

Connecting Europe Facility - ENERGY

Design and EIA of the PCI 3.24 “Hydro- pumped storage in Greece - Amfilochia

3.24-0013-EL-S-M-14

Part of Project of Common Interest no 3.24

EXECUTIVE SUMMARY

The Action contributes to the implementation of the Project of Common Interest (PCI) 3.24 Hydro-pumped storage in Greece - Amfilochia which aims to supply more flexibility and balancing to the grid, providing a back-up to intermittent renewable energy, facilitating the penetration of renewables, while also ensuring a higher security of energy supply. In almost its entirety the Action had a life span of approximately 29 months, from 07/08/14 until 31/12/16. Following this date, the only pending issue was the issuance of the Environmental Terms Approval, which eventually took place on the 11th of January of 2018. This significant delay in the EIA's processing was due to the particularly long time that several forestry authorities spent in order to provide their opinion. The Action was partly financed by the Project's Promoter (TERNA ENERGY S.A.) and partly by the European Union via Connecting Europe Facility (CEF), having a co-funding rate of 50%.

The PCI's goal is primarily to assist renewable sources integration via energy storing. The excess wind, photovoltaic or thermal energy will be hydraulically stored; through water pumping from an existing lower reservoir (i.e. Kastraki lake, built in 1960) to the upper reservoirs (namely, Agios Georgios and Pyrgos), during the low load consumption or in renewable overproduction periods. Subsequently, energy will be recovered via turbine mode, during the peak load hours. The electromechanical equipment will be installed in two independent powerhouses located near Kastraki's Lake north-western bank, with the net annual electricity generation expected to reach 816 GWh. The Action consisted of the Technical Designs' and the EIA's (Environmental Impact Assessment) preparation for the particular PCI. The deliverables of the Action and related activities were the following: Activity 1: “Action Management”; Activity 2: “Supporting Technical Studies”; Activity 3: “Main Design”, Activity 4: “Environmental Impact Assessment” and Activity 5 “Detailed Design”.

A concise description of the Activities comprising the Action is illustrated below:

- Activity 1 (07/08/14 – 31/12/16): Action Management's role was to ensure the processes of planning, organizing, controlling resources, procedures etc. It unfolded as a core horizontal activity, transcending all aspects of the technical designs' review, cost assessment, Project's viability, managing of procurement and contracts. One of the main deliverables of the Activity was the 'Quality Plan'. Its role was to efficiently and adequately control documents produced and distributed amongst the team, monitor the project's progress (e.g. through frequent meetings), as well as closely review the design process. Another deliverable was the 'Communication & Visibility Plan', which contributed towards performing all the necessary actions, securing the Action is properly communicated and that adequate publicity is achieved to raise awareness among key stakeholders.
- Activity 2 (12/01/15-10/12/15): Before proceeding to the Main Design it was essential that a group of Supporting Studies be carried out. These included Land Surveying (e.g. aerial photographs and land topography in appropriate scale, at the area of dams, intakes, power stations), initial Geological and Geotechnical Studies (e.g. detailed mapping and initial drillings), as well as an Energy Studies optimization, based on project modifications which incurred after updating the preliminary design. Gathered data, not only provided the necessary input for producing the Main Design, but also helped refine key outputs of the project's design, such as the initially estimated installed capacity and the amount of energy produced/pumped.
- Activity 3 (09/03/15-29/02/16): The Main Design was a core element of the Action and covered the hydraulic and M&E (Mechanical and Electrical) designs for dam and waterways, Civil/M&E designs for the Power stations, road access design, as well as the High Voltage Center's and Interconnection lines' design. This stage present the critical phase before the compilation of detailed design, because it is during this stage that all the alternative solutions for the Action's structures are reviewed. This activity's deliverables were reports, drawings

and the relevant Bills of Quantities, with all output produced here being treated as a starting point for Activity's 5 elaboration.

- Activity 4 (16/04/15-31/01/2018 estimated): The main objective of this activity was the compilation and subsequent issuance of the Environmental Terms Approval for PCI-3.24 by the Ministry of Environment and Energy, following the evaluation of the Environmental Impact Assessment (EIA) Study. The EIA study had to take into account all technical parameters presented in the Main Design, as well as the physical interventions expected to take place during construction. The expected issuance of the Decision on the Environmental Terms Approval completes the environmental permitting procedure and constitutes a prerequisite for the construction permit's issuance.
- Activity 5 (29/01/16-31/12/16): Detailed Design followed on from Main Design, so that the whole Project Design process is finalized. It included additional Land Surveying, final Geological and Geotechnical studies and Detailed Design for the Project components (Dam and Waterways, Power stations, Access roads, High Voltage Center and Interconnection lines). The primary aim of this stage was the preparation of the detailed design of the hydro pumped energy storage project (consisting of final reports, Bills of Quantities, estimated budget, technical specifications and drawings explaining a concrete technical design solution) which will constitute the final deliverables of the Action. In addition, the second part of the activity consisted of drafting the tender documents for works and supplies that will be used for the bidding procedure.

Overall, the Action contributes to the technical maturity and consequently implementation, of the Project of Common Interest PCI 3.24 Hydro-pumped storage in Greece – Amfilochia, and therefore provides a more precise estimation of its investment cost in order to start the subsequent construction phase, enabling the Promoter to accomplish the project in the most reliable, feasible and viable way.

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