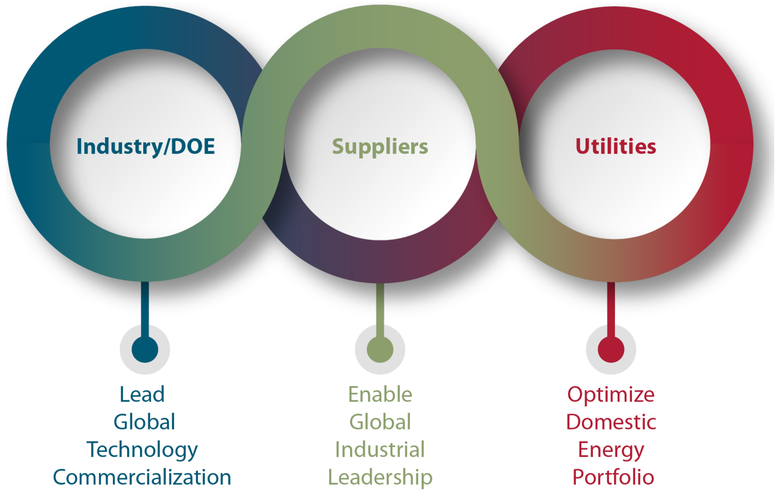
Molten Salt Reactors

GAIN Gateway for Accelerated Innovation in Nuclear

DOE-NE has established the Gateway for Accelerated Innovation in Nuclear (GAIN) to provide the nuclear community with access to the technical, regulatory, and financial support necessary to move innovative nuclear energy technologies toward commercialization while ensuring the continued safe, reliable, and economic operation of the existing nuclear fleet.



Additional Molten Salt Reactor Resources:

bit.ly/GAIN-MSR

bit.ly/YouTube-MSR

bit.ly/ORNL-MSR

bit.ly/FluidFuelReactors

Contact GAIN:

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Developing safe, reliable sources of carbon-free energy will be the next decade's greatest challenge for power producers in the US. Several US-based companies are developing Molten Salt Reactors (MSRs), a type of advanced nuclear reactor, to help meet that energy challenge.

MSRs utilize low pressure, high temperature fluoride or chloride salts as liquid fuels and coolants. MSRs are different from most other advanced reactor concepts because of their ability to operate in a low pressure environment, as well as at higher temperatures and for longer durations than other reactor types. Developers of this reactor offer increased safety, reduced proliferation risk, passive safety system features, and short-lived waste.

MSRs could play a significant role in closing the nuclear fuel cycle, increasing fuel utilization, and reducing long-lived waste products.

Readily Apparent Safety

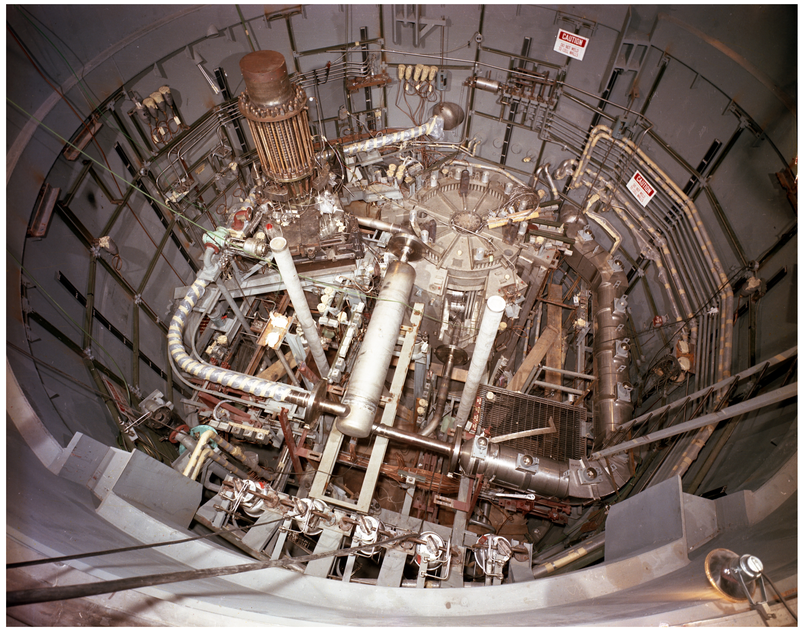
Due to the inherent characteristics of low pressure, chemically-inert coolants and liquid fuel systems, MSRs are easily coupled to passive safety systems that eliminate the need for many of the safety systems needed for other reactor types. MSRs can be designed to be "walk away" safe and operate with low pressure components and systems, which improve the economic performance and enhance the safety of the reactor.

High-Quality Energy

MSRs produce high temperature heat for efficient electricity production and for application in high temperature industrial applications, including the production of hydrogen. MSRs are attractive because of their potential to operate at higher, more efficient temperatures for extended operational cycles.

Load Following and Integration

By employing MSRs in an energy mix, a power producer is able to provide reliable energy to its customers while integrating with variable resources. Flexible load following capabilities of MSRs enable integration with intermittent renewable energy sources; moreover, the high-grade heat produced by MSRs make thermal energy storage or integration with industrial processes possible and attractive during low electricity demand intervals.



A top view of the Molten Salt Reactor Experiment (MSRE) at Oak Ridge National Laboratory.

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COST EFFICIENCY

As utilities evolve to meet the challenges of a modernizing grid, advanced nuclear reactor technologies seek to provide economically viable solutions through simplified designs and reduced operational costs.

INTEGRATION & RELIABILITY

Flagging load growth and the rise of distributed generation sources are driving advanced nuclear developers to provide flexible, always on power to end users.

SAFETY & WASTE

The possibility of Fukushima-like events is eliminated by the inherent physics of the reactor through a failsafe design; fuel waste concerns are substantially reduced.

- Some designs are intended for factory assembly and fixed modular construction, assuring on-budget projects while reducing overall costs.
- Able to operate at full power while being refueled, avoiding a disruption in customers' energy demands.
- When compared with current reactor designs, passive safety features cut capital, operations, and maintenance costs.
- Reactors can achieve higher temperatures, producing electricity more efficiently or high-quality heat for industrial processes.
- MSRs are designed for a modern grid, capable of load following and integrating with variable renewable energy sources.
- Flexible designs allow for the use of various fuel types; some designs are capable of consuming used fuel from other reactors.
- Fuel compositions are flexible compared to current generation reactors, allowing for various fuel cycle approaches to increase resource utilization and reduce waste.
- Passive safety features can allow for "walk away" safety, even during severe events.

		Thermal Output (per unit)	Electrical Output (per unit)	Total Plant Footprint	Primary System Water Requirements	Industrial Heat & Steam	Load Following
< 10 MWe	Micro Systems	< 30 MWt	< 10 MWe	Fast Food Restaurant	None	✓	✓
10 - 300 MWe	Small Systems	30 - 1000 MWt	10 - < 300 MWe	Parking Garage	None	✓	✓
> 700 MWe	Large Systems	> 1000 MWt	> 700 MWe	Industrial Factory	None	✓	✓

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