar power plant "Eling" | 0,40                  | 10 279         | 6,13                        |
| Solar Green Energy Plant  | 3,00                  | 8 234          | 4,91                        |
| HPP Sharri                | 6,45                  | 4 663          | 2,78                        |
| HPP Vica                  | 4,60                  | 4 187          | 2,50                        |
| HPP Shterpca              | 5,30                  | 4 184          | 2,49                        |
| DH. Gjakovica             |                       | 1              | 0,00                        |
| <b>Total RES</b>          | <b>60,55</b>          | <b>167 798</b> | <b>100%</b>                 |

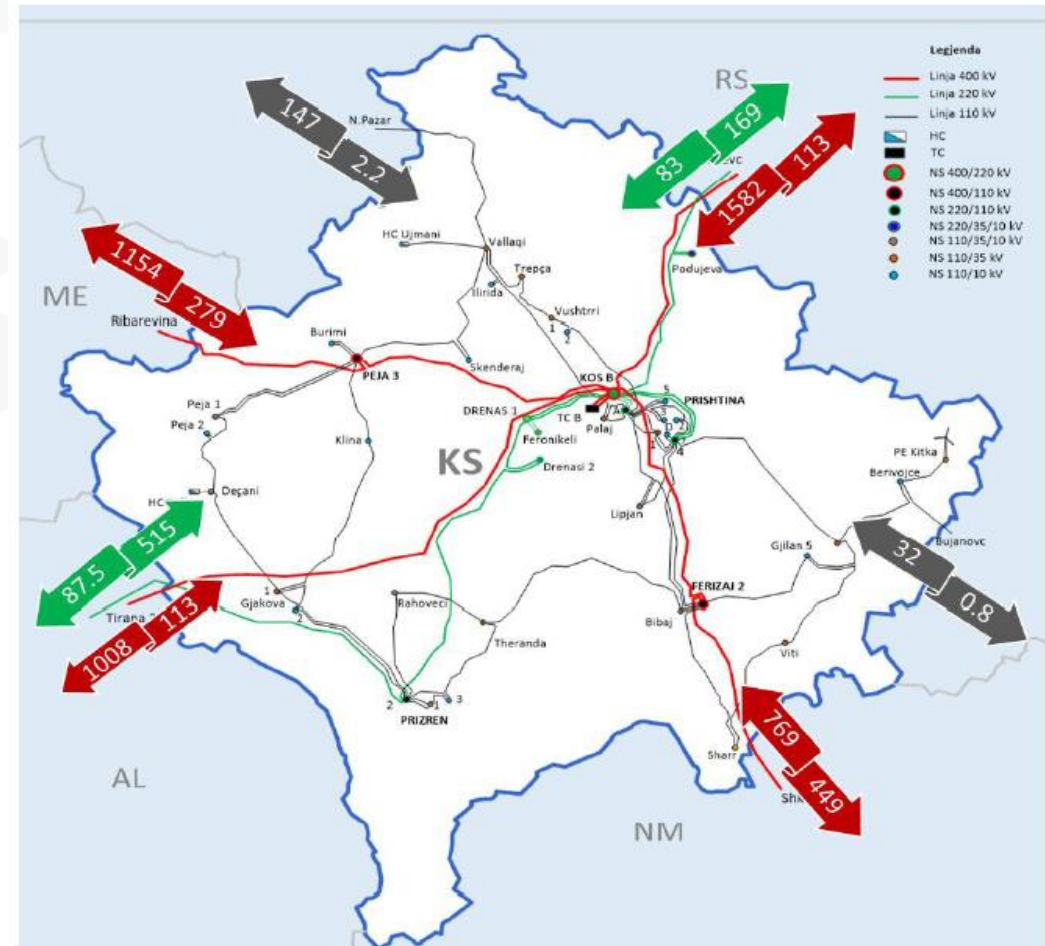
- Production of RES connected to transmission network in 2022.

| RES in transmission  | Installation capacity | Production     | Participation in production |
|----------------------|-----------------------|----------------|-----------------------------|
|                      | MW                    | MWh            | %                           |
| HPP Gazivode/Ujmani  | 35,00                 | 77 828         | 16,58                       |
| HPP Kaskada Lumbardh | 32,15                 | 28 615         | 6,10                        |
| Air Energy/Kitka     | 32,40                 | 87 822         | 18,71                       |
| PEE Selaci           | 103,41                | 275 121        | 58,61                       |
| <b>Total RES</b>     | <b>202,96</b>         | <b>469 387</b> | <b>100%</b>                 |

# Transmission system

- The transmission network of the electricity system of Kosovo\* is quite developed and offers sufficient security of the system and is well inter-connected with the regional and European system through interconnecting lines with:
  - Albania, North Macedonia, Montenegro and Serbia – with 400 kV lines;
  - Albania and Serbia – with 220 kV lines; and
  - Serbia - with two 110 kV lines.

- Electricity flows through interconnection lines.



# Transmission system

- Substations in the transmission network.

| Transformation (kV/kV)  | Owner           | No. of substations | No. of transformers | Power (MVA) |
|-------------------------|-----------------|--------------------|---------------------|-------------|
| 400/220                 | KOSTT           | 1                  | 3                   | 1200        |
| 400/110                 | KOSTT           | 2                  | 4                   | 1200        |
| 220/110                 | KOSTT           | 3                  | 9                   | 1350        |
| 220/35                  | Feronikel       | 1                  | 2                   | 320         |
| 220/35/10(20) (Besiana) | KOSTT           | 1                  | 1                   | 40          |
| 220/10(20) (Besiana)    | KOSTT           |                    | 1                   | 40          |
| 220/10(20)              | KOSTT           | 1                  | 2                   | 80          |
| 110/35/10(20)           | KOSTT           | 6                  | 7                   | 277.5       |
| 110/35/6.3              | Trepça          | 1                  | 2                   | 126         |
| 110/6.3                 | Trepça          |                    | 1                   | 31.5        |
| 110/35                  | Gazivode/Ujmani | 1                  | 1                   | 20          |
| 110/6.3                 | Sharri          | 1                  | 2                   | 40          |
| 110/10(20)              | KOSTT           | 14                 | 26                  | 913.5       |
| 110/35                  | KOSTT           | 7                  | 19                  | 641         |
| 110/10                  | KOSTT           | 2                  | 8                   | 252         |
| 35/110 (Decan)          | Kelkos          |                    | 1                   | 40          |
| Total                   |                 | 41                 | 89                  | 6 608       |

# Electricity distribution system

- The distribution network, is responsible for the operation and maintenance of the distribution system and the management of generators connected to the distribution system.
- The distribution network consists of voltage lines of 35 kV, 10(20) kV, 6 kV and 0.4 kV, as well as the corresponding substations of the level 35/x kV, 10(20)/0.4 kV and 6/0.4 kV.
- Substations and transformers according to voltage level in distribution system operator (DSO).
- Power lines in distribution system operator (DSO).

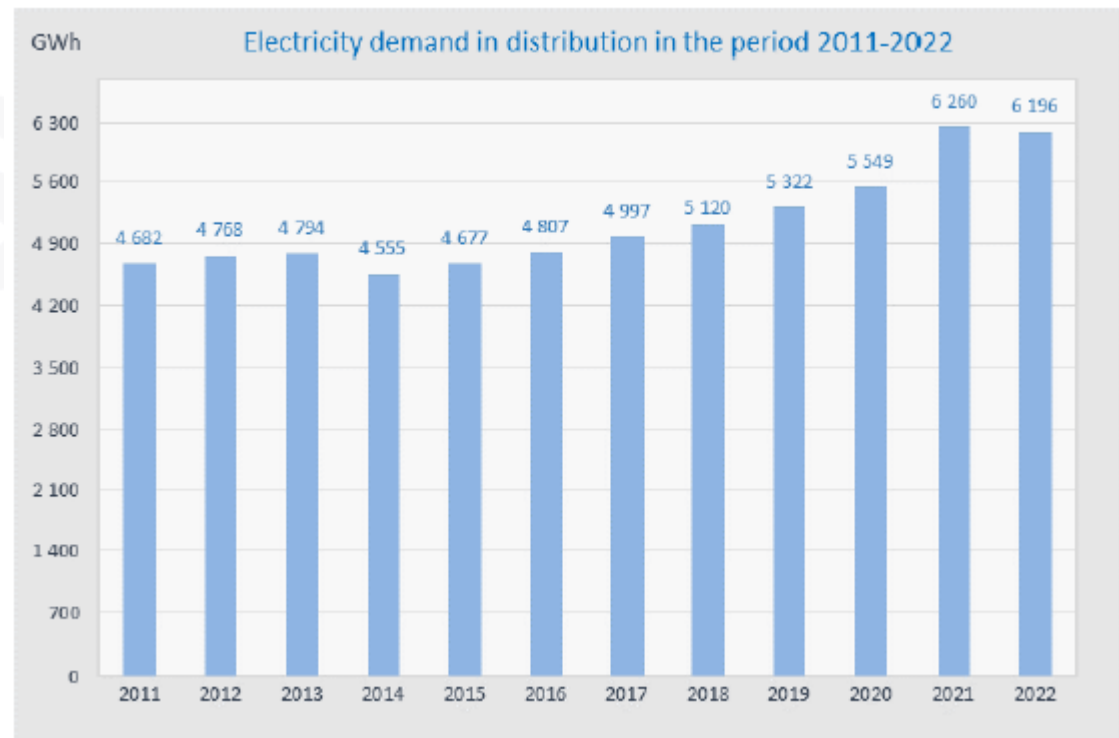
| Transformation (kV/kV) | Owner   | No. of SS | No. of TR | Installed power (MVA) |
|------------------------|---------|-----------|-----------|-----------------------|
| 35/10                  | KEDS    | 44        | 94        | 662                   |
| 35/10                  | Private | 11        | 15        | 68                    |
| 35/20                  | KEDS    | 2         | 5         | 41                    |
| 35/6 kV                | Private | 5         | 12        | 43                    |
| 35/0.4kV               | Private | 19        | 28        | 25                    |
| 10(20)/0.4             | KEDS    | 2 551     | 2 646     | 1 355                 |
| 10(20)/0.4             | Private | 3 078     | 3 095     | 1 567                 |
| 10/20                  | KEDS    | 1         | 1         | 109                   |
| 10/0.4                 | KEDS    | 2 893     | 2 893     | 909                   |
| 10/0.4                 | Private | 1 247     | 1 253     | 606                   |
| 6(3)/0.4               | KEDS    | 66        | 66        | 13                    |
| 6/0.4                  | Private | 1         | 1         | 1                     |
| Total                  |         | 9 918     | 10 109    | 5 399                 |

| Voltage (kV) | Owner | Arial network (km) | Cable network (km) | Total (km) |
|--------------|-------|--------------------|--------------------|------------|
| 35 kV        | KEDS  | 484                | 138                | 622        |
| 10(20) kV    | KEDS  | 1 632              | 546                | 2 178      |
| 10 kV        | KEDS  | 4 165              | 904                | 5 069      |
| 6 kV         | KEDS  | 42                 | 8                  | 50         |
| 3 kV         | KEDS  | 4                  | 1                  | 5          |
| 0.4 kV       | KEDS  | 17 915             | 2 659              | 20 574     |
| Total        |       | 24 243             | 4 256              | 28 499     |

# Electricity distribution system - demand

- The electricity demand at the level of the Distribution System Operator in 2022 was realized at the value of 6,196 GWh, while in 2021 it was 6,260 GWh, which represents a decrease of approximately 1.01%.
- The demand in the distribution system is constantly increasing, whereas the last year it suffered a decrease due to the impact of the change in the tariff structure, the establishment of the tariff block, as well as higher average temperatures compared to 2022, mainly during the winter season.

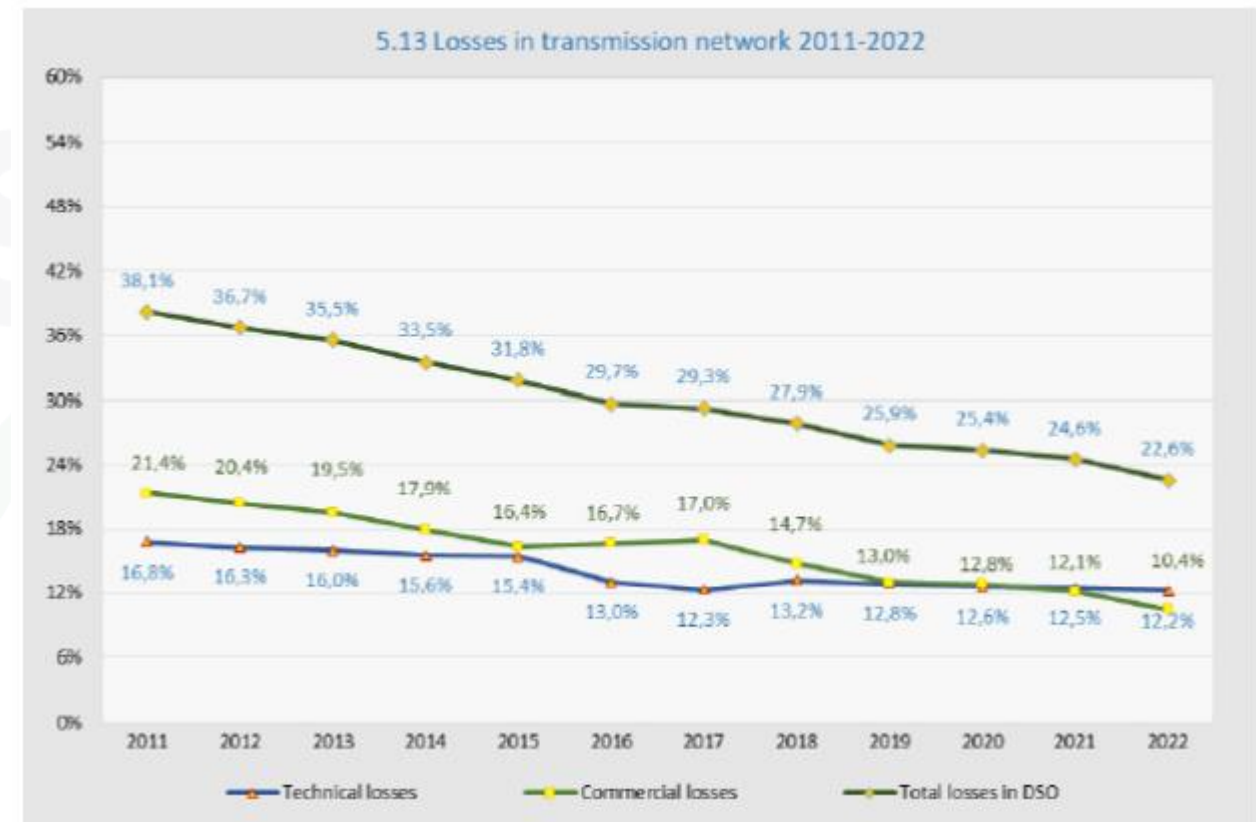
Demand for electricity in the distribution system 2011-2022.



# Electricity distribution system - losses

- Despite the investments made so far in the distribution network, electricity losses still remain high and represent a worrying problem for the electricity sector.
- Losses also have a negative impact on the supply of customers and the financial sustainability of supply and distribution operators, as well as the entire energy sector.
- The trend of reducing losses but also fluctuations in the level of technical and commercial losses can be seen.

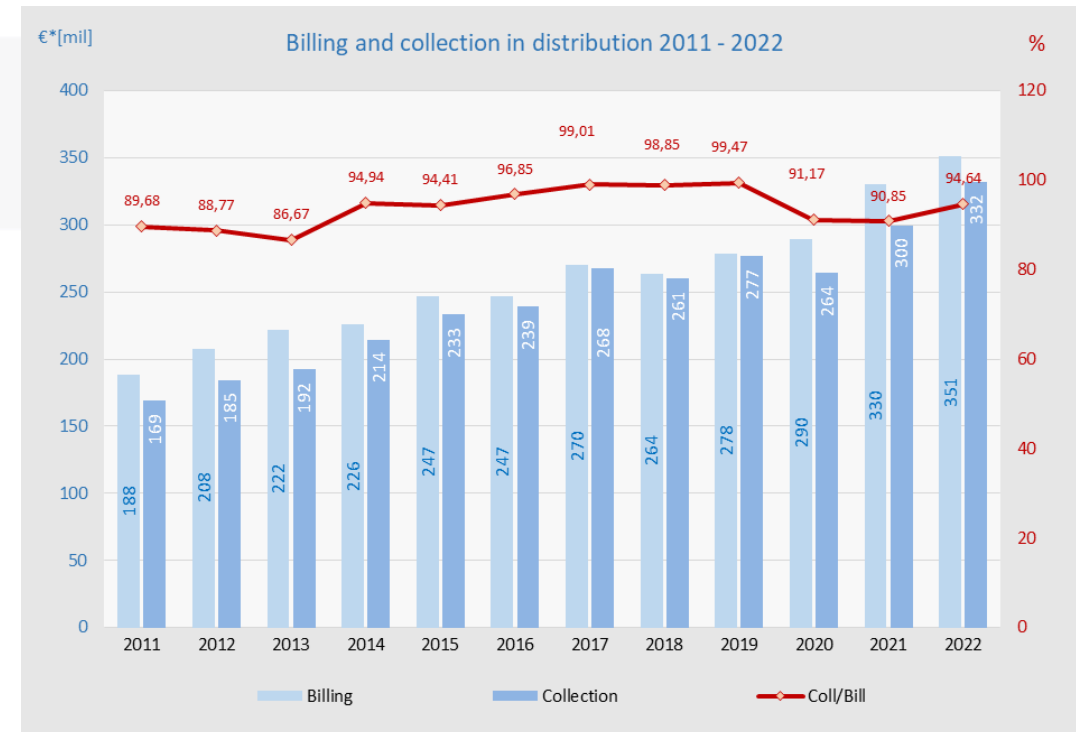
Technical and commercial losses in distribution for the period 2011-2022.



# Electricity supply

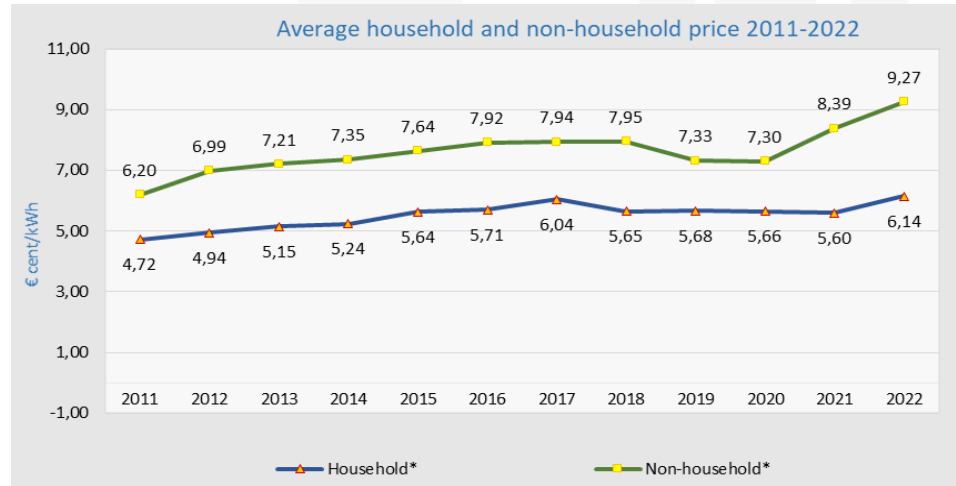
- The supply of electricity to final customers during 2022 has continued to be carried out by KESCO.
- The participation of family customers in the total billed consumption still remains dominant with about 63.27%, followed by commercial consumption with 23.59%, then by industrial consumption with 12.38%, and finally by consumption in public lighting with 0.76%.
- Compared to the previous year, gross demand decreased by 4.91%, consumption by family customers decreased by 0.47%, consumption by commercial customers increased by 4.77%, and industrial consumption decreased by 27.6%.

Billing and collection in distribution during the years 2011-2022.



# Average price of electricity

- The average selling price of electricity is based on tariffs for regulated electricity activities and varies depending on the category of customers, the voltage level to which the customers are connected and the use of electricity at different tariffs according to the season and time in which the energy is used.
- The average selling price also varies by districts depending on the concentration of commercial/industrial activities that use electricity in certain periods.
- Compared to the countries of the region and based on the data released by Eurostat for the first half of 2022, Kosovo\* has the lowest average price without VAT for household customers.



The average selling price of electricity (without VAT) over the years.

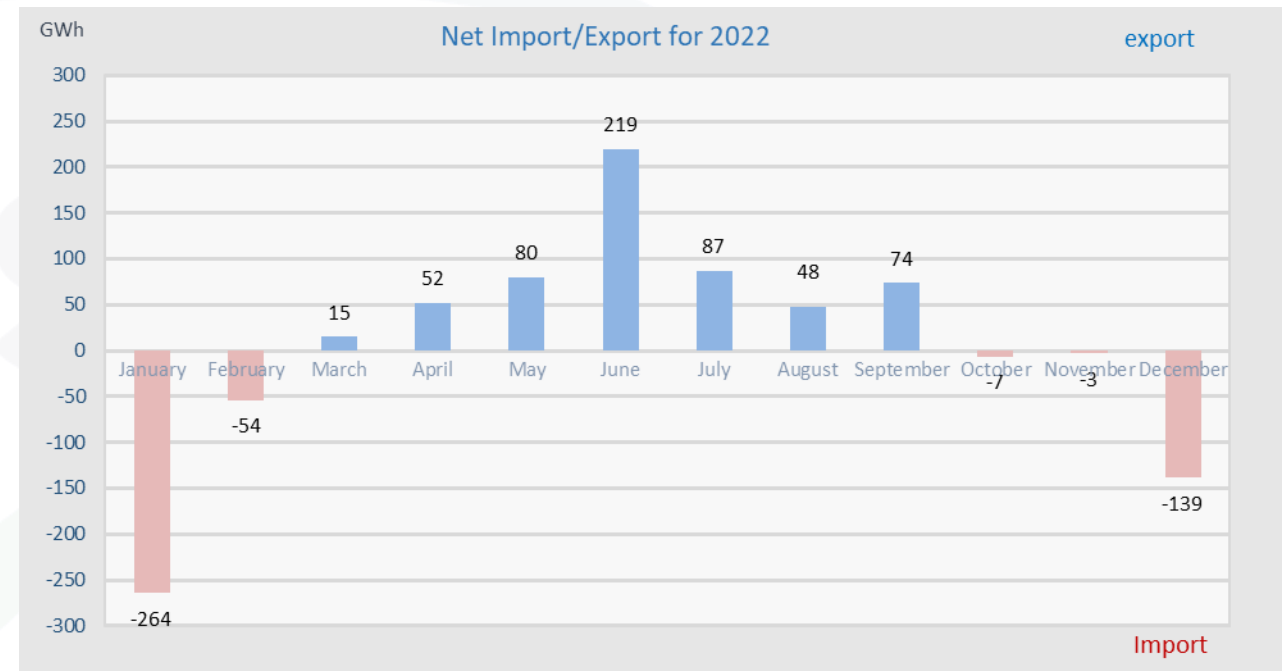


Average prices for household customers for the first 6 months of 2022 (without VAT)



# Import and export of electricity

- The participation of import against the overall demand for electricity was 11.63%, marking a decrease of about 7.41% in relation to 2021.
- The import of electricity for 2022 was 550,216 MWh lower than in 2021, which was 1,311,461 MWh.
- The average price of electricity import with commercial contracts during 2022 was €268.82/MWh, and compared to 2021 year which was €119.29/MWh.
- In 2022 the average import price is higher for €149.53/MWh.



Import and export of electricity in 2022

Thank you for your attention!