

# LWRS Status Highlights

The mission of the Light Water Reactor Sustainability Program (LWRS) 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

## Plant Modernization

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

### Research Areas:

#### *Digital Infrastructure:*

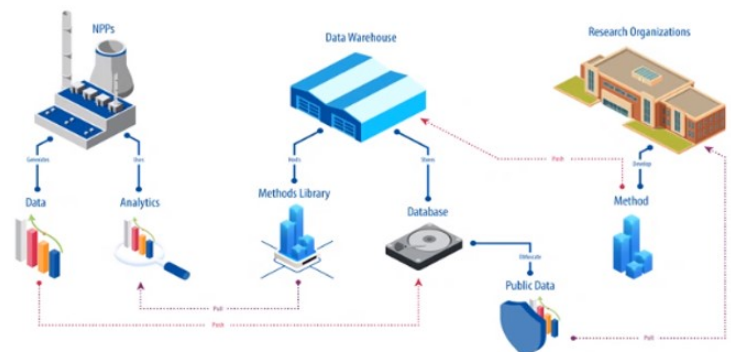
*Currently:* developing scope and implementation plan for deploying the Digital Infrastructure.

*Next Phase:* Demonstrate a full-scale business case analysis for implementing a comprehensive digital infrastructure upgrade.

#### *Data Architecture:*

*Currently:* developing a data portal for inspections, piloting the portal on PI&R inspection, and equipping the data portal with automated means of data analysis to verify compliance

*Next Phase:* Connection of data portal to collaborating nuclear power utilities and expansion of its scope and capabilities



Data Architecture for an Automated Plant

#### *Human & Technology Integration:*

*Currently:* demonstrating the early guidance developed to support developing a new vision and adoption of advanced automation and technology; collaborating with Constellation's Limerick digital safety-related upgrades in performing function and task analysis; collaborating with Southern to inform the development of Farley's new concept of operation and vision

*Next Phase:* full-scale pilot

#### *Integrated Operation for Nuclear:*

*Currently:* evaluating the innovation necessary to deliver a technology-centric and highly automated business model; benchmarking five areas with industry (Digital I&C Updates, Condition Based Maintenance, Remote Plant Support, and Automated Troubleshooting, Digital Training Transformation, and Automated Planning & Scheduling) More details [here](#).

*Next Phase:* broad scope analysis of additional work reduction opportunities, demonstrating the effectiveness of ION guided plant modernization

# Materials

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

## Research Areas:

*Reactor Pressure Vessel*– No updates for this newsletter

*Concrete* : Development of an advanced image reconstruction technique for concrete surface and subsurface has been completed. More details [here](#).

*Cable Aging Degradation*– The cables radiation accident dose section has been completed. In the other section of the report, the LOCA test is still ongoing. The final report will be issued by November 2022.

## 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):*

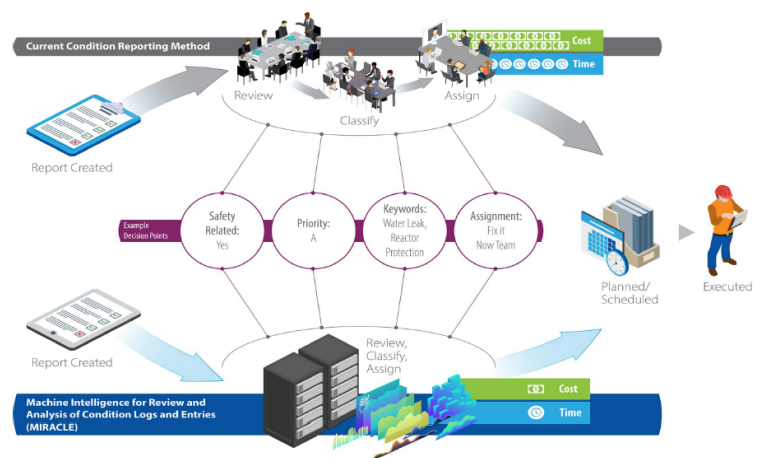
•HUNTER: (Human Unimodel for Nuclear Technology to Enhance Reliability): A software tool built on plant operations procedures that will auto-calculate performance shaping factors during different scenarios, [report](#) has been released.

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

This effort has an objective to make licensee's internal assessments and external inspections more efficient by providing valuable insights into plant performance. The program will leverage information from Corrective Action Programs data to identify relevant performance trends. This program has been completed

## Risk-Informed Asset management

The RISA team has developed an approach to employ artificial intelligence technologies to analyze plant records and extract quantitative information to support the modernized approach to equipment maintenance. The LWRs-developed tool enables the utilization of plant performance records to support data analyses targeting improved equipment maintenance. The program has been released.



Risk-Aligned Data Driven Process Diagram

# Physical Security

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

## Research Areas

### *Advanced Security Technologies Safety*

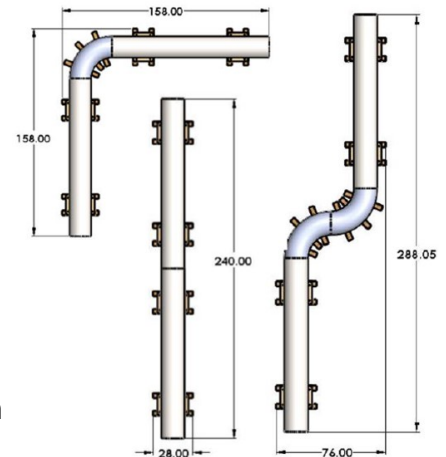
- Remote Operated Weapons System (ROWS)- conducted preliminary Sentry-II ROWS modeling with collaboration of utilities.

### *Risk-Informed Physical Security*

- Dynamic Risk-Informed Framework– discussion series for developing a risk-informed security methodology with a pilot unity has been completed
- Performance Based Data Collection Methodology

### *Advanced Security Sensors and Barrier Systems*

- Deliberate Motion Analytics (DMA)- the first pilot study has been completed (collaboration with American Electric Power and Energy)
- Water Intakes—no updates for this newsletter
- Unattended Openings (UAOS)- testing and draft report have been completed.
- Vital Area Doors—no updates for this newsletter



Unattended openings illustration

## Flexible Plant Operation and Generation (FPOG)

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

## Research Areas:

### *Safety Assessments*

- HERON 2.0 –The software has been validated and a [report](#) released to the public

### *Thermal-Energy Dispatch*

- PWR-hydrogen plant simulator [report](#) has been completed.

### *Design and Economics*

- Technical and Economics Assessment for hydrogen and synfuels production has been completed.

## Upcoming Events

RISA Project Status Update- [A risk-informed approach for the regulatory-required fuel reload safety analyses](#)—September 6, 2022 1:00-2:00

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