Pacific Northwest
NATIONAL LABORATORY

PNNL's Capabilities in Support of Advanced Reactor Demonstrations

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U.S. DEPARTMENT OF ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

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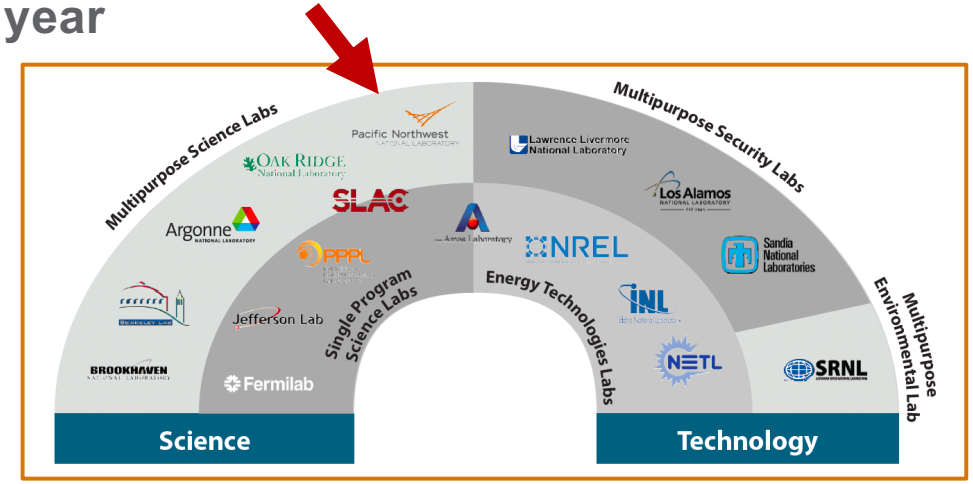
PNNL, a Multipurpose Science Lab is leveraging its Capabilities to Support the Nuclear Industry

$400-500M of R&D in Nuclear Science &Technology per year

- Trusted partner in
  - Advancing nuclear technologies
  - Enabling safeguards
  - Reactor & fuel, licensing & regulatory infrastructure
  - Reactor chemistry
  - Material science and engineering



U.S. DEPARTMENT OF ENERGY

DOE-NE
DOE-EM

NRIC National Reactor Innovation Center

GAIN Gateway for Accelerated Innovation in Nuclear

PNNL's Nuclear Capabilities are Modern, Comprehensive, and Unique

Environmental Molecular Sciences Laboratory (EMSL)

Radiochemical Processing Laboratory

Advanced Processing and Engineering Laboratory

Process Development Laboratories

Marine Sciences Laboratory (Sequim Bay)

Non-Destructive Evaluation Laboratories

Material Sciences Laboratory

Radiological Exposures & Metrology Laboratory

Ultra Low Background & Radiation Detection

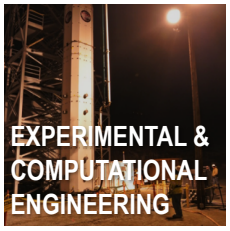
PNNL's Nuclear Energy Expertise and Capabilities are Broad

- Wasteform Development
- Thermal Processing
- Process Engineering

- Glass Development Lab
- Rad & Non-Rad Melter Platforms
- Reactor Component Test Facility

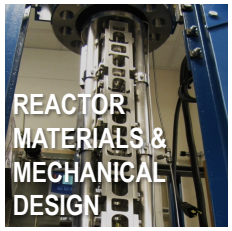
- Separations
- Radiochemistry
- Irradiated Materials Characterization
- Actinide Sciences

- Radiochemical Processing Laboratory
- Microscopy Quiet Suite



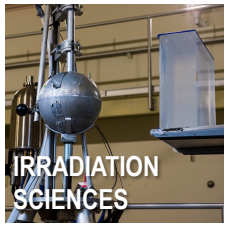
- Multi-Phase Fluids
- Simulant Development
- Structural Analysis
- Safety Analysis

- Pilot Scale High-Bays
- Colloid Laboratory



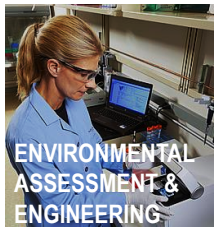
- Stress Corrosion Cracking
- Radiation Effects
- Materials Modeling
- Mechanical Design
- Nano Materials Science

- Corrosion Laboratory
- Nuclear Mechanical Testing
- Irradiated Materials Characterization



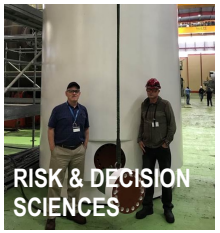
- Neutron Metrology
- Radiation Effects on Materials
- Radiation Dosimetry and Measurement

- Low Scatter Neutrons
- Gamma Bunker
- High Exposure Facility
- Industrial X-ray Facility



- NEPA Assessments
- Human & Ecological Health
- Field & Systems Engineering
- Microbiology

- Microbiology Labs
- Design, Engineering, and Fabrication spaces
- Detection & Interdiction Testing Platforms



- Nuclear Safety & Engineering
- Risk Informed Decision Analysis
- Software Based Decision Support Tools

- Field Testing & Evaluation Systems
- Web-Based Information Systems

- Geochemical Assessment
- Remediation Science & Engineering
- Geophysics/Geomechanics

- Characterization & Fate/Transport Labs
- Mass Spec Labs
- Geophysics Labs
- Waste Form Testing Labs

- Materials Development, Processing & Performance Testing
- Synthetic Chemistry
- Polymers

- APEL-- Solid Phase Processing
- 3410 -- Mechanical Testing Lab
- APEL -- Polymer Processing
- PSL -- Applied Synthetic Chemistry

- NRC Lead Organization for Development and Evaluation of Techniques
- Finite Element and Semi-Analytical Simulations
- Prognostics and Health Management

- Phased Array Ultrasound
- Guided Wave Ultrasonics
- Eddy Current
- Digital Radiography
- Cable NDE

- Core Design; Thermal Hydraulic and Safety Analysis
- Criticality Safety Assessment
- Radiation Shielding Analysis
- Fuels and Materials Performance Analysis

PNNL's Capabilities in Support of Reactor Deployment Efforts

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Recent Investments in MSR Capabilities

Capabilities leveraged in support of NRIC

Reactor chemistry & physics

- Safeguards & signatures
- Molten salt properties measurements
- Molten salt properties modeling
- Handling of Be, Pu, transuranic bearing and radioactive salts
- Synthesis of irradiated salts
- Reactor physics and neutronics
- Online monitoring of molten salts, reactor coolant & effluent

Non-destructive evaluations (NDE)

- High temperature sensing technology
- Online monitoring of structural components
- Component Integrity

Advanced fuels designs

- Fuel material & fabrication space
- Metallic fuel fabrication
- Post irradiation examination
- Fuel Processing

Reactor materials

- Material design and modeling
- Material testing
- Material characterization

Technical Evaluations & Assessments

- Techno-economics assessments
- FFTF legacy and lessons learned

Licensing

- Reactor regulation & licensing
- Human factors engineering

- Environmental impact assessments
- Probabilistic risk assessment (PRA)

Systems & components design

- Metal organic frameworks & off-gas systems
- Advanced Manufacturing & cold spray technology
- Buried piping inspection
- Cable aging management
- Cyber security

Irradiation Sciences

- Radiological risks and hazards assessment
- Radiation protection and dose assessment

Spent fuel management & decommissioning

- Spent fuel recycling
- Spent fuel storage and transportation
- Reactor decommissioning

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PNNL is ready to leverage its capabilities to assist the industry with its advanced reactor demonstration efforts.

Contact

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