Study Committee A1

Study Committee Rotating Machine

Paper ID 836_2022

XFLEX HYDRO

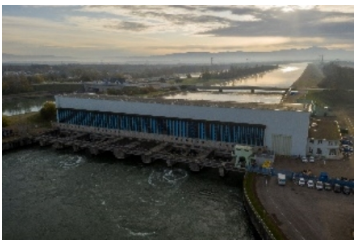
# Increasing Flexibility thanks to Micro Hybrid Concept XFLEX HYDRO Demonstrator at Vogelgrun HPP

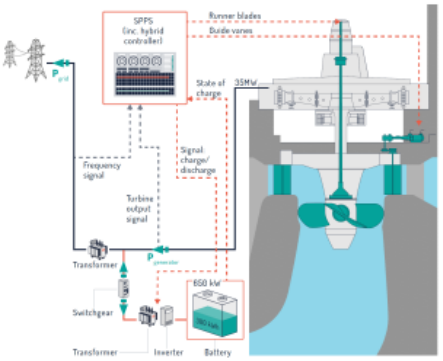
JL DROMMI, G PAIS, Ch NICOLET, Ch LANDRY

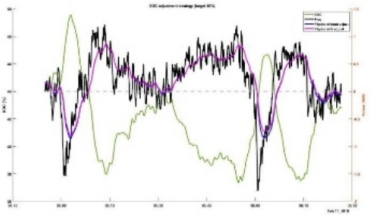
Electricité De France, CEA INES, Power Vision Engineering

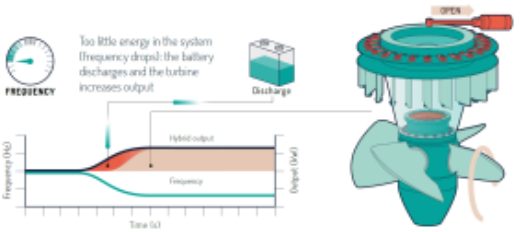
## GOALS of DEMO:

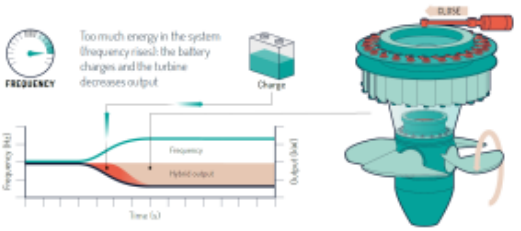
- Improved Dynamic for Grid Frequency Control
- Compliance with Grid Code
- Assess Wear & Tear of Hydro Unit
- Reduce Turbine component Wear
- Reduce Fatigue of Runner Blade Cinematic
- Extend seal life expectancy





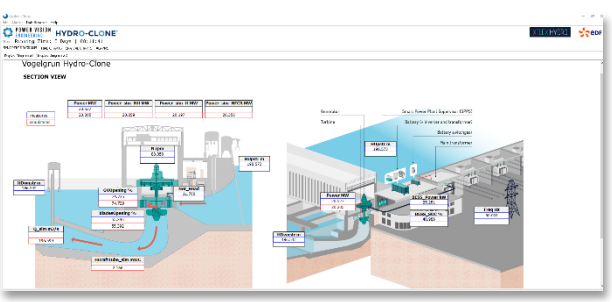






## Method/Approach

- Use a reduced size battery (BESS)
- Develop a joint control algorithm Hydro + BESS
- Simulation and co simulation between 2 software models
- Live test at site with full size equipment
- Instrumentation
- Digital twin HydroClone
- Digitilisation approach



Study Committee A1

Study Committee Rotating Machine

Paper ID 836_2022

XFLEX HYDRO

# Increasing Flexibility thanks to Micro Hybrid Concept XFLEX HYDRO Demonstrator at Vogelgrun HPP

JL DROMMI, G PAIS, Ch NICOLET, Ch LANDRY

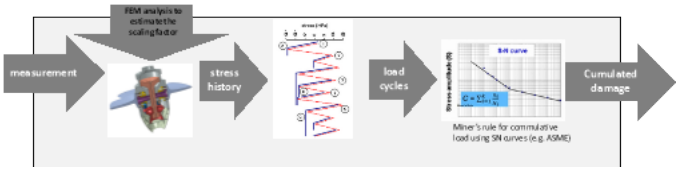
Electricité De France, CEA INES, Power Vision Engineering

## Experimental setup & test results

- VOGELGRUN PLANT
- 4 x 35MW ;
- 750 000 MWh
- 1400m3/s
- 2 locks 20000 barges per year

**Battery installed in parallel of one existing hydro unit**

- Hydrid controller tuned as per initial studies
- Comparison Hybrid vs Non Hybrid
- W&T reduction : 45% of actuator mileage or sign change
- Non hybrid FCR : represents 80% of actuator W&T

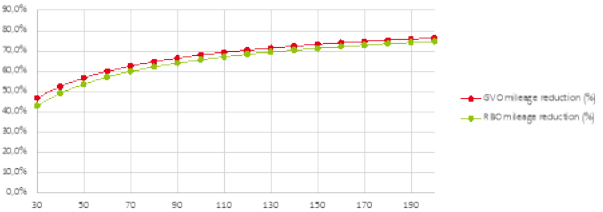


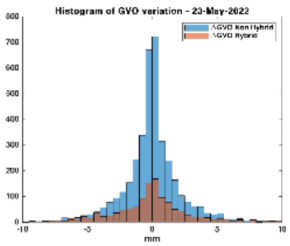

## Discussion

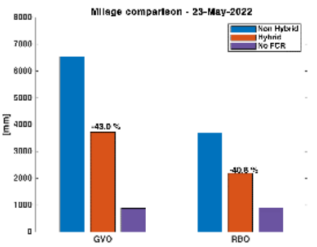
- Test results based on 4 different approachs
- On site behavior in line with simulation
- Hybrid controler tuning to further reduce W&T
- Life consumption predictive algorithm

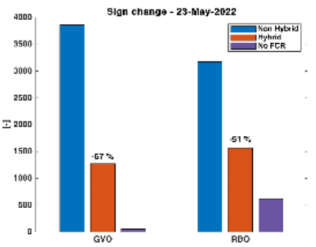
## Objects of investigation

- Power stability
- Efficiency
- Fatigue of components




## Conclusion

- Influence of primary control on actuators is quantified
- Hybrid W&T benefit is substantiated
- Benefit vs payback remains challenging