

Modernizing a Legacy Hydroelectric Fleet's Automation Strategy

RESULTS

- Establishes a standardized automation foundation supporting river management optimization, remote operation automation and unified condition monitoring
- Reduces design costs, simplifies training, and enables consistent equipment tagging across sites
- Standardized automation foundation supports workforce transition by simplifying training and enhancing workforce mobility
- Increases unit availability through improved equipment reliability and accelerated troubleshooting response time
- Supports cybersecurity compliance now and into the future
- Simulation tools proactively identify and resolve potential issues before they impact operations
- Completed 13 units to date, applying lessons learned to future deployments

APPLICATION

Modernization of hydroelectric fleet

CUSTOMER

US-based utility

CHALLENGE

A large U.S. energy provider faced the challenge of modernizing its aging hydroelectric fleet, which includes over 100 generating units—some more than a century old. Past upgrades were done piecemeal, resulting in a fragmented system with limited automation and inconsistent data availability. The lack of standardization created operational inefficiencies, increased maintenance demands and reliability concerns. To achieve 80 additional years of reliable operation, the power producer needed a scalable, standardized automation strategy that could bring consistency, improve data access, strengthen its cybersecurity posture and enhance overall fleet performance.

SOLUTION

The energy provider partnered with Emerson to implement an automation strategy as part of a multi-billion-dollar, multiyear comprehensive modernization program, which included turbine replacements, generator rewinds, excitation updates and new hydraulic power units across its hydroelectric fleet.

The backbone of the automation solution was Emerson's unified Ovation Automation Platform, which replaced fragmented legacy systems. This standardized control architecture is adaptable to each site's unique requirements, while maintaining consistency across all units.



"The decision to move to a distributed control system (rather than using PLCs) was based on data visibility and analytics. Ovation technology is an all-encompassing solution—graphics, logic, alarms, historian—everything is built into one platform. We're just beginning to unlock the opportunities within the Ovation™ Automation Platform."

-Principal Engineer
US Utility

The Ovation platform controls and monitors:

- Unit operations including the governor, lube oil, high lift, aeration, cooling water, and braking
- Balance of plant operations for service air/water, switchgear, sump, unwatering, lake level/pond, spillway gate, headgate and inlet valve systems
- Integration of excitation, electrical protection, energy management, weather station and enterprise data historian systems
- Interplant coordination of remote operations, river management and optimization

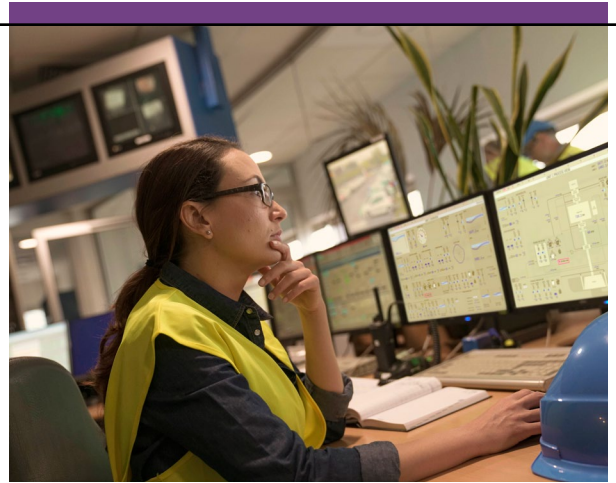
Implementing an integrated advanced automation solution enables real-time monitoring, predictive maintenance, and centralized data collection. This approach not only streamlines plant management and enables remote operations and interplant coordination, but also lays the foundation for scalable upgrades, reduced maintenance costs, improved asset reliability, and enhanced decision-making through better data visibility.

Key components of Emerson's solution included:

- Standardized Automation Platform: Emerson's Ovation control system provides consistent control logic, high-performance HMI, and integration with third-party systems.
- Data-Driven Operations: Emerson's Ovation solution enables centralized monitoring via a 24/7 Monitoring & Diagnostics Center, leveraging data from new Emerson Rosemount instrumentation (level, pressure, flow, position, temperature).
- Integrated Vibration Monitoring and Protection: The Ovation Machinery Health Monitor enables early detection of mechanical issues and prevents costly equipment failures.
- Cybersecurity Suite: Emerson's DHS-certified Ovation control system provides antivirus, patch management, and compliance automation.
- Program Management Approach: A dedicated team coordinated execution across all sites, ensuring alignment, stakeholder engagement, and adaptability to site-specific constraints.

Beyond these core components, Emerson also addressed the complex hydraulic power unit (HPU) modernization with a tailored approach that balanced standardization and site-specific needs.

Faced with nearly 30 different configurations, Emerson used a configure-to-order design approach, selecting common families of components, such as sumps, motors, pumps, valves and accumulators, that can be mixed and matched in a way that



Implementing an integrated advanced automation solution streamlines plant management, and enables remote operations and interplant coordination.

ensures each site is right-sized while maintaining a consistent hydraulic schematic. Additional instrumentation was added to monitor wicket gate opening and closing pressures, sump temperature and level, and accumulator level.

Emerson's comprehensive solution also addressed challenges and strategic priorities identified in the power producer's long-term plan, including schedule flexibility, workforce transitions, and component obsolescence. The integrated Ovation platform enables the utility to balance innovation with standardization, leveraging advanced applications and simulation to support training and long-term workforce development. Importantly, the standardized automation foundation positions the utility to adopt future innovations such as AI-driven analytics and predictive optimization, ensuring long-term adaptability and performance gains.

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