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# Idaho National Laboratory Fusion Safety Program Overview

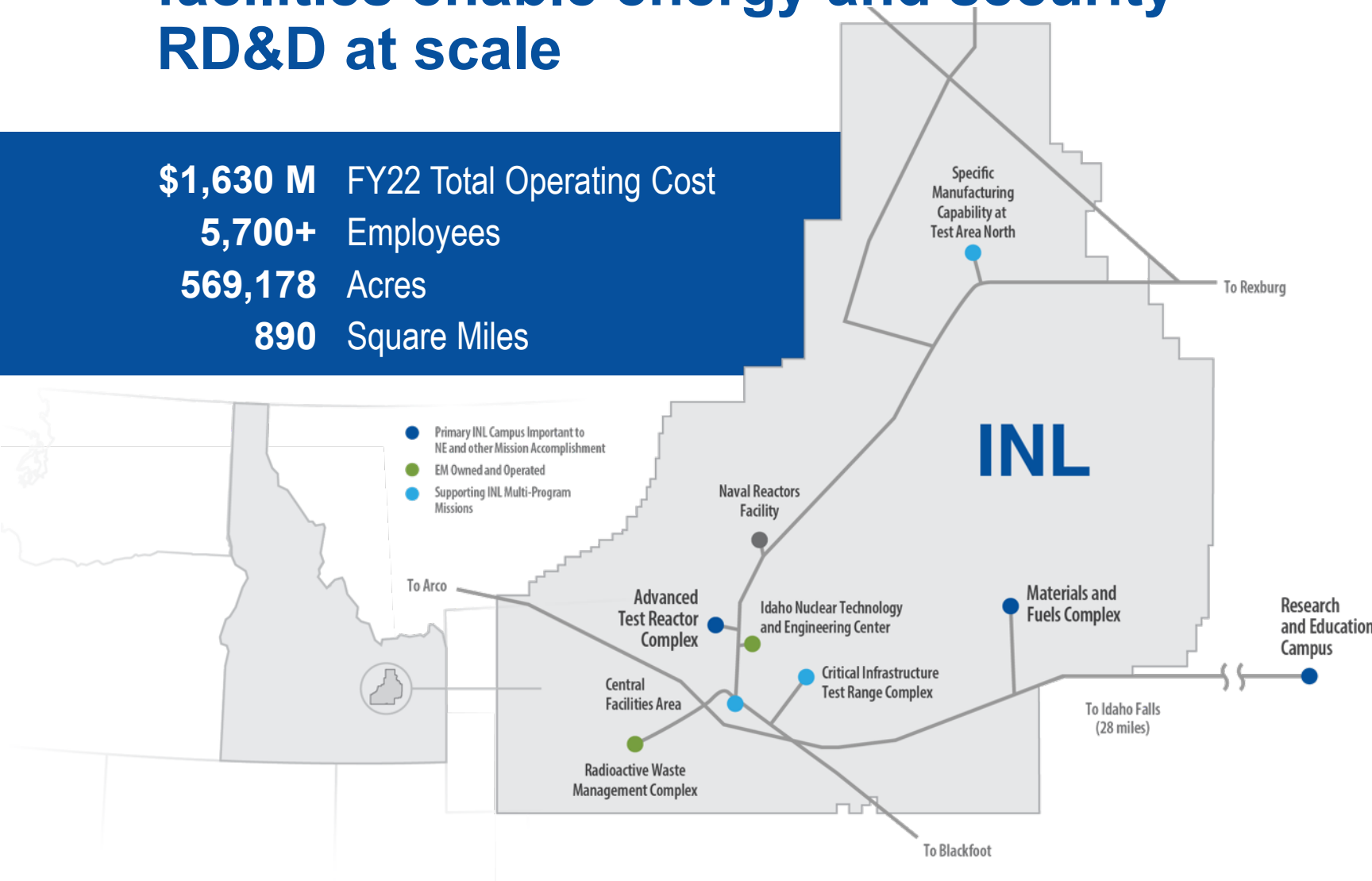
INL is managed by Battelle Energy Alliance  
for the US Department of Energy



Idaho National Laboratory

# Unique INL site, infrastructure, and facilities enable energy and security RD&D at scale

**\$1,630 M** FY22 Total Operating Cost  
**5,700+** Employees  
**569,178** Acres  
**890** Square Miles



**4** Operating reactors

**12** Hazard Category II & III non-reactor facilities/ activities

**50** Radiological facilities/activities

**17.5** Miles railroad for shipping nuclear fuel

**44** Miles primary roads (125 miles total)

**9** Substations with interfaces to two power providers

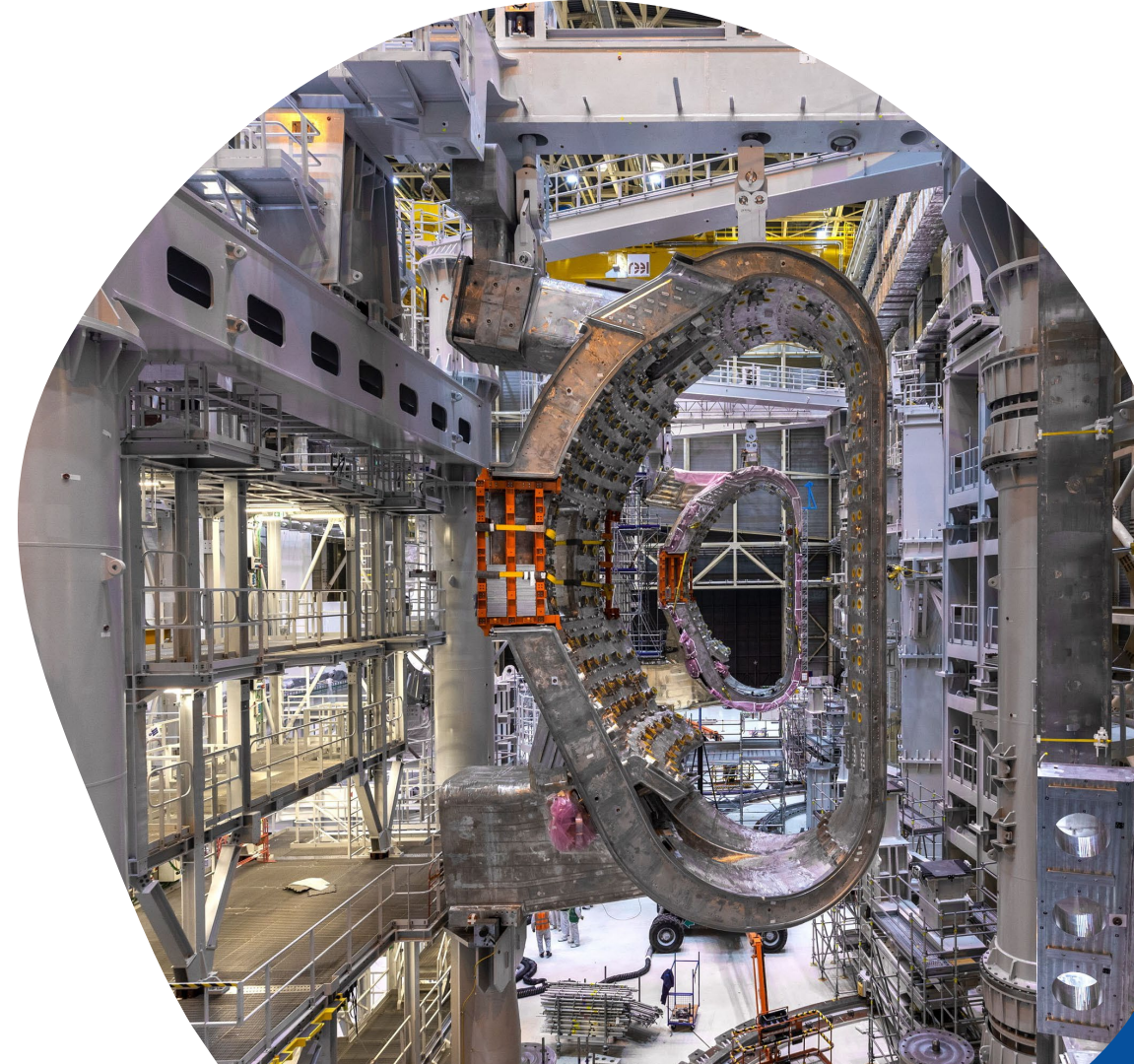
**126** Miles high-voltage transmission lines

**3** Fire Stations

# The INL Fusion Safety Program

- In the last 30 years INL has provided an essential contribution to the Office of Fusion Energy Science by providing safety analysis in support of the design of fusion energy systems.
- Modeling and simulation activities focus on the potential risks and hazards associated with fusion energy and the safety assessment of magnetic fusion energy systems.
- Current work supports the Department of Energy 'Bold Decadal Vision for Commercial Fusion Energy' and the engagement with the emergent fusion private sector.

MELCOR is an engineering-scale code designed to model severe accident conditions in a nuclear environment. A version of the code developed at INL for fusion applications is used to support the design and fabrication of ITER, under construction in southern France. ITER operation will demonstrate the commercial viability of fusion as energy source.



# The INL Fusion Safety Program

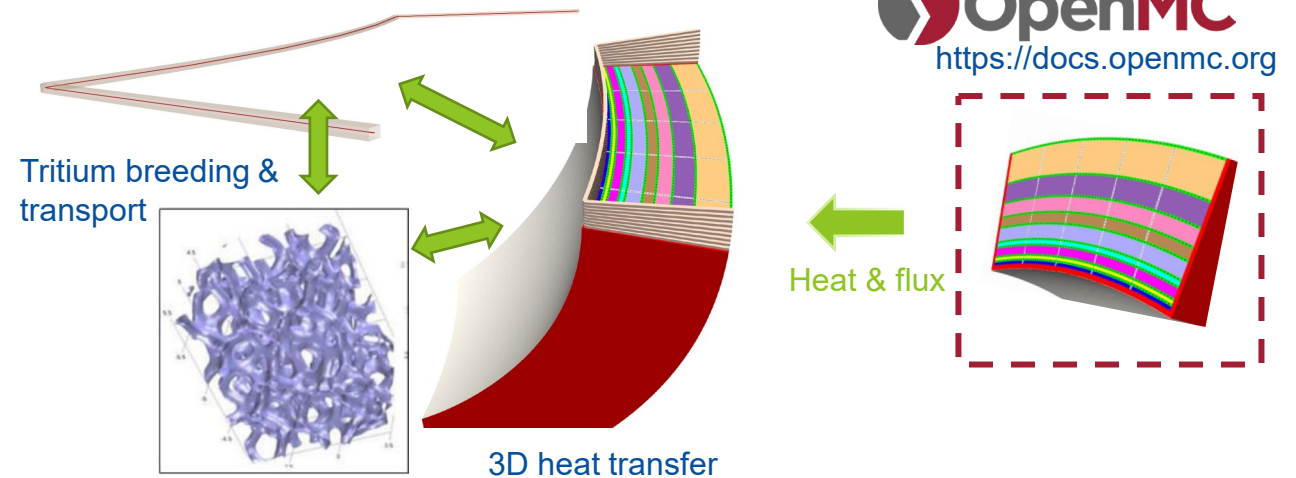
INL operates the Safety and Tritium Applied Research (STAR) facility, dedicated to experimental research on the potential risks and hazards associated with tritium retention and permeation in fusion material and the development of technologies to minimize the environmental impacts of fusion energy.

After the recognition of fusion energy science as a core capability for the laboratory, INL is expanding the scope of research activities to include multi-physics modeling (leveraging on the MOOSE framework) and fusion blanket components testing.

STAR is a DOE less-than Hazard Category 3 nuclear facility with a maximum allowable tritium inventory of 1.6 gram (~ 15,390 Ci), radioactive and hazardous materials (beryllium, lead) handling capability



<https://mooseframework.inl.gov/>



Kong, Fande, and Paul W. Humrickhouse. "Toward a Fully Integrated Multiphysics Simulation Framework for Fusion Blanket Design." *IEEE Transactions on Plasma Science* (2022).

***Thank you! Happy Holidays from Idaho!***



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