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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

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29.3.2019

The FinReactor - clean heat for all / J.
Hyvärinen



The need for heat

In Finland, space heating emits 5 to 10 MtCO₂ 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

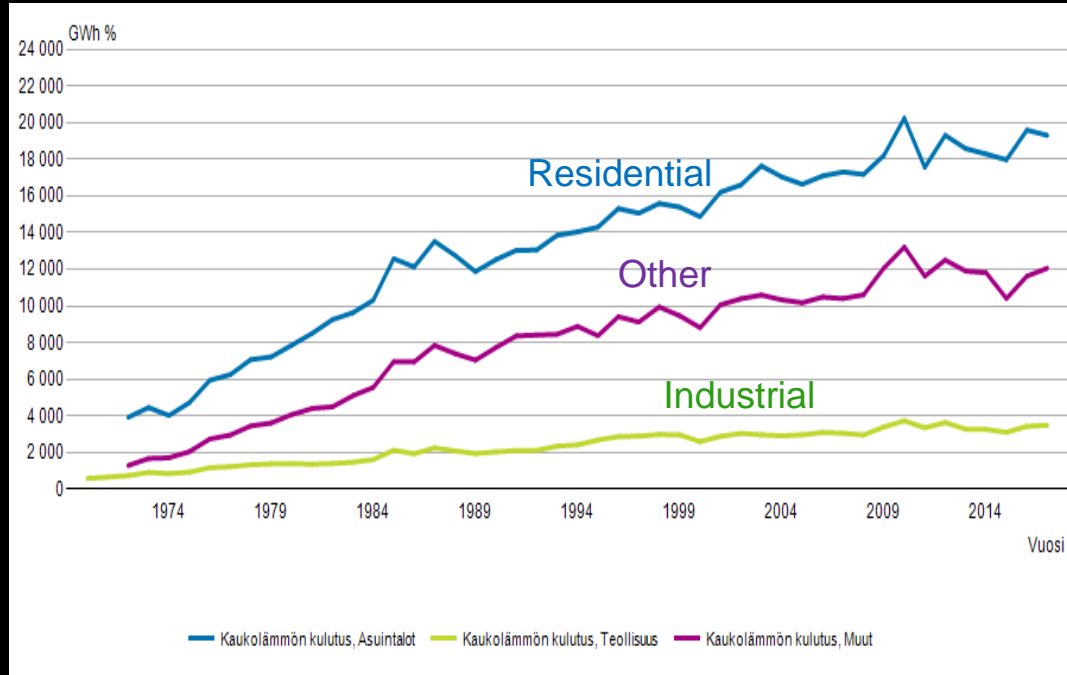
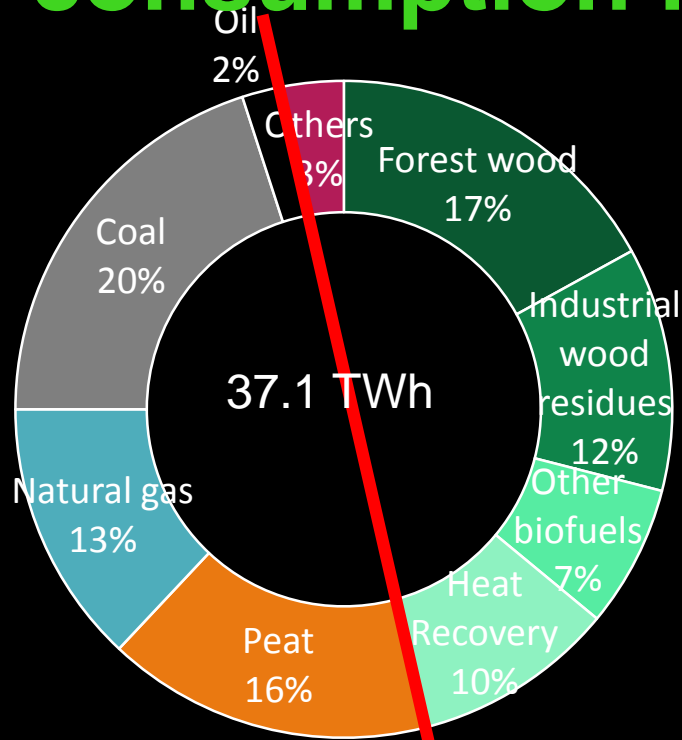
Other uses for heat at same temperature range:

- 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

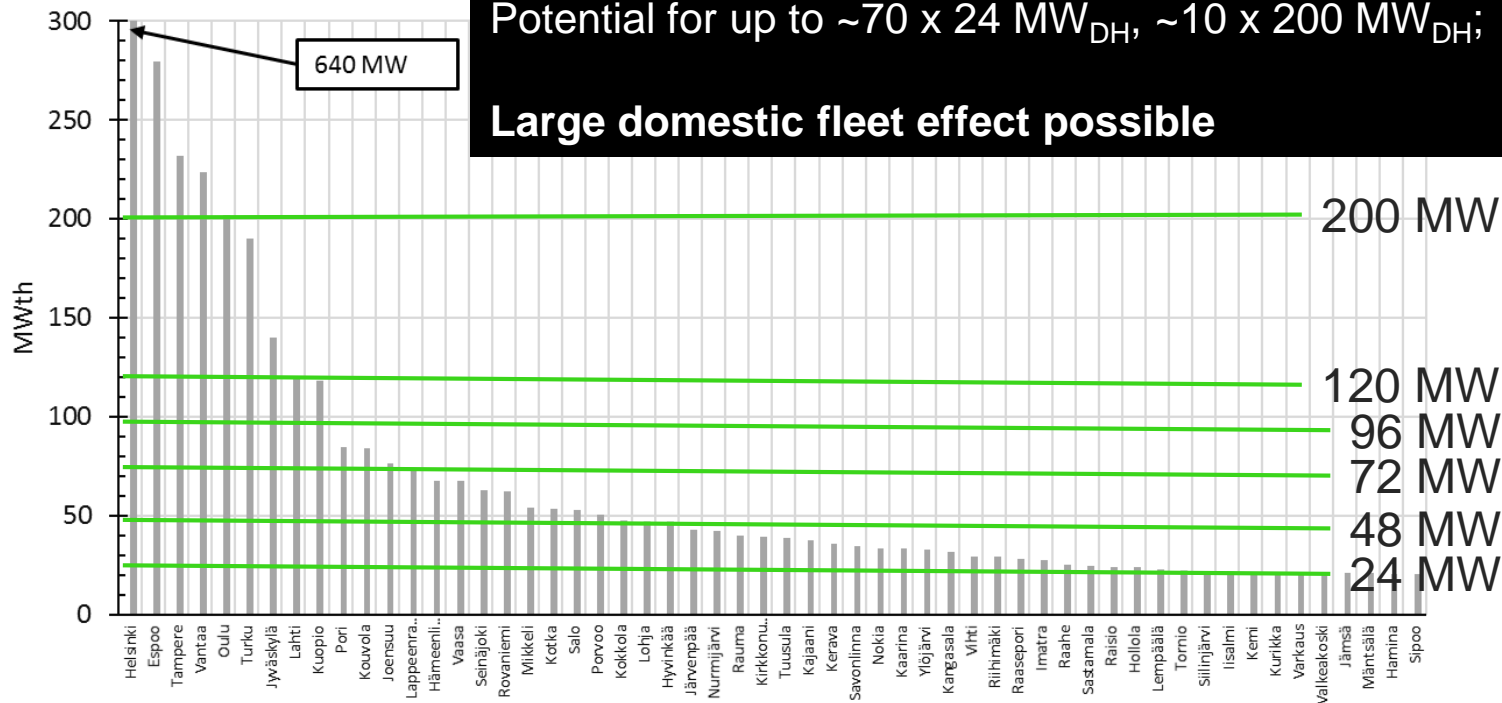




Finnish population centres are small

Small reactors → large, geographically distributed population.
Potential for up to $\sim 70 \times 24 \text{ MW}_{\text{DH}}$, $\sim 10 \times 200 \text{ MW}_{\text{DH}}$;

Large domestic fleet effect possible



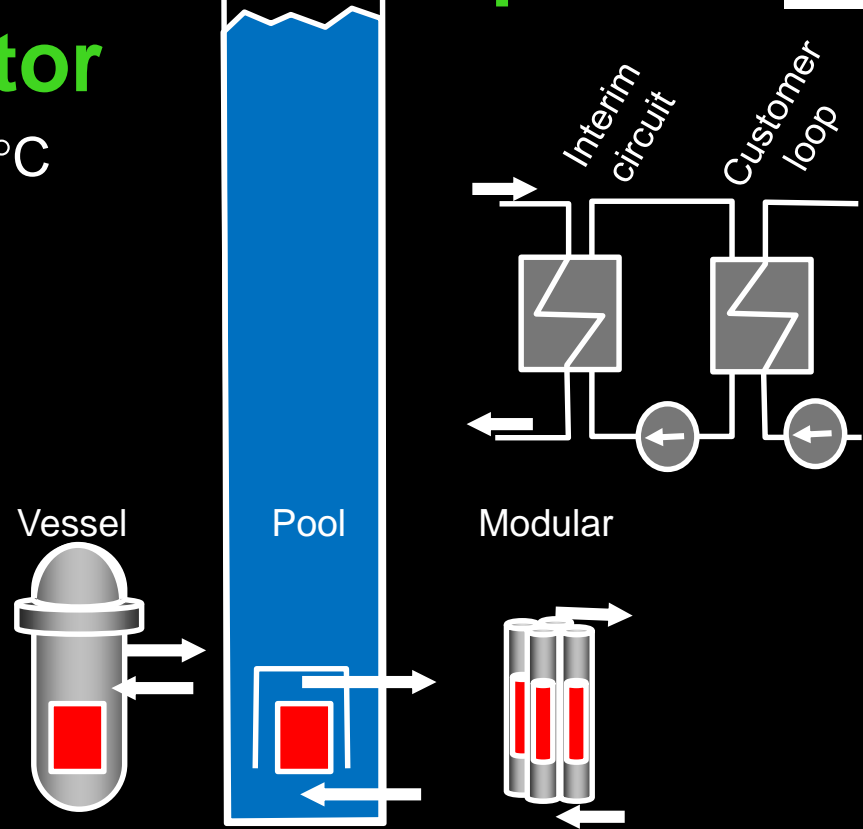
FinReactor: the solution for a simple low temperature reactor



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

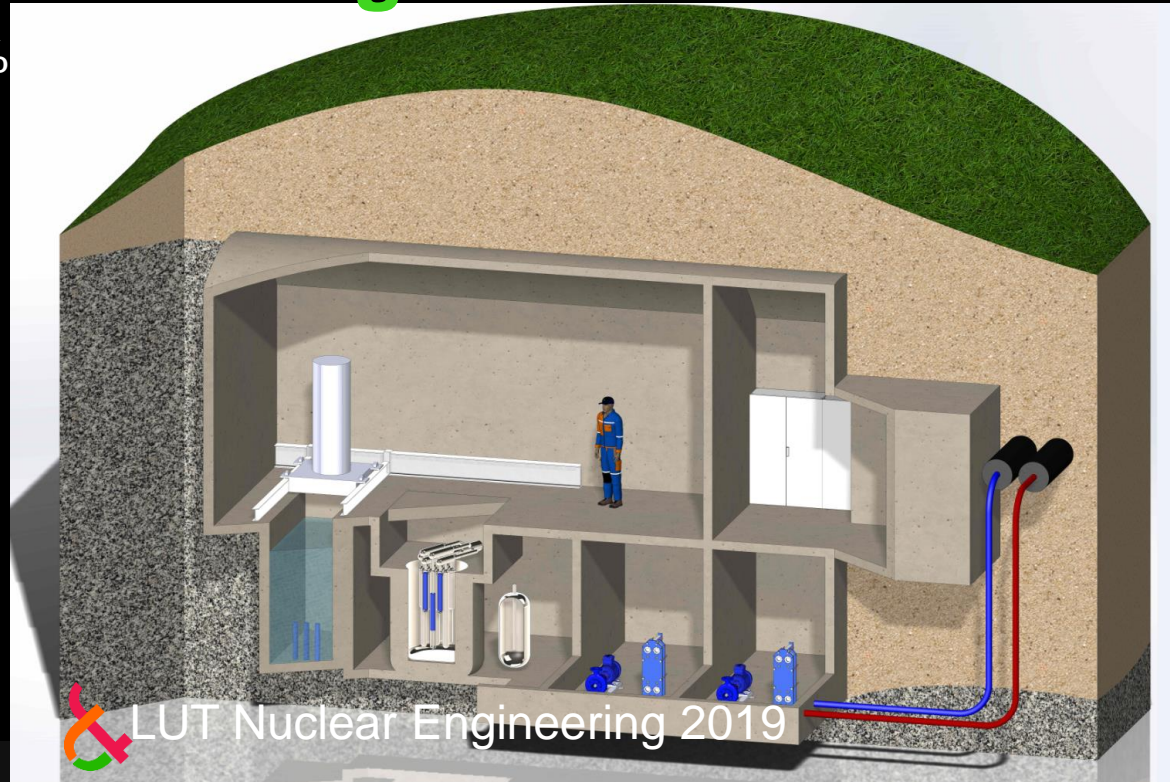
Energy efficiency near 100 %

Below-grade siting

Unmanned (remote) operation possible

Scalable modular design, standard industrial components

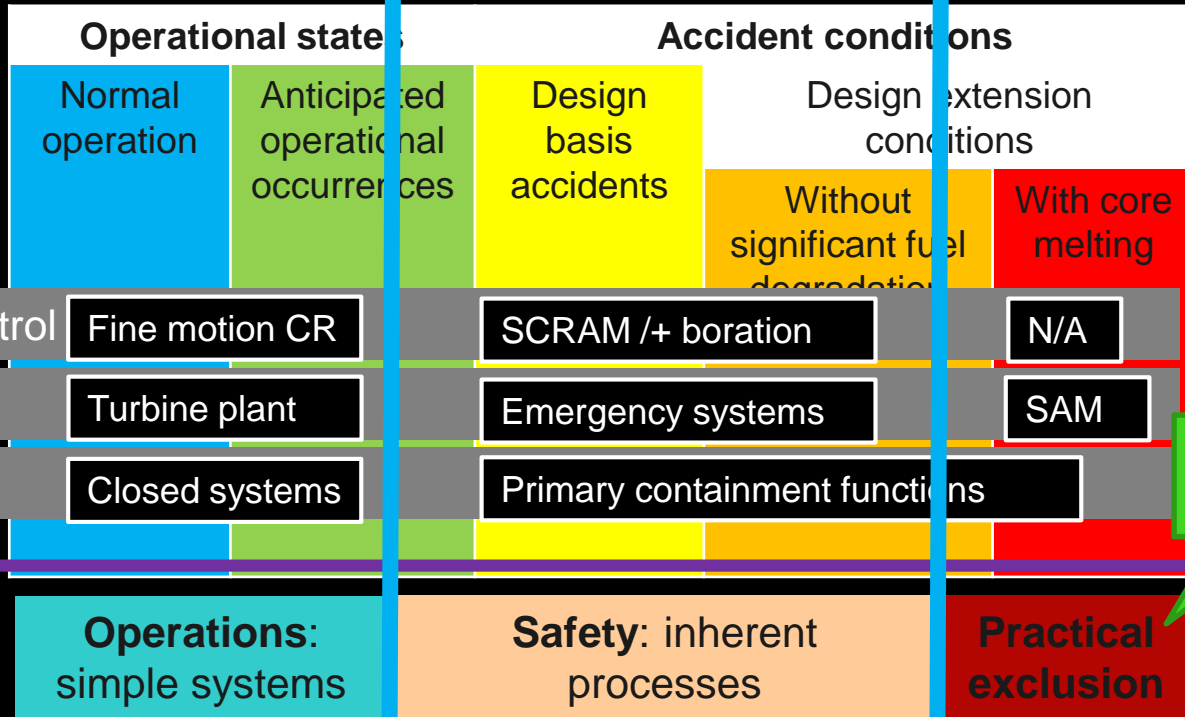
Inherently safe, secure and proliferation resistant





FinReactor safety: simplify present requirements

Large reactor
Defence-in-Depth
[IAEA]

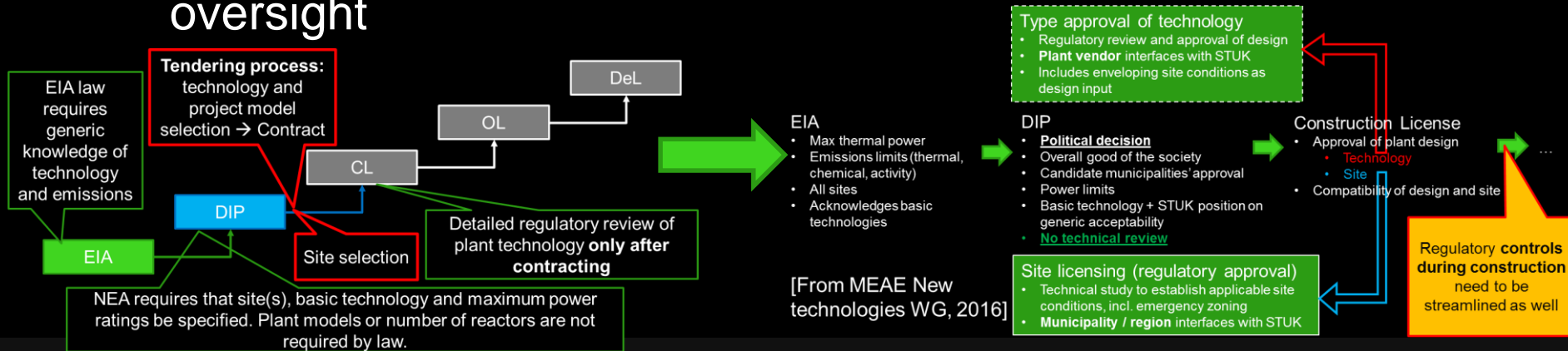


Small loads, high capacity structures



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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