



High Voltage Shore Connection (HVSC) Pre-Feasibility Study EXECUTIVE SUMMARY



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1. EXECUTIVE SUMMARY

Dubrovnik is located in the far south of the Republic of Croatia and Dubrovnik-Neretva County. The port of Dubrovnik - Gruž is located on the north coast of the gulf and the east coast of the gulf of Rijeka, and has 1629 m of built coast and 829 m of undeveloped coast.

Port of Dubrovnik - Gruž is an important transport hub for local, regional and international maritime passenger traffic of the southern Adriatic. The most significant number of arrivals is the traffic of liner passenger vessels, while the total number of passengers is dominated by the segment of cruise passengers.

The main purpose of the Pre-Feasibility Study is to analyze the possibility of constructing a high-voltage shore connection (HVSC) at the Dubrovnik - Gruž port so that the Port of Dubrovnik Authority receives sufficient detailed information to make a decision on further project development activities.

In the case of power supply to unconventional consumers (HVSC) in the port of Gruž with power of $3 \times 15 \text{ MVA} = 45 \text{ MVA}$, the current state of the transmission and distribution power grid is not satisfactory, and so much power with sufficient reliability can only be supplied by upgrading the transmission network.

According to the data from the list of cruise ships for cruise ships at the Dubrovnik Gruž port, in 2018 there were 423 cruise ship entries at the Dubrovnik Gruž port. Out of 423 cruise ships docked, assuming that HVSC system was installed in Dubrovnik-Gruž in 2018, 98 would be able to supply cruisers with electric power energy from land, accounting for approximately 25% of total landings.

Taking into account the power required to power these cruisers, the potential electricity consumed is approximately 6,603 MWh.

After determining the investment costs, operating revenues and costs and sources of financing, it is possible and useful to determine the financial viability of the project. A project is financially viable when there is no risk that it will run out of money in the future. During the construction phase, state co-financing of HRK 51.83 million should be ensured, but once the system is operational, project revenues in each year are higher than operating and maintenance costs, which ensures positive operations in all years of project consideration, ie financial sustainability.

After the HVSC connection is built, the GHG emission will be reduced. The reduction of GHG emissions is reflected through MWh of electricity sold, as a replacement for the commissioning of marine generators according.

Emissions were quantified by calculating total CO₂ equivalents (CO₂e). Greenhouse yields other than CO₂ are converted to CO₂e by multiplying the amount of a given GHG by a factor equivalent to its global warming potential. For NO_x it stands at 298.

Accordingly, the estimated CO₂e reduction for the first year of connection is 20,888 tCO₂e.

Based on the analysis, it can be concluded that the construction of a high-voltage land connection in the port of Dubrovnik - Gruž is a financially unprofitable project, and it requires EU co-financing but a largely socially profitable project.

The economic and financial assessment of the project in question is based on an analysis period of 25 years. In terms of investment, buildings with regular maintenance have a life expectancy of more than 100 years. The only thing that needs to be done in the case of electric power structures is the worn out equipment, which is an investment outlay after 25-30 years.

It should be borne in mind that the current way of evaluating investment projects does not sufficiently appreciate the long-term costs and benefits for the short-term benefits and costs. High discount rates on economic analysis discourage investment with long-term benefits. This disadvantage is especially pronounced in such electric power plants where initial investment is high, costs of operation and maintenance are low, profit is certain, but it is realized through many years. Given that Dubrovnik is one of the world's major tourist destinations, and for the last two years it is also the best cruise destination in the Eastern Mediterranean category in front of Kotor, Venice, Santorini and Rhodes, except for exceptional circumstances, the number of tourist arrivals by cruise ships in the future will certainly not reduce.

In technical terms, high-voltage land connections will ensure a secure and reliable supply of cruise ships - cruisers with electricity from their land during their berth at the port of Dubrovnik - Gruž, while at the same time having a favorable environmental impact, as a consequence of which we will reduce ship emissions of harmful substances into the surrounding air.

We believe that such a project would, first of all, have the greatest environmental impact for the city of Dubrovnik, since it would certainly improve the quality of the surrounding air and reduce pollution of the surrounding soil and water. Reducing marine exhaust emissions would reduce the amount of particulate matter in ambient air that has been confirmed to cause cardiovascular, respiratory and nervous system diseases.

In addition, this type of power to the ship also reduces the noise and vibration of the port.

In addition to all of the above, it is important to emphasize that the investment project in question is fully aligned with national and European energy goals. These objectives seek to mitigate the impact on climate change and ensure energy sustainability by reducing greenhouse gas emissions, using renewable energy sources and increasing energy efficiency.

The following are the steps (projects and permits) that are required before the start of construction:

- spatial planning
- studies and tests for preliminary design (geodesy, recording and assessment of the condition of structures, connection to the network)
- conceptual design
- environmental impact analysis
- obtaining a location permit
- elaborations and backgrounds for the main project
- industry studies and backgrounds for the main project

- main project
- obtaining the main design approval and building permit
- bidding documentation
- detailed design

From the financial analysis the financial model is not profitable, that is, the net present value of such a project is € 69.33 million, and EU co-financing is needed.

According to the conducted financial analysis and EU guidelines on co-financing through funds, the total amount co-financed by the EU amounts to HRK 63.77 million, which is 44.13% of the total investment costs.

The social criteria for the project's cost-effectiveness in current economic and economic opportunities are: increased electricity production, reduced CO2 emissions, increased employment, reduced noise and pollution.