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Hydro 21



hydro21gre

Hybrid methods Efficiency Genissiat hydropower plant

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 **HydroServices**





1. Context and objectives
2. Ultrasound system in the penstocks
3. Comparison with ADCP measurements / CFD
4. Turbines efficiency and conclusion

1. Context and objectives



➤ 19 development schemes

➤ 19 Hydro Power Plants

25% of French hydropower generation

3.000 MW of installed capacity

Genissiat Hydropower plant

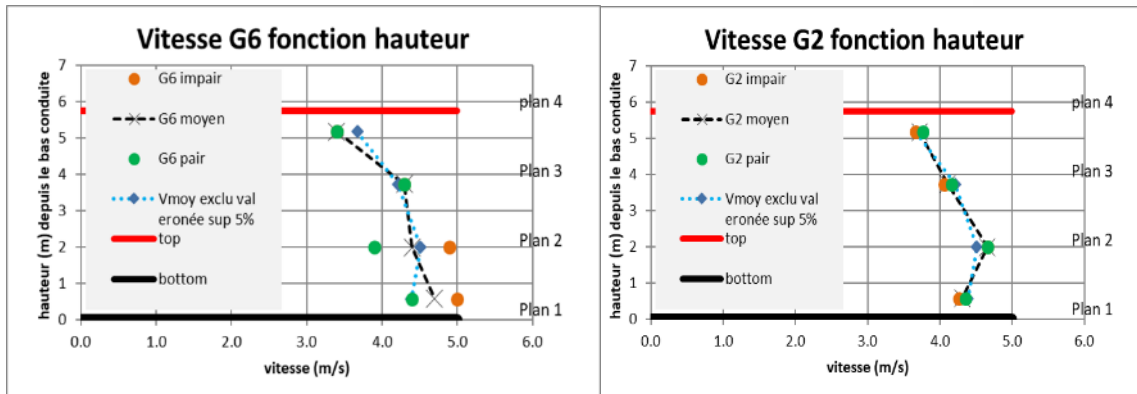
- The first building (1948)
- The highest head (70m, 420MW)

To optimize Genissiat Hydropower plant :

- Energy production
- Maintenance

2. Ultrasound sensors system and discharge measurement

Vertical velocity profile for unit G6 (bank) or G2 (center)



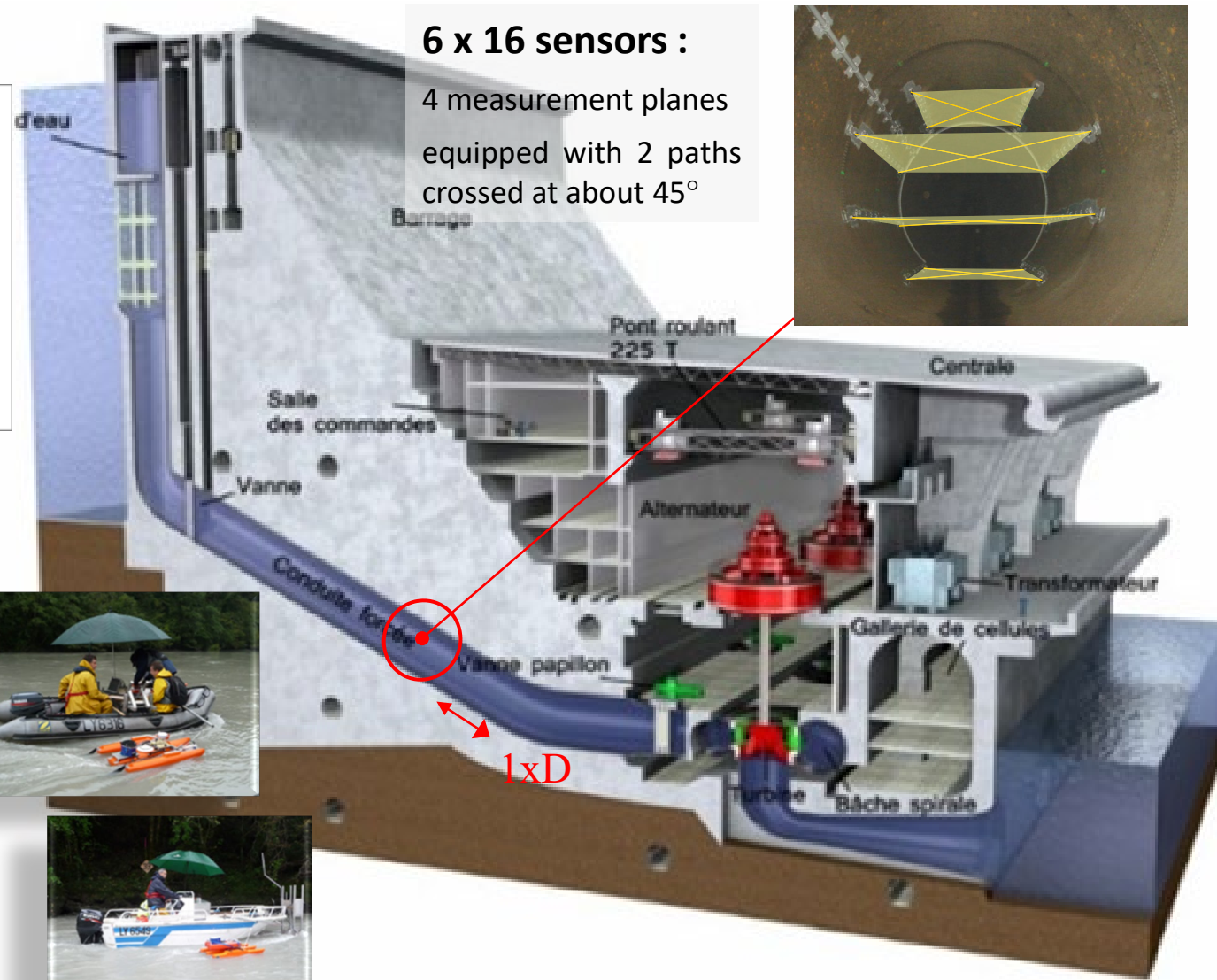
ADCP Gauging:

About 30 ADCP used at the same time in 2010 and 2012

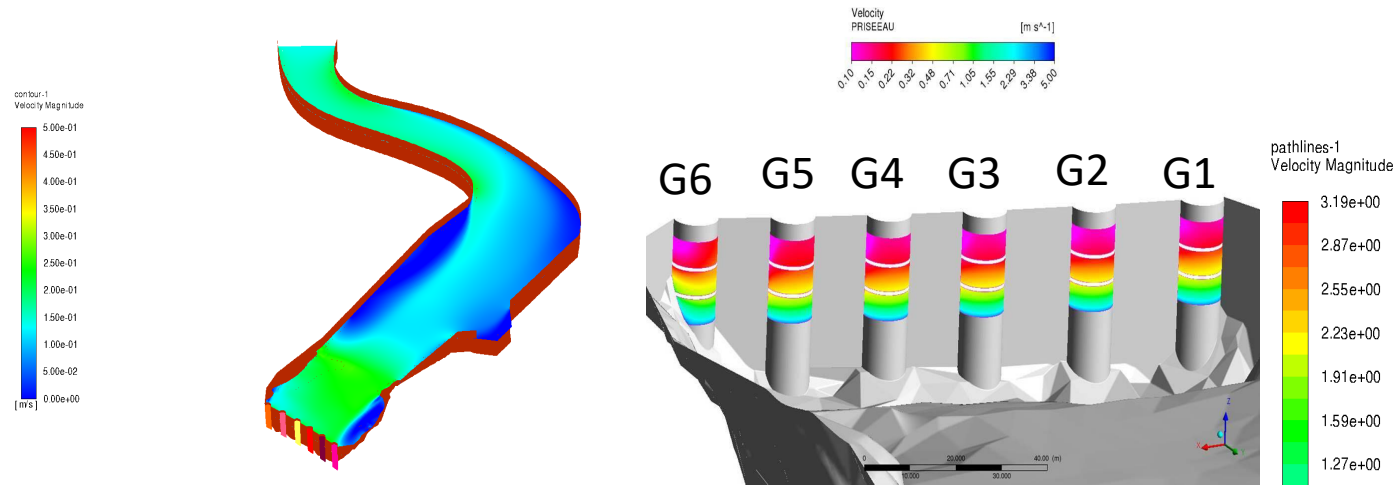
Less than 3% for each turbine



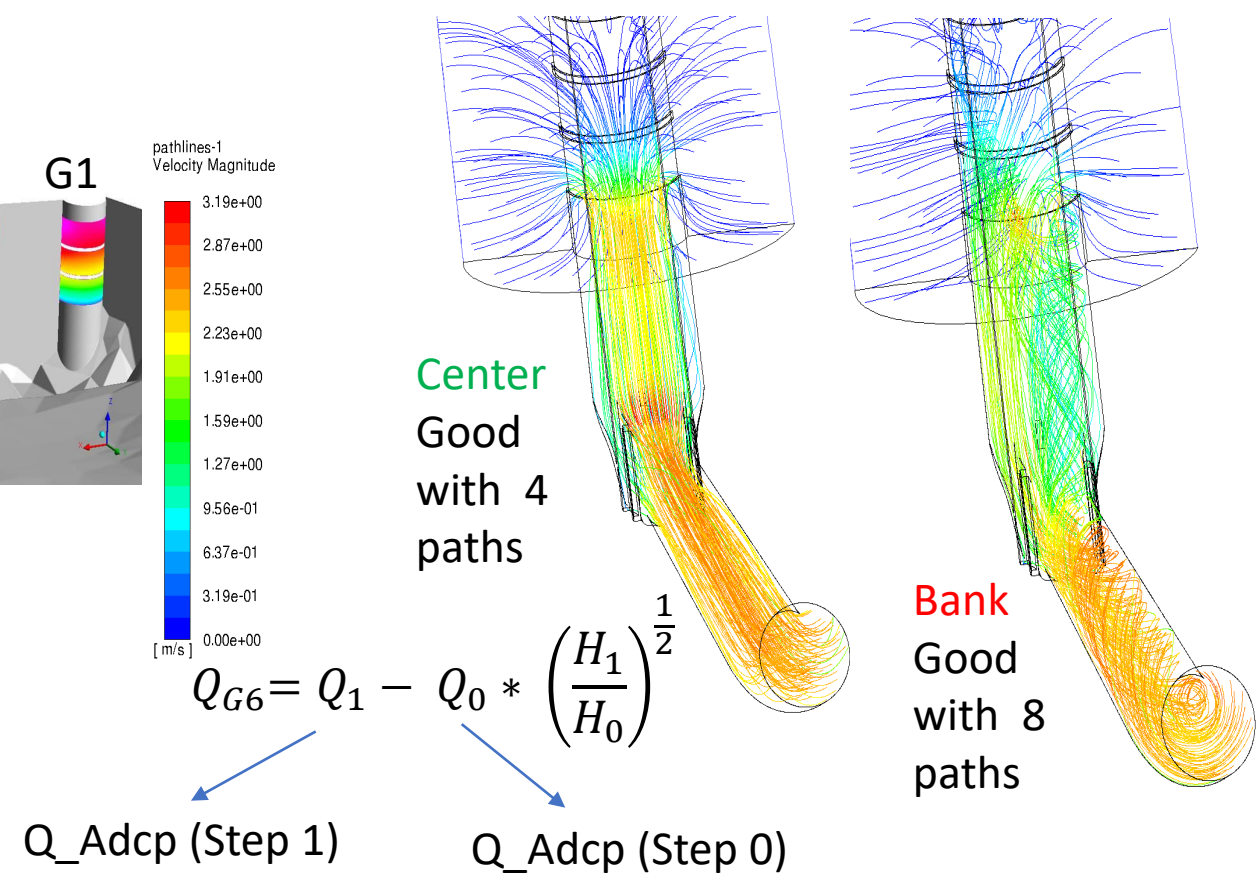
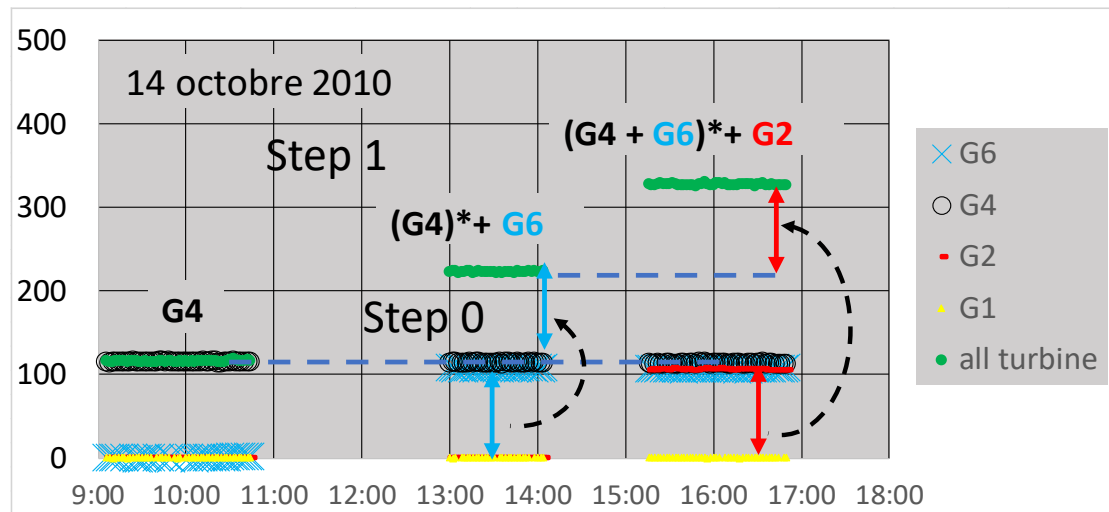
Installation of the sensors on the 6 units between 2008 and 2011



3. Comparison of the flowrate measured by the US sensors with ADCP and CFD

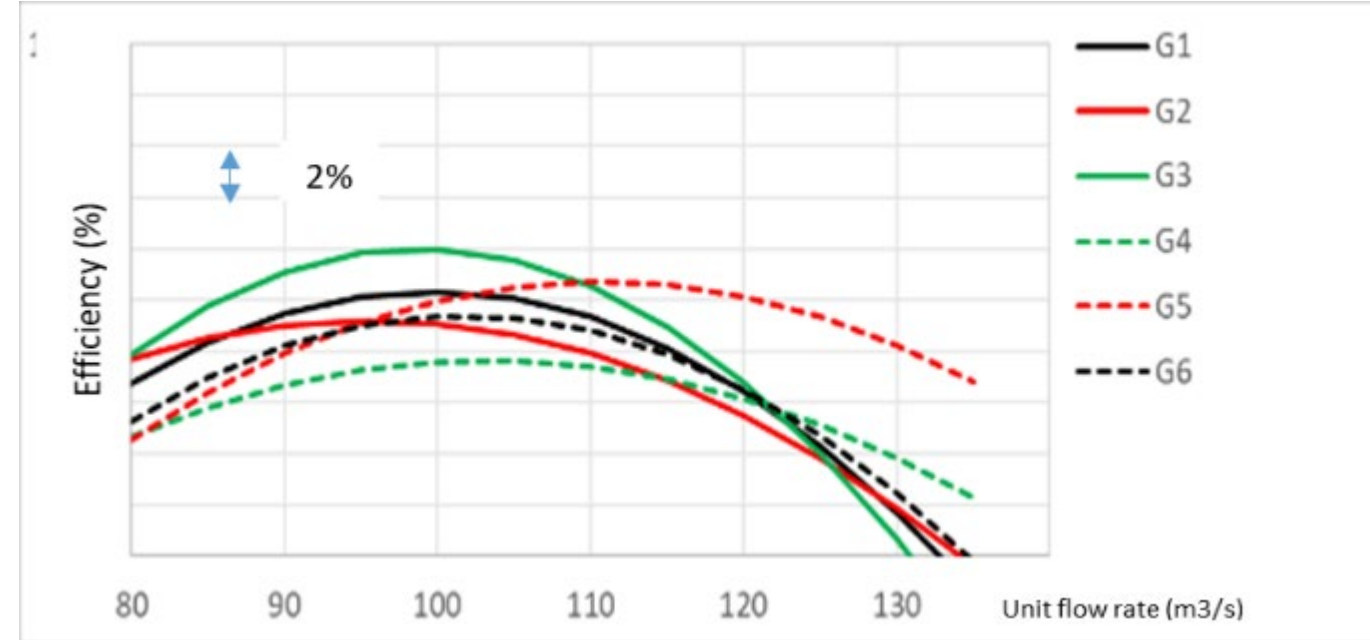
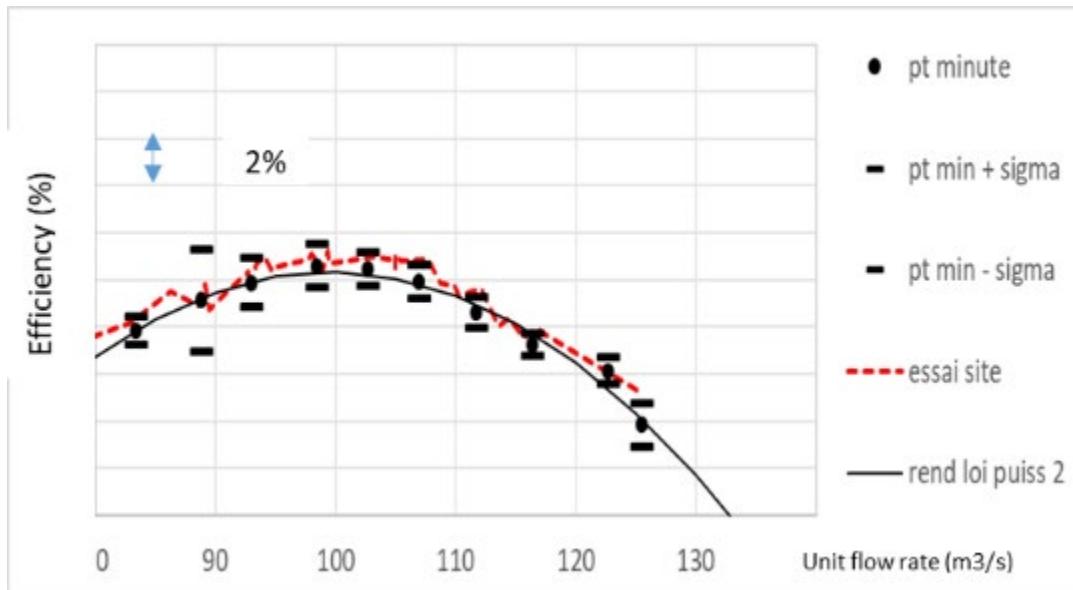


CFD of the reservoir and units water intakes



This comparison allowed to detect an error in the programming of the acoustic paths. The first comparison gave errors about 7% for units G1, G4 and G6
After correction : less than 3%

4. Turbines efficiency and conclusions



Turbine efficiency

- Mapping of efficiency for each turbine in real time
- Optimizing the discharge for each turbine provide : 400k€ per year, compared to 800k€ for equipment installation

Conclusion

- Using adcp discharge **measurement and cfd modeling** lead to **validate** the uncertainty of efficiency less than 2%
- Without these methods : default on installation is always possible, doubt on measurement, doubt on results
- **Easiest maintenance** with monitoring efficiency



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Hybrid methods

Efficiency Genissiat hydropower plant

Thank you for your attention