Joint Programme on Hydropower

Annual Report 2023

EERA
European Energy Research Alliance
Hydropower

MESSAGE FROM OUR COORDINATOR

Over the past year, our collaborative efforts have led to significant achievements. Through engaging discussions and productive workshops, we've developed joint project proposals, expanded our valuable networks and launched innovative pilot projects

I am confident that JP Hydropower represents the finest group of researcher, and our collaboration has fostered strong teams and numerous innovative initiatives.

As we continue our journey toward sustainable and efficient energy practices, working together remains our primary objective. We must collaborate to tackle the various technological, digital, environmental, and societal challenges facing the hydropower sector. Addressing these challenges directly and finding innovative solutions through our combined efforts is crucial.

Ole Gunnar Dahlhaug

MESSAGE FROM THE MANAGER

"Hydropower offers a vital solution, playing a significant role in helping the EU meet its decarbonisation and renewable energy goals. Its importance will continue to grow, providing essential storage and flexibility to the power system, thus enabling other renewable sources to flourish.

The Joint Programme on Hydropower, with its outstanding expertise, is ready to meet the challenge of advancing research and promoting the role of this remarkable technology.

Martina Campajola

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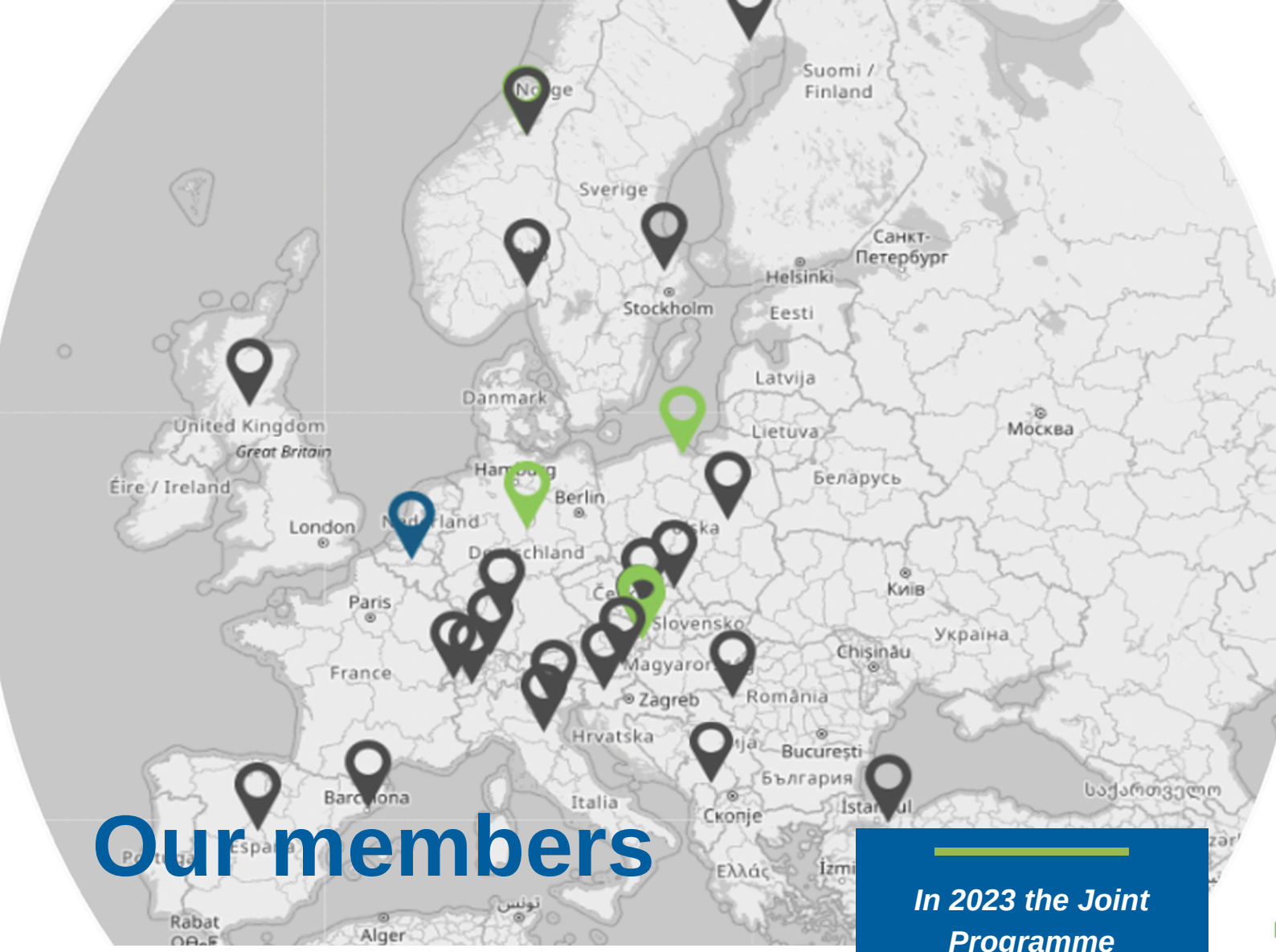


Our members

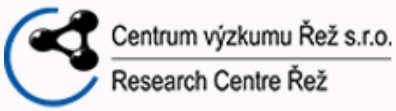
In 2023, the Ss. Cyril and Methodius University in Skopje (UKIM) from North Macedonia joined the joint programme, bringing significant expertise to the hydropower sector. UKIM, renowned for its advanced research and development in hydropower engineering, will contribute to the programme through its innovative research, educational initiatives, and collaborative projects. The university's focus on enhancing hydropower efficiency, sustainability, and environmental impact aligns with the programme's goals. UKIM's involvement will strengthen regional and global efforts to advance renewable energy solutions and foster international cooperation in the hydropower field.

In 2023 the Joint Programme added 1 new member to the group:


AIT
AUSTRIAN INSTITUTE OF TECHNOLOGY


BERA
Belgian Energy Research Alliance


BRNO
UNIVERSITY
OF TECHNOLOGY


Centrum výzkumu Řež s.r.o.
Research Centre Řež


efzn
Energie-Forschungszentrum
Niedersachsen


ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE


ETH zürich


Hes·so
VALAIS
WALLIS


IMP
PAN
GDAŃSK


LULEÅ
UNIVERSITY
OF TECHNOLOGY


NINA
Norwegian Institute for Nature Research


NTNU


SINTEF


TU
Graz


TU
WIEN
TECHNISCHE
UNIVERSITÄT
WIEN
Vienna | Austria


TÜBİTAK


ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA


UNIVERSITÀ
DEGLI STUDI
DI PADOVA


University of
Strathclyde
Glasgow


UPC


POLITÉCNICA


up


USN
Universitetet
i Sørøst-Norge


UPPSALA
UNIVERSITET


vr vis


VŠB TECHNICKÁ
UNIVERZITA
OSTRAVA


Warsaw University
of Technology

Horizon Europe

Horizon Europe plays a crucial role in advancing the hydropower sector by funding innovative research and development projects that drive the industry towards greater efficiency and sustainability. As a cornerstone of the EU's research and innovation framework, Horizon Europe provides essential support for cutting-edge technologies and breakthrough solutions in hydropower, including advancements in turbine design, energy storage systems, and environmental impact mitigation.

The goal of the Joint Programme (JP) within Horizon Europe is to harness these innovations to enhance the viability and performance of hydropower plants, promoting cleaner and more reliable energy sources. By fostering collaboration between researchers, industry leaders, and policymakers, the JP helps accelerate the transition to sustainable energy, thereby contributing significantly to the EU's climate goals and energy security objectives.

For instance, ReHydro (HORIZON-CL5-2023-D3-02-09) focuses on the demonstration of sustainable hydropower refurbishment, with research partners including SINTEF, EPFL, UNIPD, and NINA.
Store2Hydro (HORIZON-CL5-2024-D3-01-07) is dedicated to developing hydropower equipment that improves techno-economic efficiency and resilience during refurbishments, involving LTU, NTNU, NINA, AU, UoS, TUW, and UU.

Boost Hydro (HORIZON-CL5-2024-D3-01-16) aims to demonstrate innovative pumped storage equipment and tools combined with advanced storage management systems, featuring a collaboration between NTNU, LTU, NINA, UPM, USTUTT, EPFL, HESSO, UKiM, SINTEF, and UNIPD. These initiatives collectively support the transition to more sustainable and efficient energy systems, contributing significantly to the EU's climate goals and energy security objectives.

ACTIVE PROJECTS

Collaborations: ETIP

Collaboration is crucial in the hydropower sector, as exemplified by the efforts of the ETIP HYDROPOWER, which is guided by a Scientific Advisory Board led by Ole Gunnar Dahlhaug and a Governing Board comprising three JP Hydro SP Coordinators. The primary role of ETIP HYDROPOWER is to unify the sector, providing a cohesive and influential voice on critical issues without duplicating the roles of existing organisations. This collaborative approach enhances the sector's effectiveness by facilitating the tracking and implementation of research and innovation (R&I) initiatives through JP Hydro, ensuring that advancements are efficiently integrated and widely adopted.

Key working groups within ETIP HYDROPOWER focus on critical areas such as hydropower's role in flexibility and storage, hydropower and biodiversity, hydropower and climate change, and the promotion, dissemination, and uptake of past and current European R&I projects. By fostering cooperation and addressing these pivotal topics, ETIP HYDROPOWER and JP Hydropower aim to strengthen the overall impact and progress of hydropower development.

Increasing visibility in the SET Plan is essential for advancing the hydropower sector, which involves crafting a position paper and mapping out research priorities to ensure strategic focus. More cross-collaborations are necessary to achieve these goals. Coordinating initiatives with key organisations such as ETIP Hydropower, IEA Hydropower, the International Hydropower Association (IHA), Eurololectric, and the Hydropower Alliance enhances the sector's cohesive efforts and broadens its impact. Such collaborations not only unify the sector's voice but also amplify the effectiveness of initiatives and research, fostering innovation and development. Additionally, collaboration with ETIP further solidifies these efforts, ensuring that hydropower's role in the future energy landscape is well-defined and supported by comprehensive, cooperative strategies.

OUR SUB-PROGRAMMES

Ole Gunnar Dahlhaug
NTNU

Elena Vagnoni
EPFL

Martina Campajola
EERA

SP1: Hydroelectric Units

Giovanna Cavazzini
UNIPD

Elena Vagnoni
EPFL

SP4: Water resources, environmental impacts and climate adaptation

Staffan Lundström
LTU

David Finger
EI Linz

SP2: Hydropower Structures

Sébastien Erpicum
BERA

Elena Pummer
NTNU

SP5: Social acceptance, engagement and policy

Berit Köhler
NINA

Patrick Hendrick
BERA (ULB)

SP3: Grid, System Integration and Markets

Michael Belsnes
SINTEF Energy

Robert Schürhuber
TU Graz

SP6: Digitalization

Eduard Doujak
TU Wien

Johanna Schmidt
VRVis

HIGHLIGHTS FROM OUR SUB PROGRAMMES

SP1

Updating the Strategic Research Agenda (SRA).
Three main topics and challenges were identified:

- Flexibility
- Environmental issues linked to hydroelectric units' operation
- Improvement of storage capabilities

Three leaders and co-leaders are currently preparing the text for these topics.
New coordinator Giovanna Cavazzini and vice-coordinator Elena Vagnoni were appointed to lead SP1.

SP2

A new coordinator Sebasrtien Erpicum and vice-coordinator Elena Pummer were elected in June 2023..
A cross-meeting between SP2 and SP4 took place at the IAHR Vienna World Congress in August 2023.
Members were invited to submit abstracts to the IAHR ISHS 2024 in Zurich, with a potential session on hydraulic structures for hydropower development.
SP2 and SP4 planned a session for the EGU General Assembly titled "Innovation in Hydropower Operations and Planning to integrate Renewable Energy Sources and optimize the Water-Energy Nexus."

SP3

A joint workshop is scheduled for September 24th.
Effort in encouraging young researchers to participate.
Working on a preface linking all abstracts, which can be used as a policy paper.

SP4

Update the Strategic Research Agenda (SRA)
Project proposal submitted and project Coordination.

SP5

Welcomed a new member from Padova.
A project proposal and a workshop for a new national research center
Working on a review paper focused on promoting the social acceptance of hydropower in Europe.

SP6

Six SP6 members participated in the submission of the Horizon Europe proposal "MEASURE - Multi-Level Digitalization of Sustainable Hydro-power Operation" on January 10, 2023. Although the proposal was not awarded, it reached the shortlist, ranking 4th out of 29 submissions.
A national application was awarded to Pavel Rudolf (BUT) by the Czech Technology Agency for the project "Digital twin of pump for adaptive regulation of input recirculation."
SP6 members actively participated in the COST Action "PEN@Hydropower," which commenced with a kick-off meeting on September 14, 2022, in Brussels. Activities included a Training School on Sustainable Hydropower in Timisoara in May 2023, student exchanges, funded conference participation, and publications.
Pavel Rudolf (BUT) and Dagmar Juchelkova (VSB) received a grant from the Czech Ministry of Education for the project "Pump as Turbine: improving the design and operation through digitalisation."
The group continues to participate in the transversal Joint Program "Digitalization for Energy," focusing on information exchange.

IMPLEMENTATION WORKING GROUP

Initial steps

To further enhance coordination and execution of strategic initiatives, an Implementation Working Group is one of the next envisioned activities.
The initial steps involve identifying key stakeholders across all SPs to participate in the group, ensuring a diverse representation of expertise. A series of preliminary meetings will be scheduled to define the group's objectives, establish roles and responsibilities, and create a roadmap for prioritizing and implementing the identified projects. The group will focus on aligning activities with the Strategic Research Agenda, fostering collaboration among SPs, and streamlining communication channels. A dedicated platform for regular updates and feedback will be developed to facilitate transparent and efficient progress tracking.

Potential working groups

WG 1 – Technology Leadership

- Objective: Reclaim leadership in hydropower technology and foster European industry.

WG 2 – Expanding Hydropower Storage and Flexibility

- Objective: Utilize and expand hydropower for storage and flexibility.

WG 3 – Biodiversity and Environment

- Objective: Improve environmental conditions of rivers and water bodies.

WG 4 – Water, Energy & Climate Resilience

- Objective: Enhance European autonomy in water and energy security amidst climate change.