



Condition monitoring sensor installations at Asomata HPP

Bhaskar Paudel

Date: 24 October 2025

Location: Thessaloniki, Greece



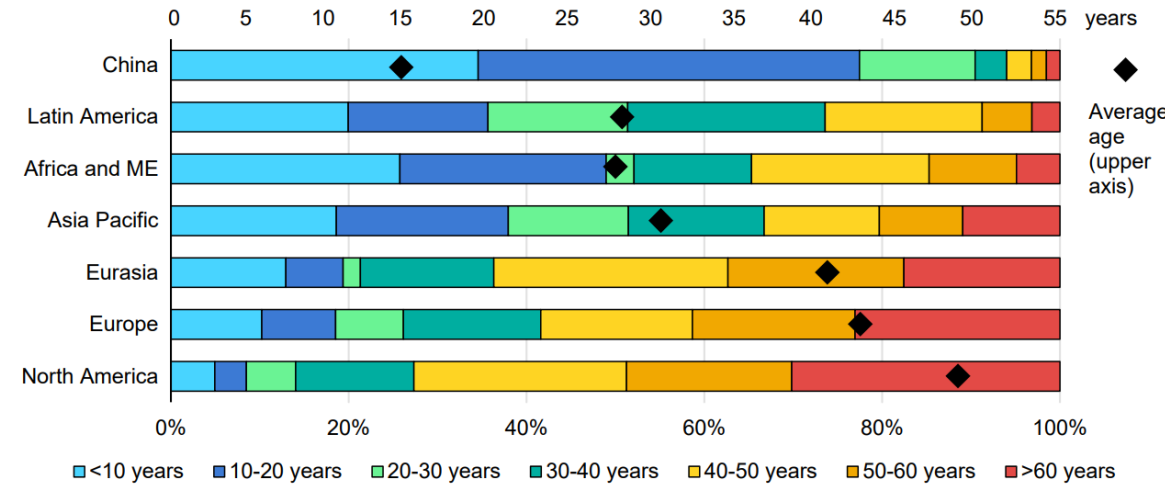
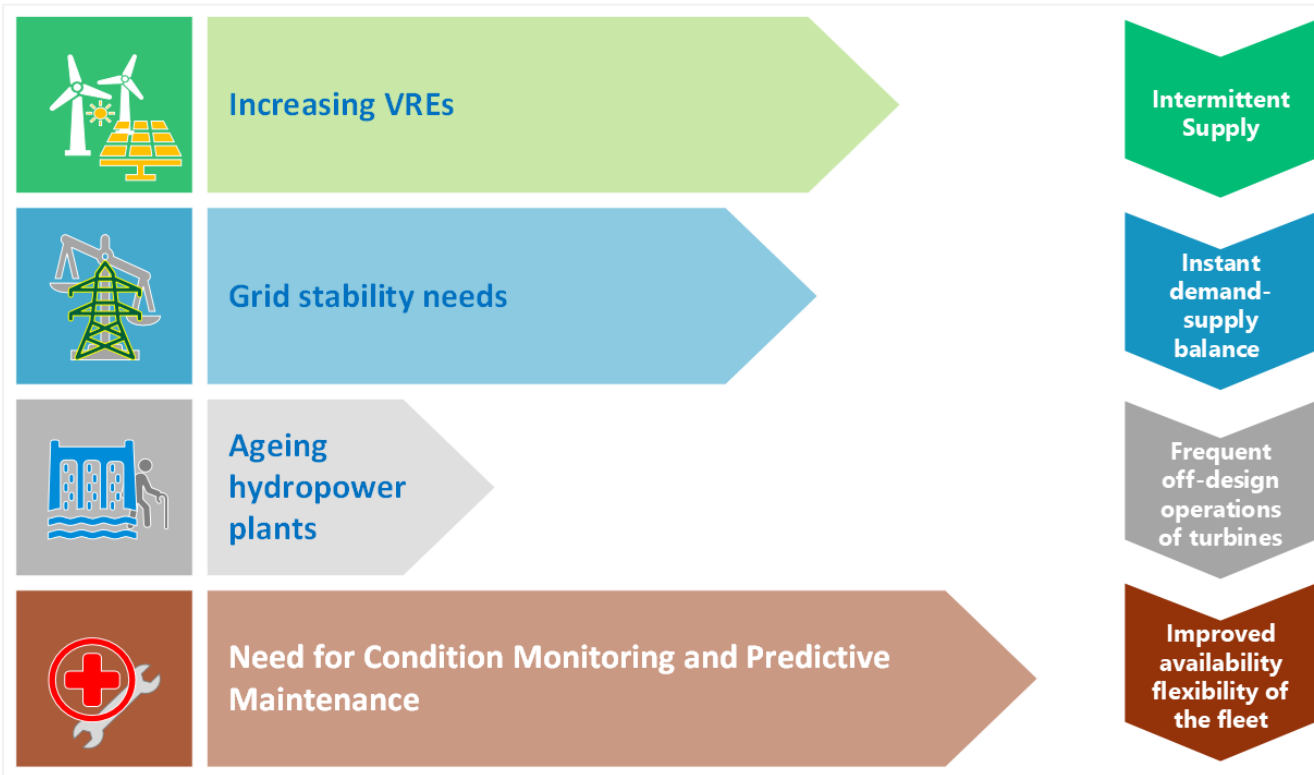
Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin



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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



Source: PPC



Literature Review

- **Renewable Energy Landscape and Hydropower Integration**

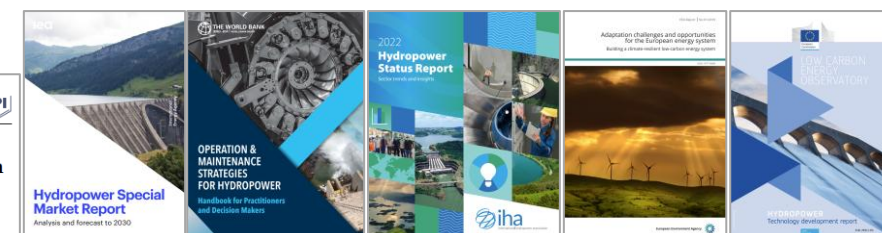
Reviewed the European and global renewable energy mix, the impact of integrating intermittent sources such as solar and wind on hydropower generation and grid stability.

- **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

Detection of cavitation in hydraulic turbines
Xavier Escaler^{a,*}, Eduard Eguisquiza^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 Schmidt¹, O Kirschner¹, S Riedelbauch¹, J Necker², E Kopf², M Rieg², G Arantes², M Wessiak¹, J Mayrhuber³

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Condition monitoring of pump-turbines. New challenges
Eduard Eguisquiza^{a,*}, Carme Valero^a, David Valentin^a, Alexandre Presas^a, Cristian G. Rodriguez^b

^aCenter of Industrial Diagnostics and Fluid Dynamics (CIDF), Universitat Politècnica de Catalunya (UPC), Av. Diagonal 647, 08028 Barcelona, Spain
^bDepartment of Mechanical Engineering, University of Concepcion, Edmundo Larrain 270, Interior, Concepcion, Chile

sensors MDPI

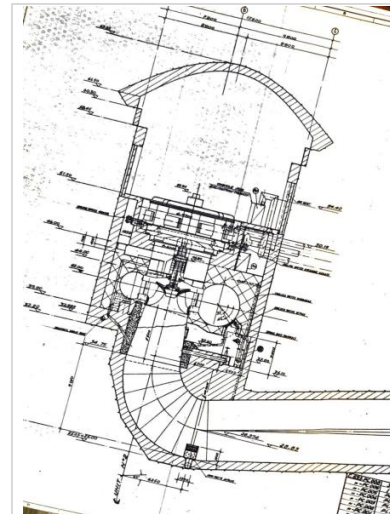
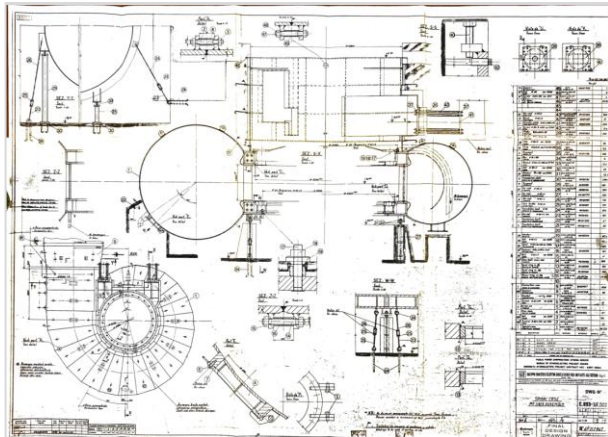
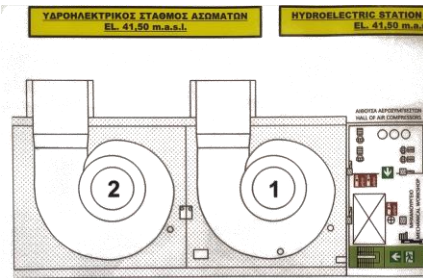
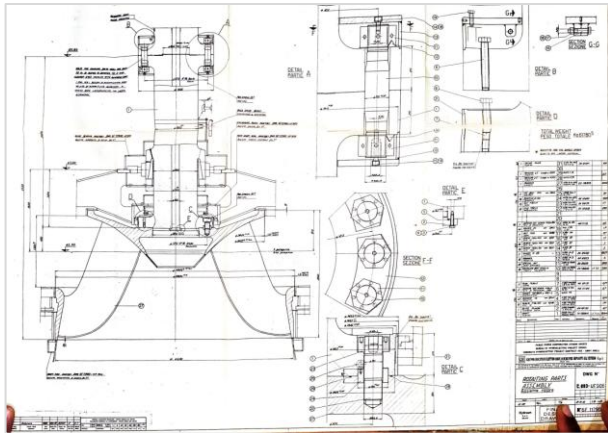
Article
Detection of Hydraulic Phenomena in Francis Turbines with Different Sensors

David Valentin^{a,*}, Alexandre Presas^a, Carme Valero, Mònica Eguisquiza^a and Eduard Eguisquiza

Center for Industrial Diagnostics and Fluid Dynamics (CIDF), Universitat Politècnica de Catalunya (UPC), Av. Diagonal, 647, ETSIB, 08028, Barcelona, Spain; alexandre.presas@upc.edu (A.P.); m.del.carme.valero@upc.edu (C.V.); monica.eguisquiza@upc.edu (M.E.); eduard.eguisquiza@upc.edu (E.E.)
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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)	± 5000 g pk
Operating temperature range	-54°C to +121°C
Excitation voltage	18-28V (DC)
Constant excitation current	2-20mA
Mounting	Magnetic



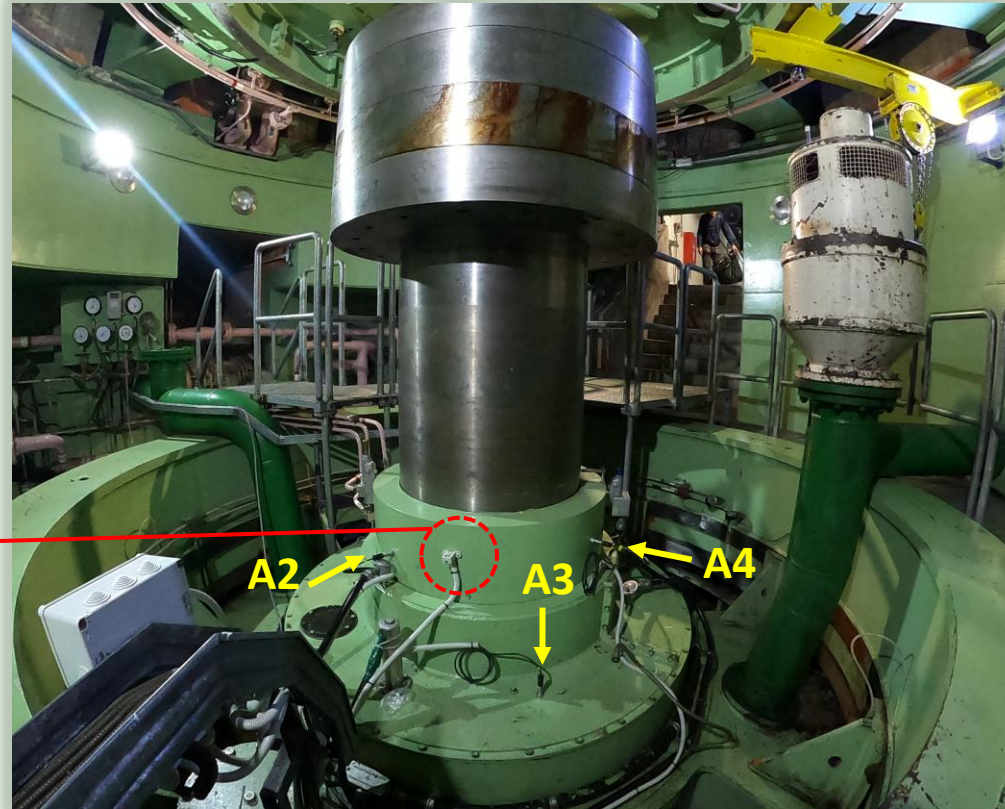
Acoustic Emission sensor

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

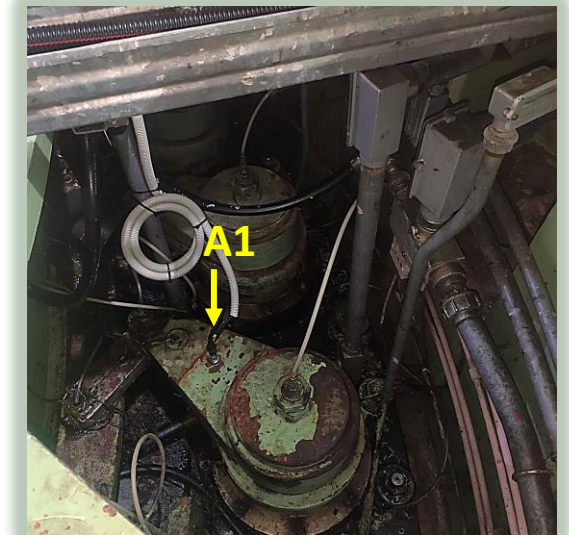
Sensor Installation in Unit-1



Acoustic Emission Sensor



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



Guide vane arm (A1)

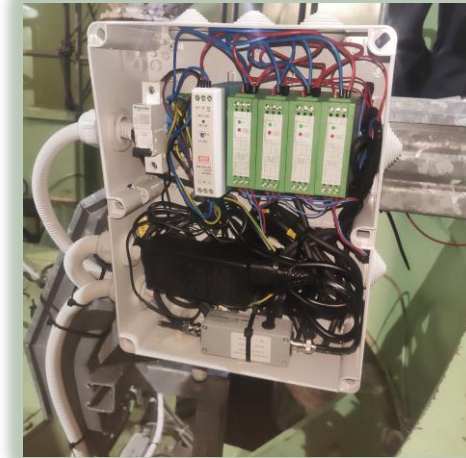
Sensor Installation in Unit-1



Turbine inlet
Existing



Draft Tube
New installation



Data Acquisition setup

Pressure Sensors

Data Acquisition

The screenshot displays the FlexLogger Lite software interface with the following components:

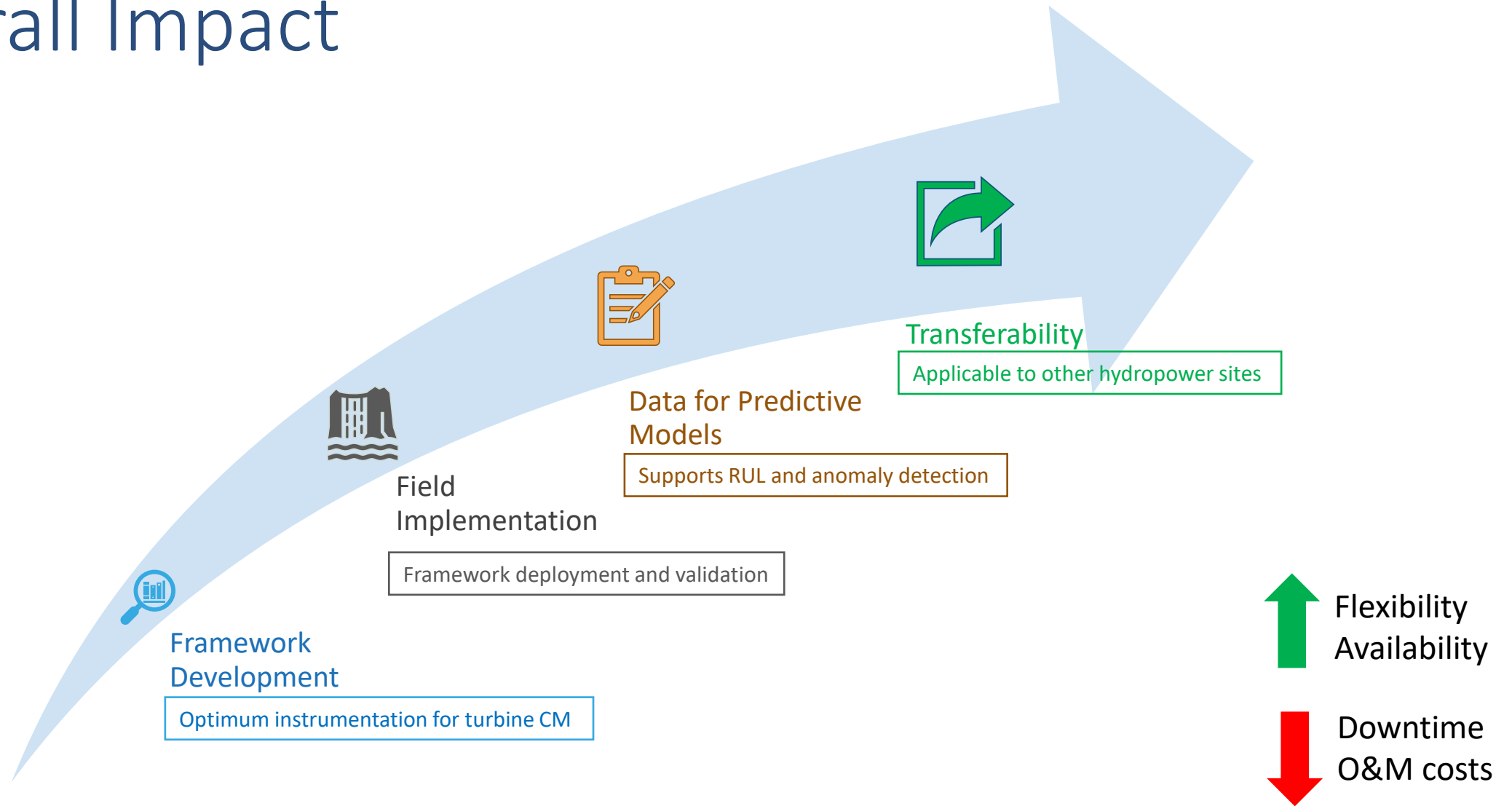
- File List (Left):** A list of log files with names like 'LogFile_2025-07-08-16-13-23.tdms' and timestamps.
- Channel Specification (Top Center):** Shows 'Local System' and 'Dev2 (SN: 02366F3A)' with 'Analog Input' channels AI0 through AI15.
- Live Value Table (Middle Left):**

CHANNEL NAME	LIVE VALUE
AI0 Dev2/ai0	0,01688 V
AI1 Dev2/ai1	0,00336 g
AI2 Dev2/ai2	0,00207 g
AI3 Dev2/ai3	-0,00534 g
AI4 Dev2/ai4	-0,01918 g
AI5	
AI6	
AI7	
AI8	
AI9	
AI10	
AI11	Not C
AI12	Not
AI13	Not
AI14	Not
AI15	Not
- Property Value Table (Middle Right):**

Property name	Property value
Date Created	9/10/2025 06:55:14,778
Description	FlexLogger
ProductName	2024 Q4
RunNumber	10
Test_properties-OUT	iacs_
Test_properties-Operator	iacs_
User_Name	iacs_
datetime	9/10/2025 06:55:14,778
- Waveform Plot (Top Right):** A plot of 'Log Dev2/ai0 [0]' showing a signal fluctuating between approximately -1.75 and 1.25 over time. The x-axis shows timestamps from 6:55:10,324 to 6:55:14,230.
- Waveform Plot (Bottom Right):** A plot of 'Log Dev2/ai0 [0]' showing a signal fluctuating between approximately -0.18 and 0.16 over time. The x-axis shows timestamps from 7:50:58,304 to 7:51:02,210.



Overall Impact





From Research to Real-World Impact

Revitalising Hydropower through Digitalisation



iAMP-Hydro Project



@iAMP_Hydro

