



REVHYDRO

**REvolutionary refurbishment
for an efficient and eco-friendly
Hydropower**

Horizon Europe Project (Proposal ID: 101172857)

Prof. Michel Cervantes

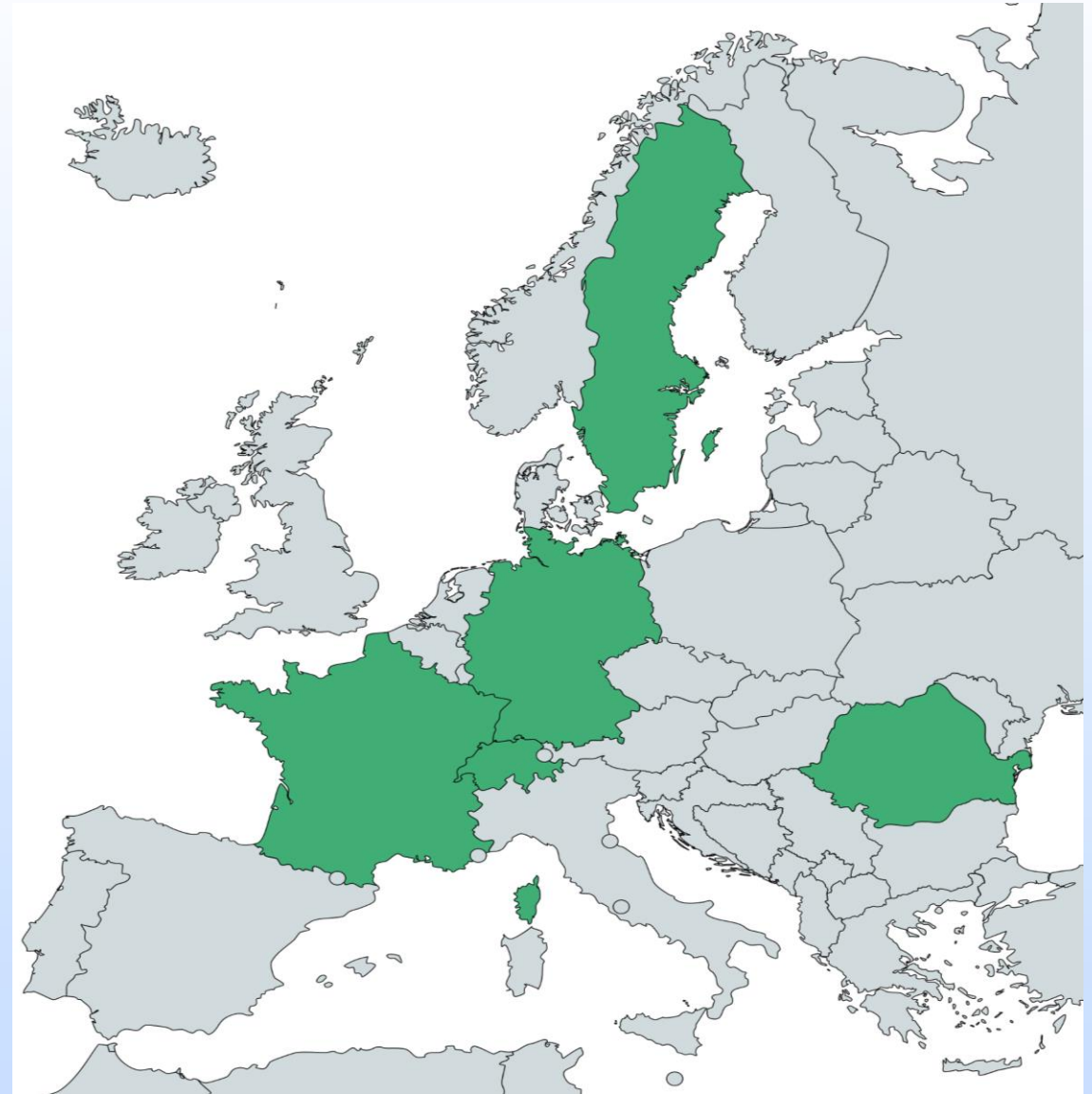


Funded by
the European Union

- Acronym: RevHydro
- Duration: 48 Months
- Start: 01/10/2024
- Budget: 4 M€
- Type of Action: Research and Innovation Action (RIA)
- Goal: Enhance hydropower efficiency, flexibility, and sustainability while adhering to environmental and economic standards.



- LULEA TEKNISKA UNIVERSITET, LTU (Sweden)
- **GE HYDRO FRANCE, GE (France)**
- **RESCOLL, RESC (France)**
- **ELECTRICITE DE FRANCE, EDF (France)**
- **COMPAGNIE NATIONALE DU RHÔNE, CNR (France)**
- UNIVERSITY OF STUTTGART, USTUTT (Germany)
- **INSTITUTULUI NATIONAL DE CERCETARE DEZVOLTARE PENTRU INGINERIE ELECTRICA, ICPE (Romania)**
- **UNIVERSITATEA DUNAREA DE JOS DIN GALATI, UDJG (Romania)**
- **ASOCIATIA INSTITUTUL PENTRU CERCETARE IN ECONOMIE CIRCULARA SI MEDIU EERNEST LUPAN, IRCEM (Romania)**
- HAUTE ECOLE SPECIALISEE DE SUISSE OCCIDENTALE, HES (Switzerland)

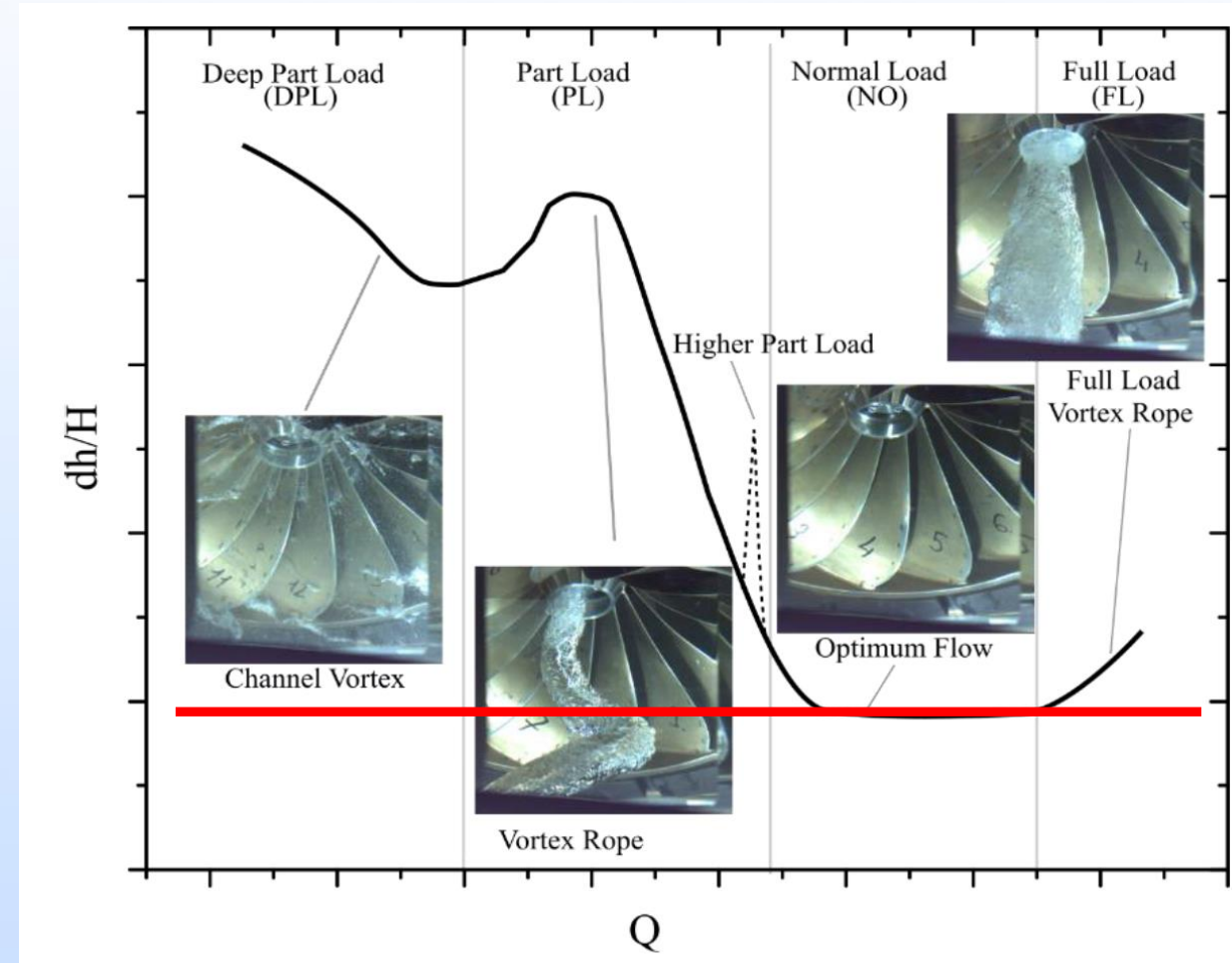


Global Importance of Hydropower:

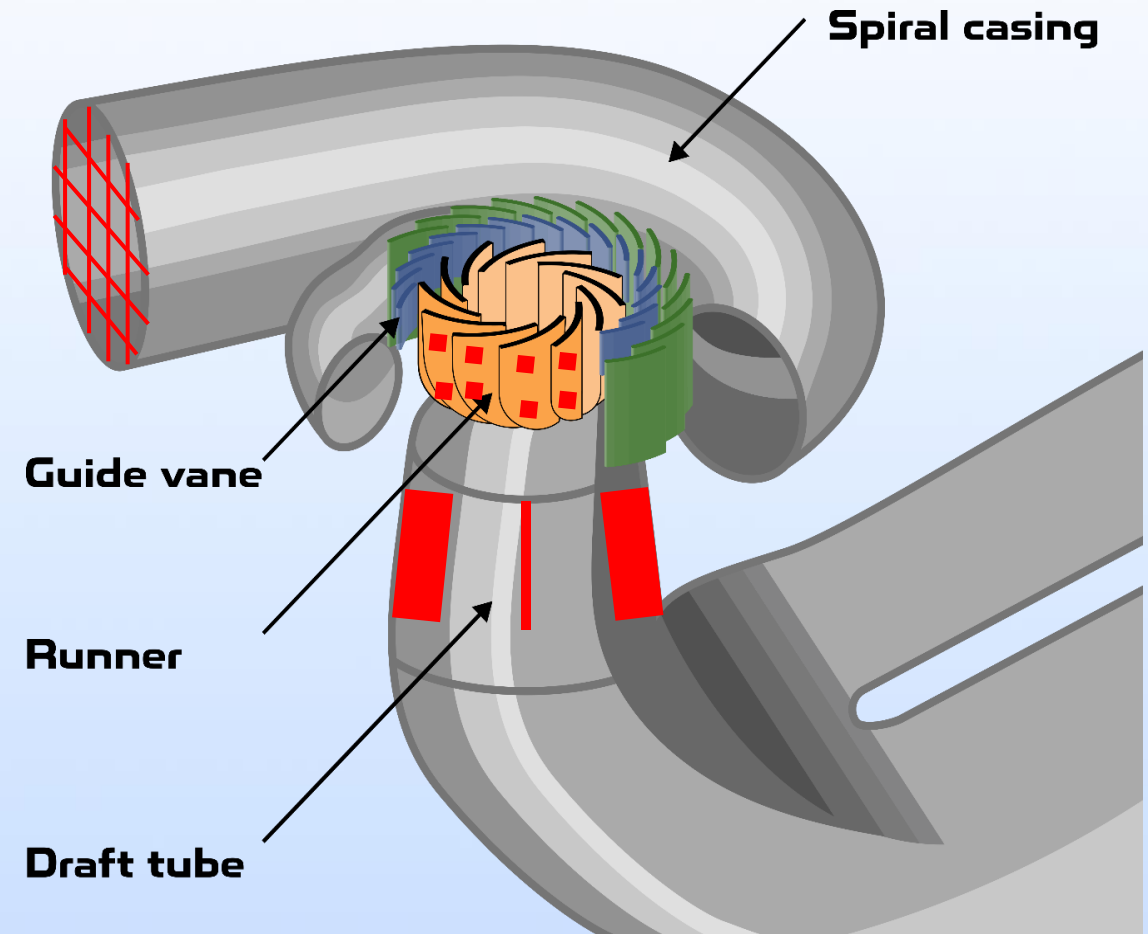
- Largest renewable electricity source: 59% of renewables.
- About 17% the electricity production worldwide.
- High flexibility

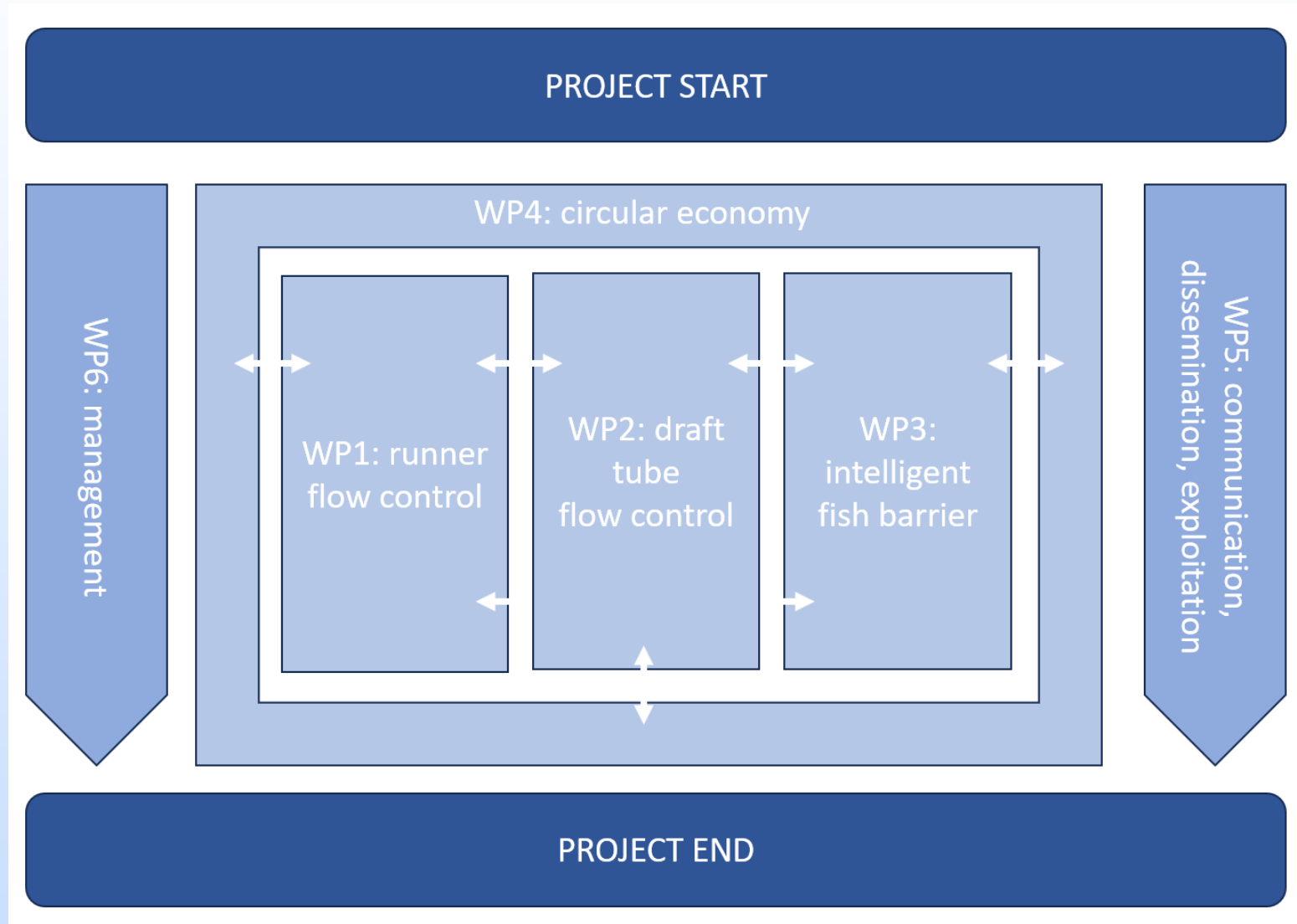
Challenges:

- Operation beyond design parameters due to introduction of intermittent renewable energies.
- Increased wear due dynamic load demands.
- Disturb fish migration.
- Refurbishment are costly.

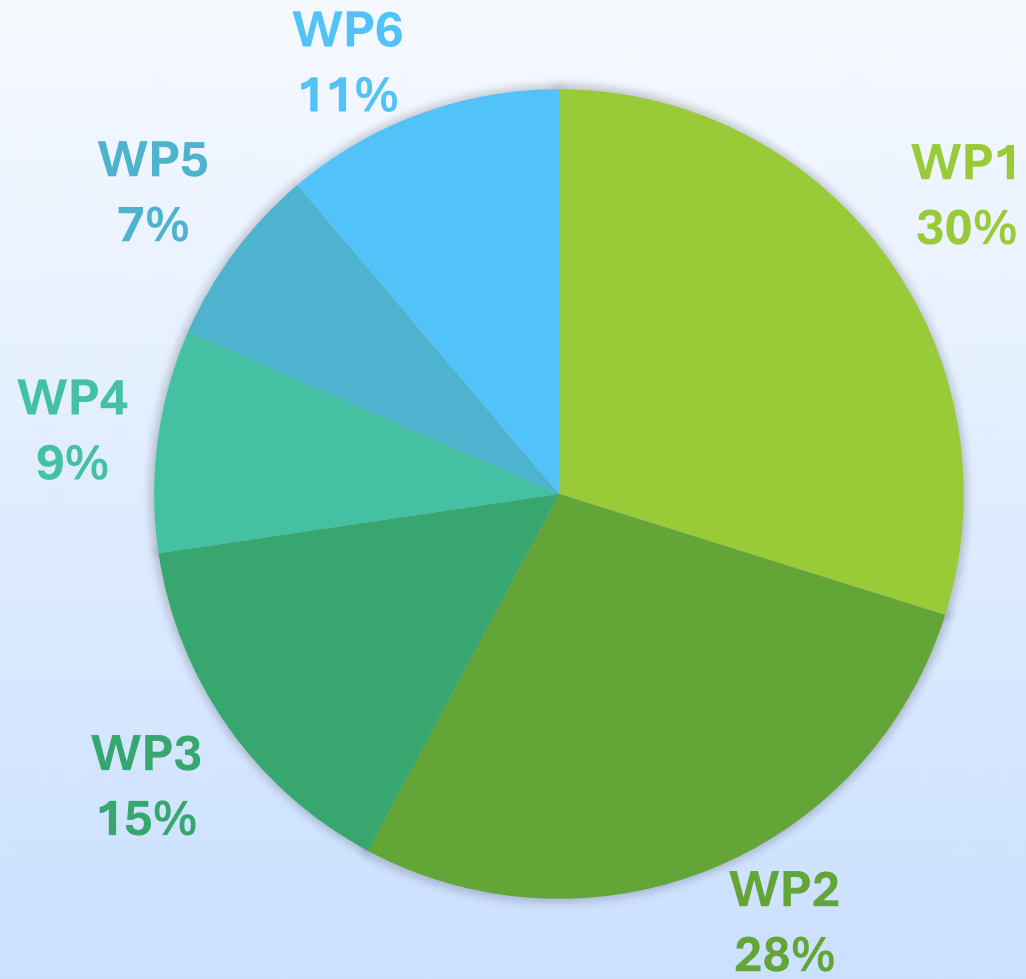


- **Flow control technologies**
 - Draft tube flow control (DFC): smart guide vanes in the draft tube
 - Runner flow control (RFC): smart add-on
- **Fish barrier technology**
 - Adaptive based AI system to redirect the fish to safe passages
- **Circular economy**
 - Minimize refurbishment impact and optimize resources

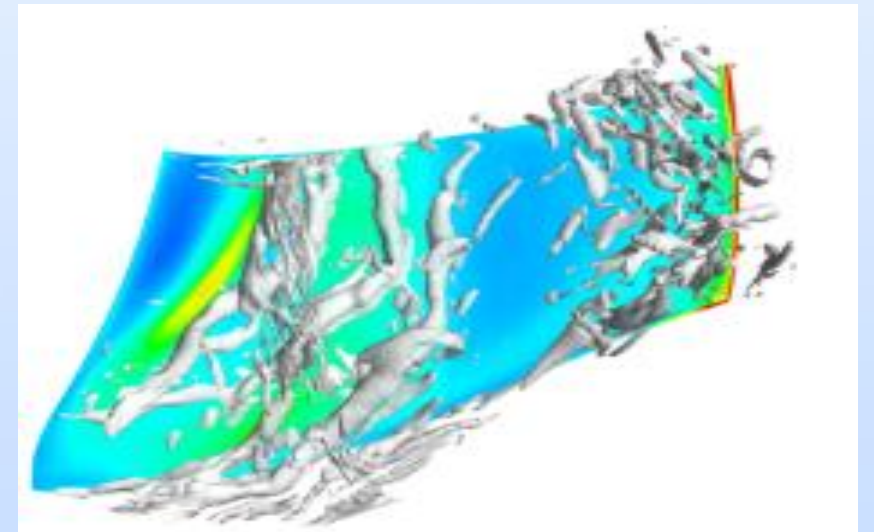
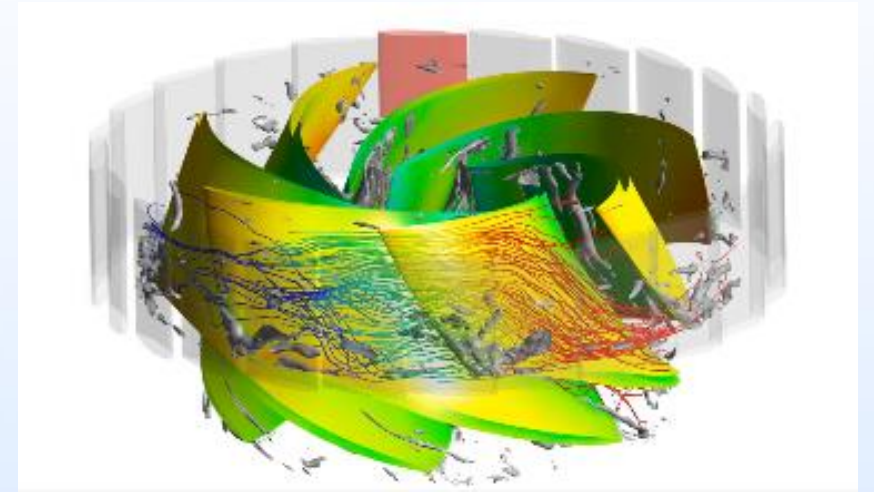




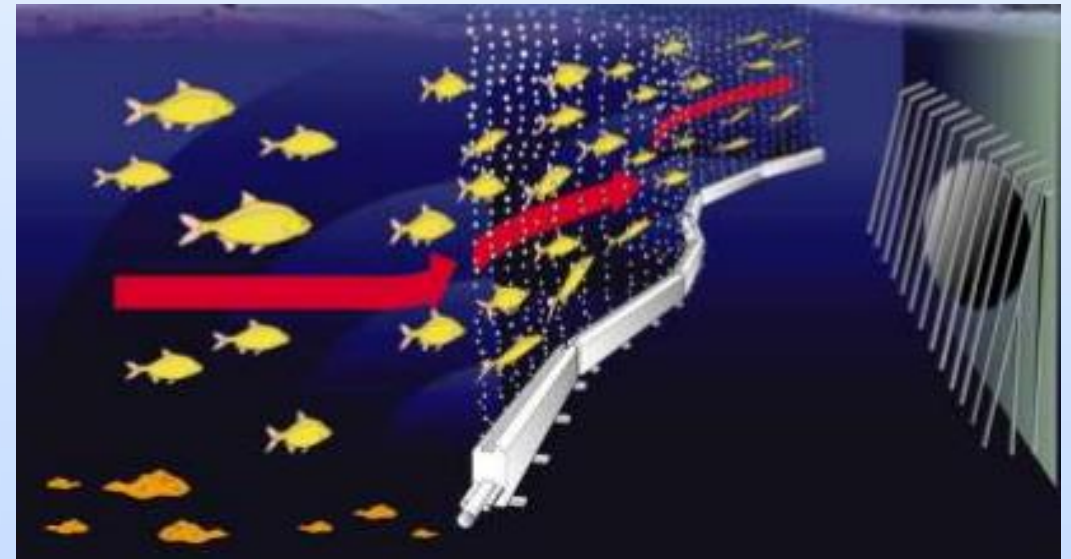
430 person
months



- **Modelling**
 - Pressure fluctuations and strains: Predicted within $\pm 20\%$ of experimental values
 - Fatigue prediction accuracy: Within $\pm 20\%$ of experimental measurements
- **Efficiency & Resilience**
 - Expand operating range by 50%
 - Turbine fatigue decreased by 80% at part load and deep part load
 - Extended turbine life by 25%
 - Turbine start/stop are increased by a factor of 10 without additional fatigue



- Environmental impact
 - At least 95% of the fish can be redirected
- Circular Economy
 - CO₂ emission reduction by 30%
 - Reduction in resource consumption by 25%
 - Reduction in OPEX by 20%
 - Reduction of CAPEX by 50%



- ❑ **Increased Energy Efficiency:** By reducing harmful off-design flow structures, the refurbishment will improve energy production efficiency by up to 10% in certain operating conditions.
- ❑ **Extended Operational Range and Lifespan:** The refurbishment will extend the operational range of turbines by 50% and increase their lifespan by 25%, reducing the frequency and cost of overhauls.
- ❑ **Enhanced Biodiversity Protection:** The I-Fish system aims to divert more than 95% of fish away from turbines, significantly reducing the ecological impact of hydropower stations.
- ❑ **Lower Costs:** Circular economy approaches will reduce CAPEX by 50% and OPEX by 20%, making hydropower refurbishment more economically viable while improving environmental sustainability.





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