
Terrestrial Energy
Carbon-Free Energy for Global Industry
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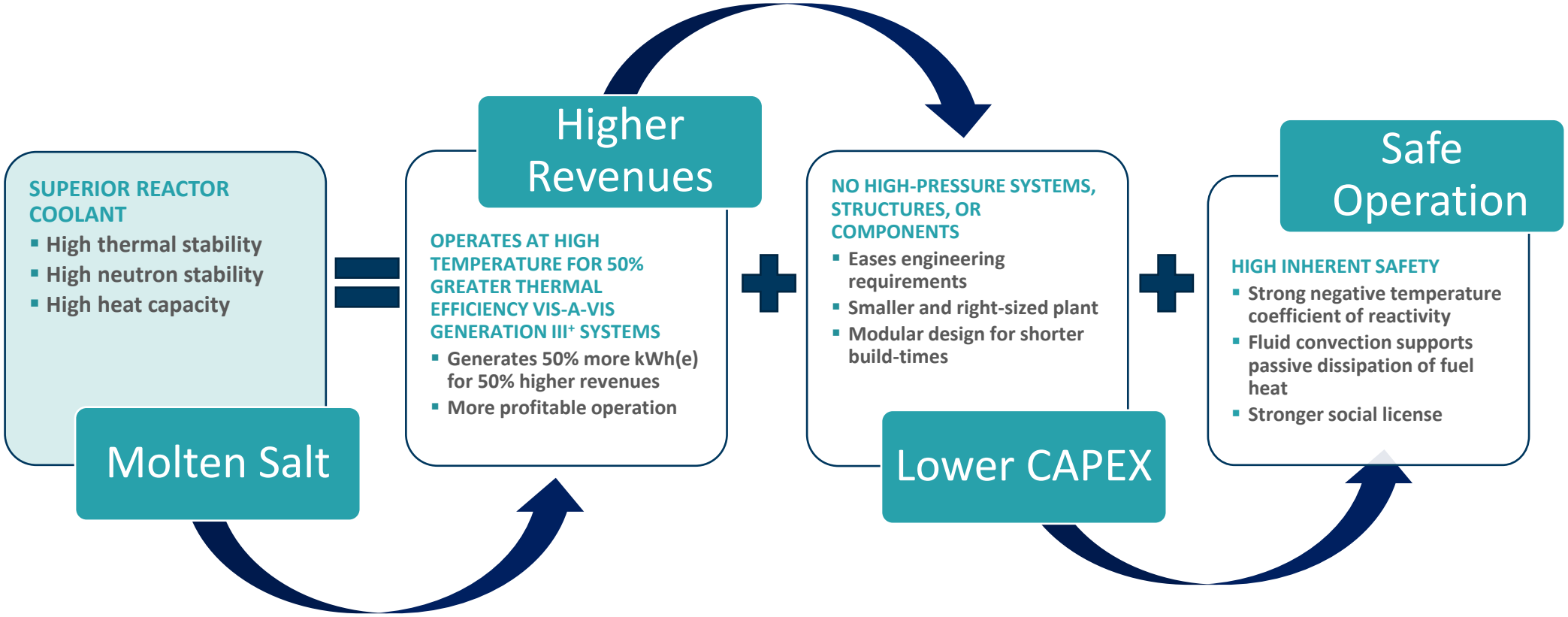
TERRESTRIAL ENERGY

Technology and design choices drive economics and use-cases for nuclear energy

Molten salt reactor technology permits safe high-temperature and low-pressure operation. This is essential for industrial cogeneration and economic performance



Fundamental technology advantages give clear potential to transform economics and use-case of nuclear energy in competitive energy markets

WHAT IS TERRESTRIAL ENERGY'S IMSR®?

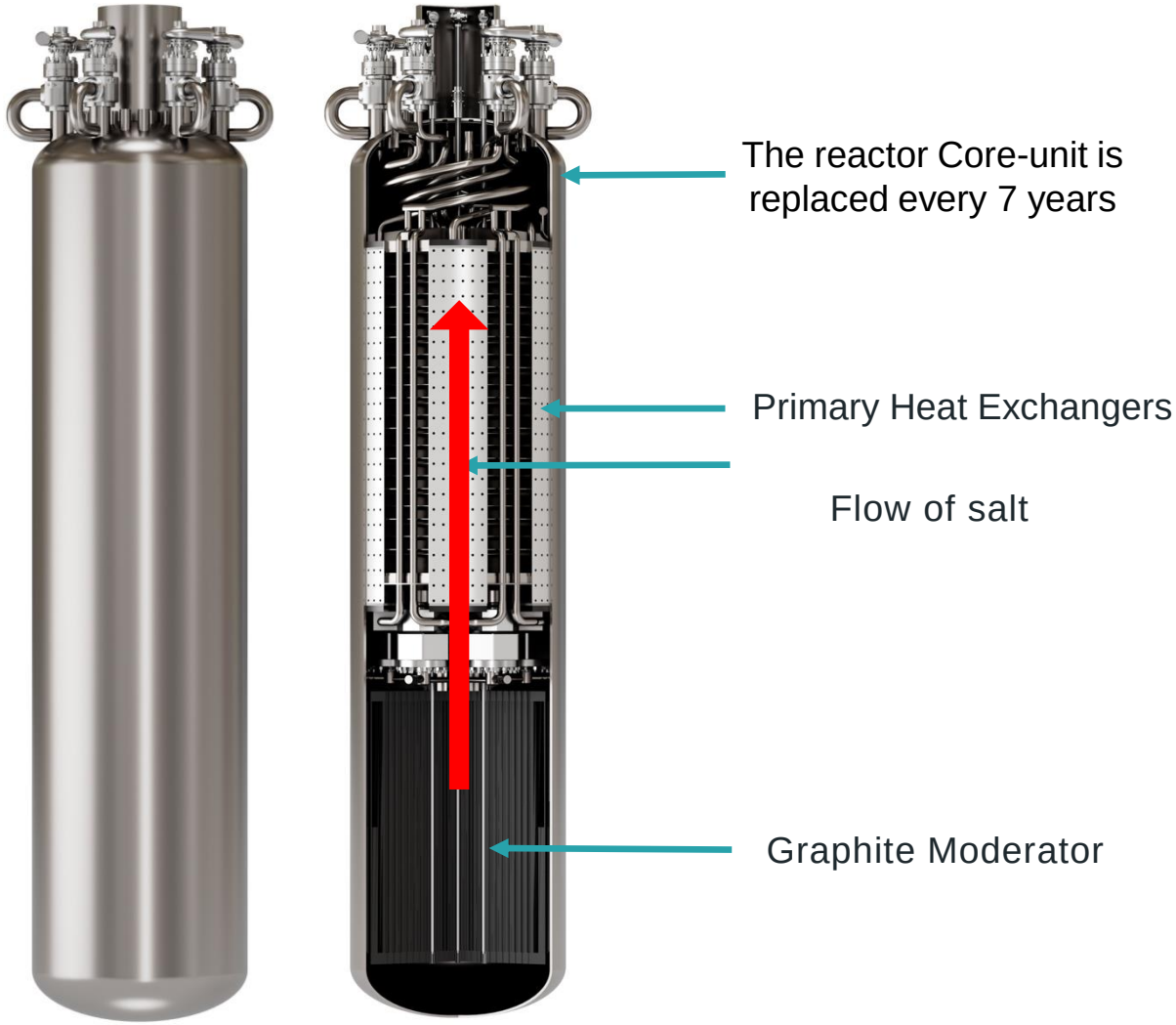
Integral Molten Salt Reactor

- Graphite moderated converter, liquid fluoride salt fueled
- Standard Assay LEU fuel, ~2% LEU startup and <5% LEU makeup
- Integrates all primary systems into a sealed reactor vessel
- 7 year Core unit "Seal and Swap" approach to graphite lifetime
- 3.7 m wide Core-unit for eased transportability
- Simple carrier salt. Commercially available, low cost and very low tritium
- Passive decay heat removal ***in situ*** without dump tanks
- Safety at forefront which leads to cost innovation

Key innovation – the sealed and replaceable IMSR Core-unit

- Key innovation is integration of primary reactor components
  - *Reactor core*
  - *Primary heat exchanger*
  - *Pumps*
- Into a sealed, compact and replaceable reactor vessel
  - *With a 7-year operating life*
- This “integral” design captures commercial value through
  - *High inherent safety*
  - *Operational simplicity*
  - *High capital efficiency*
- Patents pending and granted
  - *65 patents granted across 5 invention families*
  - *Portfolio of trade secrets*

IMSR® Core-unit and in cross-section



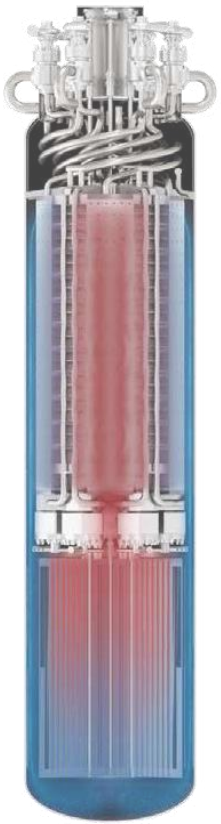
Regulatory engagement

- Regulatory program started early and with CNSC's phased Vendor Design Review (VDR) process
- CNSC's VDR scope covers all aspects of IMSR Plant construction, operation and decommissioning
  - *Commenced VDR in early 2016 and completion expected early 2023*
- Commenced USNRC regulatory engagement in 2017
  - *Strategy is a 10CFR Part 52 Standard Design Approval of the IMSR Core-unit*
- Participated in a joint agency (CNSC/USNRC) collaborative regulatory review of IMSR
- Commenced International Atomic Energy Agency (IAEA) engagement in 2020
  - *IMSR security and safeguards underway with Canadian Nuclear Laboratories*

Fuel Cycle Details

- Fuel salt production is relatively straight forward. UF6 from enrichment plants is reduced to UF4 and mixed with low cost carrier salts. Fuel qualification of liquid fuels is a lesser challenge as long term irradiations programs are not expected to be required due to their proven stability under irradiation
- IMSR runs on a ***Modified*** Once Through fuel cycle
  - *Initial Core-unit started with clean fuel salt with ~2% LEU*
  - *4.95% LEU Makeup Fuel salt added over 7 year life of first core unit*
  - *~50% increase in salt volume over 7 years as no online removal planned*
  - *To start all subsequent Core-units about 2/3rd of fuel salt transferred directly to new Core-unit and 1/3rd sent to a nearby used salt storage tank*
  - *Fission product concentration remains low for plant lifetime*
- Used salt in storage has potential for direct use as startup for fleet expansion
- Minimizes total used salt by end of plant life to ~100 m3
- Reduces Pu production to about 50% of LWR per kwh as high in-situ self consumption
- Fission product inventory reduced by about 1/3rd simply from higher thermal efficiency vs LWRs

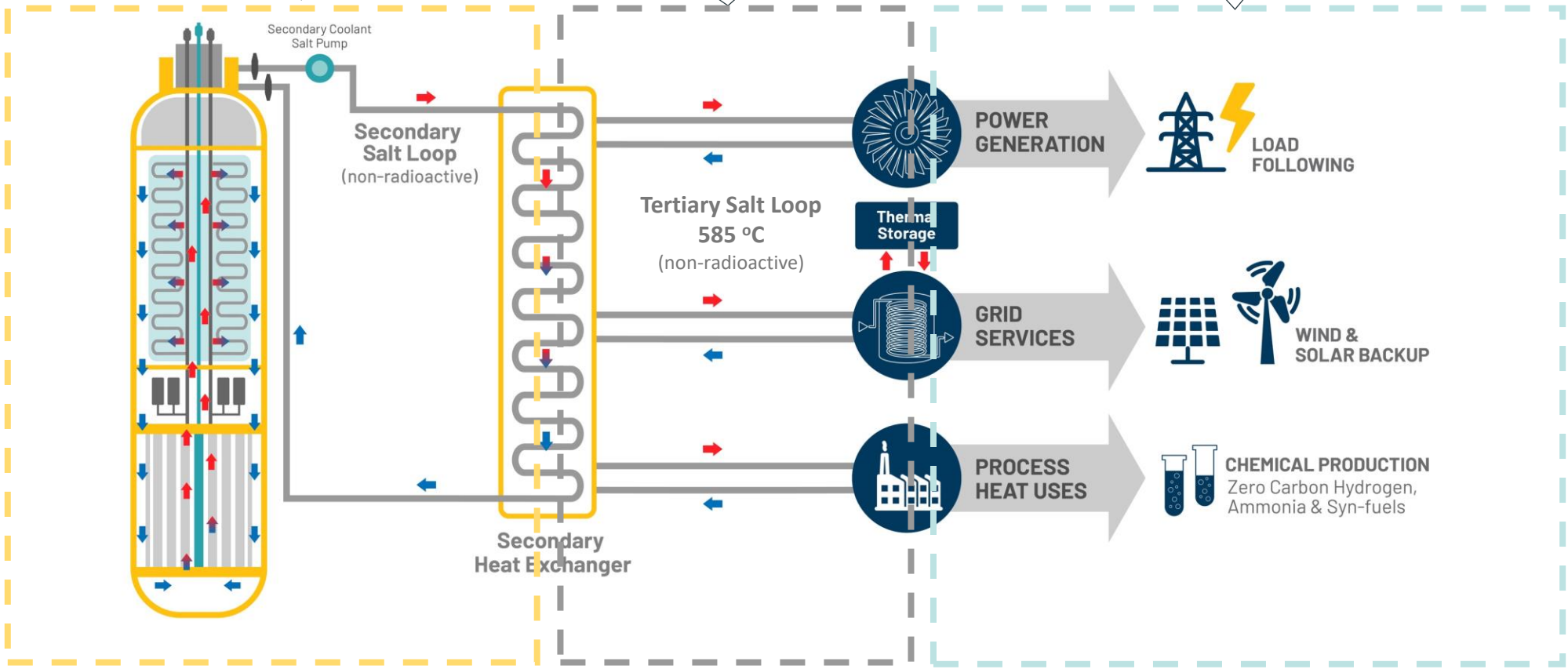
How an IMSR cogeneration plant works



IMSR Nuclear Facility
Standardized and modular nuclear-grade systems

IMSR Thermal and Electric Facility
Customized systems and modular industrial-grade (non-nuclear) systems supply thermal and electric power

Industrial user
Site with thermal and electric power requirements



IMSR Thermal and Electric Facility is customized to heat duties that are site and application specific

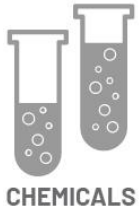
IMSR cogeneration

585 °C	IMSR generates the high-temperature heat essential for industrial cogeneration and net-zero
822 MWt / 390 MWe	Net IMSR Plant generating capacity
< $6 MMBTU	Levelized cost of “in-furnace” thermal energy generated from IMSR operation
~50%	Increase in electric power generation efficiency compared to water-cooled-water-moderated (conventional) NPPs
< $50 per MWh	IMSR Levelized cost of electric power generation
< 5 grams CO_2e	Full life-cycle grams of CO_2-equivalent per kilowatt-hour of electricity versus 825 for coal and 475 for natural gas
< 7 hectares	300 m x 200 m plant footprint delivers 390 MW of electric power
< 5% enriched LEU	Standard nuclear fuel has higher international acceptance and is available today

IMSR technology and plant design ideal for cogeneration and electric grid needs

Markets for IMSR cogeneration plants

Industry



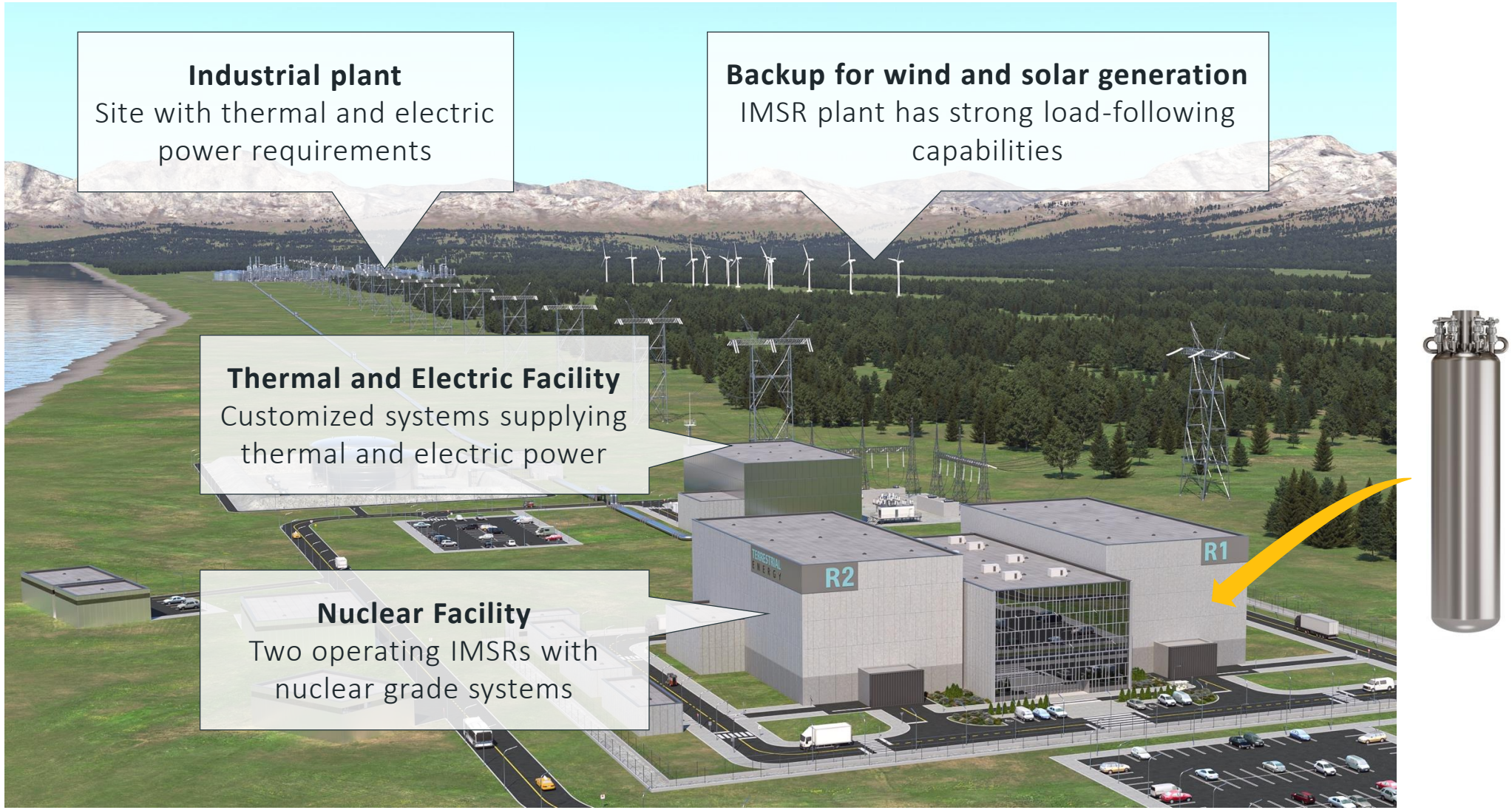
- Industrial users of cogen
  - IMSR offers a unique combination of high-efficiency electric power and 585 °C heat generation
  - *Chemical industry:*
    - Green-hydrogen production at scale and lowest cost
    - Green-ammonia, urea, fertilizers…
  - *Petrochemical industry*
    - Upgrading, refining, gas-to-liquids, synthetic transport fuels…
  - *Natural resource extraction*
  - *Steel refining*
- Electric power utility
  - *High-efficiency electric power generation*
    - Dispatchable, rapid load-following with “black start” capability for grid resilience
    - Re-powering coal power plants

Geography

- Focused on existing nuclear capable markets
  - *With clear nuclear policy support*
  - *With clear industrial policy support for green hydrogen and green ammonia production*
- IMSR Plant deployment ready in leading markets
- Deployment support by strong business case
  - *Many use-cases from “high-quality” thermal energy supply*
  - *Customization of Thermal and Electric Facility*
  - *Levelized cost of heat: less than $6 / MMBTU*
  - *Superior thermal efficiency (~44% net)*
  - *Levelized cost of electricity: ~$50/MWh*

IMSR Plants enable many industries and nations to meet economic and net-zero goals

IMSR plant supplies high-temperature industrial heat and electric power



Thermal and Electric Facility can be customized to the cogeneration requirements of an industrial plant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