

# LWRS Status Highlights

The mission of the Light Water Reactor Sustainability (LWRS) Program is to develop the scientific basis, science-based methodologies, and tools for the safe economical long-term operation of the nation's high-performing fleet of commercial nuclear energy facilities

## NRC Role on LWRS Program

The agency and the Department of Energy (DOE) has a Memorandum of Understanding (MOU) on Nuclear Innovation that allow the entities to share technical expertise and knowledge on advanced nuclear reactor technologies and nuclear energy innovation. This initiative includes aging managing research activities, risk analysis research activities, and licensing and regulatory reviews of emerging technologies to prioritize regulatory needs.

## Plant Modernization

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

### Research Areas:

#### Digital Infrastructure:

**Latest Report:** *Digital Infrastructure Migration Framework*

**Recap:** Full-scope of a Digital Infrastructure implementation and associated lifecycle support recommendations that enable a plant life of 80+ years . Report [here](#)

Link to Plant Modernization Summer Stakeholder Meeting Presentations



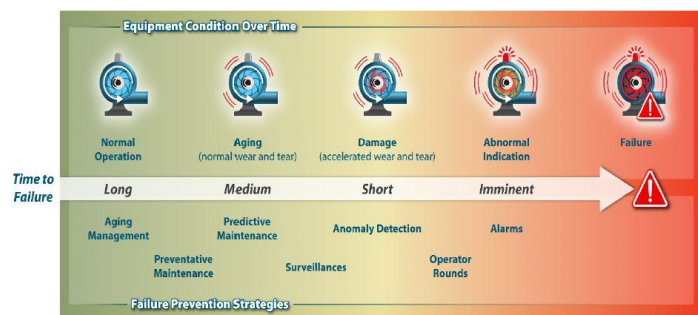
#### Data Architecture:

#### Advanced Remote Monitoring for Operation Readiness (ARMOR)

**Main Objectives:** develop technologies to log process data and technologies to analyze the process and determine needed actions

**Currently:** developing methods to determine the cause of anomalies to enable operators to rapidly evaluate the anomalies and take actions

**Next Phase:** enable anomaly detections methods to isolate real anomalies from normal plant transients



Schematic representation of equipment failure timeline and failure prevention strategies. (ARMOR)

# Plant Modernization (cont.)

## Human & Technology Integration:

### Full Nuclear Plant Modernization

**Goal:** provide guidance that allows utilities to operate safely and cost competitively with all other electrical generation sources.

**Next Phase:** Map out data evolution in a use case to identify inefficiencies in plant compliance information gathering and communication activities. Develop a method to optimize information automation based on the System-Theoretic Process Analysis (STPA) methodology.

## Integrated Operation for Nuclear (ION):

No updates for this month

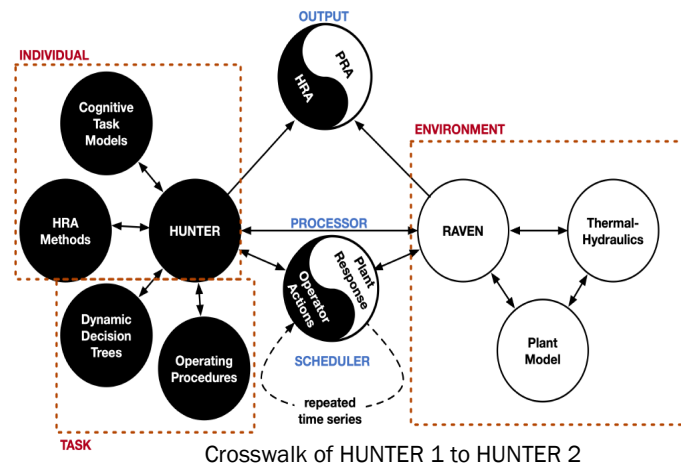
## Risk Informed System Analysis (RISA)

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

### Research Areas:

*Dynamic Human Reliability Analysis (HRA):*

**An Adaptable Software Toolkit for Dynamic Human Reliability Analysis: Progress Toward Hunter 2-** This report documents an updated conceptual framework, called HUNTER 2, that stresses the flexibility, modularity, and scalability of the software tool to allow adaptability to a wide range of dynamic human risk modeling scenarios. Report [here](#).

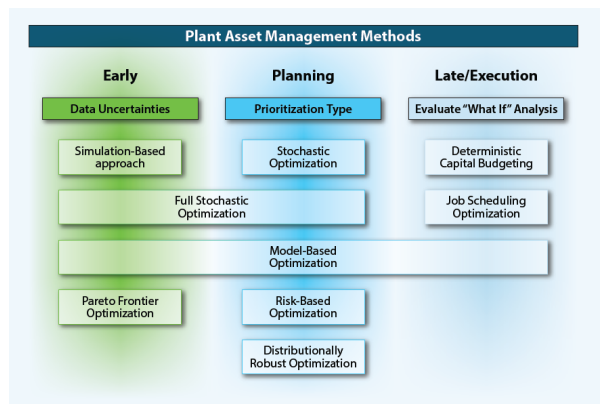


## Risk-Aligned Data-Driven Inspections and Compliance Activities:

Not update for this month

## Risk-Informed Asset management

**Development of Risk-Informed Asset Management Toolkit-**This research is developing and demonstrating methods to optimize plant operations and maintenance activities and decisions to achieve cost savings while satisfying safety and performance requirements, such as availability and reliability.



Overview of the developed optimization methods

# Physical Security

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

## Research Areas

### *Advanced Security Technologies Safety*

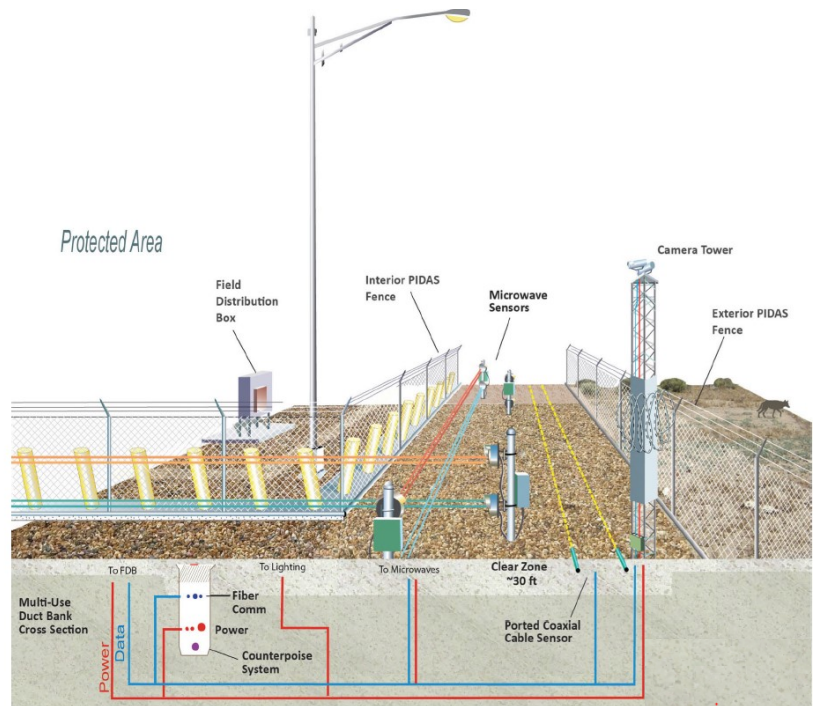
- Perimeter intrusion detection and assessment system (PIDAS)- assist the LWR fleet in addressing challenges in optimizing their physical security

### *Risk-Informed Physical Security*

- No updates for this month

### *Advanced Security Sensors and Barrier Systems*

- No updates for this month



Current PIDAS technologies at NPPs

## Materials

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

### Research Areas:

*Metals*- Assessment of the long term aging effects on performance in Alloy 690 and associated weldments. Report [here](#).

*Concrete*- No updates for this month

*Cables*- Assessment of the capability of frequency domain reflectometry to determine electrical cable submergence using an Accelerated and Real-Time Environmental Nodal Assessment (ARENA) cable/motor test bed. Report [here](#).

## Flexible Plant Operation and Generation (FPOG)

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

**Updates:** Based on the latest meeting within the industry and the agency

- Industry is leaning toward high temperature electrolysis (HTE) approach instead of the low-temperature electrolysis (LTE).
- Working on a 50.59 report.