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United States Nuclear Regulatory Commission
Protecting People and the Environment

Modernization Efforts at the NRC and in the Industry

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Plant Modernization from an NRC Perspective

Nuclear Reactor Regulation

Light Water Reactor Sustainability (LWRS)

Sponsored by the U.S. Department of Energy (DOE) and coordinated through a variety of mechanisms and interactions with industry, vendors, suppliers, regulatory agencies, and other industry research and development (R&D) organizations, the LWRS program involves research to develop technologies and other solutions to improve economics and reliability, sustain safety, and extend the operation of the Nation's fleet of nuclear power plants.

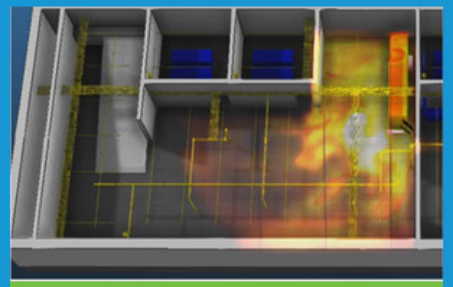
NRR Involvement in LWRS Plant Modernization Pathway

In addition to Office of Nuclear Regulatory Research efforts already underway, the Office of Nuclear Reactor Regulation (NRR) began communicating with the DOE and Idaho National Laboratory (INL) in early 2020 with an intent to better understand LWRS activities and determine their effects on the NRC's licensing and oversight of operating nuclear power plants. There is a robust, multidisciplinary team of NRC subject matter experts engaged with DOE at this time. The NRR staff frequently meet with and provide NRC inputs and feedback to INL on research conducted under the INL Plant Modernization Pathway.

LWRS Research Areas


Plant Modernization


Flexible Plant Operations & Generation


Risk-Informed Systems Analysis


Materials Research


Physical Security

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Applying the NRC Principles of Good Regulation to Cooperation with the DOE's LWRS Program

Independence
The NRC is not a formal active participant in the LWRS Plant Modernization Pathway. The NRC provides no funding, nor does it have any control over DOE or INL research.

Efficiency
The LWRS Plant Modernization Pathway has the potential to increase the NRC's inspection efficiency by leveraging innovative technology in the way the NRC interacts with licensees during inspections.

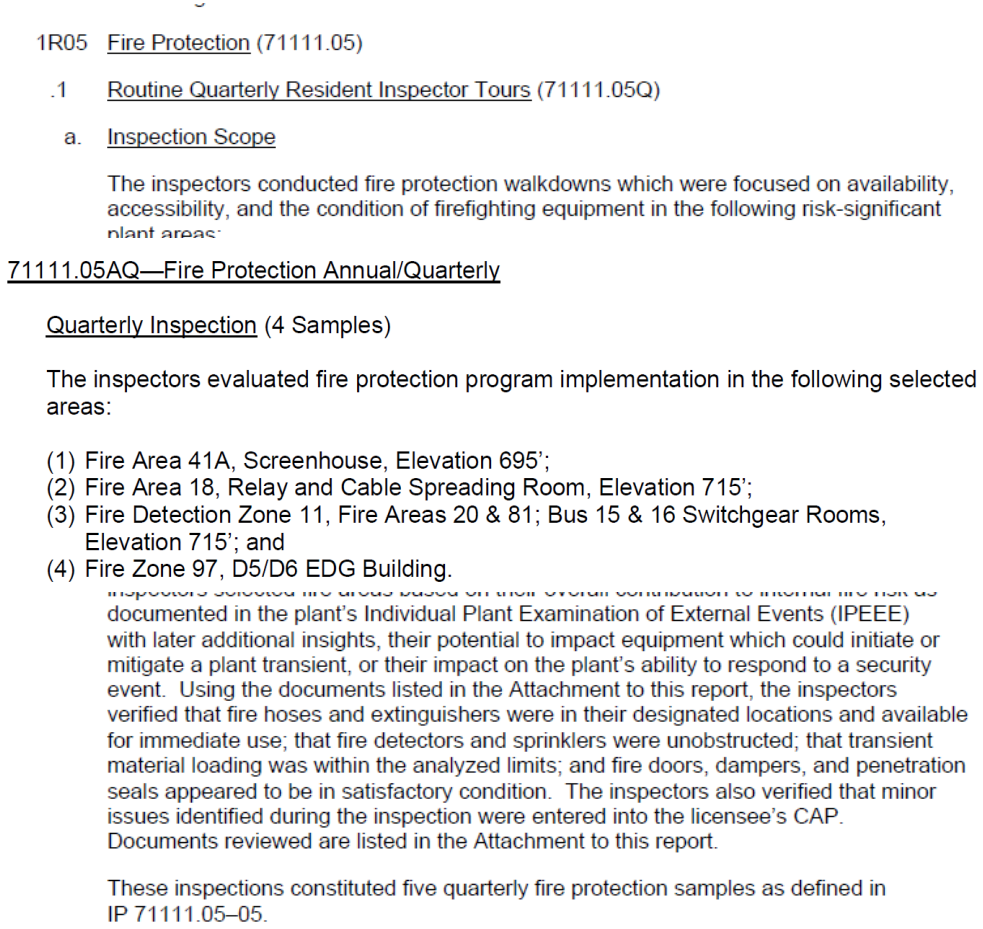
Reliability
The NRC will make no change to its oversight of LWRs without ensuring that it maintains its current standard to protect public health and safety.

Openness
The NRC is ensuring that stakeholders understand its involvement in LWRS through public meetings and events such as the RIC.

Clarity
The NRC hopes to communicate any potential concerns about plant modernization efforts in advance to ensure that stakeholders understand the regulator's position before implementation.

Recent Success: Automated Inspection Reports

- In 2017 and 2018 the NRC updated its inspection procedures, report format and inspection tracking application to allow for automatic report generation
- Reports are shorter, easier to read and quicker to generate



1R05 Fire Protection (71111.05)

.1 Routine Quarterly Resident Inspector Tours (71111.05Q)

a. Inspection Scope

The inspectors conducted fire protection walkdowns which were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

71111.05AQ—Fire Protection Annual/Quarterly

Quarterly Inspection (4 Samples)

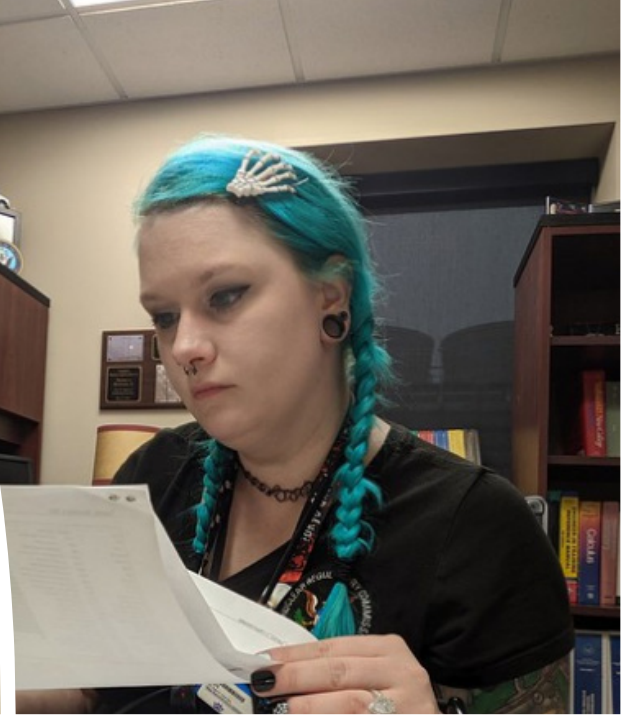
The inspectors evaluated fire protection program implementation in the following selected areas:

(1) Fire Area 41A, Screenhouse, Elevation 695';
(2) Fire Area 18, Relay and Cable Spreading Room, Elevation 715';
(3) Fire Detection Zone 11, Fire Areas 20 & 81; Bus 15 & 16 Switchgear Rooms, Elevation 715'; and
(4) Fire Zone 97, D5/D6 EDG Building.

documented in the plant's Individual Plant Examination of External Events (IPEEE) with later additional insights, their potential to impact equipment which could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the Attachment to this report, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's CAP. Documents reviewed are listed in the Attachment to this report.

These inspections constituted five quarterly fire protection samples as defined in IP 71111.05–05.

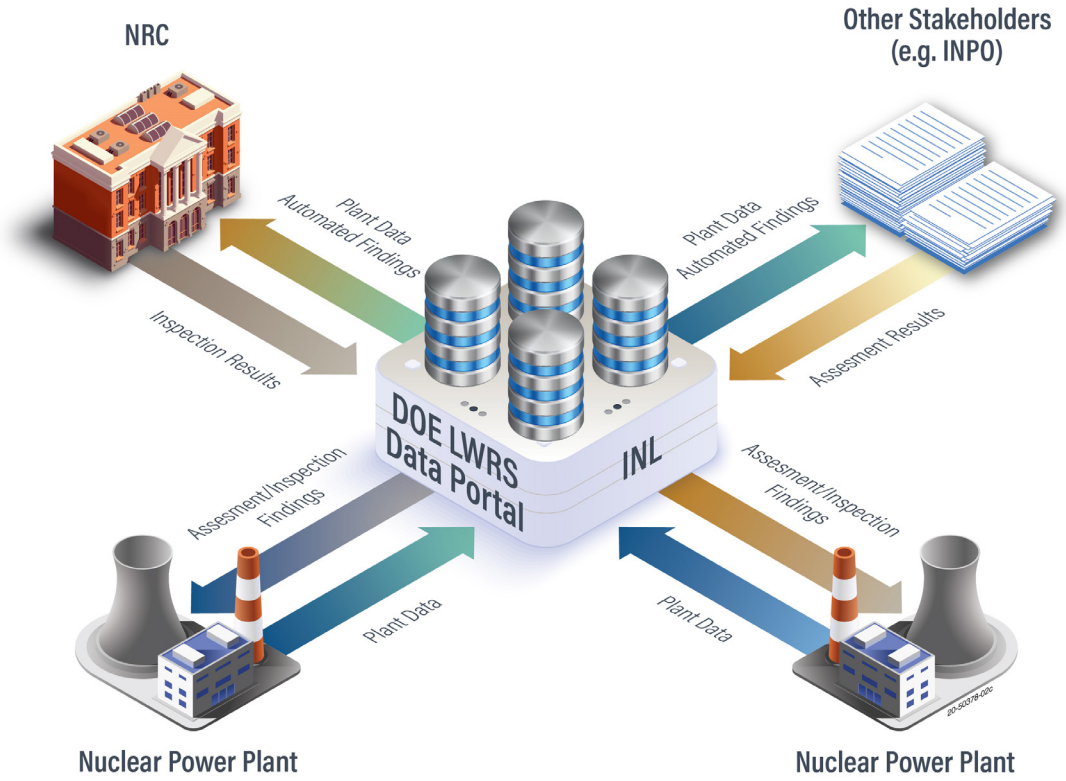
Problem Identification and Resolution Biennial Inspection Procedure (IP 71152)



- Current Inspection process
  - Site visit by team lead (bagman trip)
  - Long and complex request for documents
  - Preparation and mid week see numerous new information requests
  - Onsite weeks see a mix of in person interviews, walkdowns and more document requests
  - Usually the inspector requests are to the licensee support team via email and an application is used to track and answer data requests
  - Inspectors may use licensees' data bases, if they take the time to learn the interface, or the licensee teaches them

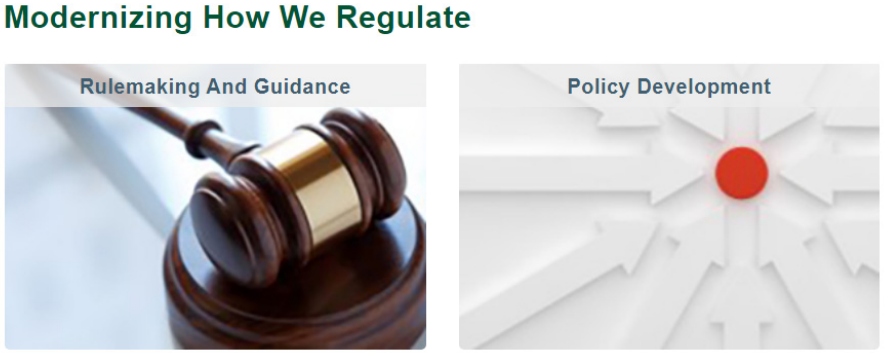
A vision for Future Inspection

- An AI enabled data portal with licensee corrective action databases automatically uploaded
- Inspectors can directly query the system for their data requests, and update them real time to adapt to changing inspection focus
- System provides automatic responses to queries without need for licensee assistance
- Single user interface that does not need to be relearned inspection to inspection
- Inspector and licensee staff can focus on issues rather than information flow



AI Use Cases at the NRC

- On October 30, 2023, Chair Hanson tasked the EDO with developing a broader list of NRC-specific AI use cases
- Deliverables included **develop** a list of recommended AI applications that would benefit the NRC the most, and include a **summary** of
  - Proposed effort
  - Potential benefits and drawbacks
  - Projected cost and savings
  - Timeframe for implementation
  - Consider proper AI usage, policy implications, and data privacy need to ensure responsible and sustainable AI implementation
- These recommendations are in SECY-24-0035, “Advancing use of Artificial Intelligence at the U.S. Nuclear Regulatory Commission,” the publicly available portions will be out in the next week.



Discussion

LWRS Plant Modernization Pathway

Plant Modernization Pathway

The Plant Modernization Pathway conducts targeted R&D to address aging and reliability concerns with the legacy instrumentation and control (I&C) and related information systems of the U.S. operating light-water reactor (LWR) fleet. The objective of these efforts is to develop, demonstrate, and support deployment of new digital I&C technologies for nuclear process control; enhance worker performance; and provide enhanced monitoring capabilities to ensure the continued safe, reliable, and economic operation of the Nation's nuclear power plants.