EGU24-9785
EGU General Assembly 2024

Assessment of legal, regulatory, and environmental issues in the commissioning of low head Pumped Hydro Storage technology: a case study in the Greater North Sea

Antonio De Luca[1], Maximo Peviani[2], Sergio Scanu[3], Andrea Miccoli[4], Giuseppe Scapigliati[1], and Marco Marcelli[2]

[1]Department for Innovation in Biological, Agro-food and Forest systems, Università degli Studi della Tuscia, Viterbo, Italy (antonio.deluca@unitus.it)

[2]Laboratory of Experimental Oceanology end Marine Ecology, Università degli Studi della Tuscia, Civitavecchia, Italy

[3]Ocean Predictions and Applications Division, Centro Euro-Mediterraneo sui Cambiamenti Climatici (CMCC), Lecce, Italy

[4]Consiglio Nazionale delle Ricerche, Institute for Marine Biological Resources and Biotechnology (IRBIM)

Low head Pumped Hydro Storage (PHS) has emerged as a promising solution for energy storage, particularly with the increasing development of off-shore wind power in Northern Europe. The ALPHEUS project (Augmenting Grid Stability Through Low Head Pumped Hydro Energy Utilization and Storage), funded by the European Union's Horizon 2020 program, places significant emphasis on investigating environmental issues and potential related impacts. By addressing key environmental aspects, the project aims to contribute to the sustainable integration of low head PHS, aligning with the broader goals of promoting renewable energy and grid stability in Europe.

The coastal zone, marked by diverse physical and ecological conditions, is susceptible to the exploitation of numerous natural resources. Studying the current status and the intricate relationships between natural ecosystems and PHS structures during installation, operation, and decommissioning involves identifying and analyzing various multidisciplinary components, including, ecology, engineering, and economics aspects. This evaluation is an integral part of the legislative and regulatory framework governing the assessment of suitable places for the deployment of coastal or off-shore energy production facilities.

The legal and regulatory framework relating to environmental aspects in two countries bordering the North Sea is also compared. Germany and The Netherlands are selected as examples for pilot sites assessment in this study including an evaluation of potential environmental constraints, the availability of environmental public data, and an assessment of existing infrastructure to be potentially converted. The assessment of sites from the environmental point of view is achieved on the basis of the "Marine Strategy Framework Directive" scheme identifying the potential interactions between the ecological parameters and the potential impacts of a PHS infrastructure. The success of sustainable low head Pumped Hydro Storage technology relies on the management of natural resources and the resolution of conflicts among sea use actors such as local communities and stakeholders.