



#NaturaEAcasa

TECHNICAL CONSULTING SERVICES - TERMS OF REFERENCE

Study of Pumped Hydro Energy Storage potential in Romania

WWF-Romania (World Wide Fund for Nature România) is an internationally recognized non-governmental organization with the primary goal of global and local nature conservation, possessing expertise in various fields, including the energy sector and related policies.

1. GENERAL INFORMATION

In the context of both the energy crisis as well as the decarbonisation planning of the energy sector in the region, discussions have already started on the pumped hydro energy storage that will allow energy from intermittent sources (such as solar, wind) and other renewables, or excess electricity from continuous base-load sources (such as nuclear) to be saved for periods of higher demand. Under an EFC grant, WWF Romania intends to subcontract a study with the aim to answer the following **key question**: what is Romania's potential for **Pumped Hydro Energy Storage (PHES)** with low social and biodiversity impacts (avoidance of protected areas, no damming of lakes involved, etc).

Examples from other countries can be taken into account.

According to **the Global Atlas¹ elaborated by Australian National University** highlighting global potential for PHES, Romania has significant hydro pump storage potential. Each site identified by the Global Atlas comprises an upper and lower reservoir pair plus a hypothetical tunnel route between the reservoirs, and includes data such as latitude, longitude, altitude, head, slope, water volume, water area, rock volume, dam wall length, water/rock ratio, energy storage potential and approximate relative cost. Wall heights are adjusted for each reservoir in a pair to yield equal water volumes to achieve the targeted energy storage. According to the disclaimer from the Australian platform, none of the sites identified “have been the subject of geological, hydrological, environmental, heritage and other studies, and it is not known whether any particular site would be suitable. The commercial feasibility of developing these sites is unknown. [...]There has been no investigation of land tenure apart from exclusion of some environmental areas and urban areas, and no discussions with land owners and managers. Nothing in this list of potential site locations implies any rights for development of these locations”.

¹ <https://re100.anu.edu.au/#share=g-6ae44e5541fc4e6f2c973e764ff914cf>

In this context, the aim for this study is to further assess the hydro pump storage potential starting with the one identified by the Global Atlas² for Romania and narrowing it down taking into consideration additional criteria for small-footprint sites selection (eg. not involving additional damming of rivers, avoiding protected areas for both reservoirs including the hypothetical tunnel route between the reservoirs, etc).

Objective

Understand the realistic low conflict-low impact nationwide potential for pumped-storage plants, in Romania as an advocacy tool for C&E mitigation goals and freshwater conservation goals. Based on the results and data provided by the study, WWF-Romania will elaborate a visual (map) of the potential sites identified.

Scope of the study

The study will assess options and results for hydro pumped storage in Romania, taking into consideration the following technical, economic and ecological perspectives/criteria as detailed further:

- **Evaluation of impacts in terms of energy storage change** (what this means for baseload needs in the future and what it means for balancing needs of other variable RES) and *if possible, environmental impacts (benefits) that can result from integration of impact mitigation measures.*
- The **economic implications of hydro pumped storage**. The study will seek to see if it is economically viable (and, if possible, what are similar experiences globally).
- **Water scarcity impacts due to climate change on the potential of hydro pumped storage** and further assess technical options. This assessment should be based on a wide methodology and not specific data for specific river catchments, due to data challenges.

Expected Outcomes:

- A methodology will be developed outlining the steps, the research methods employed for the study and the data needed.
- The study should conclude on:
 1. Technical options (including outlook on technology in next decades) and the results in terms of energy generation output and potential ecological impact mitigation.
 2. Economic implications of PHES based on technical options employed.
 3. Cost-benefit analysis of PHES.
 4. Impacts of water scarcity on future PHES in Romania.

The study will first serve as an internal reference for policy and project work and certain elements of it can be further made public.

² <https://re100.anu.edu.au/#share=g-6ae44e5541fc4e6f2c973e764ff914cf>

Energy sector

A. Technical Criteria:

- available data such as latitude, longitude, altitude, head, slope, water volume, water area, rock volume, dam wall length, water/rock ratio, energy storage potential and approximate relative cost
- efficiency and performance
- potential capacity
- technology compatibility

B. Grid Integration and sustainability (any of the following criteria would be an added value to the study):

- grid demand
- renewable integration
- sustainability policies and standards

Environmental sector (any of the following criteria would be an added value to the study)

A. Environmental Impact:

- resilience to support physical climate risks
- compliance with regulation area suitability
- cumulative impacts
- restoration of the surrounding area

B. Water status, use and availability:

- water quality and ecological status
- water efficiency
- water availability
- environmental flow requirements
- type of the PHES facility
- sediments

Socio-economic sector

A. Economic Criteria:

- safety
- cost-effectiveness

B. Social and Community Criteria:

- community impact
- social benefits
- demand assessment

3. Profile

Required Qualifications of expert/team of experts:

- At least MSc in engineering in the hydro technical, energy sector or alternatives.
- Experience in fields relevant for the study.
- In-depth knowledge of national and international energy policies, regulations, and standards.
- Experience with environmental mitigation and enhancement measures related to aquatic ecosystems is a plus.

4. Deliverables and deadlines

- Receipt of offers: July 30, 2024.
- Discussion about data that will be used: a commonly agreed date in the first part of August, 2024.
- Presentation of the preliminary report: August 23, 2024.
- Final report: no later than September 6th, 2024
- Presentation of results in an online workshop organized by WWF-Romania - date to be commonly agreed.

5. Reporting

Contractual relations will be concluded with WWF Romania, and the contract and payments will be handled by WWF Romania.

6. Evaluation criteria (Financial Offers)

- As a non-profit organization, the financial criteria is important.

Selection Criteria: The service provider will be selected based on the best quality/price ratio, considering how well it responds to the requirements outlined in the terms of reference.

7. How to apply

Please send an email expressing your interest in this consultancy opportunity with “Study on Hydropower retrofitting potential in Romania” in the subject line to adanciu@wwf.ro and rserbanica@wwf.ro no later than 30th July 2024. This should include your offer (technical and financial), a brief cover letter explaining your interest and capacity and your CV.

8. Payment

A single payment will be made upon receipt and acceptance of the final report. Non-delivery of agreed-upon deliverables or exceeding agreed-upon deadlines may result in the withholding or reduction of payment.