



# BRUSSELS HYDROPOWER DAY

25 APRIL 2023

Residence Palace, Brussels and online



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)





# 1<sup>st</sup> BRUSSELS HYDROPOWER DAY

*The added value of the hydropower sector as a catalyst and enabler in the clean and safe energy transition under the energy crisis*

## Welcome

Prof. Dr. Anton J. Schleiss

Hon. President of the International Commission on Large Dams (ICOLD),  
Professor emeritus at Ecole Polytechnique fédérale de Lausanne (EPFL)  
Coordination Team ETIP Hydropower

Brussels, April 25, 2023



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## Energy crises and role of hydropower

- The actual energy crisis reveals the important and vital role of hydropower to ensure a safe and supply of electricity
- Storage and pumped-storage hydropower will be the most vital to avoid blackouts in Europe the next winters



# Hydropower at the source of the development of Europe in the last century

## Advantages of hydropower

- Renewable energy without direct emission of CO<sub>2</sub>, excellent energy gain or pay back factor
- Excellent efficiency, production can be easily adapted to the demand (flexible peak energy)
- In-country **independent** energy creating jobs and financial resources in remote areas (taxes and concession fees)
- Improvement of infrastructures and touristic attractiveness
- Strong contribution to flood and drought protection (drinking water, irrigation, fish farming, river navigation,...)



Thissavros Dam, Greece, 172 m

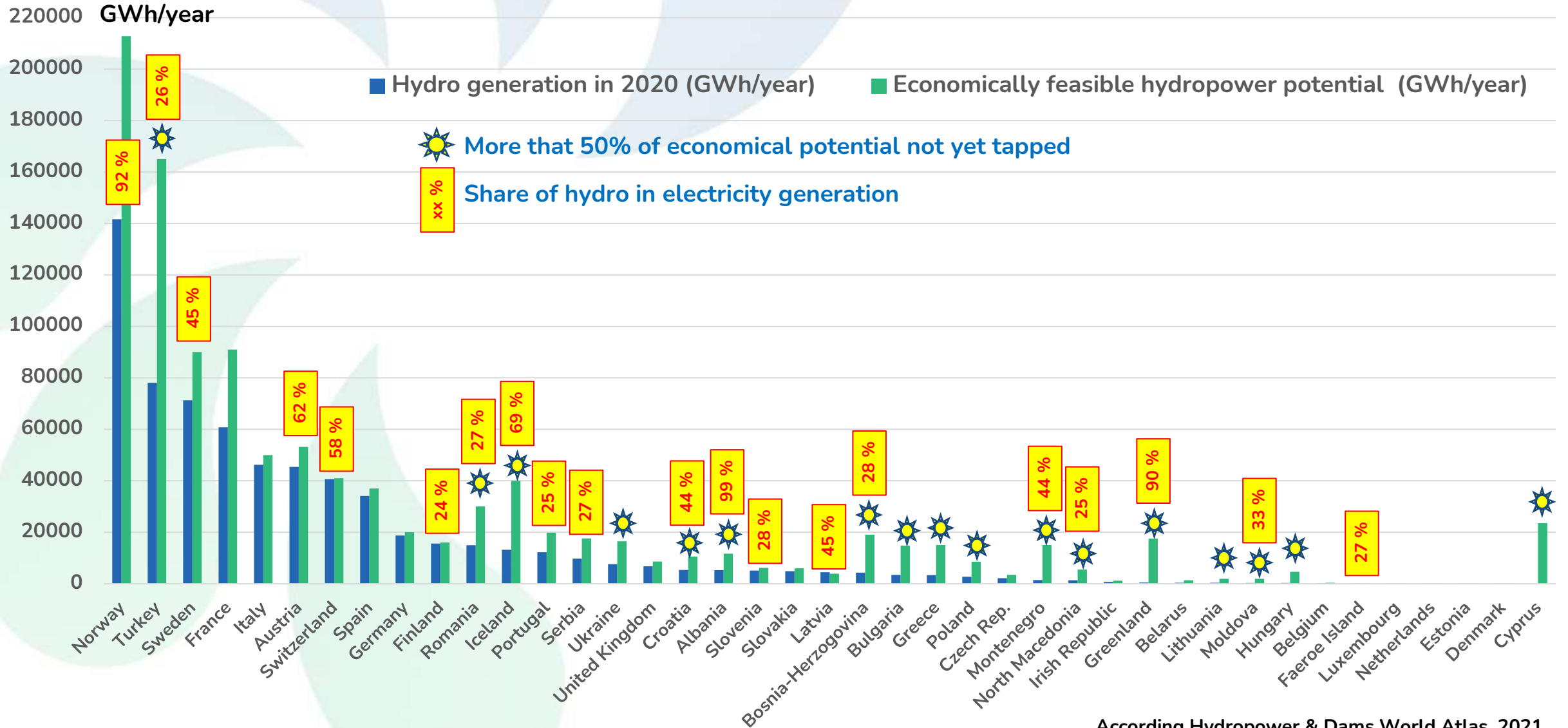
# Situation of Hydropower in Europe

Installed capacity in MW under construction since 2005 without Turkey



According Hydropower & Dams World Atlas 2022

# Generation and Potential of Hydropower in Europe



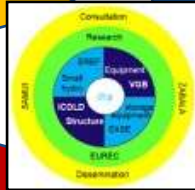
## Purpose of Conference

**Discuss opportunities and barriers affecting hydropower deployment in the framework of the energy transition within the energy crisis and the market as well as regulation conditions.**



# The outcomes of the Forum Hydropower Europe as a basis for ETIP HYDROPOWER

**R&I  
Priorities**



**Barriers**

**RIA**

**Recommendations**

18 Research Themes – 80 topics

**SIR**

Steps to new hydro deployment

11 Strategic Direction – 40 Detailed Actions



650 registered on consultation platform - 185 participants in the second on line consultation



# Objectives of ETIP Hydropower

- ETIP HYDROPOWER will enhance and disseminate the RIA and SIR taking into consideration the future needs of the sector and the R&I targets and the emerging policy priorities.
- ETIP HYDROPOWER will consolidate the strong network of the HYDROPOWER EUROPE Forum into a sustainable organization which helps to unify the voices of hydropower in Europe

# Agenda of the Brussels Hydropower Day

## Welcome and opening

9.15-9.30



Anton Schleiss –  
Coordinator, ETIP  
Hydropower



Helene Chraye – Head  
of Unit, DG RTD



# Keynote speeches: Hydropower in Europe and Worldwide

9.30-10.10

09:35 – 09:55

**Keynote 1: *The potential for hydropower in the context of current EU policies***  
(15 min presentation, 5 min Q&A)

09:55 – 10:15

**Speaker:** Mathilde Lallemand-Dupuy, Policy Officer, European Commission, DG ENER

**Keynote 2: *The important role of hydropower development in the European safe energy transition*** (15 min presentation, 5 min Q&A)

**Speaker:** Ana Paula Moreira, Head of Engineering at EDP

**Chair:** Janire Garcia, ZABALA

## Keynote 1



Mathilde Lallemand -  
Policy Officer, DG  
ENER

## Keynote 2



Ana Paula Moreira - Head of  
Engineering, EDP

## Chair:



Janire Garcia – Project  
Manager, ZABALA

## Session 1:

The added value of hydropower and energy storage in the energy transition and within the energy crisis

## Panel Discussion

10:30 –  
10:45

**Presentation 1: *The importance of flexibility contribution of hydropower* (10 min presentation, 5 min Q&A)**

**Speaker:** Ghislain Weisrock, Special Advisor for European Affairs and Power System, France Hydro Electricité

10:45 –  
11:00

**Presentation 2: *Hydropower and Energy Storage in Greece: Status, perspectives and benefits for the local communities* (10 min presentation, 5 min Q&A)**

**Speaker:** Sera Lazaridou, Senior Partner, Hydroexigiantiki Consulting Engineers Greece

11:00 –  
11:15

**Presentation 3: *Fifteen new storage increase projects in Switzerland negotiated at the roundtable with civil society* (10 min presentation, 5 min Q&A)**

**Speaker:** Peter Lustenberger, Senior Expert Asset Management, Hydroenergie & Biomasse, AXPO Power Switzerland

## Presentation 1 Presentation 2 Presentation 3



Ghislain Weisrock



Sera Lazaridou



Peter  
Lustenberger



Ana Paula  
Moreira



## Session 2:

Best practice examples  
to tackle economic,  
environmental and  
societal challenges with  
hydropower

## Panel Discussion

13:15 –  
13:30

**Presentation 1:** *How tariff and policy can influence decision makers; some best practices of hydro project for grid security? (10 min presentation, 5 min Q&A)*  
**Speaker:** Maryse Francois, CEO, MFX Consulting

13:30 –  
13:45

**Presentation 2:** *Fish behavior at hydropower plants: what we know, and how we can use it. (10 min presentation, 5 min Q&A)*

**Speaker:** Jeffrey Tuhtan, Associate Professor of Environmental Sensing Technologies, Tallinn University of Technology

13:45 –  
14:00

**Presentation 3:** *Hydropower Sustainability Standard for hydropower development (10 min presentation, 5 min Q&A)*

**Speaker:** Eddie Rich, CEO, IHA

Presentation 1   Presentation 2   Presentation 3



Diar Isid



Olivier Tricca



Benjamin Graff



Maryse Francois



Jeffrey Tuhtan



Eddie Rich

## Session 3:

Synergies and collaboration with ETIP's, EERA and other sector organisations for integrated use of renewables in view of safe electricity supply illustrated with examples of hybridization projects

## Panel Discussion

- *Hydropower as a catalyst and facilitator for the clean, safe and independent energy transition in Europe* (HYDROPOWER EUROPE, IHA, IEA Hydropower and EERA Hydro; recommendations for the SET Plan revision)  
Statement: Liv Randi Hultgreen, Executive Director, FME HydroCen – NTNU
- *XFLEX Hydro project: Integration of hydropower and batteries*  
Statement: Jean-Louis Drommi, Electricity Expert, EDF
- *Concrete actions to contribute to the revision of the Strategic Energy Technology (SET) Plan from the ETIPs' perspective (ETIP Forum)*  
Statement: Maria Laura Trifiletti, Project Manager, ZABALA
- *Presenting ASPIRE, the Alliance of Secure, indigenous & Predictable Renewable Electricity*  
Statement: Donagh Cagney, Policy Director, Ocean Europe

Statement 1



Thomas Schleker

Statement 2



Liv Randi Hultgreen

Statement 3



Jean-Louis Drommi



Maria Laura Trifiletti

Statement 4



Donagh Cagney



# ETIP Hydropower 'Unifying the voices of hydropower in Europe' - The next steps

## Final conclusions and outlook

16:00 – 16:15	<b>ETIP Hydropower 'Unifying the voices of hydropower in Europe' - The next steps</b> <b>Speakers:</b> <ul style="list-style-type: none"> <li>• Mark Morris, SAMUI France</li> <li>• Sebastian Mortier, Policy Officer, European Commission, CINEA: Explaining the CINEA approach to the ETIP Hydropower project</li> </ul>
16:15 – 16:30	<b>Final conclusions and outlook</b> <b>Speaker:</b> Patrick <u>Clerens</u> , EASE



Mark Morris,  
Director, Samui  
/ ETIP  
HYDROPOWER



Sébastien Mortier,  
Policy Officer EU,  
Power Systems



Patrick Clerens,  
Secretary  
General, EASE  
/ ETIP  
HYDROPOWER



## 1<sup>st</sup> BRUSSELS HYDROPOWER DAY

*The added value of the hydropower sector as a catalyst and enabler in the clean and safe energy transition under the energy crisis*

We wish you a successful  
conference with fruitful  
discussions

Brussels, April 25, 2023



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# Goals of European Hydropower R&I Funding

Brussels Hydropower Day

25th April 2023

**Hélène CHRAYE**  
*Deputy Director Clean Planet  
HoU Clean Energy Transition  
DG Research & Innovation  
European Commission*



# European Green Deal

## The EU will:



Become climate-neutral by 2050



Protect human life, animals and plants, by cutting pollution



Help companies become world leaders in clean products and technologies



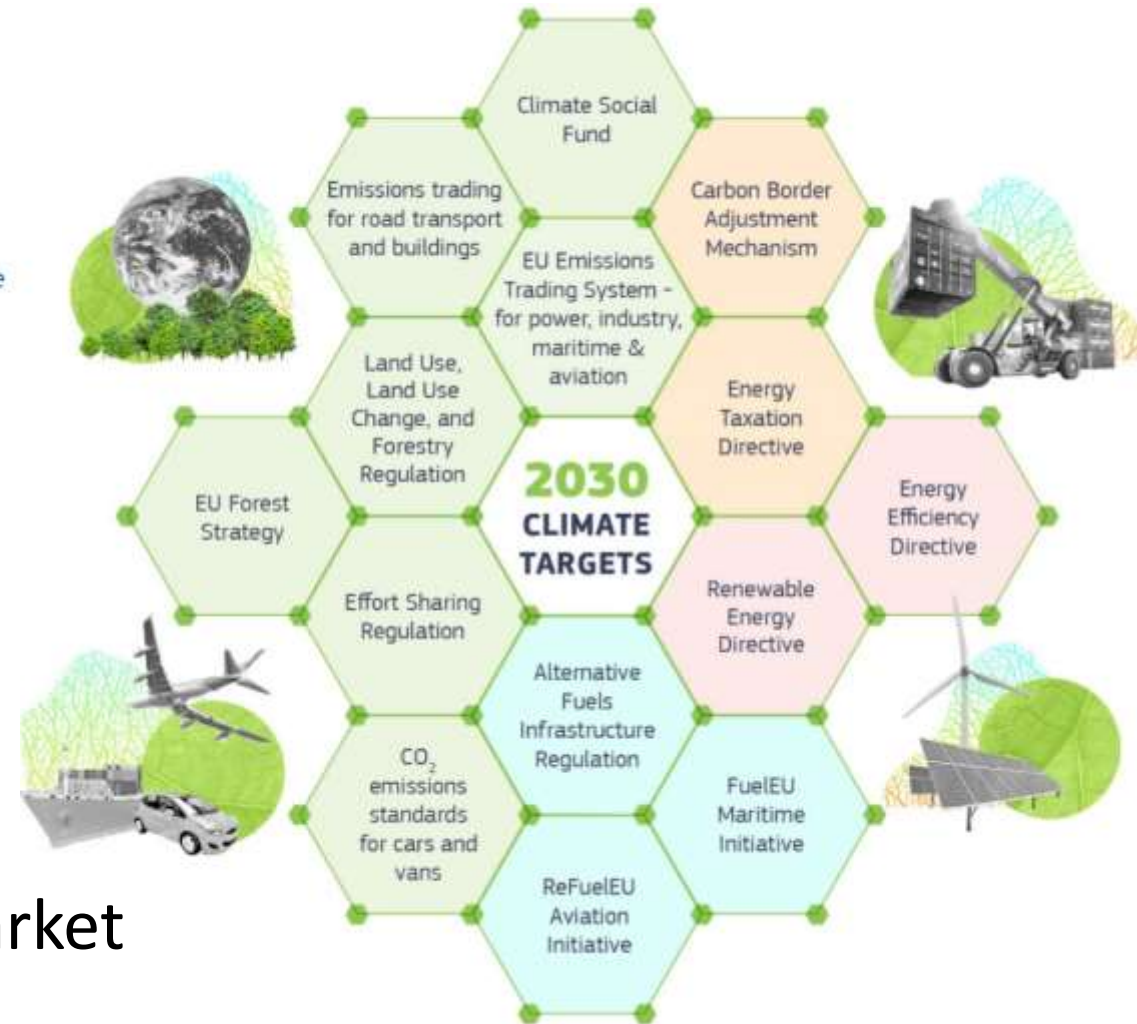
Help ensure a just and inclusive transition

➤ Fit for 55 Package

➤ REPowerEU

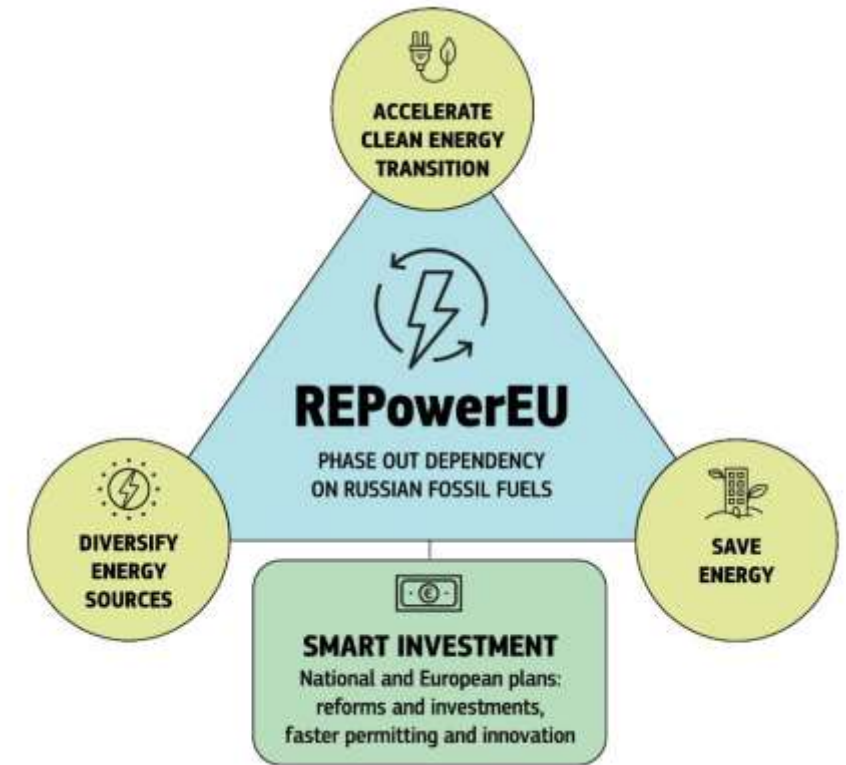
➤ EU Taxonomy

➤ Revision of the EU Electricity Market Design



# REPowerEU

- A massive **scaling-up and speeding-up of renewable energy in power generation**, industry, buildings and transport will accelerate our independence, give a boost to the green transition, and reduce prices over time.
- A dedicated **EU Solar Strategy** to double solar photovoltaic capacity by 2025 and install 600GW by 2030.
- Doubling of the rate of deployment of heat pumps, and measures to integrate geothermal and solar thermal energy in **modernised district and communal heating systems**.
- Recommendation to tackle slow and complex **permitting** for major renewable projects.
- Setting a target of 10 million tonnes of domestic **renewable hydrogen** production and 10 million tonnes of imports by 2030, to replace natural gas, coal and oil in hard-to-decarbonise industries and transport sectors.
- A **Biomethane Action Plan**.



COM(2022) 230 final

# Provisional Agreement to reinforce the Renewable Energy Directive (30.3.2023)

- Raises the EU's binding **renewable target for 2030** to a minimum of **42.5%** (aim 45%), up from the current 32% target and almost doubling the existing share of renewable energy in the EU.
- A larger share of renewables to achieve a decarbonised economy with massive scaling-up and speeding-up of renewable energy across power generation, industry, buildings and transport.
- Permitting procedures will be easier and faster under the new law. In areas with high renewables potential and low environmental risks, Member States will put in place **dedicated acceleration areas for renewables**, with particularly short and simple permitting processes.
- as a key energy-consuming sector, **industry is included for the first time in the Renewable Energy Directive**. The agreement establishes indicative targets (**1.6% of annual increase in renewable energy use**) as well as a binding target to reach **42% of renewable hydrogen** in total hydrogen consumption in industry by 2030. Targets for renewable energy use in transport (14.5% greenhouse gas intensity reduction or 29% share of renewable energy in final energy consumption), including a combined sub-target of 5.5% for advanced biofuels and renewable fuels of non-biological origin.
- Furthermore: provisions to support energy system integration via electrification and waste heat uptake; strengthened renewables targets for the heating and cooling sector; more sustainable use of bioenergy in line with ambitious climate goals.

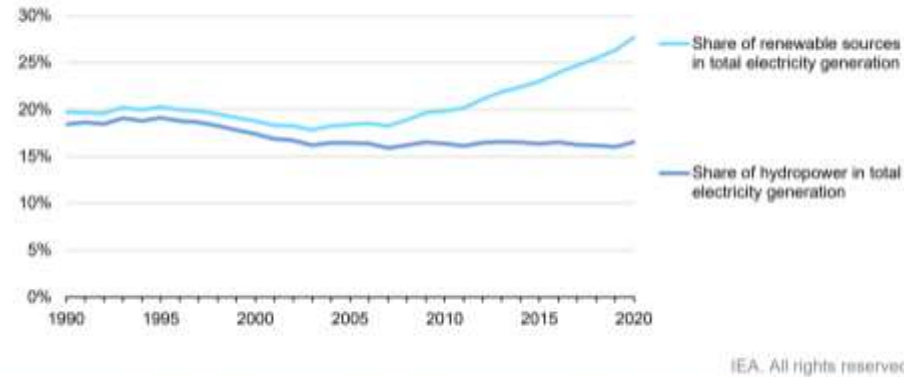


# Revision of the EU Electricity Market Design (Commission proposal)

- Revisions to several pieces of EU legislation – notably the **Electricity Regulation**, the **Electricity Directive**, and the **REMIT Regulation**.
- This reform, which is **part of the Green Deal Industrial Plan**, will also allow the European industry to have access to a renewable, non-fossil and affordable power supply, which is a key enabler of decarbonisation and green transition.
- It introduces measures that **incentivise longer term contracts** with non-fossil power production and bring more clean **flexible solutions** into the system to compete with gas, such as **demand response** and **storage**.
- It will give **consumers** a wide choice of contracts and clearer information before signing contracts for them to have the option to lock in secure, long-term prices to avoid excessive risks and volatility.
- Under the proposal, **rules on sharing renewable energy** are also being revamped. Consumers will be able to invest in wind or solar parks and sell excess rooftop solar electricity to neighbours, not just to their supplier.
- To improve the flexibility of the power system, Member States will now be required to assess their needs, establish **objectives to increase non-fossil flexibility**, and will have the possibility to introduce **new support schemes especially for demand response and storage**.
- Furthermore: reducing the risk of supplier failure (suppliers of last resort); facilitation of power Purchase Agreements; public support to new investments in the form of two way Contracts for Difference (CfDs);

# Global Hydropower Developments

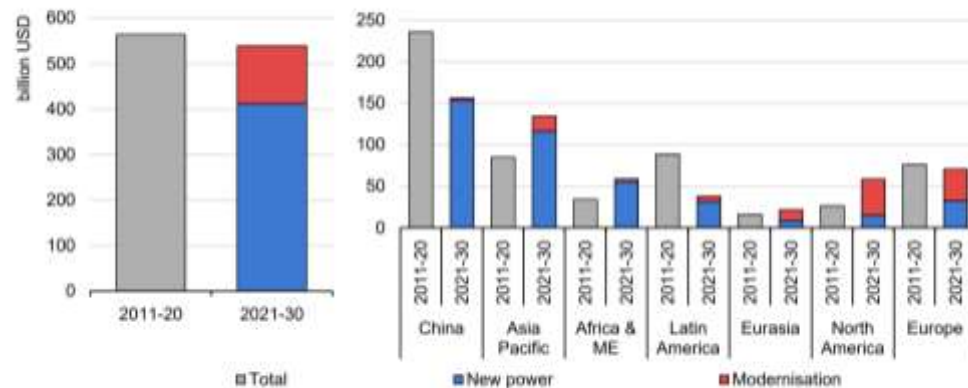
Figure 3.20 Shares of hydropower and total renewable sources in global electricity generation, 1990-2020



Sources: Based on IEA (2020a), World Energy Statistics and Balances 2020 (database); IEA (2021c), Global Energy Review 2021.

Source: IEA Hydropower Special Market Report 2021

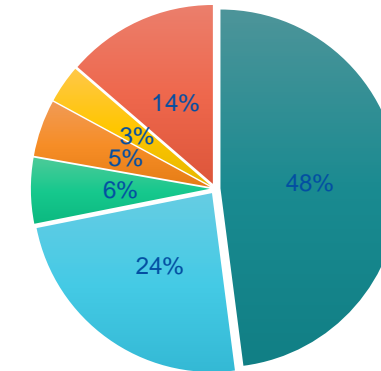
Figure 3.17 Hydropower capacity investment globally (left) and by region (right), 2011-2020 and 2021-2030



Notes: ME = Middle East.

Source: IEA Hydropower Special Market Report 2021

Global Exports in 2019 (878 M EUR)



■ EU ■ China ■ India ■ Brazil ■ USA ■ Other

Source: International Trade Center (ITC). Trade statistics for international business development 2020, in SWD(2020) 953 final.

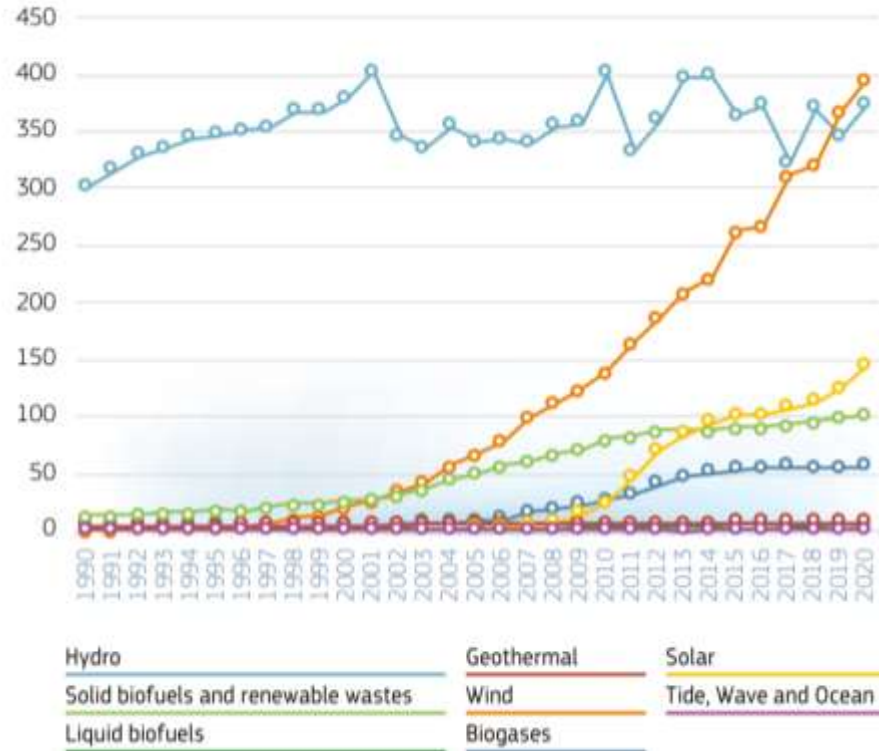
Research articles on hydropower 01/2016 – 08/2020



Source: ISI Web of Knowledge (jcr.clarivate.com), in SWD(2020) 953 final.

# Hydropower in Europe

BY FUEL: RENEWABLES – 1990-2020 (TWh)



source: Eurostat April 2022

- **Challenges and opportunities:**
  - Refurbishment
  - Flexible operation / grid balancing
  - Sustainability, e.g. water/river connectivity
- **Overall R&I strategy:**
  - long-term challenges require continuous efforts
  - maintain European hydropower research and industry value chains
  - Global cooperation on sustainable hydropower
- Limited potential of additional capacities, but high potential in energy system services
- Strong technology base



# Contribution of Horizon Europe to REPowerEU

Destination 2, 3, 4

- Cheaper and more performant renewable energy technologies (solar energy, wind energy, ocean energy, geothermal energy, hydro power, renewable fuels, heat pumps, solar heating)
- More flexible and resilient energy grids
- Better and smarter energy storage solutions

**Accelerate roll-out of renewable energy**

**Save energy / increase energy efficiency**

**Diversify energy supply**

- More energy-efficient building stock
- Increased energy efficiency in industry
- More efficient mobility solutions
- Cleaner and more efficient transport modes

- Broad portfolio of renewable energy technologies
- Maturing hydrogen-based solutions

# Hydropower in Horizon Europe Cluster 5

- **HORIZON-CL5-2021-D3-02-15** Support to the activities of the ETIPs and technology areas of the SET Plan
  - ***ETIP HYDROPOWER***
- **HORIZON-CL5-2021-D3-03-11** Development of hydropower equipment for hidden hydropower (EUR 10M)
  - ***H-HOPE***
- **HORIZON-CL5-2022-D3-03-08** Development of digital solutions for existing hydropower operation and maintenance (EUR 9M)
- **HORIZON-CL5-2023-D3-02-09** Demonstration of sustainable hydropower refurbishment (EUR 8M)
- **HORIZON-CL5-2024-D3-01-07** Development of hydropower equipment for improving techno-economic efficiency and equipment resilience in refurbishment situations (EUR 8M)
- **HORIZON-CL5-2024-D3-01-16** Demonstration of innovative pumped storage equipment and tools in combination with innovative storage management systems (EUR 8M)

# The Strategic Energy Technology Plan (SET Plan)

- *coordinating research and innovation across Europe*



Overall objective: Accelerating the development and deployment of low-carbon technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on common priorities, targets and actions.

## Priority Actions:

- 1&2. Improving performance and reducing cost of renewable energy
3. Smart solutions for consumers
4. Smart Resilience and Secure Energy System
5. Energy Efficiency in Buildings
6. Energy Efficiency in Industry
7. Batteries and e-Mobility
8. Renewable Fuels and Bioenergy
9. Carbon Capture Utilisation and Storage
10. Nuclear Safety

### Defining priorities

- SET-Plan Communication 2015

### Setting targets

- Declaration of Intent

### Implementation Plans (IP)

- Temporary Working Groups

### Execution of IPs

Hydropower:  
2013 Technology Map of the SET-Plan  
2014 Towards an Integrated Roadmap





# Thank you for your attention!

Contact: [helene.chraye@ec.europa.eu](mailto:helene.chraye@ec.europa.eu)

# **Keynote 1: The potential for hydropower in the context of current EU policies**



Mathilde Lallemand -  
Policy Officer,  
European  
Commission,  
DG ENER



# Electricity market design

Mitigating the impact of high gas prices on electricity bills, protecting consumers and boosting RES investment

# Feedback from public consultation

- Strong **support** to the way **short-term markets** work.
- Consensus on the **need to complement** the short term market with more **long-term** tools.
- **Investor certainty** is key to achieve the necessary investments.
- **Flexibility** should be further developed
- General call to avoid making the emergency measures part of the electricity market design.



# Pillars of the reform

- **Better protect and empower consumers**
- **Enhance stability and predictability of the cost of energy contributing to the competitiveness of the EU economy**
- **Accelerate the integration of renewables with flexibility services**
- **Better energy market monitoring and surveillance (REMIT)**

# Enhance stability and predictability of the cost of energy contributing to the competitiveness of the EU economy

**Problem:** *Energy bills can be overly impacted by short-term electricity prices (now often driven by - volatile fossil fuel costs), with severe impact on EU households and economy. Investors in fossil-free generation require predictability and stability of revenues.*

## Power Purchase Agreements (PPAs)

- **Facilitate** an incentivize PPAs
- **Address obstacles** such as default risk
- Possibility to combine RES tenders and PPAs

## Two-way Contracts for Differences (CfDs) for public support for new investments

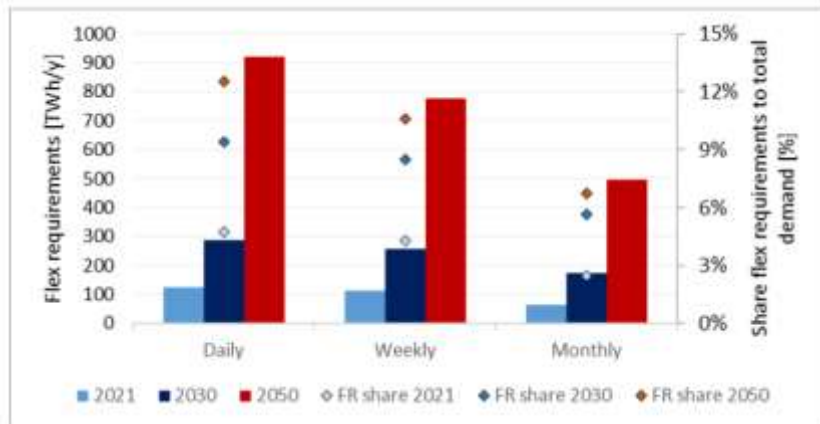
- For solar, wind, geothermal, hydro without reservoir and nuclear energy .
- **Collected revenues** to be distributed to final customers

## Improve liquidity of forward markets

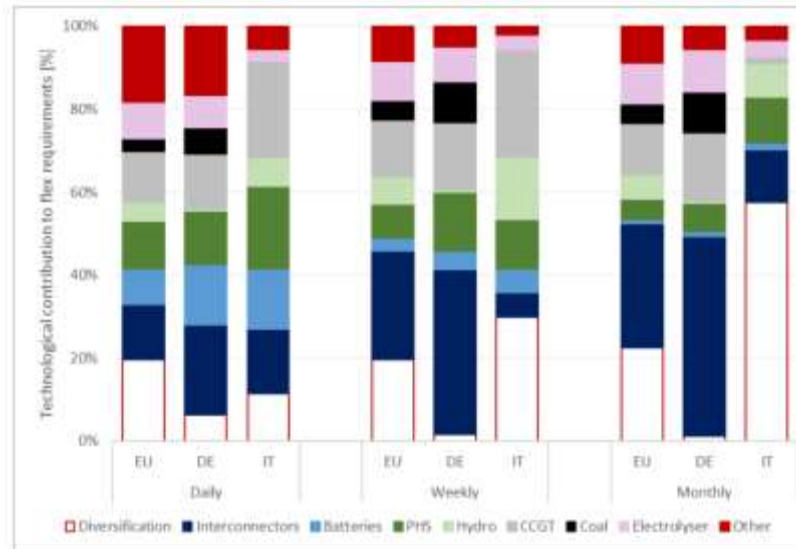
- Create "**virtual hubs**" with regional reference prices.
- TSOs to issue "**zone-to-hub**" **transmission rights** for the following 3 years.

# Accelerate the integration of renewables with flexibility services

*Increasing share of renewables needs to be balanced with non-fossil flexibility (such as demand response, storage) in order to achieve decarbonisation.*



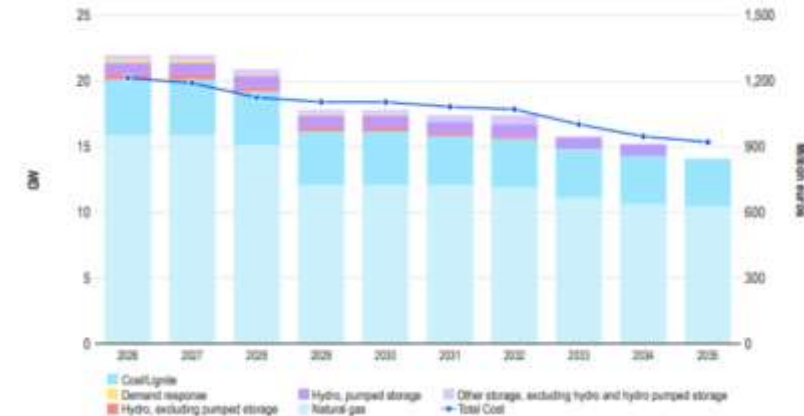
*Increase of flexibility needs, source: JRC*



*Technological contribution to flexibility requirements in 2030, source: JRC*



*Daily flexibility needs to double between 2021 and 2030, source: JRC*



*Coal/lignite and natural gas dominate long term contracted capacity in the EU 27 for 2026-2035, source: ACER*



# Accelerate the integration of renewables with flexibility services

## Enhance non-fossil flexibility sources, such as demand response and storage

- Assess the **need for flexibility** in the electricity system
- **Indicative national objective** for demand side response and storage.
- MS may apply **support schemes** for available non-fossil flexibility capacity.

## Enhance the use of flexibility services by system operators

- **Peak shaving product**
- **Transparency on** connection capacity and connection requests
- **Network tariffs** to incentivize the use of flexibility services

## Create more opportunities for trading (of renewables and flexible sources)

- Cross-border intraday trading closer to real time

# Thank you

# Keynote 2: The important role of hydropower development in the European safe energy transition



Ana Paula Moreira – Head of  
Engineering, EDP Generation





# Coffee Break

10.10-10.30

## Session 1: The added value of hydropower and energy storage in the energy transition and within the energy crisis

10.30-11.15



Ghislain Weisrock –  
Special Advisor, France  
Hydro Electricité



Sera Lazaridou - Senior  
Partner, Hydroexigiantiki  
Consulting Engineers  
Greece



Peter Lustenberger –  
Senior Expert Asset  
Management, AXPO  
Power Switzerland





Centrale de Nyer (66) – Trophées de la petite hydro 2018

# ETIP Hydropower day 2023

Hydro contribution to flexibility  
Key role and market model

France Hydro Electricité, Ghislain Weisrock  
Etude Compass Lexecon



# 2050 Net zero system

- Decarbonizing power system :
  - Variable RES main source (80%)
  - Massive need of flexibility
- **Flexibility**
  - Globally: balancing variable RES from storage to frequency control (50 Hz)
  - Locally: voltage control on distribution grid as energy collector and grid congestion

**New paradigm**

**flexibility sources independent from energy sources**



# Hydro key role

- **Pumped-storage and reservoirs** PP with very high dynamics,
- **Pondage** (2 hours storage) **and run-off river** PP with modulation capacities (millions of batteries)
- **Small hydro** (on top of 3 EU hydro sources with FR, SE) modulation, **small PSH** in order to connect more variable RES on local grid (thousands of batteries)
- Voltage control, voltage compensator, black start, inertia...

**What if no hydro on the European power system ?**

Risk of breakdown...Worse when conventional will be decommissioned

# Compass Lexecon study 2020



- On behalf of France Hydro Electricité

- Fabien Roques Compass Lexecon
  - Energy economist, Paris Dauphine university, International Association of Energy Economist
- France Hydro Electricité : French small hydro association
- Large hydro : EDF-Hydro, CNR, SHEM
- ADEME : French ecology transition agency



- **Hydro as historical source of flexibility** but technology neutral study

1. **Future flexibility need on a long term horizon 2050**

- French interconnected power system model
- Flexibility challenges on transmission and distribution grids

2. **Future business model :**

**Which signal to improve existing capacities and to invest in flexibility development ?**



# French power system 2050 : huge flexibility needs

- After RES breakup as Europe
  - Two scenarios: 82% RES + 6% nuc versus 66% RES + 23% nuc
  - Depending on ability of cross-border connection development and demand control
- Flexibility need
  - Balancing: residual demand + forecast errors + dynamic hazards
  - Daily: from 5 GW currently to 40 GW in 2050 (8 times)
  - Weekly: from 100 GWh to 700 GWh (7 times)
- Massive development of flexible capacities: 3,5 to 4,5 G€/y
  - **Existing hydro reservoir: + 900 MW (+10%)**
  - **Pumped storage from +5GW to + 10 GW (existing 5 GW)**
  - OCGT (biofuel) +27 GW, batteries +29 GW, P2G2P + 16 GW

**No technology profitable: 1 to 2,2 G€/y missing**

**Same result all over Europe**



# Current flexibility remuneration weaknesses

- Hedging residual demand – forecast errors
    - **Spacetime of market blocks** Eg : very fast hydro ramping
  - Managing hazards
    - **Insurance value of available capacities** Eg: hydro ready to start even when stopped and not on the market.  
Dispatcher and trader cool while hundreds MW on hand.
  - Ancillary services
    - **Free ancillary services:** DSO voltage control, capacity for grid congestion, black start Eg: hydro as adjustment tool
  - Capacity mechanism but no flexibility mechanism
    - **Long term signal for flexibility capacity :**  
not only enough power capacity but power capacity just in time
- Lack of investment signal and valuing existing flex**







## PSH case

- Current French NECP: + 1,5 GW before 2030
- No PSH profitable as in Europe with current market design and ancillary services : which kind of support?
- PSH = storage + flexibility services + out of market values (TSO, balance perimeter)
- Design of PSH services = energy transfer volume + pump mode modulation ability + speed of mode change + synchronous compensator + TSO/DSO (small PSH)
- Fair competition among investment cost varying up to +40%?

**Public authorities (TSO, DSO) have to plan services required**

- **Operation on market. What about investment?**
  - Marginal facility with high CAPEX: pay as clear not efficient
- **Technology neutral but optimization of each technology performances**
  - Best public cost
  - Best grid services
- 1. **CfD on energy transferred: hedging market risk**
  - Long term market forecasting uncertainty
  - Decarbonization implementation uncertainty
  - Weir prices due to erratic RES (high prices during off-peak)
  - Storage paradox: more RES / more storage needs / less hours with fuel reference
- 2. **Capacity aid : future are CAPEX**
  - Valuing all flexibility services
  - Decarbonized power system driven by CAPEX (RES, storage, flex) no longer fuel cost (EOM)
- 3. **Mix of CfD and capacity aid**


**Market design to be suitable to all flexibility sources**

**All hydro first**

**From storage to small hydro, existing and new one**







Lac Blanc – lac Noir  
The oldest European PSH  
100 MW decommissioned  
A project waiting for support



# Thank you for your kind attention



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75008 Paris  
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# HYDROPOWER AND ENERGY STORAGE IN GREECE

## STATUS, PERSPECTIVES AND BENEFITS FOR THE LOCAL COMMUNITIES

Sera Lazaridou

Civil Engineer MSc, DIC  
ICOLD European Club President



Hydroexigiantiki  
Consulting Engineers

Christos Dimou

Civil Engineer PhD,  
GCOLD Vice-President



Public Power  
Corporation S.A.



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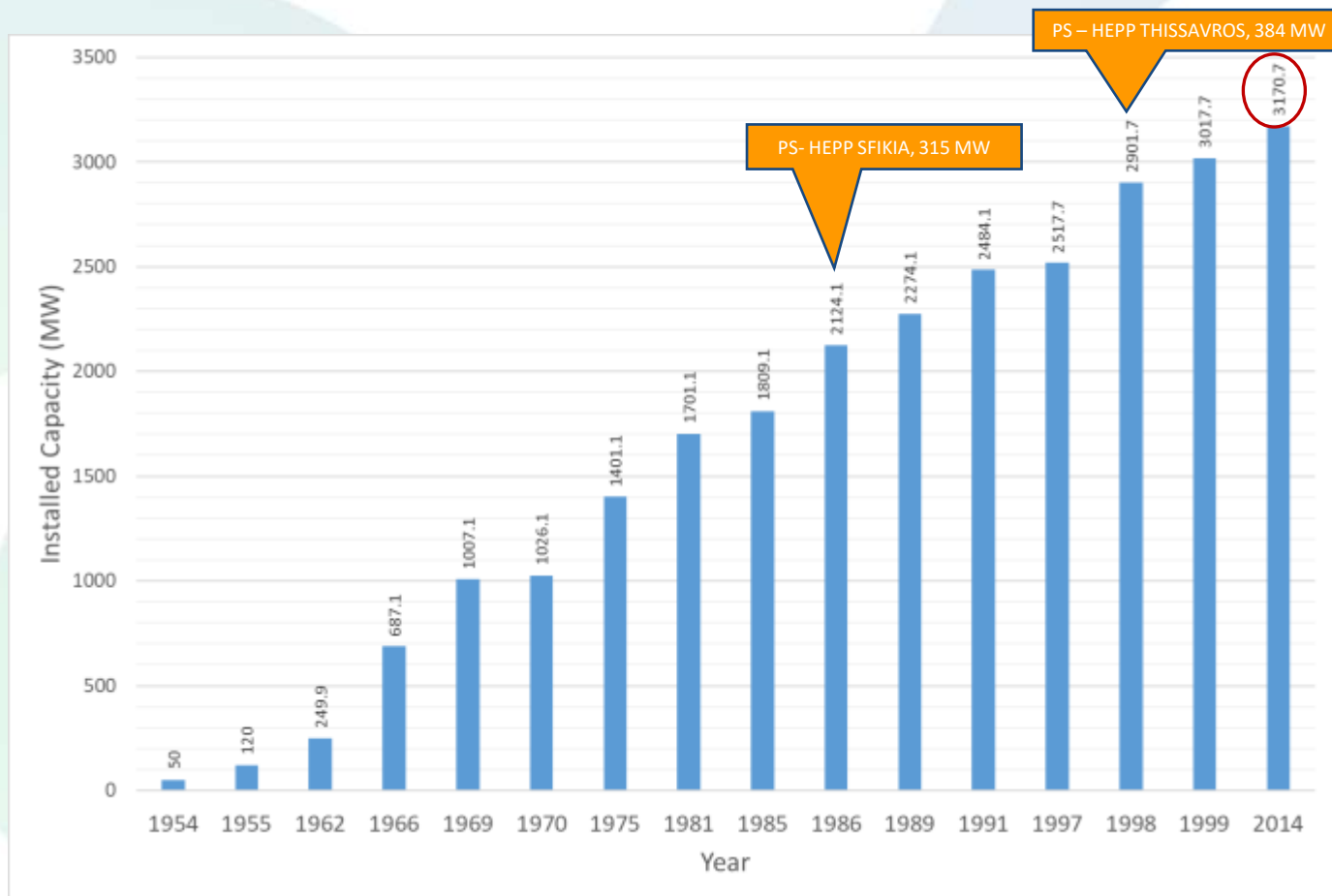
# HYDROPOWER AND ENERGY STORAGE IN **GREECE**: STATUS, PERSPECTIVES AND BENEFITS FOR THE LOCAL COMMUNITIES - **PRESENTATION OUTLINE**

- 01- HYDROPOWER AND PUMPED STORAGE HYDRO STATUS IN GREECE**
- 02- ENERGY MIX AND PENETRATION OF RENEWABLES**
- 03- POTENTIAL DEVELOPMENT FOR THE ENERGY TRANSITION**
- 04- MULTI PURPOSES AND THEIR BENEFITS FOR LOCAL COMMUNITIES: THE CASE OF HEPP TAVROPOS**
- 05- REMARKS**



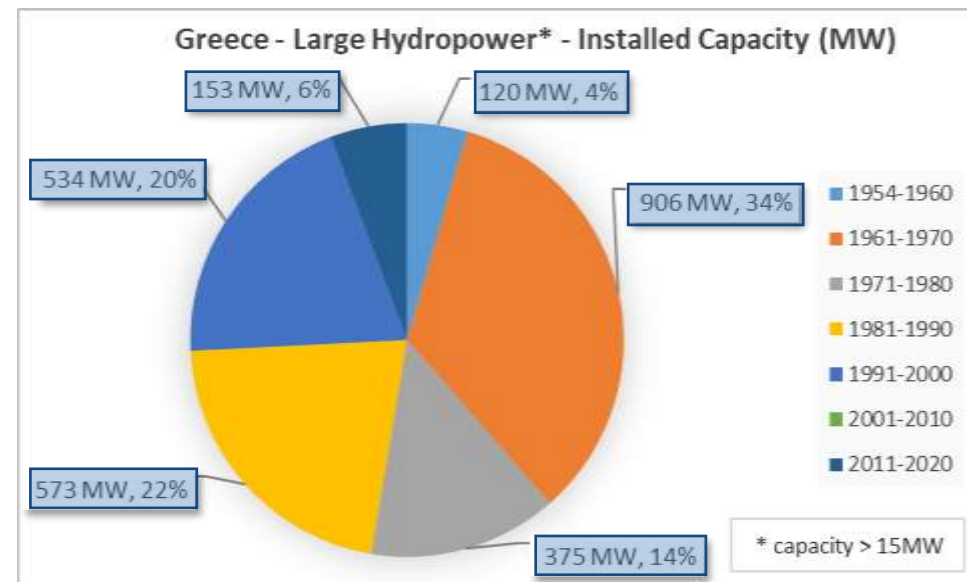
# 01- HYDROPOWER AND PUMPED STORAGE HYDRO STATUS IN GREECE

## Large Hydropower installed capacity (MW) - PPC



Source: PPC SA

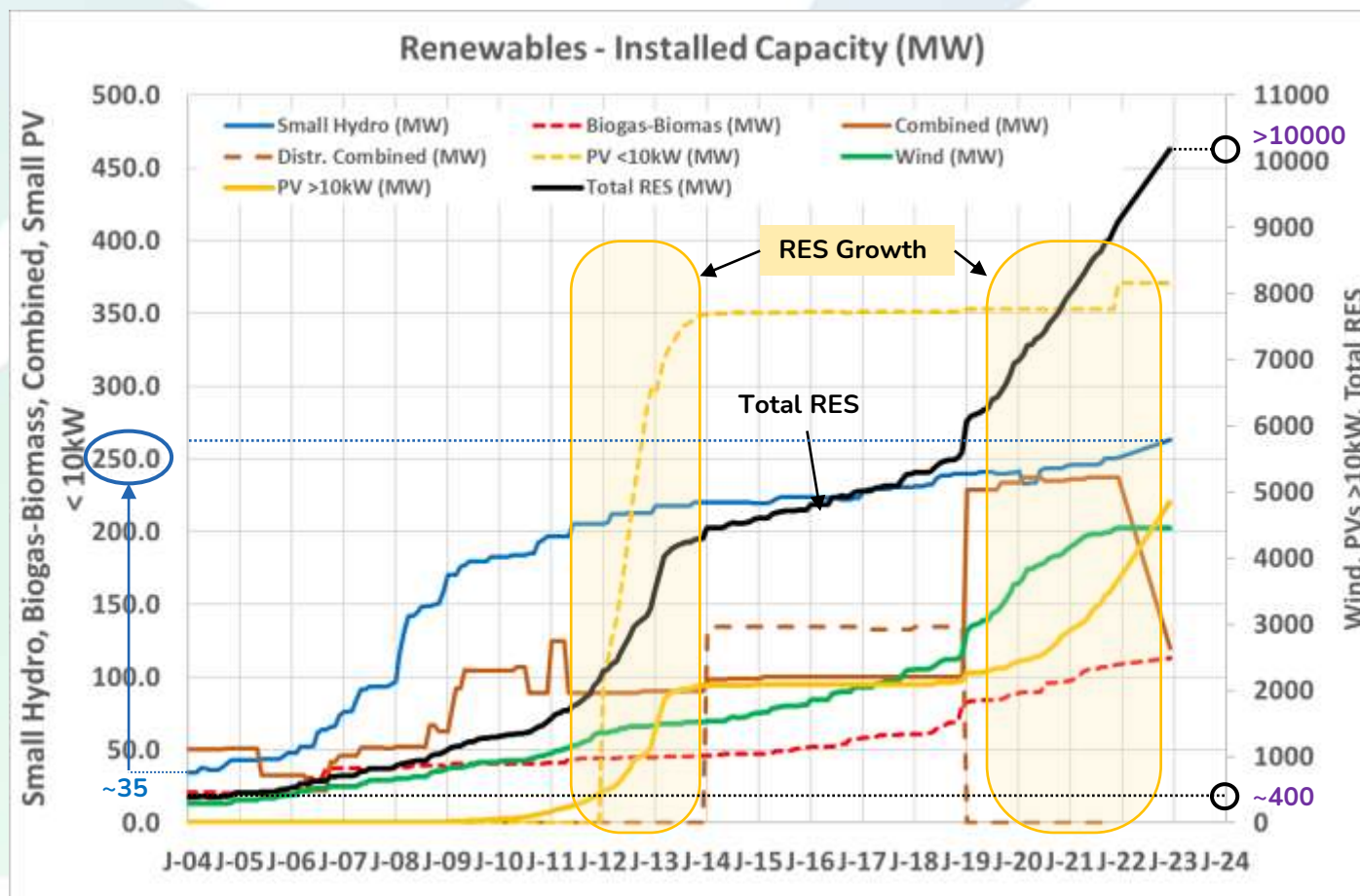
16 Large HEPPs: ~3.2 GW  
Net Reservoir Volume ~ 5700 mcm



PS - HEPPs: Sfikia & Thissavros  
699 MW Generating Capacity

## 01- HYDROPOWER AND PUMPED STORAGE HYDRO STATUS IN GREECE

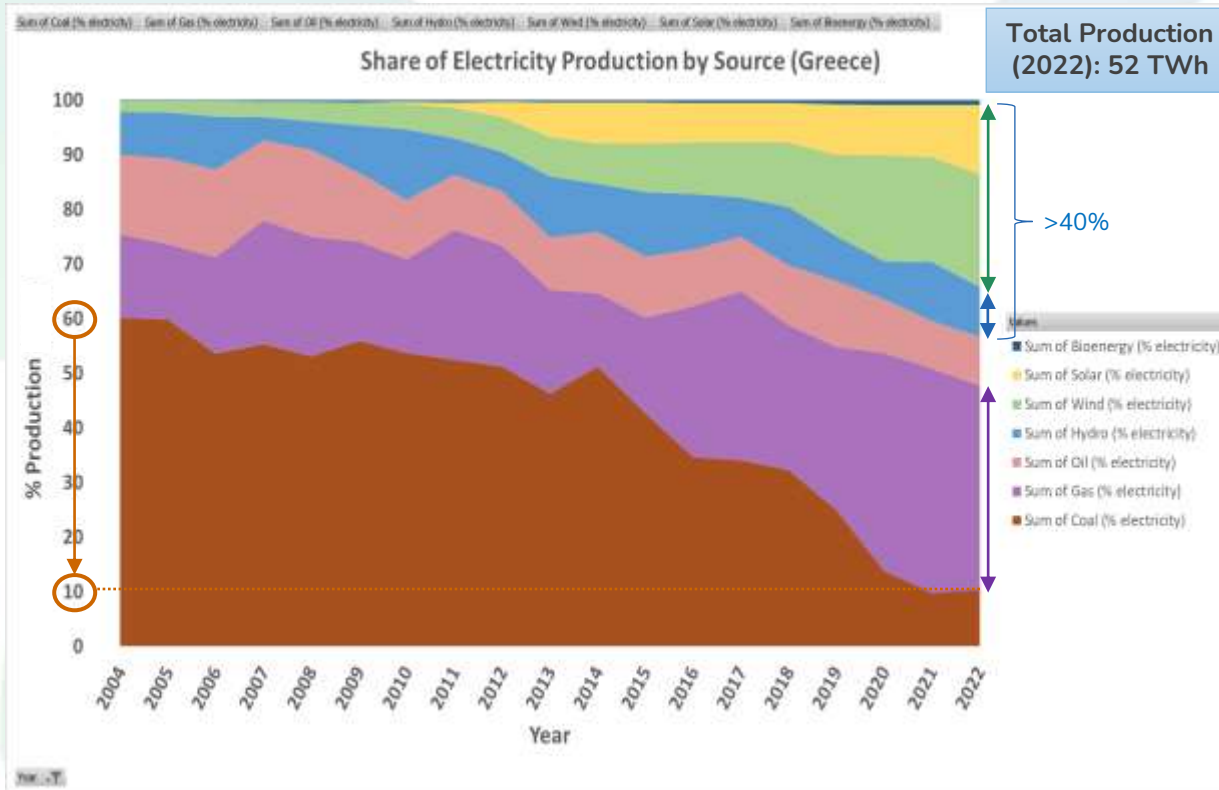
### Renewables (excl. large hydro) - Installed Capacity (MW)



Source: <https://www.dapeep.gr/>

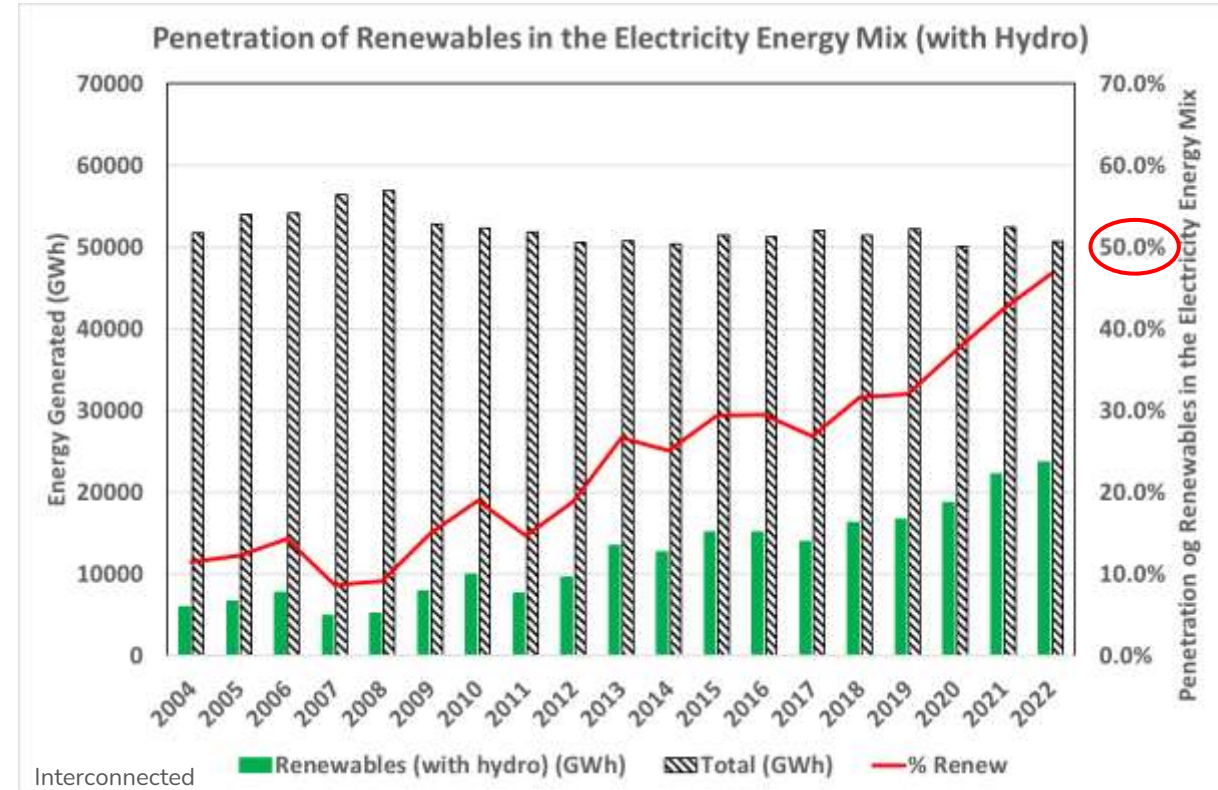
- ❖ RES (excl. large hydro) nameplate capacity increased from ~400MW (2004) to over 10GW (2022).
- ❖ Wind and solar have a share reaching ~90% of total nameplate capacity by RES (excl. large hydro).
- ❖ SHEP nameplate capacity increased but its share has reduced compared to wind and solar.

## Electricity (domestic) Production by Source (GREECE)



Source: Our World in Data based on BP Statistical Review of World Energy (2022). Ember (2023)

Electricity energy mix



Interconnected

Sources: <https://www.dapeep.gr/> & <https://www.admie.gr/>

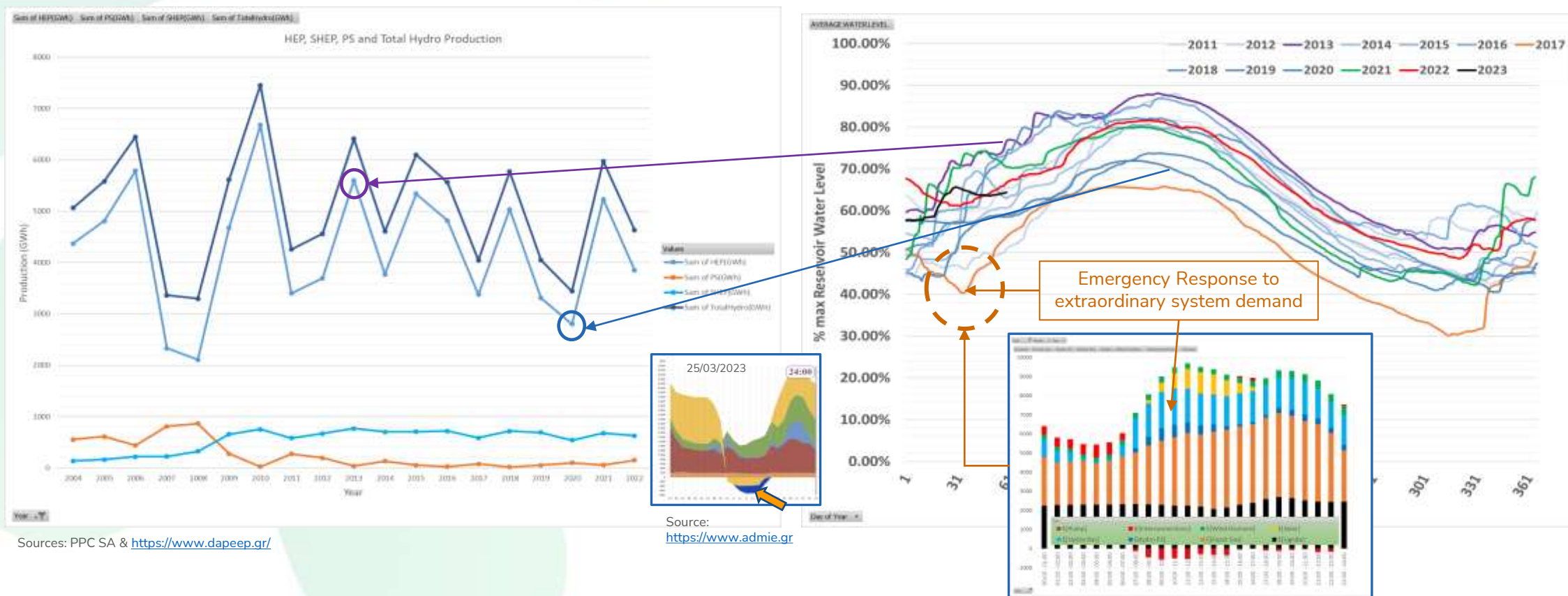
Electricity energy mix - Interconnected



## Electricity Generation by Total Hydro (GWh) – Water & Energy Reserves

Total Hydro - HEP + PS + SHEP (GWh)

Average reservoir levels in Large Hydropower (PPC)

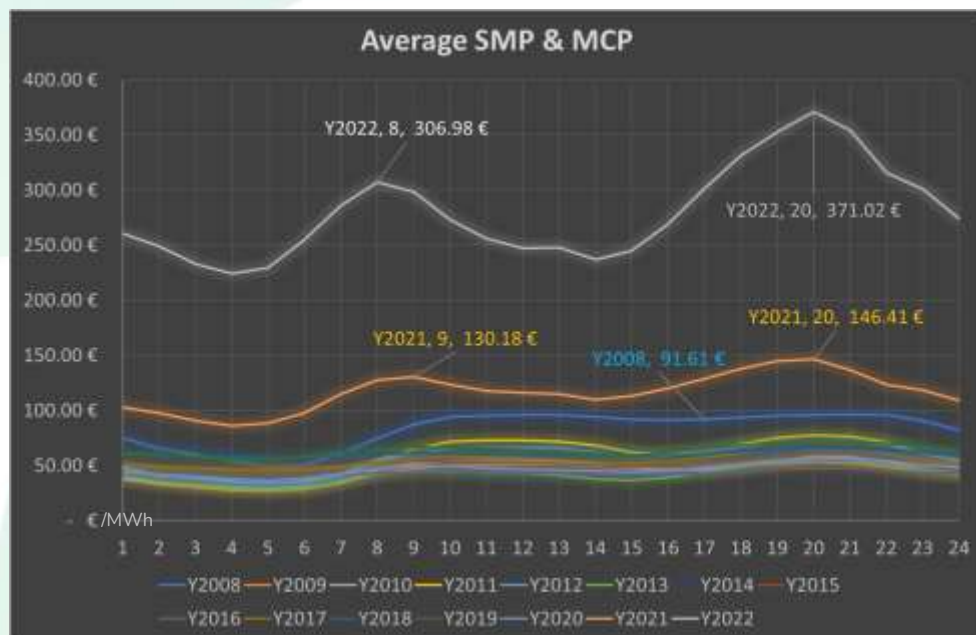




## 03- POTENTIAL DEVELOPMENT FOR THE ENERGY TRANSITION

### New National Energy & Climate Plan main objectives & targets (2030):

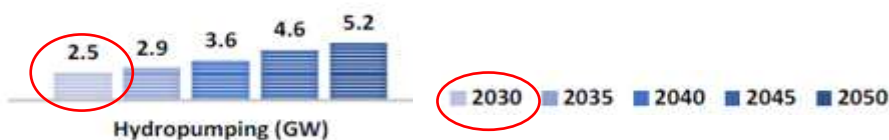
Energy Crisis - Average Hourly Prices, 2021-2022



Source: <https://www.enxgroup.gr/>

- ❖ Share of energy from renewable sources in gross final consumption for electricity (%): ~61-64% (NECP, 2019) → ~80%(NECP, 2023\*)

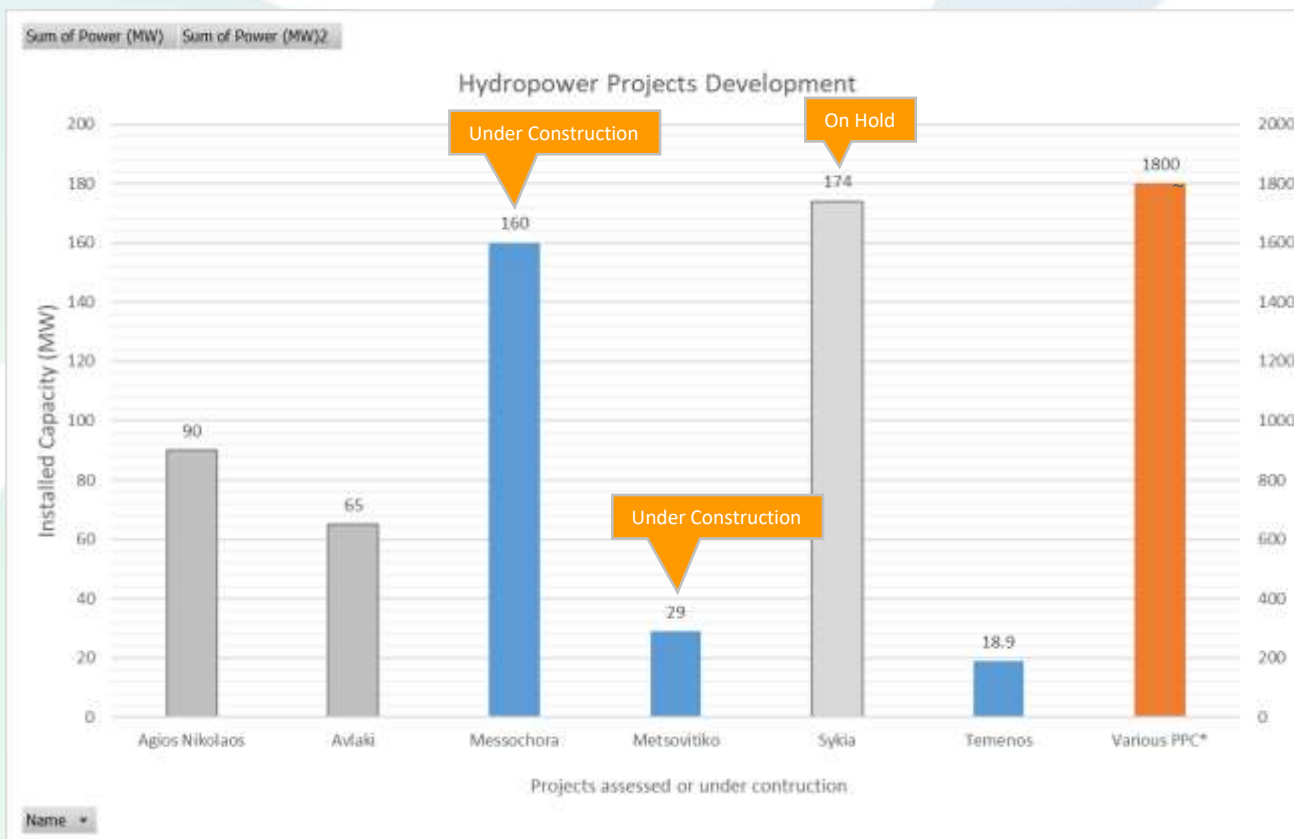
- ❖ Promoting storage systems: 8GW (2023\*), PS-HEPPs at 2.5 GW



- ❖ **Hydropower Nameplate Capacity** in ENCP 2023\* for 2030 at **4GW** (3.9GW in ENCP 2019), **hydro production** increases from 6.6TWh (ENCP 2019) to **7.1TWh** (ENCP 2023\*).
- ❖ Total net capacity in 2030 is predicted to increase to 36.1GW. This makes energy storage crucial.

\* **New NECP, expected to be issued to update 2019 NECP. Information provided is according to published data from the Ministry for the Environment and Energy (01/2023)**

## Perspectives in Large (and Small) HEPP Development (MW)



Sources: Georgiopoulos – Dimou, 2017 & Stefanakos 2021

**SHEPPs\*\*:** ~ 110 MW (installation permit), ~ 135 MW (with environmental permit), ~ 600 MW (production permit)

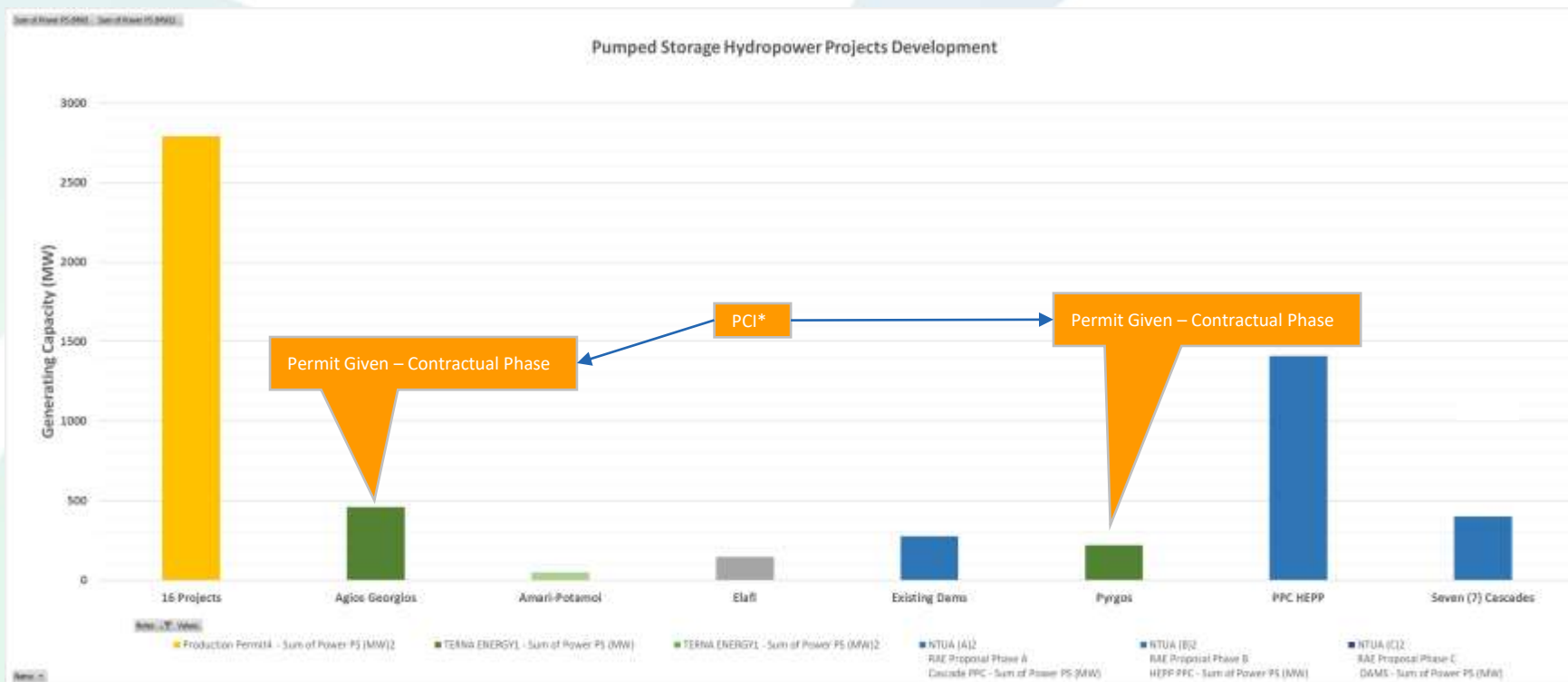
- ❖ Currently, ~32% of technically exploitable hydropotential has been tapped.
- ❖ Two conditional hydropower projects (PPC) are currently under construction, adding ~190MW.
- ❖ Several other projects in a mature, late design phase or on hold of construction could add another ~ 350 MW of hydro nameplate capacity.
- ❖ These projects could upgrade technically hydropotential exploitation up to ~ 40%.

Name	Type	Power (MW)	Prod. (GWh/a)	Reservoir Net Capacity (mcm)	Notes
Messochora	RES	160	365	228	Contr.
Metsovitiko	ROR	29	51.89	0.26	Constr.
Temenos	RES	18.9	62	11.35	Late Des
Avlaki	RES	65	225	250	Design
Agios Nikolaos	RES	90	320	60	Design
Sykia	RES	174	390	300	Contr. - Hold
Assessed PPC*	RES	~1800	~4850	-	Various

\* Assessed by PPC at various stages, Stefanakos (2021)

\*\* Papachristou, RAE - Regulatory Authority for Energy, 2023

## Perspectives in PS – HEPP Development (MW)



Sources: Stefanakos 2013, & Dimou, 2019, & <https://www.rae.gr/>

\* Project of common interest (PCI), [https://ec.europa.eu/energy/infrastructure/transparency\\_platform/map-viewer/main.html](https://ec.europa.eu/energy/infrastructure/transparency_platform/map-viewer/main.html)

NTUA (A)2: Seven (7) Cascades of PPC HEPPs reservoirs under study.

NTUA (B)2: Fifteen (15) upper reservoirs assessed, with seven (7) existing PPC HEPPs as lower reservoirs.

NTUA (C)2: DAMS – Investigation of existing dams (other than Hydro) as lower reservoirs

Two projects are currently under construction (TERNA), adding ~680 MW of generating capacity.

Name	Type	Power PS (MW)	Notes
Pyrgos	PS	220	TERNA ENERGY <sup>4</sup> Storage Permit
Agios Georgios	PS	460	TERNA ENERGY <sup>4</sup> Storage Permit
Amari-Potamoi	HY	50	TERNA ENERGY <sup>5</sup>
Elafi	PS	147	PPC SA <sup>1</sup>
Seven (7) Cascades	PS	400	NTUA (A) <sup>2</sup> RAE Proposal Phase A Cascade PPC
PPC HEPP	PS	1410	NTUA (B) <sup>2</sup> RAE Proposal Phase B HEPP PPC
Dams Existing	PS	275	NTUA (C) <sup>2</sup> RAE Proposal Phase C DAMS
16 Projects	PS	~2790	Production Permit <sup>3</sup>

<sup>1</sup> Final Design

<sup>2</sup>NTUA. 2010. Investigation of the potential for Realization of Energy Storage Units via Pumped-Storage Hydro-Electricity Power Plants in regions of the Interconnected Grid of Greece. Research funded by the Regulatory Authority for Energy. RAE code O-22217.

<sup>3</sup> RAE (Regulatory Authority for Energy) storage permits including a pump storage project in lignite mine (data retrieved 10/04/2023).

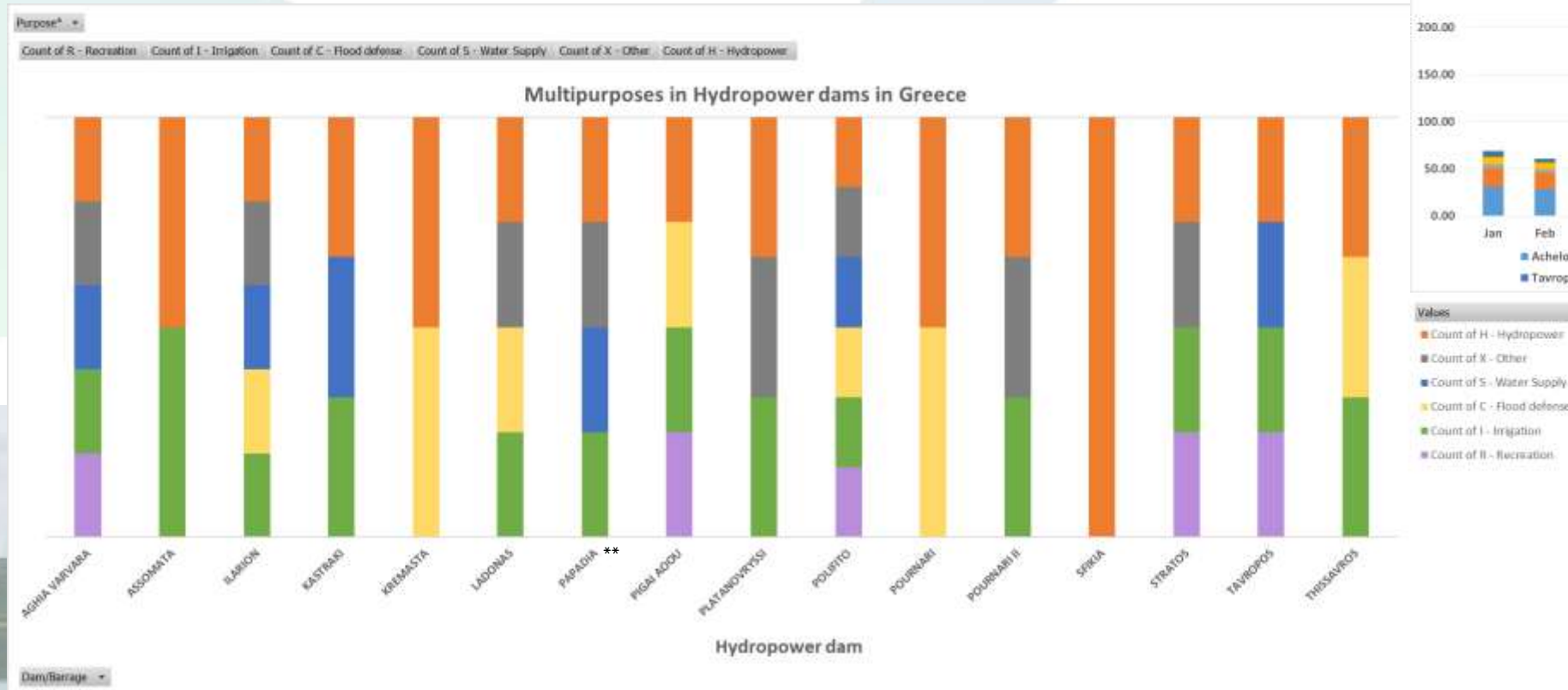
<sup>4</sup> Contractual Phase

<sup>5</sup> Licensing Stage



## 04- MULTI PURPOSES AND THEIR BENEFITS FOR LOCAL COMMUNITIES

### Multiple purposes of hydropower dams in Greece

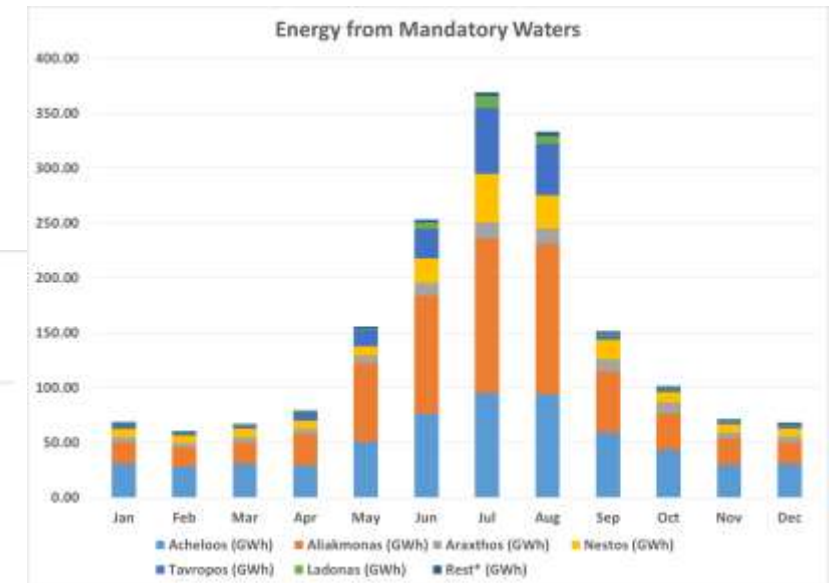


Source: WRD ICOLD / Greece & Application of WFD 2007/60 Directive in Greek River Basins

Note 1: Abbreviations are based on ICOLD World Register of Dams, X-Other: environmental flows and water for thermal plants

Note 2: The Energy Regulatory Authority (RAE) defines maximum and minimum reservoir safety water levels for maximum energy production and flood defense (par. 4 art.18 Law 4425/2016 & par.3 art. 21 Balancing Market Rulebook).

\*\*SHEP



Source: Dimou, 2019.

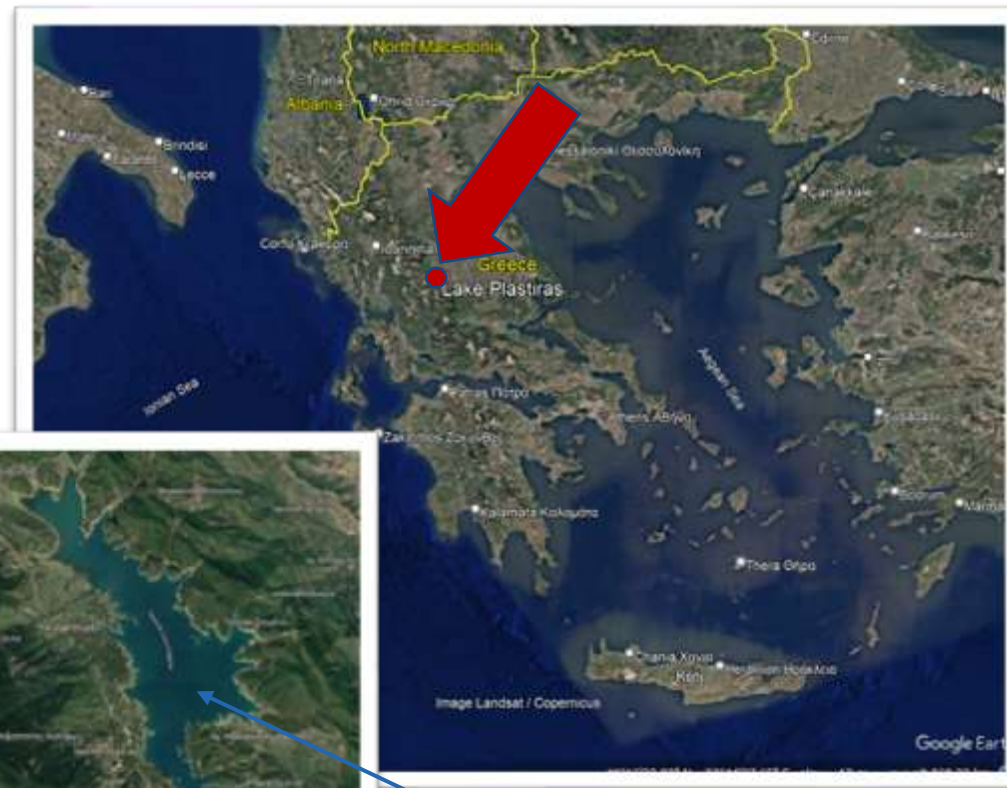
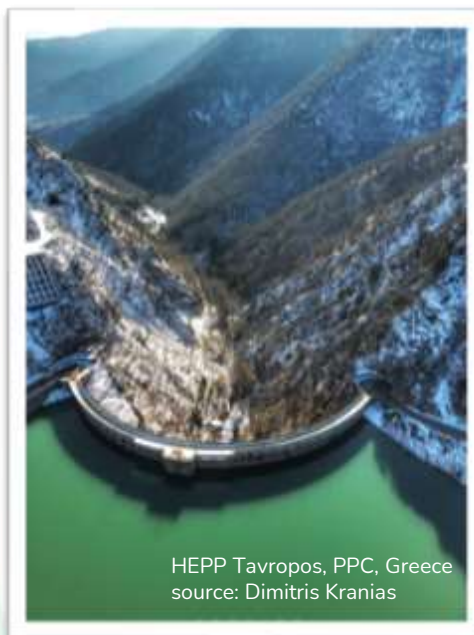
- ❖ Eco flows correspond to roughly 40% of the total mandatory water demand.
- ❖ Annual supply to serve potable water needs and irrigation purposes is ~30% of net reservoirs capacity.

Pigai Aouu HEPP reservoir, PPC, Greece  
source: Sera Lazaridou

## 04- MULTI PURPOSES & THEIR BENEFITS FOR LOCAL COMMUNITIES: THE CASE OF HEPP TAVROPOS

HEPP TAVROPOS: A multipurpose dam in Thessaly, central Greece

- 3<sup>rd</sup> oldest large HEP, commissioned in 1962
- Construction period 1955-1959
- Double curvature arch dam, 83m high
- Owned by PPC
- Purposes:
  - Power generation
  - Irrigation
  - Water Supply
  - Recreational activities
- Installed capacity: 130MW
- Head: 577.00m
- Max PP: +792.00,
- Min PP: +786.00 (+784.00)



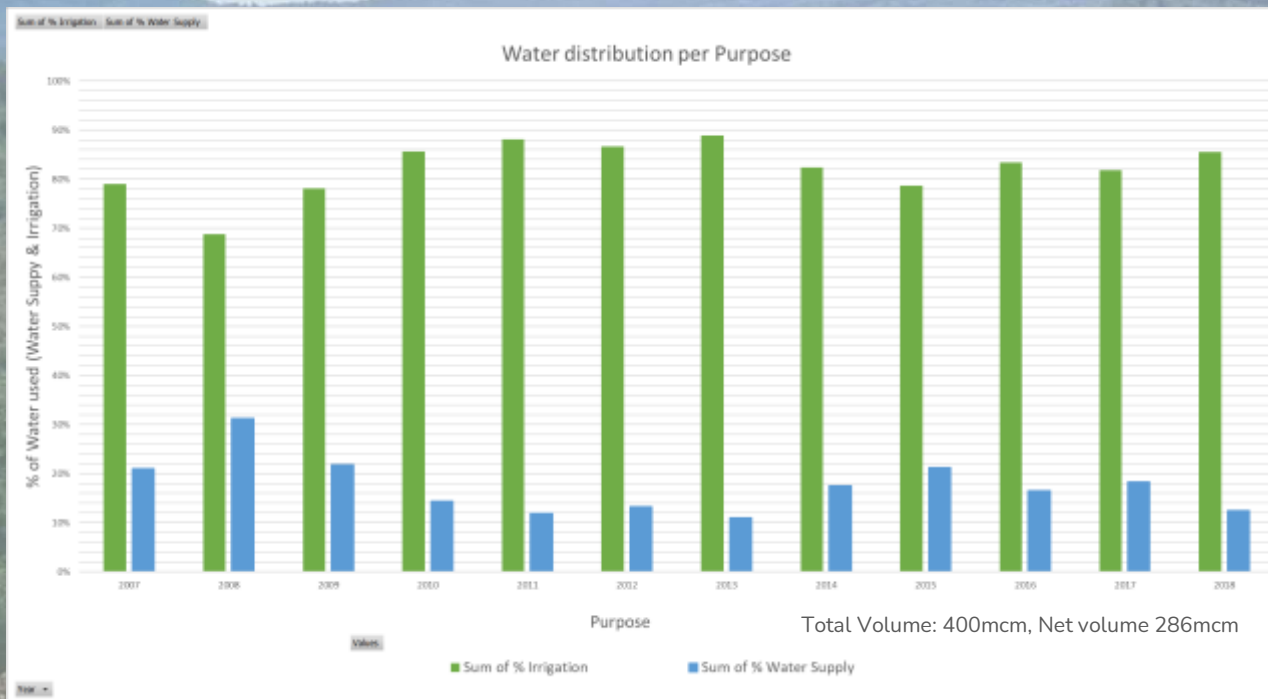
Lake Plastira

Tavropos Dam



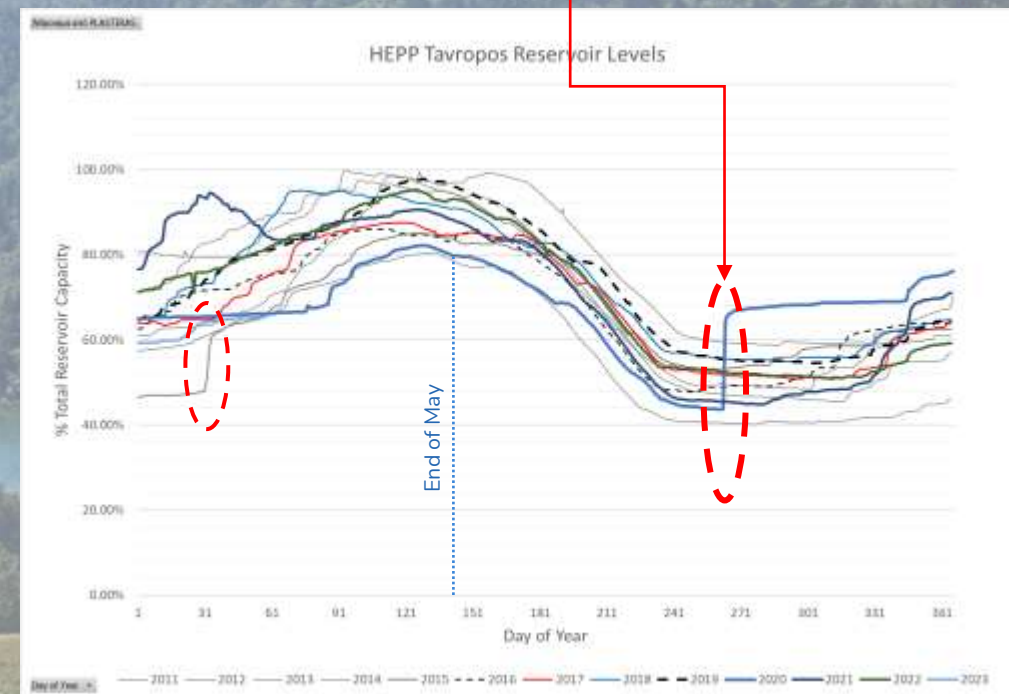
## 04- MULTI PURPOSES & THEIR BENEFITS FOR LOCAL COMMUNITIES: THE CASE OF HEPP TAVROPOS

### Irrigation & Water Supply from Plastiras lake



Source: Hydroexignatiki SA, EIA, 2019.

### Flood Storage - Mediane lanos



Source: PPC SA



## 04- MULTI PURPOSES & THEIR BENEFITS FOR LOCAL COMMUNITIES: THE CASE OF HEPP TAVROPOS

### Touristic development – Recreation Activities



Identified as a Special Area of Conservation (SAC) for the Natura 2000 network

- ❖ Hydro - Potential exploitation
- ❖ PS-HEPPs for energy storage using indigenous sources
- ❖ On going development
- ❖ Multiple uses and Benefits
- ❖ Community and Industry Interrelations



# REFERENCES - ACKNOWLEDGEMENTS

## THANK YOU

**Acknowledgements:** Dr J. Stefanakos (f. Ass. Prof., NTUA), Ms. Yioula Tsiknakou (TERNA ENERGY)

### References

- Anagnostopoulos, J, Papantonis D., 2013. School of Mechanical Engineering, NTUA. 2013. Store Project - Facilitating energy storage to allow high penetration of intermittent Renewable Energy.
- Argyrakis, I., PPC HEPPs and their contribution in water resources management.
- Dimou, C., 2019. Pumped Storage HEPPs in an Evolving Landscape - The Case of Greece
- Dimou, C., 2019. The Role of Hydro Power in ensuring the stability of the Electric Grid
- Georgiopoulos, D., Dimou, C., 2017. Aspects of Development of future Hydro Projects in Greece 2015-2040
- Hydroexigiantiki SA, 2019. EIA of an alternative water intake and pipeline from lake Plastira to ensure water supply.
- Leris G. 2007 – PPC SA Hydropower Stations – An Overview (in Greek)
- Papachristou, D., RAE, The role of RES and SHEP in the energy crisis, Verde.Tech, 03/2023
- Sakellari, I., Dimou, C. et al, 2019. Hydro Potential in Greece, a Review of Development and Perspectives - Comparison with other European Countries
- Skrekas K., Ministry of the Environment and Energy, 2023. The New NCEP (Power Point presentation)
- Stefanakos, J., 2021. Large and small HEPPs. Their role in the energy system of Greece.
- Stefanakos, J., 2016. Why we must built more large hydros in Greece? A review of development, role - operation - yield of hydroelectric projects. Perspectives for further utilization in the electricity generation sector.
- Stefanakos, J., 2013. Investigating the possibilities of building new pumped storage hydro installations in Greece
- Tsiknakou, Y., 2022. The role of PHS in a net zero economy.

source: <https://www.tavropos.com>





# SWISS ROUND TABLE HYDRO POWER

15 NEW STORAGE INCREASE PROJECTS  
NEGOTIATED WITH CIVIL SOCIETY

Peter Lustenberger, Axpo Power, Switzerland



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)



### Axpo – Swiss Energy Company with International Reach

Reach: 30+ Countries; 40+ Markets  
Employees: 5'973  
Energy Production: 34.7 TWh

### Axpo Hydro – CH Largest Hydro Operator

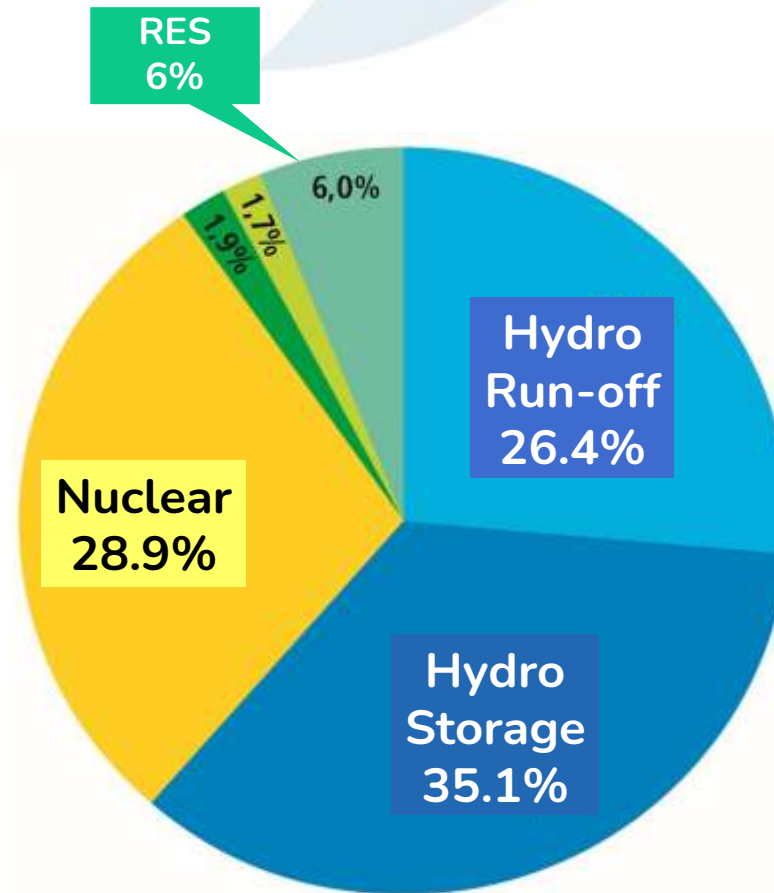
Employees: 627  
Plants operated: 89  
Turbines: 4'938 MW (254 units)  
Pumps: 1'455 MW (79 units)  
Production: 10.7 TWh



Pump Storage Plant Linth Limmern (2015)  
1'000 MW, Investment 2'000 Mio. EUR

## Electricity Production in Switzerland today

### Production of Different Technologies (2021)



Swiss Annual  
Electricity Production  
63.4 GWh



# Electricity in Switzerland – Outlook

## Mind the Gap!

### Yearly Electricity Balance

today

2050

Consumption  
in TWh

62.8\*

86.3

Production  
in TWh

63.4\*

35.7

50.6



- E-Mobility
- Heat Pumps
- H2 & Syn. Fuels
- Population Growth



- Increase of Residual Water Loss



- Shutdown of Nuclear Plants



- Low Investment in RES
- High Permitting Hurdles

\*Average 2010-2019

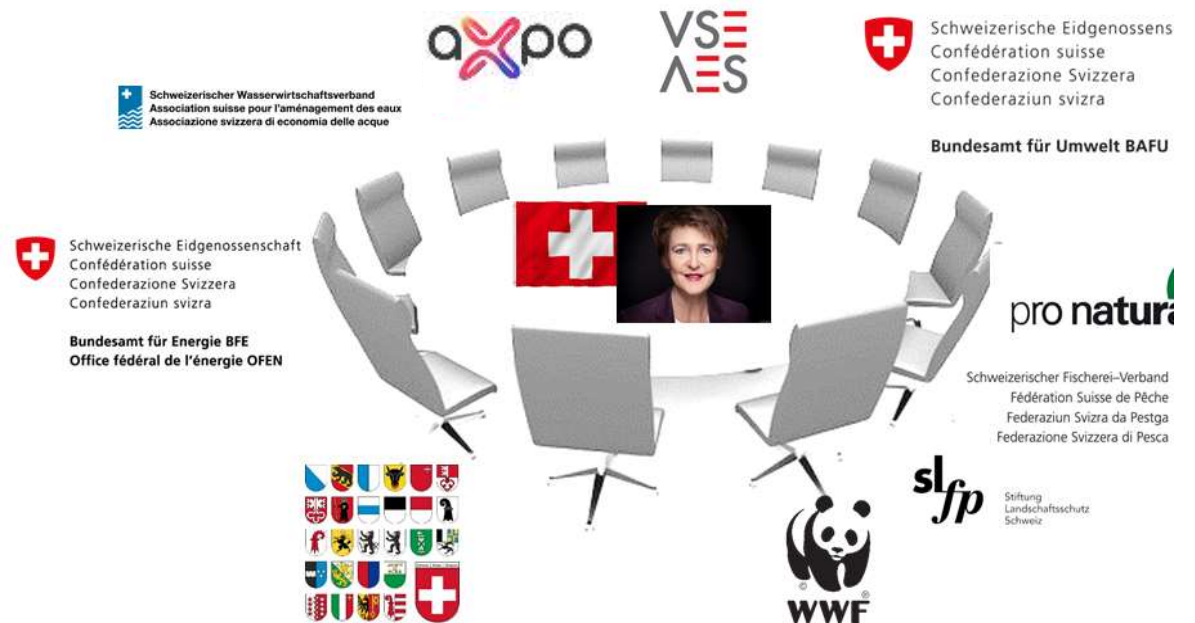
## Swiss Round Table Hydro Power The Initiative

- Strategy - **Push PV** and Wind: +30 TWh by 2035
  - Challenge **Winter Production**
- **Initiative** by Simonetta Sommaruga
  - Swiss Federal Council DETEC (until 12.2022)  
Fed. Dept. of Environment, Transport, Energy and Communications
- Round Table to **generate a common understanding for the challenges of**
  - **expanding hydropower** to support the energy strategy 2050
  - reaching zero emissions target
  - ensuring security of energy supply
  - **preserving biodiversity**



## Swiss Round Table Hydro Power Participants and Work Force

- Parties Invited at Round Table (5 Stakeholder Groups)
  - Environmental protection agencies (NGO)
  - Hydropower operators and industry associations
  - Cantonal authorities
  - Federal office of energy
  - Federal office for the Environment
- Work Force
  - Working Group assigned by RT
  - 15 Experts (3 per stakeholder)





# Swiss Round Table Hydro Power The Process

## 1. Round Table

4 Working Group Meeting  
3 Subgroup Meetings

10.08.2020  
Kick Off

- exchange
- position
- **assign Working Group**

## 2. Round Table

5 Working Group Meeting  
6 Subgroup Meetings

21.06.2021  
Goals & Assignment

- review the results of the working group
- **sharpen the goal**
- **assign a professional moderator** to working group

## 3. Round Table

13.13.2021  
Agreement & Signing

- **finalize** common agreement to support 15 selected hydro storage projects
- **sign agreement**

## Results of the Working Group – Part I

### Input to 2. Round Table

### Results after 4 workshops and 3 subgroup meeting

- Stakeholders **reaffirmed their concerns**
  - NGO: loss of biodiversity (2 TWh target no priority)
  - Cantonal Authorities: shift of power from local to national authorities
  - Operators: missing the target
- **49 project proposals pre-assessed**
  - 17 with low conflict potential
  - 18 with higher conflict potential
  - 14 with very high conflict potential or big technical challenges
- **Ecological compensation measures discussed**
  - No common agreement

## Results of 2. Round Table

### Explicit Assignment to Working Group

#### 1. Identify Hydro Projects

- With the energetically most promising potential for additional seasonal power storage of 2'000 GWh
- with the least impact on biodiversity and landscape
- realizable until 2040

#### 2. Identify Ecological Compensatory Measures

- project specific
- general recommendations

#### 3. Draft a common recommendation

- Projects list to meet target
- Ecological compensatory measures
- Point out possible differences, if any





## Decision of 2. Round Table

### Assignment of a Moderator to Working Group



### Prof. em. Dr. Michael Ambühl

- ETH Zürich  
Head of Chair of Negotiation and Conflict Management
- Former State Secretary for Foreign Affairs in Switzerland

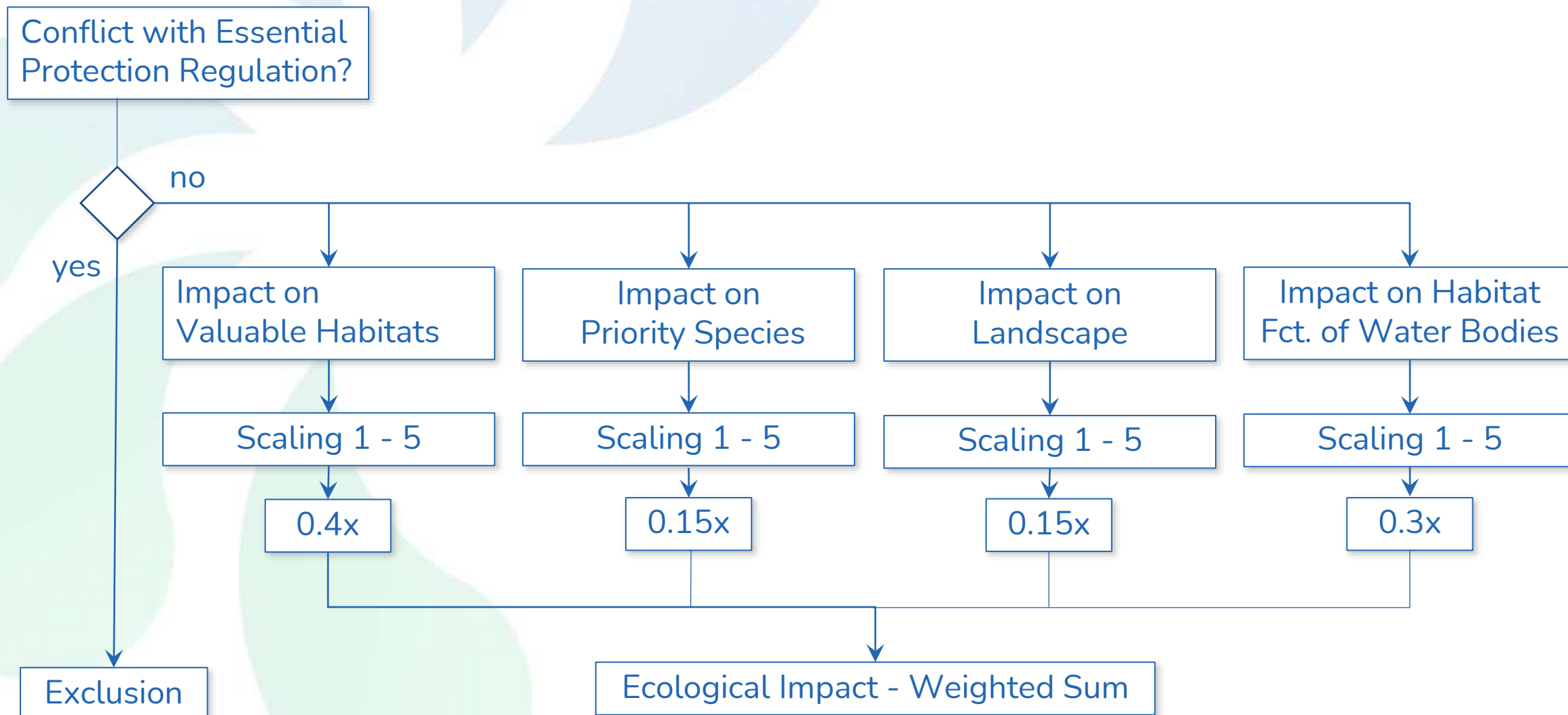
## Working Group – Part II

### Kick-Off: Agree on Target, Rules and Methodology

- Confirm the assignment and **commit to the target**
- Agree on «**Rules of the Game**»
  - Transparency
  - Confidentiality
  - Will for Consensus
  - Communication
- Define and **agree first on method** to rate project proposals
  - energetic potential
  - ecological impact
- Rate and **select of project only after agreement on method**

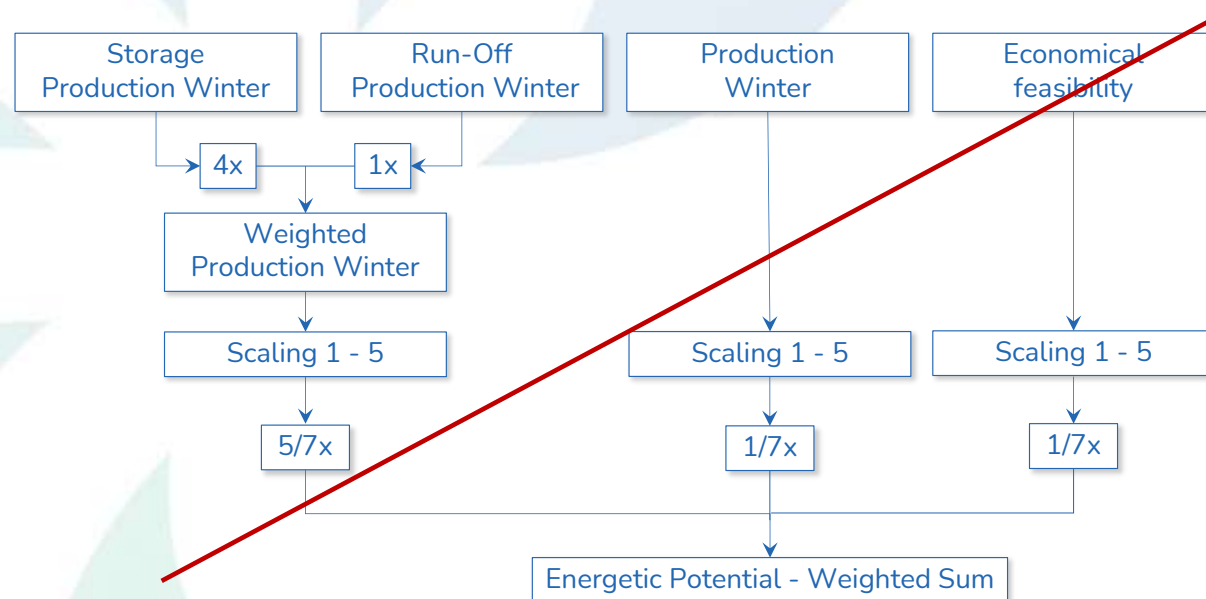
# Long List of Projects

## Quantification of Ecological Impact





# Long List of Projects Quantification of Energetic Potential



**Sole Criteria:**  
**Additional Winter Production in GWh/a**

# Rating and Ranking of 34 Projects

## 15 Projects to Reach Target of 2 TWh Winterproduction

$$\textcircled{1} : \textcircled{2} = \text{Ranking}$$

Nr.	Project Name	Kt	Ecological Impact, weighted [1,5]	Additional Winterproduction (GWh/a)	Ecological Impact per GWh/a Winterprod.
1	Gorner	VS	3.4	650.0	5.2
2	Trift	BE	1.7	215.0	8.1
3	Chummensee	VS	1.3	165.0	8.1
4	Gougra	VS	1.1	120.0	9.1
5	Grimsensee	BE	2.4	240.0	10.0
6	Gurnera, Nalps	GR	1.1	99.0	10.9
12	Obertalser Speicher	VS	1.0	50.0	20.0
13	Lac des Toules	VS	1.1	53.0	20.1
14	Lago del Sambuco	TI	1.0	45.8	22.1
15	Griessee	VS	1.0	46.0	22.6
	Project 16		1.2	50.0	23.5
	Project 17		1.0	36.3	28.2
	Project 18		1.9	40.0	48.7
	Project 19		2.6	52.8	49.0
	Project 20		2.3	43.2	52.4
	Project 21		2.6	42.5	61.5

15 projects yield +2 TWh winterprod.

cut off

# 15 Storage Projects Recommended for Development

## 4 Examples

### New Reservoir



#### Gorner (GD)

Zermatt/VS

+650 GWh/a winter

+200 GWh/a year

### New Upper Stage



#### Trift (KWO)

Gadmen/BE

+245 GWh/a winter

+145 GWh/a year

### Elevation Earth Dam



#### Mattmark (KWM)

Saas Almagell/VS

+65 GWh/a winter

+0 GWh/a year

### Elevation Concrete Dam



#### Sambuco (Ofima)

Fusio/VS

+46 GWh/a winter

+0 GWh/a year



## Result of the Round Table

### Signing of a Common Declaration

#### Declaration: Round Table Recommends:

- to **develop the 15 projects** identified with priority
- Negotiation of project **specific ecological compensation measures** in early stage of development

#### Next Steps

- **Government** to establish positive boundary conditions (**funding**)
- **Project owners** to **develop** projects (technical, ecological, legal)
- **Authorities** to facilitate and support **permitting** process
- **NGO's** to **participate** in development early and **support** realization

#### Realization Remains a Great Challenge!



- **Top floor driven & lead and top floor participants of stakeholders** at Round Table
- **Unconditional commitment** of the Round Table to **goal**
- Definition of **clear and explicit targets** by Round Table
- **Acceptance** of these targets **by all members** of the Working Group
- **Confidentiality** to allow open exchange
- Tough **independant moderator** to drive process and keep the flock in line
- **Sufficient time** for discussion and negotiation
- **Time pressure** to generate results – WG meetings open-end
- **Escalation path** of non-resolvable differences
- **Trust**

## Swiss Round Table Hydro Power



The result of the Round Table provides is a (small) contribution to the future Swiss energy production.

It is a **great template** how stakeholders with divergent goals can jointly develop ways forward.



## Session 1: Panel discussion

11.15-12.00



Ana Paula  
Moreira - Head  
of Engineering,  
EDP



Ghislain  
Weisrock –  
Senior  
Advisor, France  
Hydro Electricité



Sera Lazaridou -  
Senior  
Partner, Hydroexigia  
ntiki Consulting  
Engineers Greece



Peter Lustenberger –  
Senior Expert Asset  
Management, AXPO  
Power Switzerland



Moderator:  
Patrick Clerens  
- Secretary  
General, EASE

# Lunch Break

12.00-13.15

## Session 2: Best practice examples to tackle economic, environmental and societal challenges with hydropower.

13.15-14.00



Maryse Francoise –  
CEO, MFX Consulting



Jeffrey Tuhtan - Associate  
Professor, Tallinn University  
of Technology



Eddie Rich – CEO, IHA





# SESSION 2: BEST PRACTICE EXAMPLES TO TACKLE ECONOMIC, ENVIRONMENTAL AND SOCIETAL CHALLENGES WITH HYDROPOWER

**INTRODUCTION**

**BY DR. JEAN-JACQUES FRY**

**BRUSSELS HYDROPOWER DAY 2023**



Funded by  
the European Union

[www.hydropower-europe.eu](http://www.hydropower-europe.eu)

# The world is facing three major shocks

1

CLIMATE CHANGE

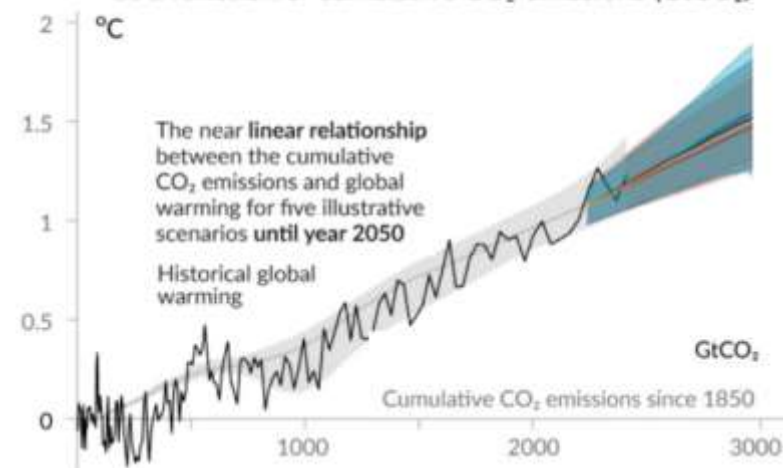
2

BIODIVERSITY LOSSES

3

GLOBAL ENERGY CRISIS

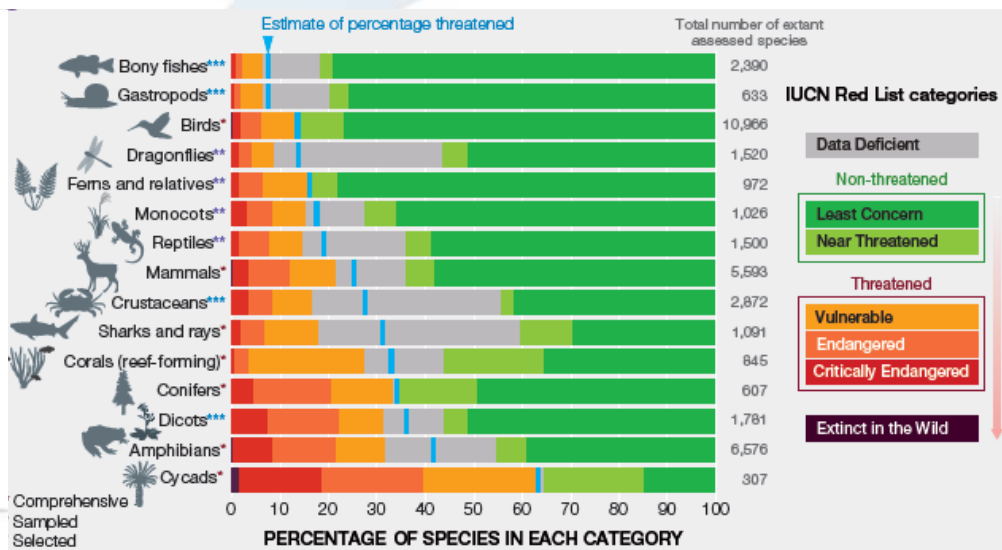
Global surface temperature increase since 1850-1900 (°C) as a function of cumulative CO<sub>2</sub> emissions (GtCO<sub>2</sub>)



IPCC First assessment report on Climate Change



1990



IPBES Global Assessment report on Biodiversity



2018



EIA world energy outlook



2022





# How hydropower can tackle 3 challenges?

1

## ECONOMICAL

- How tariff and policy can influence investors? What are the best practices of hydro project for grid security?



Maryse FRANCOIS

2

## ENVIRONMENTAL

- What is the behavior of fish species? How can we use it to protect them?



Dr. Jeffrey TUHTAN

3

## SOCIETAL

- What Sustainability Standard can boost hydropower development?



Eddie RICH



# The 3 speakers on best practice

1

Maryse FRANCOIS



- CEO, MFX Consulting. Senior consulting engineer hydropower and hydrostorage, renewable energy, independant non-executive board member

2

Dr. Jeffrey TUHTAN



- Associate Professor. Graduate from California Polytechnic State Univ., USA, 2004. Dr.-Eng. degree from the Univ. of Stuttgart, Germany, 2011. He leads the Centre for Environmental Sensing and Intelligence at the Tallinn Univ. of Technology.

3

Eddie RICH



- CEO at the International Hydropower Association since September 2019. He has worked on the role of corporates in international development for over 20 years.



# How tariff and policy can influence decision makers

Some best practices of hydro power for grid security

Maryse FRANCOIS

**MFX CONSULTING**

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# Global electricity evolution

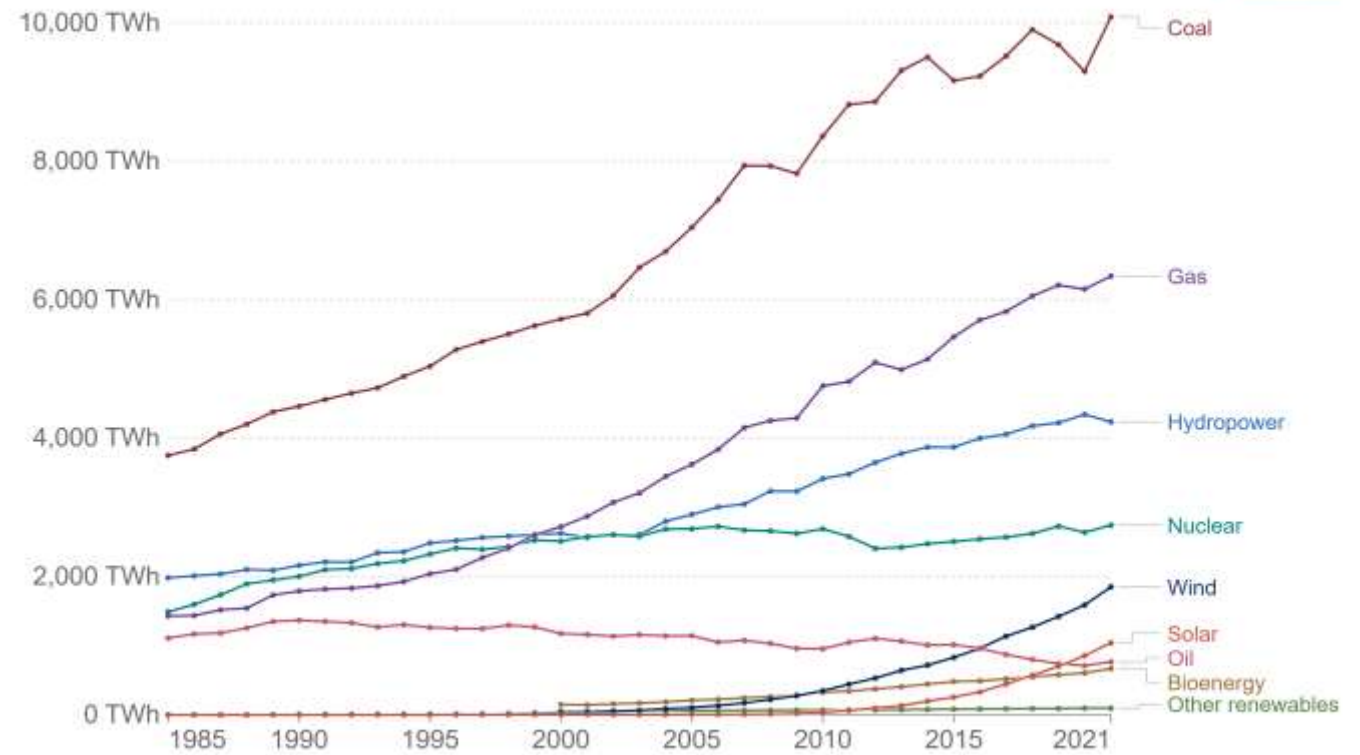
More renewable energy

Hydro power 16%

Solar ( intermittent) : 4%

Wind (intermittent) : 7%

Electricity production by source, World



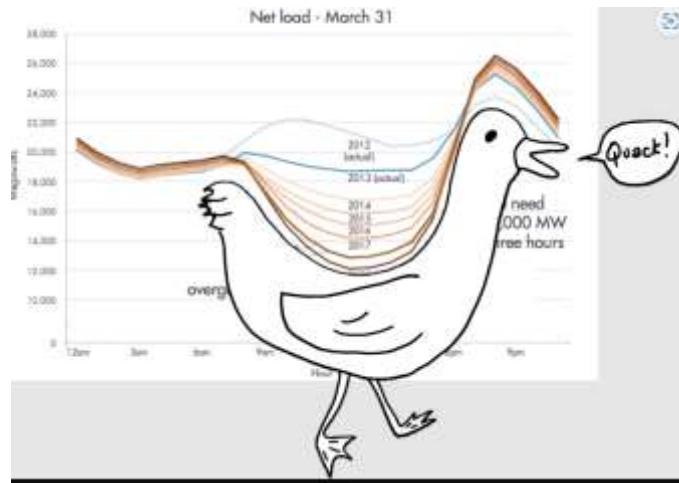
Source: Our World in Data based on BP Statistical Review of World Energy (2022); Ember (2023)  
Note: 'Other renewables' includes waste, geothermal and wave and tidal energy.

OurWorldInData.org/energy • CC BY

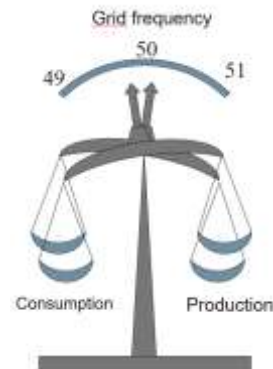


# Need of storage

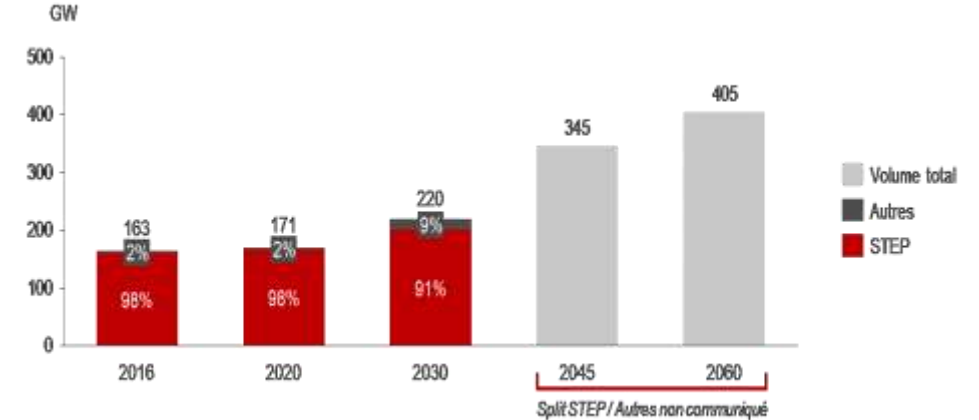
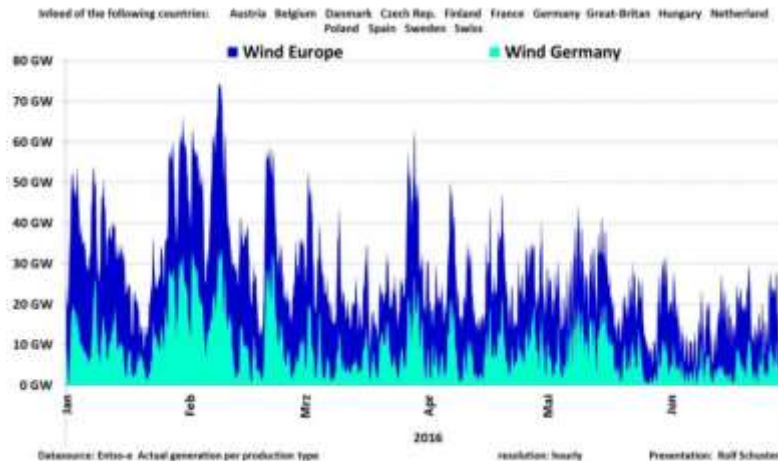
More renewable energy



**STORAGE**



**STORAGE**



Source : IEA - 2017 - « Energy Technology Perspective (ETP) 2017 »

# Pumped Hydro Storage Plants

All Services

- **Large energy capacity: Several GWh (up to 350 GWh)**
- **Power and capacity can be chosen**
- **Efficiency of the cycle 80%**
- **Flexibility**
- **Provide inertia**
- **Quick reactive time**
  - Minutes to start
  - Seconds/ minutes to change mode
  - Millisecond reaction time for variable speed
- **Ancillary services**
  - Black start
  - Frequency regulation
  - Voltage control

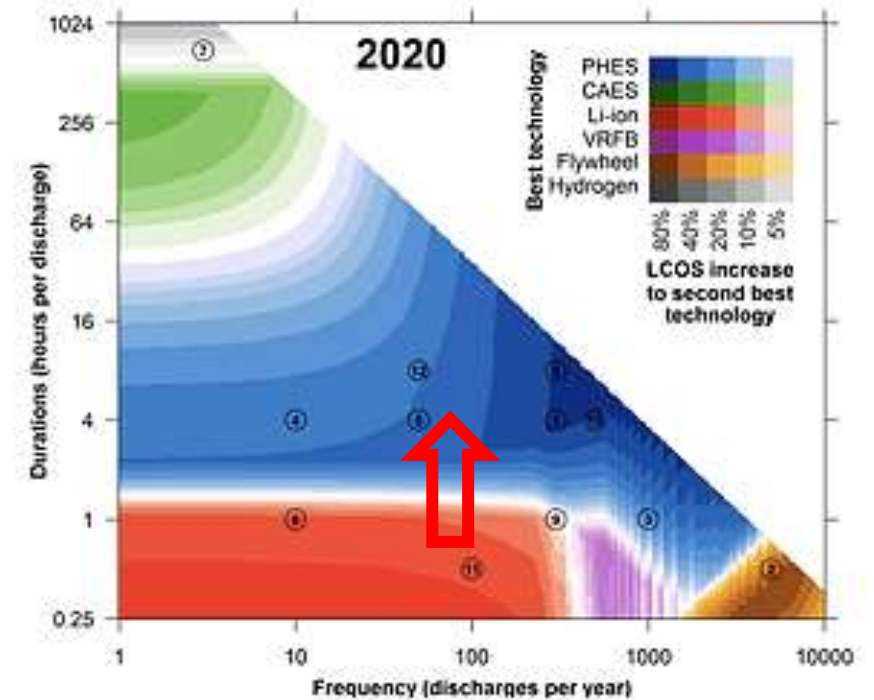


**TECHNICAL SOLUTIONS**

# Pumped Hydro Storage Plants

Cost effective solution

- Cost effective solution
- Low CO<sub>2</sub> emission ( 6g/kwh)
- Low use of raw material ( 36g/kwh) mainly nonmetallic one
- Large number of possibilities
- Closed loop solution
- Low footprint:  
Olympic swimming pool and 500m : 3 MWh



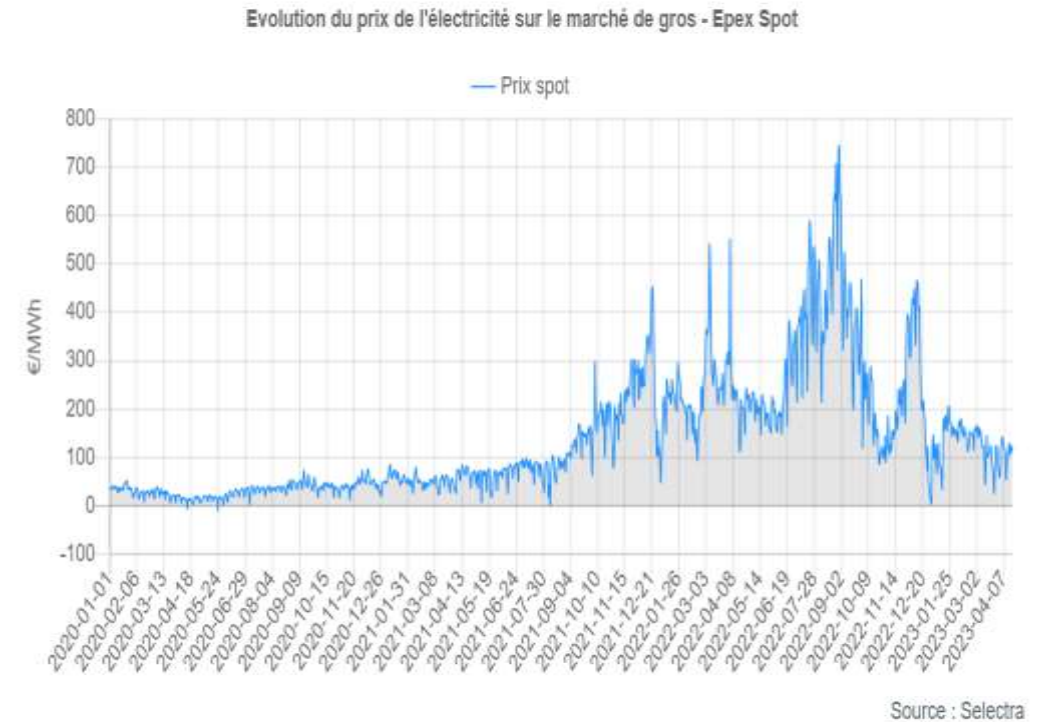
**SIMPLIFY PROCESS**



# Pumped Hydro Storage Plants

A long term investment

- **High initial Investment cost**
- **Long time for authorization and construction**  
➔ **Long term vision**
- **High risk**  
➔ **Long term variation of electricity cost.**
- **Security of the grid**  
➔ **An asset for the country**



**PUBLIC ENGAGEMENT NEEDED**

# CHINA

A grid asset

## Target:

- Reaching peak emissions by 2030
- Carbon neutrality 2060

➔ Faster wind and solar deployment

➔ Intermittent renewables integration

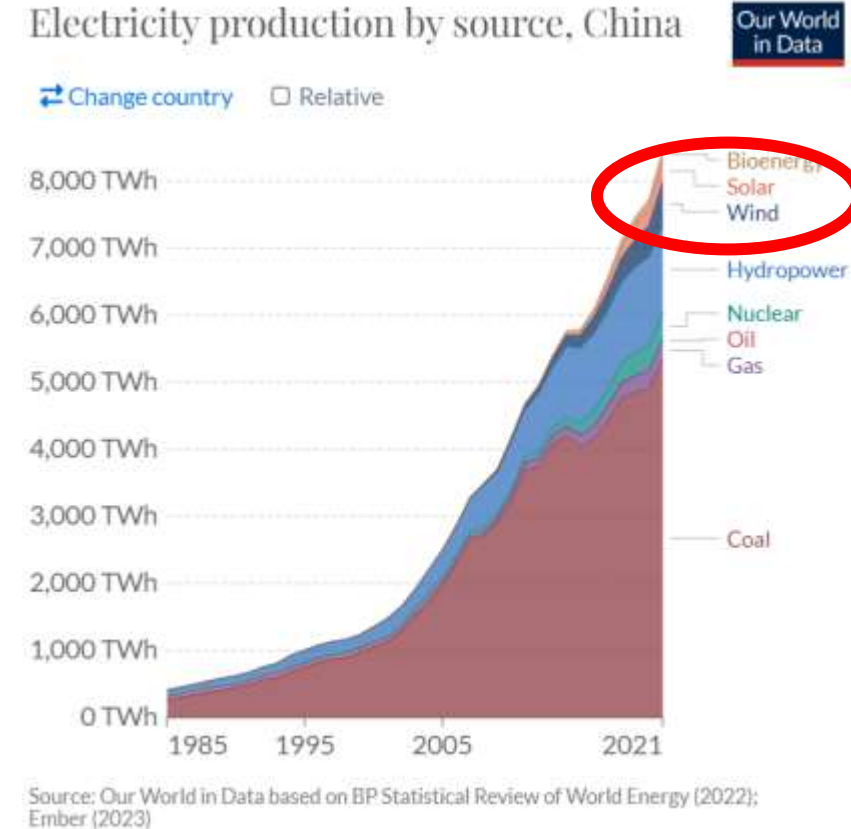
PSPs in operation in 2016: 26 GW

PSPs in operation in 2021: 36 GW

New announcement

➔ Reach 62 GW by 2025

➔ Reach 120 GW by 2030



## INCENTIVES TO BE SUFFICIENT TO SUCCEED

# CHINA

PSP a grid asset

---

- **HUIZHOU: 34 GWh 2450 MW China**  
Southern Power Grid  
➔ Reserve capacity in Guangdong
- **HOTHOT: 1224 MW**  
CTG Mongolia  
➔ Wind farm
- **FENGHING: 40 GWh 3424 MW**  
State Grid Corporation  
➔ Variable speed technology





# ISRAEL

An electrical island

**2016 : Israel decide to develop 800 MW pumped storage**

- **Gilboa: 2 X 150 MW daily storage, commissioning 2020**  
First PSH owned by a private company  
based on
  - Purchase agreement with the authority ( Long term)
  - EPC contract
  - Maintenance contract
- Specific conditions on reactive time
- Kokhav Hayarden: 2 X 172 MW commissioning 2023
- Manara: 156 MW



**TARIFF DEFINED**

# AUSTRALIA

## Grid stability needs

---

### Stability of the grid needed

**2021 : 22% of wind and solar**

**Regional blackout**

- **Snowy 2.0 under construction**  
**2000 MW 350 GWh**  
**Fixed speed and variable speed**
- **Projects with IPP**  
**Revenues based on**
  - **Arbitrage ( pricing every 5 min)**
  - **Ancillary Services**



# SWITZERLAND

A central position

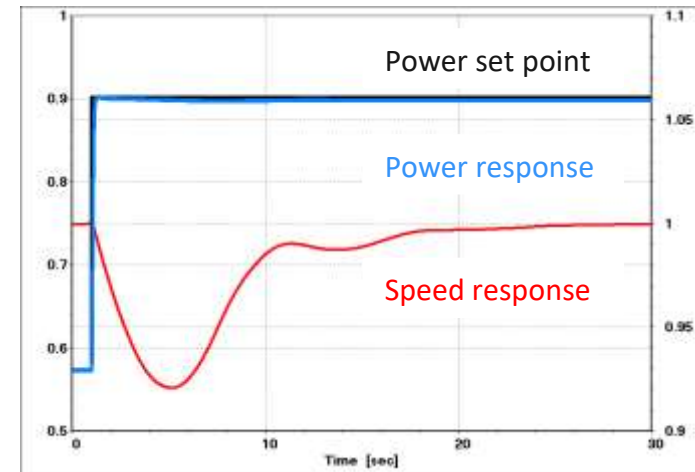
## Variable Speed Technology

- Linth Linthal : 4 x 250 MW, 34 GWh
- Nant De Drance: 6 x 150 MW, 20GWh

## Strong grid support:

- Quick power response
- Primary frequency control in both turbine and pump mode
- Large operating range
- Possibility to increase head variation

➔ Access to arbitrage and ancillary service market



GE pictures



# New services requested

To support intermittent

- **Portugal: As consequence of wind power increase, an evolution of the way of operating the pumped storage plant is needed. More flexibility is requested**  
➔ **Alqueva pump storage power plant was adapted**
- **France : Short circuit solution was defined in order to increase the flexibility of Grand Maison a five stages pumped storage plant**

**ADAPT TARIFF**



PHOTOS XFLEX

# REFURBISHMENT

A large numbers od possibilities

---

## Upgrade old fleet:

- Increase global cycle efficient
- Provide more flexibility
- Increase operating range
- Increase reaction time
- Increase availability



Cabin Creek hydropower plant was commissioned in 1967 and is classified as a facility required for reliable operation of the grid. Upgrade needed due to increased penetration of intermittent wind and solar.

## LONG TERM VISION

# CONCLUSIONS

---

- **Pumped Storage Plants are mandatory to support intermittent renewable energy and achieve the net zero carbon emission target**
- **Pumped Storage Plants are an asset for the grid and a security for the country**
- **Pumped Storage plants are cost effective, have a long lifetime, use few raw materials and can be implemented on many locations.**
- **A large initial investment needs long term vision on tariff and policy.**



# CONCLUSIONS

What is needed

---

**Simplify licensing process**

**Reduce permitting time**

**Reward services provided**

**Define long term policy/ contract**

**Valorise multi purpose water use**

*“Hydropower is the forgotten giant of clean electricity, and it needs to be put squarely back on the energy and climate agenda if countries are serious about meeting their net zero goals,” said Fatih Birol, the IEA Executive Director*



# Thank you

Maryse FRANCOIS

[maryse.francoisxause@orange.fr](mailto:maryse.francoisxause@orange.fr)





# FISH BEHAVIOR AT HYDROPOWER PLANTS WHAT WE KNOW, AND HOW WE CAN USE IT

ASSOC. PROF. JEFFREY A. TUHTAN

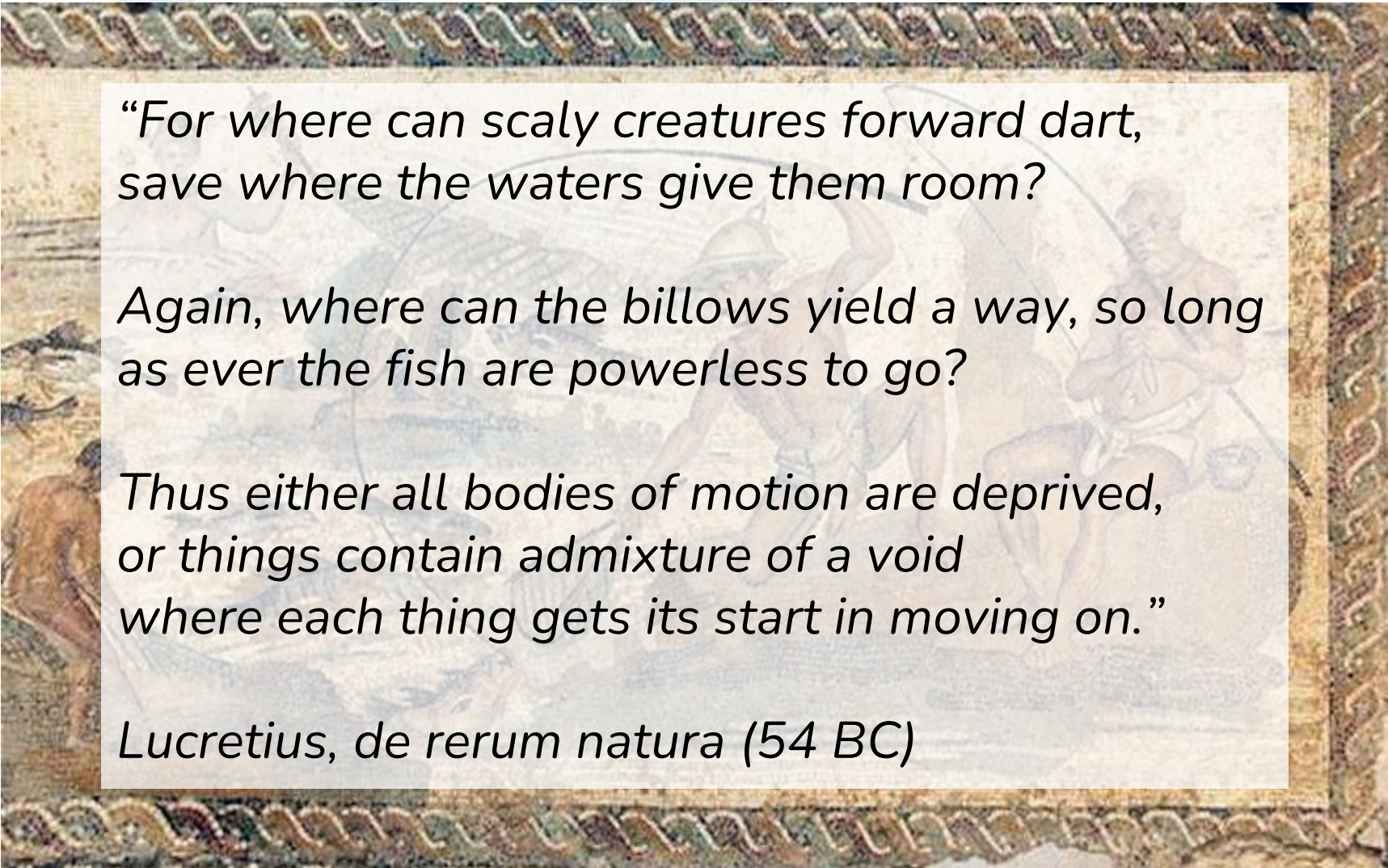
Tallinn University of Technology  
Dept. of Computer Systems  
Estonia



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)





*“For where can scaly creatures forward dart,  
save where the waters give them room?”*

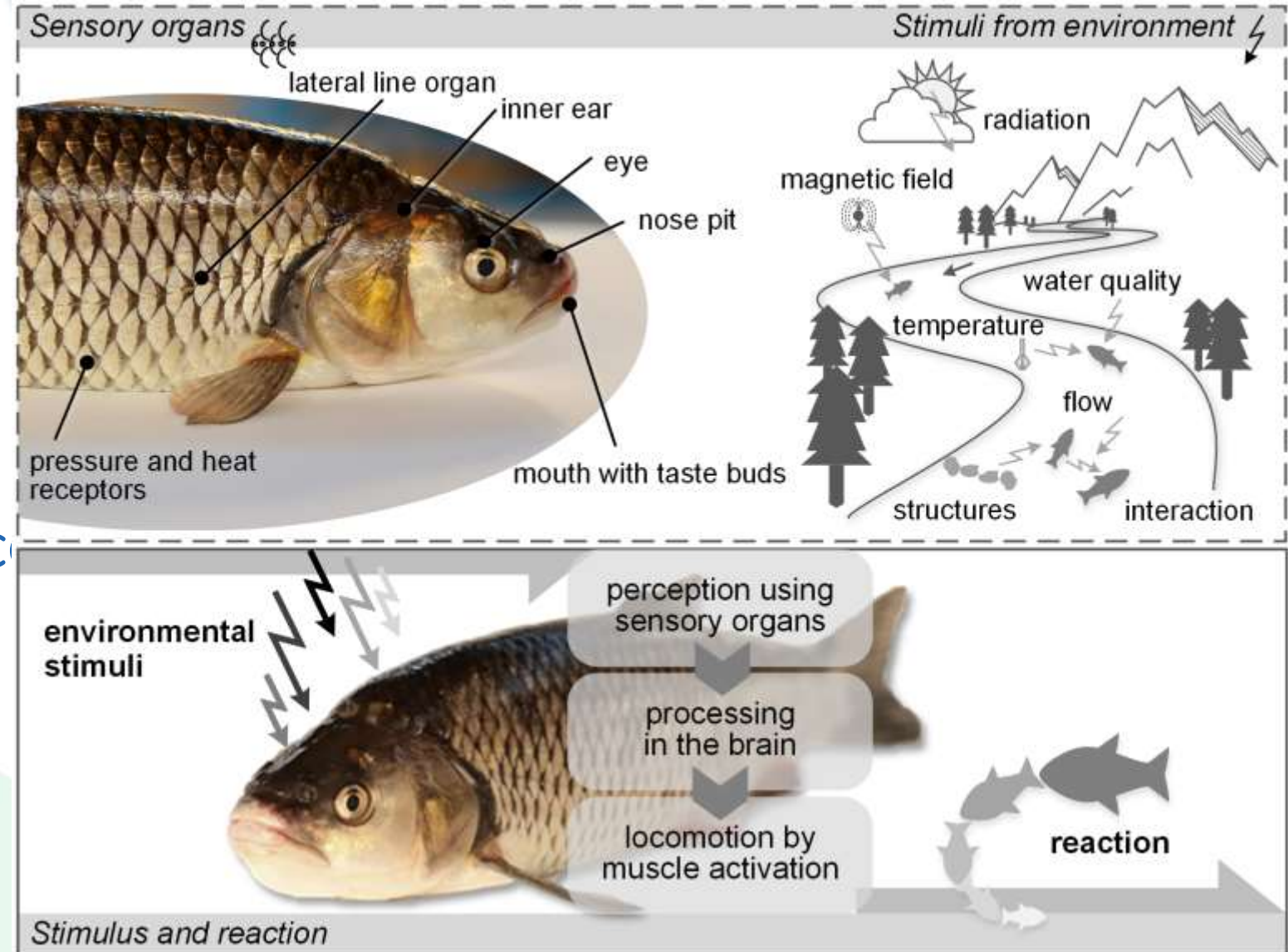
*Again, where can the billows yield a way, so long  
as ever the fish are powerless to go?*

*Thus either all bodies of motion are deprived,  
or things contain admixture of a void  
where each thing gets its start in moving on.”*

*Lucretius, de rerum natura (54 BC)*

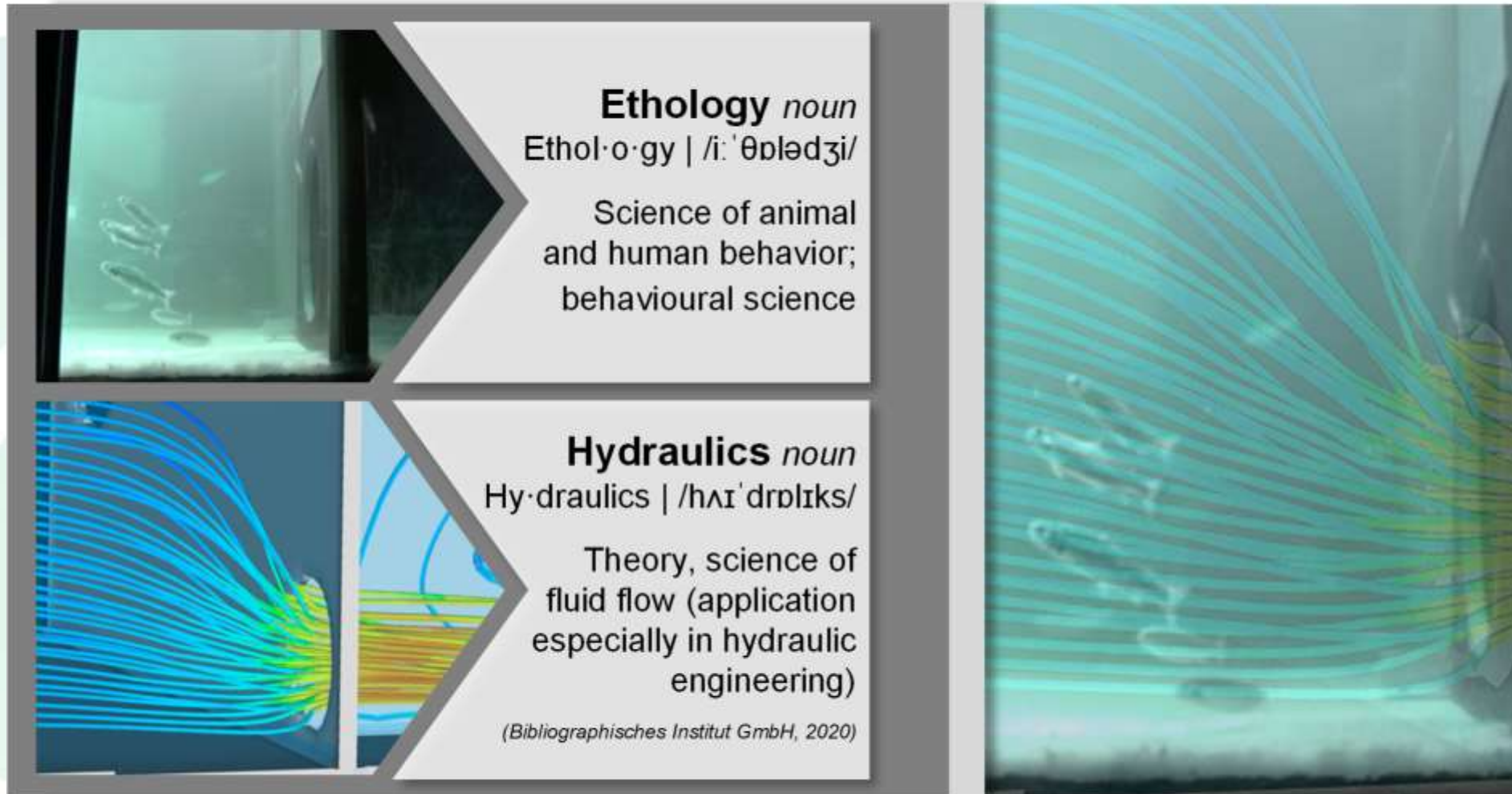
## Fish Sensing & Behavior

- Feeding
- Reproduction
- Escape & Avoidance





# Ethohydraulics: The Study of Fish Behavior and Flow

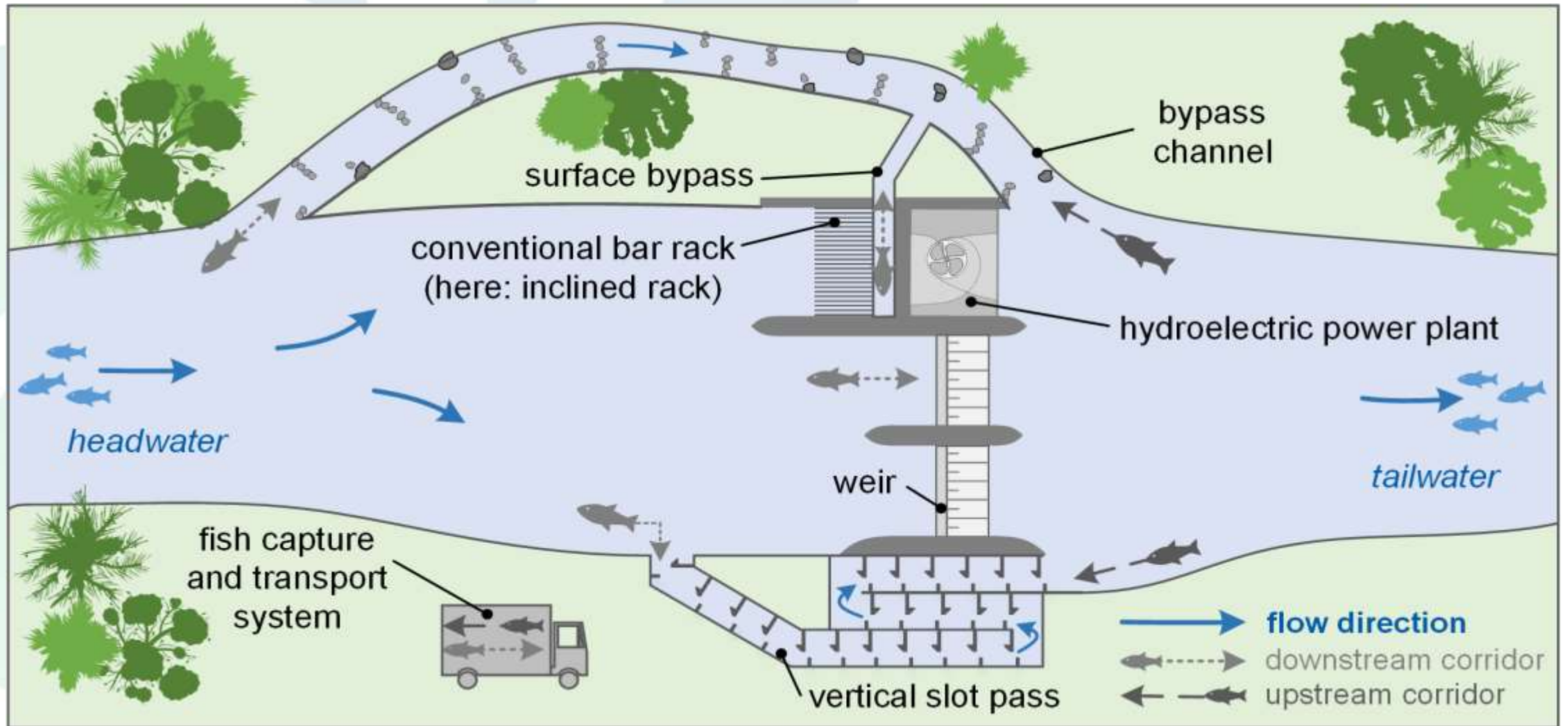


**Ethology** *noun*  
Ethol·o·gy | /i:ˈθɒlədʒi/  
Science of animal and human behavior; behavioural science

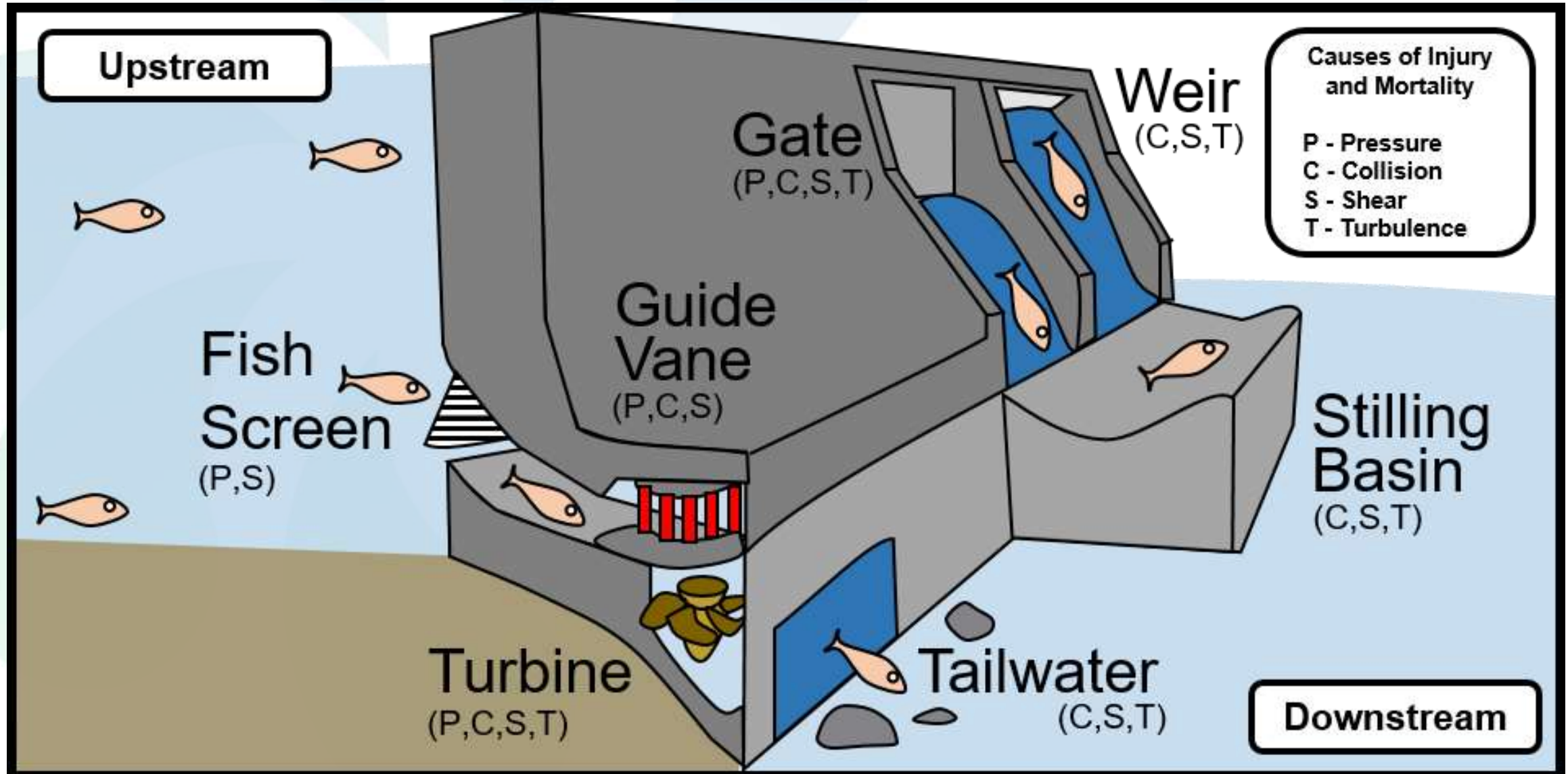
**Hydraulics** *noun*  
Hy·draulics | /hʌɪˈdrɒlɪks/  
Theory, science of fluid flow (application especially in hydraulic engineering)  
(Bibliographisches Institut GmbH, 2020)



## Enabling Upstream Fish Migration

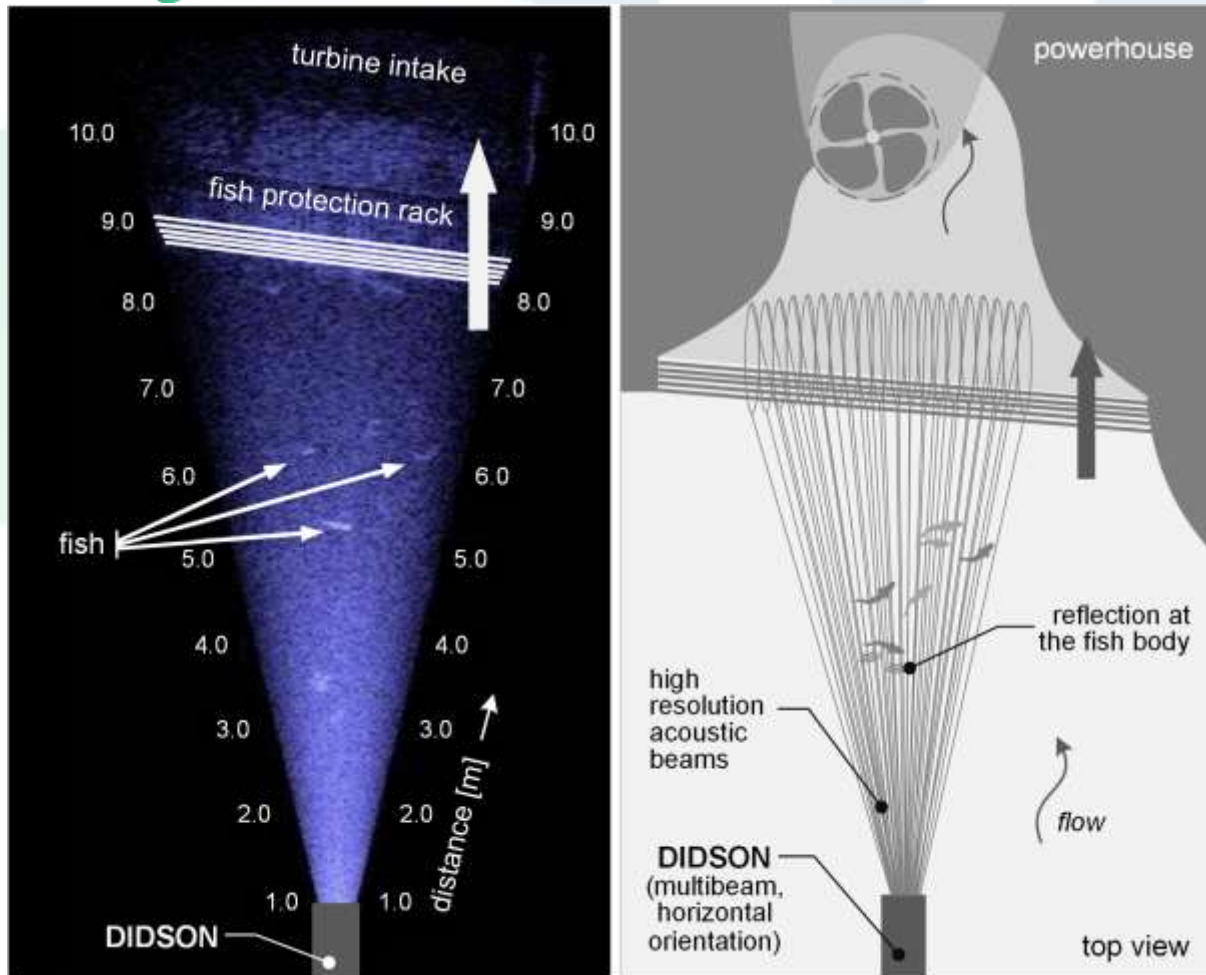


## Ensuring Safe Downstream Fish Migration

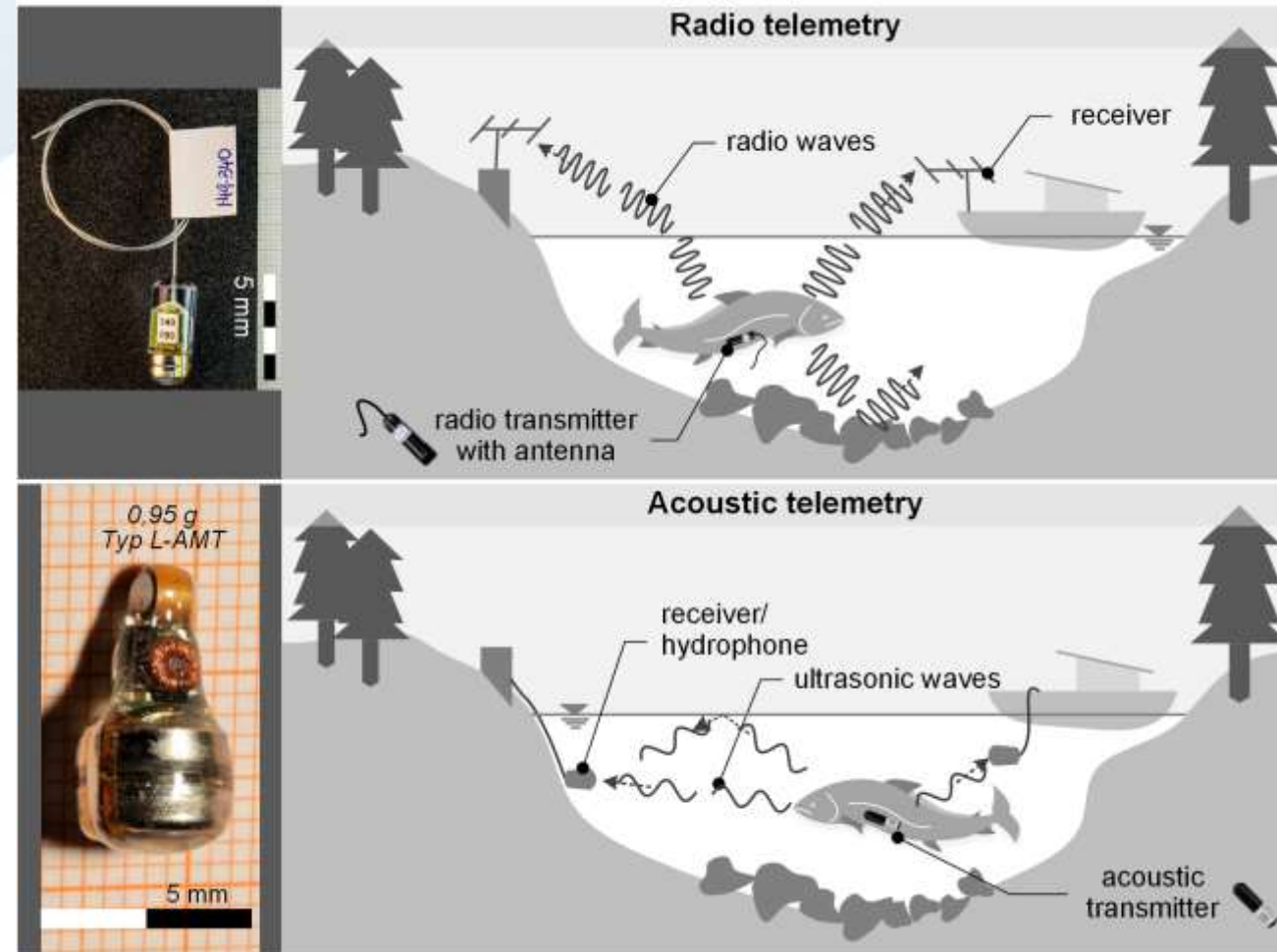




## Monitoring Fish Behavior at Hydropower Plants



Sonar



Telemetry

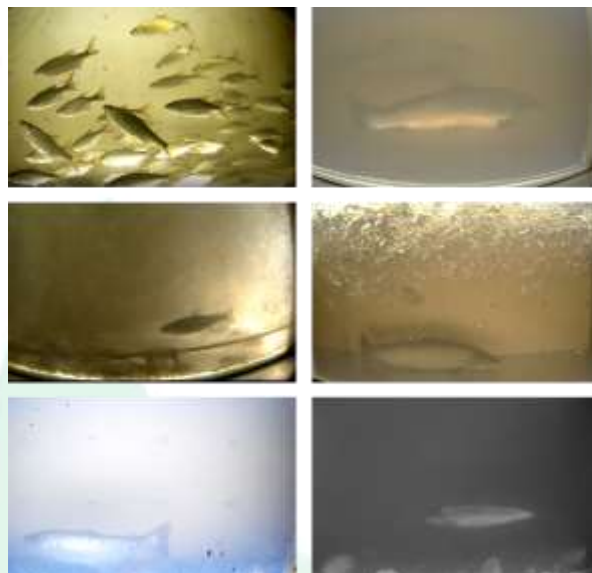
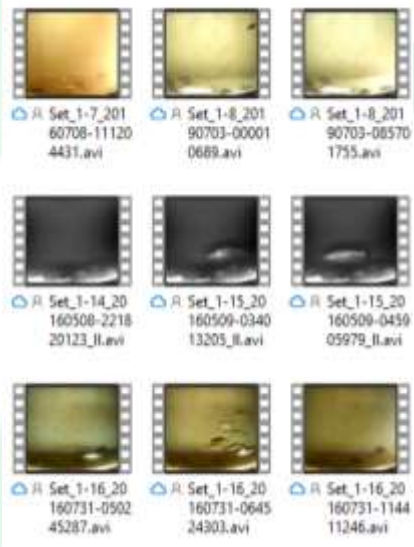


Upload  
videos from  
fish counter

Classification of the six  
environmental  
conditions

Sort and classify  
videos with fish  
and no fish

Classification of fish  
species, size and  
migration behaviour



**Chub (96.1%)**



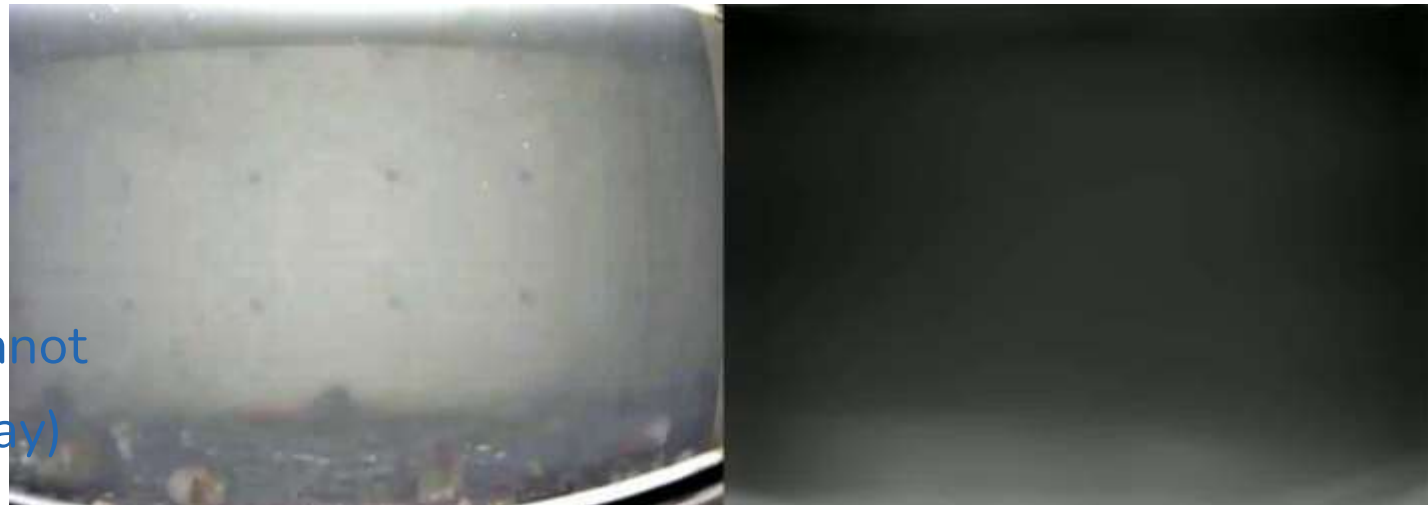
**Length** ( $45 \pm 3.7$  cm)  
**Behaviour:** *Up-In*

## Smart Fish Counter with Machine Learning

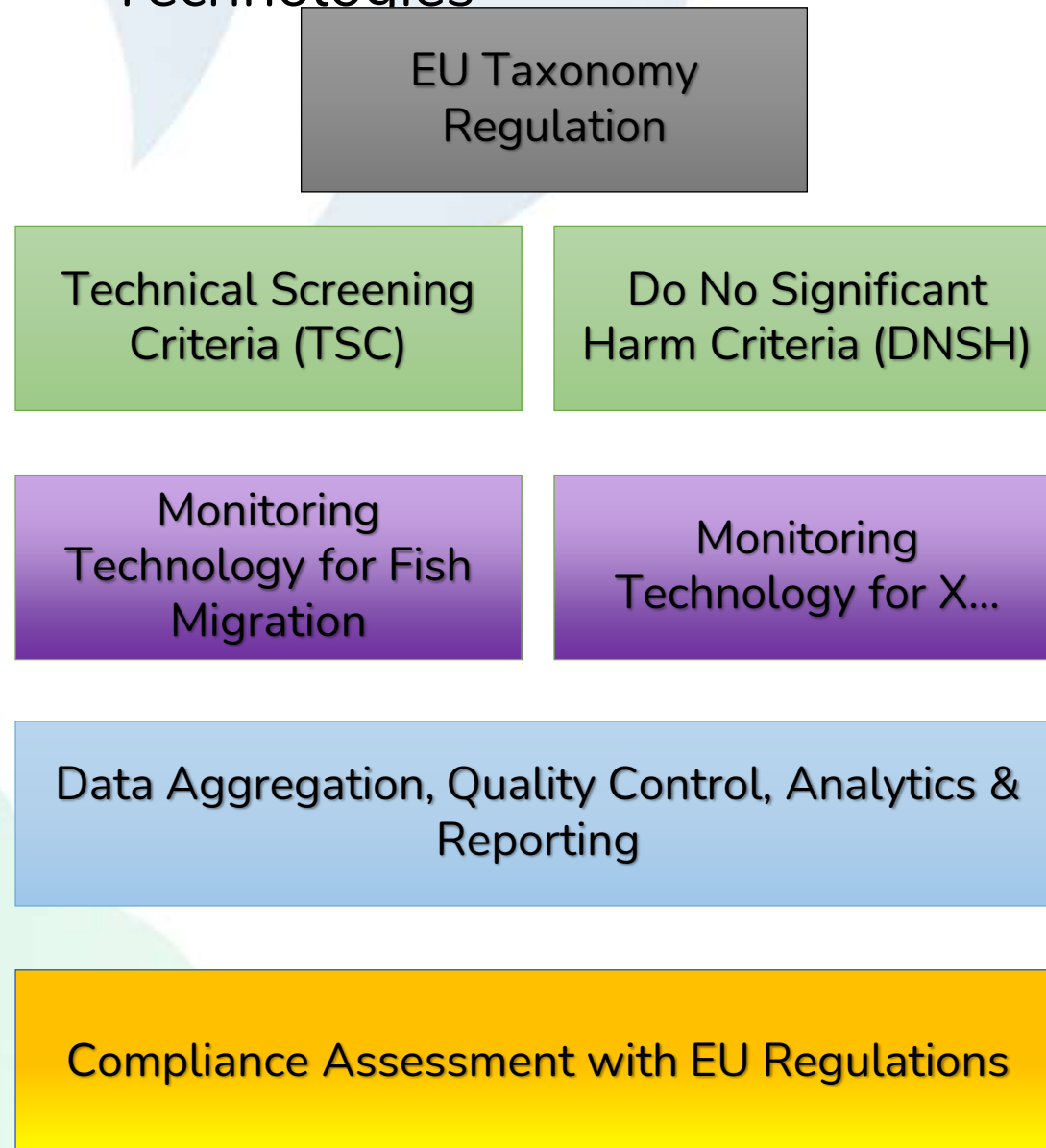
## Counting Like Humans, but Faster!

- Approximate counting during shoaling & swarming
- Six different migration sub-behaviors
- Detection of disease & injury
- Classification of exotic species

- **Human:** 2,000x 3 minute videos / month
- **ML:** 5,000x 3 minute videos / day
- Models can be cross-trained, humans cannot
- **Human:** 0.3 EUR / video (ca. 200 EUR / day)
- **ML:** ca. 10,000 EUR / year (all videos)



## The Future: Automated Environmental Compliance Technologies



Automation



Thank You!



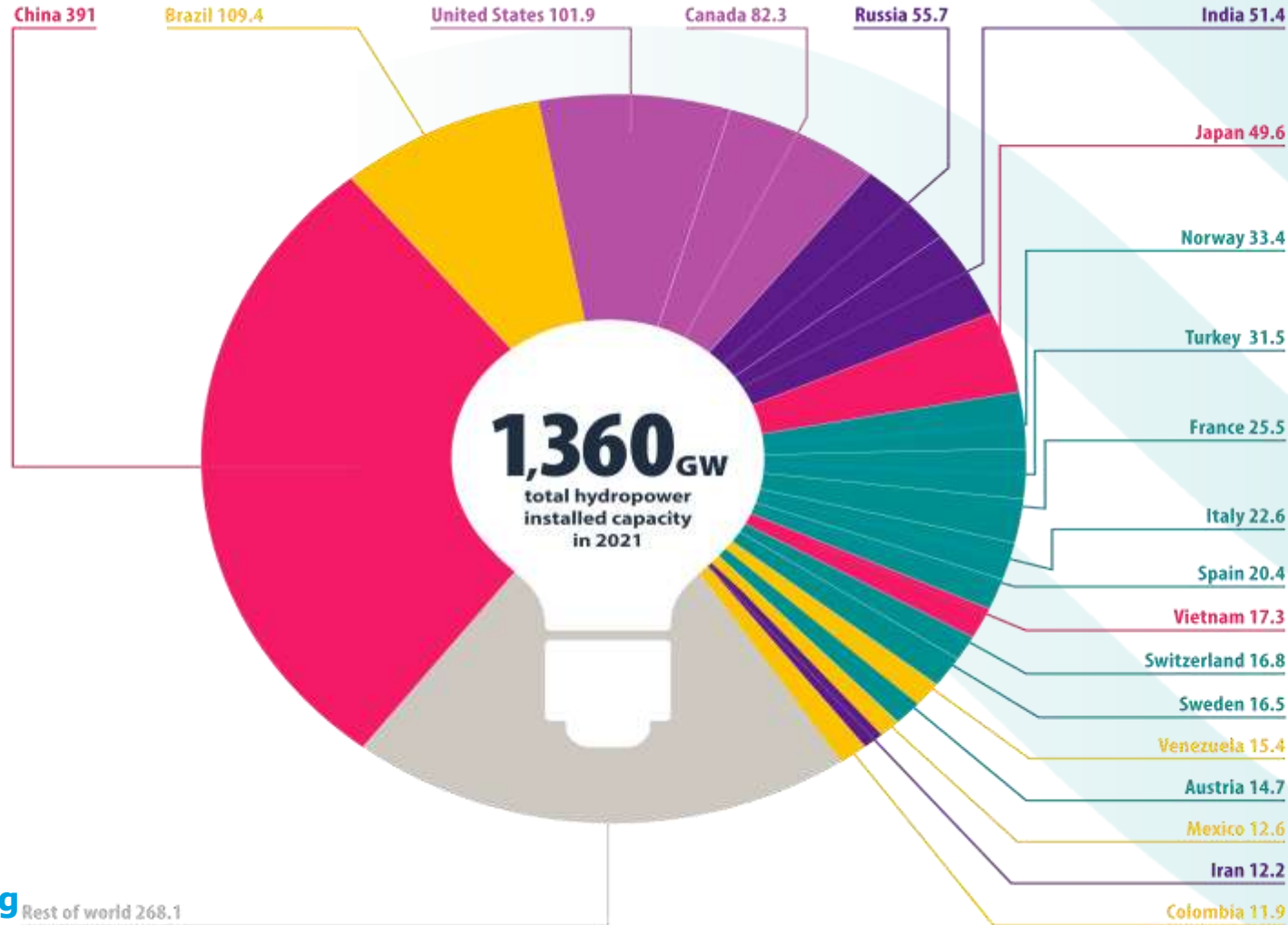
# Hydropower Sustainability Standard

*"Going forward the only acceptable  
hydropower is sustainable hydropower."*



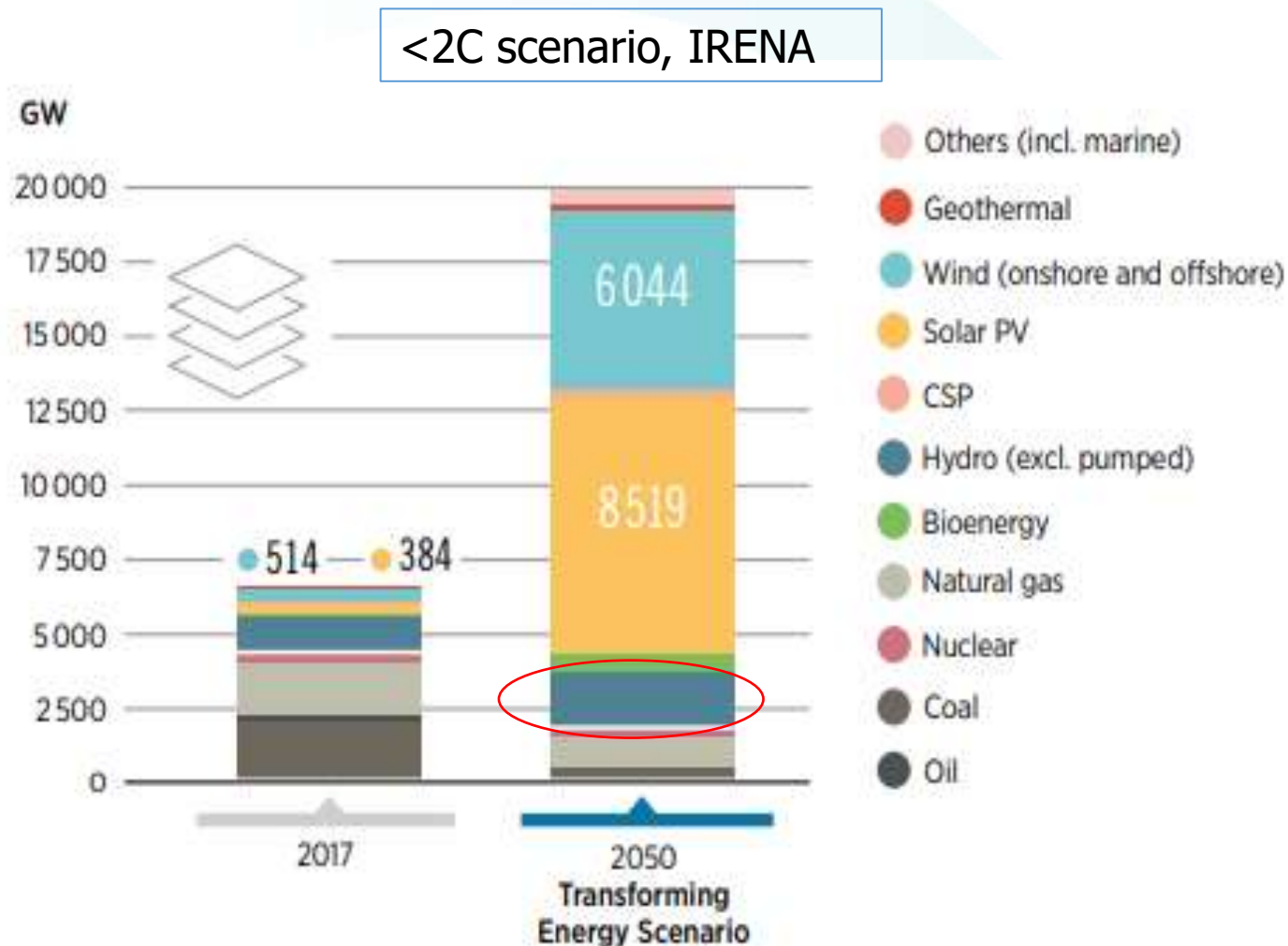
[hydropower.org](http://hydropower.org)

# Global hydropower installed capacity





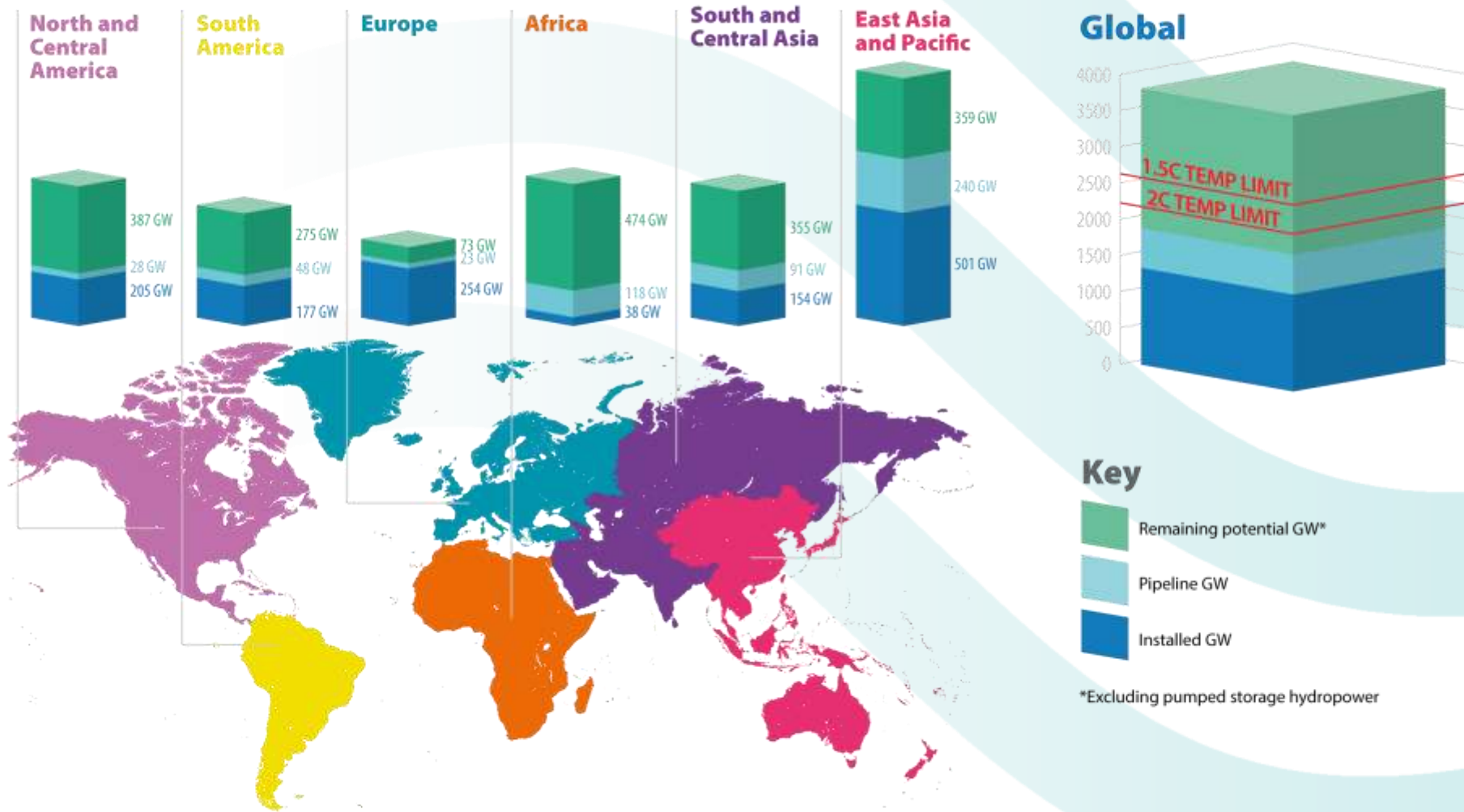
- Wind and solar are growing many times faster than hydropower, **need to double hydropower capacity in next 30 years.**
- **Hydropower fills the hole left by coal.** It will provide baseload firm electricity and also support wind and solar.



Global electricity generation by source 2050, Transforming Energy Scenario (IRENA 2020 – Global Renewables Outlook: Energy Transformation 2050)

# Global hydropower potential

Where are the opportunities for new development?



# The Hydropower Sustainability Alliance

a not-for-profit standard setting body to promote  
transparency and inclusivity in hydropower.



Norad

**VOITH**

**The custodians of the independent**





Problem

# Hydropower at a crossroads

Hydropower has a vital role to play in the transition to a low-carbon economy.

Support wind and solar  
deployment while providing  
**water and electricity services**  
for a growing population.

**But irresponsible  
hydropower projects are  
no longer acceptable.**

Hydropower at a crossroads

But irresponsible  
hydropower projects are  
no longer acceptable.





## Solution

How can **investors** tell the good actors from the bad?

How can **communities** trust and have a voice in hydropower development?

How can **developers** address complex ESG issues?

How can **governments** be sure that hydropower sustainably contributes to scaling up renewable energy?

**We need a  
Standard.**



# Hydropower Sustainability Standard

"Sustainable hydropower is a clean, green, modern and affordable solution to climate change. Going forward, the only acceptable hydropower is sustainable hydropower"

*The San José Declaration on Sustainable Hydropower*



## Sustainability Standard

IHA encourages its members to seek certification under the Hydropower Sustainability Standard, using a set of guidelines and tools for assessing environmental, social and governance performance.

Developed and governed by a multi-stakeholder council, the Standard and tools are aligned with World Bank and IFC performance standards.

## Training academy

Our training and capacity building courses are geared towards companies that seek to develop or report on projects which meet good and best practice.



*"IHA's efforts on sustainability have improved both the preparation and construction of new hydropower projects and the operation of existing hydropower projects."*

***Landsvirkjun***



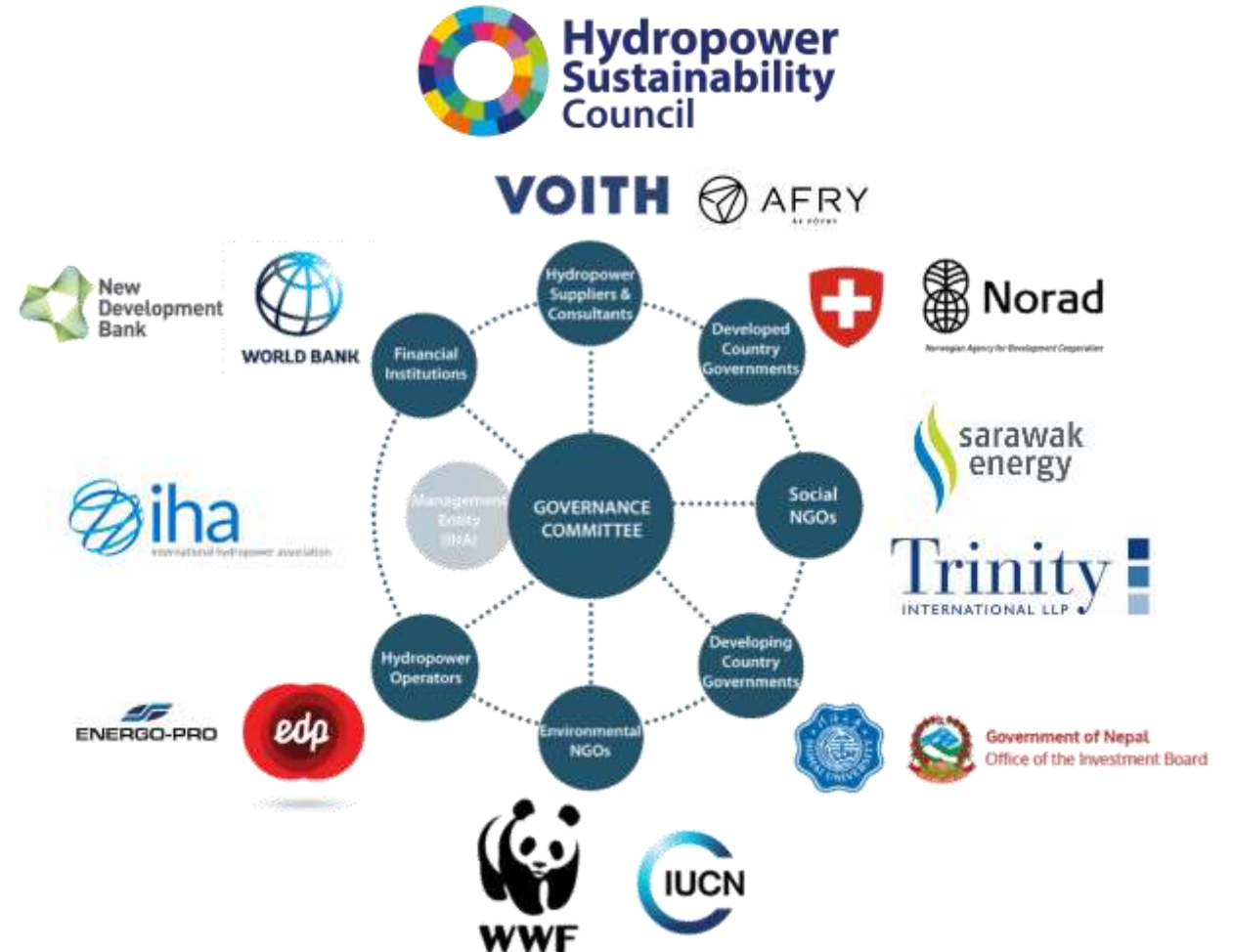
# Multi stakeholder origin



Who developed the HSAP (in 2010)?



Who governs the Standard (today)?



# What does the Standard cover?



**Environmental & Social Assessment and Management**



**Labour and Working Conditions**



**Water Quality and Sediments**



**Community Impacts and Infrastructure Safety**



**Resettlement**



**Biodiversity and Invasive species**



**Indigenous Peoples**



**Cultural Heritage**



**Governance and Procurement**



**Communications and Consultation**



**Hydrological Resource**



**Climate Change Mitigation and Resilience**



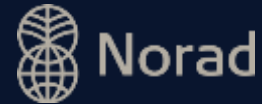
# Solution

## Demonstrate sustainability



**CERTIFIED**  
Project: Lorem Ipsum  
Stage: Preparation  
Date: March 2023

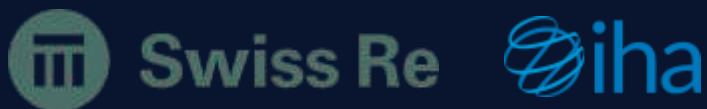
## Build trust and reputation



## Manage risk with independent audit



## Align with industry and investors



## Access Climate Bonds



# Project Certification Pipeline

30+ Hydropower projects seeking Certification

No.	Project name	Country	Assessment Date	Certification Date	Status
1	Sebzor	Tajikistan (HESG Fund)	Oct-22	Q1 2023	Assessment complete
2	confidential	Canada	September 2022	Q3 2023	Report preparation
3	confidential	Colombia (HESG Fund)	Nov-22	Jun-23	Assessment ongoing
4	confidential	Brazil	Jan-23	Q2 2023	Assessment ongoing
5	confidential	Albania	Junel 2023	Q4 2023	Confirmed interest
6	confidential	Sarawak	Jul-23	Q4 2023	Confirmed interest
7	confidential	Iceland	2023	Q3 2023	Confirmed interest
8	confidential	Malaysia	Q1 2024	By end of 2024	Confirmed interest
9	confidential	Switzerland	2023	Q4 2023	Confirmed interest
10	confidential	Indonesia	Q3 2024	By WHCongress	Confirmed interest
11	confidential	Portugal	2023	2024	Confirmed interest
12	confidential	Brazil	2024	2024	Expressed interest
13	confidential	Laos	2023	2023	Expressed interest
14	confidential	Mozambique	2024	TBC	Expressed interest
15	confidential	Rwanda (HESG Fund)	Ongoing	TBC	TBC after assessment
16	confidential	Tanzania (HESG Fund)	Ongoing	N/A	TBC after assessment
17	confidential	Mozambique (HESG Fund)	November 2022	TBC	TBC after assessment
18	confidential	Zambia / Zimbabwe	2023	TBC	TBC after assessment
19	confidential	Nicaragua (HESG Fund)	2023	TBC	TBC after assessment
20	confidential	Indonesia (HESG Fund)		TBC	TBC after assessment
21	confidential	Brazil	2023/2024	TBC	TBC after assessment
22	confidential	Brazil		TBC	TBC after assessment
23	confidential	Brazil		TBC	TBC after assessment
24	confidential	Brazil		TBC	TBC after assessment
25	confidential	Brazil		TBC	TBC after assessment
26	confidential	Brazil		TBC	TBC after assessment
27	confidential	Brazil		TBC	TBC after assessment
28	confidential	Brazil		TBC	TBC after assessment
29	confidential	Brazil		TBC	TBC after assessment
30	confidential	Brazil		TBC	TBC after assessment
31	confidential	Brazil		TBC	TBC after assessment

# Measuring Emissions from reservoirs: G-res tool

- Evaluation of Greenhouse gas (GHG) emissions from reservoirs
- Simple-to-use, web-based tool launched in 2017
- Services offered:
  - Certified User training
    - ✓ Virtual: April 24-26-28, 2023
    - ✓ Virtual: June 5-7-9, 2023
    - ✓ In person, Bali: Nov 6-8, 2023
  - Validation of results - *required to use G-res Tool results*
  - Assessment of reservoirs

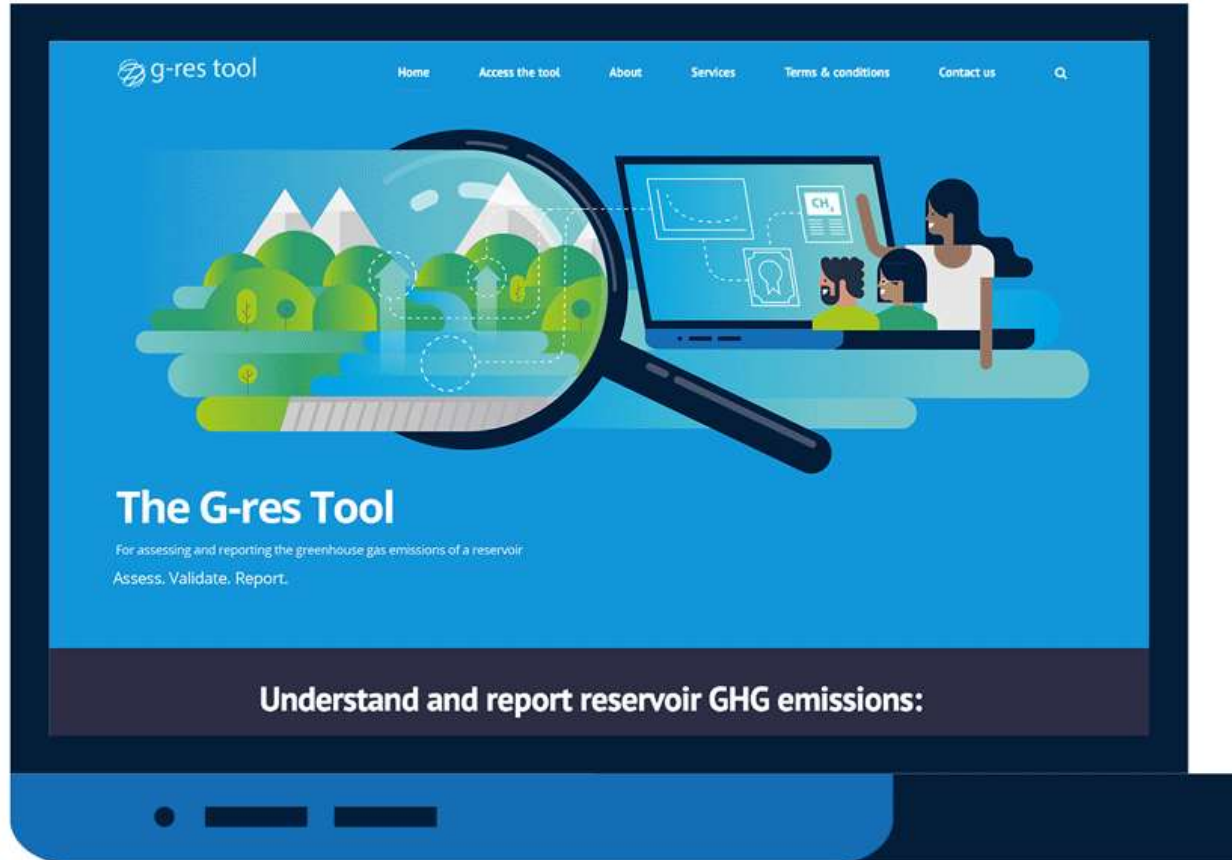
Initiative partners:



In collaboration with:







## G-res can be used:

- **Feasibility** stage: to avoid high-emitting projects
- **Design** stage: to implement measures to reduce GHG emissions
- **Operation** stage: to report on GHG emissions

## With financial support from:



## Session 2: Panel discussion

14.00-14.45

Moderator:  
Anton  
Schleiss



Maryse  
Francoise –  
CEO, MFX  
Consulting



Jeffrey Tuhtan -  
Associate  
Professor, Tallin  
n University of  
Technology



Eddie Rich –  
CEO, IHA



Dr Benjamin  
Graff – Open  
Innovation  
Manager CNR



Olivier Tricca  
– Power  
Engineer, EIB



Diar Isid –  
Policy Officer,  
DG – ENER,  
European  
Commission

# Coffee Break

14.45-15.00



## Session 3: Synergies and collaboration with ETIP's, EERA and other sector organisations for integrated use of renewables in view of safe electricity supply illustrated with examples of hybridization projects

15.00-15.15



Liv Randi  
Hultgreen -  
Executive Director,  
FME HydroCen –  
NTNU



Jean-Louis  
Drommi -  
Electricity Expert,  
EDF



Maria Laura Trifiletti -  
Project Manager,  
ZABALA



Donagh Cagney -  
Policy Director,  
Ocean Europe





# HYDROPOWER AS A CATALYST AND FACILITATOR FOR THE CLEAN, SAFE AND INDEPENDENT ENERGY TRANSITION IN EUROPE

RECOMMENDATIONS FOR THE SET PLAN REVISION

BY HYDROPOWER EUROPE, IHA, IEA HYDROPOWER AND EERA JP HYDRO

Liv Randi Hultgreen, Executive Director FME HydroCen



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)

## Hydropower as a catalyst and facilitator for the clean, safe and independent energy transition in Europe

- Hydropower is a key technology for the energy transition and the **largest renewable energy** source in Europe.
- Given Europe's ambition to raise the renewables target to 45% hydropower is critical to ensure Europe's energy system has the necessary **renewable electricity and flexibility** to protect grid stability from intermittent renewable energy, to sustain the green transition.
- While hydropower is the largest renewable non-intermittent electricity supplier in the World and in Europe, there remains significant potential, mainly through **refurbishments, new multipurpose storage projects and pumped-storage powerplants**.
- Europe must protect against periods of dunkelflaute by including **flexible power generation and dispatchable large capacity renewable storage**, like hydropower, in national targets.



## Hydropower as a catalyst and facilitator for the clean, safe and independent energy transition in Europe

- There are **barriers to overcome** for hydropower development in Europe; large scale storage, electricity market mechanisms, social and environmental measures, long regulatory lead time and high initial investment needs.
- More funding is needed in **research and innovation** to deploy solutions at the scale required in support of sustainable solutions that offer win-win situations for the environment and from an operational perspective.
- To ensure there is enough hydropower to meet Europe's decarbonization goals and maintain energy security, hydropower must have a prominent role within the **Strategic Energy Technology (SET) Plan**.
- ETIP Hydropower will serve as the basis for **collaboration** between industry stakeholders on hydropower and increase their visibility within the SET Plan.
- EERA JP Hydropower is the **hub for renewed research on hydropower**, and its R&D-community will collaborate with the industry through ETIP initiatives.



# XFLEX HYDRO INITIATIVE

ENHANCING HYDRO POWER FLEXIBILITY

25 APRIL 2023, 9:00-16:30PM

Jean-Louis Drommi - Electricity Expert, EDF



Funded by  
the European Union

The Hydropower Extending Power System Flexibility (XFLEX HYDRO) project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857832

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)



# XFLEX HYDRO, A European Project

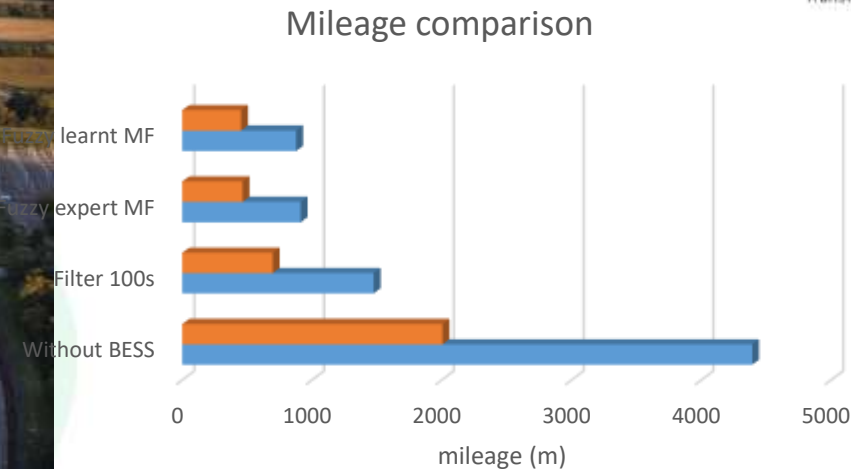
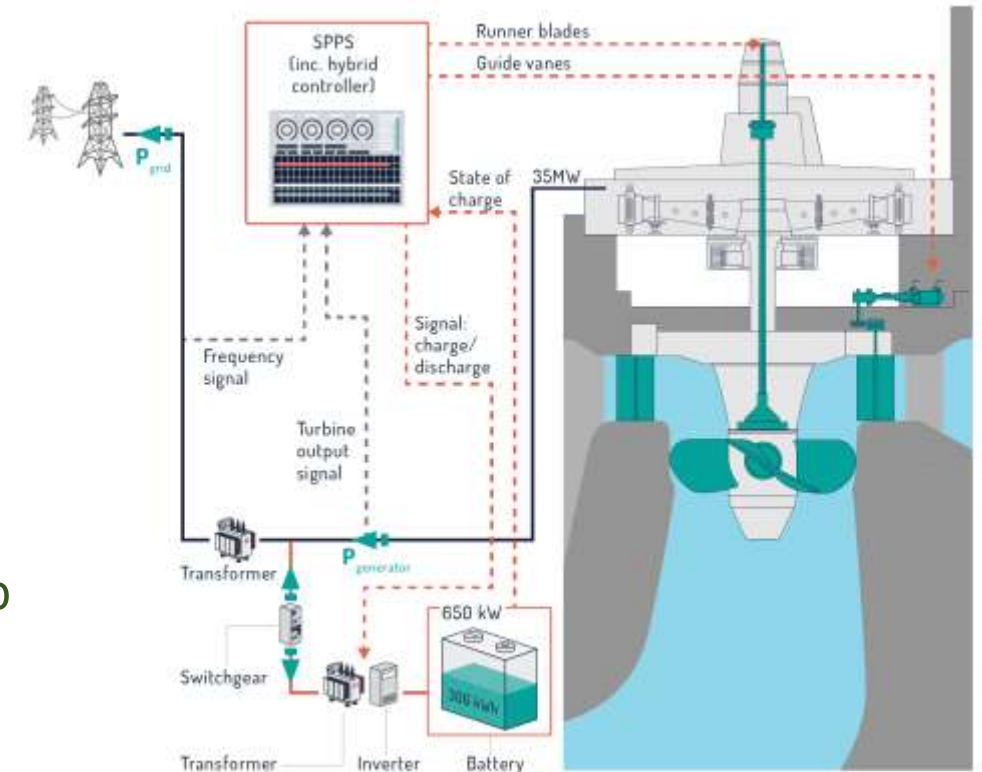
- Consortium 19 partners
- 250 000 hours
- 7 demonstrator sites
- Targets : increasing flexible services for grid support





# Hybridising Vogelgrun Kaplan Unit

- Run of River Plant
- 4x35MW => 1 Unit hybridized
- Operates 24/7 => Hybrid since Aug 2021
- Provision of balancing power
- Small size Battery (1/5 of balancing power)
- Hybridisation => Reduce Wear and Tear by 90%



## Key Take Away



- Flexible features of dispatchable power are to be used ever more
- New plant design must take onboard flexibility requirement
- Pay back of flexible services must show a profit for investors
- Hydro, though very flexible, is expected to do more. The profession intends to meet the challenge



Thank you!





# XFLEX HYDRO INITIATIVE

ENHANCING HYDRO POWER FLEXIBILITY

25 APRIL 2023, 9:00-16:30PM



Funded by  
the European Union

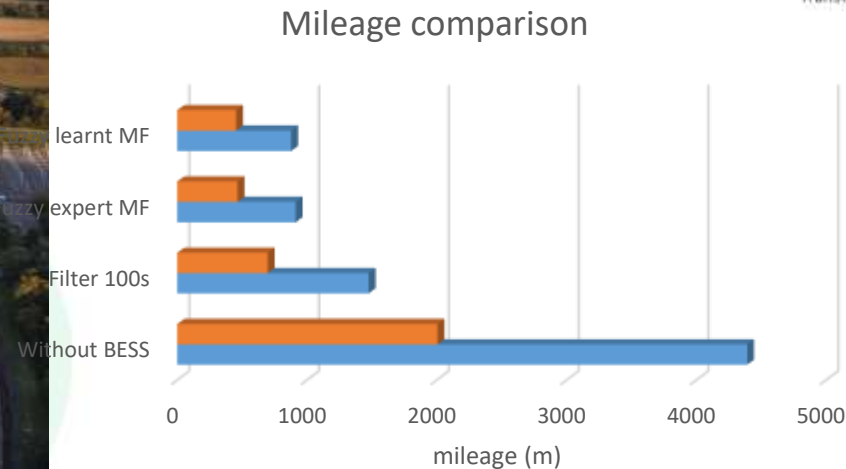
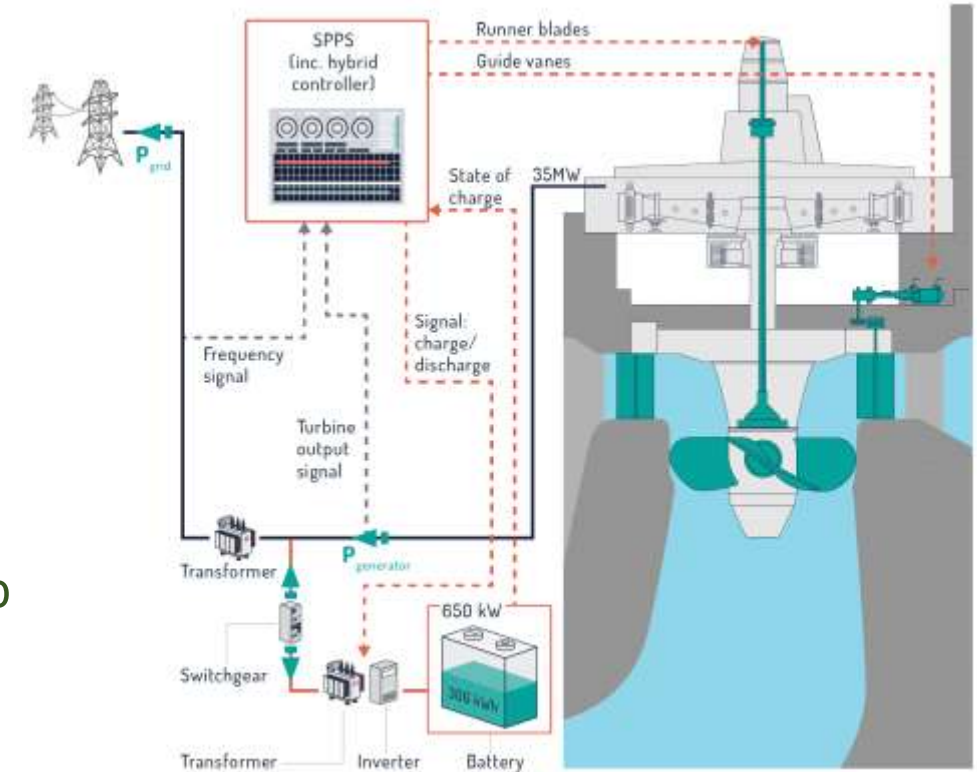
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[www.etip-hydropower.eu](http://www.etip-hydropower.eu)



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Thank you!

# ETIPs FORUM



# ETIPs FORUM

**Maria Laura Trifiletti**  
**ETIPs FORUM Facilitator**  
**ETIP SNET Coordinator**

*20 April 2023*

*16.30-16.40*

# ***European Technology and Innovation Platforms - ETIPs***

The 11 European Technology and Innovation Platforms (ETIPs) were created to support the implementation of the SET Plan:

- bringing together EU countries, industry, and researchers in key areas.
- promoting the market uptake of key energy technologies by pooling funding, skills, and research facilities.





# ***ETIPs FORUM - Creation and objectives***

*On 2<sup>nd</sup> June 2021 the ETIPs decided to set a common FORUM > the **ETIPs FORUM***

***With the support of EERA***



*The **main objective** of the ETIPs FORUM is to streamline shared topics into multiple working sessions in order to:*

- identify potential common activities / common topics*
- avoid overlaps in execution of common tasks and activities*
- facilitate definition of future topics and action for collaboration*

*The **final goal** is to accelerate the execution of the SET Plan*



# ETIPs FORUM - Concrete actions

## Concrete actions carried out till today and planned in the next months:

- **Oct 2022** → **Set of recommendations to the SET PLAN in the framework of the renewal process**
- **Nov 2022** → Joint position papers (e.g. ETIP RHC and ETIP SNET published a paper Coupling of Heating/Cooling and Electricity Sectors in a Renewable Energy-Driven Europe)
- **Dec 2022** → Presence at ENLIT 2022 in Frankfurt with a Panel and a booth
- **Feb 2023** → Participation at the ENLIT Impact Circle and drafting programme of the EU project Zone for the next 2023 edition 2023 in Paris
- **May 2023** → **Launching a common brainstorming activities on key cross cutting challenges along the objectives of the SET PLAN**
- **June 2023** → Participation as a speaker at the EUSEW policy conference jointly with DG ENER Unit B5, DG R&I and JRC – June 2023
- **June 2023** → Participation at the EUSEW Energy Fair with a shared stand with the ETIP SNET and BRIDGE Initiative



# *Next activities*

**Launching a common brainstorming activities on key cross cutting areas along the objectives of the SET PLAN, such us:**

- Social science humanities & Citizens engagement
  - Digitalization & Cyber security
  - Skills
  - Raw Materials & Circularity
  - Technology infrastructure
  - (hybrid) energy storage
- 



## ETIPs FORUM



*THANKS FOR YOUR  
ATTENTION*

# Presenting ASPIRE, the Alliance of Secure, indigenous & Predictable Renewable Electricity



Donagh Cagney -  
Policy Director,  
Ocean Europe

## Session 3: Panel discussion

15.15-16.00



Thomas Schleker  
– Policy Officer,  
European  
Commission, DG  
RTD



Liv Randi Hultgreen  
– Executive Director,  
FME HydroCen /  
NTNU



Jean-Louis  
Drommi -  
Electricity E  
xpert, EDF



Maria Laura  
Trifiletti –  
Project  
Manager,  
ZABALA



Donagh Cagney  
– Policy  
Director, Ocean  
Europe



Moderator:  
Andrej Misech  
– Project  
Officer, EUREC



# ETIP Hydropower 'Unifying the voices of hydropower in Europe' the next steps

16.00-16.15



Mark Morris – Director,  
Samui



Sébastien Mortier – Project  
Advisor, CINEA approach





# Unifying the Voices of Hydropower in Europe

NEXT STEPS...

Mark Morris

HYDROPOWER DAY 2023   Brussels, 25<sup>th</sup> April 2023



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)

## Key points

### 1. An overview

### 2. Key project actions:

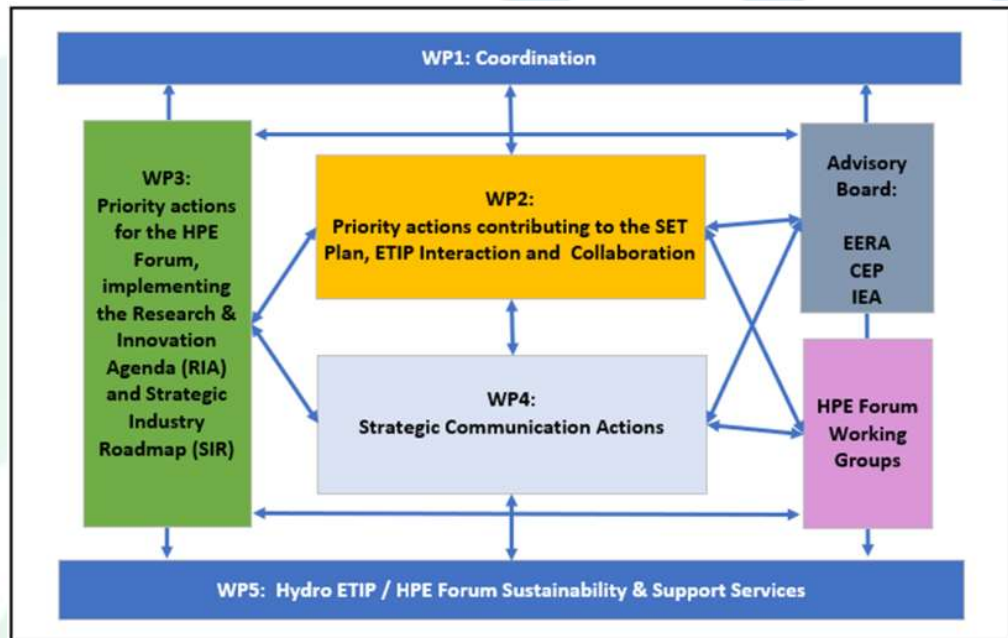
- Establishing & implementing ETIP governance structure
- ETIP participation in the SET Plan process
- Facilitating RIA and SIR priorities
- Facilitating R&I
- Establishing a sustainable organisation

### 3. In conclusion

- How to participate and steer direction of the ETIP

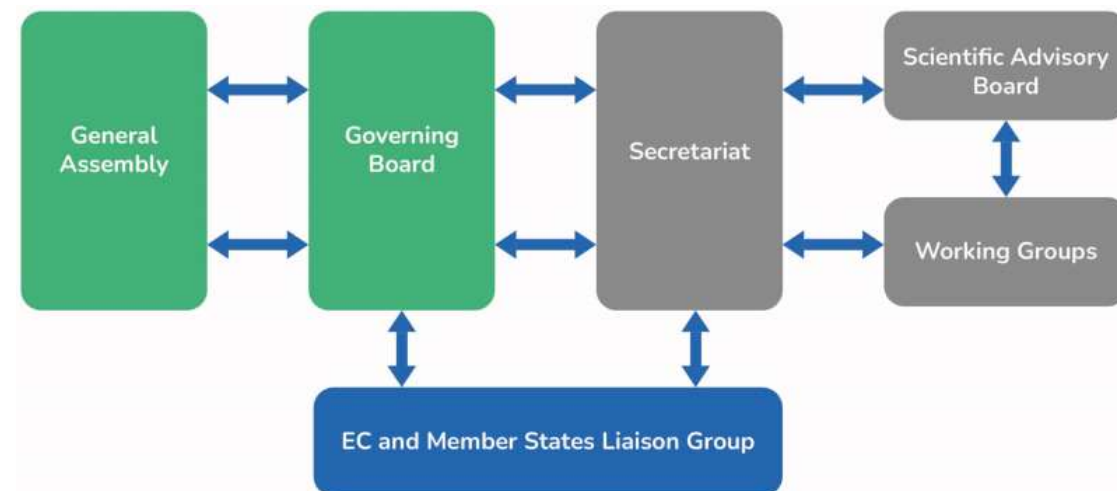


## [1] An overview...

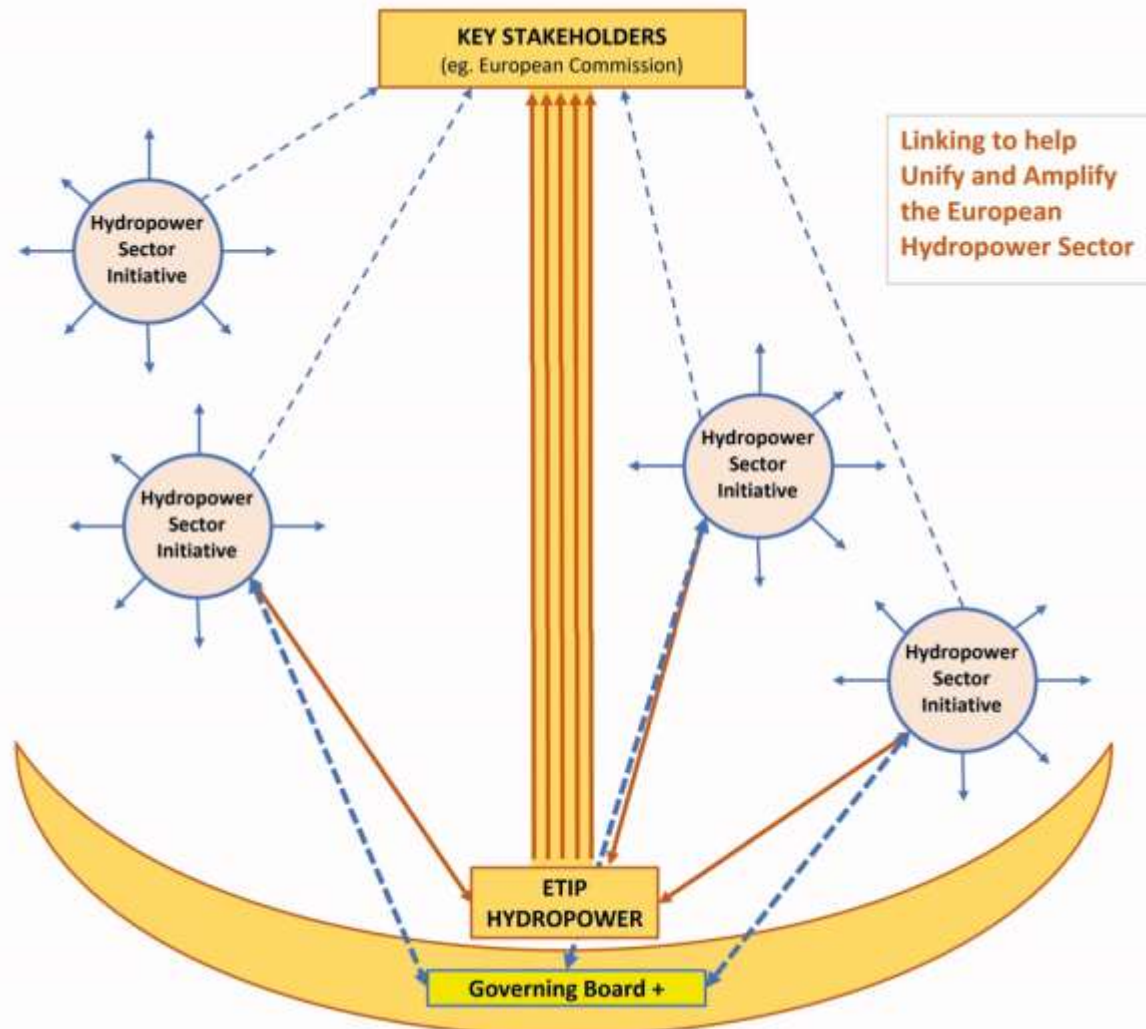


**EC Funded ETIP HYDROPOWER Project – 3 yrs – various actions implemented by the project team**

One of those actions is to setup and implement the governance structure for the ETIP HYDROPOWER – open participation, elected governing board...



## A key role to unify & amplify...

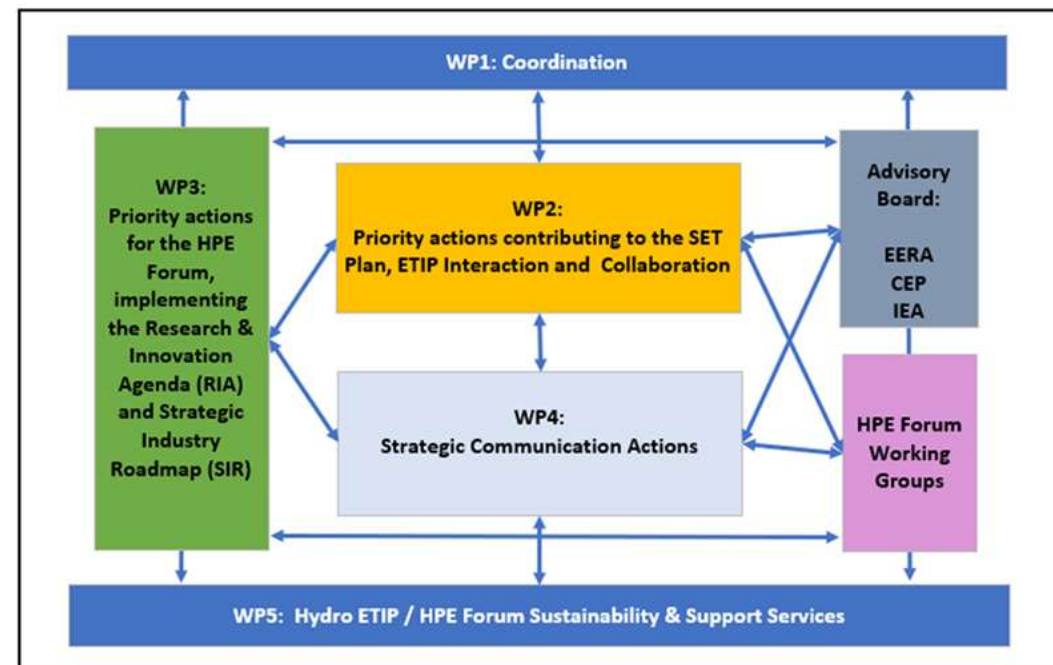


A key role for the ETIP HYDROPOWER is to help **unify** the hydropower sector, presenting a **single voice on key issues**.

This function does not duplicate the role of existing associations – **it enhances**.

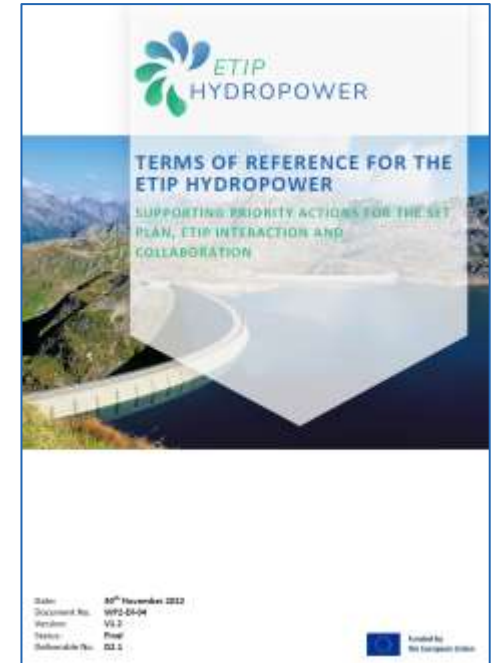
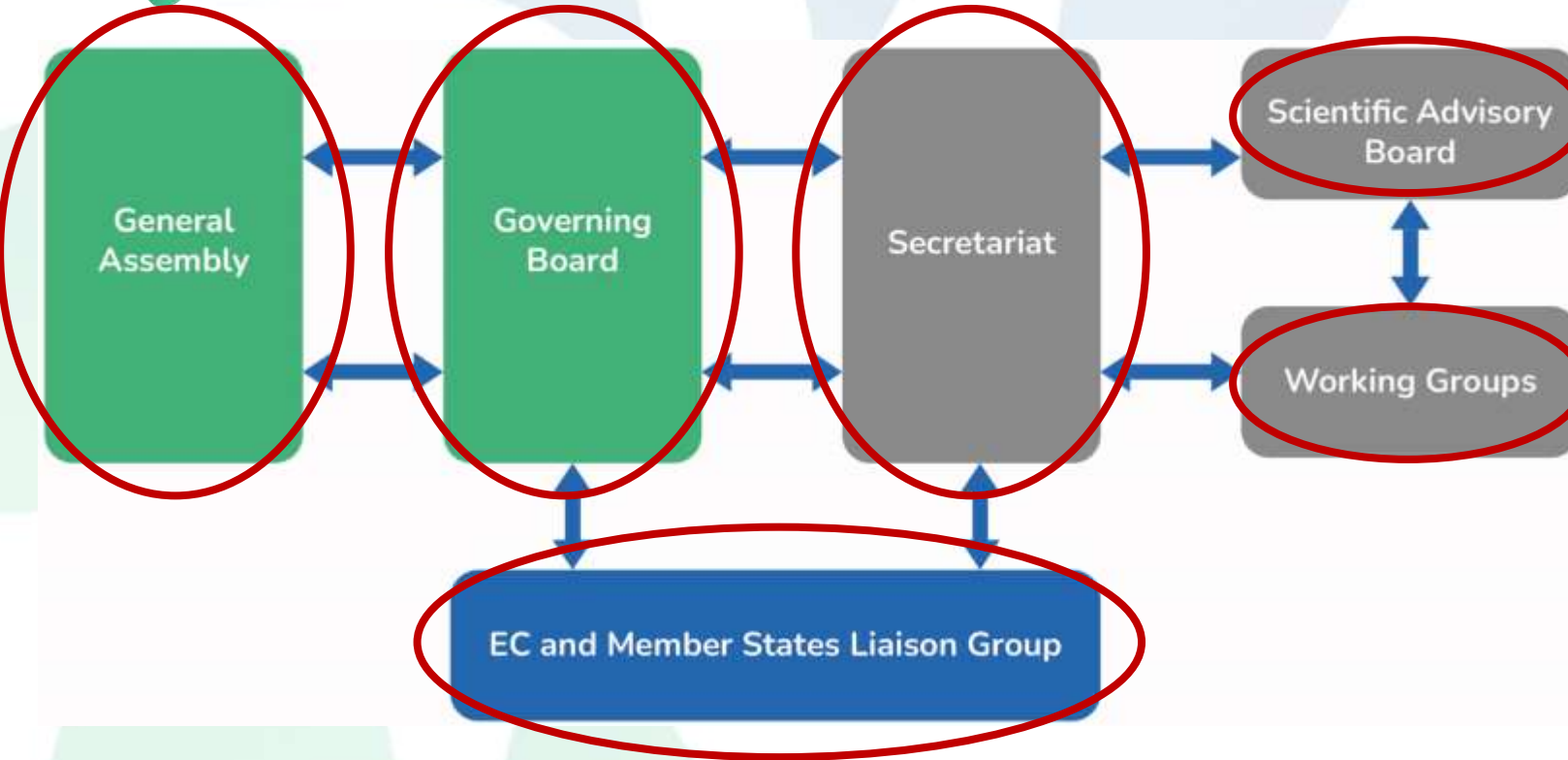
## [2] Key project actions:

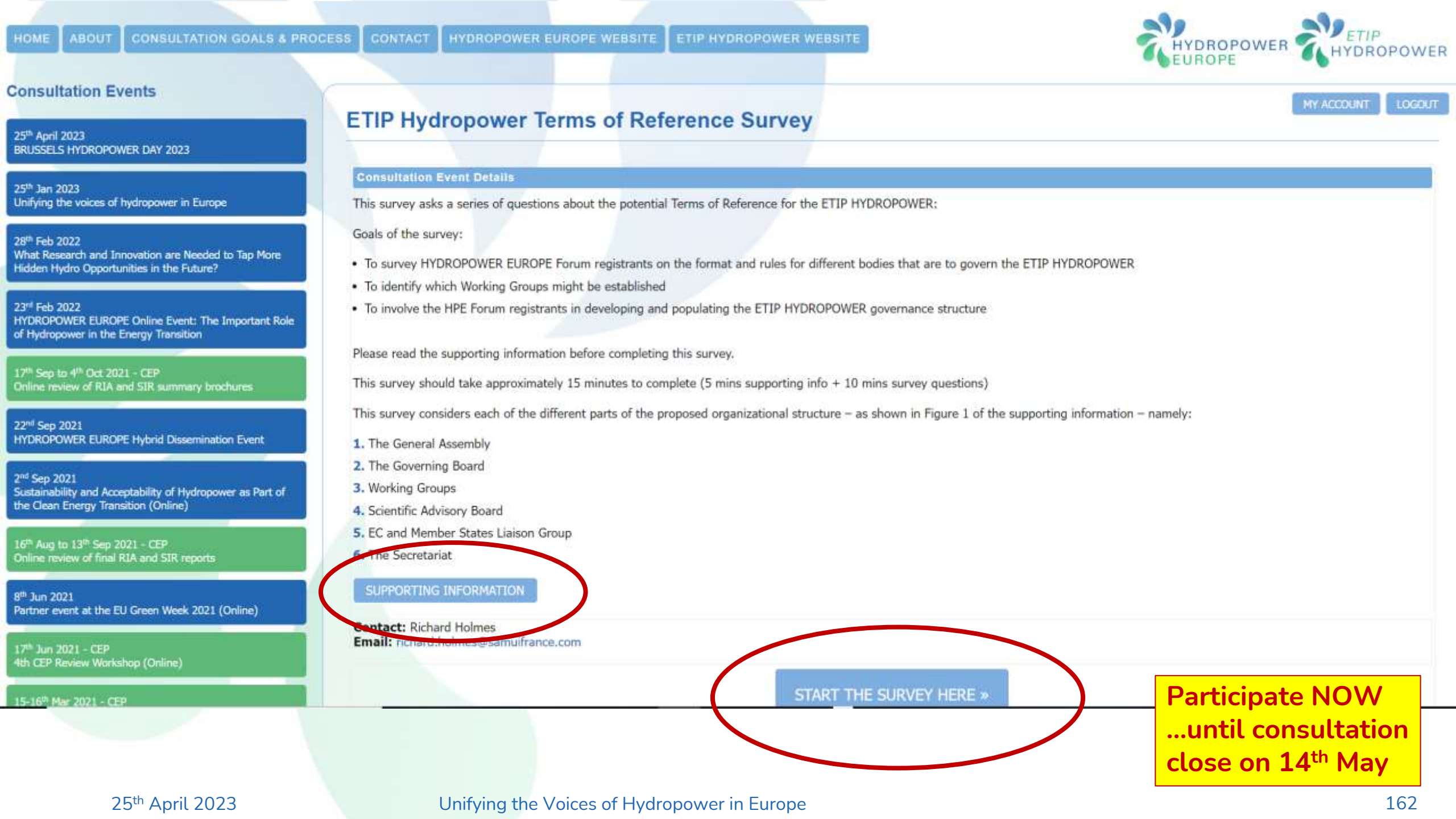
- Establishing & implementing ETIP governance structure
- ETIP participation in the SET Plan process
- Facilitating RIA and SIR priorities
- Facilitating R&I
- Establishing a sustainable organisation





# Establishing & implementing ETIP governance:





## Consultation Events

25<sup>th</sup> April 2023  
BRUSSELS HYDROPOWER DAY 2023

25<sup>th</sup> Jan 2023  
Unifying the voices of hydropower in Europe

28<sup>th</sup> Feb 2022  
What Research and Innovation are Needed to Tap More Hidden Hydro Opportunities in the Future?

23<sup>rd</sup> Feb 2022  
HYDROPOWER EUROPE Online Event: The Important Role of Hydropower in the Energy Transition

17<sup>th</sup> Sep to 4<sup>th</sup> Oct 2021 - CEP  
Online review of RIA and SIR summary brochures

22<sup>nd</sup> Sep 2021  
HYDROPOWER EUROPE Hybrid Dissemination Event

2<sup>nd</sup> Sep 2021  
Sustainability and Acceptability of Hydropower as Part of the Clean Energy Transition (Online)

16<sup>th</sup> Aug to 13<sup>th</sup> Sep 2021 - CEP  
Online review of final RIA and SIR reports

8<sup>th</sup> Jun 2021  
Partner event at the EU Green Week 2021 (Online)

17<sup>th</sup> Jun 2021 - CEP  
4<sup>th</sup> CEP Review Workshop (Online)

15-16<sup>th</sup> Mar 2021 - CEP

## ETIP Hydropower Terms of Reference Survey

### Consultation Event Details

This survey asks a series of questions about the potential Terms of Reference for the ETIP HYDROPOWER:

Goals of the survey:

- To survey HYDROPOWER EUROPE Forum registrants on the format and rules for different bodies that are to govern the ETIP HYDROPOWER
- To identify which Working Groups might be established
- To involve the HPE Forum registrants in developing and populating the ETIP HYDROPOWER governance structure

Please read the supporting information before completing this survey.

This survey should take approximately 15 minutes to complete (5 mins supporting info + 10 mins survey questions)

This survey considers each of the different parts of the proposed organizational structure – as shown in Figure 1 of the supporting information – namely:

1. The General Assembly
2. The Governing Board
3. Working Groups
4. Scientific Advisory Board
5. EC and Member States Liaison Group
6. The Secretariat

[SUPPORTING INFORMATION](#)

**Contact:** Richard Holmes

**Email:** richard.holmes@samuifrance.com

[START THE SURVEY HERE »](#)

**Participate NOW  
...until consultation  
close on 14<sup>th</sup> May**

# ETIP participation in the SET Plan process:

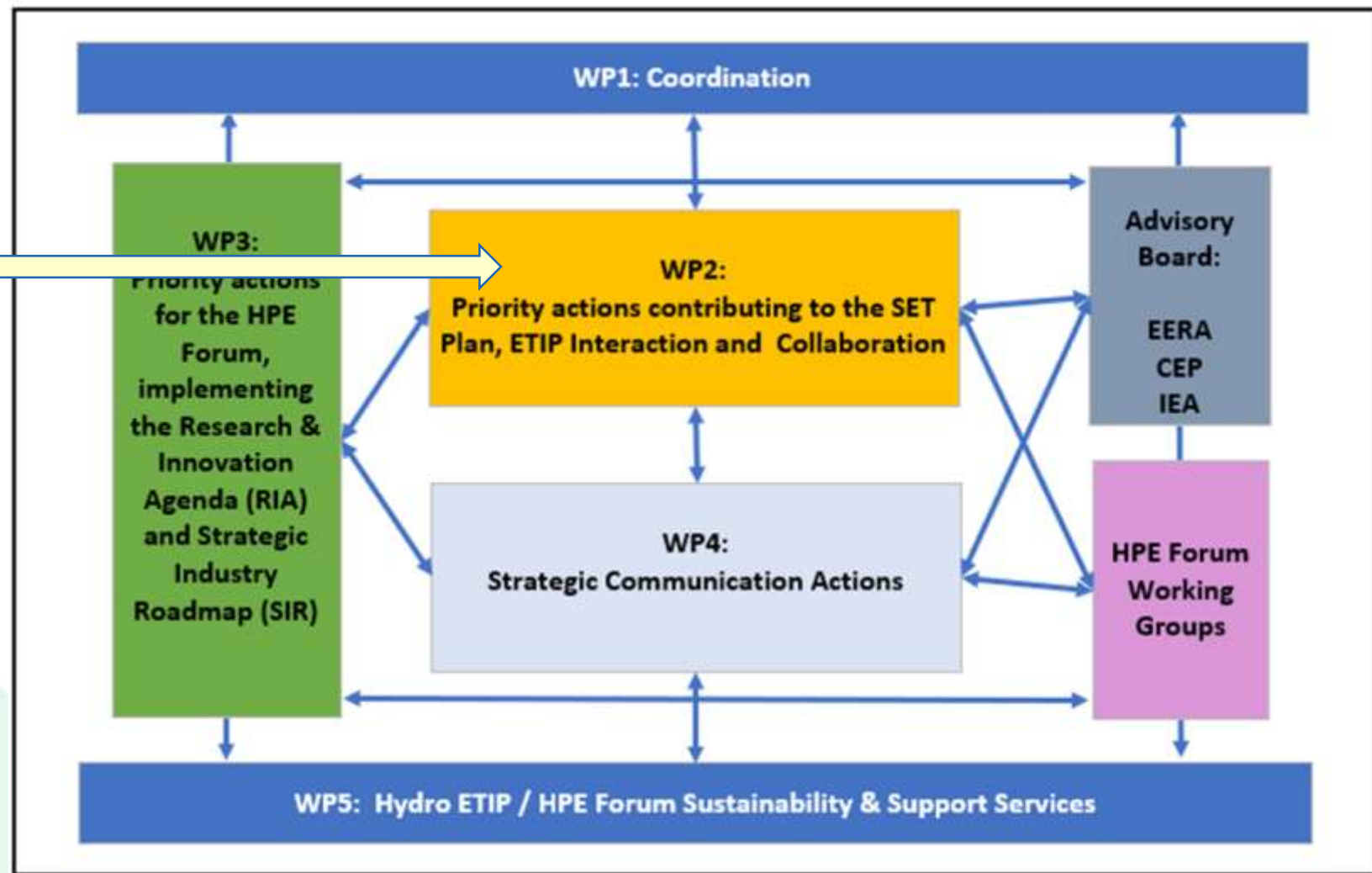
## WP2: SET Plan, ETIP interaction & collaboration

Establishes the ETIP governance structure

Implements the ETIP process

Supports the SET Plan

Develops and maintains ETIP cooperation actions





# Facilitating RIA and SIR priorities:

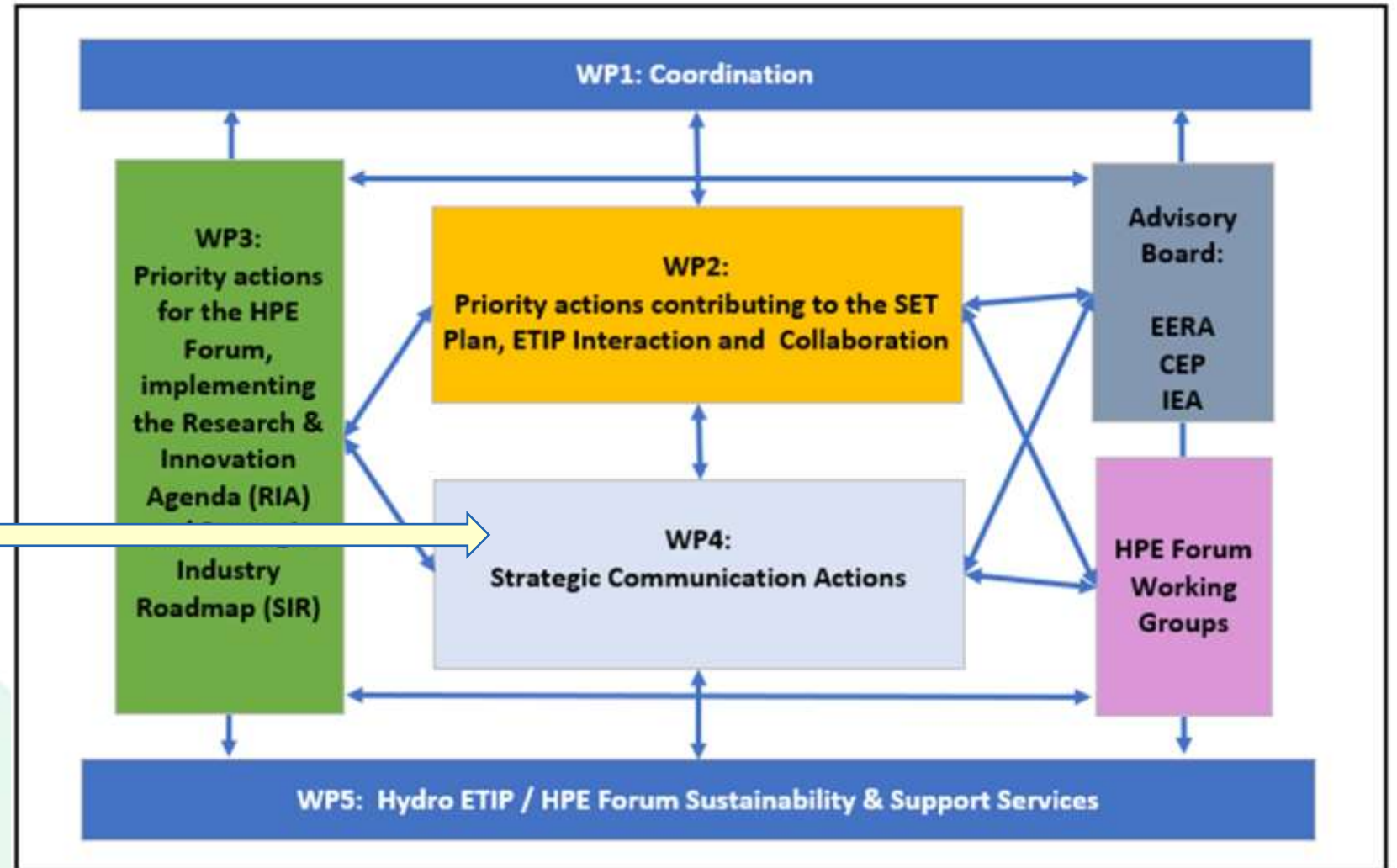
Including...

## WP4: Strategic communication actions

Increasing public awareness

Annual hydropower day in Brussels

Promotion of innovation and best practice for industry

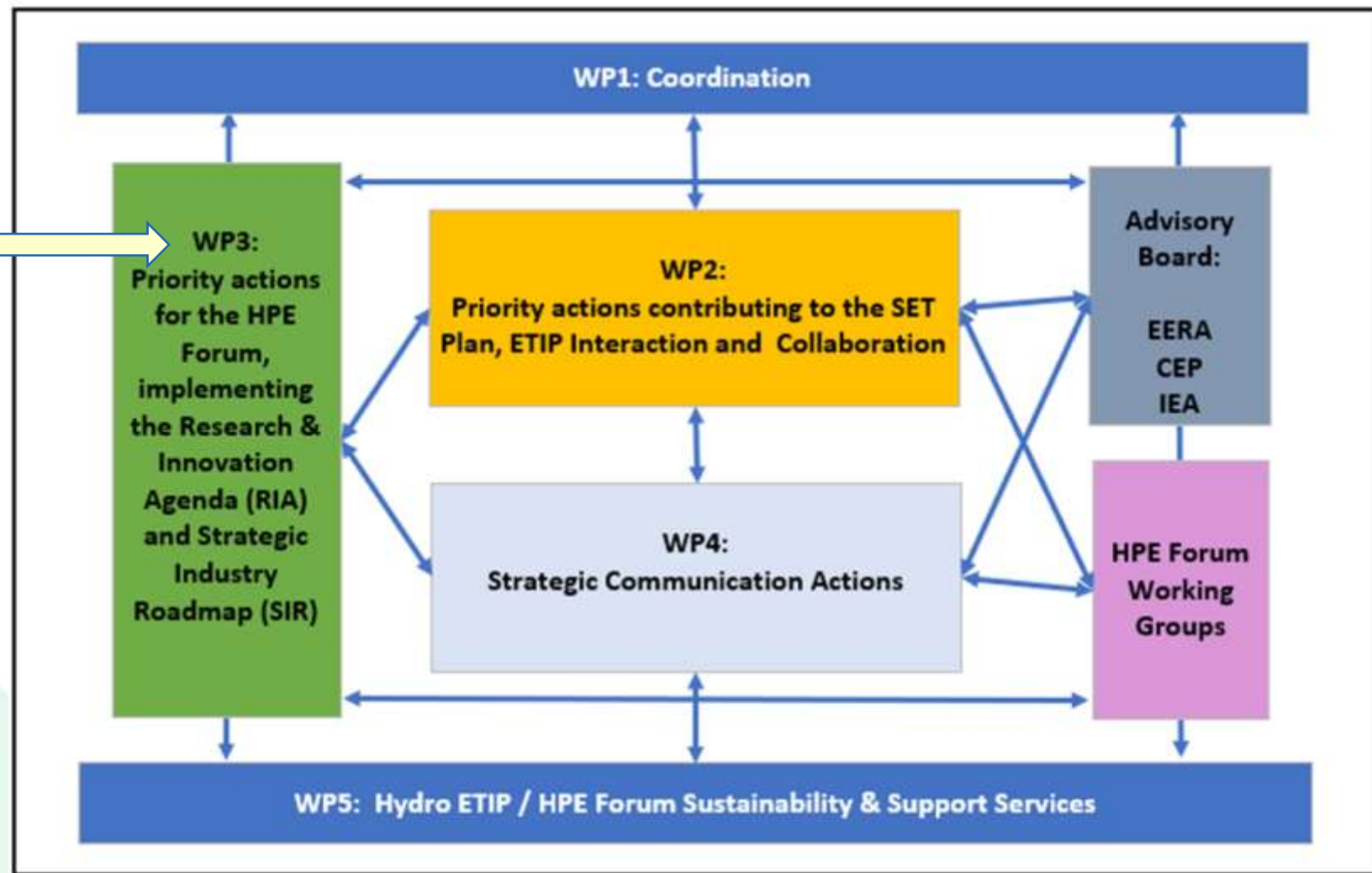


## Facilitating R&I:

### WP3: Supporting priority actions for the Forum and RIA / SIR

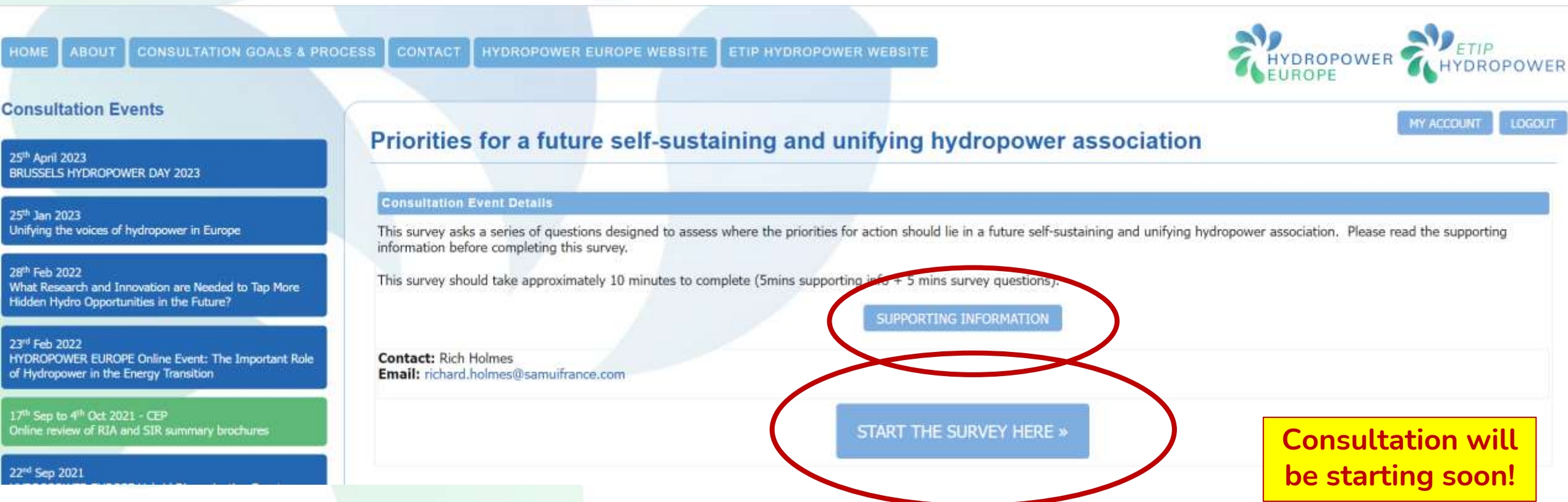
Developing a more detailed framework for tracking and updating R&I priorities, funding opportunities etc.

Implementing this process during the ETIP HYDROPOWER project...



## Establishing a sustainable organisation:

When the EC funding for ETIP HYDROPOWER finishes after 3 years, a structure is needed for a self sustaining / self financing association.



The screenshot shows the ETIP HYDROPOWER website. The top navigation bar includes links for HOME, ABOUT, CONSULTATION GOALS & PROCESS, CONTACT, HYDROPOWER EUROPE WEBSITE, and ETIP HYDROPOWER WEBSITE. The right side features the HYDROPOWER EUROPE and ETIP HYDROPOWER logos, along with MY ACCOUNT and LOGOUT buttons.

**Consultation Events**

- 25<sup>th</sup> April 2023  
BRUSSELS HYDROPOWER DAY 2023
- 25<sup>th</sup> Jan 2023  
Unifying the voices of hydropower in Europe
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- 22<sup>nd</sup> Sep 2021

**Priorities for a future self-sustaining and unifying hydropower association**

**Consultation Event Details**

This survey asks a series of questions designed to assess where the priorities for action should lie in a future self-sustaining and unifying hydropower association. Please read the supporting information before completing this survey.

This survey should take approximately 10 minutes to complete (5mins supporting info + 5 mins survey questions).

**Contact:** Rich Holmes  
**Email:** richard.holmes@samuifrance.com

**SUPPORTING INFORMATION**

**START THE SURVEY HERE »**

**Consultation will be starting soon!**



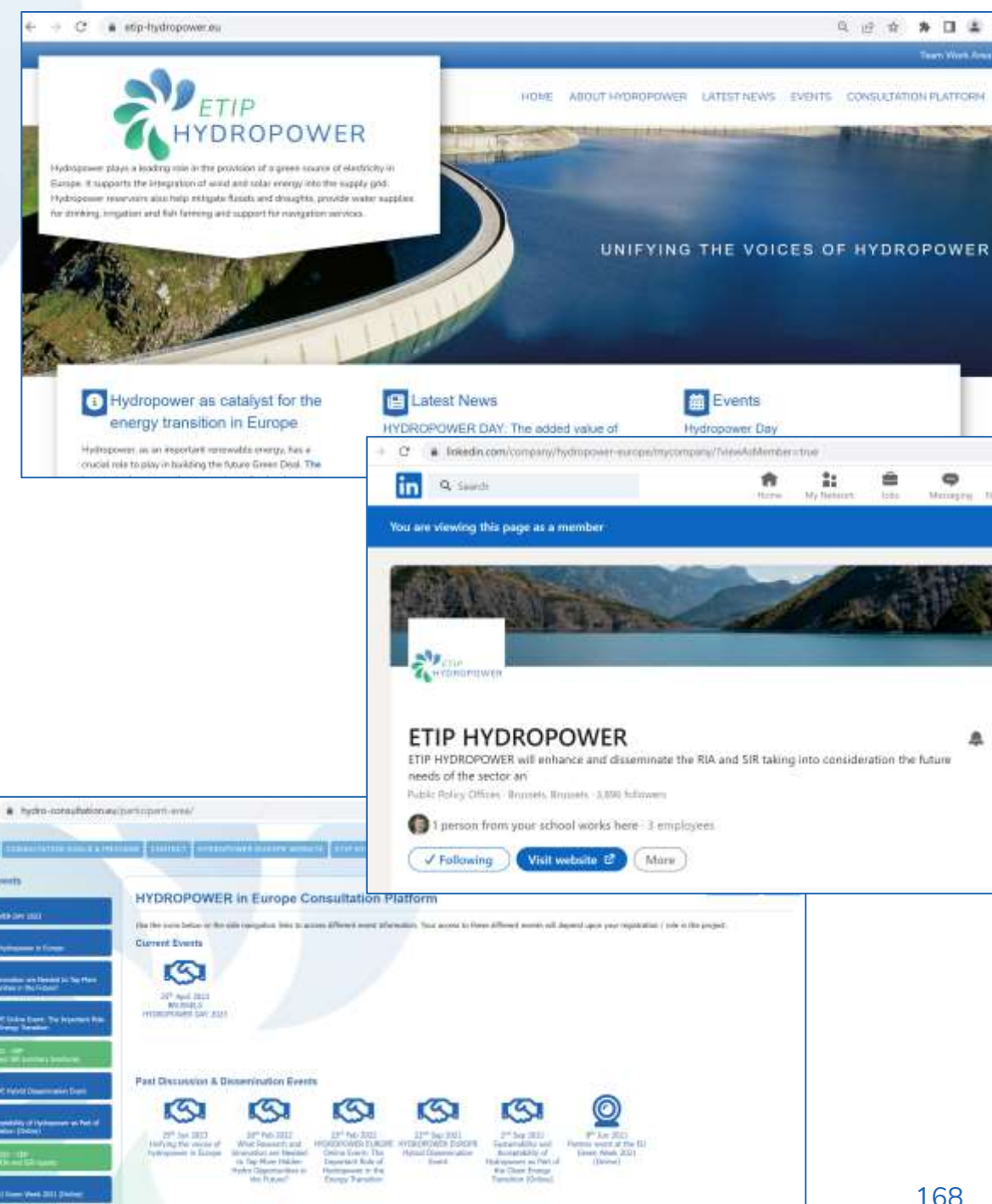
## In conclusion:

- We have EC funding for 3 years to implement the ETIP HYDROPOWER project programme
- A formal governance structure will be implemented, allowing anyone to participate in the various different roles
  - Participate NOW in the consultation process to confirm the governance approach
- Work is underway to ensure continuance of ETIP HYDROPOWER beyond the 3 yr EC funding
  - Participate in the consultation process in the coming weeks to confirm the priorities for such an association

## In conclusion:

A reminder that

- We provide information via our website at [www.etip-hydropower.eu](http://www.etip-hydropower.eu)
- We have active social media accounts such as LinkedIn:
- We undertake consultation and communication events via our consultation platform at <https://hydro-consultation.eu>
  - (currently 675 consultees registered... )



## Further information?

For further information please contact:

Mark Morris

[mark.morris@samuifrance.com](mailto:mark.morris@samuifrance.com)

[info@etip-hydropower.eu](mailto:info@etip-hydropower.eu)

[www.hydropower-europe.eu](http://www.hydropower-europe.eu)

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)



**NOW some words from  
our project officer:**

**Sébastien Mortier...**



# Conclusions and outlook

16.15-16.30



Patrick Clerens -  
Secretary General, EASE



# THANK YOU FOR JOINING US AT BRUSSELS HYDROPOWER DAY

25 APRIL 2023

Residence Palace and online



Funded by  
the European Union

[www.etip-hydropower.eu](http://www.etip-hydropower.eu)