

## JSC ESM'S HANDLING OF THE ENERGY CRISIS 2021/2022 AND 2022/2023

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### Abstract

JSC ESM as a serious, socially responsible company and the largest state-owned electricity production capacity, has the most important role and obligation to supply households and small consumers with electricity. This obligation derives from the Energy Law of 2018, according to which the largest producer of electricity in the country is obliged to offer for sale to the universal supplier electricity of at least 80% of the total annual needs of the supplier in 2019 and reducing it from year to year, up to 30% in 2025.

Hence, the issue that has been developed is very interesting and useful due to the fact that it will give us a clear picture of the operation and production of energy capacities within JSC ESM, the production price, the import of electricity, the price and the funds spent, in times of an energy crisis, which also led to a price crisis.

In that context, the analysis in this paper is mainly focused and aims to address the way in which JSC ESM dealt with the energy crisis and also the price crisis, as well as the measures it took to mitigate their effects.

All this will be useful and of great importance, and will serve as a predetermination as well as a good lesson on how to behave and take action in such or similar energy situations.

*Keywords:* producer of electricity, universal supplier, energy capacities, energy crisis, price crisis.

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### 1. Introduction

Starting from the second half of 2021 and continuing through to 2023, the energy crisis took on significant proportions, affecting both the production and consumption of electricity in Europe, as well as in the Republic of North Macedonia. The impact of the pandemic on the global economy, combined with the enormous increase in the price of natural gas at the global level, caused electricity prices to rise considerably during the energy crisis.

Thus, this period of the energy crisis also led to a price crisis. This situation completely changed the normal operating rules of the electricity market and the energy economy in general.

As a result, the electricity sector experienced serious disruptions in terms of rising prices and evident insecurity in the supply of electricity sources.

In light of this, JSC ESM, as the responsible and obligated company for supplying electricity to households and small consumers, undertook a series of measures and activities to increase electricity production and ensure uninterrupted electricity supply. Beyond this obligation, the company also took on the responsibility of supplying electricity to institutions and various companies. This difficult and undesirable situation was successfully managed by JSC ESM through selfless work, great effort, and dedication from the company's management and all its employees. In line with this, the management also took over the administration of other domestic electricity-producing companies, all in order to increase production and enhance the security of regular and uninterrupted supply for all consumers.

In this context, the paper is composed of two parts. In the first part, the operation of the company is described through economic parameters during the energy crisis, focusing on the company's electricity production in particular, and domestic production in general. The analysis then

continues with other parameters such as electricity imports, prices, and expenditures at the national level, the cost and selling price of electricity by JSC ESM, as well as human resource management within the company. In the second part, we proceed with the description of the measures and activities undertaken by the company, as well as the implementation of Decrees and Decisions approved by the Government and Parliament of the Republic of North Macedonia, aimed at overcoming and mitigating the effects of the energy and price crises. Subsequently, the paper will examine the Challenges and Recommendations, and finally, it concludes with a summary.

## **2. Operation of JSC ESM during the energy crisis**

The total installed capacity of JSC "ESM"-Skopje, as the largest electricity generation company in the Republic of North Macedonia and state-owned, amounts to 1,697.6 MW. This total installed capacity consists of the following (JSC ESM, 2020–2023):

The total installed capacity of thermal power plants is 1,034 MW, which makes up 60.91% of ESM's total installed capacity. This includes the Bitola Thermal Power Plants (Bitola 1, Bitola 2, and Bitola 3) with a combined capacity of 699 MW, the Oslomej TPP with 125 MW, and the Negotino TPP with 210 MW.

The total installed capacity of hydropower plants is 556.8 MW, or 32.80% of ESM's total installed capacity. This includes the hydropower plants of HPP System Mavrovo: Vrutok HPP – 165.6 MW, Raven HPP – 21 MW, and Vrben HPP – 12.8 MW; HPP System Crn Drim: Spilje HPP – 84 MW, and Globocica HPP – 42 MW; Tikvesh HPP – 113 MW; and HPP System Treska: Kozjak HPP – 82 MW, and Sveta Petka HPP – 36.4 MW.

The total installed capacity of combined heat and power plants is 60 MW, or 3.53% of the total installed capacity of ESM. This includes the Energetika and KOGEL thermal power plants, each with a capacity of 30 MW.

The total installed capacity of power plants using renewable energy sources (wind and photovoltaic) is 46.8 MW, or 2.76% of ESM's total installed capacity. This includes the Bogdanci Wind Park with 36.8 MW, and Oslomej 1 Solar Power Plant with 10 MW.

The actual electricity production of JSC "ELEM" during the period 2020–2023 did not meet planned production targets, ranging from 80.3% in 2020 to 95.8% in 2022. The unfulfilled planned production in 2021, 2022, and 2023 is mainly due to underperformance of the thermal power plants, even though the hydropower plants exceeded their production plans. In 2020, however, neither thermal nor hydropower plants achieved the planned production (JSC ESM, 2020–2023).

The achieved production accounted for a minimum of 40.42% of gross electricity demand in 2021, which totaled 7,984 GWh, and a maximum of 56.34% in 2023, with gross demand of 7,028 GWh. Production by other producers contributed a minimum of 22.88% in 2020 (with gross electricity demand of 7,673 GWh) and a maximum of 41.49% in 2023 (gross demand: 7,028 GWh). Domestic production accounted for a minimum of 68.96% in 2021 (gross demand: 7,984 GWh) and a maximum of 97.83% in 2023 (gross demand: 7,025 GWh). This domestic production represents the combined output of ESM and other domestic producers.

The electricity sector of the Republic of North Macedonia, in addition to facing numerous and diverse economic issues, is also dealing with a continually increasing electricity consumption compared to production. In this context, the remaining portion of electricity demand is covered by imports, which raises concern due to the country's import dependency. This dependency reached a low of 2.16% for the first time in 2023, based on a gross electricity demand of 7,025 GWh, while the highest value was 31.04% in 2021, with gross demand of 7,984 GWh. The decrease in electricity imports since 2021 is the result of increased domestic production and decreased gross electricity demand. Gross electricity demand is calculated as the sum of

domestic production and electricity imports (Table 1) (Government of the RNM, 2022-2023; RNM, 2025).

From Table 1, we can calculate that the funds spent on energy imports, specifically electricity imports, in the Republic of North Macedonia during the period 2020–2023 amount to 5,218.5 million euros, and specifically 1,228.0 million euros for electricity alone. The average value of funds spent during the research period for energy imports, specifically electricity, is 1,304.6 million euros, or 307.0 million euros for electricity. The total funds spent on electricity imports account for 23.53% of the overall energy import expenditures. The lowest amount of funds spent on electricity imports was 154.1 million euros in 2020, while the highest amount, 579.0 million euros, was recorded in 2022 (Table 1) (NBRM, 2020-2023).

**Table 1.** Operation data of JSC ESM in the period 2020-2023

	2020	2021	2022	2023
<b>JSC ESM</b>				
1. Planned production of JSC ESM [GWh]	4472	3908	3876	4171
2. Realized production of JSC ESM [GWh]	3590	3227	3712	3958
3. Realized /Planned [%]	80.3	82.6	95.8	94.9
4. Total realized expenses of JSC ESM [million €]	212.17	287.57	513.48	495.16
5. Production price of JSC ESM [€/MWh]	59.1	89.1	138.3	125.1
6. Selling price of electricity produced by JSC ESM, according to the Universal Supplier [€/MWh]	34.50	37.50	44.30	54.47
7. Number of employees in JSC ESM	4699	4471	4061	4475
8. Number of employees in JSC ESM/GWh	1.31	1.38	1.09	1.13
9. Production from other producers [GWh]	1756	2279	2039	2915
10. Domestic production [GWh]	5346	5506	5751	6873
11. Import of electricity [GWh]	2327	2478	1325	152
12. Gross demand for electricity [GWh]	7673	7984	7076	7025
13. Realized production of JSC ESM/Gross demand for electricity [%]	46.77	40.42	52.46	56.34
14. Production from other producers/Gross demand for electricity [%]	22.88	28.54	28.81	41.49
15. Domestic production/Gross demand for electricity [%]	69.67	68.96	81.27	97.84
16. Import of electricity/Gross demand for electricity [%]	30.33	31.04	18.73	2.16
17. Energy [million €/year]	601.0	1026.9	2141.0	1449.6
18. Electricity [million €/year]	154.1	280.7	579.0	214.2
19. Electricity/Energy [%]	25.64	27.33	27.04	14.78
20. Price of imported electricity [€/MWh]	66.2	113.3	437.0	1409.2

**Source:** (JSC ESM, 2020-2023); (NBRM, 2020-2023); (Government of the RNM, 2022-2023) and (RNM, 2024) as well as from own calculations based on data obtained from them. In JSC ESM, the largest electricity production company in North Macedonia and a 100% state-owned joint-stock company, the number of employees has fluctuated over the years. During the period 2020–2022, the number of employees decreased, reaching 4,061 in 2022, which is a reduction of 638 employees, or 13.58% compared to 2020. This decline in 2021 and 2022 was primarily due to the energy crisis. However, in 2023, the number of employees increased to 4,475, which is an increase of 414 employees, or 10.19% compared to 2022. In relation to electricity production, the employee-to-GWh ratio was highest in 2021, reaching 1.38 employees per GWh, due to the lowest realized production in that year (Table 1). This indicates that when production decreases and employment increases, the employee-to-GWh ratio also rises. A reduction in production contributes to higher costs and, consequently, to a higher production price of electricity. This is evident from the table, where in 2022, the highest costs were recorded at €513.48 million, coinciding with the highest production price of electricity at €138.3/MWh.

The selling price of electricity produced by JSC ESM, supplied to the Universal Supplier, has increased year by year, ranging from €34.50/MWh in 2020 to €54.47/MWh in 2023. This electricity price, however, remains significantly lower than the production cost of JSC ESM in the corresponding years. The price difference for JSC ESM is compensated by the Government of the Republic of North Macedonia (JSC ESM, 2020-2023).

### **3. Measures and activities of the JSC ESM to deal with the energy crisis**

Since 2019, JSC ESM began implementing projects related to the energy transition, i.e., energy transformation. All of the company's activities were aligned with the adopted Energy Development Strategy of the Republic of North Macedonia until 2040 (Government of the RNM, 2019), and with the movement toward the green scenario. However, while ESM was planning and implementing these projects and successfully completing some of them the energy crisis occurred. First came the COVID-19 pandemic, which brought economic consequences and challenges, followed by the actual energy crisis.

This crisis hit JSC ESM directly. Both the electricity crisis and the heat energy crisis, in coordination with the government, were managed through JSC ESM.

The government, in response to both energy crises of 2021/2022 and 2022/2023, adopted decisions where the sole measure arising from these decisions was the injection of financial resources into energy companies in order to stabilize the electricity market.

For the 2021/2022 energy crisis, the Government adopted the following decisions and decrees:

1. Decision No. 40-11328/1 dated November 9, 2021, declaring a state of crisis in the supply of electricity across the entire territory of the Republic of North Macedonia, to last for 30 days starting from November 9, 2021 (Government of the RNM, 2021).
2. Decree No. 40-10977/1 dated October 30, 2021, declaring a state of crisis in the electricity supply, effective from November 3, 2021 (Government of the RNM, 2021a).
3. Amendments to a Decree No. 40-13575/1 dated December 28, 2021, declaring a state of crisis in the electricity supply, effective from January 1, 2022 (Government of the RNM, 2021b).

The Assembly also adopted Decision No. 08-5211/1 dated December 9, 2021, declaring a state of crisis in the electricity supply across the entire territory of the Republic of North Macedonia, which will last for 6 months, from December 9, 2021, to June 9, 2022 (Assembly of the RNM, 2021).

Regarding the energy crisis of 2022/2023, the Government adopted the following decisions and decrees:

1. Decision No. 41-7438/1 dated August 25, 2022, declaring a state of crisis in the electricity supply across the entire territory of the Republic of North Macedonia, lasting 30 days starting from September 1, 2022 (Government of the RNM, 2022).
2. Amendment to a Decree No. 41-2652/1 dated March 22, 2022, declaring a state of crisis in the electricity supply, starting March 24, 2022 (Government of the RNM, 2022b).
3. Decision No. 41-9773/3 and Decision No. 41-9775/3 dated October 30, 2022, declaring a state of crisis in the electricity supply, starting November 2, 2022 (Government of the RNM, 2022a).
4. Amendment to a Decision No. 41-9766/7 dated November 15, 2022, declaring a state of crisis in the electricity supply, starting November 17, 2022 (Government of the RNM, 2022c).

The Assembly also adopted Decision No. 08-4043/1 dated September 30, 2022, declaring a state of crisis in the electricity supply across the entire territory of the Republic of North

Macedonia, lasting 7 months, from October 1, 2022, to April 30, 2023 (Assembly of the RNM, 2022).

The logical question arises: Why did this crisis occur?

It should be understood that the crisis did not originate from us or local factors. The shortage of electricity and energy sources and the price increases are the result of a combination of events as military actions, reduction in gas supplies from Russia and war-affected regions, previous electricity price increases caused by the rise in carbon credit prices (i.e., the increased cost of electricity produced from coal and other fossil fuels), and reduced production from wind farms and other renewable sources in Europe last year, among others. Regarding the situation in our country surely, we would have handled the crisis more easily if we had more capacity or more power plants. Unfortunately, over the past 30 years, serious investments in new power plants have not been made, with only one or two examples of small constructions. However, in recent years, AD ESM has started a large investment cycle primarily in renewable energy power plants, and certainly, we are working on maintaining and revitalizing existing power plants.

Using funds specifically allocated from the budget for the energy crisis, AD ESM provided cheaper electricity both for the regulated market and part of the free market, and fully took over the obligation to supply the city of Skopje with heating energy, instead of the company BEG (Balkan Energy Group).

Therefore, budget support was provided, which was actually intended for the citizens and was channeled through JSC ESM. For 2021 and 2022, this amounted to about 232 million euros for the electricity crisis (JSC ESM, 2020-2023) and about 36 million euros for the heating energy crisis.

Below are more specific steps taken by JSC ESM in managing the energy crisis.

The first step in managing the energy crisis when it appeared was that ESM maximally engaged its own capacities. It increased coal extraction and also procured coal from domestic mines and from abroad. Regarding hydroelectric plants, unfortunately the hydrological conditions were not favorable, so it could not rely much on the reservoirs. Part of the production also came from the wind park, and the first quantities of electricity were obtained from the photovoltaic power plant (PVPP) Oslomej 1, which was launched in trial production.

The second step was that after 12 years, ESM was forced to activate the standby oil-fired thermal power plant Negotino. This is a state-owned power plant with “cold reserve” status, designed exactly for such situations. It faced significant difficulties, such as outdated equipment, a long period of inactivity (although maintained), staff gradually retiring which reduced operational experience in the team, etc. Nevertheless, Negotino started operating.

The third step, the company signed a contract to purchase electricity from a private gas power plant, TE-TO in Skopje. Then, it took over district heating in Skopje and ensured that there would be no interruptions in heat supply.

With maximum efforts, ESM managed to get through the 2021/22 crisis without a single day of electricity or heating restrictions.

It should be noted that in 2022 ESM sold electricity to EVN Home at an affordable price set by the government, supplying EVN Home with 100% of its electricity needs (instead of 60% as allowed by law, and this possibility in 2023 is 50%) (Assembly of the RM, 2018), as well as fully covering technical losses in the EVN Electricity Distribution system and fully covering technical losses in the MEPSO system (JSC ESM, 2020-2023). All this was done to keep the price for end consumers as low as possible.

In public discourse, the readiness of state-owned power plants and their capacity to produce electricity is often commented on and analyzed.

However, these power plants are 40, 50, and 60 years old, heavily depreciated, and electricity production is maintained through continuous repairs and maintenance. When we say continuous, we literally mean every day.

Company management in recent years has performed capital repairs in the REK Bitola thermal power plant that had not been done for a long time, investing funds, time, and work to strengthen them and make them more durable and reliable in the production process. Hydroelectric plants were also rehabilitated. However, their age as facilities built long ago cannot be changed. The lack of investment in new power plants over the past 30 years cannot be undone, but accelerated pace and large steps can compensate for some of the losses from the past.

JSC ESM has aggressively entered an investment plan to build power plants from renewable sources — wind, solar, and hydro (JSC ESM, 2022).

Currently, 12 projects are being implemented by JSC ESM, which will bring an installed capacity of 1760 MW, more than the existing installed capacity of ESM's current capacities, which is 1420 MW.

- In 2019, JSC ESM purchased and put into operation the 30 MW cogeneration gas power plant KOGEL, connected to the existing system of the subsidiary Energetika-Skopje.
- In April 2022, the 10 MW photovoltaic power plant Oslomej-1 was launched in test production, the first photovoltaic power plant in state ownership. ESM built it under extremely difficult conditions during the COVID crisis and energy crisis. This is the first photovoltaic power plant in Southeast Europe built on an old coal mine.
- The construction process is underway for another 10 MW photovoltaic power plant, Oslomej-2, fully owned by JSC ESM.
- The construction of two photovoltaic power plants of 50 MW each (total 100 MW) in Oslomej has been completed, as a public-private partnership with JSC ESM.
- Four photovoltaic power plants with a total capacity of 280 MW (20 + 60 + 100 + 100) will be built in REK Bitola, also on the site of old mines, and with this capacity will replace one block of REK Bitola.
- A cogeneration gas power plant of 250-400 MW will be built in REK Bitola to replace 2 blocks of the thermal power plant.
- Construction is underway on the heating pipeline from REK Bitola to Bitola, Novaci, and Mogila, which will provide district heating for institutions and residents in the three municipalities.
- JSC ESM leased 10% of the liquefied natural gas capacity at the gas terminal in Alexandroupoli, Greece, i.e., 550 million m<sup>3</sup> of LNG annually for a period of 15 years.
- The procedure that was near completion for selecting a company to build the Chebren hydroelectric power plant, as a public-private partnership with JSC ESM, was canceled.
- Activities are underway to complete the installed capacity of the Bogdanci wind park, second phase, by adding additional turbines with an installed capacity of 14 MW.
- The procedure for the third phase of revitalization of hydroelectric plants has been completed, with an investment value of 28 million euros.

All these projects will increase the amount of electricity produced from renewable sources and gas. Under these conditions, ESM will be able to reduce coal production and thereby reduce CO<sub>2</sub> emissions. However, it must be kept in mind that in the energy sector, results come after a longer period, and the effect of today's work in energy will be seen in 3 to 5 years. In any case, investments in renewable energy sources are the only true long-term solution to handle potential energy crises.

Additional obligations imposed on ESM by the government during the crisis as state anti-crisis measures should be mentioned. Besides ensuring stable prices for households and small consumers, ESM was obliged to provide cheaper electricity to schools, the food industry, water management, and other vital state entities (JSC ESM, 2020-2023). The goal was to ensure electricity supply to schools for uninterrupted teaching, prevent price increases of certain food products and even reduce them, maintain security and continuity in water supply, sewage, and water treatment, etc. With the outbreak of the energy crisis in Europe and the rise in electricity

prices on the exchanges, electricity traders in the country began terminating contracts with entities they were obligated to supply with electricity, and the burden of providing electricity shifted to JSC ESM. Given the prices of energy carriers and raw materials, it is known that ESM cannot cover all of this economically, so all crisis measures undertaken by ESM are supported by the budget, aimed at providing more affordable energy to citizens and society.

Working with budget funds, ESM as a company showed great responsibility and conscientiousness, and was the first in society to voluntarily introduce saving measures. All non-productive expenses were reduced; all purchases not necessary during 2022 were postponed to 2023, thus helping to relieve budget pressure on ESM during the most difficult crisis period. In April 2022, the public procurement plan, financial plan, and investment program for 2022 were revised.

In conclusion, it can be said that the experience ESM gained managing the energy crisis in the winter of 2021/2022 was used to prepare well for the 2022/23 energy crisis, which is now behind us, as a heating season with increased energy demands. Based on this experience, during the crisis, ESM managed to achieve a record daily production in the last decade. In February 2023, ESM produced 22,933 MWh of electricity in one day through its capacities, the highest daily production in the last 10 years and a new record for ESM in the last decade (JSC ESM, 2023), thanks to the maximum commitment and professional work of all employees in the company.

Today, the company BEG, transformed into three legal entities within JSC ESM, ESM Heat Production, ESM Heat Supply, and ESM Heat Distribution along with the Negotino TPP, are owned by and part of JSC ESM.

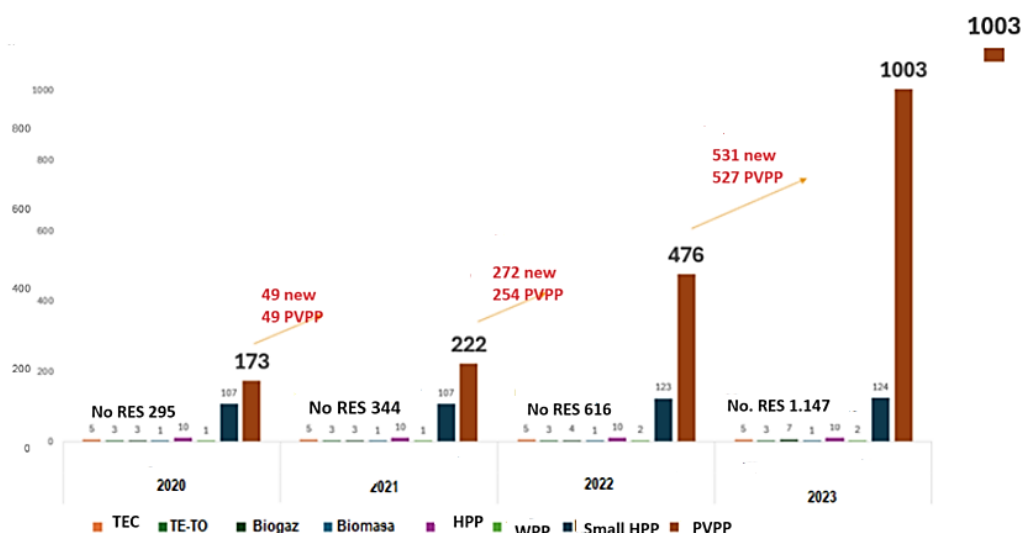
#### **4. Challenges and Recommendations**

The energy crisis, which started in the second half of 2021, on one hand meant a drastic increase in electricity prices and shortages, and on the other hand resulted in an increased number of investments in renewable energy sources.

The Republic of North Macedonia, following the path of energy transition outlined in the Energy Development Strategy of North Macedonia until 2040 (Government of the RNM, 2019), has made significant growth in recent years in investments for energy production from renewable sources, especially solar energy.

In 2023, North Macedonia built 531 new power plants with an installed capacity of 367 MW. Of these, 527 are newly built solar power plants with an installed capacity of 362 MW. The total number of power plants from renewable energy sources in 2023 is 1,147, with an installed capacity of 1,311 MW (Energy, Water Services and Waste Management Services Regulatory Commission of the Republic of North Macedonia, 2023).

The graph below shows the number of power plants from renewable energy sources from 2020 to 2023, from which we can clearly observe the rapid increase in the number of photovoltaic power plants during these years (Imer Zenku and others, 2024).



**Figure 1.** Number of power plants in the period from 2020 to 2023 (by technologies)

Source: (Energy, Water Services and Waste Management Services Regulatory Commission of the RNM, 2023, p.39)

On the other hand, North Macedonia's energy system is facing serious challenges due to the rapid increase in electricity production from photovoltaic power plants. As authorities revealed, during the Easter weekend (April 20, 2025), the situation was on the brink of collapse. The excess electricity had nowhere to be redirected, and the only way to avoid a failure was the immediate disconnection of part of the solar capacities from the system (tv21.tv, 2025).

This is an additional argument that alongside photovoltaic power plants, battery systems should also be built to enable the storage of electricity during the day when there is surplus, and its use during the night hours when it is needed.

Based on the energy transition, North Macedonia became a member of the PPCA Alliance during the London Climate Action Week (JSC ESM, 2021) and is the first country in the Western Balkans that, together with Spain, committed to phasing out coal-based electricity production by 2030 (META.MK, 2021).

Because of this, and to reduce the country's import dependency, new energy capacities need to be built, primarily from renewable energy sources, as well as gas thermal power plants to produce base-load energy. This construction particularly concerns JSC ESM, as the coal-fired thermal power plants it owns must be closed and replaced with energy facilities based on renewable energy sources.

## 5. Conclusion

Taking into account the energy transition scenarios adopted by the Strategy for Energy Development in North Macedonia until 2040, prepared by ASHAM-Skopje, North Macedonia, as a candidate country for EU membership, must close the existing coal-fired thermal power plants and replace them with energy facilities producing electricity from renewable energy sources (RES). This primarily concerns the largest state-owned energy company, JSC ESM, for electricity production, with the goal of fulfilling the legal obligation to supply households and small consumers with electricity.

To meet this challenge, JSC ESM must continue with:

1. Investments in green energy, which means constructing photovoltaic power plants, specifically:
  - In the area of the exhausted mine at the MPC Oslomej, the PVPP Oslomej 2 with an installed capacity of 10 MW, in addition to the already built PVPP Oslomej 1 with 10



MW, owned by JSC ESM, and two PVPP Oslomej 3 plants with a total installed capacity of 100 MW, built as public-private partnerships (PPP).

- In MPC Bitola's mine, the construction of four PVPPs with a total installed capacity of 280 MW, specifically (20+60+100+100) MW.
  - Floating photovoltaic power plants (FPVPP) in the reservoirs of JSC ESM's hydroelectric plants (Vrutok 76 MW, Kozjak 76 MW, Spile 96 MW, and Tikvesh 64 MW), totaling 312 MW.
2. Increasing the number of turbines at the Bogdanci Wind Park, with an installed capacity of 14 MW.
  3. To secure base-load energy, JSC ESM must prepare feasibility studies and construct cogeneration gas power plants at:
    - In MPC Bitola with a capacity of 250-400 MW, which will replace two units of the thermal power plant,
    - In MPC Oslomej and
    - In TPP Negotino and
  4. To ensure the same base-load energy, JSC ESM must repeat the canceled tender and realize the construction of the HP Čebren, owned by the company or in PPP.

All these measures serve a major and significant public interest, consisting of reducing local pollution, lowering greenhouse gas emissions, creating green jobs, increasing production from renewable energy sources, reducing electricity imports, lowering the production cost of electricity by JSC ESM, meeting targets for the share of renewable energy sources in the gross final energy consumption, strengthening the entire power system, etc.

Such investments by JSC ESM, mainly in green energy, play a crucial role in fulfilling obligations arising from the Energy Community Treaty, of which North Macedonia is a signatory (Assembly of the RNM, 2006).

In this context, it is imperative for JSC ESM as a state company to increase electricity production alongside the energy transition. This will ensure regular and unrestricted supply of electricity to its consumers and enhance security for easier and more successful management of any potential future energy or financial crisis.

## Nomenclature

BEG	Balkan Energy Group
FPVPP	Floating Photovoltaic Power Plant
GW	Giga Watt
GWh	Giga Watt Hour
HP	Hidro Plant
HPP	Hidro Power Plant
JSC ESM	Joint Stock Company Power Plants of North Macedonia
MPC	Mining Power Combine
MWh	Mega Watt hour
MW	Mega Watt
NBRM	National Bank of the Republic of Macedonia
PPCA	Powering Past Coal Alliance
PPP	Public-Private Partnerships
PVPP	Photovoltaic Power Plant
RES	Renewable Energy Sources
RNM	Republic of North Macedonia
TPP	Thermo Power Plant

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