Fast Modular Reactor (FMR) Concept

Thermal power: 100 MW
Electric output: 44 MW
Coolant: Helium
System pressure: 7 MPa
System temperature: 509 - 800 °C

Reactor Type
- Gas-cooled Fast Reactor (GFR)
- High-Temperature Reactor (HTR)
- Small Modular Reactor (SMR)

The community-friendly, safe, and distributed resource for the 2035 US Market
A Regulatory Engagement Plan (REP) is encouraged by the NRC as an early step in the overall program to develop and deploy a new reactor technology.

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- NRC hosted a public meeting regarding the FMR PDC on 9/21/2022
- Radionuclide transport methodology
- Licensing basis event selection and safety analysis
- Probabilistic risk analysis and process hazard analysis
- Categorization of structures, systems and components into safety-related and non-safety-related systems
Accelerated Fuel Qualification (AFQ): Methodology to Reduce Time and Cost to Qualify New Fuels

- Brings together modeling and simulation with targeted experiments
- Emphasis on physics-based modeling and simulation versus use of empirical fits
- Use of integral as well as separate effects and accelerated experiments


C. Drzewiecki, J. Schmidt, C. VanWert, P. Clifford, NUREG 2246, 2022
Fuel Qualification for AdvancedReactors
Fast Modular Reactor (FMR) Fuel Test Plan

- **Accelerated testing** for long lifetime fuels: Advanced Test Reactor (ATR) high-burnup irradiation tests
  - Fission accelerated steady-state testing (FAST) approach with irradiation system for high-throughput acquisition (ISHA) capsule to accelerate the irradiation in compact-size rodlets

- **Separate effects test:** Transient Reactor Test (TREAT) facility transient tests
  - Reactivity-initiated accident (RIA) power pulse test in a modified version of the dry in-pile fracture test (DRIFT) capsule

- **Sub-integral test** to bound fuel failure criteria: In-pile tests to component properties
  - Confirm the hermeticity, pellet-cladding mechanical interaction to inform FMR design