

LWRS Status Highlights

Program Mission

The Light Water Reactor Sustainability (LWRS) is a Department of Energy (DOE) program conducting research to develop technologies and other solutions to improve the economics and reliability, sustain the safety, and extend the operation of our nation's fleet of nuclear power plants (NPP). The NRC and the DOE has a [Memorandum of Understanding](#) (MOU) on Nuclear Innovation that allow the entities to share expertise and knowledge on advanced nuclear reactor technologies and nuclear energy innovation which extend to the area of light water reactor long-term operation and proposed modification for light water reactor sustainability

Plant Modernization Pathway

Main Goal: enable plant efficiency improvements through a strategy for long-term modernization

Pathway Multi-Year Outcomes:

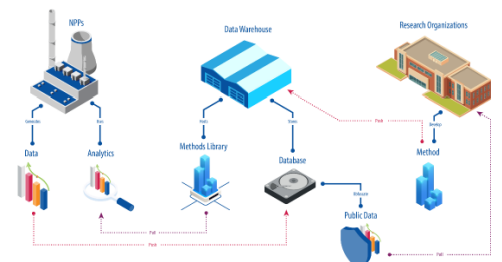
Data Architecture

- ⇒ Demonstrate the effectiveness of digitalization and information automation (2024)
- ⇒ Deploy the equipment condition monitoring platform framework (2024)
- ⇒ Demonstrate explainable predictive maintenance technology (2024)
- ⇒ Assist a utility in the implementation of Data and AI Lifecycle Management (2024)

Latest Report :

[A Novel Data Obfuscation Method to Share Nuclear Data for Machine Learning Application](#)

– In this effort, deceptive infusion of data (DIOD) is applied and demonstrated using two use cases for regression. One use case targeted a physics-based model generated from a simple, noise-free point-kinetics (PK) model with one delayed neutron group; the second targeted a process that resembles an actual nuclear power plant process.



Data obfuscation example

Materials Research Pathway

Main Goal: understand and predict long-term behavior of materials in nuclear power plants

Materials Research Planned Multi-Year Outcomes:

Core Internal and Pressure Boundary

- ⇒ Complete long-term thermal aging on Alloy 690 and its weldment (FY23)
- ⇒ Complete feasibility study for replacing LiOH with KOH (FY23)
- ⇒ Complete long-term stress corrosion cracking (SCC) initiation testing of alloy 690 (FY25)
- ⇒ Complete long-term SCC initiation testing on blunt notch high CrNi-based weld metals (FY25)

Latest Report:

Frequency Domain Reflectometry (FDR) Simulation Techniques for Digital Twin Representation of an Electrical Cable – This report summarizes the development of an electrical cable digital twin. The influence of test simulation parameters and the relative influence of cable anomalies, including thermal aging, water or moisture exposure, water or moisture ingress, and other anomalies were investigated.

Risk Informed System Analysis (RISA) Pathway

Main Goal: develop safety analysis methods and tools to optimize the safety, reliability, and economics of nuclear power plants

RISA Planned Multi-Year Outcomes:

Power Upgrades

- ⇒ Market and business case analysis to evaluate benefits (FY24)
- ⇒ Technical evaluations of plant systems (FY25)
- ⇒ Risk assessments to support approval of power upgrades (FY25)

Optimization of Outage Activities

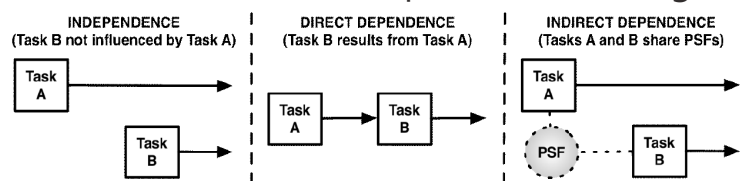
- ⇒ Development of tools and methods to optimize plant outage activities via improved outage planning and execution (FY24)

Latest Report:

Solutions for Enhanced Legacy Probabilistic Risk Assessment Tools and Methodologies – This report focuses on the potential to improve model

efficiencies, including quantification speed, via enhanced techniques for modeling human-action dependency analyses.

In addition, this report explores opportunities to improve the underlying theoretical bases of a dependency analysis by investigating prospects for empirical data collection.



Task dependence diagrams

Physical Security Pathway

Main Goal: develop technologies and technical bases to optimize physical security

[EMERALD MASS-DEF Workshop](#)

On May 18, 2023 researchers from INL will be offering at the agency a hybrid workshop on the Modeling and Analysis for Safety and Security using Dynamic EMERALD Framework (MASS-DEF). This is a method for statistically evaluating a change in defense strategy, particularly for operator actions or standby equipment either during or after an attack. (Link below and event flyer on the title)

Date: *May 18th, 2023*

Time: *1:00-4:00 PM (EST)*

[MS Teams](#)

Flexible Plant Operation & Generation (FPOG) Pathway

Main Goal: enable diversification and increase revenue of light water reactors to produce non-electrical products

No updates or reports from the FPOG pathway for this issue.

LWRS May Calendar

RISA Monthly Call

- ["Human Reliability Analysis \(HRA\) Dependency– data collection study"](#),
[May 2, 2023 1:00-2:00 pm](#)*
- ["Feasibility Study– Sizable Power Upgrades"](#)– [May 16th, 2023 1:00-2:00pm](#)*

LWRS Spring Program Meeting Slides

- [Day 1](#)– [April 26th, 2023](#)
- [Day 2](#)– [April 27th, 2023](#)

[Past Issues](#)