# FROM PREVENTATIVE TO PREDICTIVE

WITH INDUSTRIAL IoT

AEGIR **Predictive Maintenance Solution™**

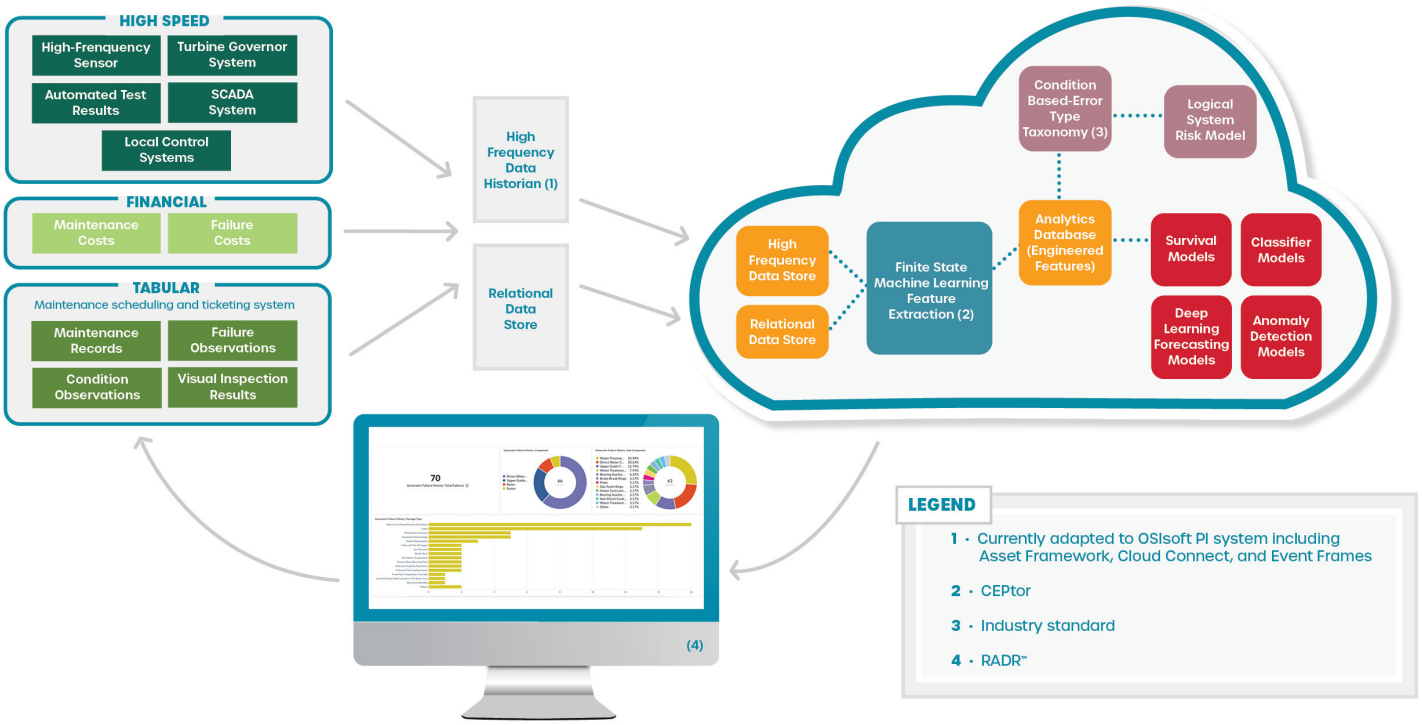
Through monitoring asset data, a predictive solution extends the life of components by providing targeted alerts from machine learning models trained on thousands of hydropower components. This allows interventions to be prioritized by risk and criticality, rather than following a scripted maintenance schedule.

## INTRODUCTION

The power industry is being transformed by an explosion of sensor data, computing power, and more reliable wireless connectivity. The Industrial Internet of Things (IoT) takes advantage of these technologies to provide key insights about power production equipment, thus converting hydropower from a traditional preventative to a data-driven predictive maintenance approach to asset management. As aging generation facilities experience increased maintenance costs, two issues arise:

1. Functioning equipment is taken off-line for periodic inspection cycles, causing unnecessary revenue loss.

2. 30% of potential failures occur between maintenance cycles. These unplanned outages are often the most expensive, causing extensive damage and lengthy repair times.




**OFFICE LOCATIONS**
Charlottesville, VA | Baltimore, MD
Raleigh, NC | Washington, DC



elderresearch.com
contact@elderresearch.com
434.973.7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING

## STEP 1: DATA COLLECTION

The first building block in a predictive maintenance solution involved properly collecting and processing data. These data include:

- Operational data that is communicated directly by the assets
- Maintenance and test results
- Records of prior maintenance costs

## STEP 2: DATA COLLATION

- Source data is combined in a data lake within our cloud environment or client premises.
- Sensor data is collected in data historians, such as the OSISoft PI System, while tabular data is collated into a relational data store.

## STEP 3: CLOUD PROCESSING AND MODEL DEVELOPMENT

- The CEPtor™ finite state machine extracts key features for machine learning, observes power cycle sequences from SCADA indicators, generates alerts on expert-defined triggers, and uses automated anomaly detection to identify unusual behavior.

## STEP 4: MACHINE LEARNING RISK MODELS

- Our expert-driven taxonomy of hydropower components, testing methods, and damage types allows for a hierar chical view of system condition over time.
- Deep Learning and Survival Analysis models, trained across many generators, turbines, transformers, and other equipment types, continuously predict the likelihood of a component failure within the next few months.

## STEP 5: VISUALIZATION AND CASE MANAGEMENT

- The RADR™ visualization tool allows users a self-service web application for understanding system health using customizable dashboards. Alternatively, OSISoft customers can select to have model results displayed within the PI Asset Framework, PI Event Frames, and PI Vision tools.
- RADR™ also provides case management integration. When technicians receive an alert from the machine learn ing models, they have supplementary information helping to isolate the problem, track cases, prioritize mainte nance, and manage workflows. Results from these maintenance activities are fed back into the system to further enhance the machine learning models. Customers can also choose to integrate with existing asset maintenance systems, such as IBM Maximo, Norconsult JobTech, and others.

CASE STUDY

**THE CHALLENGE** Sira-Kvina Kraftelskap, a hydropower company providing 5% of Norwegian electricity, engaged Elder Research for a solution to predict component failure and avoid costly unplanned downtime.

**THE SOLUTION** Using the Ægir Predictive Maintenance Solution™, Elder Research identified the cause of a complex, expensive generator failure that was indecipherable using traditional techniques. This event had kept Norway's largest power generator offline for many weeks, causing tens of millions in lost revenue.

**THE RESULTS** Our solution is now in production on top of the OSISoft PI System, providing real-time alerts of anomalous behavior and predicting likely fault events for technical intervention, providing 45% return on investment within just the first year.

**OFFICE LOCATIONS**
Charlottesville, VA | Baltimore, MD
Raleigh, NC | Washington, DC



elderresearch.com
contact@elderresearch.com
434.973.7673

ELDER RESEARCH
DATA SCIENCE · AI · MACHINE LEARNING