Decommissioning of research reactors in Finland

SAMIRA workshop 13th November 2019

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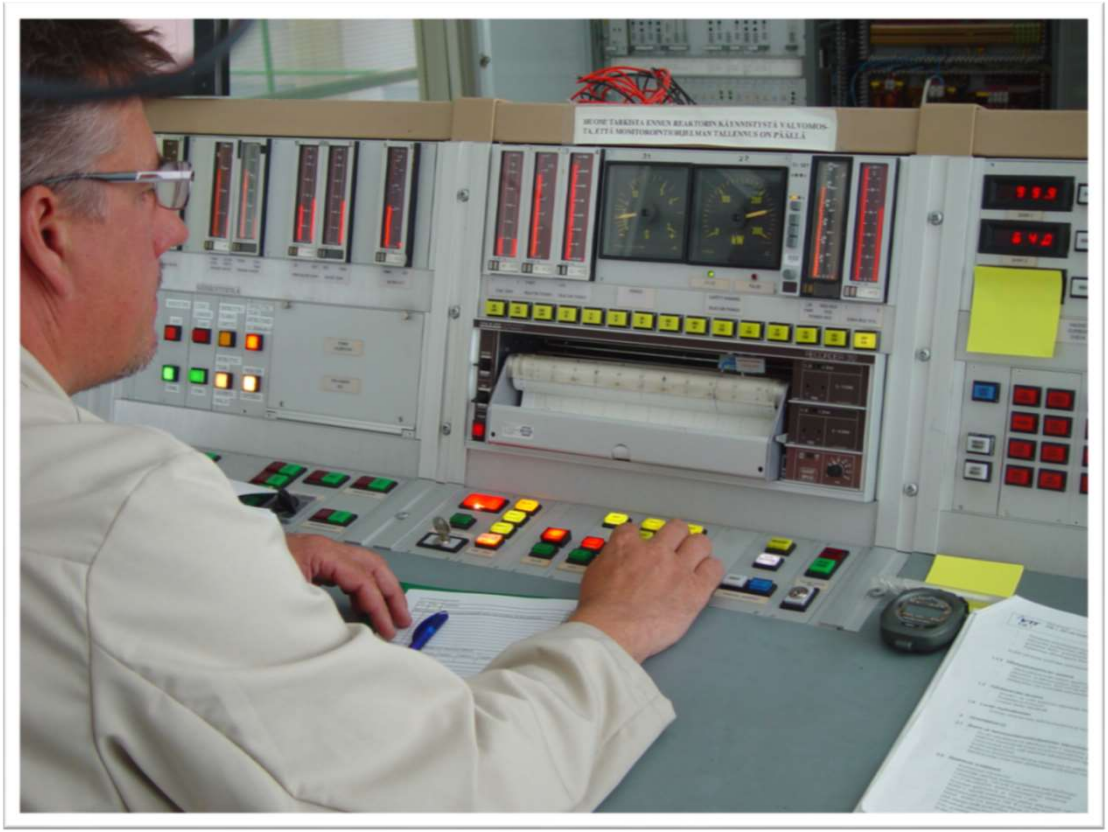
FiR 1 Research reactor

The reactor building in Otaniemi, Finland. Source: VTT Technical Research Centre of Finland

VTT’s FiR 1 research reactor (on the left) and the research reactor’s pool and core (on the right). Source: VTT Technical Research Centre of Finland

FiR 1, Triga Mark II, 250 kW



The opening day in 1962 (on the left) and the last day 30.6.2015 (up).
Source: VTT Technical Research Centre of Finland

VTT is responsible for the waste management – cooperation needed

- According to Finnish legislation, **VTT is responsible** for the management of the spent fuel and the radioactive waste of the research reactor.
- **The government** has the secondary responsibility.
- Low and intermediate level waste produced in the research reactor **must be handled, stored and disposed of in Finland**.
- **Spent fuel of the research reactor** can be handled, stored and disposed of **abroad**.
- VTT have **no disposal facilities of their own** and **no centralised disposal facilities exist** in Finland**.**

Waste management plans were not ready during operation

- VTT performed EIA process in 2013 – 2015.
- VTT applied licence from the Finnish Government for decommissioning and dismantling in 2017.
- **VTT is currently negotiating with national companies and also internationally for waste management.**
- **There is a need of national co-operation before the licence can be granted.**
- The cost estimates of the decommissioning depends on plans and commercial agreements and are still evolving.

Waste inventories are well known

- The fuel is a homogenous mixture of low-enrichment (less than 20%) uranium and zirconium hydride.
- **Amount of spent fuel is small:** 103 rods, 21.4 kgU, 129 TBq
- However, the fuel is **unique** in the national waste inventory.
- **Amount of low and intermediate level waste is also small**: 40 m³, 75 t, 3.3 TBq,
- The material is mostly activated concrete
- However, some **unique** materials exists: graphite, Fluental moderator material

FiR 1 Waste Management was discussed in National Cooperation Group

- National Cooperation Group on Nuclear Waste Management since 2017 in Finland
- Chaired by **Liisa Heikinheimo**
- Members from licensees, authorities and universities
- The Group’s task was to examine the objectives, development measures and alternative solutions for safe and cost-effective management of spent nuclear fuel and other radioactive waste

Spent fuel plans – 1. option: US

- VTT´s principal option is to **return the spent fuel to US** (Idaho, INL).
- The spent fuel is of United State origin.
- VTT has permission to return the spent fuel to US until May 2029.
- Timetable is open and, **without additional storing solutions in Finland, the fuel forms the bottleneck for decommissioning.**

Spent fuel plans – 2. option: Finland

- VTT´s secondary option is to **dispose the spent fuel in Finland.**
- Posiva's encapsulation and disposal facility is under construction in Olkiluoto site in Eurajoki, Finland.
- Handling and disposal of VTT's fuel in Posiva´s facility would **require a large amount of work**.
- Is that **efficient** thing to do due to the fact, that the **amount of the fuel is very small**?

Plans for LLW and ILW

- VTT will also need **domestic cooperation** to handle, storage and dispose their low and intermediate level waste.
- VTT is currently **discussing with domestic companies** about the issue.
- We have in Finland two disposal facilities in use for low and intermediate level waste.
- **The licences do not allow disposal of VTT's radioactive waste.**

Cooperation Group meeting in May 2018. Source: Jorma Aurela, MEAE

Cooperation Group presented its final report to Minister of Economic Affairs Katri Kulmuni on 2 September 2019. Source: MEAE

http://urn.fi/URN:ISBN:978-952-327-441-9

The report includes recommendations and suggestions for VTT

Recommendation 8. The working group recommends that VTT and the Ministry of Economic Affairs and Employment actively promote the return of spent nuclear fuel to the United States. If it cannot be returned to the United States, VTT should ensure that a national disposal solution can be found. VTT should prepare a progress plan for the interim storage and disposal of spent nuclear fuel in Finland together with Posiva and/or Posiva's owners. Under the existing agreement in principle, the negotiations should be initiated no later than 30 June 2020. The deadline for implementing the recommendation is 31 December 2022.

Recommendation 9. The working group recommends that VTT examine the management of radioactive wastes generated in connection with its research activities and preparation for its costs as a whole and prepare a long-term plan also for the waste management of VTT Centre for Nuclear Safety, including its decommissioning. The Radiation and Nuclear Safety Authority should examine VTT's solution in terms of the requirements under the Radiation Act. The deadline for implementing the recommendation is 31 December 2022 for VTT and 31 December 2023 for the Radiation and Nuclear Safety Authority.

Suggestion 3. The working group proposes that VTT submit to the Ministry of Economic Affairs and Employment a report on experiences from the decommissioning of the research reactor. This report could also contain clear proposals for developing the regulations subordinate to the Nuclear Energy Act in Finland. The report is to be delivered together with the report on experiences submitted to the Radiation and Nuclear Safety Authority as required in the Regulatory Guides on nuclear safety and security.

Suggestion 4. The working group proposes that VTT work together with TVO or Fortum, striving to find a sustainable solution on commercial terms and prepare a progress plan for the management of VTT's low and intermediate level wastes and other radioactive wastes. The indicative deadline for carrying out the suggestion is 1 June 2020.

Points to take home

- Although the amount of waste produced in connection with non-energy use is less than that produced in connection with the use of nuclear energy, **waste management must be in place for both**.
- Waste management of non-energy waste **is possible to combine nationally** with the waste management of waste produced in connection with use of nuclear energy.
- Combined national waste management needs **cooperation between waste producers based on commercial agreements, agreements on liability issues, cooperation enabling legislation and societal acceptability.**
- In cases of very specific waste types that are **unique in the national waste inventory, it might be feasible to have supra-national cooperation** for the waste management, either for the treatments of the wastes or both treatments and final disposal.

Thank you!

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