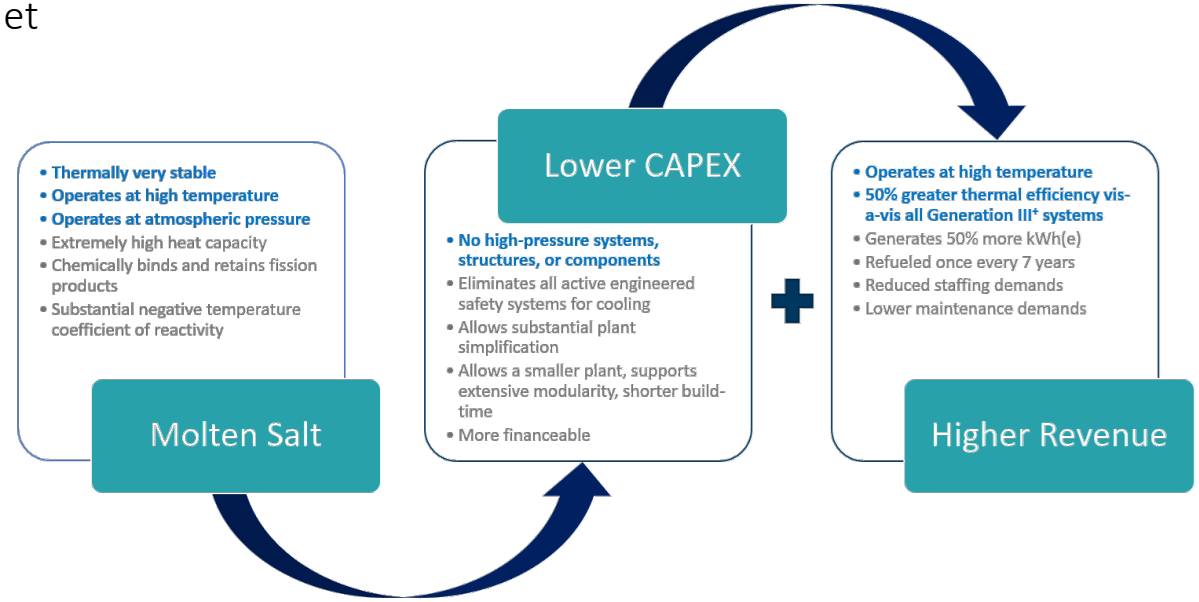
Leading the Way to a Bright Energy Future

Molten Salt Reactor Workshop 2021
Oak Ridge National Laboratory

October 18th, 2021

IMSR® Technology Summary

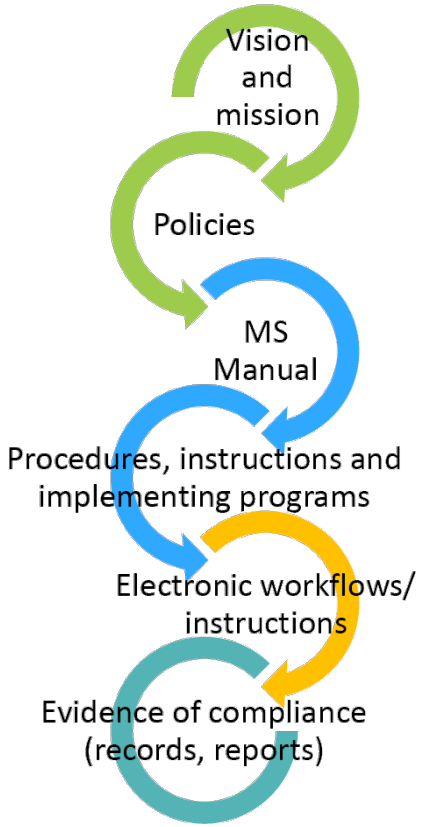
- 442 MWth liquid fueled and cooled, thermal spectrum, graphite moderated, pool-type, molten fluoride salt reactor
- Hydrostatic operating pressure, 700 °C outlet, 620 °C inlet
- 390 MWe Dual Unit Plant/44% thermal efficiency
- 600 °C liquid salt industrial heat supply
- Fuel enrichment <5% - HALEU is not required
- 7-year fuel cycle length
- 56-year plant design life
- 17-acre site layout
- Plant boundary EPZ
- Black start capable
- Inherent and passive decay heat removal, indefinite coping time, no operator action required
- Capable of 10% per minute from 100% to 30% to 100% load following ramp rate



IMSR® technology provides a solution to the current unaffordable and uncompetitive nuclear new build market problem

IMSR® Engineering and R&D Programs

- Comprehensive advanced reactor design process.
  - *Defines the entire IMSR® technology development program.*
  - *Encompasses all research, development, analysis, engineering, licensing, and testing.*
  - *Will lead to a fully designed, engineered, and licensed IMSR® nuclear power plant.*
- Basic Engineering phase for the IMSR® plant is on schedule for completion in 2021.
  - *Establishes the system level technical details to enable detailed engineering.*
- A "buy vs make" focused R&D program of validation and verification will be completed by 2026.
  - *Physics*
  - *Thermal Hydraulics*
  - *Materials*
  - *Chemistry*



Engineering is on pace to meet the principal business objective to develop, license, construct, commission, and demonstrate a commercial plant IMSR® in the 2020's

IMSR® Deployment Before 2030

- Progress in engineering and supplier engagement supports the established deployment schedule
- Early-stage supplier agreements in place
  - *Graphite, pumps, fuel supply, simulator*
  - *BOP – Steam generators, turbine equipment*
- IMSR® continues to be evaluated as one of three designs selected by Ontario Power Generation to advance SMR deployment in Ontario
- Internationally renowned nuclear industry suppliers and utilities are supporting development and deployment of IMSR® through a Nuclear Innovation Working Group
  - *Ontario Power Generation, Bruce Power, Burns & McDonnell, SNC-Lavalin, Corporate Risk Associates Limited, Kinectrics, Laker Energy Products, Promation, and Sargent & Lundy*
- Business case drives private capital investment support
  - *CAPEX < $1 billion, superior thermal efficiency (~44%), LCOE of $50/MWh*

Engineering, technology, and supply chain development is focused on early deployment and commercial success of IMSR®

IMSR® Regulatory Progress

- IMSR® has successfully completed the Canadian CNSC Vendor Design Review (VDR) Phase I.
  - *VDR Phase II is on schedule to complete in 2021*
- US NRC regulatory engagement is underway.
  - *10CFR Part 52 Standard Design Approval of the IMSR® Core-unit*
  - *Prerequisite to 10CFR Part 50 Construction Permit Application*
- IMSR® is the subject of a joint CNSC/USNRC collaborative regulatory review by both agencies.
- Successful completion of regulatory reviews will be catalytic
  - *Domestic regulatory approvals are required for deployment to international markets*
  - *Green light for first electric utilities to start deployment of first IMSR® power plants*
  - *Nuclear supply chain commitment to IMSR® development*
  - *Broader private capital involvement*

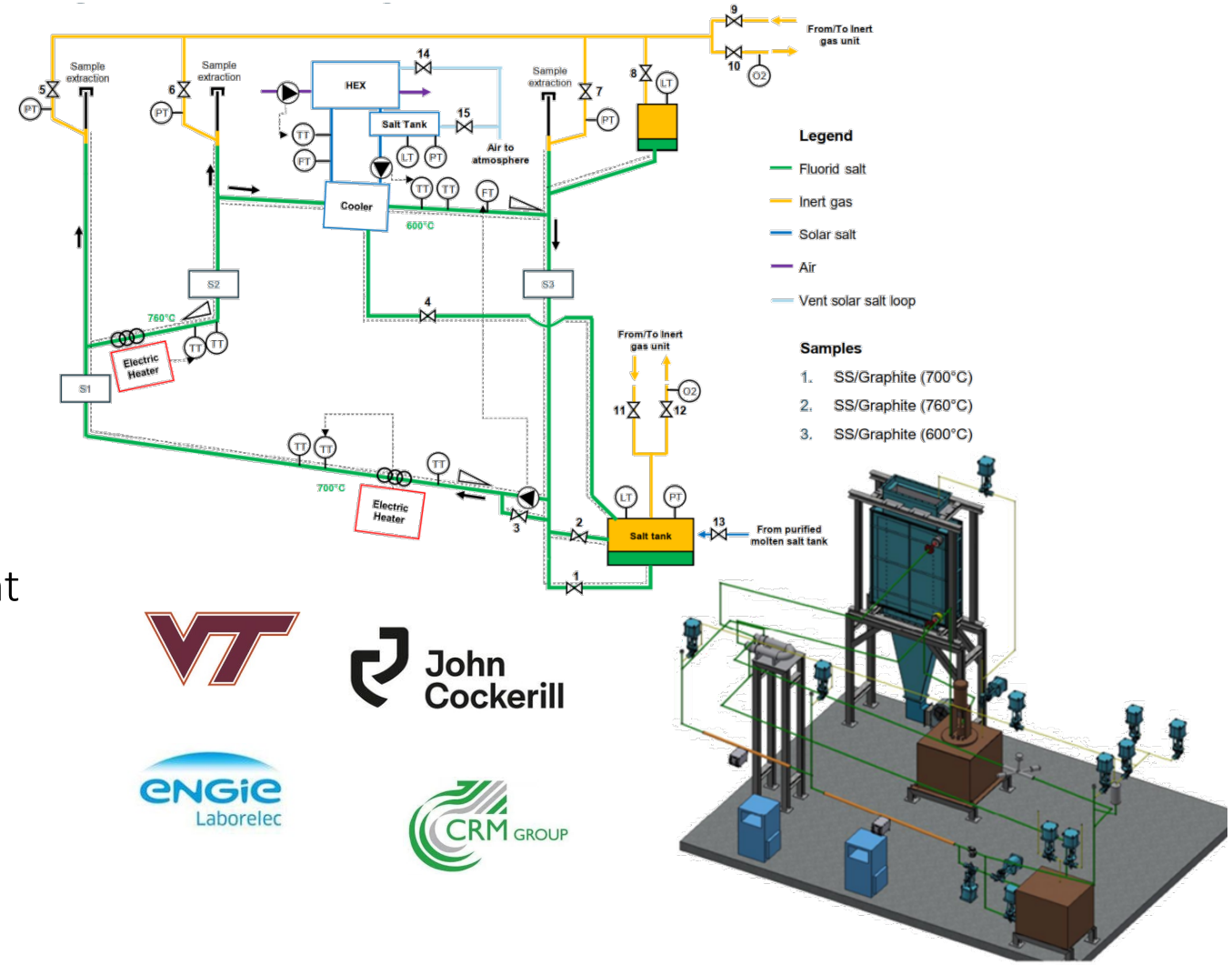
IMSR® licensing progress is key to continued private investment and commercial success

Graphite Qualification

- Pore size
- Purity
- Density
- Thermal Conductivity
- Dimensional change predictions
- Anisotropy
- Stiffness & bend strength
- Irradiation creep behavior

Alloy Qualification

- Galvanic Corrosion
- Flow accelerated corrosion
- Corrosion due to impurities
- Evolution of mechanical properties under irradiation
- Corrosion
- Creep
- Mechanical properties model development
- Fracture and Crack Growth
- Fatigue and stress relaxation
- Radionuclide diffusivity
- Others as specified by ASTM Sec III Div 5



Fuel Qualification

- Fuel salt heat capacity
- Fuel salt thermal conductivity
- Fuel salt viscosity
- fuel salt lanthanide solubility
- Fuel salt thermogravimetric analysis

4 Million in private capital invested to leverage lab capabilities at INL, ANL, and ORNL

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