

# LWRS Status Highlights

## Program Mission

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

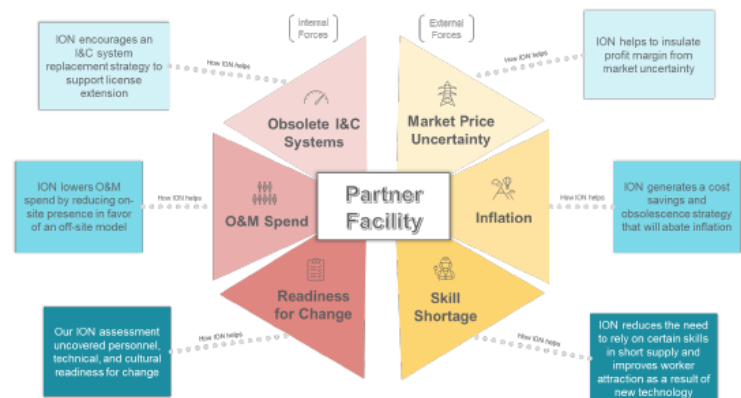
### **Latest Report :**

### **Applying the ION Business Model to a Domestic Nuclear Plant: Assessment and Transformation Implementation Plan-**

This report describes the implementation of a Integrated Operations for Nuclear (ION) process. Previous reports

detailed work-reduction opportunities and their potential impact on savings in operations and maintenance (O&M) cost reductions to domestic nuclear plants.

Advancing the concept once again, researchers have developed and now tested a methodology for assessing a nuclear plant and developing a roadmap for implementation of ION. This report describes that process, which was completed with a domestic nuclear site partner.



**Internal and external forces acting on the facility and ways ION alleviates those forces**

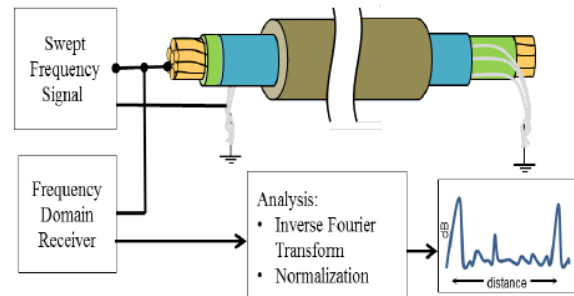
## Materials Research Pathway

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

### **Latest Report:**

### **Extended Bandwidth Spread Spectrum Time Domain Reflectometry Cable Test for Thermal Aging, Low Resistance Fault, and Water Detection-**

This report presents an evaluation of a Pacific Northwest National Laboratory (PNNL) developed spread spectrum time domain reflectometry (SSTDR) capability that could extend the SSTDR bandwidth to higher frequencies using software-controlled laboratory instruments. The software adjustable PNNL-SSTDR produced similar cable anomaly detection at the lower bandwidths available to the commercial LiveWire SSTDR. Responses to cable shorts and low impedance faults between phases were particularly evident at the higher bandwidths available to the frequency domain reflectometry (FDR) and the PNNL-SSTDR.



**FDR cable test**

## 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

### **Latest Report:**

**Methods and Feature Enhancements for Industry Use of EMERALD-**Event Modeling Risk Assessment using Linked Diagrams (EMERALD) is a dynamic probabilistic risk assessment (PRA) tool developed by the Idaho National Laboratory (INL). It is an open-source tool that has been used for many research projects along with more recent academic and industry projects. To expand for more industry use and analysis, a strong validation framework and test cases needed to be developed. Also, additional features needed to be added to enable some scenarios and ease of use. This report goes over the initial validation framework setup and testcase as well as the software modification from this project. Initially, this project was going to include implementing methods for coupling with classical PRA tools. However, earlier research concluded that coupling methods would only be mathematically valid for limited scenarios, so work was pivoted to other areas of improving industry use.

## Physical Security Pathway

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

**Latest Report:**

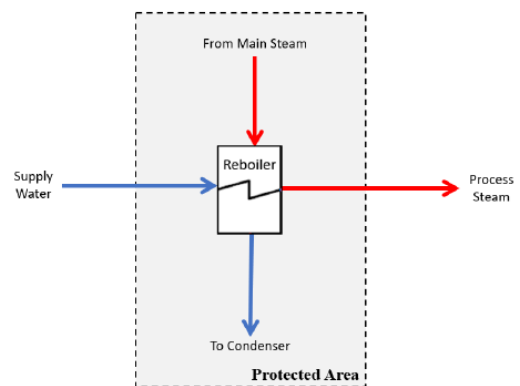
No report for this issue

## Flexible Plant Operation & Generation (FPOG) Pathway

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

**Latest Report:**

**Heat Balance Model Analysis and Equipment Assessment for 30% Thermal Extraction from a Nuclear Power Plant** - This report assesses the impacts of high levels of thermal extraction on a generic nuclear plant design to determine feasible extraction limits. The utilization of nuclear plant steam for direct thermal applications includes hydrogen generation, district heating, thermal storage, and industrial processes. Steam utilization can help increase nuclear plant efficiencies and economics while providing a low-carbon solution for thermal power users.



Supply and return locations of nuclear steam/condensate

## LWRS March Calendar



### Monthly Calls

- RISA Call “Data Fusion of Numerical and Textual Equipment Reliability Data: A Knowledge-Graph-Based Approach” – **March 5, 2024**—1:00 -2:00 PM
- FPOG Call– “ Deep Dive on Hydrogen Explosions, Fires and Steam Rupture Risks” -**March 11, 2024** 10:00-12:00 AM
- Physical Security Call - **March 20,2024**—2:00-3:00 PM
- Materials Call– **March 21,2024**– 3:00-4:00 PM

[Past Issues](#)

### Management Briefing and Technical Sessions Presentations