

NUCLEONICS WEEK

Volume 56 / Number 45 / November 5, 2015

Operators deploying new data analysis tools focused on nuclear plant operations

A new generation of data analysis tools is being adapted for use in improving the operating performance of nuclear power plants, some of which are under intense pressure from low power prices to avoid unplanned outages, industry officials said in interviews.

GE Hitachi Nuclear Energy and Exelon announced September 29 that they would work together on pilot programs to use plant data to predict the performance of components and provide early notice of potential problems. Another initiative will use software to examine historical data to better determine staffing levels for different plants and situations, the companies said in a joint statement.

GEH and Exelon will share in the financial benefits of the use of the system, Eric Mino, GEH vice president of asset management services, said in an interview October 28. "We are building the capability for operators to have a global look, a fleet-level look" at data affecting plant operations, he said.

That and other industry efforts are part of a trend toward more careful and extensive use of data to improve operations, a process sometimes known as analytics.

The trend is being driven by a strong incentive to keep plants operating "breaker-to-breaker," meaning continuously from the end of one refueling outage to the beginning of the next, because power prices during a few days in the peak demand season can determine whether a station is profitable, industry officials said.

In merchant markets, where prices are set by markets and not by regulators, operators must take advantage of peak demand days when prices can rise to profitable levels, companies such as Exelon and Entergy have said.

"Breaker-to-breaker runs are very important ... While short outages are nice, predictable outages, reliable outages and outages that prepare the plant to run for the entire cycle are the most important thing," David Howell, senior vice president of Westinghouse's operating plants business, said in an interview September 30.

Westinghouse is offering its Reconnect system, which monitors the performance of key valves, pumps and other components. That system also connects to an electronic work management system that allows workers to access procedures and track maintenance, he said.

Corrective to predictive maintenance

Corrective maintenance, the main way of doing things two decades ago, meant fixing things that were not working properly or had already failed, industry officials said. Preventive maintenance, seeking to service components before they fail, has since become the preferred approach, they said.

And even more recently, nuclear plants have been using data from components — for example, measurements of vibration in pumps and oil temperature in motors — for some time as part of preventive maintenance. That data has been aggregated and used to analyze performance.

However, in the last five years "advanced pattern recognition" has been used to analyze data from components in an effort to make predictions about performance degradation and failure, Maria Korsnick, chief operating officer of the Nuclear Energy Institute, said in an interview October 23. Korsnick is the former chief nuclear officer for Constellation Energy Nuclear Group.

Those types of systems could be set up to notify an engineer about abnormal operation, she said.

Such information can supplement data normally examined, such as pump flow, which might not be degraded even as vibrations are increasing, she said. "Essentially it's early detection, and it's an easier fix," Korsnick said.

The higher level of detail from data, and better ways to analyze the patterns, can help plants fine-tune the templates used to establish maintenance or replacement intervals for components and consumables such as filters, she said. This can mean that some components can be repaired less frequently and some might be done more frequently, she said.

GEH and Exelon will work together on developing Watchtower, a predictive engine that will help Exelon combine existing component performance analysis

software tools from each site into a comprehensive picture of the fleet, GEH's Mino said.

The software is part of a General Electric platform called Predix that provides "cloud-based" data services to industrial plants, including nuclear stations, he said. "It is an analytics platform," for which users can develop and sell applications that perform specific types of analysis, Mino said.

Exelon will be offered the ability to produce software applications for sale in a GE-run software marketplace, he said.

In addition, the software platform will eventually be built in to certain types of industrial equipment, including pumps, motors and lighting, Mino said. In non-nuclear applications, networking between related components will allow wind turbines, for example, to predictively adjust to changes in wind speed detected by other turbines, Mino said.

Such "machine-to-machine" adjustment would require a license amendment from NRC before that logic could be added in safety-related equipment in a nuclear plant, he said.

The system will be able to use operating data but will not have the ability to control safety-related systems, increasing security, he said.

In nuclear plants, the platform is providing the ability to develop computer models of components at a level of detail not seen before, Mino said.

In addition to the predictive maintenance system under development, Exelon and GEH are working together on a management system that will take data about operating trends and NRC oversight to select the right manpower for different situations.

GEH is speaking with other large nuclear plant operators, including Southern Nuclear Operating Co., Duke Energy and Entergy, about using its system, Mino said.

'Managed approach' to maintenance

The Westinghouse system also connects to its outage control systems, which include streaming video of outage procedures to allow them to be monitored at Westinghouse's headquarters for better process control, he said.

Operators are using the results to prioritize maintenance of systems that can cause unplanned reactor trips, Howell said.

"They're trying to keep costs down. However, each customer we talk to is really interested in what's going to keep me running breaker to breaker," he said. That is driving a "managed approach" to maintenance, rather than waiting until components fail and then fixing them, Howell said.

"It's all very focused on being available and reliable to the customers at critical times," Korsnick said.

Outage lengths are still important, but each plant must assess the value of hiring additional contractors to trim a few days off the schedule, she said. In some markets, where the price of power is lower, especially during so-called shoulder seasons of less demand when outages usually take place, the value of a day or two of additional generation may not justify the cost of additional workers, she said. "The price of the commodity plays into that conversation," Korsnick said.

Some plants consistently achieving very short outages of 20 days for example, may not have the incentive to shorten them further, unless the outage is scheduled unusually close to the peak demand season, Korsnick said.

— William Freebairn, Washington

Any reproduction of this article is strictly prohibited without prior written permission from Platts (www.platts.com).