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# Laying the Groundwork for AI-Powered Predictive Maintenance in Power Generation

**Solutions:**

- ImpactNOW AI Proof of Value
- Microsoft Fabric

## Replacing Offline Analysis with Real-Time Intelligence

**A large-scale power generation facility in the Northeast faced significant challenges with their reactive approach to equipment monitoring.**

Operational data from AVEVA PI was manually exported for offline analysis, creating delays between data collection and insight. This process limited scalability, prevented real-time visibility into asset health, and made early detection of equipment issues nearly impossible.

The organization set out to move from reactive, spreadsheet-based analysis to proactive, AI-driven predictive insights with the goals of improving operational efficiency, optimizing energy output, and reducing unplanned downtime.

As their trusted technology partner, ProArch proposed an AI Proof of Value (PoV) to demonstrate how a modern, real-time data platform could unlock predictive maintenance capabilities.

## The Approach: Building a Real-Time Data and AI Foundation

Building on our existing deep domain knowledge of the company's environment, ProArch executed a 2-week ImpactNOW Proof of Value (PoV).

Unlike the previous offline methods, this solution leveraged Microsoft Fabric Real-Time Intelligence to process sensor data instantly.

## Key Components

**High-Impact Scope:** Monitored 3 critical pumps and 4 associated sensors, selected for operational importance and failure risk.

**Real-Time Architecture:** Replaced manual data exports with direct ingestion from AVEVA PI into Microsoft Fabric, enabling continuous monitoring of sensor data.

**Anomaly Detection:** Implemented real-time detection to identify irregularities in pressure, vibration, or flow immediately, triggering alerts for the operations team.

**Performance Benchmarking:** Built a real-time dashboard comparing current pump performance directly against the manufacturer's performance curve. This allows operators to instantly see if a pump is deviating from its optimal operating zone.

**Historical Calibration:** Used historical operating data to calibrate performance curves specific to the plant's real-world conditions.

**Validation:** Ran historical data through the anomaly detection model to identify past anomalies. These were cross-referenced with actual maintenance logs to validate the model's accuracy and build trust in the system

## Technical Foundation

**The PoV sprint focused on:**

- Leveraging historical and real-time data from Aveva PI.
- Implementing a scalable data architecture in Microsoft Fabric, leveraging Azure EventHub, Container Apps, and LakeHouse for real-time data ingestion and visualization
- Demonstrating how integrated AI can identify patterns, forecast performance, and support proactive maintenance decisions

# Early Results & Measurable Operational Impact

The Proof of Value successfully demonstrated how shifting from offline analysis to Microsoft Fabric Real-Time Intelligence delivers immediate operational value.

- **Validated Accuracy:** Historical back-testing correctly identified known past anomalies, validating the AI models.
- **Real-Time Operational Visibility:** Delivered a live view of pump health against manufacturer benchmarks—eliminating manual analysis and delayed insights.
- **Scalable Foundation:** Established an architecture capable of expanding from 3 pumps to the entire facility.

# Positioning the Plant for Predictive Maintenance at Scale

This initial phase created the foundation for a unified, AI-enabled data platform capable of supporting predictive maintenance at scale.

Working with ProArch, the organization is now positioned to realize their long-term strategic goals:

50% reduction in unplanned downtime through predictive alerts.

25% reduction in maintenance costs by moving from schedule-based to condition-based maintenance.

A clear path to expanding AI-driven insights across assets and systems