U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

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Nuclear Energy University Program (NEUP) Fiscal Year 2020 Annual Planning Webinar Molten Salt Reactor

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U.S. Department of Energy
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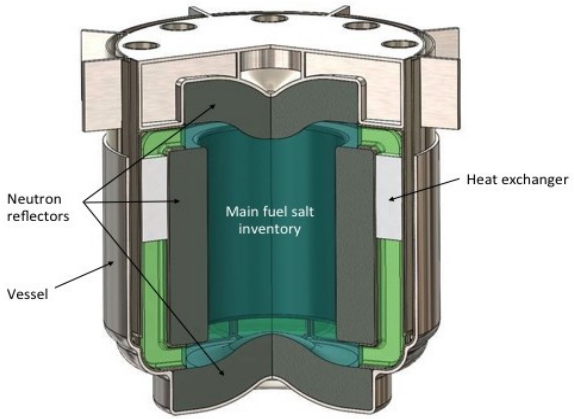
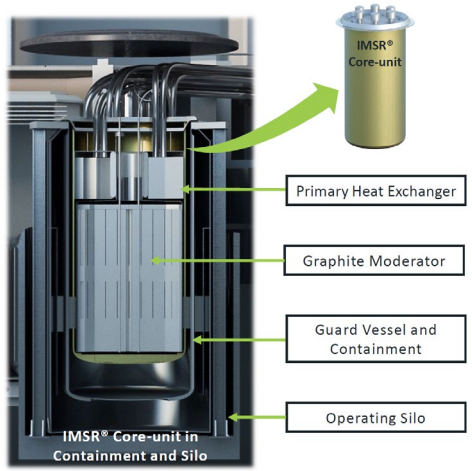
Molten Salt Reactor (MSR) Strategy

- Assist in the near-term deployment of molten salt reactors, both salt-cooled and salt-fueled concepts, by establishing viability, developing needed research capability and enabling technology, reducing cost, and accelerating development to facilitate industry success.

Examples of MSR Designs being Developed by Industry

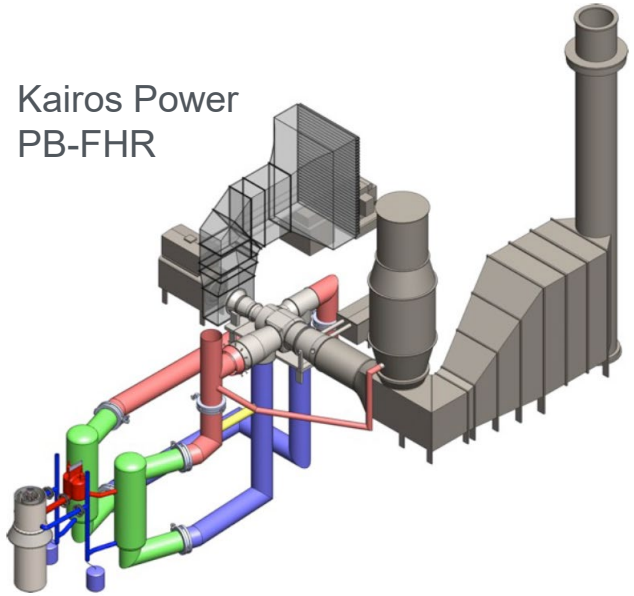


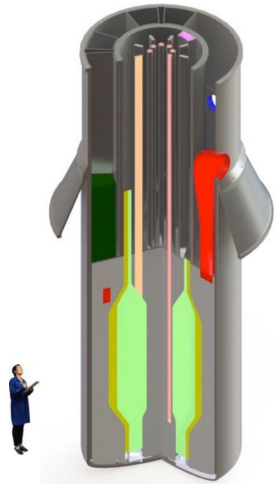
TerraPower
MCFR



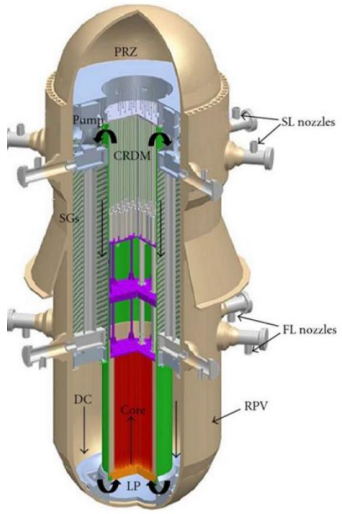
Terrestrial Energy
IMSR

Kairos Power
PB-FHR

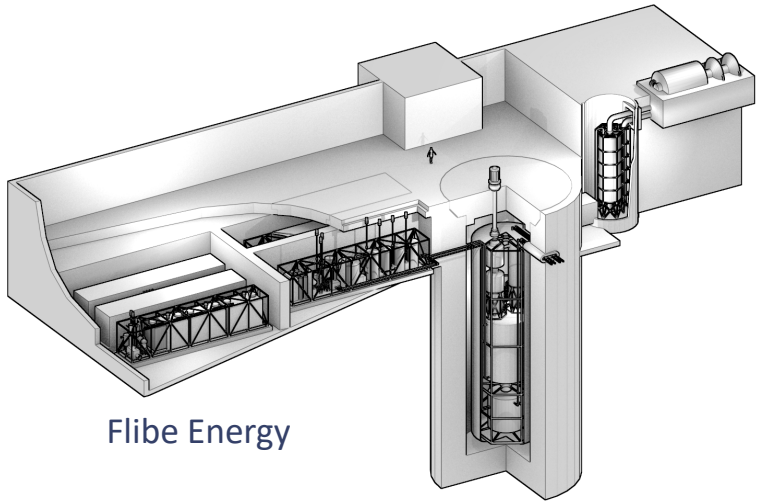




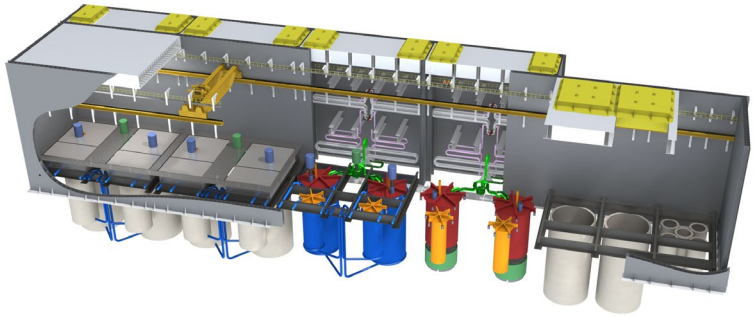
Reactor Vessel
Cross Section



Elysium USA, MCSFR



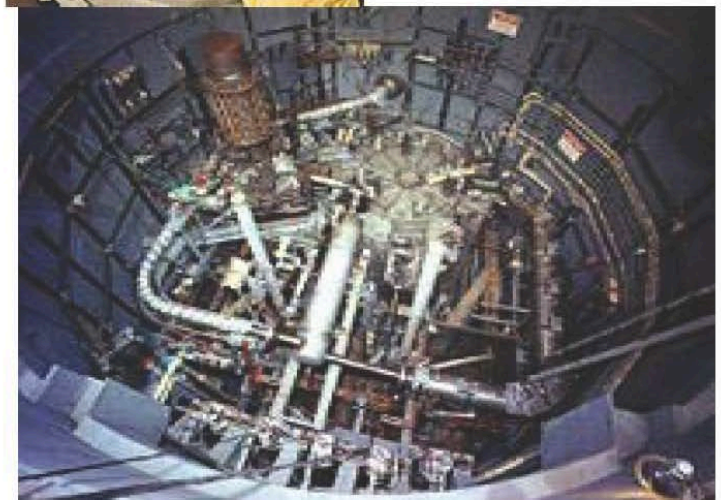
Flibe Energy

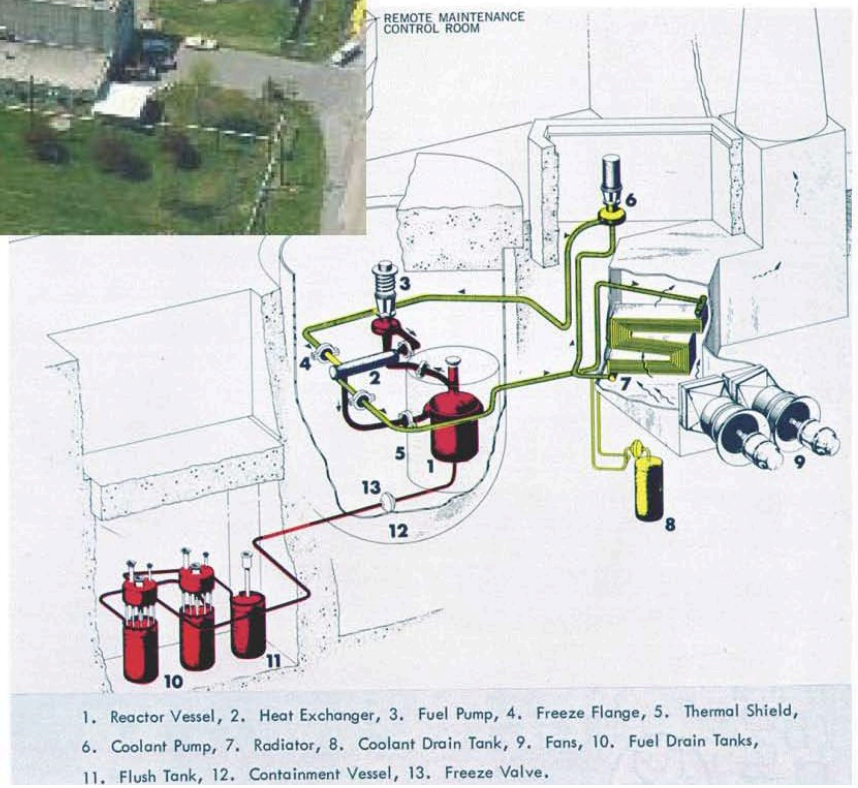


ThorCon Power

Molten Salt Reactor Experiment (MSRE)

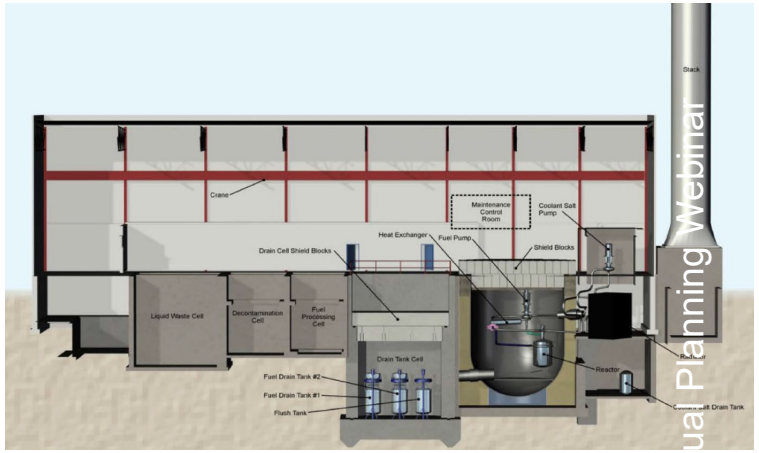
Operated at Oak Ridge National Laboratory from 1965 to 1969, is the Primary Reactor-Based Experience with Molten Salt Reactors





Molten Salt Reactor Experiment (MSRE)

- Fuel (^{235}U, ^{233}U and ^{239}Pu) dissolved in a fluoride salt
  - Liquid-fuel reactor
  - Thermal-spectrum limited breeder reactor
  - 7.34 MW
  - 1225°F (662 C) outlet temperature
  - Fuel salt was 65% Li7F - 29.1% BeF2 - 5% ZrF4 - 0.9% UF4



- New interest in MSRs
  - Fast spectrum or thermal spectrum (chloride and fluoride salts)
  - Liquid fuel and salt-cooled solid fuel
  - Various plant sizes
  - Target diverse markets – base load electricity generation, process heat applications, desalination, water purification, remote locations

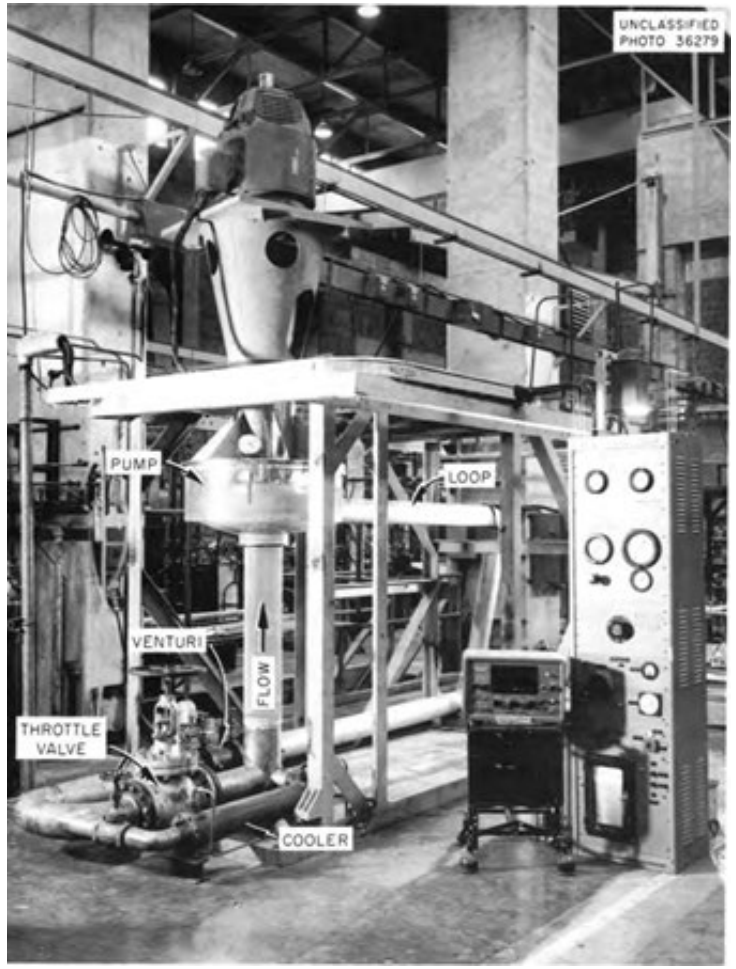
RC-5.1: Pump scaling technology for Molten Salt Reactors

- **Proposals are requested to develop and demonstrate pumps that could serve as a technology model for future MSRs**
- **Key Engineering challenges will be considered;**
  - Unique materials
  - High temperature operation
  - Complex chemistry and impact on corrosion rates
  - Access for inspection and maintenance
  - Radioactive fluids, surrogate data testing
- **Important features include:**
  - Capacity range relevant for MSRs and FHRs
  - Designs suitable for repeated sealing with thermal cycling and conditions above 500C
  - Assembly methods that address removal, inspection, and maintenance

Additional information

Office of Science and Information Technology (OSTI)

- Salt pump technology
- https://www.osti.gov/biblio/1257909-high-temperature-salt-pump-review-guidelines-phase-report



Points of Contact for RC-5 Molten Salt Reactor

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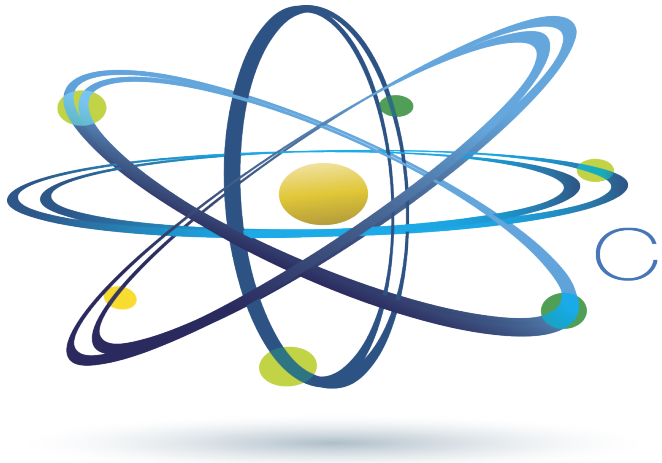
Questions



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