EERA Joint Programme on Hydropower

Annual Report — 2020

EERA
European Energy Research Alliance
Hydropower

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Foreword

From the Secretary General:

When citizens and government will have finally overcome the successive resurgences of the COVID pandemic, climate emergency will inevitably re-emerge at the top of our priorities as the single major global challenge. And there is no vaccine against it.

Science tells us we need to globally reach zero GHG emissions within the next 3 decades. This will not happen by continuous improvement; it will require no less than reinventing our society. At EERA, our mission is precisely to catalyze European energy research for a climate neutral society by 2050. To achieve this transformation, a full range of approaches and solutions will be necessary; new technologies will emerge, some will collapse, others will reinvent themselves.

Some 140 years after the first hydroelectric power station began operations in Wisconsin, USA, Hydropower stands now as a critical transformation technology, capable of, beyond carbon-free power generation, providing the critical reliability, flexibility and resilience services to our tomorrow's distributed, multi-vector and multi-directional energy networks.

In this context, EERA is proud that its Joint Programme on Hydropower is providing world-class research and innovation in this critical technology, which notably was recently acknowledged by re-positioning hydropower at the center of EU strategic research programmes.

Adel El Gammal, EERA Secretary General

Foreword

From the Coordinator:

I find it motivating to see the developments of renewables and the shutdown of fossil fuel power plants these days, and I tell myself that this will be the renaissance of hydropower.

The green transition is changing the requirements from hydropower's capabilities to higher levels; e.g. the utilization of the storage capacity will be operated differently, ramping rates will be tougher, and the stability of the energy system will be challenged. On top of this, the safety of supply has to be maintained.

In order to fully utilize hydropower's capabilities, we need further development of its technology, introduce new markets, and above all; ensure sustainable operation and social acceptance.

JP Hydropower is the perfect platform to communicate the correct message to the policy makers. Here, we can discuss new ideas, develop cross disciplinary consortiums, and bring forward new ideas and innovations. I am proud to see the development of JP Hydropower. This year JP Hydropower consists of members from 28 organizations in 14 different countries . It is a unique network of research organisations and it is growing stronger every year.

Ole Gunnar Dahlhaug , JP Coordinator

From the JP Manager:

Since I joined the EERA Joint Programme on Hydropower, I have sensed very strong community links between its members.

The difficulties faced in 2020 have had an impact not only on our lives, but also on our possibilities to interact and discuss together, risking hampering our collaboration.

Notwithstanding the issues that homeworking has caused, I have witnessed huge efforts from all the JP participants to make things happen. This is, I think, what is most remarkable about the JP on Hydropower: the everyday work of its researchers, the willingness to find partnerships across fields of expertise and national borders, and the constant availability to go the extra mile.

I am optimistic about the future of this JP: if COVID could not prevent us from working together and shaping a better future for hydropower research, we are ready to take up any other challenge along the way.

The focus of the European Union on carbon neutrality and fighting climate change gives hydropower the chance to play a fundamental role in the clean energy transition: it is our task to rise to the occasion and to make sure the opportunity is not lost.

Raffaele Guerini, JP Manager

Organisation

JP Steering Committee (JPSC)
(one representative of each Full Member)

JP Coordinator
Ole Gunnar Dahlhaug

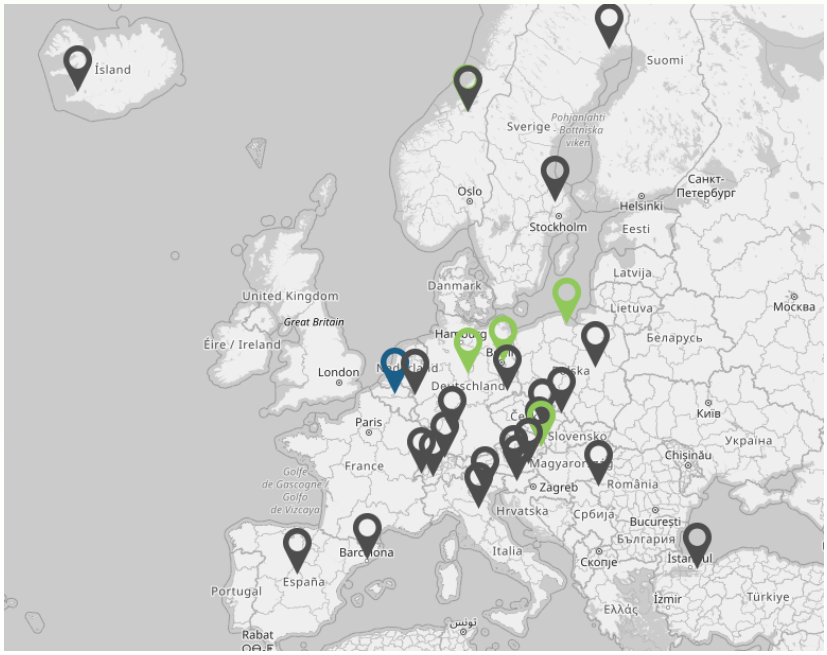
JP Manager
Raffaele Guerini

Advisory Board

JP Management Board (JPMB)
JP Coordinator + SP Coordinators

SP 1	SP 2	SP 3	SP 4	SP 5	SP 6
Mechanical, Hydraulics and Electrical	Hydropower Structures	Grid, System Integration and Markets	Environmental Impacts and Climate Adaption	Policy Making and Social Acceptance	Digitalisation
					
Coordinator François Avellan	*Coordinator* Jochen Aberle	*Coordinator* Marius Siemonsmeier	*Coordinator* Staffan Lundström	*Coordinator* Berit Köhler	*Coordinator* Eduard Doujak
					
V-Coordinator Pål-Tore Storli	*V-Coordinator* Robert Boes	*V-Coordinator* Robert Schürhuber	*V-Coordinator* David Finger	*V-Coordinator* Patrick Hendrick	*V-Coordinator* Hans Ivar Skjelbred

JP Membership



14 Countries

28 Members

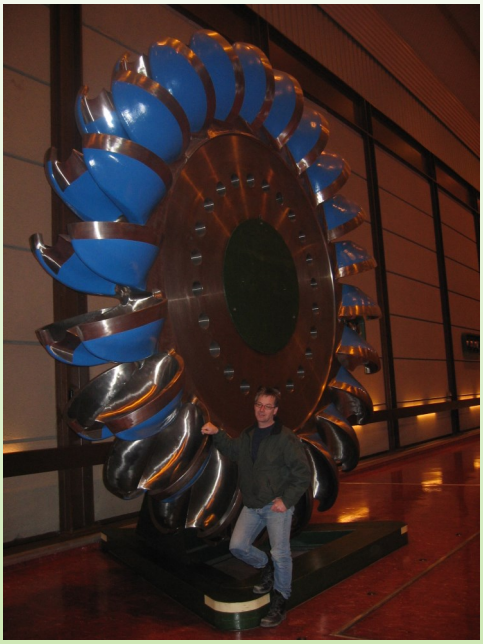
100+ Researchers

Austrian Institute of Technology	Austria	The Norwegian Institute for Nature Research	Norway
Belgian Energy Research Alliance / represented by ULB	Belgium	TU Dresden	Germany
Brno University of Technology	Czech Republic	TU Graz	Austria
Ecole polytecnique fédérale de Lausanne	Switzerland	TU Wien	Austria
Energie-Forschungszentrum Niedersachsen/TU Braunschweig	Germany	TUBITAK	Turkey
ETH Zurich	Switzerland	Università di Bologna	Italy
Haute Ecole Spécialisée de Suisse	Switzerland	Universitat Politecnica de	Spain
Lulea University of Technology	Sweden	University of Ljubljana	Slovenia
Norwegian University of Science and Technology	Norway	University of Padova	Italy
Reykjavik University	Iceland	University of Stuttgart	Germany
RWTH Aachen University	Germany	University of Timisoara	Romania
SINTEF Energy Research	Norway	Uppsala University	Sweden
Szewalski Institute for Fluid-Flow Machinery	Poland	VSB - Technical University of Ostrava	Czech Republic
Technical University of Madrid	Spain	Warsaw University of Technology	Poland

JP Hydropower Advisory Board

The EERA JP on Hydropower launched in 2020 its Advisory Board, composed by representatives of the following organisations:

- Ivar Arne Borset, Statkraft
- Alexander Krenek, Eurelectric
- Mario Bachhiesl, VGB
- Peter Stettner, Andritz
- Bruno Georis, Engie
- Fredrik Engström, Vattenfall
- Christian Dupraz, Swiss Federal Office of Energy
- Martin Pfaunder, Swiss Federal Office for the Environment FOEN



Source: NTNU

Objectives:

- Provide strategic advice from industry, policy and civil society perspectives
- Give input to the Strategic Research Agenda of the JP Hydropower
- Identify R&D and innovation needs
- Bridge relevant networks and stakeholders
- Ensure JP Hydropower's relevance to the hydropower sector
- Increase the awareness and knowledge about hydropower research for the sector, and promote its role to enable the green energy transition

Consortia & Applications

Horizon 2020

DISHydro — Digitalisation for Sustainable Hydropower - Multi-Scale approach implemented in Central Asia

8 JP Members involved

19 JP Members involved

49 Researchers involved

COST Action

PEN@Hydro — Pan-European network for a sustainable, digitalised hydropower contributing to the energytransition

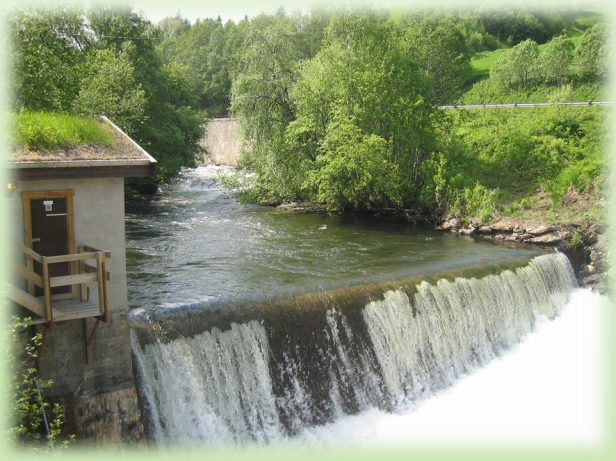
CETP SRIA

Feedback from Hydropower on the "Enabling Technologies" Input Paper of the Clean Energy Transition Partnership

13 Editors involved

"The EERA JP on Hydropower is a great meeting place. Here I find very good scholars, with whom I can share knowledge and the necessary experience to collaborate on diverse, challenging projects."

Eduard Doujak, Coordinator of Sub-Programme 6 on Digitalisation



Source: NTNU

EERA European Energy Research Alliance Hydropower

Active Projects

HydroFlex

HydroFlex

HydroFlex's objective is to develop new technology that increases the flexibility of hydropower. It is focusing on many start-stops and high ramping rats of hydropower plants. The project will demonstrate how variable speed will increase the flexibility of hydropower plants. At the same time, the project is doing research on the market, social acceptance and environmental consequences from such operation. We are proud to present results from our research on turbine, generator, converters, and innovative mitigation measures on the environmental consequences. Please visit our website for updated information: www.h2020hydroflex.eu

AFC4Hydro's objective is to develop a new solution to improve the performance of hydropower as a clean and renewable energy source. This involves the design and validation of an Active Flow Control system in actual hydraulic turbines that permits to operate the units at extreme off-design conditions, sustain more frequent power ramp transients, achieve higher efficiencies and reduce the maintenance costs. The research will be carried out from reduced scales in laboratories to actual industrial environments with full-scale prototypes. Please visit our website for updated information: https://afc4hydro.eu/

AFC4Hydro

AFC4Hydro

Participation in Active Projects

RESEMO

HydroCen

DIRT-X

FlexWatt

ALPHEUS

FranSed

HYPOS

LIFE4FISH

XFLEX

Hydropower Europe

JP Hydropower in 2021

NETWORKING ACTIVITIES

Horizon Europe

COST Action

Clean Energy Transition Partnership

VISIBILITY OF THE JP

Participation in relevant conferences

Organisation of ad-hoc events

RESEARCH COLLABORATION

Joint publication of Special Issues

Writing common papers (inside and across SPs)

JP Hydropower kick-off 2018 - NTNU offices in Brussels