



**Craig Primer**

Plant Modernization Pathway Lead

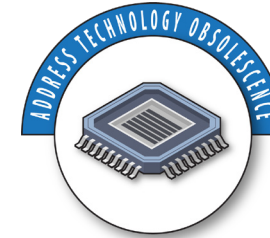
# LWRS Plant Modernization Overview

2024 LWRS Program Spring Review Meeting

April 30, 2024



# Research Objectives and Goals



Significantly reduce risk of modernization by:

- **Developing technology modernization solutions** that address aging and obsolescence challenges
- **Delivering a sustainable business model** that ensures continued safe, reliable operation at a cost competitive level



**Long Term Management  
Of Plant Systems**

License Extension  
60, 80, or 100 years



**Nuclear Cost  
Competitiveness**

Cost pressures from other  
generation sources



**Worker Attraction  
and Retention**

Worker interest in new  
technology

# ION

## Leveraging Technology Innovation and Advanced Business Process Automation to Sustain the Nuclear Fleet



### Adopting Proven Transformation Methods

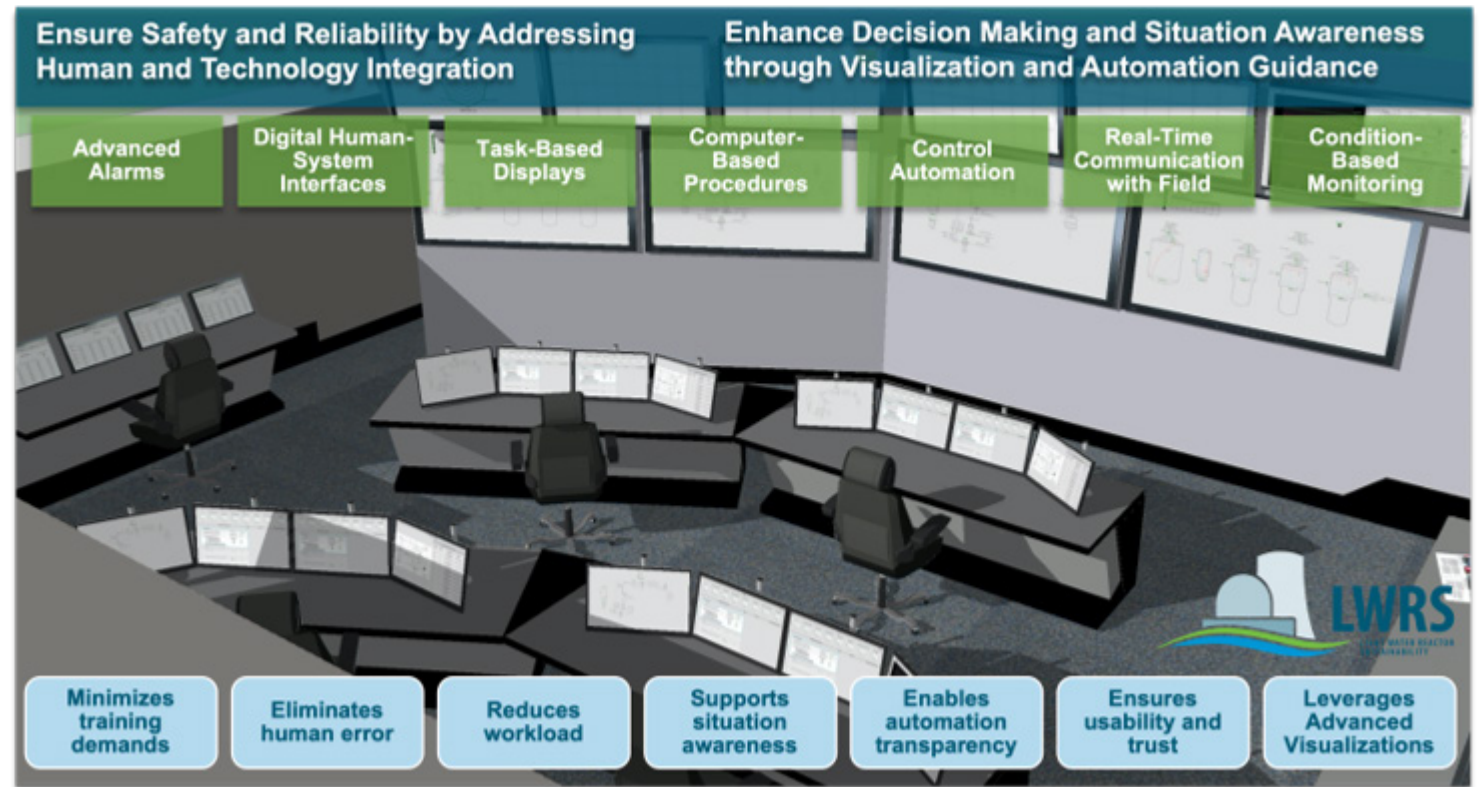
- Integrated Operations Methods from the North Sea Oil Production Drive Cost Competitiveness
- Provides Improved Operational Readiness with a projection of one third reduction in cost through a top-down strategic innovation process
- Lessons Learned from Application Research at Xcel Energy, Comanche Peak, and South Texas Project

LWRS researchers partner with South Texas Project Nuclear Operating Company to pilot the implementation of the Integrated Operations for Nuclear (ION)

# Human & Technology Integration

Provides an assessment methodology to enable nuclear industry to adopt advanced digital capabilities (control system automation, artificial intelligence, machine learning, and modern HSIs)

LWRS Researchers are assisting industry safely and efficiently deploy large-scale digital modifications.



Integration of

- Data Architectures & Analytics Applications
- Digital Infrastructure
- Integrated Operation for Nuclear Capabilities

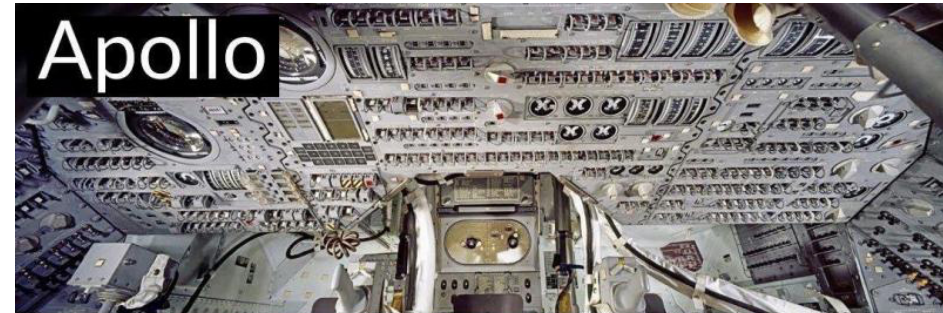
With the human's responsible for the safe and reliable plant operations

# Digital Infrastructure

Provides an optimized, plantwide Digital Infrastructure modernization framework to host digital transformation

## The Digital Infrastructure strategy and pilots provide industry with:

- Transition of current safety-related I&C functions to one digital, safety-related platform
- Transition of the current non-safety/balance-of-plant I&C functions to one digital, non-safety-related platform, and
- Integrate I&C digital platforms into one larger Digital Infrastructure
- Implementation of a new-state digital Main Control Room and other Operations Centers

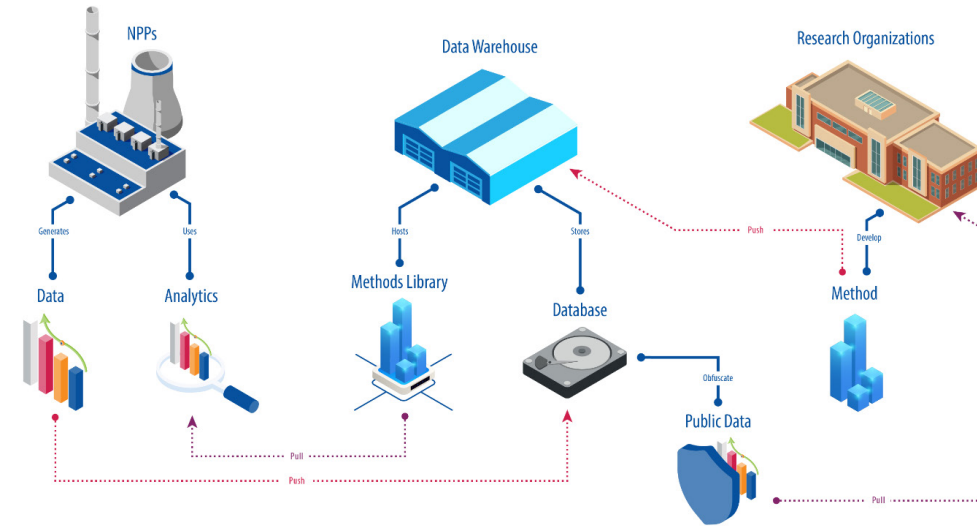


Advancing comprehensive digital architecture implementation with collaborating utilities

# Data Architecture & Analytics

Eliminating unnecessary O&M costs by automating and optimizing critical support activities

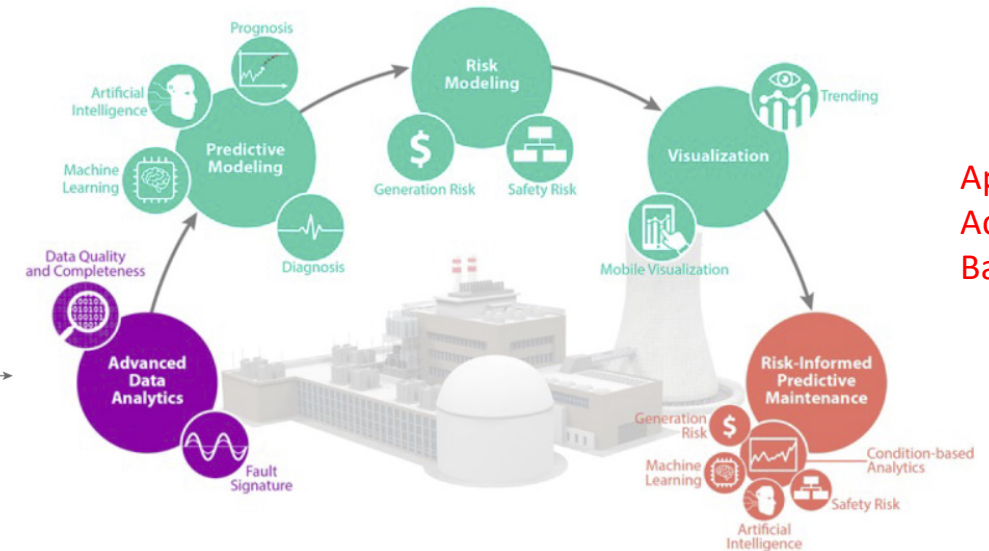
A successful demonstration was performed of a digital platform to deal with nuclear power plant data and manage compliance activities more efficiently.



Data Management

Data Analytics

Data Collection



Appropriate Action Taken Based on Data

Development of an artificial intelligence (AI)-based predictive maintenance strategy for improving trust between operator and AI technologies for decision-making

# High-level impactful 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 (2025)

## ION:

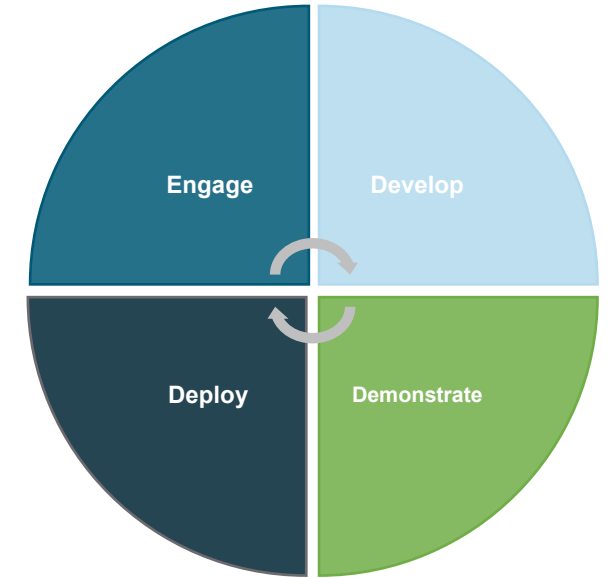
- Demonstrate with collaborating utilities deploying key enabling applications of the ION Business model (2024)
- Demonstrate an integrated ION upgrade process with cost savings documented (2025)
- Developed a novel Technical, Economic and Risk Adoption (TERA) framework evaluate work reduction opportunities (WROs) in nuclear power plants. (2024)

## DIGITAL INFRASTRUCTURE:

- Continue Digital Infrastructure upgrades collaboration and share lessons learned with the nuclear industry (2024)
- Collaborate with participating utilities to develop a best practice strategy for maintaining and upgrading LWR Digital Infrastructure (2025)
- Assist a utility in the implementation of an integrated digital infrastructure strategy (2025)

## HUMAN & TECHNOLOGY INTEGRATION:

- Develop HTI guidance that optimizes work and supports effective use of information (2024)
- Demonstrate the work optimization HTI framework with an industry collaborator (2025)





# Sustaining National Nuclear Assets

*[lwrs.inl.gov](http://lwrs.inl.gov)*