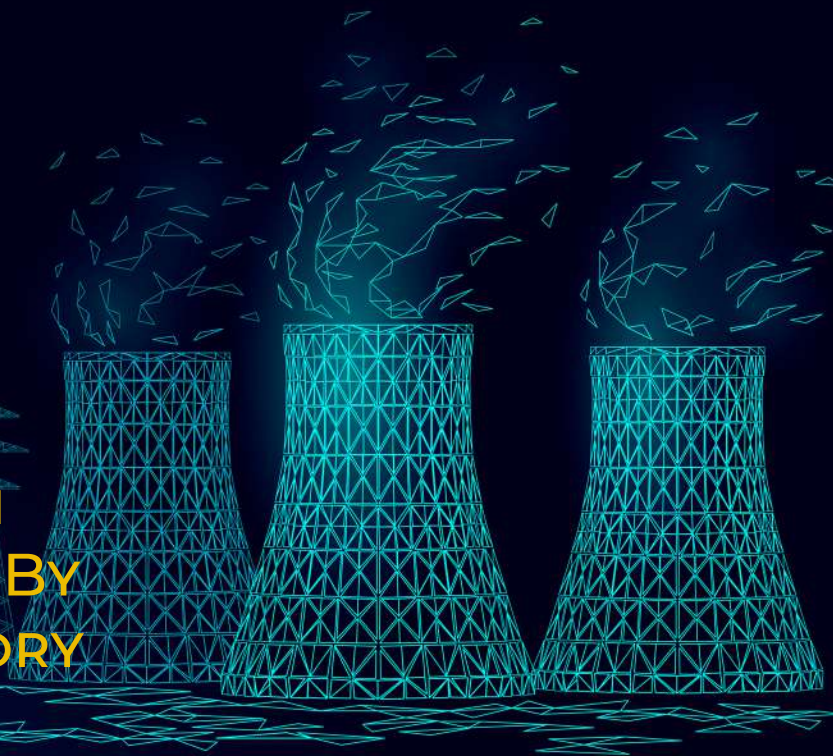CASE STUDY

HOW EXELON GENERATION SAVES UP TO $660k/YEAR BY AUTOMATING COMPENSATORY FIRE WATCH CART

LEARN HOW TWIN EAGLE CONSULTING HELPED EXELON GENERATION DEVELOP A REMOTE MONITORING PLATFORM FOR FIRE WATCH.

ABOUT EXELON GENERATION

Exelon Generation, a subsidiary of **Exelon Corporation** (NASDAQ: EXC), is one of the largest, most efficient clean energy producers in the United States. The fleet has a generating capacity of more than 30,000 megawatts, enough to power more than 20 million homes and businesses.

Exelon Generation operates the largest U.S. fleet of zero-carbon nuclear plants with more than 18,700 megawatts from 21 reactors at 12 facilities in Illinois, Maryland, New York, and Pennsylvania. In 2019, their plants had a best-in-class fleet capacity factor of nearly 96%. The business unit also operates a diverse mix of wind, solar, hydroelectric, natural gas, and oil facilities in 17 states and Canada, that provide nearly 12,000 megawatts of safe, reliable, efficient energy.

Exelon Nuclear, a division of **Exelon Generation**, operates the largest U.S. fleet of carbon-free nuclear plants with more than 18,700 megawatts of capacity from 21 reactors at 12 facilities in Illinois, Maryland, New York, and Pennsylvania. The Exelon Nuclear team of 10,000 employees implement industry best practices to ensure safe, reliable operation throughout Exelon's nuclear fleet.

HIGHLIGHTS

- Up to $660k/Year in Savings per plant

- 24/7 Remote Monitoring

- Elimination of Errors

- Plug and Play Platform

- 36-48 Battery Hours Before Recharge is Required

- Analyze Historical Data to Implement Best Practices

- Integrates Into Existing Network and SCADA

- No Security or Safety Concerns From the NRC

The Challenge

Like all utilities, Exelon is facing financial pressure to operate more efficiently. The 2020 COVID-19 pandemic saw U.S. energy consumption rates drop significantly, which forced the company to look for ways to cut costs to maintain profitability, while adhering to critical safety protocols. In the nuclear energy field, cutting corners on safety is not an option.

Since 1975, fire protection regulations have been federally mandated and monitored by the United States Nuclear Regulatory Commission (NRC) to ensure that a nuclear power plant (NPP) can safely shut down a nuclear reactor in the event of a fire. NPPs must have procedures and mechanism in place to:

- Minimize the potential for fires and explosions
- Detect, control, and extinguish fires that do occur
- Ensure that plant operators have redundant shutdown equipment available

As a result, NPPs have compensatory measures in place to help prevent and detect fires. The most common of these is known as a Fire Watch – a person trained to look for fire hazards, detect early signs of fire, and initiate alarms. This individual is generally equipped with safety gear, a checklist of inspection tasks, and two-way radio. He/She is tasked with walking the plant floor at regularly scheduled intervals (typically each hour), checking equipment, and physically inspecting for smoke and/or flame. If either are detected, he/she radios for a fire safety response.

In the case of Exelon, these hourly manual inspections cost ~$1 million in labor expense per year per plant. Additionally, as with any manual system, reliability and speed of information transmission could be compromised by any number of factors, including human error. At times, response/reaction times could be up to one hour, during which time significant damage could have been sustained. Further, there was no way to capture, record, and store real-time data. With the additional pressure to cut costs while maintaining or improving reliability and response times, a new solution was required.

That is why a visionary Innovation Specialist at Exelon conceived a new, remote Fire Watch solution. He looked to Twin Eagle Consulting, the industry experts in Optical Automation, to help architect and implement a flexible platform to 1) Automate Exelon's Fire Watch, and 2) Implement a mobile platform to automate Exelons Fire Watch and enable remote monitoring.

Goals

- Backup main fire protection systems in the event of outage or maintenance
- Enable remote monitoring and alerts
- Reduce manual labor costs
- Increase reliability and accuracy of inspection and detection
- Reduce response times in the event of an incident
- Capture real-time data
- Efficiently maintain historical data for regulatory and performance-monitoring purposes
- Develop a robust, flexible technology platform that could automate, monitor, and analyze any other critical functions

"THE BIGGEST BENEFIT OF THIS PLATFORM IS ITS FLEXIBILITY. WHATEVER YOU NEED TO MONITOR - INSIDE OR OUTSIDE - YOU CAN CONFIGURE IT TO DO."

The Solution

Exelon's Innovation Specialist partnered with Twin Eagle Consulting to design and create a flexible platform to support remote monitoring and detection. The end result was a mobile cart platform to automate inspection process, integrate existing sensor data, and align that data with optical sensors. The configuration of the carts includes:

Hardware
- Linux-based, industrial grade, fan-less edge computer
- wireless fire detection system
- radiometry camera
- LTE cellular router
- mobile cart that houses all hardware components and can be easily moved around the facility as necessary
- AC powered with 2 days of battery backup

Software
- Linux Ubuntu 18.04 LTS
- Video Management System (VMS)
- Twin Eagle-developed custom application that
    - Captures and consolidations instrumentation data
    - Creates alerts or events based on established criteria
    - Provides graphical user interface (GUI) to track key events, including inspection times, locations inspected, events and alarms, and historical data and video

How it works

Weighing ~500 pounds each, carts can easily be rolled into any room in the NPP. Instead of snapshotting data points once per hour, they capture and transmit real-time data, including video, 24 hours a day, 7 days a week. Functions include smoke detection, flame detection, radiometry to detect "hot spots" in the room, or a specific location. Note- multiple carts may be needed for full coverage. Any anomalies and/or alerts are immediately transmitted to the control room, and a response team can be dispatched.

The mobile carts serve several different functions at Exelon. The carts provide essential real time monitoring that allows plant staff to quickly analyze data and respond in the event of an anomaly. Specific use cases include the following:

Plant Start Up After Outage

NPPs run at 100% power for two years straight, are then shut down, refueled, and restarted. There is more risk of fires on startup due to a number of factors, like electrical shorts and sparks. Rather than relying on manual, once per hour inspections by onsite staff, the carts can monitor startup 24/7 and immediately pinpoint where and when fire, smoke, or temperature fluctuations are detected.

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Fire Protection Outages

The Fire Watch carts can be used as backup systems when a plant's permanent fire protection systems are down due to breakage, maintenance, or repair. In these cases, the carts can be rolled into any area of the plant to detect smoke, flame, temperature fluctuations, hot spots, and more.

Staff Safety/Security

For any number of reasons, there are times when staff should not or cannot be in a particular area of the facility. In these situations, the carts can be placed in affected areas to provide supplemental fire monitoring.

Ad Hoc Monitoring

Situations often arise where staff might want to monitor a specific area of the plant for a variety of reasons. The mobile carts give them the flexibility to monitor any part of the plant to capture and respond to real-time environmental data.

RESULTS

The response to Exelon's mobile fire watch carts has been overwhelmingly positive. With 17 carts currently deployed (and more planned), the company is recognizing tangible benefits, including:

Cost Avoidance

Prior to deployment of the fire watch carts, Exelon spent ~$1,000,000 per year in labor (regularly hourly pay, overtime, and contractor fees) to manually inspect and monitor an NPP. Post deployment, the company has been able to reduce overtime and contractor fees and save 50-67% off of labor costs – a potential savings of $500,000 to $660,000 per year.

Improved Response Time

With the capability of 24/7 remote monitoring and alerts, Exelon is getting real-time alerts and responses. Prior manual inspections were done once per hour. That meant response times could vary from 1-59 minutes, during which significant damage could be done. The mobile carts enable a near instantaneous response if/when fire, smoke, or temperature changes are detected, saving Exelon time and money.

Reliability

Exelon's employees and contractors are highly trained to inspect, monitor, and capture readings of critical systems. However, the potential for human error still exists. Backup and/or supplemental automated remote monitoring decreases the possibility of erroneous readings.

Flexibility

Exelon's platform is essentially plug and play, enabling modified configurations to monitor any interior or exterior systems.

Non-Invasive Systems

The remote carts do not require manual intervention or integration with existing systems. They can be plugged into the existing AC power system (120V) but can run independently for 36-48 hours before recharging is required.

Streamlined Processes
With automated detection and alerts, Exelon was able to simplify the alert and response process. Data is captured real-time from multiple sensors and systems; it is transmitted to a response center that can then dispatch a response team.

Historical Data Capture
In addition to real-time data, Exelon can now capture, access, and analyze historical data from all detection systems and sensors in any plant in one place – a reliable, immediately accessible audit trail for safety mandates and protocols.

Integrated Data
Exelon's innovative platform integrates multiple data points and sources (e.g., thermal, optical, temperature, vibration, pressure, etc.) from disparate systems. This provides a holistic view of all monitoring tools and enables employees to make educated decisions based on multiple data points instead of just one.

Predictive Maintenance
Integration of data from disparate systems gives Exelon informed insights into how equipment is performing historically and anticipate when maintenance or replacement might be required.

Data Security and Integrity
To eliminate security concerns with hard-wired devices, data is transmitted via a wireless communications infrastructure (LTE, 5G, or private wireless.) As wireless is non-intrusive into existing communications systems, the NRC has expressed no security or safety concerns.

Empowering a Brighter Future

Exelon and the Twin Eagle team designed a flexible, modular platform that can automate and improve a host of critical functions within multiple industries, including:

- Nuclear
- Electric Utilities
- Solar
- Wind
- Oil and Gas
- Hydroelectric
- Wastewater
- Mining
- Agriculture
- And more...

Interested?

Call or email us if you would like to what optical solution is right for you. The consultation is 100% free.

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