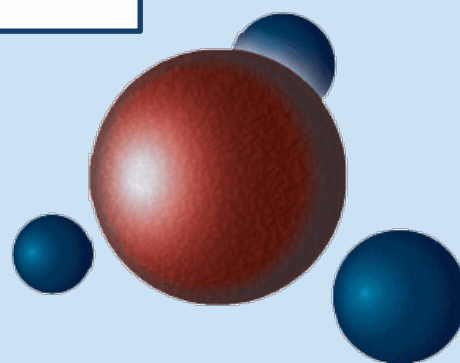


2022
ELECTRICITY
SECTOR
FACT SHEET IN
BULGARIA

16 SEP



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The “2022 Electricity sector fact sheet” is a summary of the "Report on the dynamics of changes in the main indicators in the BULATOM database on the main characteristics of the electricity sector of Bulgaria to 2022“, prepared by order of the Association "Bulgarian Atomic Forum” – BULATOM by the company "SELMEDA" EOOD



SELMEDA

Introduction

The Report was prepared by the company SELMEDA LTD in fulfilment of item 2.3. from the Terms of Reference to the Contract with BULATOM dated 12.05.2023 in order to present the dynamics of changes in the main indicators in the publicly available data on the main characteristics and results of the energy sector in Bulgaria in recent years, presented in the 2023 edition of the Database Electricity System (BD-EU).

Database BD-EU is a specialized information tool developed in 2021 by the company SELMEDA LTD, including a representative set of publicly available official data on the state and development of the country's electricity sector.

The initial version of DB-EU for 2021 analyses information up to the end of 2020 and the end of the relevant price/regulatory period under the Energy Act. The 2022 edition of DB-EU reflects the changes that occurred in 2021 and the corresponding regulatory period 2021-2022. The current 2023 edition of DB-EU again reflects the changes that occurred in 2022 and the corresponding regulatory period 2022 -2023, because in order to expand the scope of DB-EU, an English translation has been added to the new edition.

In sections 2 and 3 of the report, an assessment and presentation of the dynamics of changes in the main indicators and results of the work of the electricity sector in Bulgaria of main interest for the activity and goals of BULATOM, taking into account their change, presented in the 2023 edition of the DB- EU.

Specific conclusions on the change in the main observed trends, which characterize the development of the electricity sector in the medium-term plan, are also presented.

1. Electricity sector main performance indicators

1.1. Electricity Production

1.1.1. According to the official data of the Energy and Water Regulatory Commission (EWRC), in the period 2018 – 2020 there is a constant decrease in the total electricity generation in the country averaging 5.8% per year to below 37.5 TWh in 2020. ***In 2021, this downward trend is interrupted, and the total electricity generation sharply increases to a level of over 42 TWh, while in 2022, the total electricity generation reaches a level of over 45 TWh.***

1.1.2. A big portion of this growth in the country's electricity generation, averaging 10.6%, is due to a ***substantial increase in the output from lignite-fired thermal power plants of 3.8 TWh per year for both 2021 and 2022.*** This increased output constitutes 95% of the total growth in generated electricity during the period 2021-2022, compared to the levels from 2020.

Thus, in practice, the reduction of more than 30% in electricity from such plants is compensated for in the previous three years, and for 2022, the production of electricity from lignite-fired thermal power plants exceeds the levels of at least the last five years.

1.1.3. ***The electricity generated by the Kozloduy NPP over the last four years has remained stable at over 15.6 TWh,*** securing 34% - 42% of the total electricity produced in the country.

1.1.4. According to the EWRC data, the total increase in electricity generated by renewable energy sources in 2022 is 585 MWh compared to 2021, and ***this is mainly due to the production from Solar Power Plants, while Wind Power Plants have not demonstrated significant growth rates in recent years:***

- For the period 2018-2022 - a total growth of 11.3% in the electricity from Wind Power Plants: from 1.35 TWh in 2018 to 1.5 TWh in 2022.
- For the period 2018-2022 - a total growth of 45.5% in the production of electricity from Solar Power Plants: from 1.38 TWh in 2018 to 2.01 TWh in 2022.

1.1.5. In the period 2017-2022, ***the production of electricity from Hydro Power Plants (HPPs), as well as the part of it generated by Storage Hydro Power Plants (SHPPs) does not demonstrate specific trends or substantial output changes*** and represents the dynamics of the utilization and availability of water resources.

1.1.6. During 2022, the share of the different producers in the total country electricity generation is as follows:

- Condensing thermal power plants - 44%
- NPP - 34%
- Renewables -12%
- HPP owned by NEK - 6%
- District heating plants - 4%
- Industrial TPP - 0%

1.2. Electricity Consumption

1.2.1. According to the data from the Electricity System Operator (ESO EAD), in the period 2018-2022, there is a slight decrease in the end-user consumption of electricity in the country: from 33.18 TWh in 2018 to 32.18 TWh in 2022, regardless of the changes in consumption during this period.

Similarly, the total consumption of electricity which, in addition to the end-user consumption, accounts for transmission losses, consumption for house needs of power plants, and the consumption of SHPPs in pumping mode decrease from 39.1 TWh in 2018 to 38.3 TWh in 2022.

1.2.2. The comparison of the dynamics of the increase in electricity generation (6.5% for 2022) and of the decrease in the total consumption (about 1.7%) shows that ***the growth in electricity generation in 2022 is not determined by the increase in the domestic market but rather responds to the increased demand for electricity in a regional aspect*** and to the corresponding increase in electricity export.

1.2.3. At the same time, the total consumption of 38.3 TWh registered in 2022 is **not only significantly different from the estimated consumption development scenario used in the Integrated National Energy and Climate Plan**, but also remains lower than the minimum scenario of ESO EAD.

1.3. Transmission and cross border exchange of electricity

1.3.1. **2022 recorded an increase in the transmission of electricity through the country's electricity transmission network**, with the main growth observed in the **significant increase in transmission from export and re-export by over 30% compared to 2021, reaching 28.9% of the total transmission through the electricity transmission network of the country.**

1.3.2. According to ESO EAD data, despite the permanent decrease in the net physical export of electricity from the country by an average of 28% per year in the period up to 2020, from 2021 a sharp increase in the net physical export was observed. As a result, **in 2022 the net physical exports equalled more than 37% compared to the final consumption in the country.**

1.3.3. According to ESO EAD, in 2022 the largest trade exchanges with the neighbouring power systems were executed as follows:

- The **largest is the import of electricity from Turkey**, in the volume of **847,624 MWh (which is, however, a decrease of 45.7% compared to 2021), followed by the import from Romania** in the volume of 736,899 MWh (decreased by more than 55% compared to 2021).
- The **largest export of electricity was realized to Romania**, in a volume of 5,583,182 MWh (which is an increase of almost 20% compared to 2021), **followed by exports to Greece** in a volume of 3,351,023 MWh (representing a decrease by 8.3% compared to 2021).

1.4. Distribution and internal consumption of electricity

1.4.1. In contrast to 2021, when all producers except Kozloduy NPP significantly increased their sales, **in 2022, significant growth was observed only in the sales of "TEC Maritsa Iztok 2 " EAD.** For 2022, the share of "NPP Kozloduy" EAD decreases to 44%, the share of

"TEC Maritsa Iztok 2" EAD increases to over 23%, and the remaining producers contribute to a total of one third (33%) of the sales of the large producers on hourly schedules, according to the data of ESO EAD.

1.4.2. ***In 2022, the largest share in the distribution of the electricity is for the company "Electric Distribution West" EAD with 41% or 9,019,917 MWh, in second place is "Electric Distribution South" EAD with 37% or 8,084,296 MWh and in third - "Electric Distribution North" AD with 22% or 4,825,929 MWh.***

1.4.3. According to ESO EAD data, in the period up to 2020, all electric distribution companies (EDCs) saw a decrease in the share of sales on the regulated market and an increase in the volume of sales on the free market to an average of 44-45% of the total sales volume in 2020.

In 2021, in all EDCs, the number of customers supplied by the Supplier of Last Instance (SLI) grows, the volume of the regulated market stabilizes and even grows slightly, and the share of customers supplied on the free market decreases.

In 2022, the share of those supplied by SLI practically maintains its levels from the previous year, while the tendency for a slight increase in the share of end customers supplied by the regulated market, at the expense of the share of end customers supplied on the free market, is maintained.

1.4.4. According to the decisions of the EWRC for the relevant regulatory periods, ***the quantities of electricity for the performance of the functions of the public supplier decrease*** in the period 2018 to 2021 from 12.43 TWh in 2018 to 10.98 TWh in 2021, ***but for 2022 they show growth*** again to 12.09 TWh. According to EWRC's decision from June 30, 2023, the required amount of electricity for the regulated market for the regulatory period July'23 - June'24 is 12,222,981 MWh, which represents a slight increase of just over 1% compared to the previous regulatory period and together with the distribution of EDC sales ***shows a break in the downtrend in the regulated market seen through 2021.***

1.4.5. ***Unlike the regulatory period July 2022 - June 2023, for the regulatory period from July 1, 2023, the EDWR envisages the purchase for the needs of the public supplier of electricity from TPP "Maritsa East 2" EAD again in the amount of 2.20 TWh, an amount representing a 120% increase over 2020.***

1.4.6. During the current regulatory period (from July 1, 2023) ***the required quantities of 12.22 TWh of electricity for the needs of the regulated market are provided mainly by the following entities:***

- Kozloduy NPP EAD: 32.3%
- AES – 3S Maritsa East 1 EOOD: 19.4%
- Contour Global Maritsa East 3 AD: 19.3%
- TPP Maritsa East 2 EAD – 18%
- Hydro Power Plants owned by NEK EAD: 8.8%

The remaining amounts of about 2.3% are to be ensured by the production of renewables power plants and high-efficiency combined cycle produced electricity purchased at preferential prices.

1.4.7. ***The average growth of prices on the regulated market for the period after 2017 is 19.86% or an average of 3.31% per regulatory period.*** Cumulatively, the growth in prices on the regulated market during the last three regulatory periods, 4.40% (2020), 3.40% (2021), and 4.37 (2022), is significantly larger than the annual growth averages.

2. Generating capacities performance trends

2.1. Installed power

2.1.1. According to ESO EAD *in the period after 2018 the total installed capacity in the country gradually increases* from 12,501 MW at the end of 2018 to 13,505 MW at the end of 2022, which is an increase of 8% or 1.6% on average per year.

2.1.2. The above change is mainly due to:

- ***a significant increase in the capacity of Solar Power Plants*** from 1,052 MW at the end of 2018 to 1,726 MW at the end of 2022, representing a growth of 64%. In addition, SPPs also show a significant increase in installed capacity for 2022 alone, with growth of 38.5% compared to 2021, according to ESO EAD data.
- ***increase in the capacity of natural gas thermal power plants from 983 MW at the end of 2018 to 1,307 MW at the end of 2022, representing a growth of almost 33%***. It should be noted that for the last year, the increase is minimal (below 3%) compared to 2021.

2.1.3. The above-mentioned changes do not affect the top ranking in the structure *of installed capacity in the country - dominated by lignite-fired thermal power plants (30.5%), hydroelectric power plants (23.8%) and nuclear power plants (14.8%)*.

However, it should be noted that the registered growth of solar power plant capacity for 2022 moves this type of power generation to fourth place in terms of share of the total installed capacity in the country, ahead of natural gas thermal power plants.

2.1.4. ESO EAD data shows that, according to the announced investment intentions, ***in the period 2023-2032, a total of 13,451 MW of new capacities are planned for construction, 12,135 MW of which are Renewable Energy Sources.***

2.2. Use of installed capacity

According to the data of ESO EAD, the average annual load factor of the installed capacities after 2018 is characterized by:

- *a constant very high load factor of the installed capacities at Kozloduy NPP within the range of 94%-95%*
- *significant variations of the load factor of the condensing coal and natural gas fired plants in the range of 35%-56.5%*
- *relatively constant load factors of the district heating and industrial thermal power plants respectively in the ranges of 43%-47% and 25%-35%*
- *narrow range fluctuations of the load factor of the renewables and biomass capacities (except for HPPs) as follows:*
 - Hydro Power Plants: 12%-18%,
 - Wind Power Plants: 21%-24%,
 - Photovoltaic Power Plants: 13%-16%,
 - Power Plants on Biomass: 43%-45.5%

2.3. NPP

2.3.1. The production of electricity from Kozloduy NPP, the plant availability and load factors are at their maximum values in the period 2019-2022.

2.3.2. Kozloduy NPP was practically not subject to grid dispatching load reductions in this period, which allows net electricity output in the range from 15.73 TWh in 2019 to 15.64 TWh in 2022.

2.3.3. According to the financial reports of the Kozloduy NPP for the last year, more than 75% of the electricity sales of the Kozloduy NPP were realized on the IBEX market. This represents a decline compared to the previous four years, in which this share exceeded 80% and is a result of the larger portion of sales to the regulated market as per the decisions of EWRC.

2.3.4. In the period 2023-2032, there are no plans to commission new NPPs according to the ESO EAD information.

2.4. TPPs

2.4.1. After 2019, the electricity generation from thermal power plants varies widely from 14.64 TWh in 2020 to 22.29 TWh in 2022, which shows that this is **currently the main reserve of base energy capacities in the country, which ensure adequacy of system during sudden changes in the local and regional electricity market.**

2.4.2. In 2022 the main change in electricity generation is at the expense of condensing thermal power plants, while district heating and other thermal power plants demonstrate a decrease in generation for the past year.

2.4.3. According to the ESO EAD information, *in the period 2023-2032, there are plans to commission new 1,317 MW of thermal and combined cycle generating capacities.*

2.5. RENEWABLE ENERGY SOURCES

2.5.1. According to the register of the Agency for Sustainable Energy Development (ASUER), in the period after 2018, **there is no significant change in the number of electricity generating facilities registered as renewable sources, except for the huge increase of the number of solar power plants** from 1955 in 2018 to 7207 in 2022.

The average installed capacity of new solar power plants built over the last three years has almost tripled - from 58.3 kWp/plant in 2020 to 163.2 kWp/plant in 2022.

2.5.2. In contrast to the minimal changes in the electricity generated by renewables in recent years, regardless of the increase in the installed capacities of Solar Power Plants, and in particular 2021, when their generation registered a decrease of almost 3%, compared to 2020, according to the data of ASUER, **the electricity generation of SPPs for 2022 marks a growth of over 31% compared to the previous year.**

2.5.3. In addition, the analysis of the generated output for the period 2019-2022 of the different types of renewable energy sources, registered and monitored by ASUER, leads to the conclusion that **with the exception of HPPs, WPPs and SPPs, other renewable energy generating capacities have no practical contribution to electricity generated to cover the consumption in the country** having a total production of less than 300 GWh per

year (less than 1.0% of the minimum total consumption forecast of ESO EAD of 38.60 TWh in 2023).

2.5.4. According to ESO EAD data, based on announced investment plans, ***in the period 2023-2032, a total of 12,135 MW of renewable energy sources are planned for construction***, of which 11,677 MW of solar energy. These data represent a sharp increase in investment intentions to install RES capacities, and in particular SPPs, compared to the announced investment intentions in the period 2022 - 2031, which forecasted the construction of a total of 4,858 MW, of which 4,439 MW solar energy.

Thus, by 2032, 30.04% of domestic consumption is expected to be satisfied with electricity produced by RES.