

THE NUCLEAR NEWS INTERVIEW

Enhancing equipment reliability

A team from Exelon Corporation won this year's Best-of-the-Best TIP Award for a program to inspect and test spare parts prior to installation at the plants.

Each year, the Nuclear Energy Institute salutes the industry's leading innovators with its Top Innovative Practice (TIP) Awards. According to Sue Perkins-Grew, NEI's senior director of nuclear security and incident preparedness, "The TIP Awards showcase how the bright minds in nuclear are driven by purpose, moving the industry forward."

This year, NEI bestowed TIP Awards on 12 "bright-minded" industry teams, including two from Exelon Generation. One of those teams, composed of Exelon Supply Operations and Exelon PowerLabs employees, took home the Best-of-the-Best Award—NEI's highest innovation award—for its Parts Quality Initiative, or PQI.

To learn more about PQI and why it caught the eye of the judges, *Nuclear News* Associate Editor Michael McQueen talked with three members of the team: John Makar, Exelon senior supply operations specialist; Scott Danehower, Exelon PowerLabs technical services manager; and Tom Wait, PowerLabs operations manager.

First, for those who may not be familiar with it, what is PowerLabs?

Danehower: Exelon PowerLabs is the primary calibration and testing laboratory for Exelon Corporation. The lab has been in existence since 1911. We have over 100 years of history. We're a wholly owned limited liability company of Exelon Corporation, and we do both in-house—meaning inside Exelon Corporation—and external commercial work, including calibration and testing services for the industry. We are a fully qualified, audited nuclear supplier as well.

And where is PowerLabs located?

Danehower: We have four locations. Our headquarters is in Coatesville, Pa. We have other facilities in Plattsburgh, N.Y., Madison, Pa., which is near Pittsburgh, and Braidwood, Ill.

How did the idea for the PQI originate?

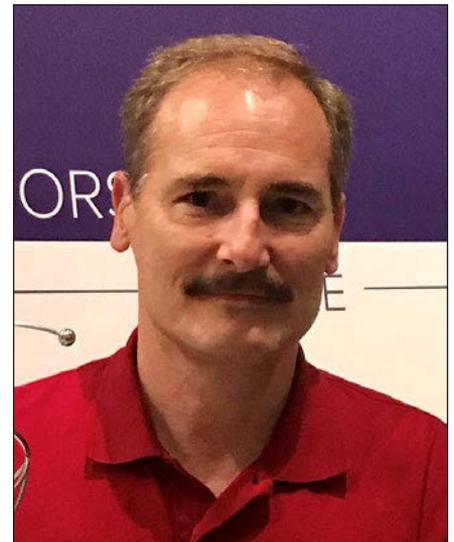
Makar: In the early 2000s, Exelon recognized that a large percentage of its fleet's capacity factor losses were associated with



Makar



Danehower



Wait

Photos: Exelon Generation

vendor-related parts quality issues. In some years, like 2005, as high as 45 percent of our fleet capacity factor losses were attributable to vendor or parts quality. That's a huge number. So at that time, a number of people started working on the problem and asking, "What can be done to resolve this issue?" As time went by, people at PowerLabs were working with the engineering, maintenance, and supply operations folks, and they came up with the concept of doing more rigorous testing of parts as they come in to the shipping dock, rather than waiting until they are issued to or installed at the plants. So, the inception of PQI was in the 2006 time frame. From there, it has evolved through experience gained by testing a number of components.

How many components have you tested?

Makar: We have tested over 60,000 components since that time. We have been able to narrow down which items should be tested because of reliability concerns.

Danehower: I would just add that we are continually refining what we test to optimize the program.

How does PQI work?

Makar: When we order parts at the plant, the first thing we do is screen the part to determine whether it's in a critical application.

What does "critical" mean in this context?

Makar: A critical component, as defined by the industry, is one that is important to safety, shutdown safety, or power generation capability. It's really a risk-informed decision-making process, and engineering has the bulk of the responsibility to make those decisions on what is critical versus noncritical. So we take that information and apply it to the part. If the part is critical, when it arrives from the vendor, we redirect it to PowerLabs, where we have test templates that we have developed over the years to do testing on the materials.

Let's just say, for example, that a relay is received by PowerLabs. We open up a job in our OneLab database and use that database to track everything from receipt of the relay through testing. Any documentation that we need—including the final testing and inspection reports—is in there. And then we ship the relay back to the site with a "pass-fail" and a test report on how the relay performed.

Danehower: After that, the data are gathered and reported to the OneLab database, which is where all of our customers, all of our fleet sites, and any of our commercial customers can go and look at the results of the data, trend the data, and use that to make decisions on which components might need additional test-



Photo: Exelon Generation

Exelon's Parts Quality Initiative team received the Nuclear Energy Institute's Best-of-the-Best TIP Award on May 23. From left: Scott Danehower, PowerLabs technical services manager; Meghan McQuiston, senior manager of nuclear supply operations; John Makar, senior supply operations specialist; Roosevelt Groves, director of outage programs and alliances; Bill Pitesa, NEI's chief nuclear officer; and Tom Wait, PowerLabs operations manager.

ing, which should stay in the program, and which should be removed. It also provides some information to help improve the quality of the parts, working hand-in-hand with vendors and manufacturers.

Wait: Our templates are meant to be dynamic. They contain the appropriate component test and acceptance criteria. The templates focus on testing those attributes that we feel, based on our experience, need to be verified for liability. To us, it's important that we have a consistent testing protocol across all of our customers, so that we're testing the components in the same way for everyone. Not only do we keep the templates optimized at the test-criteria level, but we also optimize the program by component type—those components that warrant our resources versus those that do not. After over 10 years of testing and optimization, we've been able to optimize all of our components and test criteria to get us the most benefit for the money spent.

Makar: And we also provide feedback. It's dynamic. For example, if we identify a specific problem on a component, we will work with a vendor to see what they can do to repair or redesign it, or we work to improve their testing and reliability approach to the component as well as our own. This ensures that we have a higher-reliability component going into the plant. Our engineers and technicians at PowerLabs are very engaged with the vendors in solving problems and making the components better. That affects not just us; it affects the whole industry.

Wait: Since we represent such a large population of power plants in the supply chain, we have enough data to provide what we consider to be relevant trends, so we can offer back to those manufacturers and suppliers significant trends about the reliability of their parts.

Which components have a high failure rate?

Danehower: Relays have a high failure rate. Sometimes when a relay's contacts are not aligned properly or assembled properly, it shows up in variability and contact resistance. A population of relays typically has contact resistance values that conform to a particular set of acceptance criteria. If we have relays that appear to be outliers, or if there is a high degree of variability in the result, it suggests that there is something that is not uniform or something that is not aligned or set up properly. The data provide us with a red flag that we need to be concerned about that relay, which is an outlier from industry norms.

Could you briefly explain what a relay does?

Danehower: There are all different kinds of relays, but in general, a relay is a device that will monitor a signal—a voltage, a current—and it reacts to that signal. So, if the voltage goes too high or too low, or there's too much current or too little current, the relay has the ability to operate and give us a signal or contact closure that can then be used in logic circuits to initiate various activities—turning on a pump, turning on a motor, switching something else on or off.

How would you say PQI has helped improve plant operations, in general and in specific instances?

Makar: In general, as I mentioned, in the 2005 time frame, 45 percent of our total fleet capacity factor losses were a result of manufacturing and vendor-related parts quality issues. Contrast that to 2015 and 2016, where less than 6 percent of our total capacity factor losses were attributable to manufacturing and vendor quality issues. That is a huge improvement and a

Digital Plant Viewer

Exelon Generation's second TIP Award this year went to its Digital Plant Innovation team for the Digital Plant Viewer, a Web-based mapping interface that accesses radiological surveys, live video feeds, and 360-degree images. While nuclear employees already use a wide array of mapping, telemetry, and other data systems to run plants daily, this innovation, according to Exelon, pulls the technological systems together in one place for the first time.

The Digital Plant Viewer was used during the recent spring refueling outage at LaSalle-1, after station employees spent several months mapping the facility using 360-degree cameras to create virtual tours. The tours were coupled with portal technology to provide live video, temperature, and up-to-date radiation dose information throughout the plant. This technology, according to Exelon, reduced work time inside the plant, limiting radiological exposure to record low levels. Further, Exelon sees the Digital Plant Viewer as the first step in creating a true virtual reality simulation of the plant that will improve employee training and other areas. At the start of the outage, LaSalle Site Vice President Bill Trafton said, "This technology will help our people to work safer and smarter, because they can get more data and information about their tasks before they even enter the plant."

Led by Brian Carroll, innovation specialist, the Digital Plant Viewer team also included Kevin Burroughs, principal innovation specialist; Eric Cota, lead IT analyst; Cliff Gray, innovation manager; Robert Holleran, senior project manager; Kim King, innovation specialist; and Chris Ledwich, radiation protection technician.



Photo: Exelon Generation

Outage workers at Calvert Cliffs save time by familiarizing themselves with the plant using the Digital Plant Viewer.



Photo: Exelon Generation

The Digital Plant Viewer is a Web-based application that provides an interactive plant map with 360-degree images, live video, real-time radiological exposure data, and wireless telemetry.

huge dollar savings for us, Exelon, and our customers. Since 2014, we have stopped over 2,100 parts from being installed in our plants.

Wait: Here's another benefit: You can imagine the choreography of planning and scheduling plant maintenance work orders at our nuclear plants. When a work schedule is established to get certain jobs done and workers discover deficient parts at the time of installation, they're unable to complete those jobs on time. The Parts Quality Initiative has a huge impact from a work management point of view. We're able to screen parts prior to their being put into inventory, ensuring a higher degree of success from a work/maintenance planning perspective.

Danehower: We've also been able to recapture costs for these parts because we're able to return them to the vendor/manufacture under warranty. In the past, these parts would go into inventory at our plants or warehouses and sit on a shelf for several years before they were needed. And if a problem was found at that point, then the part would be out of warranty.

But since we now test it upon receipt, we can identify any problems while the part is still under warranty and have a warranty claim. Forty percent to 70 percent of just the testing cost alone has been paid for by the money recaptured by returned parts. The program almost pays for itself that way.

Is PQI used only throughout Exelon's nuclear fleet?

Makar: We use it to some degree in our nonnuclear plants as well.

Danehower: We should also add that Entergy Corporation and Public Service Electric & Gas in New Jersey are participating in parts quality testing in our program.

Why do you think PQI might have been chosen for NEI's Best-of-the-Best Award?

Wait: The reason I believe this won is that we are building a community beyond Exelon, including Entergy and PSE&G right now, as Scott just mentioned, and hopefully others in the near term, to collect and share data. The more test data you

have, the more visibility and clarity you have around trends. And this is the best opportunity we have right now to drive reliability across the industry.

Any final thoughts?

Makar: We estimate that our return on investment for our fleet, and then for our customers, is on the order of five- or six-to-one every year on the reduction of lost power generation. What that means, for example, is that for every \$1 million we spend on the pre-receipt inspection testing of these critical components, we save between \$5 million and \$6 million in lost generation. That number is based on a very conservative \$10 per megawatt-hour of replacement power cost. As we all know, that can fluctuate wildly depending on the season.

I'd also like to reinforce the importance of PQI to nuclear safety. A big portion of this program helps improve the reliability of our safety systems. That cannot and should not be lost in the big picture of things. The safety of the plants is always our first and foremost job. **NN**