



Naturskyddsföreningen

Nuclear waste management in Sweden compared to nuclear waste management in Denmark

Dr. Johan Swahn, Director

The Swedish NGO Office for Nuclear Waste Review, MKG

e-mail: johan.swahn@mkg.se, mobile: +46 70 4673731

Första Långgatan 18, SE-413 28 Göteborg, SWEDEN,

Tel: +46 31 7110092, Fax: +46 31 7114620

<http://www.mkg.se>

The Danish Radioactive Waste Management Programme

- The international criticism of the Danish radioactive waste programme is very valid!
- The Danish siting process for finding a community to host a repository goes against international principles and experience -> No voluntarism – no local veto!
- The Danish radioactive waste classification is partly not in accordance with international principles -> 230 kg of irradiated fuel has to be considered as spent nuclear fuel, i.e., high-level radioactive waste!
- The Danish choice of repository method is not in agreement with the waste classification and certainly not state-of-the-art environmentally -> Even a repository for short-lived radioactive waste has to be deposited deeply (at least several hundred meters) and in the appropriate geology and hydrology!

Sweden – Denmark

A General Nuclear Comparison

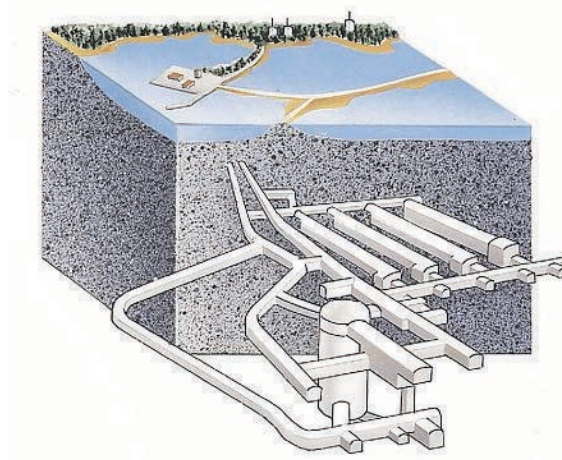
- Sweden:
 - A military and civil nuclear program started in the 1940s-1950s
 - A nuclear research facility, Studsvik, was inaugurated in 1956 and included 3 research reactors and a hot lab facility.
 - Twelve nuclear power reactors were constructed, 10 are still operating.
 - A final repository for short-lived operational radioactive waste, SFR, operating at the Forsmark nuclear power plant.
 - A centralized intermediate storage facility for spent nuclear fuel, Clab, operating at the Oskarshamn nuclear power plant.
- Denmark:
 - A civil nuclear program started in the 1940s-1950s.
 - A nuclear research facility, Risø, was inaugurated in 1955 and included 2 research reactors and a hot lab facility.

Sweden – Denmark

A General Nuclear Comparison

- Sweden:
 - A military and civil nuclear program started in the 1940s-1950s
 - A nuclear research facility, Studsvik, was inaugurated in 1956 and included 3 research reactors and a hot lab facility.
 - Twelve nuclear power reactors were constructed, 10 are still operating.
 - A final repository for short-lived operational radioactive waste, SFR, operating at the Forsmark nuclear power plant.
 - A centralized intermediate storage facility for spent nuclear fuel, Clab, operating at the Oskarshamn nuclear power plant.
- Denmark:
 - A civil nuclear program started in the 1940s-1950s.
 - A nuclear research facility, Risø, was inaugurated in 1955 and included 2 research reactors and a hot lab facility.

Final disposal of short-lived nuclear waste



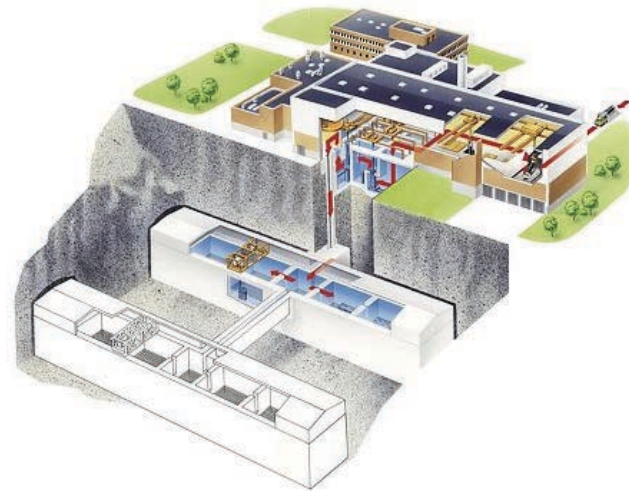
SFR – Final repository for short-lived radioactive waste at the Forsmark nuclear power plant

Sweden – Denmark

A General Nuclear Comparison

- Sweden:
 - A military and civil nuclear program started in the 1940s-1950s
 - A nuclear research facility, Studsvik, was inaugurated in 1956 and included 3 research reactors and a hot lab facility.
 - Twelve nuclear power reactors were constructed, 10 are still operating.
 - A final repository for short-lived operational radioactive waste, SFR, operating at the Forsmark nuclear power plant.
 - A centralized intermediate storage facility for spent nuclear fuel, Clab, operating at the Oskarshamn nuclear power plant.
- Denmark:
 - A civil nuclear program started in the 1940s-1950s.
 - A nuclear research facility, Risø, was inaugurated in 1955 and included 2 research reactors and a hot lab facility.

Interim storage of spent nuclear fuel



Clab – Central intermediate storage of spent nuclear fuel at the Oskarshamn nuclear power plant

Sweden – Denmark

A General Nuclear Comparison

- Sweden:
 - A military and civil nuclear program started in the 1940s-1950s
 - A nuclear research facility, Studsvik, was inaugurated in 1956 and included 3 research reactors and a hot lab facility (still operating).
 - Twelve nuclear power reactors were constructed, 10 are still operating.
 - A final repository for short-lived operational radioactive waste, SFR, operating at the Forsmark nuclear power plant.
 - A centralized intermediate storage facility for spent nuclear fuel, Clab, operating at the Oskarshamn nuclear power plant.
- Denmark:
 - A civil nuclear program started in the 1940s-1950s.
 - A nuclear research facility, Risø, was inaugurated in 1955 and included 2 research reactors and a hot lab facility.

Sweden – Denmark

A Radioactive Waste Inventory Comparison

- Sweden:
 - Historic radioactive waste from the Studsvik nuclear research facility and other early research facilities, includes largely unknown amounts of intermediate-level long-lived radioactive waste as well as irradiated fuel rods from the hot lab facility (considered as high-level waste). Hot lab facility still producing waste!
 - Short-lived operational radioactive waste from nuclear reactors, put in SFR.
 - Spent nuclear fuel (high-level from nuclear reactors, put in Clab.
 - Intermediate-level long-lived waste from nuclear reactors.
- Denmark:
 - Historic radioactive waste from the Risø nuclear research facility, , includes largely unknown amounts of intermediate-level long-lived radioactive waste as well as irradiated fuel rods from the hot lab facility (considered as high-level waste).

Sweden – Denmark

A Radioactive Waste Inventory Comparison

- Sweden:
 - Historic radioactive waste from the Studsvik nuclear research facility and other early research facilities, includes largely unknown amounts of intermediate-level long-lived radioactive waste as well as irradiated fuel rods from the hot lab facility (considered as high-level waste). Hot lab facility still producing waste!
 - Short-lived operational radioactive waste from nuclear reactors, put in SFR.
 - Spent nuclear fuel (high-level from nuclear reactors, put in Clab.
 - Intermediate-level long-lived waste from nuclear reactors.
- Denmark:
 - Historic radioactive waste from the Risø nuclear research facility, , includes largely unknown amounts of intermediate-level long-lived radioactive waste as well as irradiated fuel rods from the hot lab facility (considered as high-level waste).

Sweden – Denmark

A Repository Comparison

- Sweden:
 - An existing repository for short-lived operational radioactive waste, SFR, at 75 m depth under the Baltic sea floor.
 - Plans for a new repository for short-lived decommissioning radioactive waste, SFR 2, at 120 m depth under the Baltic sea floor.
 - Plans and licence application for a repository for spent nuclear fuel, and historic and new irradiated fuel from hot cell facility.
 - No plans for a repository for historic, operational and decommissioning, intermediate-level long-lived waste from nuclear reactors.
- Denmark:
 - One repository for all waste, or perhaps not for the 230 kg irradiated fuel. Repository design not even appropriate for short-lived waste.

Problems in Sweden relevant for Denmark

- SFR was intended for only short lived-waste. Too much long-lived waste has been put into the repository giving problems with the safety case (now 10 000 years).
- Some of the historic waste was thought to be only-short-lived and put in SFR. Now re-evaluated and is being taken out again. A big program to characterize all historic waste is being prepared.
- SFR was built at only 75 m depth and with radioactive release and dilution to the Baltic as part of the safety case. This is no longer acceptable and even the plan to put SFR 2 at 120 m can not be seen as acceptable.
- No plan for a repository for long-lived intermediate-level waste.

Possibilities in Sweden relevant for Denmark

- Sweden has big problems with the historic radioactive waste and like in Denmark needs to characterise much of it again. Needs to built a special facility for this at Studsvik. There is also relevant experience of repackaging at Studsvik.
- Sweden has historic and new irradiated fuel from the Studsvik hot cell facility. This waste is put in special steel containers and stored in Clab for final disposal together with the spent fuel.
- Swedish law allows the import of radioactive waste under “special conditions”. It is possible to “trade radioactivity”, i.e., a certain amount of activity of high-level waste (or perhaps even long-lived intermediate-level radioactive waste) can be traded for the same amount of activity (larger volume) of short-lived waste.
- Experience of siting process based on voluntarism.

So What Should Denmark Do?

- Even though large efforts have been put into the present radioactive waste management programme it does have the quality that Denmark as an environmentally progressive country should aim for.
- Build an intermediate storage facility that can be used for characterisation and re-packaging.
- Start co-operating with Sweden on historic waste management (both with the implementers SVAFO/SKB and the regulator SSM). Norway should also be interested!
- Start discussions with Sweden also about export/trade of waste.
- Continue development work on a state-of-the-art repository for short-lived and intermediate-level long-lived waste.
- In the longer run, start a siting process for a repository for a repository based on voluntarism.
- Establish a financing system?

mkg

Miljöorganisationernas
kärnavfallsgranskning



Naturskyddsföreningen

Johan Swahn, johan.swahn@mkg.se, +46 70 4673731

The Swedish NGO Office for
Nuclear Waste Review