

# **Human in the Loop: The Changing Role of Humans in New Advanced Reactor Designs**

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A group of people are seated around tables in a meeting room, engaged in discussion. In the foreground, two individuals are wearing dark blue hoodies with "RISK PILOT" printed on the back. The background shows a presentation screen and other participants. The overall atmosphere is professional and collaborative.

# Risk Pilot

For over 20 years, Risk Pilot's consultants have developed reliable systems and assessed, mapped and minimized the risks associated with operations where **safety is the highest priority**.

Our cross-functional competence includes **risk management, systems engineering and human factors (HTO)**.

We work with consultancy and R&D assignments primarily in the nuclear power industry (including new build), as well as transport, rail and healthcare.

# New nuclear in Sweden

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## Sweden plans 'massive' expansion of nuclear energy

17 November 2023 [Share](#)

The Swedish government unveils a roadmap which envisages the construction of new nuclear generating capacity equivalent to at least two large-scale reactors by 2035, with up to ten new large-scale reactors coming online by 2045.



The roadmap was presented by (from left) Finance Minister Elisabeth Svantesson, Labour Market and Integration Minister Johan Pehrson, Energy and Business Minister Ebba Busch and the chairman of the Business Committee Tobias Andersson (Image: regeringen.se)

- ▼ 3 nuclear power plants (6 reactors) currently in operation – Ringhals, Forsmark, Oskarshamn.
  - Mix of BWR & PWR.
  - Currently generating about 1/3 of Sweden's electricity.
- ▼ Nov 2023 – Swedish government announced plans to construct 2 large-scale reactors by 2035 and the equivalent of 10 new reactors, including SMRs, by 2045.



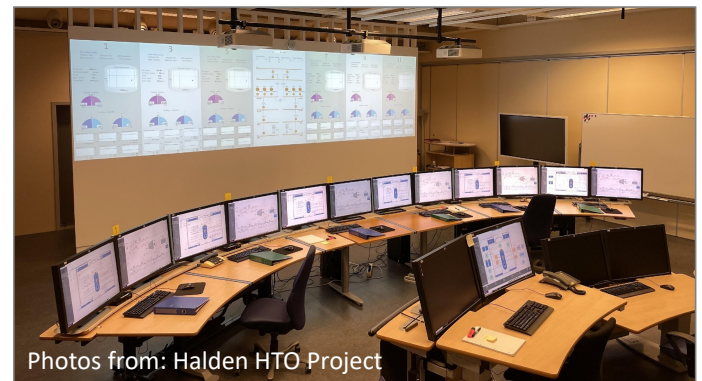
# Previous SMR research

## ▼ “Human Performance in Operation of Small Modular Reactors”

- Halden HTO Project, Norway
- Ongoing research topic since 2018
- Experimental approach, testing licensed nuclear operators in the Halden SMR simulator.

## ▼ Research topics:

- Multi-unit operation & disturbances
- Staffing, roles & responsibilities
- Monitoring strategies & workload
- Remote operation
- Changing role of the operator



Photos from: Halden HTO Project



*What do you see as the greatest human factors challenge or opportunity we will face in the nuclear industry in the future?*

- ▼ Understanding the impact of advanced technology (incl. automation and AI) on human performance & reliability.
- ▼ Will we still need to keep the human in the loop, and if so, how?
- ▼ How will we evaluate this from a human factors perspective?
  - Methodology?
  - Data to substantiate reliability claims?
  - Expectations from the regulator?

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