

## MODERNIZATION OF TPP OSLOMEJ



*Prepared by: Development and Investments Department*

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## INTRODUCTION

**Project type:** Electricity generation

**Installed power:** 129,5 MW

**Electricity generation:** 800 GWh



TPP Oslomej, is the second thermal power plant (by installed capacity) in Republic of North Macedonia, which produces around 10% of domestic electricity production. TPP Oslomej consists of one block with a total installed capacity of 125 MW beginning operations in 1980 year.

This thermal power plant currently uses remaining quantities of coal from local lignite mine Oslomej - West (Basin Kicevo) as primary fuel with an average calorific value of 7,600 kJ / kg, the specific consumption of 1,5 kg / kWh, additional

specific consumption of fuel oil from 2,16 gr / Wh.

Due to depletion of the available coal reserves and the serious obstacles that stem from socio - cultural environment in relation to the exploration of the Popovjani site (Kicevo basin) with exploitation reserves of 9,000,000 tons, this power plant is facing significantly with uncertainties regarding supply with fuel.

### Significance of the project:

In order to extend the lifetime of TPP Oslomej, a Feasibility Study was prepared in 2015 by renowned consultants for modernization of the plant by using imported coal with higher calorific value.

The strategic goal is to determine the current condition of TPP Oslomej in order to expand the lifespan of the power plant in accordance with national requirements and the environmental requirements of EU and providing long-term and sustainable coal supply.

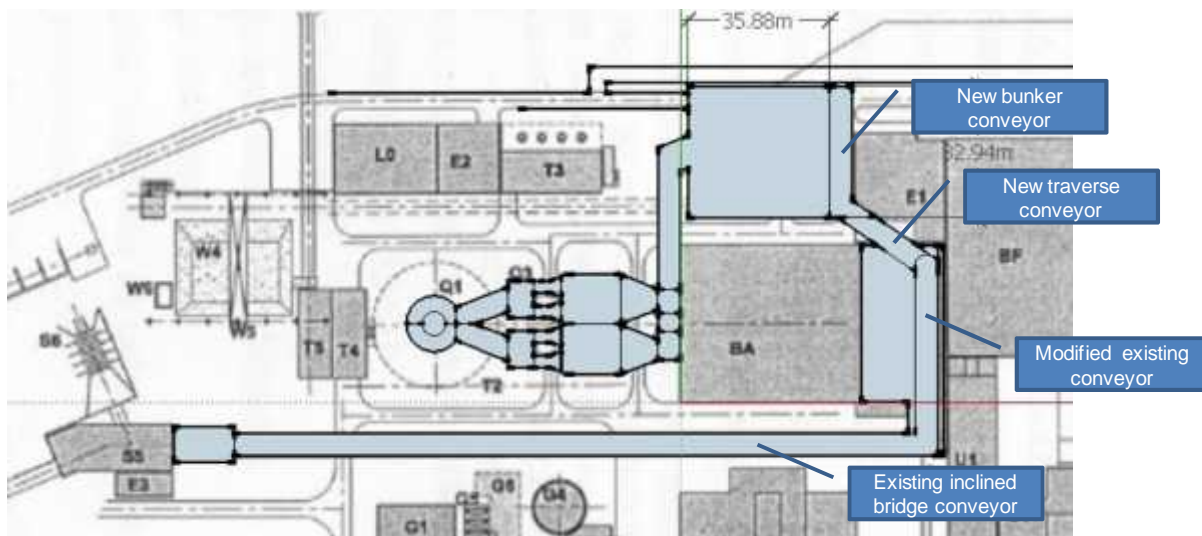
The objectives of the project should cover the following aspects:

- Extension of the lifetime of TPP Oslomej for at least 30 years,
- providing specified fuel, including market research,
- comply with EU Directives (IED Directive 2010/75 / EU), and providing the highest standards regarding the protection of the environment where reducing emissions of CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub> and dust emissions permitted under the EU by 2016,

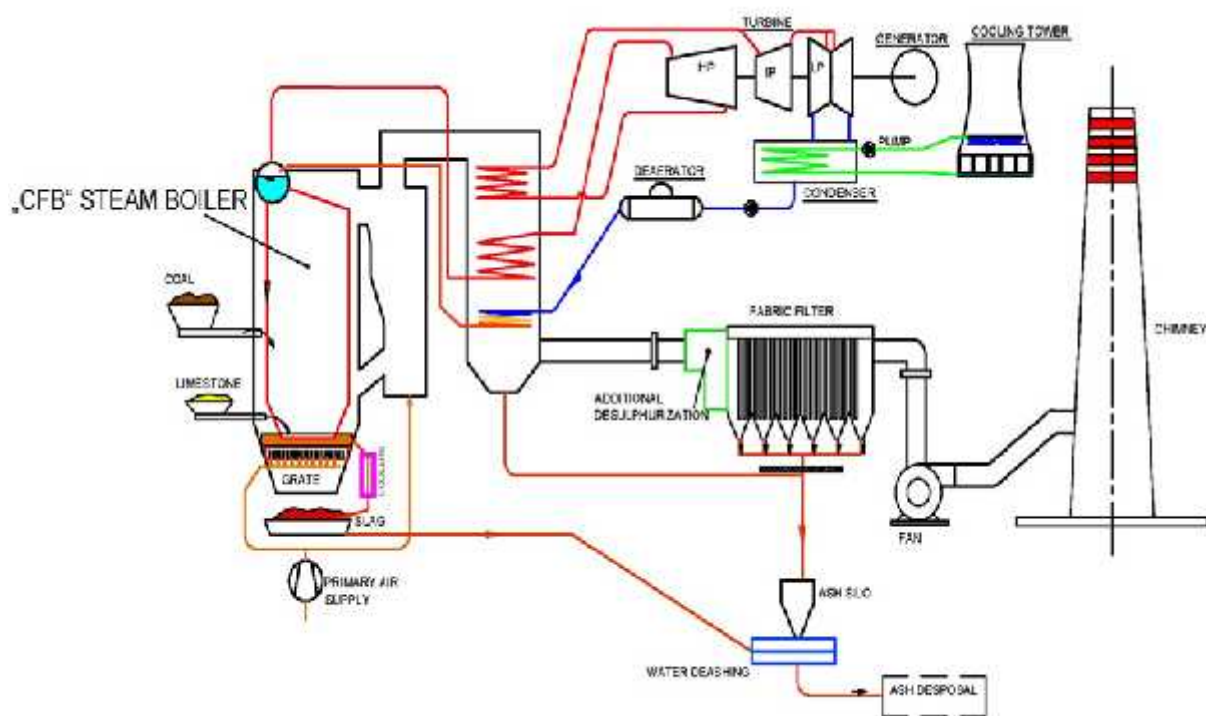
- use of best available technologies (BAT),

The study contains an analysis of the potential suppliers of coal with higher calorific value with quantitative and qualitative confirmation (certificate) and safety analyses for the period that follows.

The study analyzed several technical options for the boiler type, and a variant of CFB type of boiler (circulating fluidized bed) is chosen as best option. Main feature of this boiler type is that the process of flue gas desulphurization does not require special separate FGD installation, but the process takes place in the boiler.



*New facilities in the modernized TPP Oslomej*



*Scheme of thermal power plant with CFB boiler*

Combustion process in CFB boiler takes place in the combustion chamber at temperatures between 850-900°C. The primary combustion air is introduced from the bottom of the chamber injected through nozzles to create a mixing zone where the coal combust. During the combustion process, due to the high speed of combustion gases within the range of 6-10m/s, most of the fine particles leave the combustion chamber and they are separated in the recirculating chamber. The rest of the ash again enters the combustion chamber directly, thus achieving a high degree of combustion of the coal amounts to 98%.

ESIA was prepared for this project in 2016.



*Power house and turbine*

The realization of this project will obtain soundly balanced domestic production capacity with acceptable electricity price, irrespective of the negative and turbulent stock movements and changes in the world energy market. At the same time, it extends the lifetime of Oslomej with installed capacity of about 129,5MWel for additional 30 years, and according to the national requirements and EU requirements for environment through long-term providing and supplying with high calorific value.

### **Technical parameters for modernized TPP Oslomej**

The technical parameters of the modernized TPP Oslomej are defined in the Feasibility Study. It is planned to increase the current installed capacity, while the steam parameters remain unchanged (steam flow 380 t/h and pressure 130 bar) in order to use the existing turbine equipment which will be subject to a process of revitalization.

The efficiency of the modernized unit will be increased up to 36-37%, while reliability and availability of the unit will be on a higher level compared to the previous operation.



Electricity production from this capacity is estimated to be over 800 GWh per year.

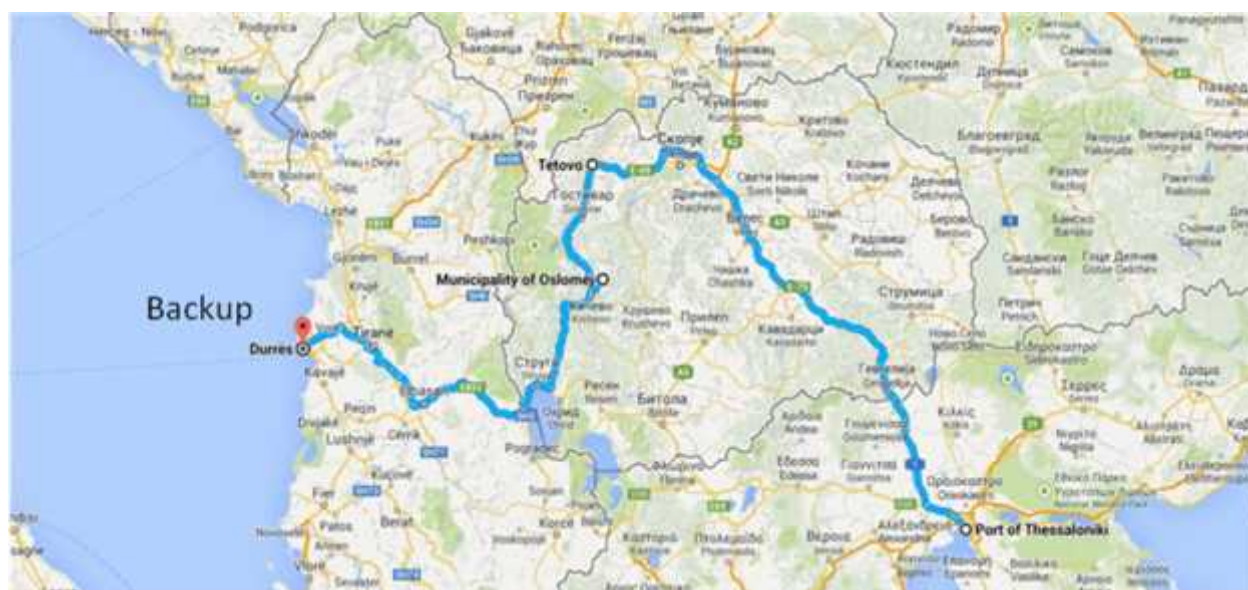
### Selection of coal and transport to TPP Oslomej

Based on the analysis in terms of available coal on the world market, the composition (qualitative) and price / energy value it is concluded that the most suitable (and most economically justified) type of coal in the future which would be used in thermal power plant Oslomej is bituminous coal with calorific value of about 26MJ/kg.

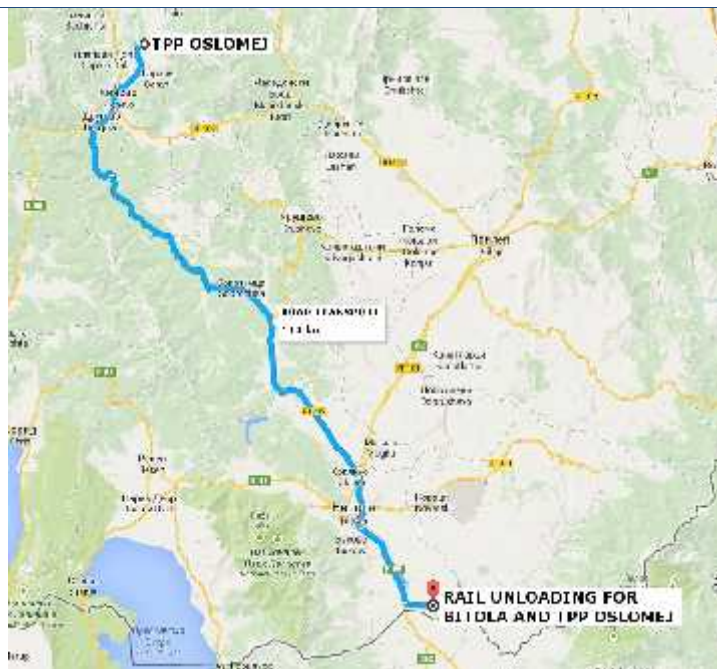
In the process of procurement of coal will be considered and its composition (physical and chemical characteristics) as defined in the study which in the future will be used for definition of the technical characteristics of the steam boiler and its design.

In the process of procurement of coal attention will be paid to the physical / chemical properties and calorific value of coal and in future agreements with trade and freight forwarding companies, main position will be exactly the price / calorificity.

Regarding the transport of coal it is expected to be procured from the world coal market by transparent prices, there are analyzed two types of transport (road and rail) and several varieties of transport routes that take into account the lowest transport costs.



*Transport route for road and rail transport*



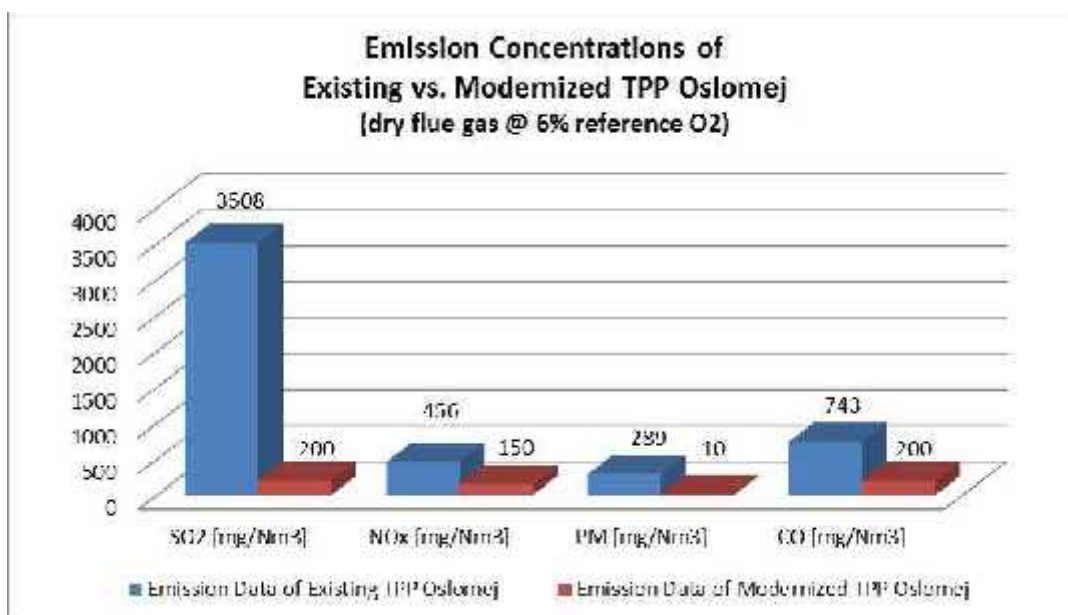
Transport route for combined transport

**Environmental aspects**

Emissions standards that will be applied for this project are the current values of European regulations. Emission standards as defined in the European Directive 2010/75 / EU for industrial emissions should be applied for modernized TPP Oslomej.

- SO<sub>2</sub> emissions concentration should not exceed 200 mg / Nm<sup>3</sup>
- NO<sub>x</sub> emissions concentration should not exceed 150 mg / Nm<sup>3</sup> and
- Emission of particles is restricted to 10 mg / Nm<sup>3</sup>.

By comparison of emissions between existing and modernized TPPOslomej can be noticed a significant improvement, as shown in the following figure.



The values of the concentration of emissions and also specific emission, i.e. when linked to a produced MWhel, will significantly be reduced.

The main drivers of this improvement are:

- Modification of the technology of combustion of coal in a steam boiler in accordance with the measures for reducing of the primary emission as desulphurisation of flue gas in the combustion chamber
- Optimization of the plant and improvement of efficiency
- Implementation of highly efficient equipment to dust removal (filter bags)
- Defining the stringent requirements regarding emissions under 2010/75 / EU

Better quality of coal (ie reduced quantity of ash), the efficiency of the power plant and other measures for optimization of the power plant which will be applied for modernized Oslomej will significantly improve the situation compared with the existing TPP Oslomej also in terms of discharge of waste from the plant. The expected reduction in the accumulated debris for modernized TPP is estimated to be approximately 75%.

### Planned investments

For realization of this project it is envisaged capital investment amounting to 126M€ of which amount majority is envisaged for the construction of a new boiler for burning high-calorie coal. The table shows the estimated costs for implementation of the project Modernization of TPP Oslomej:

<b>TOTAL INVESTMENTS - TPP Oslomej (based on the Pheasibility Study)</b>	
Consultant / Supervising	1.502.000 Euro
Civil works	800.000 Euro
Electrical equipment	11.462.000 Euro
mechanical equipment	96.103.000 Euro
Other activities	16.377.000 Euro
<b>Total:</b>	<b>126.244.000 Euro</b>

Based on the entire analysis of indicative and other data which in the period after finishing of the Pheasibility Study were obtained from other companies and consultants, the total investment for the entire modernization of TPP Oslomej is expected to be 145 milion euros (according to the estimations for investments for the equipment which was not included within the scope of the Study in 2015).

According to the estimations, the production price of electricity after the eventual modernization of TPP Oslomej is estimated to be above 61 EUR/MWh.

Implementation of the project is planned to be implemented over a period of 4 years.