Condition monitoring sensor installations at Asomata HPP

Date: 24 October 2025

Location: Thessaloniki, Greece

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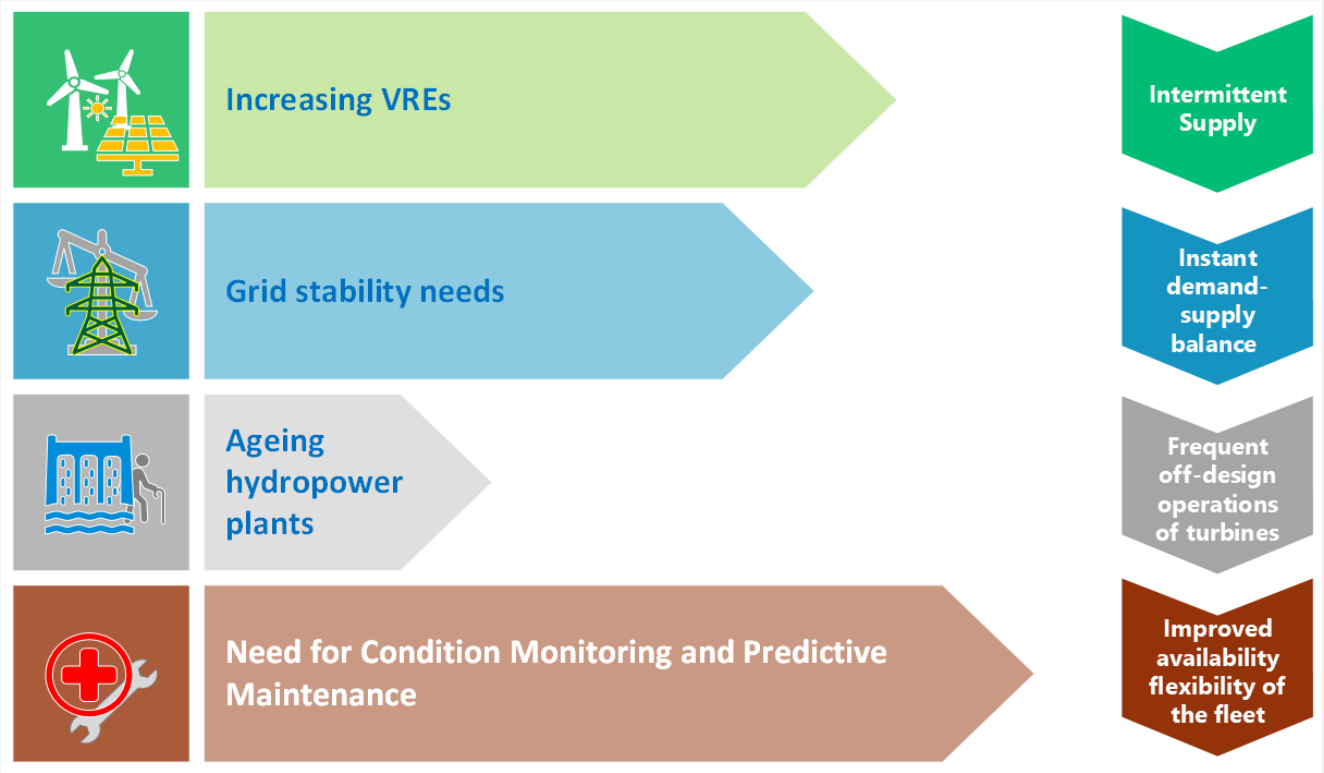
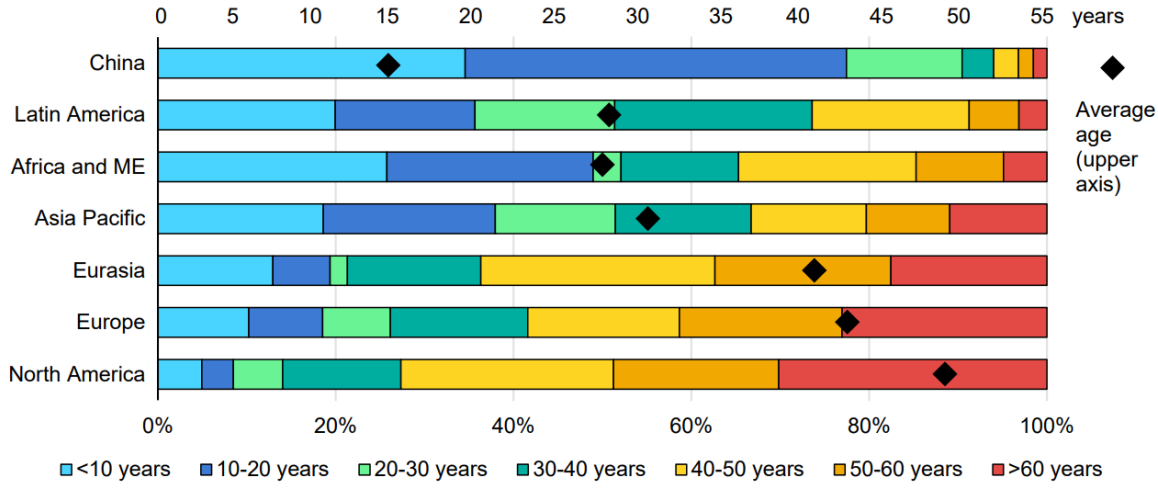
Background



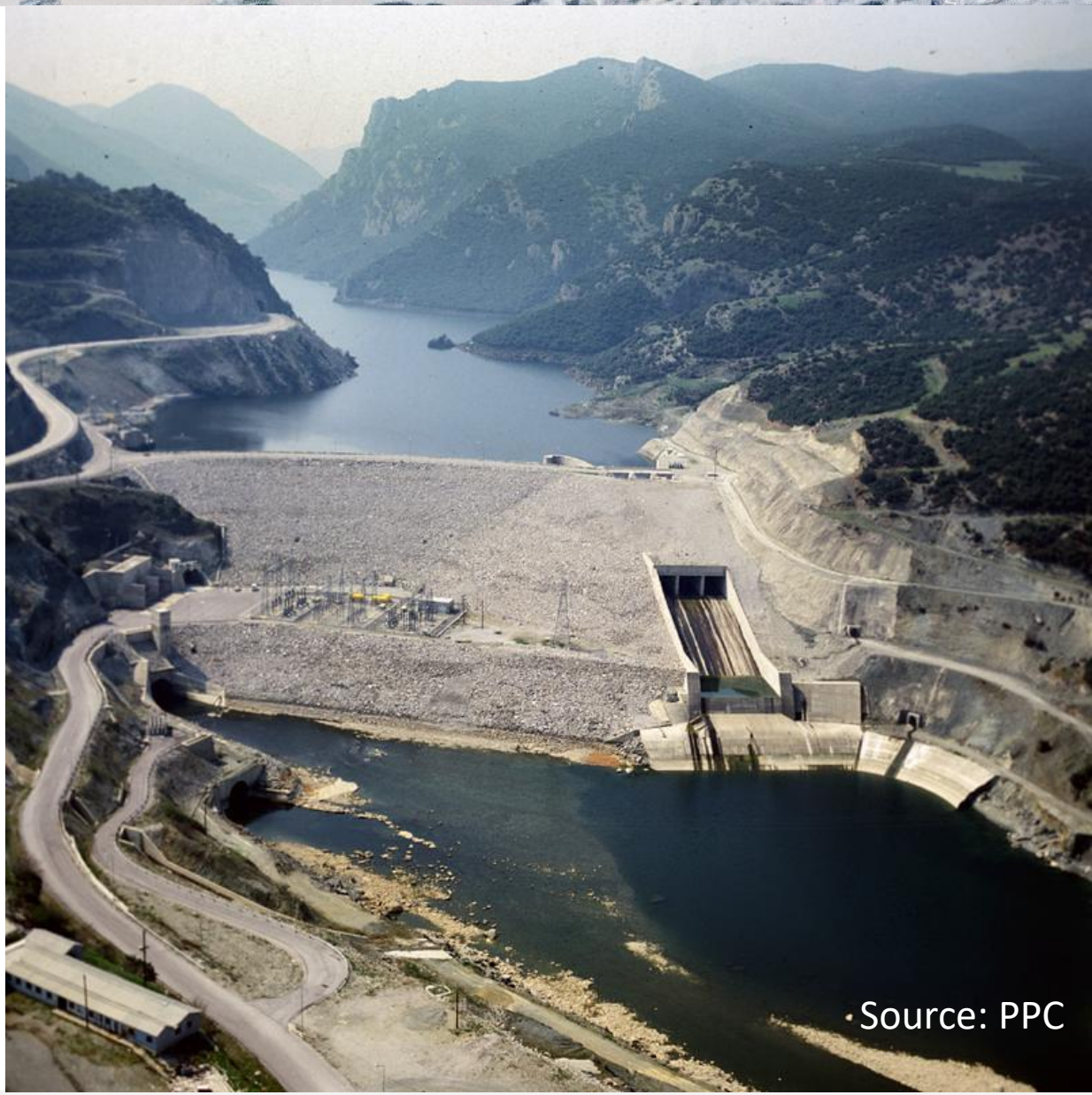


Age profile of installed hydropower capacity, 2020

(Hydropower Special Market Reports, International Energy Agency)

Salient Features

Year of Commission	1980
Age	**45 years**
Turbine Type	Vertical shaft **Francis**
Rated Net Head	38.7 m
Design Flow Rate	166.5 m^3/s
Installed Capacity	2 x **55.7 MW**
Speed	125 rpm



Literature Review

- **Renewable Energy Landscape and Hydropower Integration**

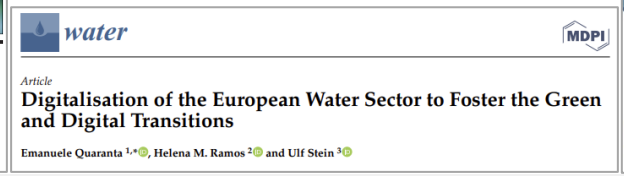
  Reviewed the European and global renewable energy mix, the impact of integrating intermittent sources such as solar and wind on hydropower generation and grid stability.

- **Digitalisation in Hydropower Operations**

  The broader implications of digital technologies in optimising hydropower plant operations were explored, emphasising advancements in monitoring, automation, and predictive maintenance

- **Operational Regimes and Impact**

  Various operating conditions of the hydropower plant were analysed to understand associated hydro-mechanical phenomena and their influence on machine efficiency and longevity.



Literature Review

- **Sensor Selection and Customisation**

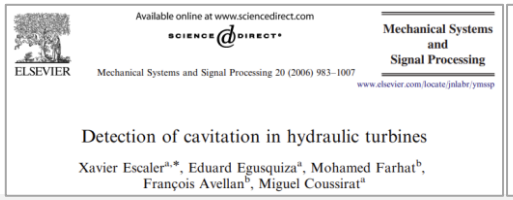
  A comprehensive review of sensor technologies was conducted to identify suitable options, assess their key characteristics, and refine specifications for the experimental test rig and demonstration sites in Spain and Greece.

- **Instrumentation and Data Acquisition**

  The study examined the full instrumentation setup, covering sensor mounting, optimal orientation, and the data acquisition and transfer processes critical for accurate measurements.

- **Site Configuration and Test Rig Design**

  A detailed evaluation of the hydropower plant layouts at each demonstration site was performed, alongside the design and installation of the TCD laboratory test rig.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Mechanical Systems and Signal Processing
Mechanical Systems and Signal Processing 20 (2006) 983–1007
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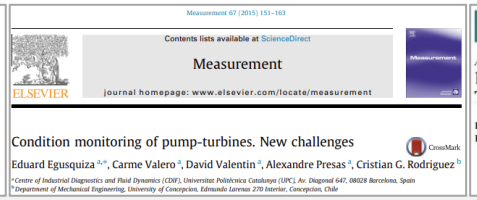
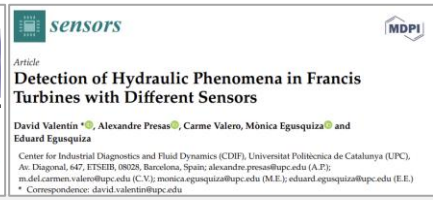
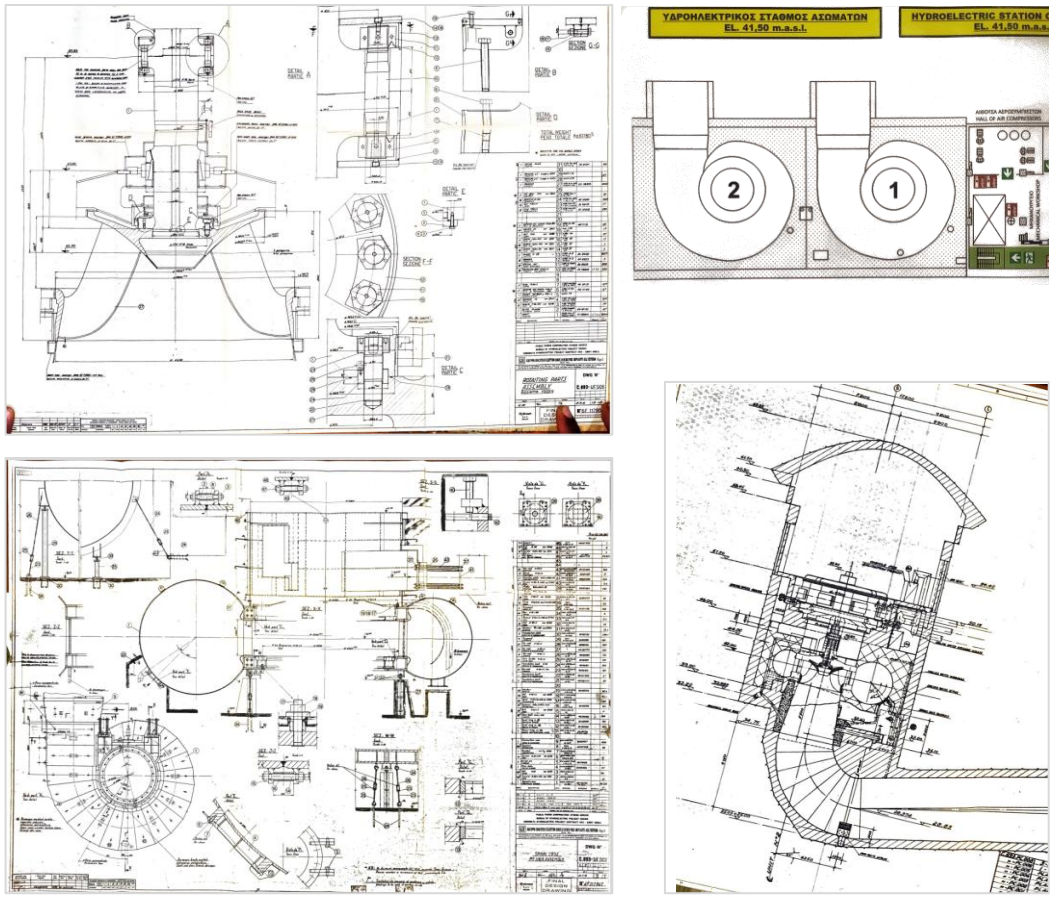
Detection of cavitation in hydraulic turbines
Xavier Escaler[a,*], Eduard Egusquiza[a], Mohamed Farhat[b], François Avellan[b], Miguel Coussirat[a]


Influence of the vibro-acoustic sensor position on cavitation detection in a Kaplan turbine
H Schmidt[1], O Kirschner[1], S Riedelbauch[1], J Necker[2], E Kopf[2], M Rieg[2], G Arantes[2], M Wessiak[3], J Mayrhuber[3]
[1]Institute of Fluid Mechanics and Hydraulic Machinery; University of Stuttgart, Pfaffenwaldring 10, 70569 Stuttgart, Germany
[2]Voith Hydro Holding GmbH & Co. KG, Alexanderstrasse 11, 89522 Heidenheim, Germany
[3]VERBUND Hydro Power AG, Europaplatz 2, 1150 Wien, Austria


Measurement 67 (2015) 151–163
Contents lists available at ScienceDirect
Measurement
journal homepage: www.elsevier.com/locate/measurement
ELSEVIER
Condition monitoring of pump-turbines. New challenges
Eduard Egusquiza [a,*], Carme Valero [a], David Valentin [a], Alexandre Presas [a], Cristian G. Rodriguez [b]


sensors
MDPI
Article
Detection of Hydraulic Phenomena in Francis Turbines with Different Sensors
David Valentín *, Alexandre Presas, Carme Valero, Mònica Egusquiza and Eduard Egusquiza
Center for Industrial Diagnostics and Fluid Dynamics (CDIF), Universitat Politècnica de Catalunya (UPC), Av. Diagonal, 647, ETSEIB, 08028, Barcelona, Spain; alexandre.presas@upc.edu (A.P.);
m.del.carmen.valero@upc.edu (C.V.); monica.egusquiza@upc.edu (M.E.); eduard.egusquiza@upc.edu (E.E.)
* Correspondence: david.valentin@upc.edu

Site Assessment



Available Information

Field Visit

Sensor Specifications

Accelerometer

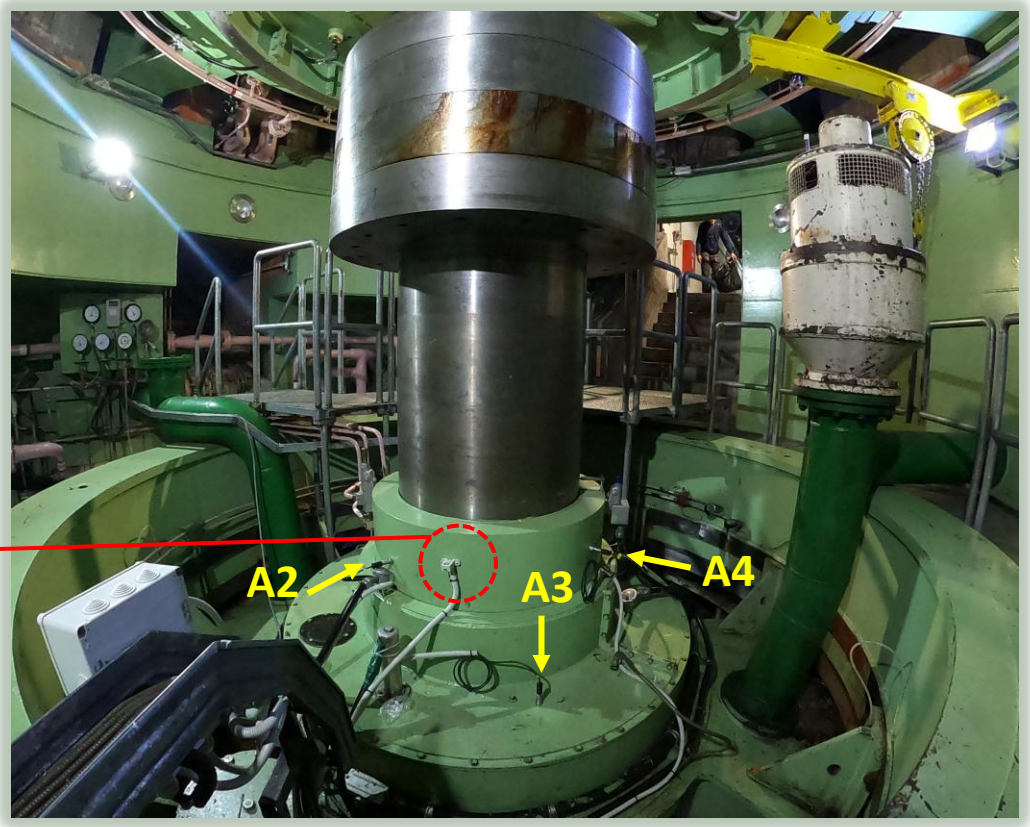
Type	Piezoelectric
Sensitivity	100 mV/g
Frequency range (±3 dB)	0.2 Hz – 15 kHz
Measurement range	± 50 g
Resonant frequency	30 kHz
Resolution	0.00015g rms
Overload limit (Shock)	±5000g pk
Operating temperature range	-54°C to +121°C
Excitation voltage	18-28V (DC)
Constant excitation current	2-20mA
Mounting	Magnetic

Acoustic Emission sensor

Type	Piezoelectric
Peak Sensitivity Ref V/(m/s)	> 65 dB
Frequency range	100 kHz – 1000 kHz
Preamplifier	40 dB
Resonant frequency Ref V/(m/s)	500 kHz
Resolution	0.00015g rms
Operating temperature range	-20°C to +50°C
Mounting	Magnetic hold-down

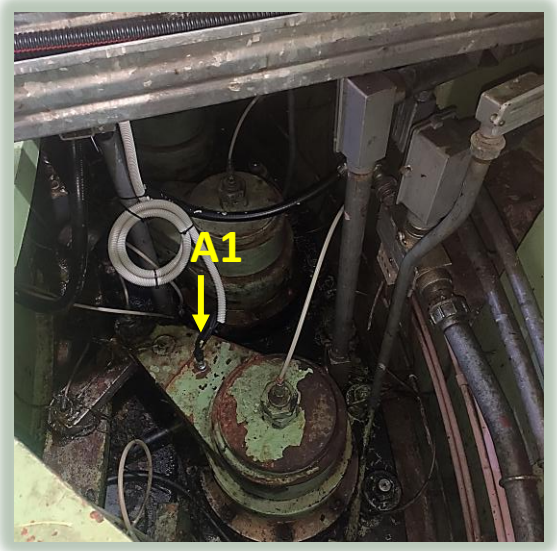
Sensor Installation in Unit-1

Acoustic Emission Sensor



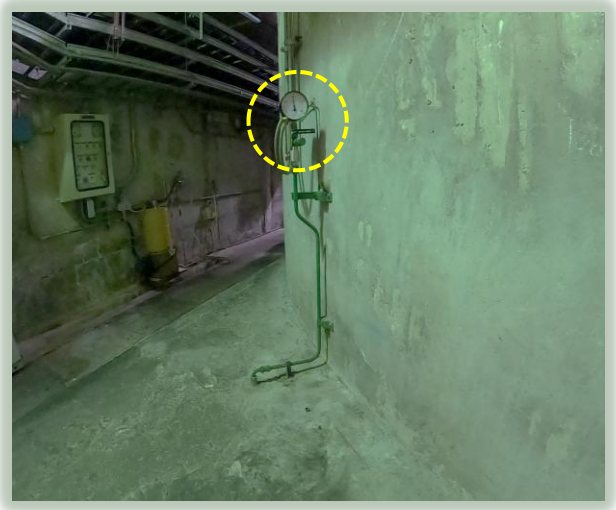
Accelerometers

Turbine bearing (A2/A4), Headcover (A3)



Guide vane arm (A1)

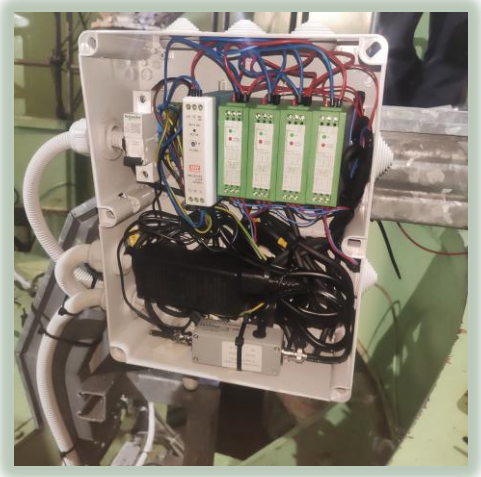
Sensor Installation in Unit-1



Turbine inlet
Existing

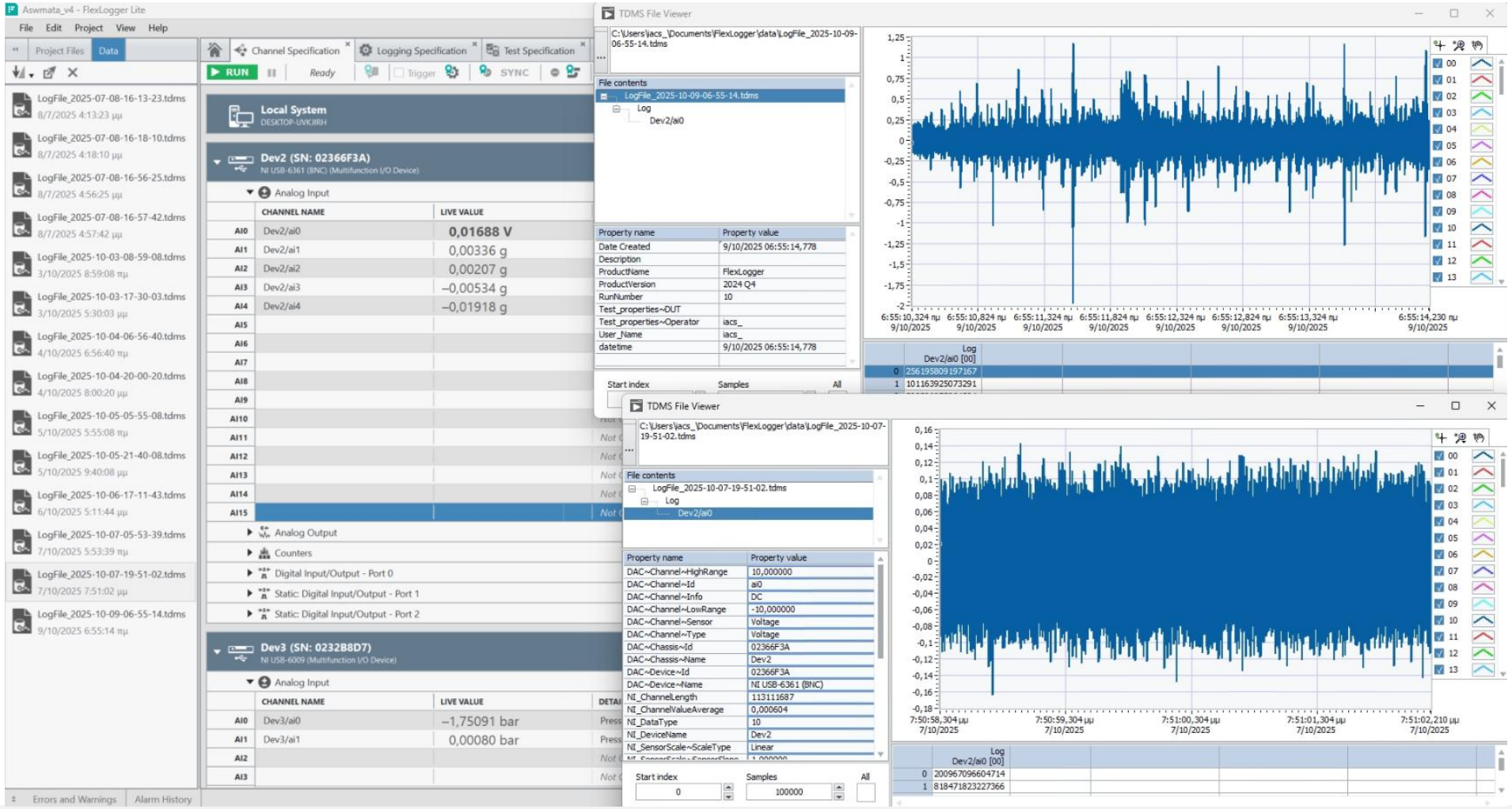
Draft Tube
New installation

Pressure Sensors

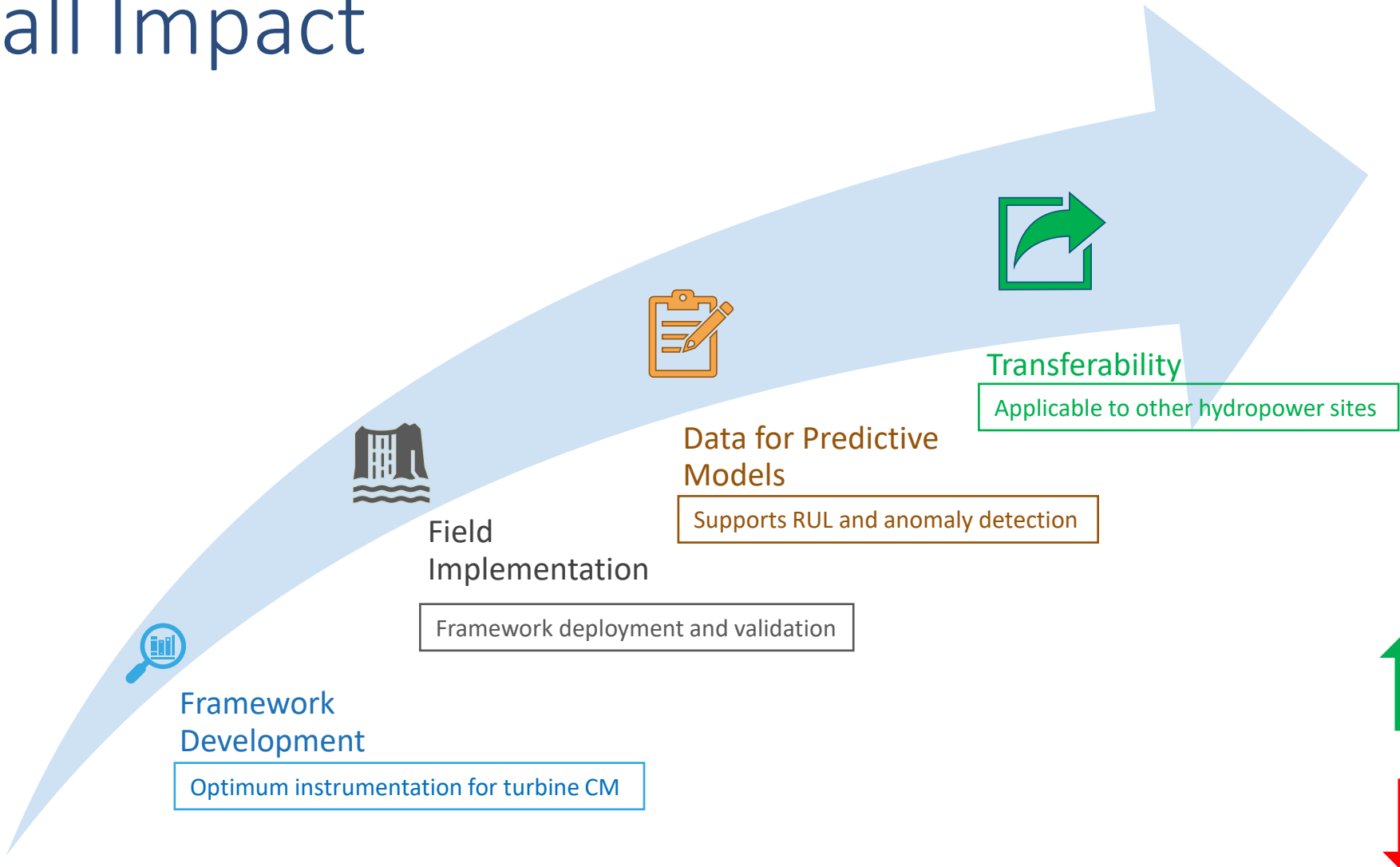


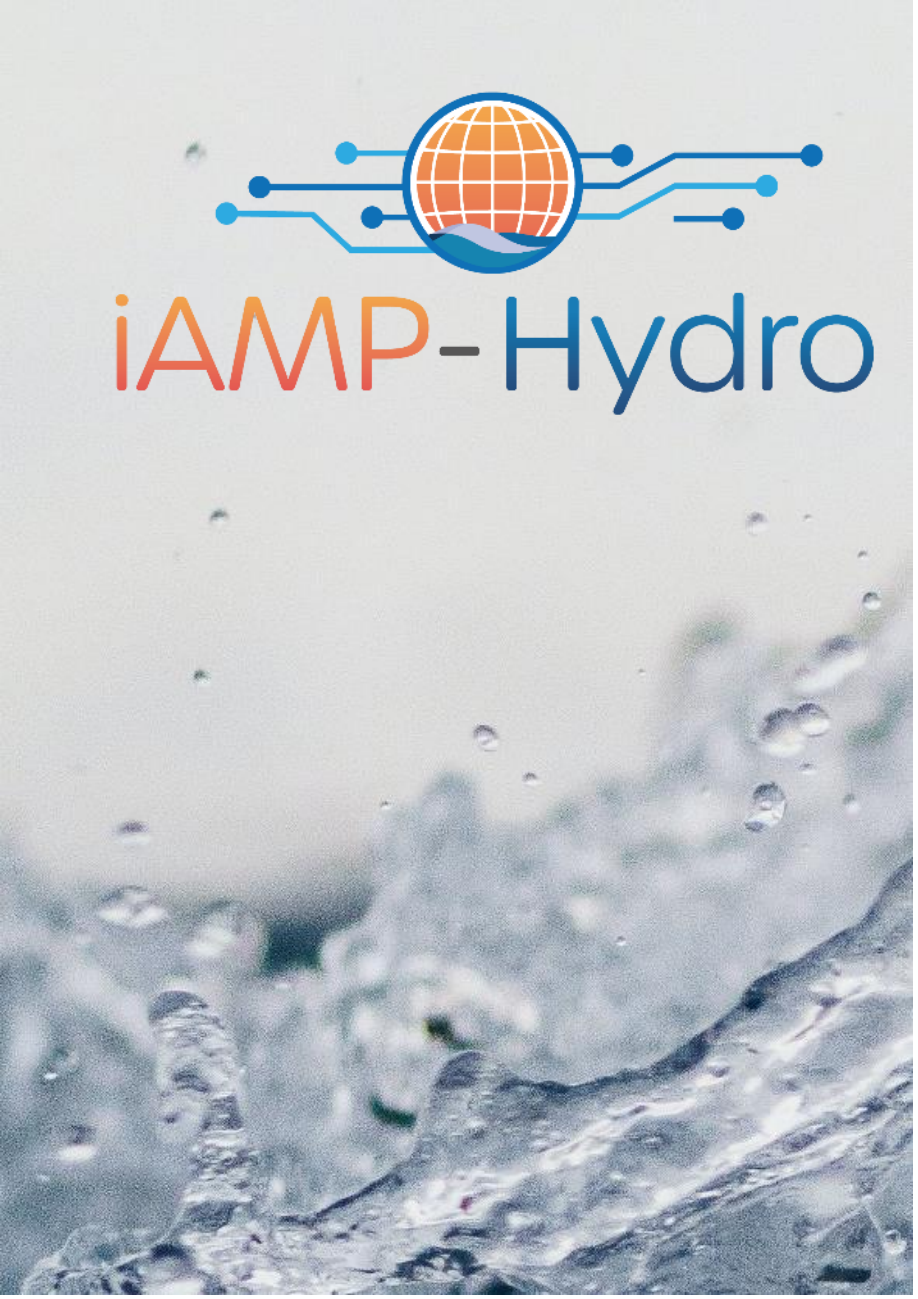
Data Acquisition setup

Data Acquisition



Overall Impact





From Research to Real-World Impact

Revitalising Hydropower through Digitalisation

iAMP-Hydro Project

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