Grebla Lake - Floating Photovoltaic Power Plant

Project financed under ENERGY PROGRAMME ROMANIA (“Innovation Norway”)
EEA and Norway Grants 2014-2021

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1. Presentation of the Promoter

Project Promoter:

- **TMK Hydroenergy Power**, a subsidiary of the **PPC Group**, is a green energy producer that operates and invests in the hydropower system in Caras Severin, with the goal of contributing to the well-being of the local community while also assisting Romania in meeting its green energy quota targets.

- In **December 2010**, the CEZ Group in Romania acquired 100% of the shares of the company that owned the hydropower system near Reşita, consisting of 4 microhydropower plants: Grebla, Crăinicel 1, Crăinicel 2 and Breazova and the related hydro installations from Timiş Trei Ape, Gozna, Văliug and Secu, having a total installed capacity of approximately 22 MW after the re-engineering process and a production of approximately 70 GWh/year.

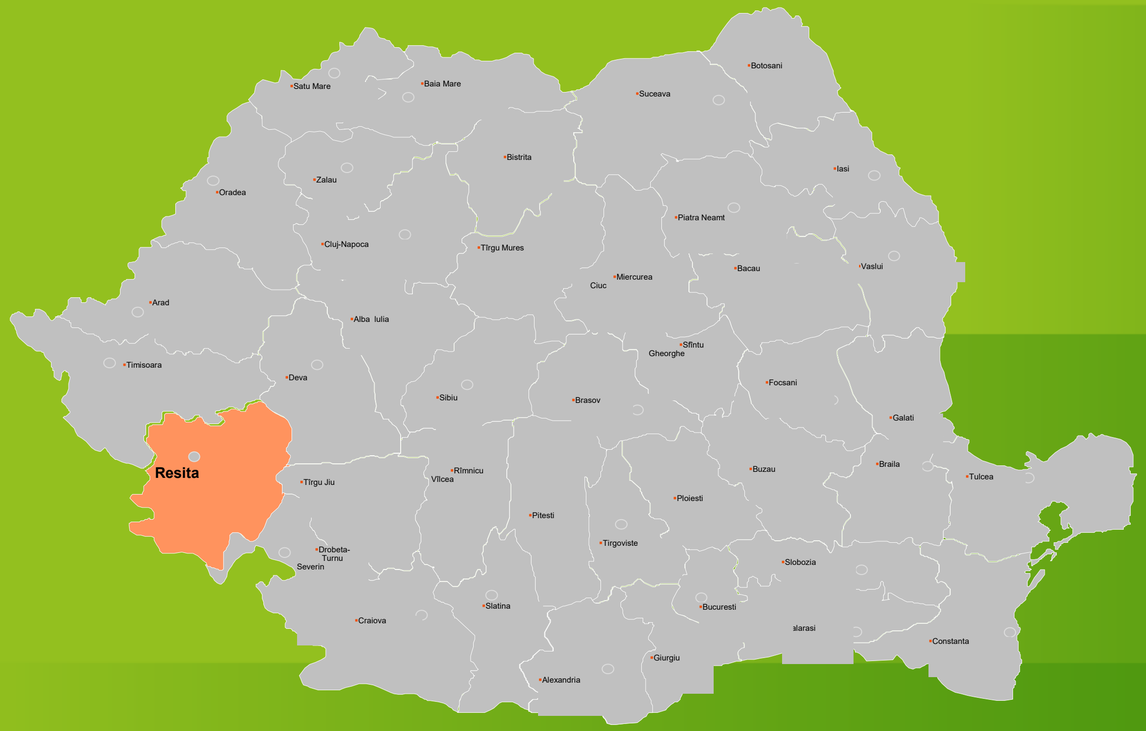
- In **March 2021**, TMK Hydroenergy Power along with the other CEZ Group companies in Romania were acquired by the funds managed by Macquarie Infrastructures and Real Assets (MIRA), part of the Macquarie Group in Australia.

- In **April 2024**, CEZ Group in Romania became EVRYO after rebranding campaign, continuing the mission started 19 years ago, highlighting the Group's concern for a green future and putting the benefit of people, communities at the center of all actions.

- In **November 2024**, TMK Hydroenergy Power along with the other renewable companies from EVRYO were acquired by the **PPC Group**.

2. Location of the Project

Location: Romania, west part of country, Banat Region, Caras-Severin county, Resita city



The first floating photovoltaic systems in Romania

With support from EEA Grants, TMK managed to implement a unique project in Romania, enhance the synergy between sun, water, and the electricity infrastructure of TMK.
The innovative project not only advances Romania towards a sustainable energy future but also **exemplifies advancements in renewable energy.**

Waterbody characteristics – Grebla lake:

- the depth of the lake is ~2 m
- 2nd water supply source of Resita municipality
- water level variation is ~1.5 m
- an area of 30,420m²

3. Project description

The floating PV system - is an investment of over 1,231,600 euros to ensure implementation of a **1 MWp** floating photovoltaic system to assure the production of green energy of approximately 1,000 MWh annually to partially cover **internal consumption** of TMK HYDROENERGY POWER SRL (TMK) and to reduce its CO2 emissions for which the company has accessed non-refundable financing in 2021 of **59,88% (737,500 euros)** out of total eligible costs through the ENERGY PROGRAMME ROMANIA, “Innovation Norway”) EEA and Norway Grants 2014-2021.

The **floating system** (type BC008F) with **1820** photovoltaic panels with a power of **550 W** each and a total installed power of 1 MW cc. mounted in combination with **9** units. inverters of **110.00 kW** each has an installed power of **990 kW**, which is the minimum of the nominal power of the invertor and the nominal power of the photovoltaic panels in the power plant.

TMK contracted as **EPC contractor** the association between ETH GROUP SRL (95%) and ENERGOTECH SA (5%) for design, acquisition, installation and commissioning of the floating photovoltaic system (FPV) and transformation station. Reception Note signed on **14.05.2024**

4. Project implementation

The project was implemented in the following stages:

I. Design and permitting consents – Technical design and obtaining consents for construction and operation from the local authorities

II. Procurement – Carrying out tenders and securing the supply of the necessary products and services;

III. Construction – Physically realizing the installation: Civil works, electrical installation, FPV installation

IV. Commissioning.

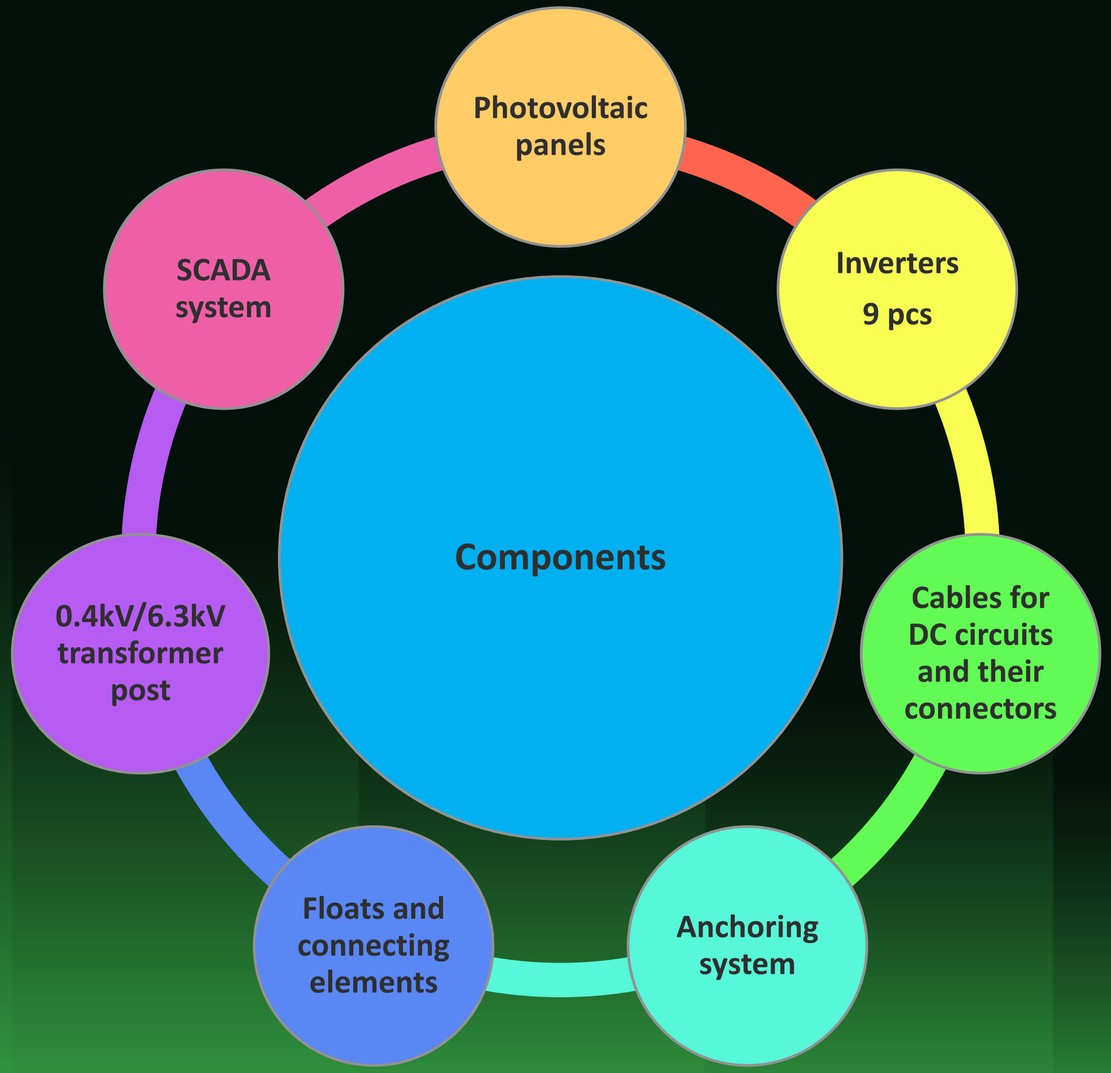
Challenges in the Project's successful implementation:

1. **Waterbody conditions**: Cleaning and sealing the Grebla compensating lake;

2. **Uncertainty about delivery times:** a great number of technology sectors was experienced manufacturing delays**;**

3. **Uncertainty about obtaining permits:** obtaining the permits/approvals considering the uniqueness of the project in Romania and the fact that HPP Grebla is historical monument.

5. Components of the photovoltaic system



6. Technology

Components of FPV System: PV panels, three-phase inverters, DC interconnecting cables, floating assembly (frames in Aluminum that can fix the PV modules at 15° tilt angles, Floats in HDPE, Side screws and bolts), anchoring system, 6.3kV power evacuation station, AC cables and interconnection cell with 6.3kV MT power station Grebla, SCADA System

- The project uses **solar panels**** which can float on the surface of a body of water. These solar panels will then feed electricity **into the TMK Hydroenergy Power's internal power grid to be used for internal consumption** replacing sometimes the need for fossil fuel-intensive energy production for providing green energy.
- The **FPV system*** consists in positioning PV panels on water, for a total amount of 1820 PV panels. 550 **Wp installed has each panel.**
- **Anchoring and mooring system** – The power plant will be maintained by **anchoring the floating system of 32 concrete blocks set on the bottom of the lake.**
- **Inverters and transformation station** – There are 9 invertors with 110 kWp input . The evacuation of electric power produced by the solar panels will be made at a nominal voltage of 6,3 kV through an L.E.S. extending over a length of 300 m to the transformer station located in the vicinity of the HPP Grebla.
- The entire portfolio of photovoltaic system can be monitored centrally by the Central Unit (Grebla dispatcher).
- **Lightning protection installation**

7. Achieved results

- Expected outcomes:
  a) Estimated annual CO2 emissions reductions: 333 tonnes of CO2eq/year;
  b) Energy produced from other renewable sources in MWh/year: 1.087 MWh/year;

- Expected outputs:
  a) Installed capacity for production of electricity (in MW): 1 MW;
  b) Number of new installation for production of renewable energy: 1 installation;

Other indicators:
- Number of staff trained in the project: 2 employees.

- The **main objective of the project**, implementation of the floating photovoltaic system, to assure electricity from renewable resources for the company's own consumption and to reduce its CO2 emissions was **achieved.**

- Floats and connecting elements (HDPE), anchoring elements of floating structure, photovoltaic panels (550 W - 1820 panels), inverters, cables for direct current circuits and their connectors, connection station, transformer station 0,4/6,3kV 1250kVA, the monitoring system of the FPV at Grebla Dispatcher (SCADA Dispatcher that monitors the inverters and its own interconnection and transformation station) – **fully operating**

Thank you for your attention!

ppc renewables