



DESULPHURISATION IN THE WESTERN BALKANS

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March, 2023



UGLJEVIK 1

NIKOLA TESLA B

KOSTOLAC B

**COPPER
SMELTER**

BITOLA

„KOSTOLAC B” THERMAL POWER PLANT

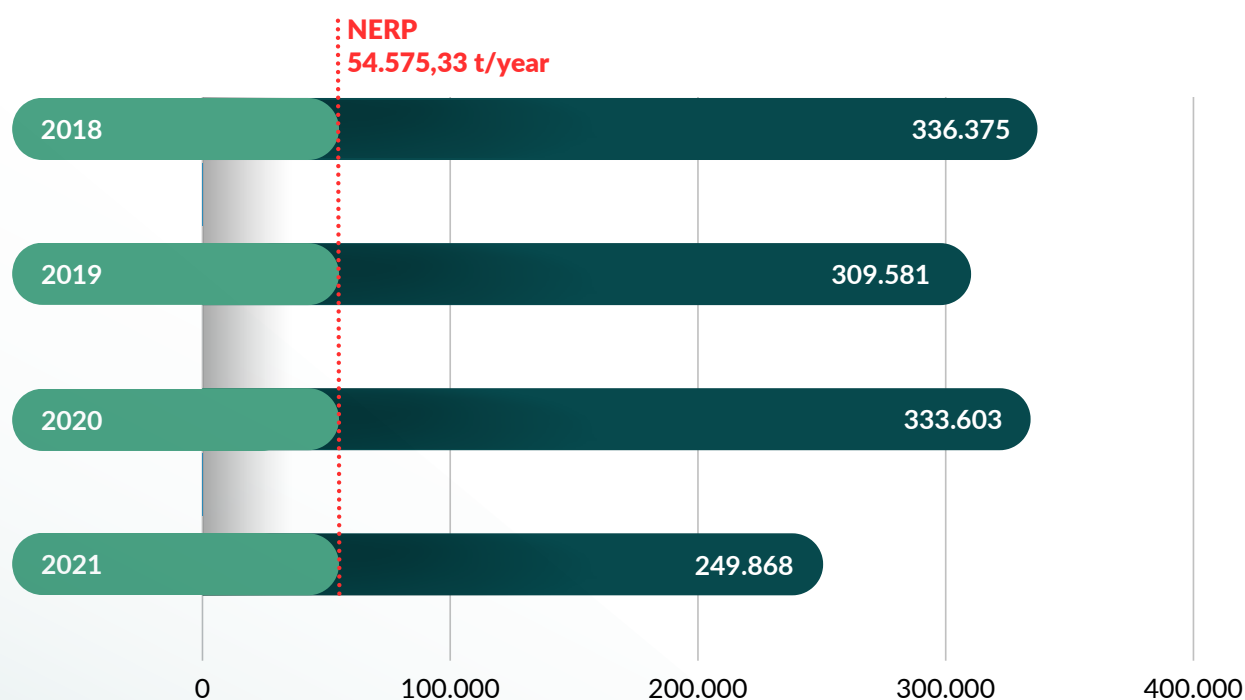
As a signatory to the [Energy Community Treaty](#), the Republic of Serbia was obliged to comply with the requirements of the [Large Combustion Plant Directive 2001/80/EC](#) starting from January 1, 2018. The Decision of the Ministerial Council from October 2013 allowed Contracting Parties to limit emissions on an annual basis by applying the National Emission Reduction Plan (NERP), instead of complying with the emission limit values prescribed in this Directive. Through [national legislation](#), Serbia confirmed the obligation to implement NERP starting

Plant capacity:	700 MW (2 x 350 MW)
Year of construction / commissioning:	1988 (Kostolac B1) and 1991 (Kostolac B2)
Type of fuel:	lignite
Source of fuel:	open-cast mine Drmno
Source of water:	river Danube
Reduction of SO_x:	YES, flue gas desulphurisation plant
Wastewater treatment plant:	NO, ongoing construction of installation



Comparison of sulphur dioxide emissions from thermal power plants of the Public Electricity Company of Serbia, which are covered by the National Emission Reduction Plan (NERP) and the maximum annual emissions prescribed by NERP

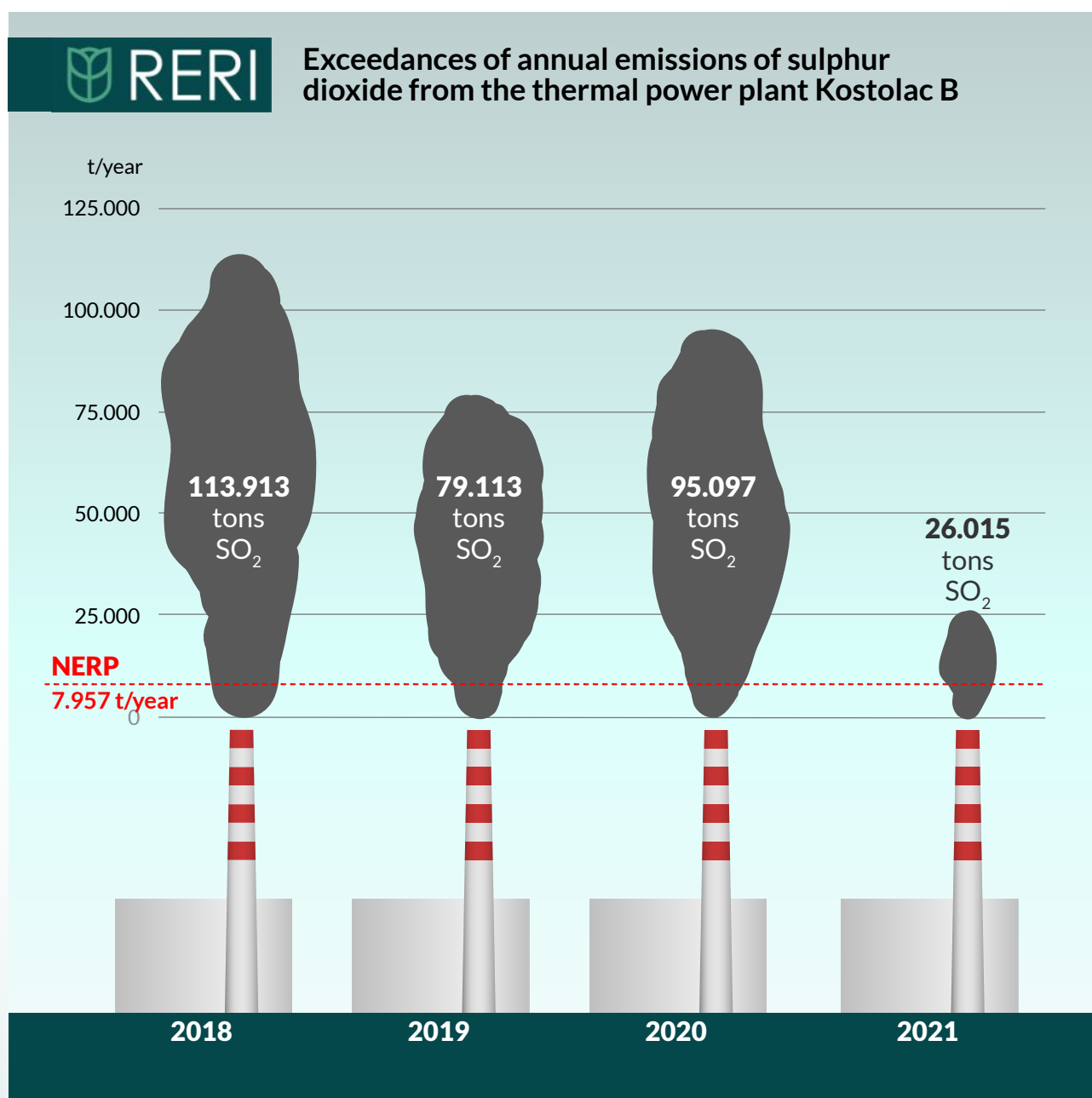
Amounts of sulphur dioxide (SO₂) t/year



from January 1, 2018, and informed the Public Electricity Company of Serbia (EPS) about this at the end of 2017. The Ministry of Environmental Protection held a public debate on the strategic environmental assessment of this plan [one year after the beginning of application of NERP](#), whereas two years after the beginning of its implementation, the Government of the Republic of Serbia adopted an [“improved” NERP](#). The NERP was adopted in the form of a public policy document, [in a way that does not guarantee compliance with the established emission limit values](#) of polluting substances, but indicates the postponement of obligations.

This is because the amended version, among other things, extended the deadlines for the construction of desulphurisation plants in certain thermal power plants (TPP).

The NERP includes 12 large combustion plants (over 50 MW), and EPS’s TPPs are [among the biggest sulphur dioxide polluters in Europe](#). TPPs Nikola Tesla (TENT) and Kostolac emit on average [35 times more sulphur dioxide](#) than the average TPP in the EU. As a measure to reduce emissions, this plan envisages the construction of desulphurization plants in seven of the eight EPS’s plants.



However, only in 2018 and 2019, the emissions of sulphur dioxide from TPPs “Nikola Tesla” and “Kostolac” [were six times higher](#) than allowed, and the exceedance continued during every subsequent year, which is why RERI [filed a lawsuit before the Higher Court in Belgrade in January 2021](#). In November 2022, the Higher Court [ordered EPS to reduce sulphur dioxide emissions multiple times](#), because its activities endanger the environment and human health. In addition, the Secretariat of the Energy Community [initiated a procedure against Serbia](#) due to violations of NERP in March 2021.

TPP “Kostolac B” is the largest emitter of sulphur dioxide in Serbia, whose two blocks emitted an average of [12 times more sulphur dioxide than allowed by the NERP](#), during 2018, 2019 and 2020, almost doubly exceeding the total permitted emissions for all twelve plants included in the NERP. Sulphur dioxide emissions were significantly reduced only in 2021, which can be attributed to fewer working hours and the fact that the desulphurisation plant was in trial operation. However, although emissions were reduced, they were still 3.5 times higher than permitted.

The planning and preparation of documentation for the construction of a flue gas desulphurisation plant in “Kostolac B” began back in 2007, [a feasibility study and an environmental impact assessment \(EIA\) study were prepared](#) in 2008, while EPS received approval for the studies in August 2010. In the same year, EPS and Kostolac TPPs and Mines signed a framework [contract with the Chinese company CMEC](#), which stipulates that this company will be the main contractor. Funding for this project was secured two years later, when [a law confirming a loan from China Exim Bank in the amount of USD 293 million was](#)

[passed](#). CMEC prepared technical documentation based on previously prepared studies, however, there were certain deviations regarding the deposition of gypsum and increase of the efficiency of desulphurisation due to the requirements set by the [Directive on Industrial Emissions](#), but also the planned construction of the new block B3 in Kostolac, which is why the EIA study was updated and the EIA approval obtained in August 2015.

The plant was constructed and [trial operation was carried out in 2017](#), and based on the tests, it was determined that the gypsum produced in the desulphurisation process is non-hazardous waste, although it was primarily characterized as hazardous. In addition, it was determined that it is necessary to change the technical documentation related to the isolation of the terrain under the gypsum landfill planned for the open-cast mine Drmno. Due to the aforementioned changes, the process of updating the EIA study was carried out, which was [approved](#) by the Ministry of Environmental Protection in July 2020. In October 2020, this plant began [trial operation](#) to determine its suitability for use. Since the trial operation can last no longer than one year, EPS submitted a request for the issuance of an operational permit in October 2021. However, in November of the same year, the competent Ministry [rejected it due to as many as 20 formal deficiencies](#), among other things, the fact that no proof was provided that the project for the wastewater treatment system was carried out. EPS again submitted a request for the issuance of an operational permit in December, which the Ministry of Construction, Transport and Infrastructure rejected in July 2021, due to the fact that the company did not submit the documentation necessary to decide upon request. In the meantime, EPS [occasionally](#)

[put the desulphurisation plant into operation](#), using the convenience prescribed by [the law that regulates the planning and construction](#), which allows that, if the competent authority does not decide within the legal term of five days on the submitted application for the issuance of an operational permit, the investor can start using the facility, provided that it has a positive opinion from the technical review committee. In December 2022, another request for the issuance of an operational permit was rejected, again for formal reasons, among other things, because EPS, contrary to the regulations, never reported the construction works which were carried out under the amended construction permit. Finally, in January 2023, EPS obtained an [operational permit](#) for the desulphurisation plant.

Reasons for (non)functionality of the plant

Considering that more than five years passed from the construction of the plant until the operational permit was obtained, as well as the fact that to date it has not contributed to the expected reduction of sulphur dioxide emissions, the question of the reason for the non-functionality of the plant has arisen. One of the key documents that should provide answers to these questions is the feasibility study for the construction of the plant, which is not publicly available. After the refusal of EPS to submit the study, claiming that the submission of the requested documentation would jeopardize the interests of EPS and the timely realization of the project, RERI obtained the feasibility study for the construction of a flue gas desulphurisation plant at the TPP “Kostolac B” from the Ministry of Construction, Transport and Infrastructure at the end of 2022, which is hereby published in its [entirety](#).

1. Technological dimensioning of the plant

In order for the plant to function properly and treat all gases, it needs to be adequately dimensioned. Dimensioning refers, above all, to the chimney, fans, gas pipeline, wastewater treatment systems, etc.

Although there are certain inconsistencies in the input data related to the quality of coal in the [feasibility study](#), no deficiencies can be identified in relation to the technical dimensioning that would affect the non-functionality of the plant.

2. Plant engineering

Operational problems may arise due to inadequate engineering of individual systems or system components. In the case of these plants, this usually refers to the elimination of droplets (exit part of the chimney) and corrosion (choice of materials), as well as the adequate selection of individual equipment.

These problems are generally treated by technical and engineering interventions during the trial operation of the plant and then corrected. Based on the available technical documentation, no deficiencies can be identified in relation to the engineering of the plant that would affect the plant's non-functionality.

3. Disposal of gypsum

If the disposal of gypsum is not adequately regulated, the desulphurisation plant cannot work continuously.

The [report for the technical inspection of the plant from 2021](#) states that the plant, after a successful functionality test in March 2017,

was conserved due to a lack of space for the disposal of gypsum. Although a mining project for the disposal of gypsum in the open-cast mine Drmno was also developed, EPS has not yet received approval for the use of these facilities, and the issue of gypsum disposal has not been permanently resolved.

Another possibility is to place certain quantities of gypsum on the market. It is expected that the plant will produce about 450,000 tons of gypsum annually, and, according to EPS, [the placement of about 125.000 tonnes of gypsum on the market](#) is ensured. If EPS successfully markets only $\frac{1}{3}$ of the produced gypsum, the question of how the remaining 325,000 tons of gypsum are disposed arises.

4. Wastewater treatment

Without a wastewater treatment plant, it is not possible to ensure the continuous operation of the desulphurisation plant.

The construction of a joint wastewater treatment plant in “Kostolac B” is planned, and the construction began in 2019. However, to date, this plant has not obtained an operational permit.

Given that EPS has not obtained an operational permit for the wastewater treatment plant, there is a high probability that the wastewater generated by the operation of the desulphurisation plant will be discharged without treatment.

The desulphurisation plant in Kostolac was supposed to be a pilot project, not only in Serbia, but also in the Western Balkans, and thus provide operational and financial experience and knowledge, which would potentially improve investment plans in other TPPs as well. Considering all the shortcomings and delays in the implementation of this project, it seems that it can serve more as a negative experience. Particularly concerning is the fact that, although the desulphurisation plant has been put into operation, the issues of disposal of waste and wastewater treatment resulting from this process have not been resolved.

In the [feasibility study](#) for the construction of the wastewater treatment plant in “Kostolac B”, it is estimated that as much as 569,400 m³ of wastewater originating from the desulphurisation plant will be generated annually.

Finally, there can be a very simple answer to the question of why it took so long to put this plant into operation, having in mind that the annual operating costs of this plant are [13,5 million EUR](#).

Author: RERI

„NIKOLA TESLA” THERMAL POWER PLANT (TENT B)

“Nikola Tesla B” Thermal Power Plant (TENT B) has the [two largest energy units](#) and is [the second largest emitter of sulphur dioxide in Serbia](#). Emissions from this thermal power plant (TPP) only in 2021 were higher than the total permitted emissions for all twelve plants included in the NERP.

Planning for the construction of the flue gas desulphurisation plant in TENT B began with the signing of the [loan agreement](#) between the Public Electricity Company of Serbia and the Japanese Agency for International Cooperation in 2011. According to EPS’ announcements, the desulphurisation project in TENT B should [reduce the annual level of sulphur dioxide emissions to 4,500 tons](#), which is about 14 times less emissions than this TPP currently emits. The foundation stone [was laid in December 2020](#), and the first construction permit was issued in March 2021. To date, a total of 5 construction permits have been issued for the phased construction of this plant. According to EPS’ announcements, the beginning of 2024 is foreseen as the deadline for the completion of the construction of the plant, but it seems that the commissioning of work of the plant could be expected much later. Namely, the notice of commencement of works according to construction permits states that the expected deadline for the completion of the works is March 16, 2024, while the construction permit for the construction of the system for the main electricity supply of the desulphurisation plant was issued in March 2023. As

Plant capacity: 1	.340 MW (2 x 670 MW)
Year of construction / commissioning:	1983 (TENT B1) and 1985 (TENT B2)
Type of fuel:	lignite
Source of fuel:	open-cast mine Kolubara
Source of water:	river Sava
Reduction of SOx:	NO, ongoing construction of the plant
Wastewater treatment plant:	NO, planning and preparation of documentation in progress

the [feasibility study](#) predicts 3.5 years for the actual construction of this system, on which the operation of the desulphurisation plant depends, it is clear that it could be put into operation at the end of 2026 at the earliest.

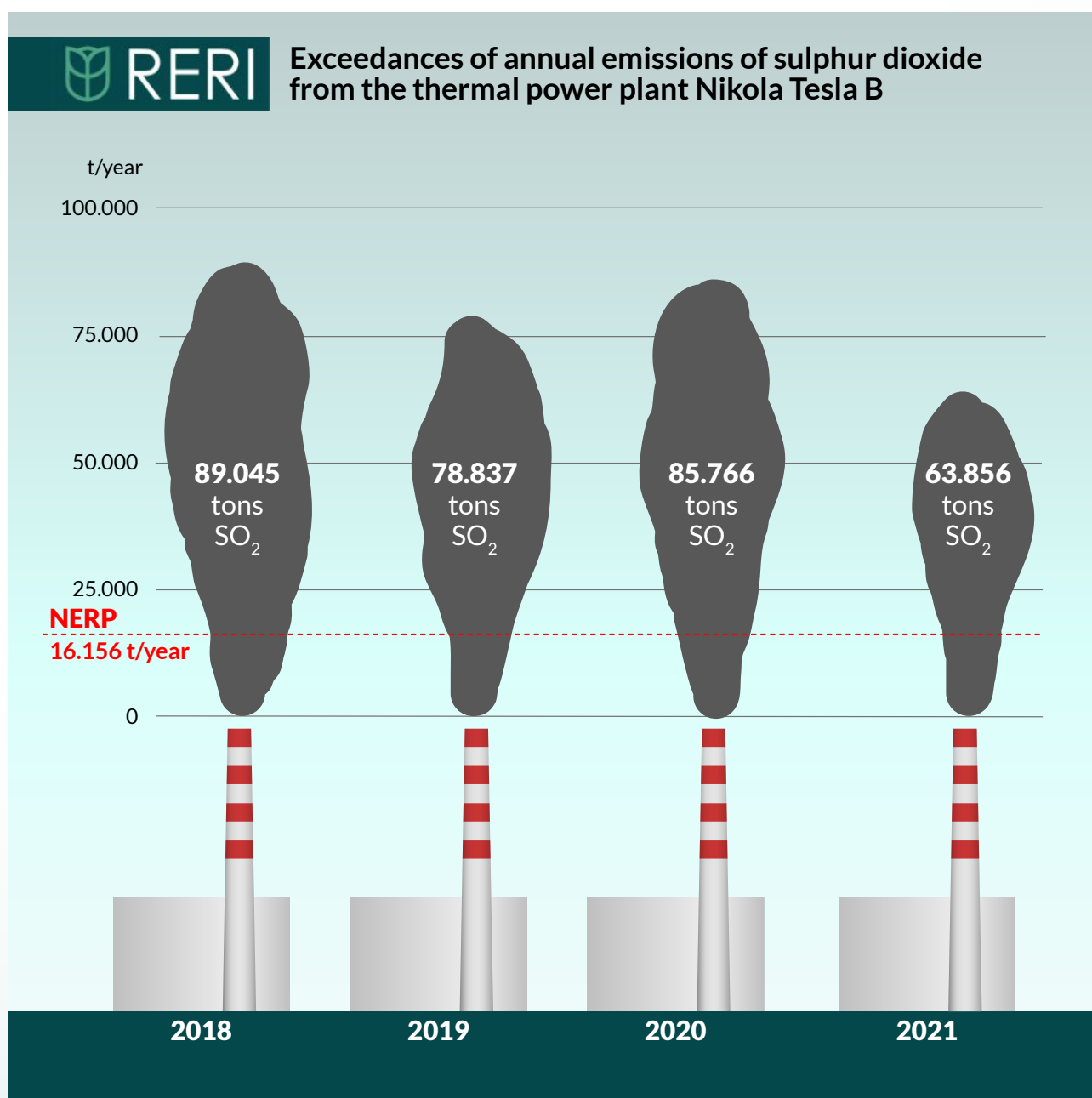
Ignoring the impact on the environment

Each of the five construction permits issued allowing EPS to construct a desulphurisation plant was issued without previously obtained approval to an environmental impact assessment (EIA) study. Issuing construction permits prior to obtaining approval of an EIA study [made it impossible to incorporate environmental protection measures and activities into construction permits](#).

EPS obtained EIA approval of the study only in March 2022, and the [environmental impact assessment study](#) for the construction of the desulphurisation plant was of poor quality and

did not analyse all the negative effects of the construction of this plant on the environment, such as the increase emissions of carbon dioxide, large amounts of technological wastewater, waste sludge, as well as gypsum. A separate problem is the fact that the alignment of the construction of this plant with the [construction of the wastewater treatment plant in TENT B](#), without which it cannot function, was not considered. In addition, EPS artificially singled out the process of disposing of waste generated in the desulphurisation

process (gypsum), presenting it as a separate project. Inadequate disposal of gypsum can have significant negative impacts on the environment, given the large amounts of this waste, as well as the fact that it may contain heavy metals. Finally, it should be noted that this project also envisages the possibility of constructing joint systems for blocks B1 and B2, but also for the [new block B3](#), which is also planned in [the draft of the new Spatial Plan of the Republic of Serbia](#).



The fact that the main goal of the plant is to reduce sulphur dioxide emissions, that is, to reduce environmental pollution, should not affect the very legality of the permitting procedure, nor should it be observed as a mitigating circumstance in the case of illegal permit issuance. Also, it should not be forgotten that the construction permit is issued for a plant for which an EIA procedure is required. It is especially important to understand that the EIA procedure is not carried out for all projects, but only for those projects that

may have significant environmental impacts. Violation of laws and procedures creates a great risk that the plant, whose initial purpose is to reduce pollution, will not contribute to that goal, since in the case of illegal construction of the plant, it is difficult to rule out the suspicion that illegalities will also occur during the operation of the facility. Finally, this is exactly what the example from Kostolac exposed.

Author: RERI

„BITOLA” THERMAL POWER PLANT

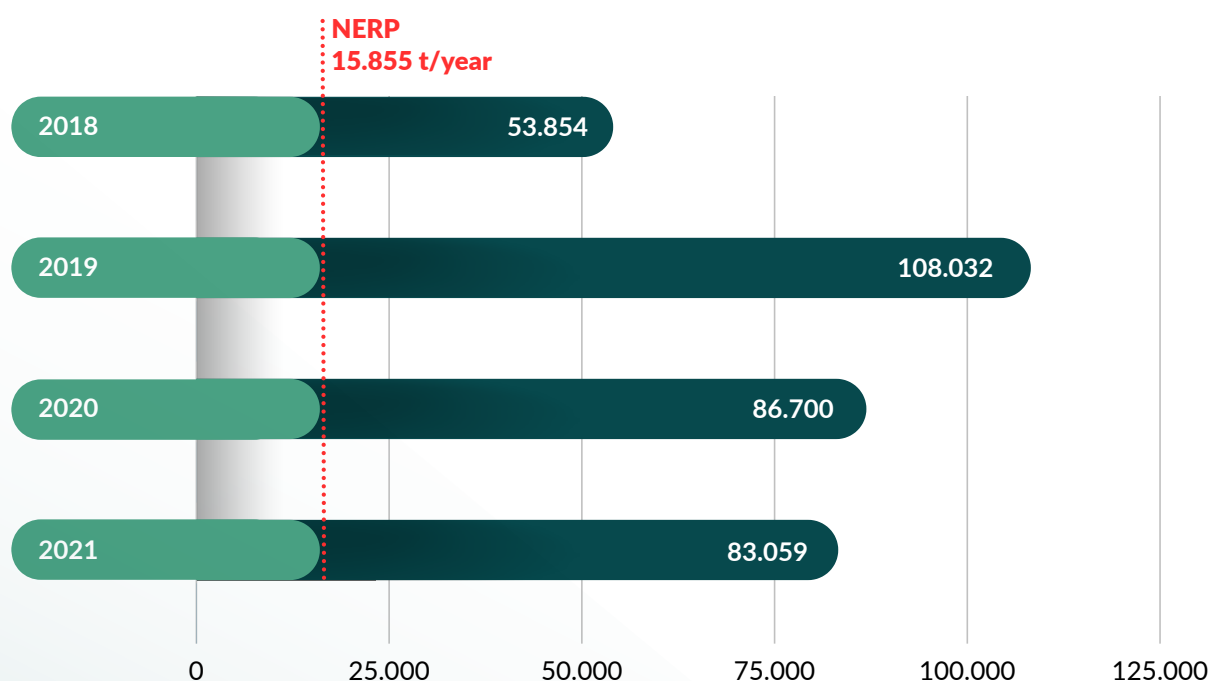
As a signatory to the [Energy Community Treaty](#) North Macedonia was obliged to comply with the requirements of the [Large Combustion Plant Directive 2001/80/EC](#) starting from January 1, 2018. The Decision of the Ministerial Council from October 2013 allowed Contracting Parties to limit emissions on an annual basis by applying the National Emission Reduction Plan (NERP). The NERP was adopted in 2017 and covers all [eight large combustion plants](#) (over 50 MW). However, during each year since the beginning of the implementation of the NERP,

Capacity of the plant:	700 MW (3 blocks x 233 MW)
Year of construction / commissioning:	1982–1988.
Type of fuel:	lignite
Source of fuel:	open-cast mines of Suvodol and Brod-Gneotino coal mines
Source of water:	river Crna
Reduction of SO_x:	NO, planning and preparation of documentation in progress
Wastewater treatment plant:	NO, planning and preparation of documentation in progress



Comparison of sulphur dioxide emissions from large power plants in North Macedonia, which are covered by the National Emission Reduction Plan (NERP) and the maximum annual emissions prescribed by NERP

Amounts of sulphur dioxide (SO₂) t/year

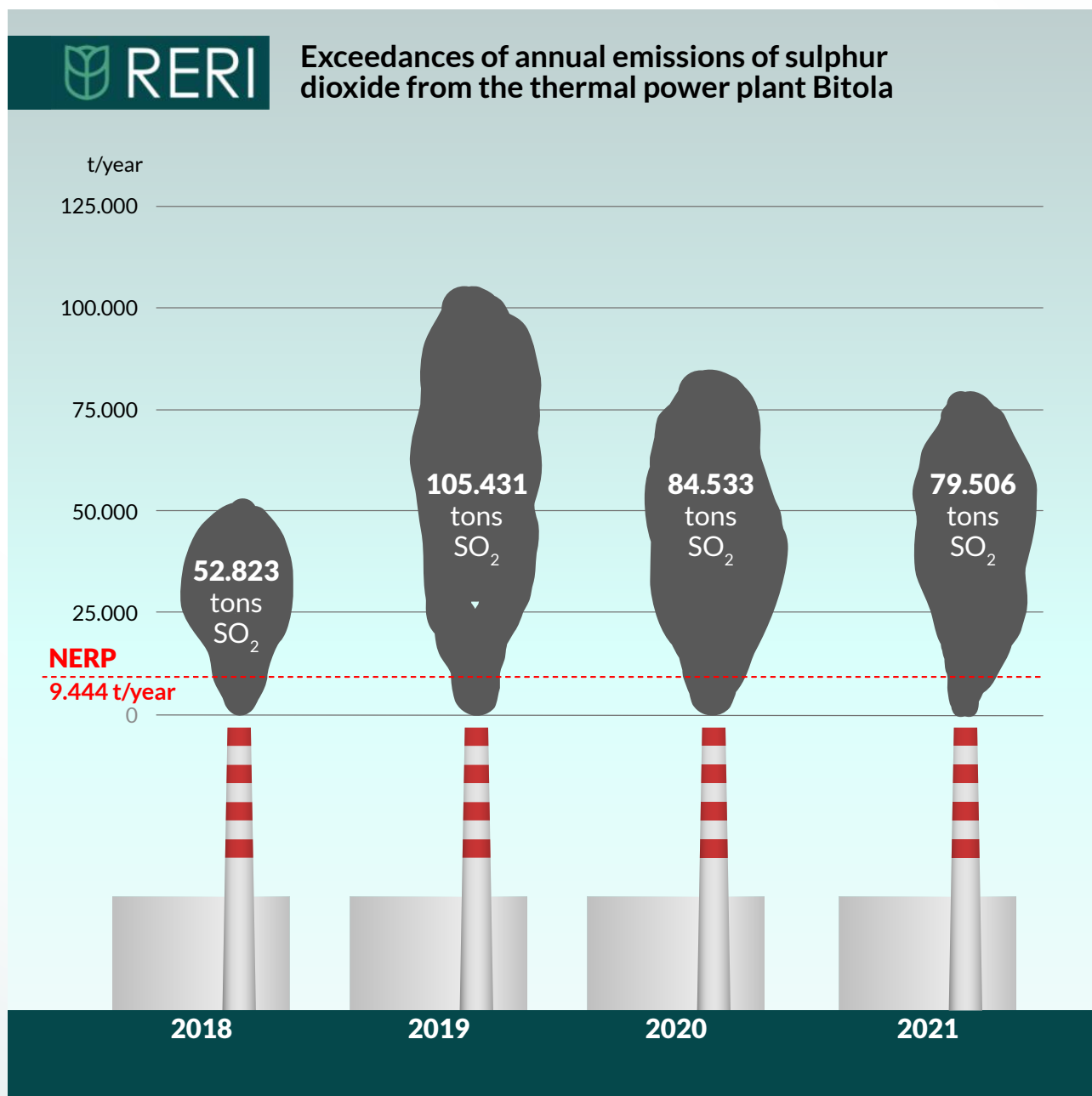


the plants covered by the plan have repeatedly exceeded the allowed values for sulphur dioxide, emitting [more than five times the national limit](#) only during 2021, which is why the Secretariat of the Energy Community [initiated a procedure against North Macedonia](#) in March 2021.

The largest emitter of sulphur dioxide in North Macedonia is Thermal Power Plant (TPP) “Bitola”, whose emissions account for an average of [97% of total emissions](#). The Thermal Power Plant “Bitola” is also the

largest TPP in the country, where about [70% of total electricity](#) is produced.

In 2012, the Electric Power Company of Macedonia [prepared a feasibility study](#), opting for wet desulphurisation technology at the TPP “Bitola”. However, due to, as stated, high investment costs and the emergence of new technologies for desulphurisation, it was decided to postpone the investment. In 2016, the Electric Power Company of Macedonia developed a new feasibility study, which determined that the wet technology is the



most favourable option, and that capital [costs will amount to 122 million EUR](#), while annual operating costs will amount to over [13 million EUR](#). The plan was to [install the technology for reducing the amount of suspended particles in the first phase of the project, and the desulphurisation plant later](#).

Although there is no official confirmation to date, in December 2022 it was announced that TPP “Bitola” finally [obtained an integrated permit](#) for the prevention and control of environmental pollution, which establishes a time frame for the realisation of this project, as indicated by [the document](#) published on the website of the Ministry of Environmental Protection and Spatial Planning. However, the attached permit does not contain either a permit number or a signature, so it cannot be claimed with certainty that it was officially issued. According to the latest [draft of the integrated permit](#), as well as the [document published](#) after the public hearing, the plant should be constructed by the end of 2026. A separate problem is the fact that the TPP “Bitola” does not have a plant for the wastewater treatment, which is necessary for the commissioning of the desulphurisation plant. The draft of the integrated permit foresees that the wastewater treatment plant [will be put into operation in 2024](#). The disposal of large amounts of gypsum, which will be produced during the desulphurisation process, is planned [at the existing landfills](#).

Solving the problem or postponing the solution

North Macedonia adopted the National Energy and Climate Plan (NECP) [in June 2022](#). The aforementioned plan envisages the closure of TPPs in North Macedonia by 2027, which was also confirmed by the [Nationally Determined](#)

[Contribution](#), which the state submitted in accordance with the obligations deriving from the Paris Agreement, but also by the [Energy Development Strategy for the period from 2020 to 2040](#), making North Macedonia [the first country in the Western Balkans](#) to set a coal phaseout date before 2030. Although all previous documents foresee the shutdown of TPP “Bitola” by the end of 2027, announcements of [the opening of new mines](#), as well as insufficiently precise plans for its decommissioning, indicate that the cessation of production from this TPP could still be expected [in the following period](#).

Compliance of North Macedonia with the NERP limits and reduction of sulphur dioxide emissions is not possible without the construction of a desulphurisation plant. On the other hand, starting from January 1, 2028, the TPP “Bitola”, has the obligation to comply with the strict requirements regarding emissions and the application of the best available techniques prescribed by the [Industrial Emissions Directive](#), which is also not possible without additional investments in facilities for reduction of pollutant emissions. However, neither the NECP nor the Energy Development Strategy, in the scenario in which 2027 is stated as the year of closure of this TPP, foresees investments in pollution reduction technologies. The above unequivocally indicates that the operation of this TPP contrary to internationally accepted obligations will continue until 2027, and maybe even later.

Author: RERI

„UGLJEVIK 1” THERMAL POWER PLANT

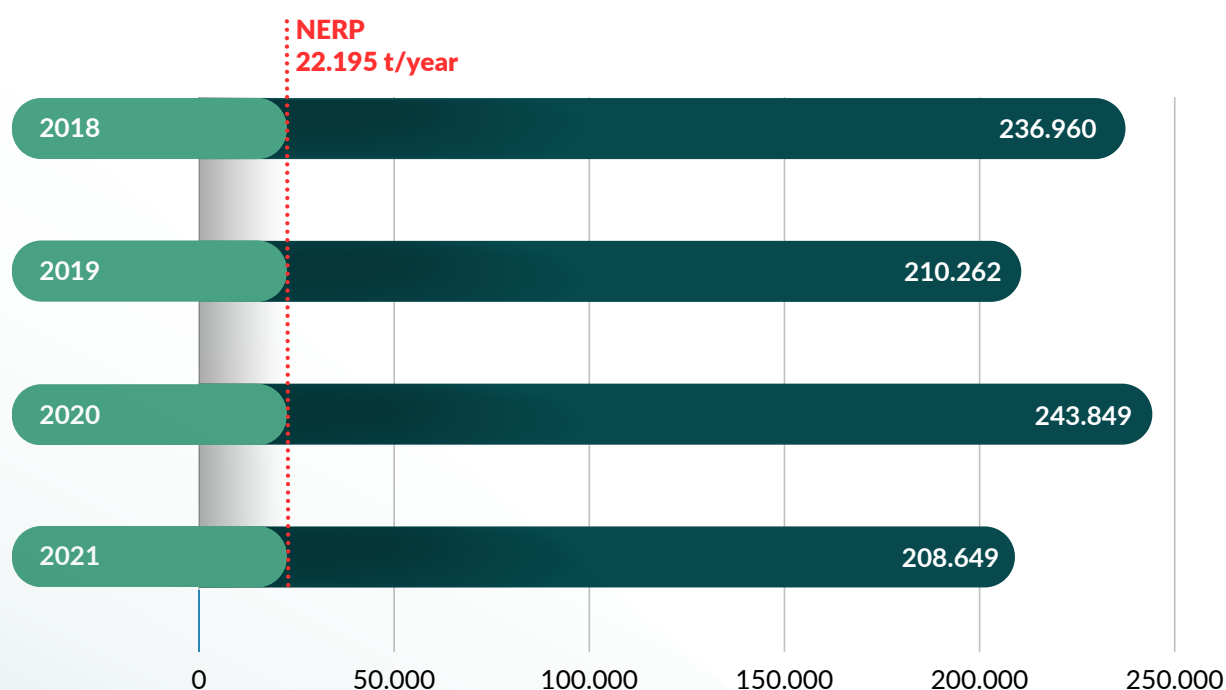
The [Energy Community Treaty](#) provides for the obligation of Bosnia and Herzegovina (BiH), as its signatory, to apply the [Large Combustion Plant Directive 2001/80/EC](#) starting from January 1, 2018. The Decision of the Ministerial Council from October 2013 allowed Contracting Parties to limit emissions on an annual basis by applying the national emission reduction plan (NERP), instead of complying with the emission limit values prescribed in this Directive. The [NERP](#) was adopted in December 2015 and includes 10 plants. However, during every year since

Capacity of the plant:	300 MW
Year of construction / commissioning:	1985
Type of fuel:	sub-bituminous coal
Source of fuel:	reservoir Bogutovo Selo
Source of water:	river Janja
Reduction of SO _x :	YES, flue gas desulphurisation plant
Wastewater treatment plant:	YES



Comparison of sulphur dioxide emissions from thermal power plants in Bosnia and Herzegovina, which are covered by the National Emission Reduction Plan (NERP) and the maximum annual emissions prescribed by NERP

Amounts of sulphur dioxide (SO₂) t/year

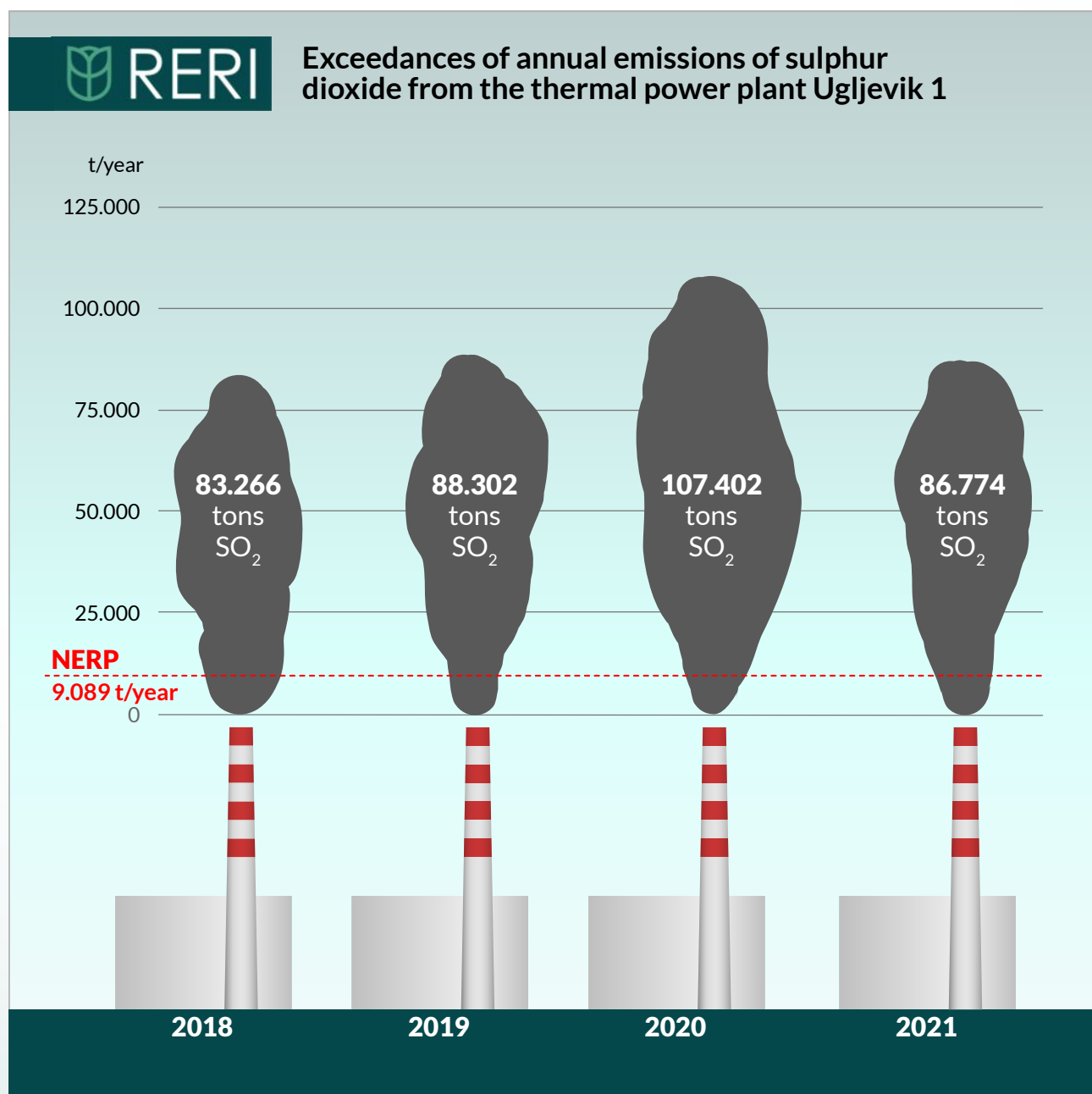


the beginning of its application, the thermal power plants (TPPs) included in NERP have repeatedly exceeded the allowed values for sulphur dioxide emissions. Thus, during each year of NERP application, TPP “Ugljevik 1” emitted [nine times more](#) sulphur dioxide than it is allowed. This is why the Secretariat of the Energy Community [initiated a procedure against Bosnia and Herzegovina](#) in early 2021.

The largest emissions of sulphur dioxide come from TPP “Ugljevik 1” (on average about 91,000 tons per year), and the NERP foresees the construction of a desulphurisation plant with the

aim of reducing these emissions. TPP “Ugljevik 1” emitted [the most sulphur dioxide in the region](#) in 2019, emitting [more sulphur dioxide than all power plants in Germany](#). Therefore, it is clear that alignment with the NERP is not possible without a significant reduction of sulphur dioxide emissions from the TPP “Ugljevik 1”. On the other hand, despite the fact that the desulphurisation plant at the TPP “Ugljevik 1” was built and [put into trial operation in 2020](#), it has not yet contributed to the reduction of sulphur dioxide emissions.

The project for the construction of a flue gas desulphurization plant within the Mine and



TPP “Ugljevik”, which is managed by the Electric Power Company of the Republic of Srpska, represents [the largest project](#) aimed at reducing emissions from TPPs and is the first of its kind in Bosnia and Herzegovina.

The implementation of the project worth 85 million EUR began in 2009 as part of the bilateral cooperation between Bosnia and Herzegovina and Japan (JICA and Mitsubishi Hitachi Power Systems), and [the start of works on the construction of the system was officially marked](#) in May 2017. The plant [started its trial operation at the beginning of 2020](#), and the results showed that sulphur dioxide emissions from the TPP [were reduced more than 100 times](#) and brought down to 150 kg. The first environmental permit for the desulphurisation plant was [issued in 2016](#), and in 2021 the competent ministry issued a [renewed environmental permit](#) valid until February 2026. [The operational permit](#) for the desulphurisation plant was issued in November 2021.

(Non)operation of the plant and projection of results

During the capital overhaul in 2017, new electrostatic precipitators were installed, as one of the prerequisites for the construction and smooth functioning of the desulphurisation plant. Three years later, it turned out that the electrostatic precipitators were not adequate, which [led to an accident and](#)

[shutdown of the desulphurisation system at the beginning of 2020](#).

After the reconstruction, the trial operation continued and the results showed that the average concentration of sulphur dioxide after passing through the desulphurisation plant [was 125,74 mg/Nm³](#), which [met the prescribed criteria](#). As the average input concentration of sulphur dioxide was [14074 mg/Nm³](#), it could be concluded that the efficiency in reducing emissions was 99.1%.

[In November 2021](#), during the first inspection regarding the fulfilment of the requirements of the environmental permit, the republic inspector stated that at the time of the inspection the desulphurisation system was not in operation due to the lack of limestone, due to overhaul and suspension of the impeller of the booster fan, as well as the fact that it did not have an operational permit. Until the moment of inspection, the desulphurisation plant worked for a total of 15 days, and the presented measurements of daily emissions showed a significantly lower concentration of pollutants during the period of operation compared to the values measured when the desulphurisation plant was not in operation.

Given the fact that the TPP “Ugljevik 1” was operating following minimum technology requirements in January and February 2022, the desulphurisation plant was operating

Desulphurization plant (recorded*)	2021 (15 days)	2022 (8 days)
SO ₂ (mg/Nm ³)	150	192
Possible reduction (SO ₂)	156.366 t	156.366 t
Achieved reduction (SO ₂)	6480 t (4,14 %)	3456 t (2,21 %)

Table: The ratio between the operation of possible/achieved benefits of the desulphurization system in Ugljevik TPP during ideal operation

for a total of 8 days in February 2022 until the second inspection, when the average concentration of sulphur dioxide was 192 mg/m³, which fully meets the requirements prescribed by the NERP.

[Inspection from March 2022](#) determined that the desulphurisation plant is fully functional and ready for operation, and that the quantities of limestone are sufficient for continuous one-month operation.

It has been confirmed that, if it is in full capacity, the desulphurisation plant is capable of significantly reducing the negative impact of the operation of the TPP on the environment. During the operation of the plant, sulphur dioxide emissions are completely minimized. However, the variability in the operation process of the entire plant, which primarily relates to the quality of coal and the amount of absorbent, as well as aging, make the system very susceptible to fluctuations and potential damage in operation. Also, to ensure smooth operation of the desulphurisation plant, it is necessary to provide a large amount of [electricity \(7000 kW\)](#),

[limestone \(54 t/h\) and water \(210 t/h\)](#). In addition, large amounts of waste gypsum are produced, which need to be adequately disposed of – it is estimated that the operation of this plant will produce [at least 300,000 t of gypsum](#) during the year 2023.

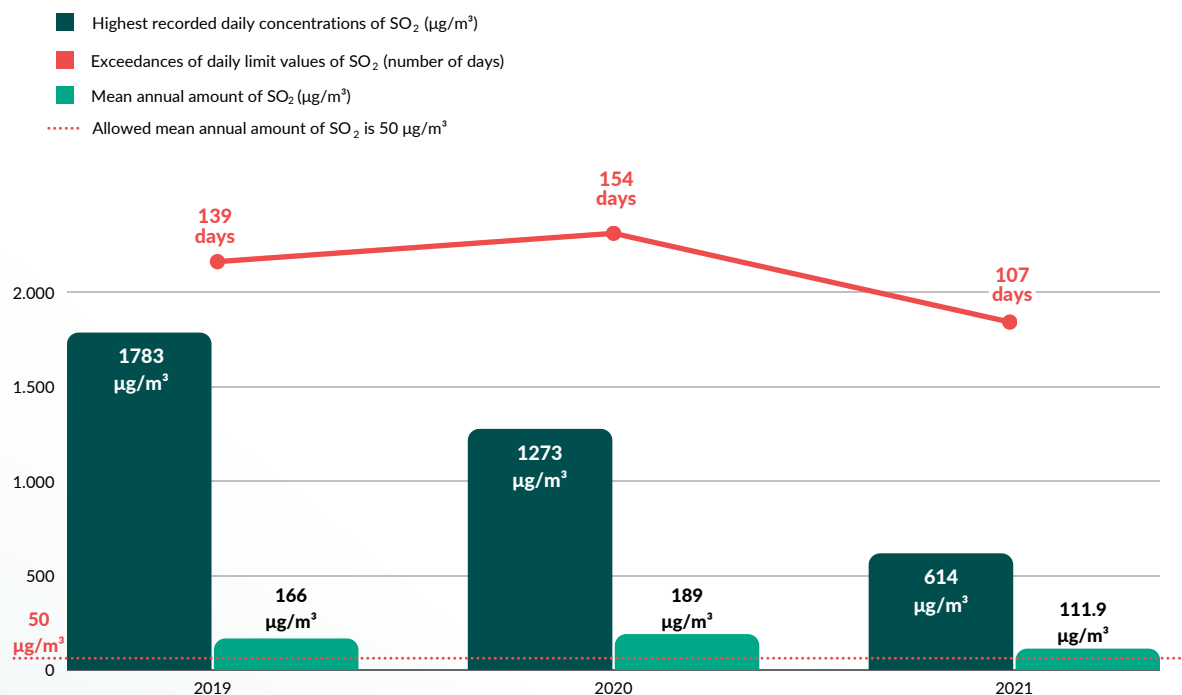
On the one hand, due to the increased consumption of electricity, with estimates that the costs of maintaining the system on an annual basis exceed [15 million KM \(7,7 million EUR\)](#), and on the other hand, due to the increasingly poor quality of coal in the existing coal mine, Mine and TPP “Ugljevik” reduced production by 10%, and demanded an increase in the price of produced electricity. With the approved new price, this company [generates revenues of 141.8 million KM \(72.5 million EUR\)](#), which is about 17 million KM (8.7 million EUR) more than in the previous period – but to the detriment of consumers, since the new price is compensated by increasing the electricity bill.

Author: Redžib Skomorac, LL. B, legal adviser, [Center for Environment \(BiH\)](#)

COPPER SMELTER IN BOR

The citizens of Bor have had problems with air pollution for many years, and the high concentrations of sulphur dioxide caused by the operation of the smelter within the factory complex of the company [Serbia Zijin Copper](#) often exhibit multiple exceedances of concentrations dangerous to human health. Thus, during the year 2021 alone, [the limit values of sulphur dioxide emissions dangerous to human health were exceeded seven times](#) at the measuring stations in Bor, and in the month of May, concentrations of up to 1320 $\mu\text{g}/\text{m}^3$ were recorded. The Environmental

Capacity of the plant:	200.000 t/year
Year of construction / commissioning:	2015, capacity increase in 2023
Raw material:	copper concentrate
Source of the raw material:	mines in Bor, Majdanpek and import
Source of water:	Bor Lake
Reduction of SO_x:	YES, flue gas desulphurisation plant
Wastewater treatment plant:	only a plant for chemical neutralization of wastewater



Comparative presentation of sulphur dioxide concentrations in the period from 2019 to 2021 in Bor according to data from the report of the Environmental Protection Agency and the annual reports on ambient air quality testing in Bor

Protection Agency classified the air quality in Bor as the [third air quality category](#) (excessively polluted air).

Due to air pollution, the Basic Public Prosecutor's Office in Bor [filed charges against the company](#) and the responsible person in April 2022, which initiated criminal proceedings for environmental pollution.

The company Zijin Bor Copper, as a rule, constructs facilities without construction permits and approvals for the construction of mining facilities, as well as environmental impact assessment (EIA) approval. The construction works on increasing the capacity of the copper smelter in Bor, a part of which is the project for the construction of a flue gas desulphurisation plant, are no exception. The fact that the desulphurisation plant was built and put into operation without the necessary permits and approval did not prevent the [Minister of Environmental Protection from visiting the production complex in September 2021 and praising the functionality and illegal operation of this plant](#). A year after the ceremonial visit of the competent minister, the Commercial Court in Zaječar convicted and [symbolically sanctioned Zijin Bor Copper](#) because it started the construction and expansion of the copper smelter in Bor without approval of the EIA study. The company and its representatives fully admitted the commission of the act before the court. The procedure based on the criminal complaint of RERI due to the illegal construction of this facility is ongoing.

Within the [copper smelter in Bor](#), technological gases from flash furnaces and converters are processed in a sulphuric acid plant, while fugitive gases (emissions that are not

released into the air, soil and water through organized and controlled discharges) are treated in a desulphurisation plant. In order for the smelting process to take place successfully in the raw material (copper concentrate), there must be at least 33% of sulphur. Sulphur burns with the addition of technical oxygen and residual fuel oil, and waste gases containing sulphur dioxide, dust and carbon oxides are produced as a product. Works are underway, with the aim [to increase the capacity of the smelter for the production of 200,000 tons of copper cathode instead of the current 40,000 tons](#).

The expected degree of desulphurisation in this plant is 93%. It is estimated that the amount of fugitive gases in the new smelter will be 639,061 m³/h. It is planned that these gases, after dedusting, will be transported to the desulphurisation plant, where the sulphur dioxide would be neutralized with limestone, and then released through a newly built 90 m high chimney in the amount of 59,588 t/year.

(Un)known waste generated by plant operation

Three types of waste are expected to be generated during operation of the desulphurisation plant: gypsum, sludge and As-sludge (sludge containing high concentrations of arsenic).

It is planned that the sludge resulting from the neutralisation of sulphur dioxide will be taken to the wastewater treatment system, while the rest of the sulphur dioxide would be emitted into the atmosphere. The wastewater produced by desulphurisation must then be treated in a wastewater treatment plant. However, Zijin Bor Copper artificially separated the projects using the [salami slicing](#) method (dividing a single

project into several separate units, thereby avoiding the EIA of the project as a whole), and failed to address the procedure of wastewater treatment in the EIA study, as well as safe disposal of sludge and solid waste resulting from wastewater treatment.

Namely, wastewater treatment produces a large amount of sludge (5,940 t/year) and As-sludge (33,429 t/year), as well as gypsum (78,210 t/year). As smelter waste gas, in addition to sulphur dioxide, contains mercury, arsenic, cadmium, nickel, etc., gypsum and sludge can also contain large amounts of these heavy metals. Therefore, the way in which sludge and solid waste, wastewater and gypsum generated in the desulphurisation process will be safely managed (how they will be disposed of, stored, preserved) is a key element of the project in question.

However, although it was necessary to determine in the EIA study whether the sludge and gypsum produced in the desulphurisation process are hazardous or non-hazardous waste, the aforementioned analysis was completely omitted, thus potentially the most significant environmental impacts were not examined. Consequently, since without

categorizing the mentioned waste it is not possible to determine the way in which that waste will be treated, the adequate measures for its treatment are not prescribed, which also stands as one of the mandatory elements of the EIA study.

Regardless of the aforementioned illegalities in the process of building the plant, as well as the fact that the company obtained certain construction permits for the construction of the smelter only at the beginning of 2023, the ceremonial opening of the reconstructed smelter was [attended by the new Minister of Mining and Energy](#). Thereby the state once again encouraged the company to continue with systematic violations of the law, instead of demanding the highest business standards and compliance with regulations in the field of environmental protection. Once again, a strategic partnership with a foreign company was placed above the interests of the citizens of Serbia.

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DESULPHURISATION IN THE WESTERN BALKANS

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