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Suomi-reaktori - the FinReactor for pure heat applications

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Clean District Heating with Small Nuclear Reactors -seminar, Helsinki, March 29, 2019


LAPPEENRANTA UNIVERSITY OF TECHNOLOGY STRATEGY 2020
TRAILBLAZER
Show the way.
Never follow.

The need for heat

In Finland, space heating emits 5 to 10 MtCO_2 annually – more than electricity production

District heating networks already exist. They require heat at 90..120 °C, a very modest requirement

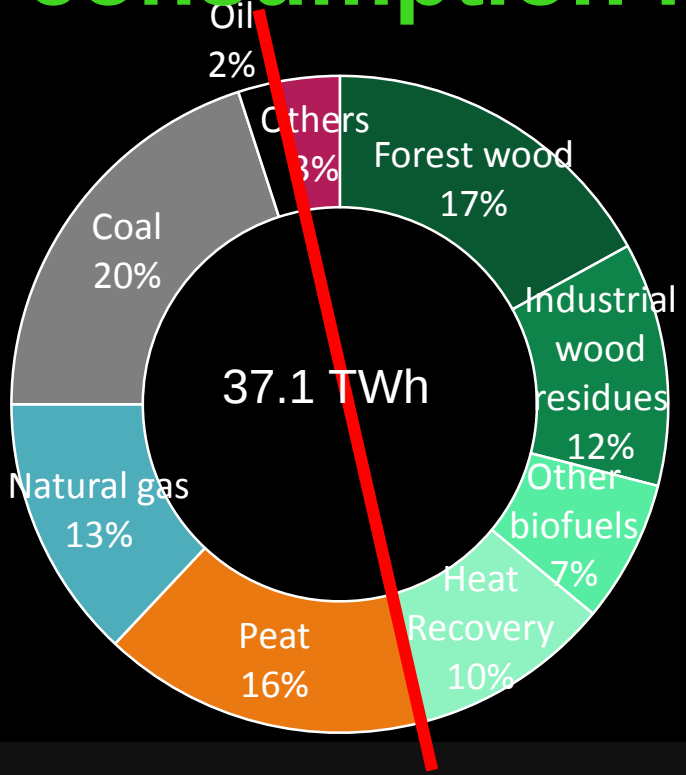
→ The heating reactor could be low pressure, low temperature, low risk

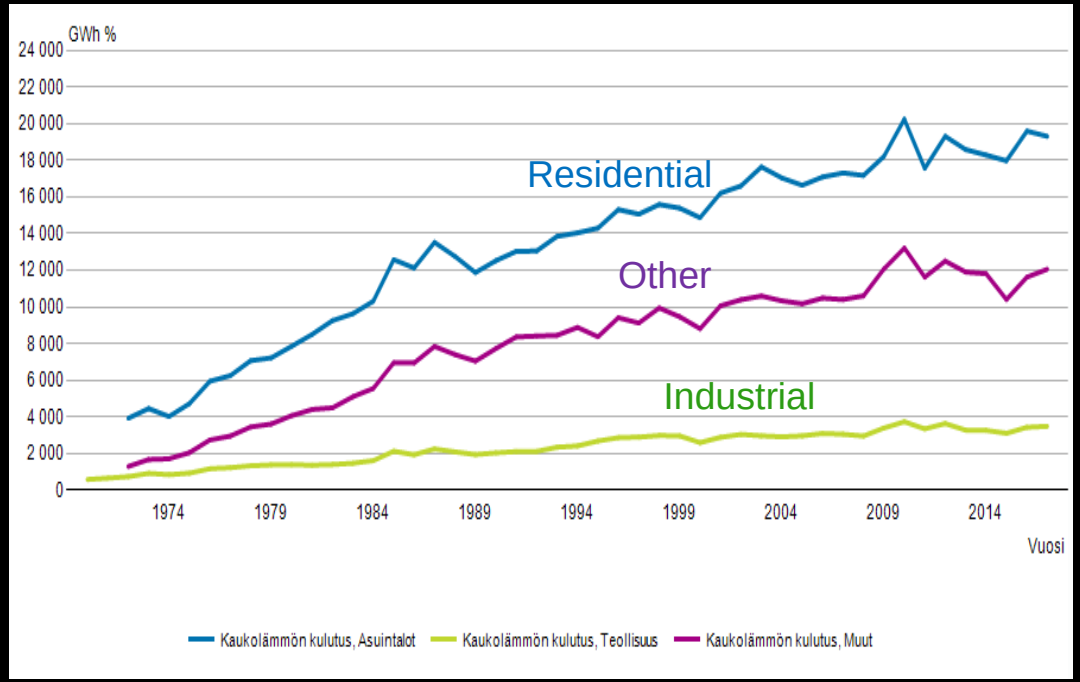
Other uses for heat at same temperature range:

- District cooling in the summertime
- Desalination

→ Potential for global market

District heating supply and consumption in Finland 2018





The opportunity

The Finnish society is ready for nuclear decentralisation

- Hanhikivi 1, a big electricity plant, is on a **greenfield site** chosen in **2011**

Cogeneration / District heating

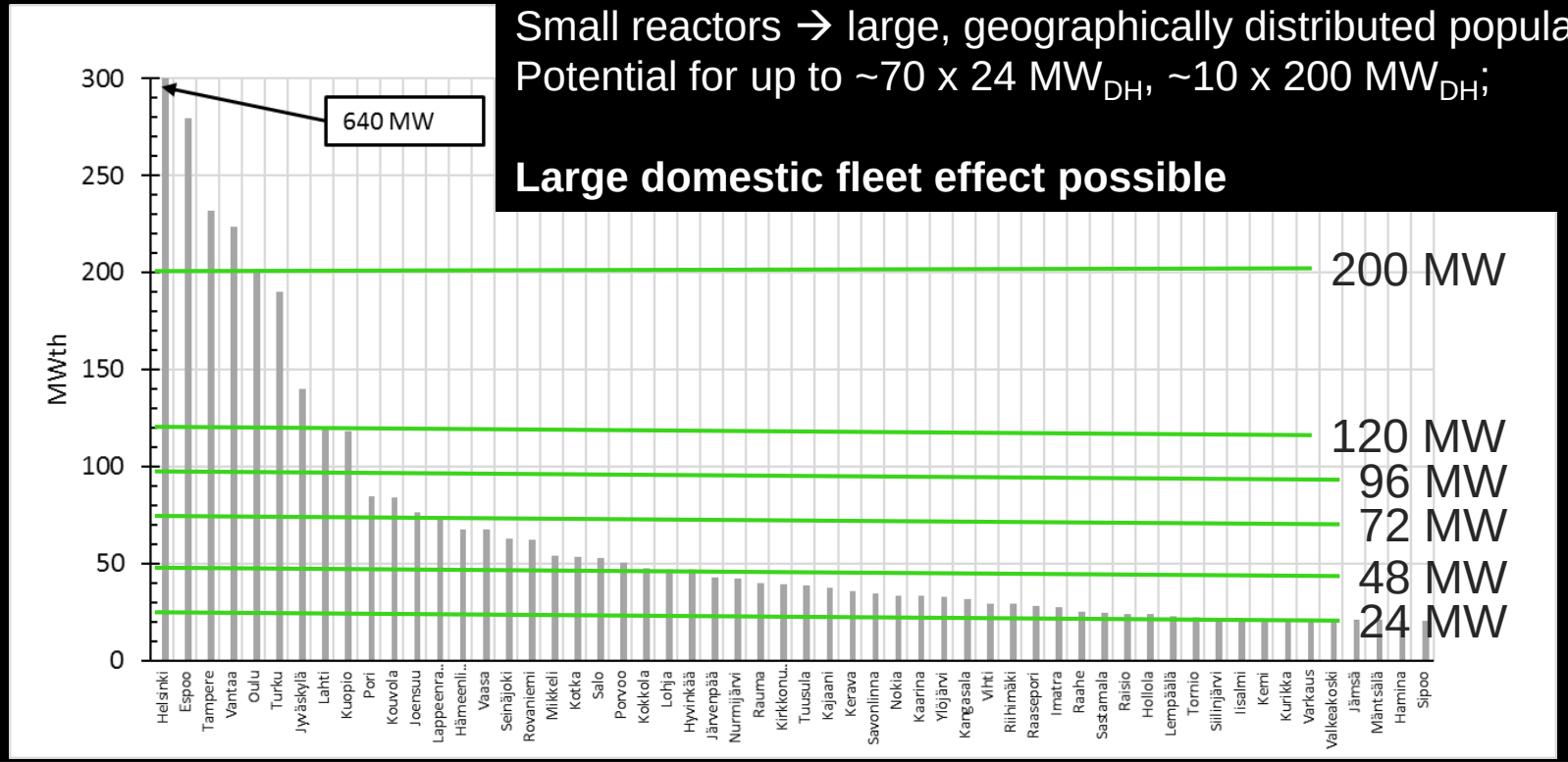
- Possible on many new sites around the country
- District heating networks already exist on population centres

→ Plug-an-play compatibility for heat source

Finnish population centres are small

Small reactors → large, geographically distributed population.
Potential for up to ~70 x 24 MW_{DH}, ~10 x 200 MW_{DH};

Large domestic fleet effect possible

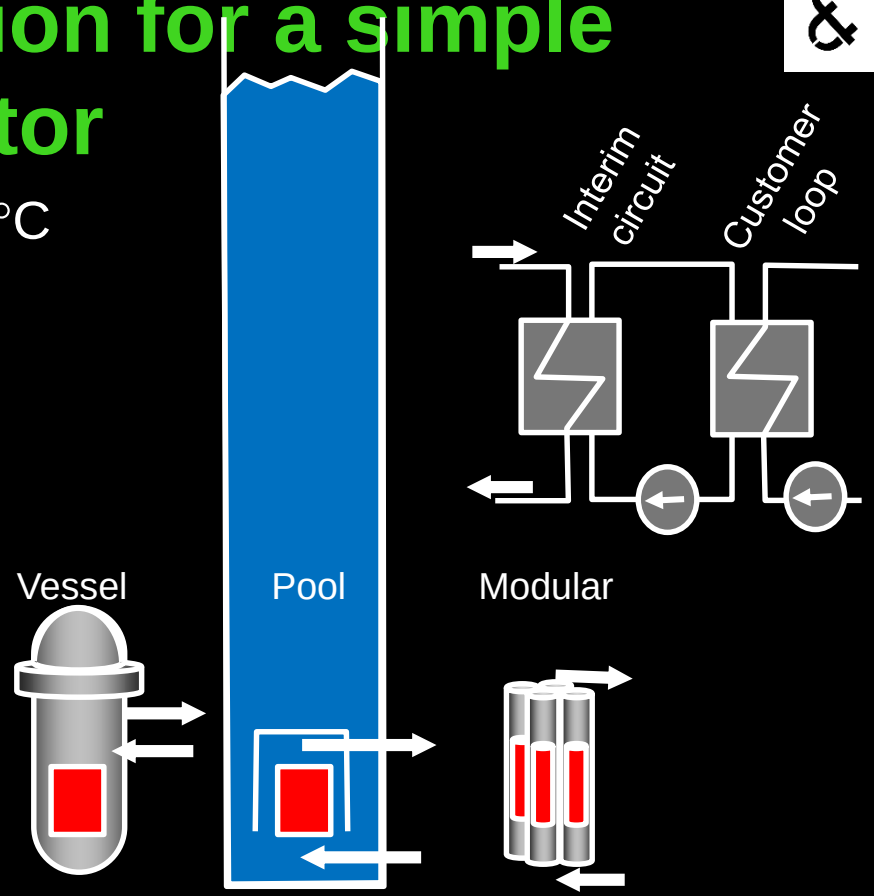


FinReactor: the solution for a simple low temperature reactor

Low temperature and pressure: 180 °C and 1.5 MPa – component manufacture in Finland feasible

Familiar light water reactor technologies and fuels, no waste problems

Utter simplicity for low cost, simple regulation, and high safety



FinReactor: the solution for a simple low temperature heating reactor

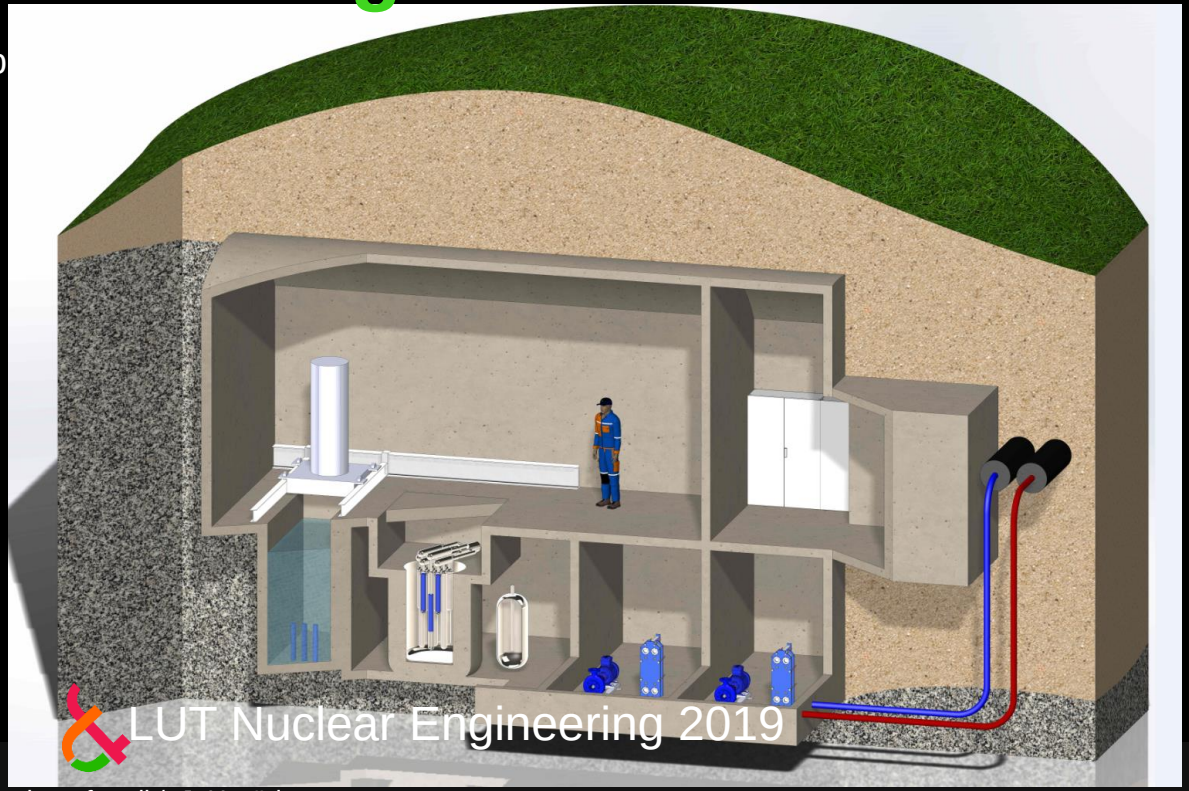
Energy efficiency near 100 %

Below-grade siting

Unmanned (remote) operation possible

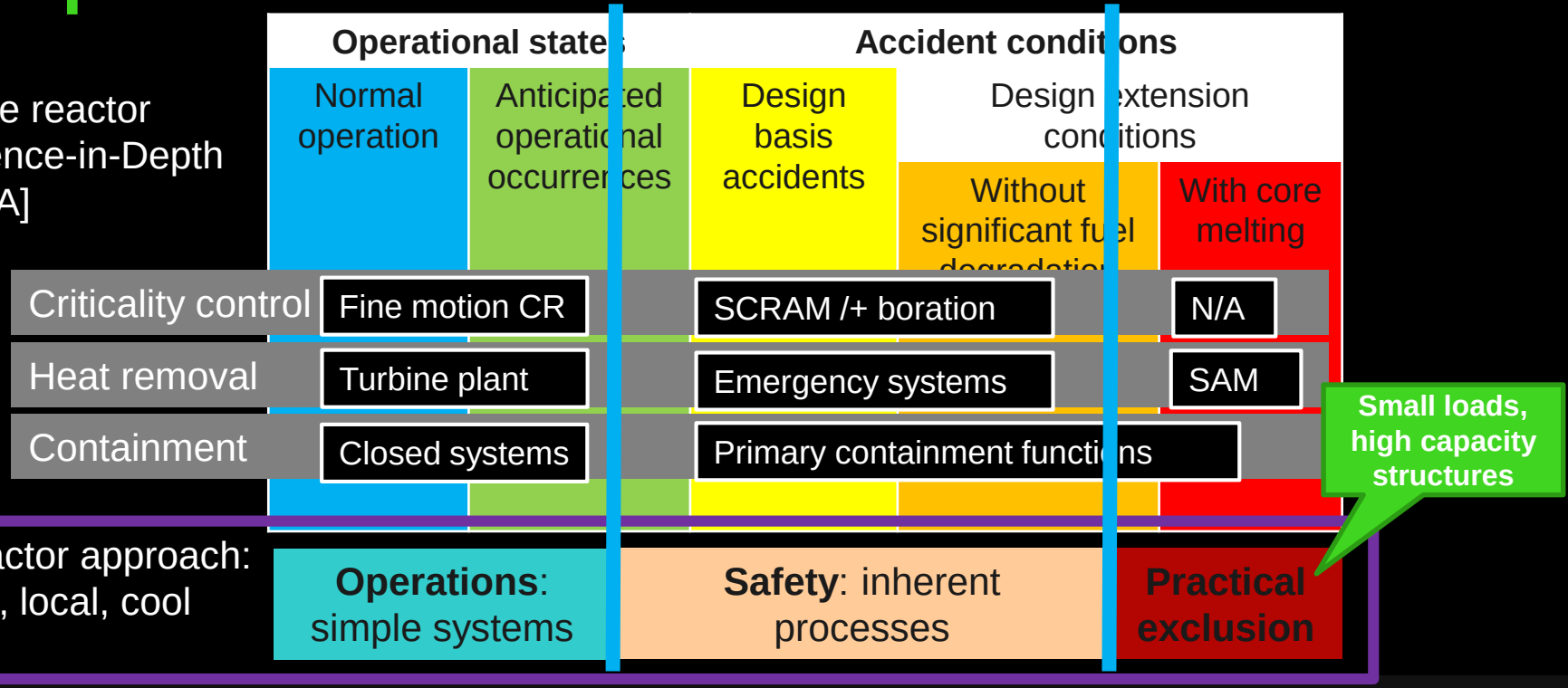
Scalable modular design, standard industrial components

Inherently safe, secure and proliferation resistant



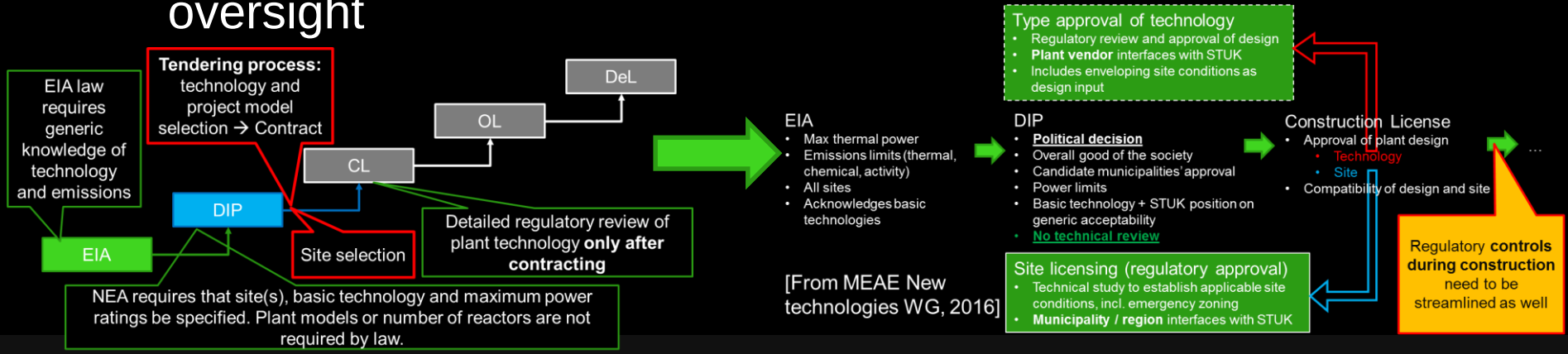
FinReactor safety: simplify present requirements

Large reactor Defence-in-Depth [IAEA]



The challenge

- Revamping nuclear licensing and regulation to enable cost-effective deployment of clean technology
- From one-off licensing to site and technology approvals
- Towards practical implementation and operations oversight



Conclusions on Suomi-reaktori

- LUT develops the FinReactor, a 24 MWth low-temperature heating reactor
- District heating reactors are immediately feasible in Finland, with major climate benefits
- Optimal vehicle for involving Finnish industries and supporting a licensing and regulations update

Thank you!

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