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Economic Viability of Alternatives for Lignite-free Electricity Production in North Macedonia: The Case of TTP Oslomej

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Summary

The Republic of North Macedonia (RNM) is undergoing a complex process of integration into the European Union (EU) including the alignment of environmental protection policies, which is one of the most challenging and cumbersome sectors. After signing the relevant international agreements and increasing awareness about the damage that fuel (lignite, coal) causes to the environment and human life, this energy source's popularity began to decline significantly. Coal usage as an electricity input in North Macedonia is less and less attractive, particularly given the low quality and limited coal reserves, coupled with changes in the strengthened European environmental legislation and increasing competition from renewable energy sources (RES). The impact of these trends will be most acutely felt in the Southwest planning region of North Macedonia, where the Oslomej thermal power plant (TPP) (one of two in the country) is located. Although the plant's lifespan is almost over, it has a significant effect on the local economy, both directly and indirectly. The sector (mining and electricity production) employs a noteworthy number of people and contributes to the regional economic value added. The lack of a clear approach to manage the anticipated post-lignite effects of Oslomej's possible decommissioning in a timely and integrated manner is evident, as institutionally-coordinated initiatives to prepare for the transition are lacking (at least as far as the public is aware). This article intends to illustrate the economically viable alternatives to be considered for reducing or mitigating the negative economic effects of the post-lignite era within the framework of an adequate and timely approach to the transition.

Keywords: Decommissioning Coal Electricity Production, Economic Viability, Alternatives, Republic of North Macedonia

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Introduction

The decommissioning of fossil fuel power production plants between now and 2030 is essential for Europe's planned low carbon future. In this in-between period, significant changes are needed within the member countries' energy sectors if the European Union (EU) is to meet its goals for the Green Deal and to be climate-neutral by 2050 (European Commission, 2019). This entails reducing greenhouse gas (GHG) emissions to at least 40% below the 1990s level by 2030 (as per the Paris Agreement of 2015). While the EU has made considerable progress in improving energy efficiency and using renewable energy sources (RES), a well-planned transition out of carbon-intensive power generation is needed to meet the long-term aim of creating a low-carbon society not only in EU, but in the Republic of North Macedonia (RNM) as well.

Through the 2030 Climate and Energy Framework (European Council, 2014) and subsequently through the Green Deal, the EU set their renewable energy target to at least 27% of total energy. The share of renewables in gross final energy consumption at an EU level was 18.9% in 2018, compared with 9.6 % in 2004 (Eurostat, 2020). The transition of the Macedonian energy sector from environmentally polluting non-renewable sources to RES is rather slow however, and lignite production is still prevalent. Lignite as a source for energy production still accounts for over 70% of the country's total energy mix (State Statistical Office, 2020).

The Republic of North Macedonia is an EU candidate country. As of March 2020, the EU's General Affairs Council decided to open accession negotiations. While aspiring to adhere to the European goals, the RNM has to deal with the challenge of being one of the countries with the highest level of air pollution.[1] Its urban areas regularly rank among the top air-polluted locations within Europe. While the EU is moving quickly away towards its ambitious environmental plans, the RNM is struggling to keep up as the environmental gap between North Macedonia and the EU widens.

The decarbonization of power production is crucial to reducing greenhouse gas emissions and tackling climate change. Decommissioning coal power plants is in line with these environmental goals. This process is expected to have a notable impact on the economy and the society as a whole, requiring a vital transformation of the energy system. The transformation towards renewable and low-carbon energy requires significant investments followed by clear national strategies and action plans. While it may be a significant potential source of economic activity and new jobs, economic losses are also expected, caused by the closure of the traditional energy plants and energy-dependent sectors. The RNM's compliance with the European environmental goals for decarbonization and the abandonment of coal-fueled energy production will undoubtedly affect the socio-economic development of the Southwest planning region in North Macedonia, where the Oslomej thermal power plant (TTP) is located.

The goal of this article is to demonstrate the possibility for economically viable and profitable alternatives that can be both positive for the environment and for the local economy by modelling several scenarios. It provides an overview of the challenges of the energy sector in the context of the environmental future of the RNM on the path to full EU membership. Furthermore, the case of the Oslomej TTP models the possible regional, economic effects though several scenarios.

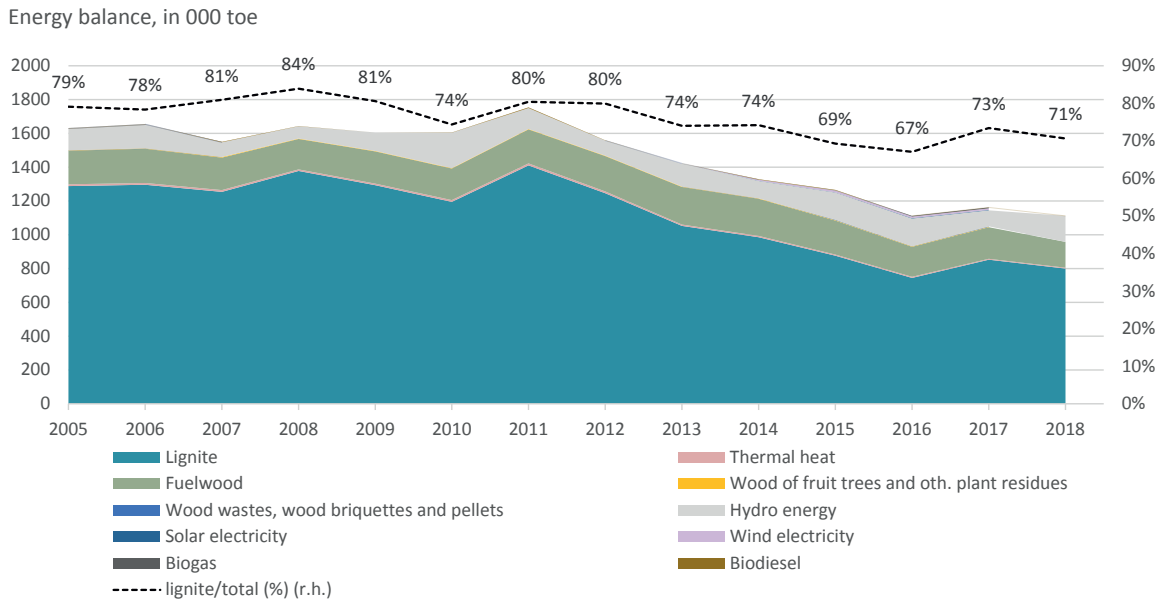
Energy-generating Mix in North Macedonia

Energy resources in the Republic of North Macedonia indicate a modest energy potential, directly affecting the opportunities to meet the country's own energy source needs. The exploited energy sources in the RNM are predominantly coal and hydro-energy. The country relies heavily on fossil fuels that are powered by a low-quality lignite and oil for electricity generation. In the last fifteen years there has been a sluggish transition from coal-

based electricity generation towards clean RES such as solar and wind. In 2018, lignite accounted for 71% of the total energy balance while collectively, solar, wind, thermal, and biogas accounted for less than 2% of the total annual electricity generation. Hydro energy generation accounted with less than 14% (State Statistical Office of RNM, 2020).

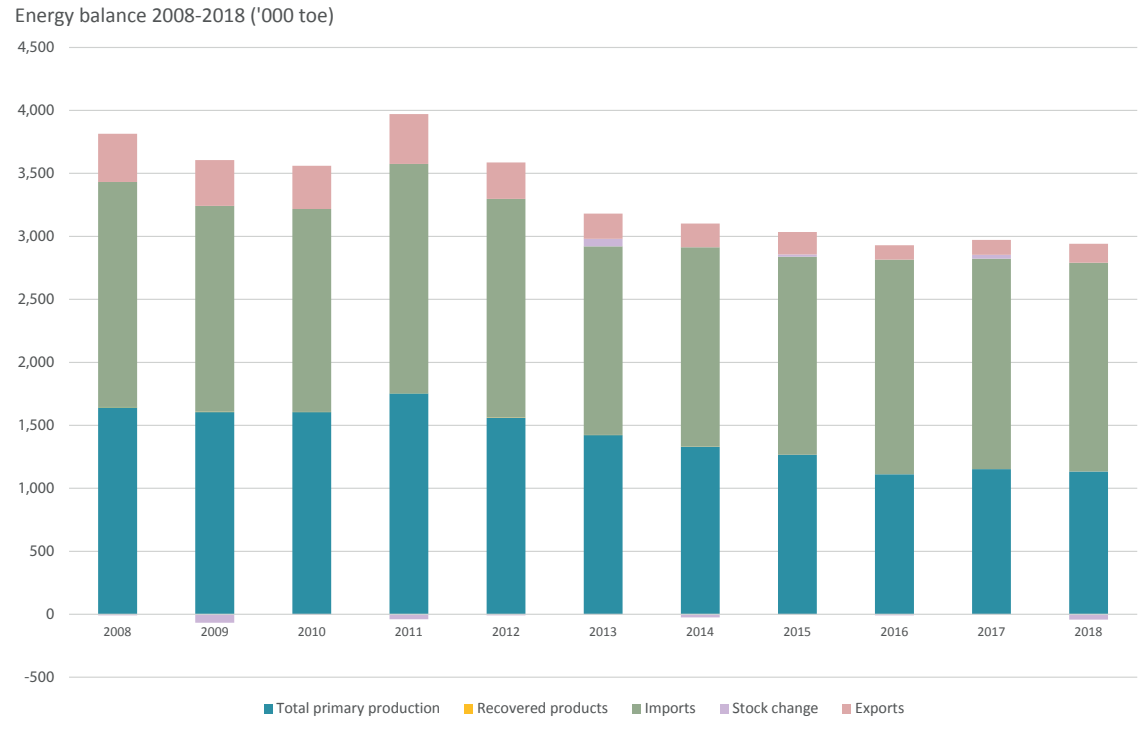
Despite investments in the system's modernization, domestic energy production has decreased by about 30% in the last ten years (Figure 1), while imports have risen to 64% of total energy consumption (Figure 2) (State Statistical Office of RNM, 2020).

Figure 1. Energy Mix in North Macedonia, 2005-2018



Source: State Statistical Office of RNM (2020)

Figure 2. Energy Balance North Macedonia, 2008-2018



Source: State Statistical Office of RNM (2020)

The International Monetary Fund has suggested that prices paid by consumers in North Macedonia for fossil fuels are broadly in line with low domestic supply costs, but that low-priced supply does not reflect the costs of environmental damage. This is mainly due to the adverse impacts on health from "local air pollution and contributions to global warming, which are tantamount to sizeable fossil fuel subsidies" (UNECE, 2019, pg. 67).

Challenges exist in meeting the country's legally binding renewable energy target, due to its reliance on fossil fuels and hydropower. The RNM's target for RES in 2020 was reduced from 28% to 23% (Energy Community, 2018) while at the same time its solar and other RES energy potential is considered to remain untapped (IRENA, 2019).

Strategic Direction in the Energy Sector and European Policies

In 2010, North Macedonia adopted three key documents for the energy sector valid for the next decade(s), the 2010 Energy Development Strategy, the 2010 Strategy for the Improvement of Energy Efficiency, and the 2010 Strategy for the Use of Renewable Energy Sources. The 2010 Energy Development Strategy (valid until 2030) faced major backlash due to a nuclear power plant scenario as one of the options. Furthermore, the Strategy was criticized for its excessive focus on hydropower and insufficient attention to other RES. A decade later, finalized at the very end of 2019, a new national Energy Development Strategy was enacted by the Government of Republic of North Macedonia (GoNM) valid until 2040. Under the Energy Community commitments to increase the share of RES, the country had a target of 28% of the gross final energy consumption in 2020, while at the end of 2018, the Energy Community's Ministerial Council adopted a decision lowering the country's 2020 target for the share of RES in gross final energy consumption to 23%. Regarding North Macedonia's energy sector in 2018-2019, the Annual Report of the Energy Community stated that, "the adoption of the Energy Law in May 2018 marks a turning point in the transposition of the Third Energy Package" (Energy Community Secretariat, 2018, p.102). "The legally binding renewable energy target was revised to 23% by the Ministerial Council in 2018. In 2017, the country achieved a 19.7% share of energy from renewable sources, lower than the 21% trajectory for the years 2017 and 2018." (Energy Community Secretariat, 2019, p.138). Further, "Almost 80% of the total GHG emissions are CO_2 emissions originating from the energy, buildings and transport sectors. Due to the extensive use of fossil fuels and particularly the dominant share of lignite for electricity production, there is significant potential in the country for policies and measures leading to GHG emissions reduction" (ibid., p.144). The EC report also notes: "The amended national renewable energy action plan is now in line with the binding target of 23% of energy coming from renewable energy sources by 2020. The new Energy Law is fully aligned with the Renewables Energy Directive. The implementing legislation is in the process of being adopted." The new strategy was adopted at the very end of 2019 to be implemented until 2040, with three ambitious scenarios. The new energy strategy clearly pinpoints the fact that TPPs fuelled by coal, such as Oslomej and Bitola, are both faced with a lack of coal sources. While Oslomej is using the final coal reserves, Bitola will be faced with this challenge in the coming decade.

The Economic Effect of Thermal Plant Decommissioning: The Case of Oslomej

The Oslomej TTP is in the Southwest planning region of the country. The energy sector of the region, primarily comprised of the Oslomej mine and thermal plant, contribute around 16% of the gross value added (GVA) of the region (Center for Economic Analyses, 2017).[2] The case of Oslomej TTP is of relevance, as the Oslomej mine produces less than 2% of the total coal produced for energy transformation when active. Oslomej TPP is the second

thermal power plant according to installed capacity in North Macedonia. At one time, it contributed approximately 10% of the total domestic electricity production. Nowadays, when it is active, it contributes up to 2% of electricity produced. Faced with the depletion of nearby coal reserves. the thermal plant's future is not only bleak, it is non-existent. Despite this, the ESM -'Power Plants of North Macedonia, Five-Year Investment Plan 2018-2022,' commissioned new coal reserves in the vicinity of Oslomej TPP, however did not occur due to the socio-environmental reasons and public pressure (Ministry of Economy of RNM, 2019).

At the same time, stakeholders are not aligned in the RNM about the direction to be taken. This is evidenced though the lack of an integrated and coordinated approach to energy development with long-term, state spatial planning; environmental protection planning; health protection measures for the population; economic development; and sustainable growth. Considering the lack of coordination, a civil society initiative evaluated the regional economic implications if and when the Oslomej thermal plant is closed. In this effort, and given several scenarios, the results serve to illustrate the existence of possible alternatives that may mitigate the economic effects of closure. The scenarios demonstrate that, if adequately planned and implemented, it is economically viable and preferable to decommission the coal plant.

In the Center for Economic Analyses and Ekosvest's (2019) economic analysis, two approaches were used in designing the scenarios: the Input-Output Model approach (IOM) for the Southwest region of the RNM, and a Cost-Benefit Analysis (CBA). The scenarios considered to estimate the possible impact were:

1) Zero scenario/No change – where no preparatory or other activities are taken after the full exploitation of the coal reserves in the Oslomej mine and there is no compensation for jobs lost, nor for the value added to be lost once the lignite units are shut;

2) Decommissioning – closing the plant according to standards and appropriate technical activities, dismantling facilities, and bringing the site to the state for brownfield investment without soil decontamination; and

3) Alternative economic activities in the primary, secondary, and tertiary sectors of agriculture, processing industry and tourism services (potential areas determined in consultation with the community) as value-added substitutes for the lost employment in the electricity supply sector through a phasing out and gradual reintegration approach.[3]

Input-Output Method (IOM)

By using the IOM model of multipliers, the three scenarios refer to the creation of new jobs and local value added that contributes to the economy of the region directly, and then takes into account the multiplier effects through the interaction with different sectors in the regional economy.

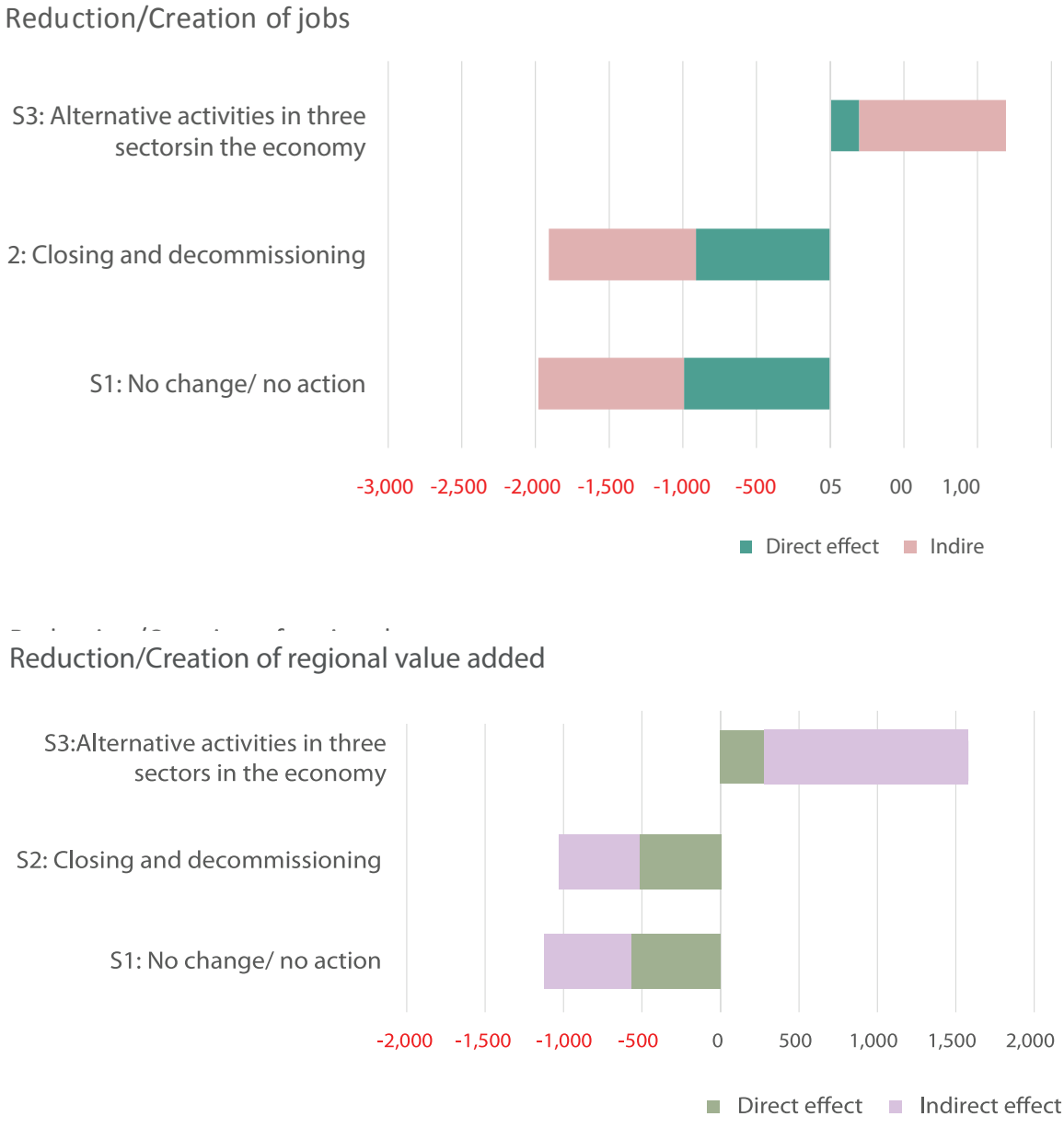
The comparison of the scenarios indicates that the decommissioning of Oslomej (either before or after the depletion of the lignite reserves) will lead to the loss of two thousand jobs. Approximately half of these jobs are direct losses with the other half are job losses in interacting sectors in the local economy.[4] The greatest impact, as a result of the multiplier effects, is expected in related economic activities such as: mining, processing, and electricity supply, while positive outcomes are expected in agriculture as well as administrative and other service activities. In terms of gross value added (GVA), the decommissioning of Oslomej will generate a loss of over one billion denars,[5] half of which will result as a direct loss from Oslomej's contribution to the sector. The remaining losses result from the indirect multiplier effects on related economic activities.

The scenario with the gradual substitution of labour in alternative economic activities illustrated though three given sectors[6] could directly replace 194 direct jobs and another 994 indirect jobs in other sectors.

Without gradual substitution, the closure of Oslomej upon depletion of lignite reserves would immediately result in 991 direct job losses and an additional 989 in other related sectors. With the decommissioning process, 912 direct jobs would be lost and an additional 999 in other, related sectors. At the same time, following an approach of substitutions with alternative economic activities, the regional value-added loss would be substituted and surpassed from the other sectors, mitigating the negative effects.

The results of the scenarios modelled with the input-output approach are summarized in the following figure (see Figure 3). These results show that only in terms of employment, the sectors in the given alternatives cannot fully absorb the labour substitution from Oslomej. However, the regional loss of value added to the economy can be significantly compensated though the generated value added from other activities that will not only substitute but contribute beyond Oslomej's value added.

Figure 3. Comparison of Scenario Effects on Jobs and Value Added



Source: CEA, Ekosvest (2019)

What is crucial is timely, systematic, and organized action, in accordance with good practices and principles that are responsive to the needs of the citizens affected and environmental protection.

Cost-Benefit Method

The results of the scenarios from the second approach, with the financial analysis indicators, show that decommissioning Oslomej is a financially unprofitable option. However, the economic analysis shows an economically feasible and profitable decommissioning scenario. Furthermore, we modelled the process of closing Oslomej with a gradual substitution of labour and reorientation towards economic activities in other sectors, which is expected to have a significant, long-term, positive economic effect. In particular, effects would be felt on the quality of life of the people, the protection of the environment, and the protection of health and human life. The given scenarios assess the financial and economic profitability in the continuance of activity at Oslomej until the full depletion of lignite reserves without any planned activities for the labour force or other economic activity; in a decommissioning process without substitution; and two alternative scenarios of possible labour substitutions within economic activities not related to coal production or other polluting, economic activities.

The results of the modelled scenarios indicate that, from a solely financial perspective, the 'no action scenario' as well as a scenario of 'no action followed by labor substitution' after the depletion of lignite reserves, has a positive financial effect. These outcomes are expected since there are no financial capital investments in the period considered, merely revenue generation (i.e. generating positive annual cash flows). Gradual labour substitution in the three sectors (agriculture, food processing and tourism) would generate positive flows after the closing of the TTP.

However, if we consider the economic feasibility and profitability of the scenarios with the benefits and costs, which are much wider than only the financial profitability, then the state of play is significantly different and the economic benefits exceed the costs many times over.

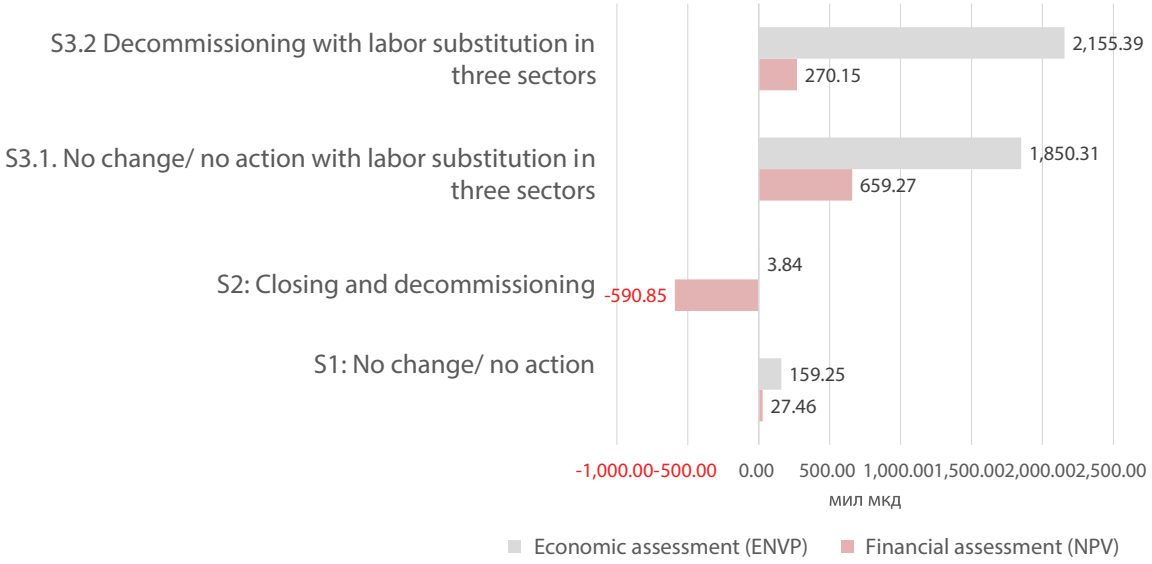
The most favourable scenario, measured by the CBA through economic net present value (ENPV), is the closure and decommissioning of Oslomej accompanied with a plan for gradual labour substitution and reintegration in other, non-polluting sectors. In the scenario, a combination of primary agricultural production, food processing, and the development of services in the field of tourism are used. This is expected to generate benefits of 2.15 billion denars[7] in a period of twenty-five years, with an internal rate of return of 24%. The most economically unfavourable scenario, on the other hand, is not taking any action due to the negative implications and costs for society as a whole.

Concluding Remarks: There are Alternatives

This paper's goal has been to illustrate the economic viability and positive outcomes of alternative scenarios that are beneficial for the economy, community wellbeing, and the environment, through the case of the Oslomej TPP. The essential prerequisites for win-win scenarios are political will, clear goals, good planning, and an integrated approach, followed by determined and efficient policy implementation involving the local community. Pursuing such a scenario is important as the RNM's transformation to a post-lignite era is lagging behind the European goals.

The movement of the RNM towards the increased capacities and usage of RES vs. non-renewables is lethargic, especially for decommissioning coal usage. The two thermal plants (one of which is Oslomej), though minimally significant energy producers nowadays, require a well-planned system of decommissioning coupled with plans for the reintegration of the labour force and mitigation of local economic effects. While decarbonization and energy

Figure 4. Comparison of Financial and Economic Viability of Scenarios



Source: CEA, Ekosvest (2019)

system restructuring is a complex, lengthy, and expensive process, immediate actions are needed.

Policymakers should balance the environmental necessity for accelerated coal plant decommissioning with a thoughtful, managed allocation of the capital losses, while constructing a just system for the transition of the labour force and local economic development. Environmental fairness programs should be enforced to ensure that the local communities participate fully and benefit from the transition process towards clean, renewable energy.

Adopting and practicing no-coal and clean energy should be put into practice more vigorously and dynamically, as there are alternatives that are socially and economically more viable than inaction. With adequate planning and support, these alternatives can turn into effective policies that will not only mitigate or reduce the potential negative economic effects, but make them even more economically sound in the long run.

Notes

1. Approximately 1,600 people die prematurely every year as a result of exposure to AAP (PM2.5) in North Macedonia (World Bank, 2019); 3900 premature deaths in the Western Balkans due to coal plants (Puljic, V. M., et al., 2019)

2. The balanced regional development indices for RNM shows a huge gap between the Skopje statistical planning region and the seven other statistical planning regions.

3. Please note that during the design of the scenarios, we did not take into account specific development parameters for each sector, such as the evolution of market value, existing and future market, return on investment, engagement of institutions, providing a favorable environment for substitution, etc.

4. For details of the methodology and the assumptions, please consult the full study: Center for Economic Analyses, (2019) Economic Analysis: Towards a Lignite-free Development, Case Oslomej.

5. 1 EUR= 61.65 MKD, 1 bill. MKD =16.2 mill EUR

6. The selection of the sectors to substitute the job losses are based on the responses of the local community.

7. 1 EUR= 61.65 MKD, 2.15 bill. Mkd =32.4 mill EUR

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Disclosure statement

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