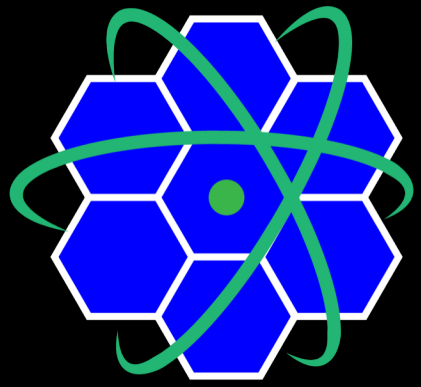

Fast Reactor Working Group Activities

2018 NRC Commissioner Meeting

April 24, 2018

Fast Reactor Working Group

- Multiple developers working on multiple technologies
- Spans variety of fast reactor technologies in development

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

Highlighted Efforts

- Fuels
  - Variety of fuels being considered
  - Working on infrastructure needs
  - Data
- Modeling and simulation
  - Existing and new tools
- Legacy data
  - Fuel and component databases
- Versatile test reactor
- Standards – ASME Section III, Div. 5
- RG 1.232 and licensing modernization

Reference Slides

Fuels

- Variety of fuels considered
  - Metal, oxide, nitride, carbide, salt
  - 7 developers considering metal fuel
- 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 do not necessarily impede operations

Metal Fuel Experience

- Metal fuel is a mature technology and the 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 overpowers, 45 loss of flow tests
  - RBCB tests
- TREAT tests
- Out of pile tests
- Resilient to variations in manufacturing techniques and tolerant of impurities

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.

Modeling and Simulation

- Varying degrees of maturity for different designs
  - 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

Historical Reports and Data

- Metal fuel 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 UO_2, UN, UC, and advanced metal fuel irradiation performance
  - Experimental data on cladding materials
- NaSCoRD (formerly CREDO) database of component reliability for liquid metal reactors