

## **European environmental regulations**

Emissions of harmful gases from large combustion plants in the European Union are regulated by two directives - Large Combustion Plants (LCPD) and Industrial Emissions (IED). Pursuant to the provisions of the Treaty establishing the Energy Community, the Large Combustion Plants Directive should have been implemented by 31 December 2017, without extensions for the preparation of the National Emission Reduction Plans. However, in October 2013, the Ministerial Council of the Energy Community decided to postpone its application by the end of 2023. In the European Union, this directive supersedes the directive on industrial emissions from 1 January 2016.

LCPD Directive refers to thermal power plants with the capacity equal to or greater than 50 megawatts. It aims to reduce dust levels and limit emissions of sulphur dioxide, nitrogen oxides and particulate matter from these plants. During the drafting of the National Environmental Approximation Strategy of the Republic of Serbia, it is estimated that the cost of aligning with the projected values will amount to EUR 1.5 billion.

The IED Directive combines the LCPD and six other directives, including the Directive on Integrated Pollution Prevention and Control (IPPC), which is one of the first directives completely transposed into the Serbian legal system. The Law on Integrated Pollution Prevention and Control defines the conditions for obtaining an integrated permit and for applying the best available technique standards adopted by the European Commission. All ten thermal power plants operated by EPS implemented the requirements of this directive. Serbia's power system is the largest in the region, while some 64 percent of electricity is generated from lignite originating from Kolubara and Kostolac. In order to implement the LCPD and IED directives, new plants and those that will be revitalized, must have a desulphurization system, flue gas denitrification and highly efficient electrostatic precipitators. Economic analysis conducted under the National Environmental Approximation Strategy has shown that it is only possible to align with the LCPD directive in 2023, which means that aligning with the IED directive will take even more time.

In EPS, it was estimated that by postponing the implementation of the large combustion plants directive, EPS avoided the situation of having its power system stability jeopardized by closing power plants with installed capacity below 300 megawatts, without any replacements, while on the other hand it is not economically feasible to apply extremely expensive modern harmful emissions reduction systems.

Application of the Large Combustion Plants Directive means that existing EPS facilities must reduce sulphur-dioxide emissions below 400 mg/m<sup>3</sup>, nitrogen oxides below 200 mg/m<sup>3</sup> and dust below 50 mg/m<sup>3</sup>. In the case of sulphur-dioxide, there is an option for the concentration to be below 200 mg/m<sup>3</sup> because in this way the requirements of the IED Directive will be met.

## **EPS projects**

The value of the projects implemented or planned by EPS to achieve the values specified to reduce air emissions of pollutants from thermal power plants, amounts to EUR 900 million between 2017 and 2025, and so far some EUR 330 million have been invested.

If the 2018 LCPD implementation decision remained in force, this would mean that units with the capacity below 300 megawatts would have to be decommissioned because emission reduction activities for these units were envisaged, making a total of more than 1,100 megawatts. Units with the total capacity of 1,200 megawatts would also be problematic, considering that they would not get environmental upgrades by the initially foreseen date. EPS projects aimed at harmful emissions reduction leave enough room to meet the obligations towards the Energy Community. Considering that time-consuming and very expensive projects are in question, it is essential to secure funds for their implementation in time. By meeting EPS obligations, Serbia would move further in the process of adapting to the EU's environmental regulations.

Construction of a desulphurization plant in the Nikola Tesla A thermal power plant, which is the most important project of EPS, valued at EUR 167 million, began in February this year. Funds were secured by the Japanese Agency for International Cooperation, JICA. The flue gas desulphurization technology based on the wet procedure and using limestone as a reagent will be installed on units A3, A4, A5 and A6, each with a capacity of 350 MW. This largest environmental project so far in Serbia will reduce sulphur-dioxide emissions at the plant outlet below 200 mg/m<sup>3</sup>, i.e. between 74,000 tons and 7,800 tons annually, thus also meeting the IED Directive requirements.

The main contractor, Japanese consortium headed by Mitsubishi Hitachi Power Systems (MHPS), and local companies will perform works worth some EUR 95 million, Milorad Grcic, EPS director said at the foundation stone-laying ceremony for the plant.

The deadline to complete the said works is 42 months after contract effectiveness.

For this year, the modernization of the oldest units A1 and A2, whose revitalization will last several years, has been announced.

“Three key segments important for environmental protection have been introduced in TENT: construction of electrostatic precipitators on all TENT units, together with the reduction of nitrogen oxides, implemented on units A3 and A5, while this system will also be implemented on unit A4 by late February. The biggest segment coming after this is flue gas desulphurization, whose construction is starting today, thanks to the Government of Japan and JICA, who gave us a favourable loan,” said the Energy Minister, Mr. Aleksandar Antic on this occasion.

EPS also faces the desulfurization project for both TENT B units, whose estimated value is EUR 160 million. According to the director Grcic, EPS is currently preparing for this project. The issue of dust pollution reduction was resolved by installing electrostatic precipitators on all TENT units.

“So far, some measures have been taken to reduce nitrogen oxides emissions, such as the installation of low-emission burners on units A3 and A5, as it turned out that combustion process optimization can also influence the control of the inlet dust concentrations of electrostatic precipitators, thus increasing electrostatic precipitator efficiency. As part of the major overhaul of the TENT A5 unit, in 2012, new heaters were installed on this unit, which are one of the parts of the nitrogen oxides reduction system. This has changed the combustion process of the boiler furnace, creating conditions for a significant reduction of nitrogen oxides. Two years later, in 2014, the NOx reduction system was also implemented on the TENT A3 unit during revitalization. In both of these projects, JP EPS invested RSD 23.8 million of own funds, part of which was used to upgrade the A5 unit mills. The nitrogen oxides reduction system project on unit A5 was carried out by Hitachi in two phases,” according to TENT’s website.

Desulphurization plants were introduced in the Kostolac A and B TPPs (valued at some EUR 96 million) as part of the Chinese loan. Chinese Machinery Engineering Corporation (CMEC) is building a new 380 MW unit – Kostolac B3, complying with the EU’s environmental requirements. The project is value at some USD 700 million, and it should be completed in 2020.

### **Unit decommissioning schedule**

When it comes to decommissioning thermal unit not meeting environmental standards in the past few years, several scenarios have been considered.

According to earlier announcements, this process will be completed by 1 January 2024, an obligation undertaken by Serbia as part of the Energy Community. These are units with the capacity below 300 MW, where rather expensive sulphur-dioxide curtailment measures and alignment with EU legislation is not economically feasible.

The draft energy strategy envisaged a successive decommissioning, between 2018 and 2024, of the thermal power capacities below 300 MW – TENT A1 and A2, Morava, Kolubara and Panonske power plants, with an average age over 45 years. This means that a total of 1,200 MW should be decommissioned, whose efficiency level fell below 30 percent. For these units, replacement capacities should be secured.

In addition, the operation of plants without a flue gas desulphurisation system should be limited to 20,000 hours in the same period.

The oldest and most unprofitable thermal units of EPS, scheduled for decommissioning, are Kolubara A1 – A4, with a nominal capacity of 161 MW and an actual capacity of 120 MW. The age of these units is about 55 years and they operate with a consumption of over 1,600 kJ/KWh, resulting in adverse financial and environmental effects.

Decommissioning of these units was originally planned in EPS by 2014. When it became clear that this would not happen within the foreseen period, in accordance with the Energy Community obligations, the deadline was shifted to 2018. It is clear that this deadline has

been missed.

If the decision by the Energy Community to delay the elimination of obsolete thermal power plants by the end of 2023 had not been made, in accordance with the Large Combustion Plants Directive, all units with the capacity below 300 MW, not foreseen for environmental upgrades, would have been shut down in 2018.

In November 2017, domestic media reported that a Decree was prepared to decommission eight thermal units that failed to meet environmental requirements of the Large Combustion Plants Directive.

In accordance with the Decree, Serbia would remain without electricity by 2024, generated in the Kostolac thermal power plants, units A1 and A2, TENT A1 and A2, as well as Kolubara.

The decommissioning schedule of EPS capacities, which was considered at the time, envisioned that in the period until 2024, the smallest and oldest units of the Kolubara TPP, A1-A4 (2018/19) could be decommissioned; followed by the Kolubara A5 (2020); TENT A1 and A2 (2021/22); Morava and Kostolac A1 (2021). In addition to TENT A1, capacity of these units is below 300 MW. Decommissioning of TENT A2 and Kostolac B was planned for 2022 and 2024, respectively.

Electricity from the decommissioned thermal units would be replaced by commissioning eight wind farms, one gas plant in Pancevo (whose construction was started in March this year) and unit B3 in Kostolac, as well as by revitalising units of almost all hydropower plants.

However, these were not definitive solutions, and investigation into the modernization profitability of the Kostolac A unit and one of the TENT units was initiated, which, according to estimates would cost some EUR 417 million in total. Since this is a lot of money, EPS would have to examine whether there are prospects for these investments. The actual decommissioning of the remaining six units would cost Serbia some EUR 26 million.

As we have seen, the revitalization of the TENT A and B units has been announced, in all likelihood this means that even this plan has been dropped.