



FRWG
Fast Reactor Working Group

Fast Reactor Working Group Activities 2018 Regulatory Information Conference

Fast Reactor Working Group



- Multiple developers working on multiple technologies
 - 9 developers, 10 designs
- Spans variety of fast reactor technologies in development:
 - Sodium, lead, salt, and gas

ARC	Westinghouse	Southern
GE	Columbia Basin	Exelon
TerraPower	Hydromine	Duke
Oklo	Elysium Industries	EPRI
	General Atomics	

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Highlighted Activities



- Fuels
- Versatile test reactor
- Modeling and simulation
- Component reliability database
- Standards

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Fuels



- Variety of fuels considered
 - > Metal, oxide, nitride, carbide, salt
 - > 7 developers considering metal fuel
- Working on relevant issues for fast reactor fuels
 - > High assay LEU supply
 - > Fuel transportation
 - > Legacy fuel data qualification
 - > Modeling and simulation
- Support deployment of a fast test reactor in the near term

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Metal Fuel Experience



- Metal fuel is a mature technology
 - > Phenomena of interest are well characterized
- Over 130000 pins irradiated in EBR-II and over 1000 pins irradiated in FFTF
- In-core tests
 - > 1986 SHRT tests
 - Also involved 40 startup cycles, 8 overpower, 45 loss of flow tests
 - No fuel failures!
 - > RBCB tests
- TREAT tests
- Out of pile tests
- Resilient to variations in manufacturing techniques and tolerant of impurities

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Fuel Design Variations



- Extend operating envelope of metal fuels — e.g. advanced metal fuels
- Next generation cladding materials
- Alternative fuel materials
 - > Carbides, nitrides, UZrH, cermets, etc.
- Vented fuel and “cladding-free” designs
- General fuel design evolution

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Fuel Paradigms



- ⦿ Robust fuel behavior can enhance the safety case
 - Fuel changing phase is not necessarily fuel failure, it can be a safety benefit
 - Coolant system can play an important role as a barrier to radionuclide release
- ⦿ Operational considerations
 - Leakers may not impede operations

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Versatile Test Reactor



- ⦿ Strongly support the deployment of a test reactor with fast spectrum capabilities
 - Accelerate new fuels and materials development
 - Enable exploratory studies on fuel design improvements and next generation technologies
- ⦿ Need for urgency in order to maximize benefit
- ⦿ Opportunity to support fuel supply chain

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Modeling and Simulation



- ⦿ M&S workshops
- ⦿ High degree of maturity for SFRs
 - Enhanced use of high performance computing to advance designs
 - Opportunities to accelerate development and design with advanced tools
- ⦿ Need to improve how these codes are used and accessed
- ⦿ Nuclear data needs

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Historical Reports, Data, and Standards



- Metal fuels reports and data
 - > Supporting documentation of applicable metallic fuel transient tests, including as-built data packages, as-run conditions, PIE results, and supporting documentation
- Legacy and modern fast reactor fuel experimental reports and data
 - > Experimental data on UO₂, UN, UC, and advanced metal fuel irradiation performance
 - > Experimental data on cladding materials
- NaSCoRD (formerly CREDO) database of component reliability for liquid metal reactors