

## TECHNICAL DESCRIPTION & CHARACTERISTICS OF HYDROPHIL

Our *HydroPHIL* platform replicates your hydroelectric unit, including its hydraulic design, mechanical inertia, actuator performance, electrical machine topology, power electronics, automation and instrumentation.

### Reduced-scale model

- 4 quadrants pump-turbine
- Customisable hydraulic design
- Ability to replicate projects from 50 m to 900 m
- Real-time operating ring
- Turbine outlet up to ~20 cm diameter

### Control

- OPAL OP4510 Real Time Controller
- MATLAB/Simulink interface
- Ability to connect and test any black boxed industrial controller

### Grid emulation

- 15 kVA bidirectional conversion mock-up
- 400 VAC grid, with harmonics up to 40 kHz

### Hydraulic circuit emulation

- Emulated water hammer with up to 16 mWC net head, 120 L/s

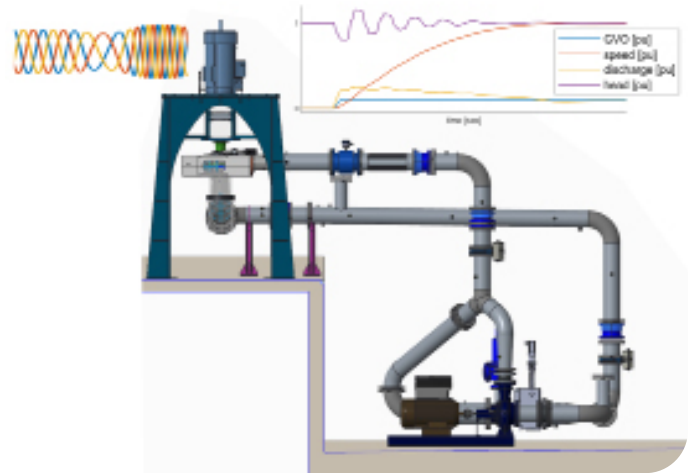
### Homology with respect to time constants

- Hydraulic inertia & dynamics (wicket gate closes <1s)
- Mechanical inertia
- Electrical time constants
- Actuator's performances

## SPECIFIC TEST CONFIGURATION

- Dynamic performance & safety characterisation
  - Wicket gate control: speed & power regulation
  - Transient behaviour: overspeed, start-up, turbine rewatering, water column separation, etc.
  - Grid compliance: fault ride-through, active & reactive power, ancillary services etc.
  - Variable speed control
  - Hybridisation
  - Safety checks using fault injection
- 4 quadrants hydraulic characterisation
- Training tailored to your specific needs

## VARIABLE SPEED & BATTERY HYBRIDISATION



We can simulate a wide range of power conversion system layouts, including: conventional fixed speed units, DFIM variable speed, fully FED variable speed and other topologies such as Hybridised Hydro Power Plants.

## FLUID DYNAMICS



We support fluid dynamics research by reproducing multiphase flows with phase changes under unsteady conditions (e.g., load rejection, rapid flow variations, or mode transitions).

**Contact our team  
to find out how we  
can work together!**

