Regulatory Research

Enabling Regulatory Readiness

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International Experimental Research

Studsvik Cladding Integrity Project –IV

OECD/NEA Program

Generating data and insights on HBU fuels during LOCA, storage and transportation

2019-2024

Framework for Irradiation Experiments

OECD/NEA Program

Various joint experiment programs for aggregating data on cladding creep behavior and transient behavior, including for ATF

2021-2024

SPARE

Studsvik Joint Project

Saves high-value irradiated fuel materials from final waste disposal for potential new research through transports

2020-2025

2021-2023

Halden Reactor Project

OECD/NEA Program

Opportunities for new insights on key fuel performance topics from old data

2021-2024

QUENCH-ATF

OECD/NEA Program

Experiments for ATF cladding materials in the QUENCH facility at Karlsruhe Institute of Technology (KIT) – Near term chromium-coated cladding under design basis accident (DBA) and beyond DBA

FFRD Research

Research Information Letter (RIL 2021-013)

- Provides NRC technical reviewers with timely interpretations of over 10 years of research on a complex technical issue important to high burnup fuel safety ML21313A145

Source Term (RG 1.183, Rev 1)

- "Applicability of Source Term for Accident Tolerant Fuel, High Burn Up and Extended Enrichment," dated May 13, 2020 ML20126G376
- "Letter Report on Evaluation of the Impact of Fuel Fragmentation, Relocation, and Dispersal for the Radiological Design Basis Accidents in Regulatory Guide 1.183" ML21197A067

Full-Core LOCA Analysis

- Method to estimate mass loss from FFRD during large break loss of coolant accident (LBLOCA) using NRC tools (Polaris/PARCS – TRACE – FAST)

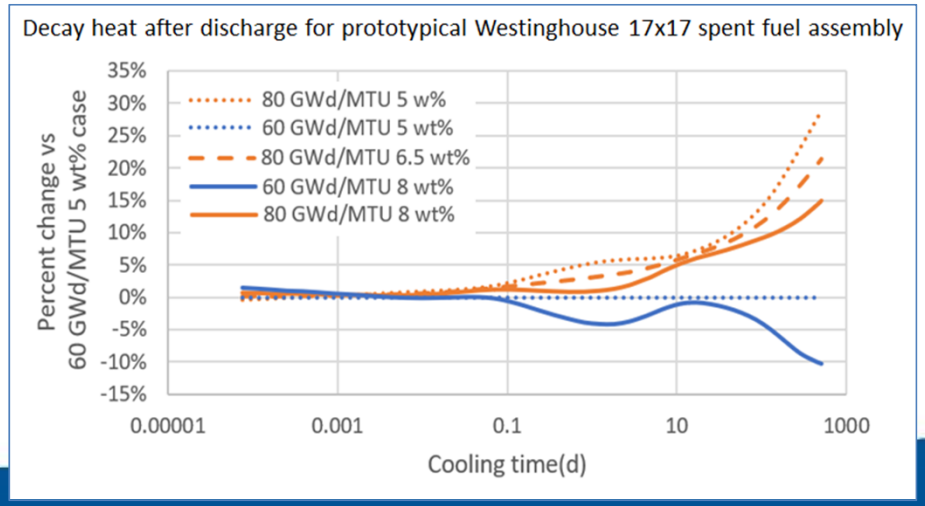
Fuel Enrichment and Neutronics Research

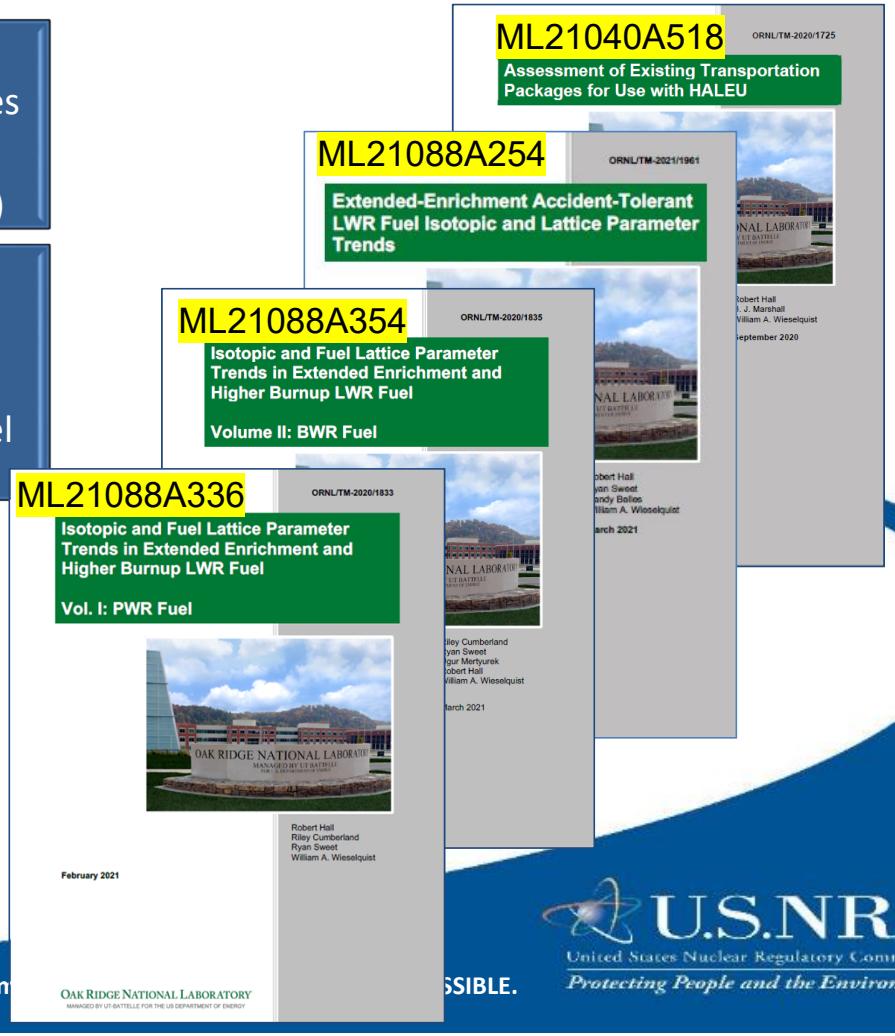
Assessments on Fresh Fuel Criticality

- ATF & Enrichment Impacts to Existing Transportation Packages (ML21040A518)
- ATF & Enrichment Impacts to Fresh Fuel Staging (FY22 Spring)

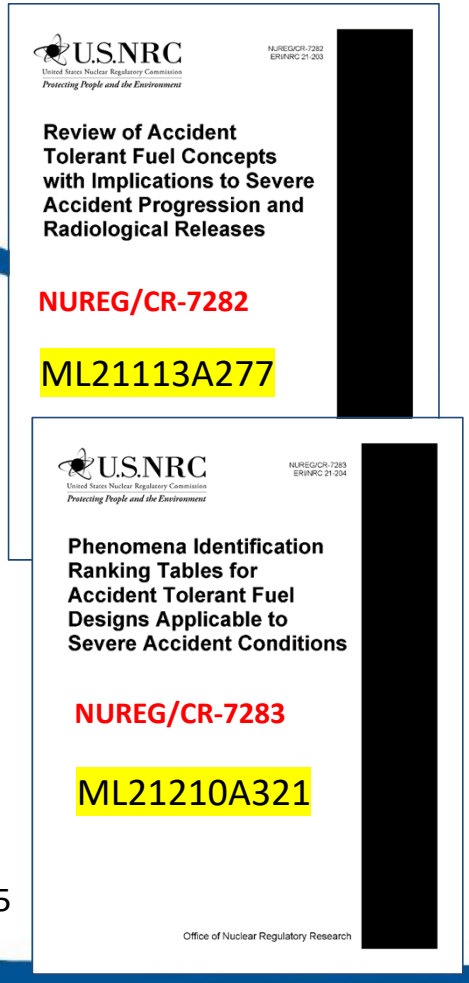
Assessments on In-Reactor & Spent Nuclear Fuel

- ATF, Enrichment, and HBU Impacts to Decay Heat and Radiation Source Term (FY22 Spring)
- ATF, Enrichment, and HBU Impacts on Lattice Physics and Fuel Isotopics for BWRs & PWRs (ML21088A336/354/254)





Severe Accident and Source Term Research


U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG/CR-7282
ER/NRC 21-203

Review of Accident Tolerant Fuel Concepts with Implications to Severe Accident Progression and Radiological Releases

NUREG/CR-7282

ML21113A277

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG/CR-7283
ER/NRC 21-204

Phenomena Identification Ranking Tables for Accident Tolerant Fuel Designs Applicable to Severe Accident Conditions

NUREG/CR-7283

ML21210A321

Office of Nuclear Regulatory Research

Cr-Doped UO_2 Fuel

- Not very different from conventional fuels
- Considerable amount of Cr already exists in conventional core
- Some thermophysical properties are slightly less well known
- Limited information regarding fission product speciation and chemistry

Cr-Coated Zr-Clad UO_2 Fuel

- Not very different from conventional fuels
- Considerable amount of Cr already exists in conventional core
- Some thermophysical properties are slightly less well known
- Initial oxidation expected to be lower

HBU/HALEU

- Thermophysical properties of fuel & cladding
- Fission product chemistry & gap inventories
- Effect of fragmentation on core degradation
- No significant differences between HBU/HALEU and HBU

RES Planned Work and Priorities

Source Term Calculations for ATF Cr-Coated Cladding using MELCOR (Sept. 2022)

Demonstrate capability to perform full-core LOCA simulation to quantify fuel dispersal (FY22/FY23)

Develop in-house familiarity with DOE codes (e.g., BISON, Serpent, Griffin)

Deploy SCALE 6.3 with updates to support ATF/HALEU/HBU analyses

Assess FAST against Halden and SCIP LOCA and transient FGR tests