Use of Wireless Technologies for Plant Modernization

February 20, 2020

NUCLEAR ENERGY INSTITUTE

Overview

- Opportunities for implementation of wireless technologies
- Current and planned implementations
- Benefits and implementation considerations
- Next steps

Opportunities For Wireless in Nuclear

- **Wireless sensor technology advancements**
- **Cost savings by avoiding need to pull cables and conduit**
- **Diverse & redundant solution for some existing plant systems**
- **Improved data & information availability**
- **Ideal in locations where sensitive I&C devices are protected from RF emissions**
- **Allow for remote analysis of test results**

Exelon - Wireless Plant Applications

Current and Near Term Applications:

- Camera monitoring of in-plant equipment in hard to access areas
- Fire Watch Patrol Cart for in-plant hourly Fire Watch patrol
- Data collection for plant efficiency and equipment status analysis
- Electronic work packages

Exelon - Wireless Plant Applications cont'd

Cyber Security Analysis & Regulatory Certainty:

- Critical Digital Asset (CDA) Screening documentation and analysis demonstrate temporary devices are not CDAs and installed CDAs are not affected by the use of wireless.

Exelon – Wireless Plant Applications Cont'd

Future Applications

- Data Acquisition System (DAS) monitoring devices on/near safety related/important to safety (SR/ITS) for equipment health monitoring
- DAS monitoring devices on/near SR/ITS components for equipment performance data collection w/o local observation
- Use of DAS throughout the plant using Radio Frequencies (RF) through installed plant radio antenna system
- Dose rate monitoring, tracking and automated survey map updates

PSEG - Wireless Power Plant Applications

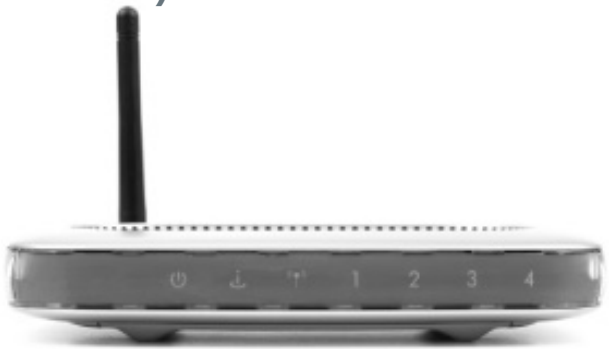
Nuclear Wireless Technology Use Cases

Nuclear Plant System	Wireless Measurement(s)	Application
Heat Exchangers	Temperature	Monitor ambient temperatures to account for seasonal weather changes
Secondary Side Valves	Position Indication	Replace labor intensive, periodic valve indication readings
Inlet Water Intake	Level, temperature flow	Monitor process changes that affect performance
Rotating Equipment	Temperature, vibration, motor current	Monitor temperature, vibration signatures and load fluctuations
Diesel Generators	Temperature, vibration, motor current	Augment existing sensor readings to provide redundancy & performance assessment
Spent Fuel Dry Cask Storage	Temperature, radiation levels	Eliminate the need for underground cable and conduit installation
Weather Stations	Temperature, wind velocity, pressure, humidity	Improve monitoring by replacing failure prone equipment

PSEG - Wireless Power Plant

Current applications

- Dosimetry
- Voice communications
- Equipment monitoring (e.g. reliability analysis)
- Cameras
- Meteorological instruments
- Heavy equipment operation (e.g. crane controls)



Future applications

- Mobile worker in the field with tablet PC
- Redundant/Diverse systems to improve existing plant equipment reliability

Benefits and Implementation Considerations

Benefits

- Cost-effective alternative to wired applications
- Easy to install
- Can be designed with built-in redundancy

Considerations

- Potential Electro Magnetic Induction/Radio Frequency Interference (EMI/RFI) impacts on I&C equipment
- Cyber security
- Network availability & data integrity
- Regulatory impacts

National Lab Engagement and Focus

The NEI Cyber Security Task Force and members of the industry have engaged the National Laboratories.

Laboratory Experience:

- Wireless technologies for nuclear applications
- Codes, standards, and regulatory guides
- Vulnerability assessments
- Security defense-in-depth analysis
- Practical experience and lessons learned

Next Steps

Industry

- NEI, industry, National Labs, and EPRI identify acceptable cyber security protections for current and future use cases
- Consider industry guidance to provide acceptable alternatives and limitations for use of wireless technologies on SR/ITS & Security CDAs
- Identify impacts to Cyber Security Plans (e.g., D.1.17 and Defensive Architecture)

Industry and NRC

- Address identified impacts to Cyber Security Plans
- Develop the criteria for demonstrating the use of wireless does not adversely impact the safety and security of the plant
- Conduct workshops to ensure consistent implementation strategies