



Molten Chloride Reactor Experiment

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Changing the World's Energy Future

Mason Scott Walls, Kristina Diane Yancey Spencer



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**Idaho National Laboratory
Idaho Falls, Idaho 83415**

<http://www.inl.gov>

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Mason Scott Walls
Texas A&M University

MCRE

Molten Chloride Reactor Experiment

Kristina Spencer, PhD
Used Fuel Management, NS&T

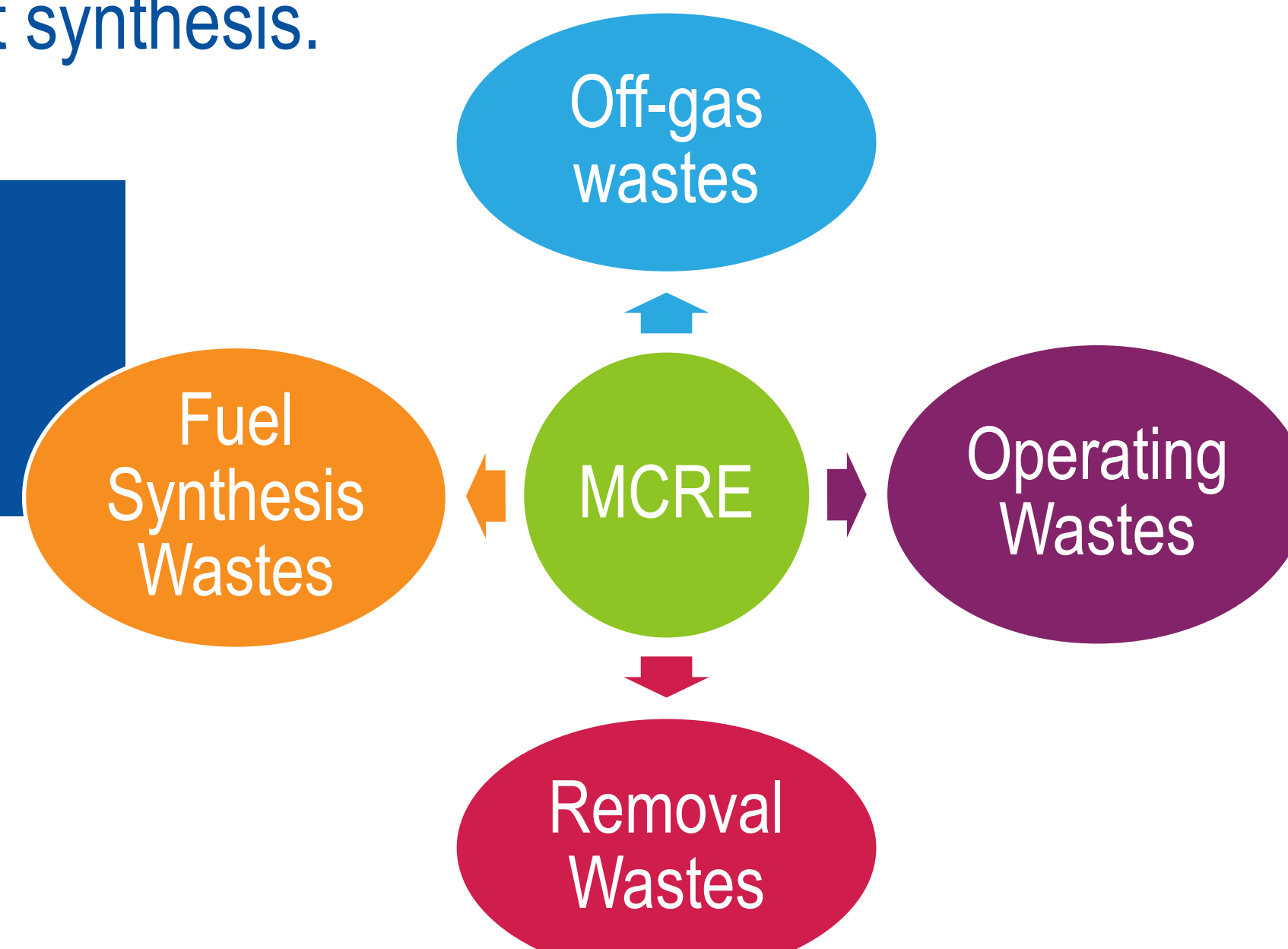
Introduction

MCRE will be the first fast spectrum, molten chloride reactor in operation.

- **Small critical experiment** to provide data for future reactors.
- Collaboration between Southern Company Services, TerraPower, and Idaho National Laboratory (INL), as well as other partners.
- Expected to be built and operated at the LOTUS testbed (ZPPR).
- Authorized by the U.S. Department of Energy.
- Technology development of salt synthesis.

Waste & Removal Planning

- First-of-a-kind reactor experiment
- From fuel production to reactor removal and disposal
- Low burnup level
- Unique waste stream.

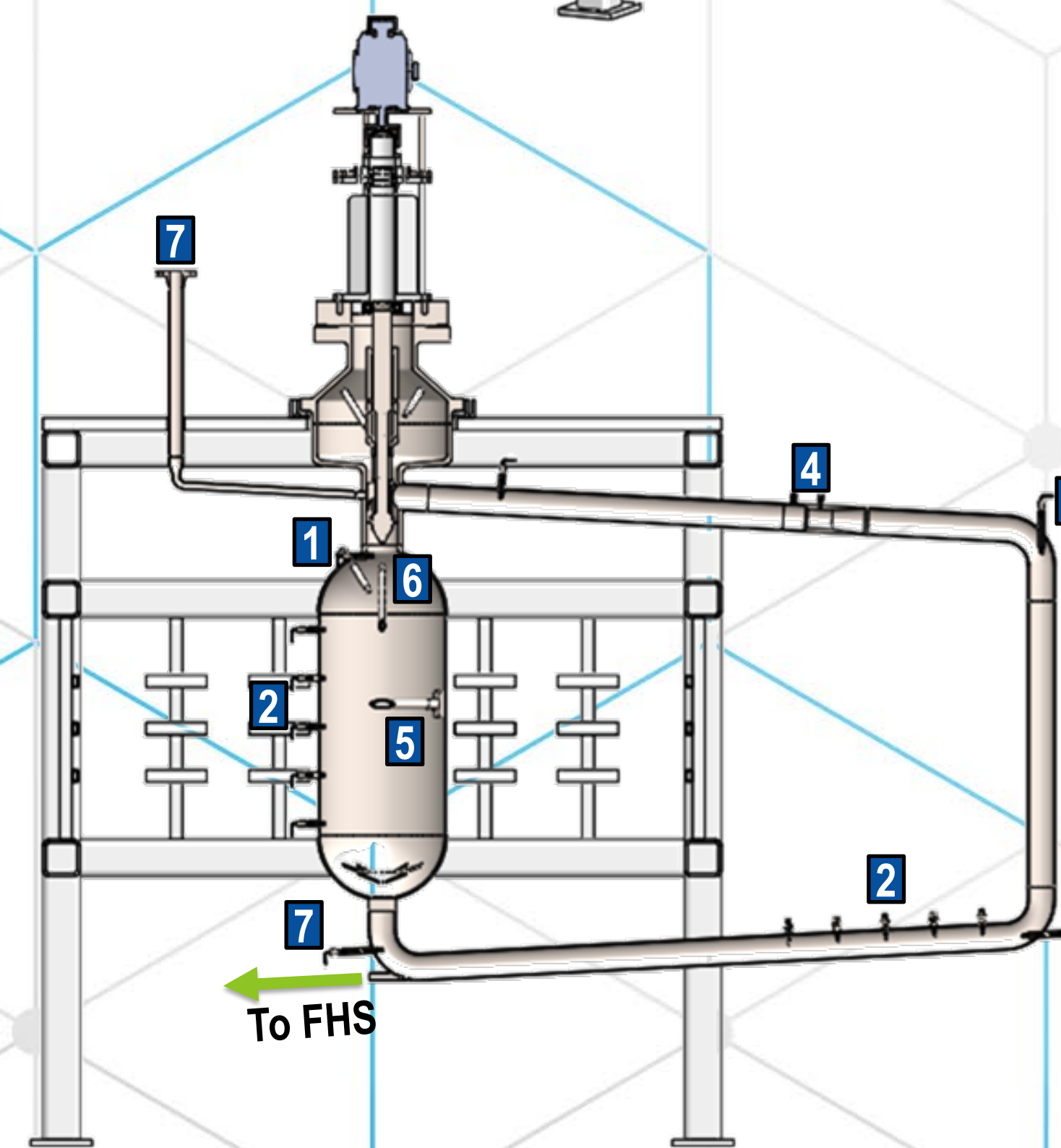
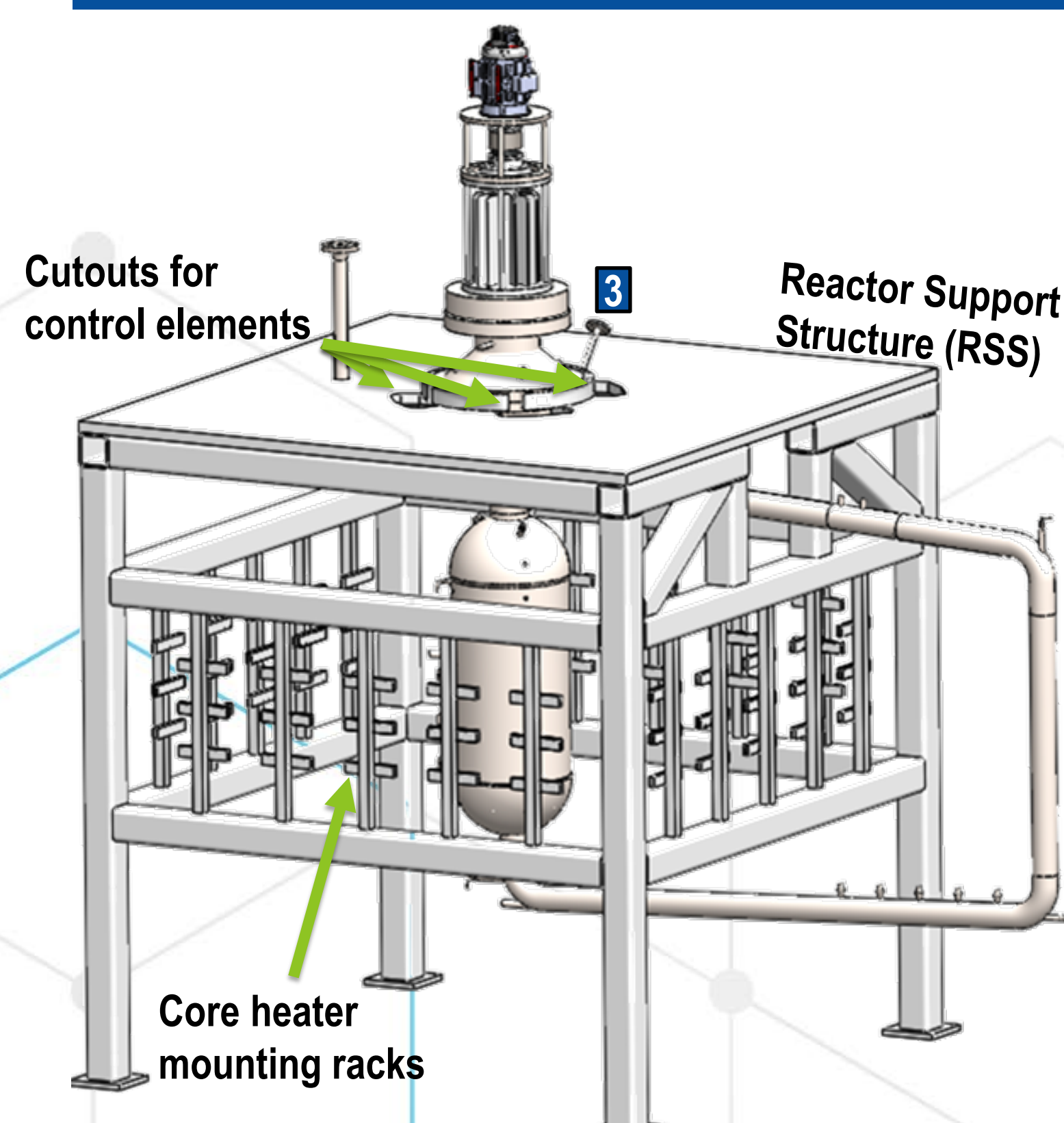


Mission & Objectives

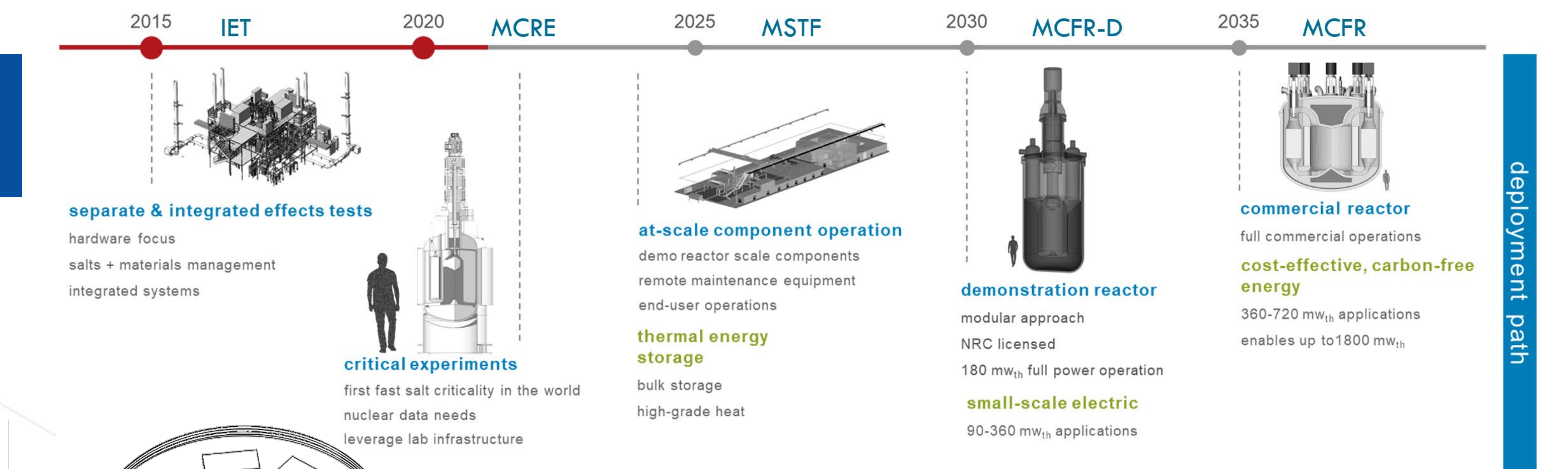
Mission statement: to measure key reactor physics phenomena and test hypotheses about Molten Chloride Fast Reactor (MCFR) behavior, to reduce uncertainty and provide foundational knowledge to support the development of the MCFR Demonstration Reactor (MCFR-D).

Objective 1	Safely achieve criticality with the first fast spectrum molten salt fueled reactor
Objective 2	Experimentally determine reactor physics and kinetics parameters to reduce uncertainty and gather data
Objective 3	Demonstrate the fuel loading, fuel salt sampling/analysis, offloading, and general handling strategy for chloride fuel salt
Objective 4	Initiate development of industry supply chain for key molten salt components operated in a high temperature and radioactive environment
Objective 5	Collect operational/testing data to lay foundation for an operating license for MCFR-D under a risk-informed performance-based (RIPB) licensing framework.

Reactor Design & Instrumentation



- 1 In-Core Multipoint Thermowell
- 2 Vessel/Loop Thermowell
- 3 Pump Bowl Thermowell
- 4 Venturi Flow Meter
- 5 In-core Irradiation Tube
- 6 Pressure Differential Indication Transmitter
- 7 Guided Wave Radar Level Transmitter



Parameter	MCRE
Rated Thermal Power	150 kW
Design Temperature	700°C
Design Pressure	500 kPa-g
Fuel Salt Mass Flow Rate	25-100 kg/s
Operating Temperature	600-650°C
Fuel Salt Melting Temperature	525°C
Fuel Salt Composition	NaCl-UCl ₃ (67-33mol%)
Fuel Salt Volume	0.4 m ³
Fuel Salt Mass	~1300 kg
Neutron Reflector	~80% dense MgO
Reactivity Control	Four rods w/ B ₄ C
ASME Code	Section III, Division 5

Pneumatic Fuel Transfer

