LWRS
LIGHT WATER REACTOR SUSTAINABILITY

LWRS Program Research Pathway Fact Sheet

Plant Modernization Pathway

Plant Modernization Pathway Human Factors and I&C experts develop and deploy transformational technologies and applications, improving plant performance and reducing overall costs

Project summary and objectives:

The Light Water Reactor Sustainability (LWRS) Program has two objectives with respect to long-term operations: (1) to provide science-based solutions to the industry to implement technology to exceed the performance of the current labor-intensive business model; and (2) to manage the aging of plant systems, structures, and components (SSCs) so that nuclear power plant lifetimes can be extended and the plants can continue to operate safely, efficiently, and economically. The LWRS Program does this through three pathways: (1) Material Research; (2) Plant Modernization; and (3) Risk-Informed Systems Analysis. The objective of the Plant Modernization Pathway is to develop an approach that reduces technical, financial, and regulatory risks of upgrading aging instrumentation, information, and control (II&C) systems, while providing the technological foundations for a transformed nuclear power plant operating model that improves plant performance and addresses the challenges of the future business environment.

Accomplishments

1. Developed an advanced digital control systems design that significantly reduces operations & maintenance (O&M) costs

2. Deployed the Human Systems Simulation Laboratory (HSSL) – a full-scope, full-scale reconfigurable control room simulator that enables research in the design and evaluation of hybrid control rooms

3. Integrated risk-informed condition-based maintenance program with an improved predictive maintenance strategy

4. Designed and Advanced Outage Control Center to improve outage coordination, problem resolution, and outage risk management

5. Published guidance on deploying advanced mobile technologies for nuclear plant field workers, including computer based procedures, automated work packages, and real-time remote collaboration technologies.

6. Seamless data integration through wireless technologies that automate plant work activities

7. Advanced applications of radio frequency identification (RFID), and Bluetooth to replace labor intensive tasks

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Human factors researchers collect data in the HSSL full-scale and full-scope simulation facility.

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Current Work

1. Performing research with industry and nuclear utilities to enable automation and digital online monitoring to enhance safety and reduce costs

2. Advancing business process automation to streamline work packages generation and improve mobile worker efficiencies

3. Developing Digital I&C Qualification approach identifying new methods that would be beneficial in qualifying digital I&C systems for safety-related usage

4. Demonstrating a risk-informed maintenance approach that reduces maintenance costs

5. Creating enhanced outage data analytics to support improved outage performance and reduced outage durations

6. Research in advanced condition monitoring technology to address challenges the LWR fleet faces in transitioning to advanced instrumentation as well as new data analytics techniques.

7. Developing automatic measurement collection methods using advanced sensors and technologies to reduce preventive maintenance field activities.

8. Demonstrating full nuclear plant modernization, which will leverage plant information to improve plant performance at lower costs to operate

Summary

Plant Modernization research ensures proven solutions are available to nuclear utilities for wide-scale plant modernization. Digital I&C modernization, process automation, and enhanced worker efficiencies provide near-term cost reductions while enabling the operating nuclear plants to transition to a technology-based business model that will be operationally and financially sound for decades to come.