

# Report: EPS position in the regional electricity market

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The analysis of the position of the Public Enterprise Elektroprivreda Srbije in the regional electricity market by 2030, prepared by the Electricity Coordination Center in 2015, takes into account two different scenarios of consumption development in Serbia - the conservative and the development scenario.

The conservative scenario implies a high level of household participation and a lower share of the final consumption industry, in line with the current form of daily consumption, and the existence of an end-customer category in the public supply, which is supplied at regulated non-market prices.

On the other hand, the development scenario implies a higher level of industrial consumption, with higher energy efficiency and a lower share of households in final consumption, as well as a more uniform daily consumption. In addition, all electricity customers are supplied at market prices.

When it comes to development scenarios by 2030 and plans for revitalization or decommissioning of existing generation units, there are three scenarios - low, medium and high.

The low production development scenario implies the absence of development plans and centring of EPS generation on existing production facilities, with minimal investment in extending the operating life and maintaining the operational readiness of existing units. In this scenario, only Kostolac B3 TPP emerges as a new generation capacity, whose commissioning is expected by 2025.

The medium scenario implies a higher level of investment in new facilities, with greater investment in the revitalization and extension of the operating life of existing facilities. In this scenario, the construction of the Kostolac B3 TPP, the Novi Sad cogeneration plant and the 700 MW lignite-fired TPP is expected and their commissioning in the period until 2020, 2025 and 2030, respectively. PSHPP Bistrica is also emerging as a new generation facility, with an expected commissioning by 2030.

The high generation development scenario implies the construction of the same three thermal power plants as the medium scenario, but with a slightly faster dynamic, according to which Kostolac B3 and Novi Sad TPP are in operation by 2020 and 700 MW lignite-fired TPP by 2025. It also envisages significant investments into the revitalization and extension of the operating life of existing facilities. The new generation facility under this scenario is also PSHPP Bistrica, now with an expected commissioning by 2025.

Market simulations in the analysis were conducted using the GTMAX software package - simulation of optimum engagement of generating units and interactions in the electricity

market in the SEE region, in order to maximize profits and minimize total operating costs, taking into account the techno-economic constraints of generating units and available cross-border transmission capacities.

During the simulations, the principle of market coupling was respected, respecting NTC-based Market Coupling principle, assuming price inelastic consumption and no market power being applied by market participants.

Simulations for four characteristic weeks (winter, spring, summer, autumn) were performed for each target year under three variants of hydrological conditions (average, dry and wet year) and a combination of possible consumption developments in Serbia (conservative, developmental) and the development of the EPS generation portfolio (high, medium, low).

**Based on the analysis of the results obtained for the period until 2030 for the region of Southeast Europe, it can be concluded:**

- The region's electricity balance towards neighbouring areas is more balanced by 2030, with moderate surpluses and export potential within 5% of total energy generated;
- The main energy transits are from east (Romania and Bulgaria), south (Turkey, Greece), southwest (Italy - after the entry of the HVDC cable between Montenegro and Italy) and northwest (Hungary, Croatia);
- The largest exporters of electricity are Bulgaria (between 12-16 TWh annually) and Romania (annually from about 6 TWh until 2020, and about 24 TWh after 2020, after the entry of new comparatively cheap generating capacities, as well as new transmission capacities towards the west);
- The largest importers of electricity are Hungary (between 14-17 TWh per year) and Croatia (between 5-7 TWh per year);
- Importers in the region are also Albania, Macedonia and Montenegro. For Albania and Macedonia, imports are increasing from 2015 (Albania's imports about 3 TWh, and Macedonia's about 1 TWh) to 2030 (Albania's imports around 4.6 TWh, and Macedonia's about 2.5 TWh). Montenegro's imports range from 0.6 - 1.8 TWh, increasing in the period from 2015 to 2025, while decreasing after 2025;
- Bosnia and Herzegovina exports electricity, but the level of exports (with a maximum of up to 5 TWh per year) is strongly correlated with different generation development scenarios in Serbia (larger construction of new generation facilities in Serbia causes repression of comparatively more expensive thermal units in Bosnia and Herzegovina in the regional market );
- The balance position of Serbia (including Kosovo) changes when different generation development scenarios are compared, and varies from the position of an exporter with

maximum exports of about 5 TWh for the high generation development scenario, to the position of an importer with maximum imports of about 6 TWh for the low scenario of EPS generation development;

-Average annual wholesale market prices are lowest in the east, in Romania (32-41 EUR/MWh) and Bulgaria (31-44 EUR/MWh), whose borders to the west have been congested for most of the year;

-Average annual wholesale market prices are highest in Hungary (45-52 EUR/MWh) and Croatia (42-48 EUR/MWh), with the highest price increases of about 15% in 2030 due to the small number of new capacities in the region between 2025 and 2030;

-The markets of Serbia, Bosnia and Herzegovina, Macedonia and Albania represent, in most of the analyses, coupled markets, with average annual wholesale prices ranging from 42-46 EUR/MWh;

-When analysing wholesale market prices, it should be borne in mind that, starting from 2020, a CO<sub>2</sub> emission allowance of 10 EUR/tonne of CO<sub>2</sub> is included, which leads to an increase in production costs and therefore a price in the wholesale electricity market compared to state as of 2015.

An analysis of the results obtained for the period until 2030, for the electricity balance of Serbia (excluding Kosovo), it can be concluded that Serbia is characterized by a mixed generation mix, with a dominant thermal production of more than 2/3 of the total energy generated, hydropower generation whose share varies between one quarter and one-third, with generation growth from wind farms reaching 20% in 2030.

A similar level of balance indicators is obtained for the conservative and developmental consumption scenario, while significant differences are present for different generation development scenarios.

In the high scenario of generation development, Serbia is an exporter of electricity on an annual basis for the considered period and for the expected hydrological conditions, with the export level slightly below 1 TWh in 2020, about 3 TWh in 2025 and over 3.5 TWh in 2030. Serbia exports in the spring and summer months, and imports in the winter and autumn months. Looking at different hydrological conditions, Serbia is an annual exporter under average and humid hydrological conditions, while for dry hydrological conditions it imports in 2020 and exports electricity in 2025 and 2030.

According to the medium scenario, Serbia is, for the expected hydrological conditions in 2020 and 2030, an annual electricity exporter with an export level of about 1 TWh. In 2025, due to the decommissioning of some thermal power plants (TENT A1, Kostolac A1, Kolubara, Morava), as well as the later commissioning plan of new facilities, Serbia becomes an importer on an annual basis of about 2, 7 TWh. Serbia also exports in the spring and summer months, and imports in the winter and autumn months.

Considering different hydrological conditions, Serbia imports electricity in all analysed years

under dry hydrological conditions, while under average and wet hydrological conditions it exports electricity in 2020 and 2030, while it imports in 2025.

The low generation development scenario implies that Serbia is an electricity importer on an annual basis, with an import level of about 1.5 TWh in 2020, 6.8 TWh in 2025 and 7.7 TWh in 2030. Serbia imports significantly in the winter and autumn months, and in the spring and summer months it becomes either balanced or imports to a lesser extent. Looking at different hydrological conditions, Serbia is an annual importer of electricity under dry, average and wet hydrological conditions in 2025 and 2030, and only exports under wet hydrological conditions in 2020.

**By analysing the results obtained for the period up to 2030 on the position of EPS in the wholesale electricity market, the following can be concluded for 2025:**

-Generated electricity from EPS capacities varies, depending on the generation development scenario, from 32.3 TWh to 41.7 TWh;

-Operating costs of generation, depending on the generation development scenario, range between 27 and 30 EUR/MWh, with CO<sub>2</sub> emission allowance included, and decrease from high to low generation scenario, due to the reduction of the share of thermal generation in total generation;

-Depending on the scenario analysed, EPS will sell between 29.7 and 38.1 TWh to end customers in Serbia;

-Under the conservative scenario, EPS will sell between 3.8 TWh and 5.8 TWh, and buy between 0.8 TWh and 2.4 TWh in the regional wholesale electricity market, depending on the generation development scenario considered;

-Under the development scenario, EPS will sell between 0.4 TWh and 4.3 TWh in the regional wholesale electricity market, depending on the generation development scenario considered;

-EPS share in the Serbian market and coverage of final consumption is the lowest in the low scenario of generation development and amounts to 76%, while for the high scenario it reaches slightly above 95% (about 2% of consumption in Serbia in the year under review is covered by subsidized renewable sources);

-The average price at which EPS sells to end customers in Serbia is 40.4 EUR/MWh under the conservative consumption scenario and 42.5 EUR/MWh under the development scenario of consumption;

-Under the conservative scenario, the average price achieved by EPS by selling in the regional market varies, depending on the generation development scenario, between 41.9 and 42.4 EUR/MWh, and the average price at which it buys in the regional market between 42.2 and 4 EUR/MWh. The difference between the price at which it buys and the price at

which it sells in the regional market is due to the fact that EPS disposes of surpluses in periods when the market price is lower and it has deficits and is forced to buy in periods when the price is higher;

-Under the development scenario, the average price that EPS achieves by selling in the regional market varies depending on the generation development scenario between 41 and 42 EUR/MWh;

-Revenues from energy sold to end customers in Serbia and purchase and sale in the regional electricity market are 78 to 95 million euros higher for the development consumption scenario, which clearly indicates the importance of full market liberalization, which means that EPS markets its generation at market prices in all categories of end electricity customers in Serbia;

-By comparing the high and low generation development scenarios, EPS has a higher market profit of EUR 56 million;

-By comparing the medium and low generation development scenarios, EPS has a higher market profit of EUR 13 million.

When it comes to 2030 projections, the following conclusions can be drawn:

-Electricity generated by EPS capacities varies depending on the generation development scenario between 32.5 TWh and 43.8 TWh, depending on the scenario considered;

-Operating costs of generation, depending on the generation development scenario, range between 27.4 and 30.3 EUR/MWh with CO<sub>2</sub> emission allowance included, and decrease from high to low generation scenario due to the reduction of the share of thermal generation in the total generation;

-Depending on the scenario analysed, EPS will sell between 30.2 and 37.4 TWh to end customers in Serbia.

-Under the conservative scenario, EPS will sell between 4.2 TWh and 8 TWh, and buy between 0.7 TWh and 2.1 TWh in the regional wholesale electricity market, depending on the generation development considered;

-Under the development scenario, EPS will sell between 0.4 TWh and 5.1 TWh in the regional wholesale electricity market depending on the generation development considered;

-EPS share in the Serbian market and coverage of final consumption is the lowest in the low generation development scenario and amounts to 79%, while in the high scenario it reaches about 93% (about 4% of consumption in Serbia in the year under review is covered by subsidized renewable sources);

-The average price that EPS achieves by selling to end customers in Serbia is 42 EUR/MWh under the conservative scenario and 46.5 EUR/MWh under the development scenario;

-Under the conservative scenario, the average price that EPS achieves by selling in the regional market ranges from 43.4 to 44.6 EUR/MWh, depending on the generation development scenario, and the average price at which it buys in the regional market is between 47.4 and 49 EUR/MWh. The difference between the price at which it buys and the price at which it sells in the regional market is due to the fact that EPS disposes of surpluses in periods when the market price is lower and it has deficits and has to buy in periods when the price is higher;

-Under the development scenario, the average price that EPS achieves by selling on the regional market, depending on the generation development scenario, is between 40.5 and 45.2 EUR/MWh;

-Revenues from energy sold to end customers in Serbia, and purchase and sale in the regional electricity market amount to EUR 164-170 million more for the development consumption scenario;

-By comparing the high and low generation development scenarios, EPS achieves higher market profit at the level of EUR 97 to 99 million;

-By comparing the medium and low generation development scenarios, EPS achieves higher market profit at the level of EUR 72 million.