



# CAMP Project (Centre for Analysis and Predictive Maintenance)

## Hydro-Québec: M&D Center

Vincent Roy  
Hydro-Québec Production



# Our mission

**Hydro-Québec Production operates and develops** Hydro-Québec's generating facilities. It **generates** electricity for the **Québec market** and **exports** power to **wholesale markets in northeastern North America.**



# Hydro-Québec : The largest electricity producer in Canada

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**\$31.4 B**

Generation assets

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**~37 GW**

Installed capacity

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**681**

Dams

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**62**

Generating stations

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**28**

Reservoirs

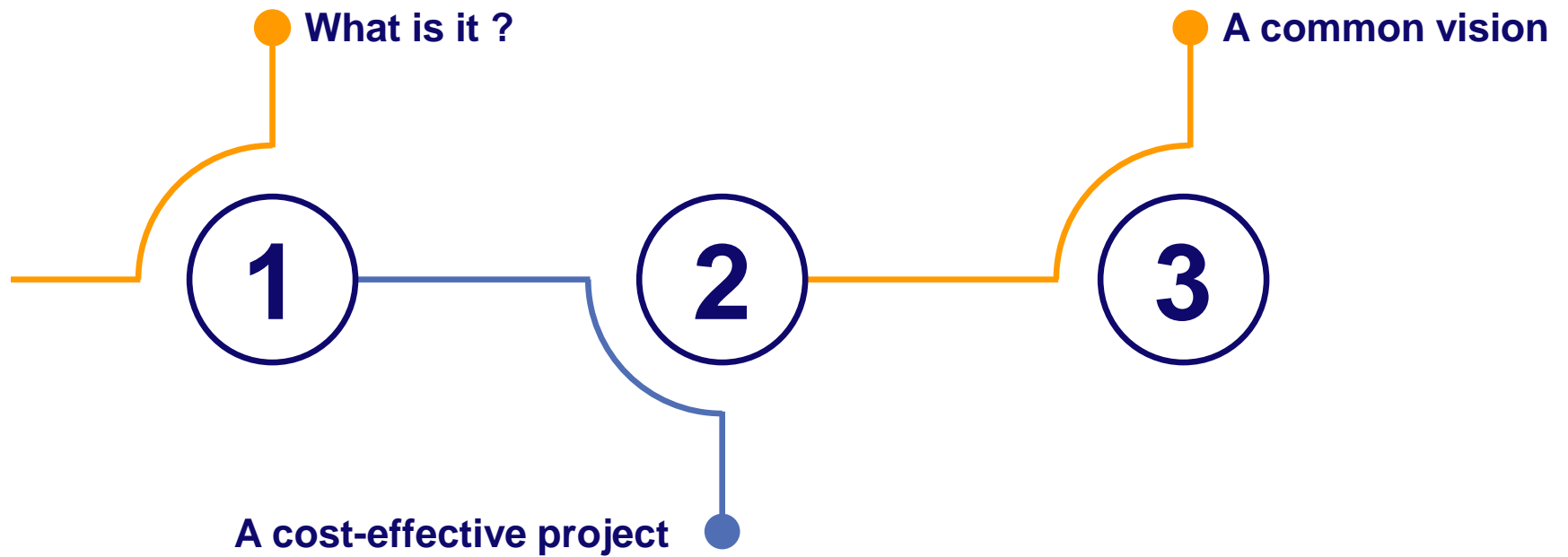
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**2,600 km**

of roads

We produce nearly  
**50% of all  
hydropower  
generated in  
Canada**

# Agenda

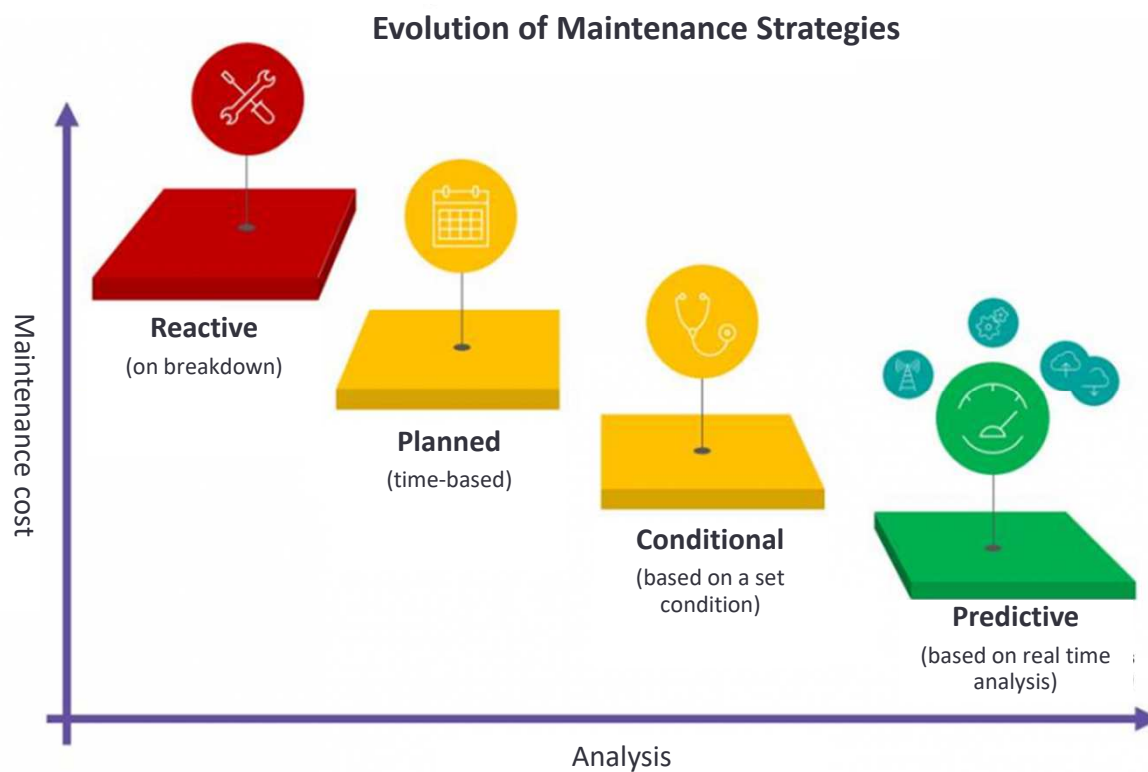


**What is it?**

**1**

# Using artificial intelligence at our generating stations

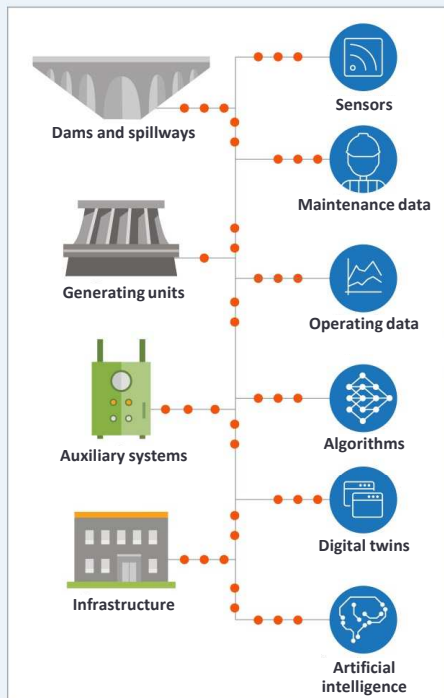
## Predictive maintenance





# Forecasting behavior to carry out predictive maintenance at the right time

By utilizing generating fleet data to its full potential



Our state-of-the-art monitoring center can :

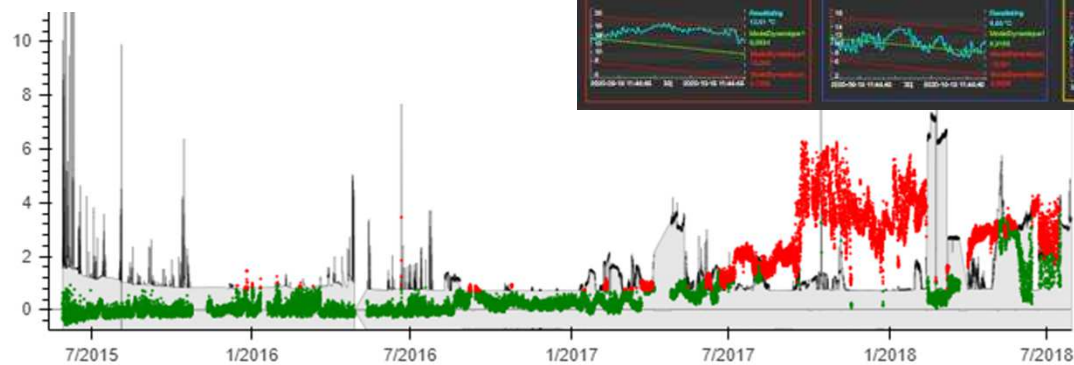
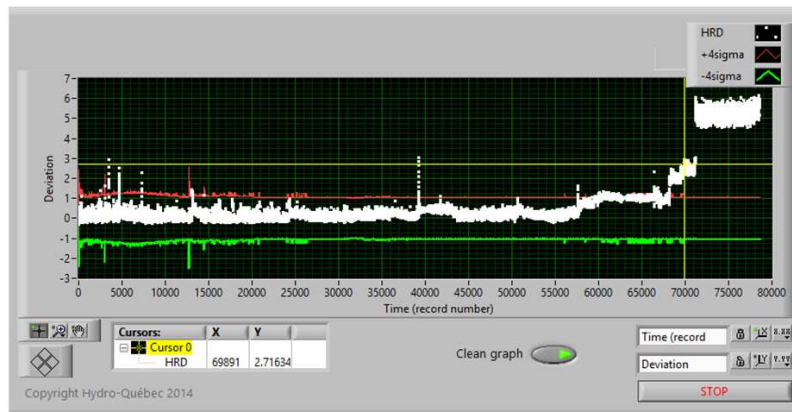


To benefit operation and expertise teams



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# Examples

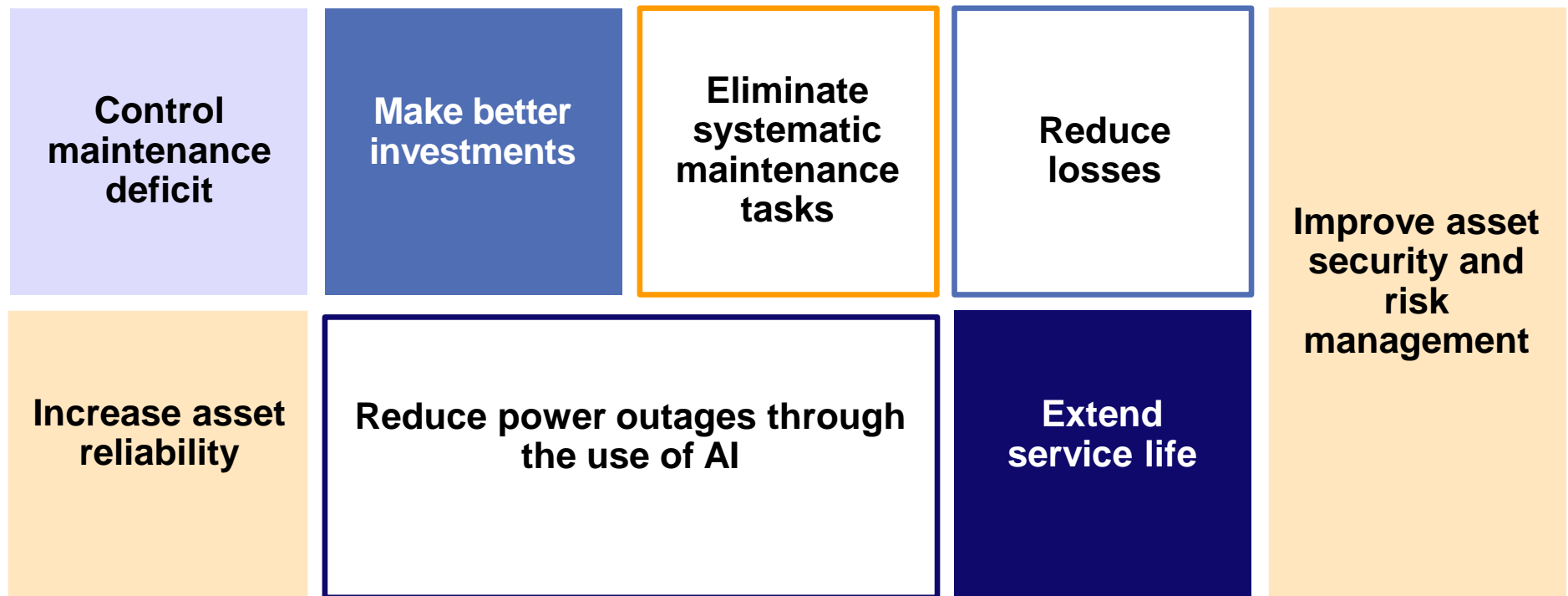




**A profitable project**

**2**

# Benefits



# Benefits

## Our business case

- Reduce power outages
- Improve asset security and risk management \*
- Reduce losses
- Eliminate systematic maintenance tasks
- Make better investments
- Recovery of analysis time for technical personnel



**A common vision**

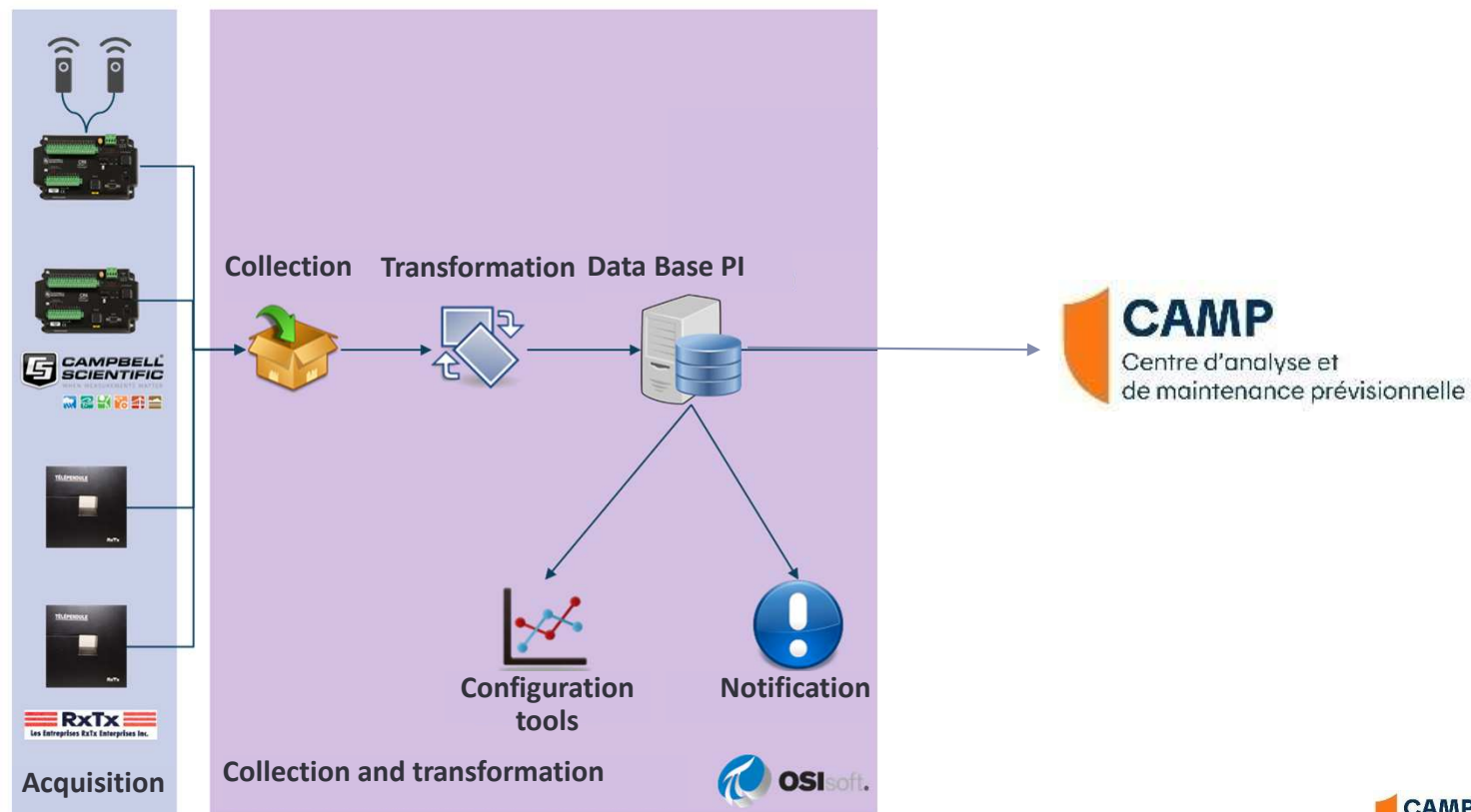
**3**

# HQ ecosystem

- **Monitoring community**
- **Remote maintenance and monitoring of IT infrastructure**
- **Hydro-Québec's research center**
  - › Prognostics
  - › Digital twin
  - › Imaging
  - › Artificial intelligence
- **AI partnership (e.g., MILA)**

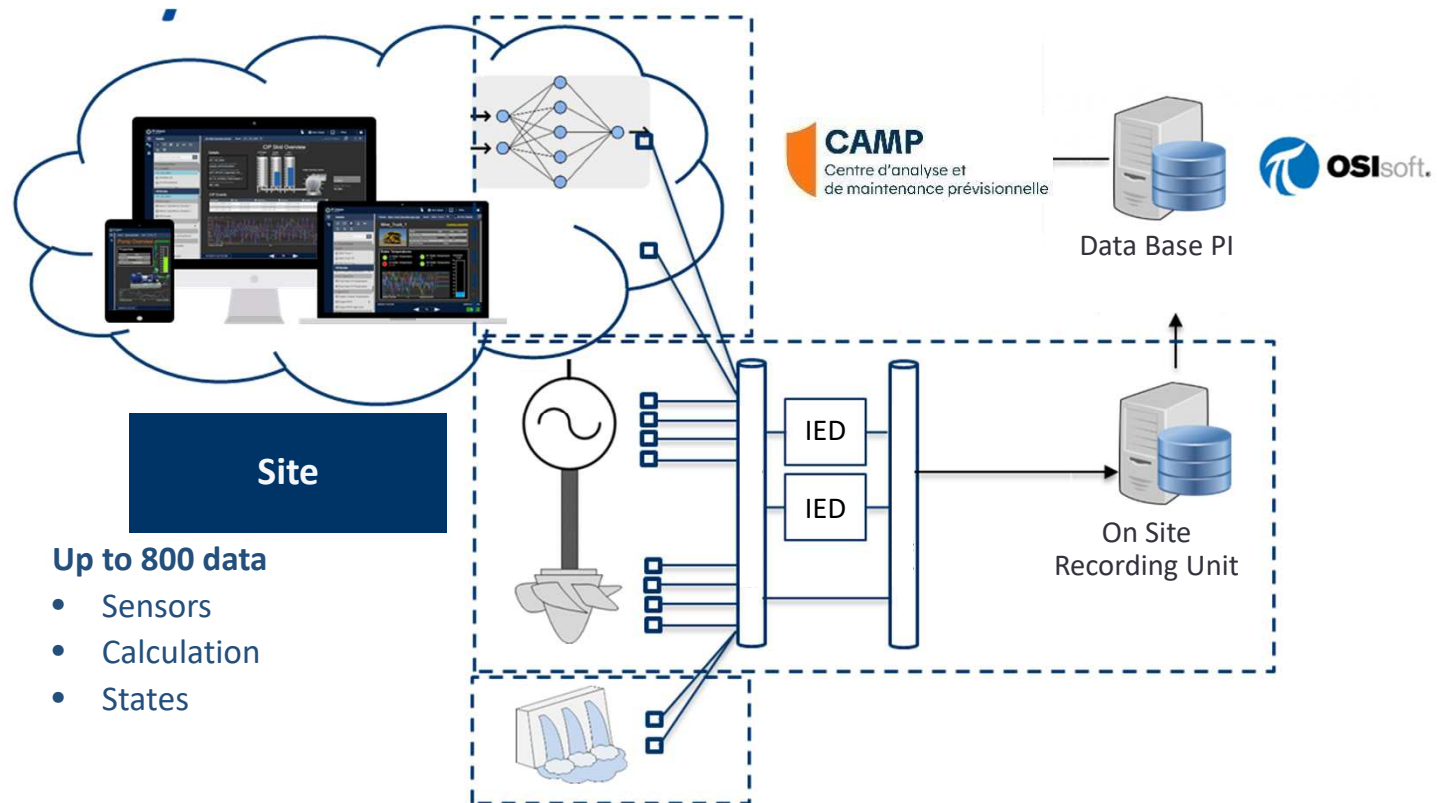


# Technology – Data acquisition for Dams

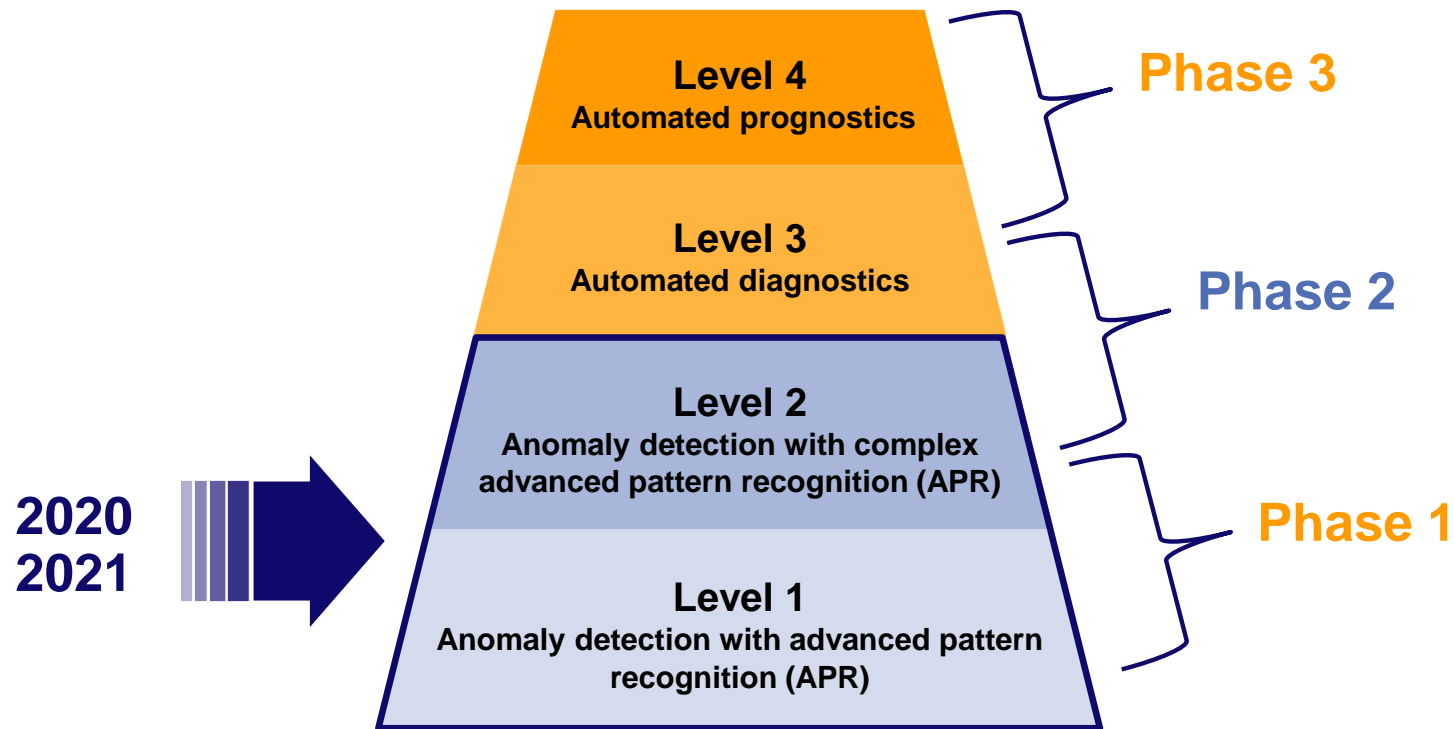




# Technology – Data acquisition for Generating Units



# Technology – Maturity scale for Monitoring



# Vision

**Operationalization  
of monitoring**

**Mastery  
of monitoring**

**Phase 1**

**Phase 2**

**Phase 3**

**Expansion  
of monitoring**

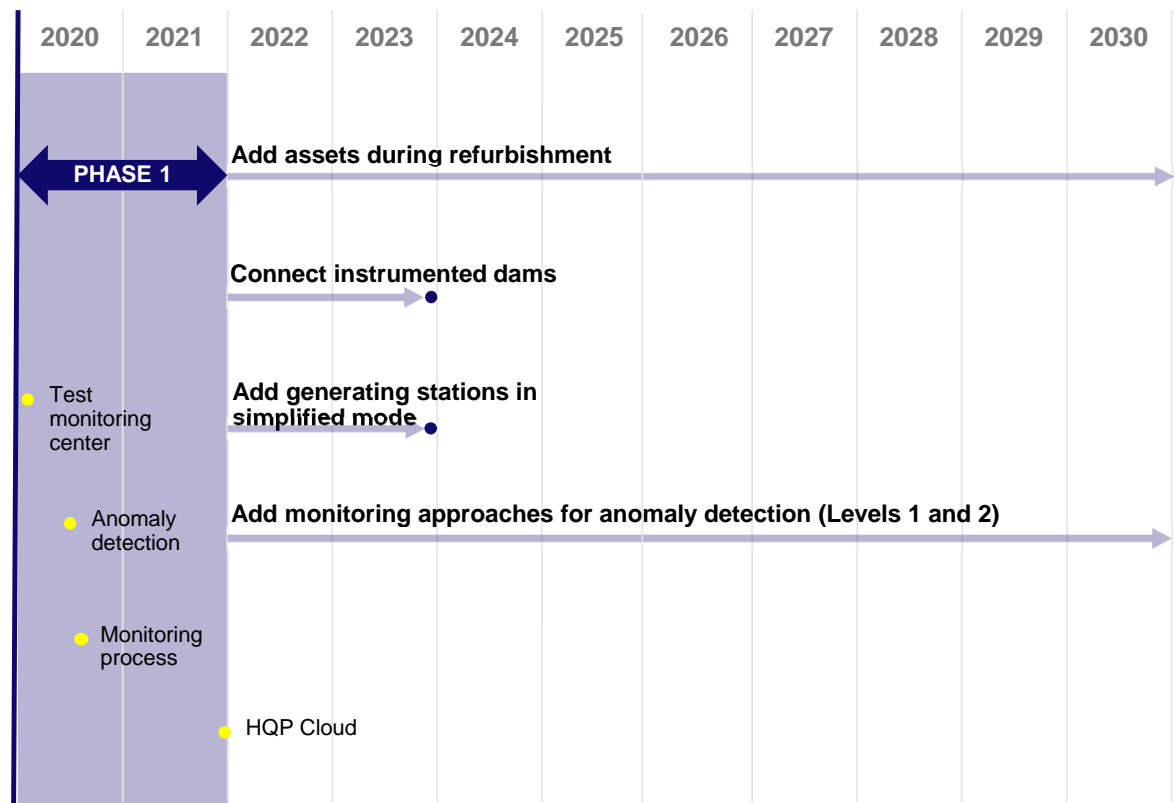
# Phase 1 – Operationalization of monitoring

## Key activities

- Connect, clean and test measurement chains
- Implement main processes
- Acquire and implement software
- Develop work tools and methods
- Support the HQP cloud
- Develop anomaly detection algorithm technology (Levels 1 and 2)
- Develop a change management plan

## Target assets

- Generating units
- Dams with data loggers
- Spillways
- Hydrometeorological stations
- Solar generating stations



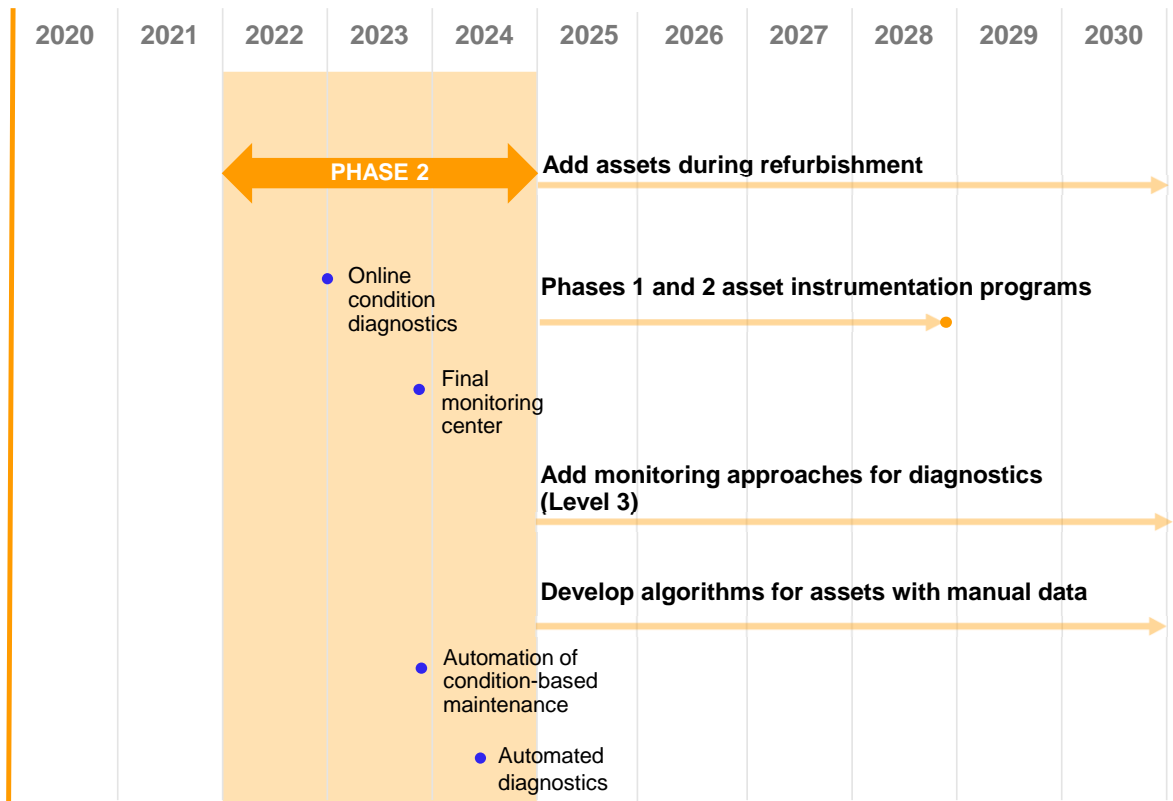
# Phase 2 – Expansion of monitoring

## Key activities

- Study new sensor technologies
- Deploy GU component digital twin for monitoring
- Develop diagnostic algorithm technology (Level 3)
- Introduce online asset condition diagnostics
- Implement trigger automation technology for condition-based maintenance
- Add instrumentation to Phase 1 assets for new monitoring approaches
- Develop technology for using manual data

## New target assets

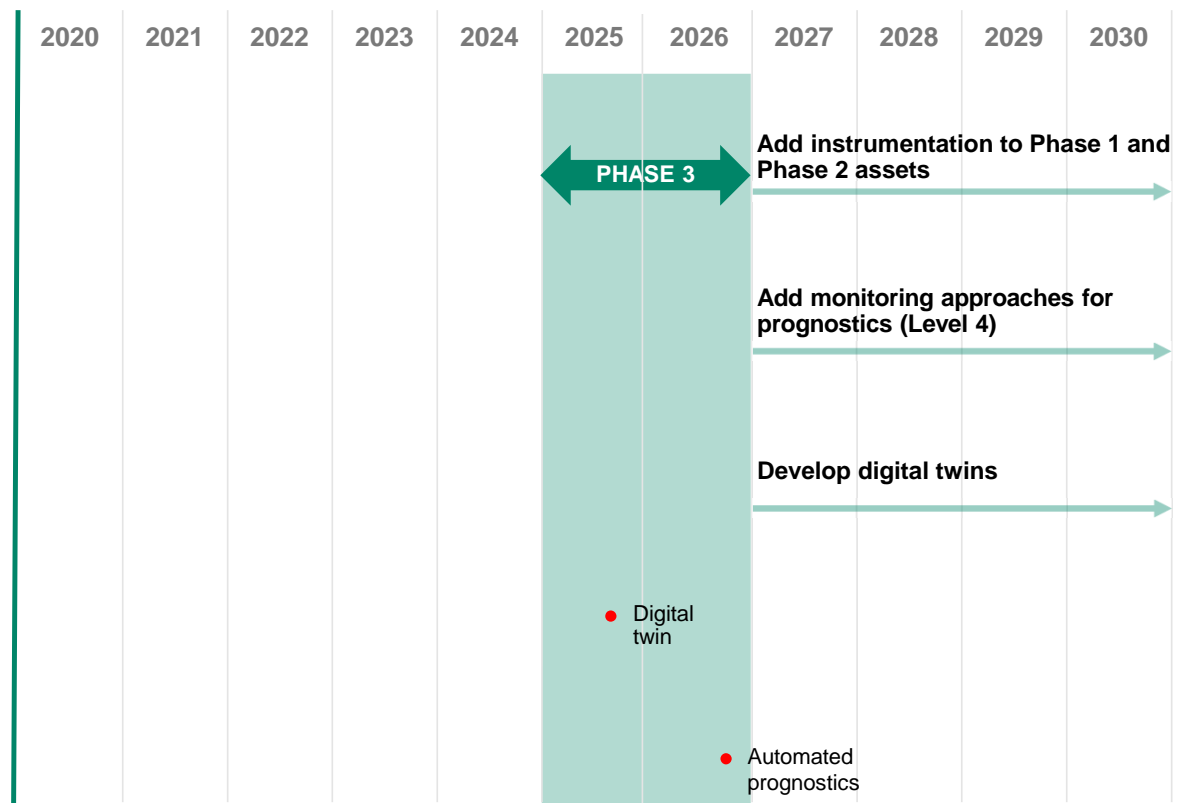
- Auxiliary assets
- Infrastructures
- Stations without data loggers
- Dams without data loggers



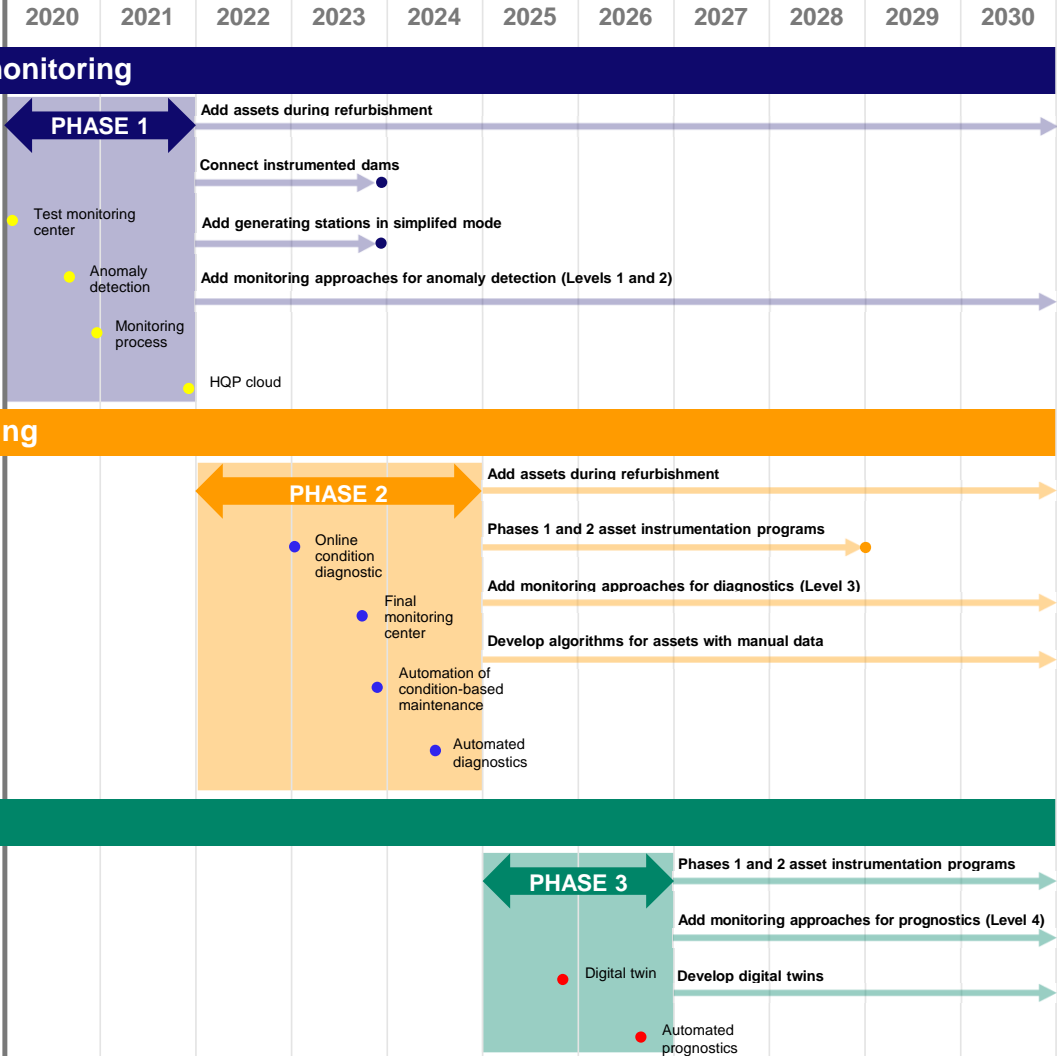
# Phase 3 – Mastery of monitoring

## Key activities

- Develop prognostic algorithm technology (Level 4)
- Incorporate asset digital twins into monitoring center operations
- Add instrumentation to Phase 2 assets for new monitoring approaches
- Implement technology for using imaging in automated monitoring







# Conclusion

- The project is going well
- Strong company-wide synergy
- Good collaboration with the engineering and maintenance staff



