

LWRS Status Highlights

Program Mission

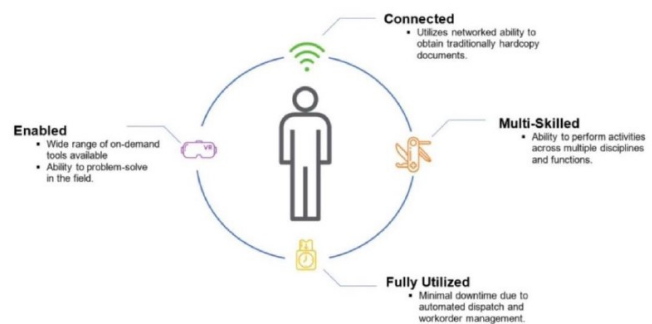
Light Water Reactor Sustainability (LWRS) is a Department of Energy (DOE) program conducting research to develop technologies and other solutions to improve the economics and reliability, sustain the safety, and extend the operation of our nation's fleet of nuclear power plants (NPP). The NRC and the 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 :

Human and Technology Integration Evaluation of Advanced Automation and Data Visualization- This technical report describes the demonstration of the human and technology integration methodology in performing full-scale performance-based human-in-the-loop tests to evaluate plant-specific advanced automation and data visualization applications within these collaborators' digital modifications. This technical report also documents future applications of human and technology integration that expand beyond main control room modernization and digital I&C upgrades, which have been a central focus to date. Thus, this technical report discusses how to implement human and technology integration across new business opportunities, how to develop an evaluation plan that defines measures and criteria, and documents key assumptions to support full plant modernization.



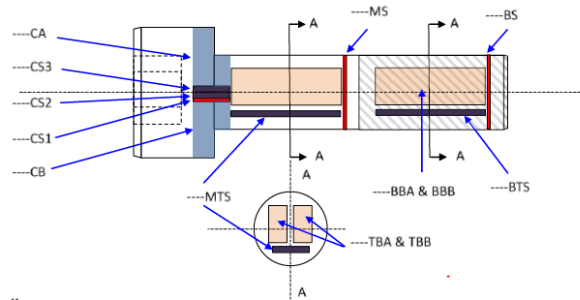
Characteristics of the worker from the future

Materials Research Pathway

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

Latest Report:

Microstructure and In-Service Degradation of Baffle-Former Bolts-In-Core Components of Light Water Reactors- This report presents a microstructure evaluation of the baffle former bolt, a commercial pressurized water reactor component. Using scanning electron microscopy (SEM), energy-dispersive x-ray spectroscopy (EDS), and electron backscatter diffraction (EBSD), analysis of the material was identified as American Iron and Steel Institute (AISI) 316 steel with an annealed austenite microstructure. Findings include abnormal grain growth in a fraction of the grains and the absence of retained ferrite. Notable observations include pre- and post-irradiation deformation overlap, including defect-free channel formation as an active deformation mechanism in the near-surface layer of baffle-former bolts (BFBs).



Bolt cutting scheme and IDs for cut objects

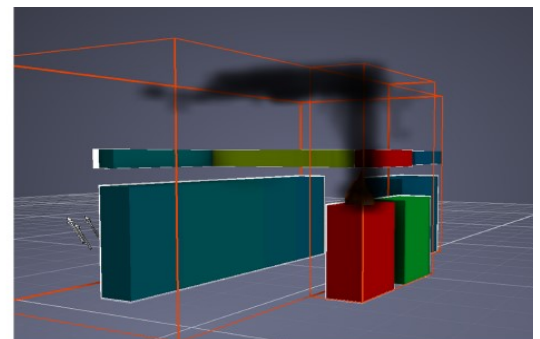
Risk Informed System Analysis (RISA) Pathway

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

Latest Report:

FRI3D Industry Adoption and Verification Tasks-

This report outlines several updates and additions that were made to help meet industry needs before it can be fully transferred to an industry partner for commercial use. Examples include software verification features and a library of commercially used fire sources. This report also goes over work for industry adoption, including an analysis pilot study done for a nuclear power plant modification. This pilot study showed a time comparison between using FRI3D and current methods used by fire analysis experts and an evaluation from the experts on the potential for use by industry.



Smoke visualization in FRI3D from fire dynamics simulation (FDS) results

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

Latest Report:

Evaluation of the Technical Feasibility, Plant Physical Modification, and Digital Controls Modifications required for 50% and 70% Thermal Energy Extraction from Pressurized Water Reactor- This report presents a

plant system integration feasibility assessment performed to establish constraints and limitations to establish a target for thermal energy that can reasonably be extracted from the secondary system of a generic pressurized water reactor (PWR) without major secondary system redesign and modification, and without impact to the primary function of the electric generator. This evaluation estimates the system operating conditions to assess the performance of the secondary systems, structures, and components when the plant is configured to divert a portion of the main steam from the turbine to the integrated energy system supply. The system has been modeled and the system thermodynamic conditions estimated for thermal power dispatch (TPD) of 30%, 50%, and 70% of the rated system thermal design.

LWRS July Calendar



Monthly Calls (*link on the dates*)

- **RISA Call-**
July 9, 2024- "EMERALD upgrade– new website, features and validations cases" - **1:00-2:00 PM**
- **Physical Security Technical Exchange-**
July 17, 2024- "Deliberate Motion Analytics Discussion" **8:00AM-noon**
- **FPOG Call-**
July 29, 2024- "Radiation detection equipment on steam lines supporting hydrogen electrolysis "- **10:00-11:00 AM**
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[Past Issues](#)