U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Exploratory Workshop for Developing an Advanced Reactor Generic Environmental Impact Statement (GEIS)

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Objectives of the Workshop

- Understand types and sizes of advance reactors under development
- Determine the viability of developing a GEIS for advanced nuclear reactors
- Discuss possible strategy for a GEIS

What would an Advanced Reactor GEIS address?

- Define the scope of the environmental effects of construction and operation of advanced reactors
- Identify and determine generic and site-specific environmental impacts

NRC Needs to Know

- Footprint and power output level of the advanced reactor
- Construction considerations
  - Constructed/assembled onsite or manufactured elsewhere for delivery and installation
  - Amount of land required to construct the reactor
  - Duration of construction
  - Number of construction workers
  - Infrastructure needed (T-lines, roads, etc.)

NRC Needs to Know

Operation Considerations

- Length of operation
- Core lifetime and nuclear fuel management
- Number of operation workers
- Radiological and non-radiological effluents released during reactor operations (gaseous, liquid) and solid wastes
- Cooling system designs

Reactor Technologies

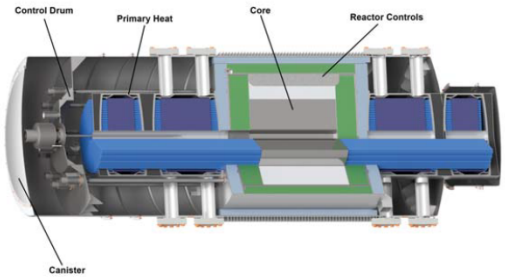
Type	Developer	Power Level Range
Compact Fast Reactor	Oklo Westinghouse [eVinci]	200 kWe to 15 MWe
High Temperature Gas Reactor (HTGR)	X-Energy [Xe-100] General Atomics [EM2] Framatome [SC-HTGR] Hybrid Power StarCore Nuclear [StarCore Module] HolosGen [Holos]	3 MWe to 850 MWe
Molten Salt Reactor (MSR) [Fluoride-Chloride-Other]	Kairos Power, LLC TerraPower Terrestrial Energy USA Elysium Flibe – Thorium Schattke Advanced Nuclear Engineering Alpha Tech Research Corp. Muons Inc.	40 MWe to 200 MWe or greater

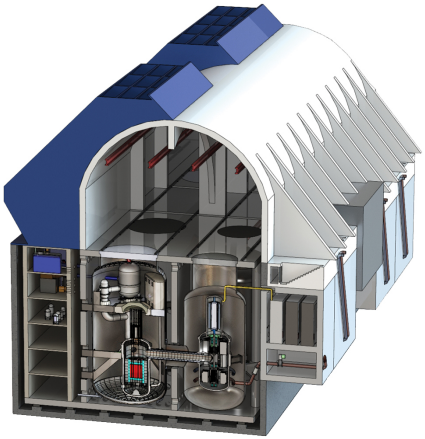
Reactor Technologies (cont.)

Type	Developer	Power Level Range
Sodium Fast Reactor (SFR)	TerraPower [Traveling Wave Reactor] General Electric [Prism] Advanced Reactor Concepts [ARC-100] NASA [Kilopower space reactor]	10 kWe to 550 MWe or greater
Lead-cooled Reactor (LFR) [Lead or Lead-Bismuth]	Gen4Energy Westinghouse Hydromine Nuclear Energy [LFR-AS-200] Columbia Basin Consulting Group	25 MWe to ~300 MWe

Reactor Technologies (cont.)

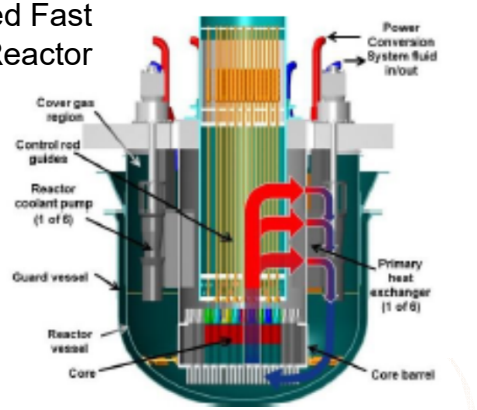
Compact Fast Reactor

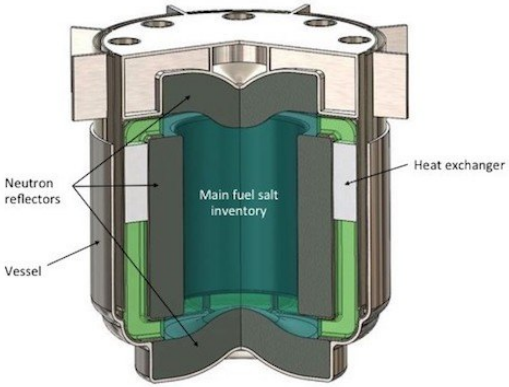




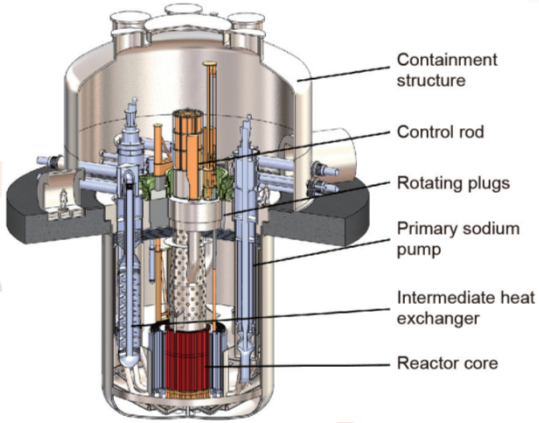
High Temperature Gas Reactor

Lead-cooled Fast Reactor





Molten Salt Reactor



Sodium Fast Reactor

http://www.westinghousenuclear.com/Portals/0/new%20plants/evincitm/eVinci%20Micro%20Reactor%20NPJ%20M-A%202019.pdf?ver=2019-04-30-211410-367
https://terrapower.com/productservices/mcfr
http://www.ga.com/advanced-reactors
http://www.westinghousenuclear.com/Portals/0/flysheets/ECOE-0002%20Lead%20Fast%20Reactor_Rev3.pdf?ver=2019-11-19-161134-690
https://terrapower.com/uploads/docs/ENG-15115-JG.PDF

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Reactor Utilization

- Demonstration
- Electric production
- Desalination
- Process heat
- Others?

Possible Paths Forward

- No GEIS
- All technologies
- Micro-reactor only
- Intermediate-sized reactor
- Large reactor
- Combinations of the above
- Other considerations

Power level Review Example

- Less than 40 MWth
- 40 MWth to 300 MWth
- 300 MWth and greater

Review Example (cont.)

Example Resource	Less than 40 MWth	40 MWth to 300 MWth	Greater than 300 MWth
Land use	10 acres or less Very small footprint	10 acres to 199 acres Small footprint	200 acres or more
Water Resources (Heat-Dissipation Systems)	Not likely to require cooling water	Potential for cooling water	Likely will need cooling water
Work Force (Construction & Ops)	Very small number	Small number	Larger number
Ecology, Cultural, Environmental Justice	Site specific	Site specific	Site specific

Important Dates

- Input to NRC by January 24, 2020
- NRC staff will assess and consider input to prepare a summary report by February 15, 2020

Conclusion

- Possible structures for a GEIS
- Types and sizes of advanced reactors to be addressed in the GEIS
- Example of how the advanced reactor design impacts the environment
- Other ideas

Submit Comments

- Email comments to AdvancedReactors-GEIS.resource@nrc.gov
- *Federal Rulemaking Website:* Go to *https://www.regulations.gov* and search for Docket ID NRC-2019-0226.
- If you have any question contact Mallecia Sutton - Mallecia.Sutton@nrc.gov (301-415-0673) or Jack Cushing – Jack.Cushing@nrc.gov (301-415-1424)