Seventh Review Meeting
Joint Convention on the Safety of Spent Fuel Management
and on the Safety of Radioactive Waste Management

June 27 – July 8, 2022

Country Group 6 Rapporteur's Written Report

Julie Mecke, NRCan, Canada

Sweden

Country Group 6

Armenia, Croatia, Estonia, Malta, Niger, Romania, Rwanda, Senegal, **Sweden**, United Kingdom, Uzbekistan

OFFICERS TO THE COUNTRY GROUP

	NAME	CP
Chair:	Mr Francois BESNUS	France
Vice-Chair:	Mr Mohamed ALBINALI	United Arab Emirates
Rapporteur:	Ms. Julie MECKE	Canada
Coordinator:	Mr Kai MÖLLER	Germany

Sweden – General Discussions

- Countries of CG6 present:
  - Armenia**,** Croatia, Estonia, Malta, Niger, Romania, **Sweden**, United Kingdom, Uzbekistan

- Canada, Germany, USA, Japan, UAE, Korea, France, Finland, Swiss, Georgia,

Sweden – Overview Matrix

Type of Liability	Long Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Spent Fuel	Geological disposal	Fees on nuclear energy (accumulated in nuclear waste fund)	Central interim storage (Clab) pending disposal	Increased storage capacity of Clab. Encapsulation plant for spent fuel. KBS-3 geological repository (general licenses approved)
Nuclear Fuel Cycle Waste	Geological disposal	Fees on nuclear energy and direct payment by NPP owners	Disposal in the repository for short-lived LILW (SFR). Shallow landfill for VLLW	Planned repository for long-lived LILW (SFL)
Application (Non-power) Wastes	Disposal in fuel cycle waste facilities when appropriate	Financed by producers/owners of waste. Government funding available for legacy wastes	Disposal in the SFR repository or interim storage pending disposal in the planned SFL repository	Planned repository for long-lived LILW (SFL)

Sweden – Overview Matrix (cont)

Type of Liability	Long Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Decommissioning	Licensee is responsible.	Mainly fees on nuclear energy	Immediate dismantling	Extension of SFR facility to receive decommissioning waste (general license approved) Planned SFL disposal facility
Disused Sealed Sources	Returned to manufacturer or disposal in nuclear fuel cycle repositories	Financed by producers/ owners of waste. Government funding available for orphan sources.	Returned to manufacturer or disposed of in SFR or in interim storage pending disposal in the planned repository	To be disposed of in repositories for nuclear fuel cycle wastes, SFR or SFL (if not returned to the manufacturer)

Sweden – updates since NR submission

Government decisions on permissibility taken on the following;

- Increase in the storage capacity at the Clab interim SF storage facility – August 2021
- Extension of the SFR repository for short-lived L&ILW – December 2021
- KBS-3 Disposal System – January 2022
  - Geological Repository for SF and
  - Encapsulation plant (Clink)

Continued licensing by the Land and Environmental Court (LEC) & SSM

Sweden – updates since NR submission (cont)

- Sweden has made a major revision of SSM's regulations between 2018 – 2022
- Amendments of the *Act on Nuclear Activities*, November 2020
- New ordinance on emergency planning zones and distances July 2022

Sweden – updates since NR submission (cont)

- IRRS mission November 2022
- ARTEMIS spring 2023
- In 2021, the Government decided on revised fees on nuclear electricity and financial securities
- In 2021, Sweden submitted its 3rd updated report on the implementation of the obligations in European Council Directive 2011/70/Euratom
- SSM has conducted an analysis of the responsibilities of legacy waste reported to the Government in February 2022

Sweden – General Discussions

- SKB, on behalf of NPP operators, is responsible for the development of RD&D program.
- SSM re-organization was conducted to prevent any potential conflict of interest. SSM has not yet had time to evaluate, however it plans to do so.
- NGOs are eligible to use funding for a contractor, but must provide detailed justification. Funding is available to participate in the process and to increase their knowledge.
- Spent fuel is the only HLW in Sweden.

Sweden – General Discussions (cont)

- From the SSM re-organization, there is a separate department specifically on regulation and knowledge development, which supports licensing and supervisional departments.
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- Extension to SL L&ILW SFR – during construction of the extension unable to receive waste , therefore NPP operators must ensure they have sufficient capacity during this construction phase. If there is an urgent need, NPP operators are encouraged to inform SKB early.

- LL L&ILW SFL – to dispose of waste primarily from nuclear fuel cycle only. However, SKB has entered into agreement to accept application waste, but it is not an obligation.

Sweden – General Discussions (cont)

- Non-fuel cycle waste there is a need for a strategy waste treatment and disposal.
- In SFR and Clab, URL, radon gas is monitored.
- SKB self-identified non-conformance legacy waste already disposed of in SFR during re-characterization and followed-up accordingly with waste producers. SKB to work with waste producers to ensure that producers are properly characterizing their waste and will work on retrieval plans.
- For Clab there is a 2 km planning zone to remediate surface contamination from emergency.

Sweden – General Discussions (cont)

- Waste minimization techniques is done where possible:
  - NPPs undergoing decommissioning, metal waste is treated and recycled and then cleared
  - Some operational waste may be incinerated
  - Shallow land burial – there is potential to be treated

Sweden – General Discussions (cont)

SSM re-organization began in 2019 and was completed in June 2021. However, it is still a work in progress. SSM is looking at a wide range of recruitment, for example, they envision a greater need for generalists.

Flexible regulatory supervision scheme, basic inspection program and inspections done on a graded approach. For example, during decommissioning, in addition to the basic program, focused on specific decomm. work packages.

The government decision requires prior consent from the municipality (Right to veto is not an absolute veto, The applicant must demonstrate that there is no other suitable site to override the veto right.)

Sweden – General Discussions (cont)

In Sweden's legislation there is no requirement to retrieve SF from DGR, however, if it were to be done – would need to demonstrate no detrimental impact on safety. SKB has shown feasible in practical test to demonstrate that retrievability is possible.

Transportation from Clab to SF DGR site will be done via normal routes – transport ship with new transport casks.

SF at Clab will reach capacity 8000 tonnes in 2023. However, there is some limited capacity at NPP sites if needed. SKB has requested an expansion to 11 000 tonnes.

Sweden – General Discussions (cont)

For non-NPP waste, the producer of the waste has to pay Cyclife. The costs charged by Cyclife includes the cost for future disposal. Cyclife has denied some waste. If orphaned waste, the government will pay, however if Cyclife denies, there is nothing else that can be done.

Recent amendments to the Nuclear Act were conducted to clarify responsibilities – for example responsibilities after DGR closure. Sweden plans to put in place conditions within the closure licence that need to be fulfilled prior to transfer to the state.

It was a government decision to split the decision for Clab and KBS-3 disposal system 2 licence applications as there was a need to do increase capacity at Clab.

Sweden – General Discussions (cont)

- SFL will be dedicated to long-lived L&ILW. There are 2 parts;
  - LL ILW from decommissioning
  - LL LLW legacy waste from fuel cycle and non-fuel cycle that is not suitable for SFR. SKB is not obliged to accommodate LL LLW coming from non-fuel cycle activities, but may enter into agreement

- Interim storage for decommissioning at Barseback and Oskarshamn: 1) LL-ILW 2) VLLW

- Sweden is open to new builds. A government policy - only announced from last week. Therefore, Sweden has not had time to evaluate the impact on future wastes.

Sweden – Follow-up from 6th Review Meeting: Challenges

1. Complete licensing for construction and operation of the encapsulation plant and Spent Fuel Disposal Facility

- In August 2021, the Government licensed extended central interim SF storage (Clab)

- In January 2022, the Government licensed encapsulation (Clink) and repository for SF

Sweden – Follow-up from 6th Review Meeting: Challenges

2. Complete licensing for the extension for the SFR facility

- In 2021 the Government licensed the extension for the SFR facility.

Sweden – Follow-up from 6th Review Meeting: Challenges (cont)

3. Addressing the issues arisen from decision to prematurely shutdown and subsequent decommissioning of several NPPs reactors (e.g. development of regulation, waste management, supply chain, funding, staffing…)

- Barsebäck & Oskarshamn NPPs – established a common decommissioning strategy and co-operate closely during dismantling. New interim VLLW from decommissioning
- Vattenfall established special unit for decommissioning of Ågesta reactor and in 2023 for the dismantling and demolition of Ringhals units 1 and 2
- SSM established:
  - authorization process for dismantling and demolition which resulted in four authorizations within less than two years.
  - regulatory supervision scheme during dismantling, combining its basic supervision program with supervision activities coupled to the licensees' dismantling work packages

Sweden – Follow-up from 6th Review Meeting: Challenges (cont)

4. Management of regulator competences taking into account increased staff turnover, retirement and need for new competences as nuclear facilities are moving to new lifetime phase (decommissioning, disposal facility construction)

- SSM proposal to Government on a national strategic focus on competence – 2022. Based on 2 previous report on long-term competence (2018) and research (2020). Dialogue on-going between SSM and the Government

- Restarted nuclear educational program at Uppsala University in 2019

- SKB's activities are planned to continue for about another 70 years, i.e. up until around 2090. Extensive cooperation with external parties - contractors and specialists and international collaboration is important for research and technology development

Sweden – Follow-up from 6th Review Meeting: Challenges (cont)

5. Management of non-conformities at SFR facility (operational and long term safety, waste acceptance process, public confidence)

- In 2012 SKB identified waste disposed of in SFR that does not comply with WACs and also included Ra-226 sources that affect post closure SA and human intrusion

- SKB plans to retrieval, characterization and further handling. However, there is a need for clarification of funding: the waste producer responsible for the non-conforming legacy waste has questioned its financial and technical responsibility.

- SSM is currently preparing an injunction relating to the retrieval of the erroneously disposed waste

Sweden – Follow-up from 6th Review Meeting: Suggestions

- To complete implementation of actions arisen from the follow-up IRRS mission performed in Sweden: provision to maintain competence for nuclear safety and radiation protection on a national level, and the systematic evaluation of operational experience from non-nuclear facilities and radiation protection events and activities, including dissemination of all significant experience.

- SSM proposal to Government on a national strategic focus on competence – 2022. Based on 2 previous report on long-term competence (2018) and research (2020).

- Restarted nuclear educational program at Uppsala University in 2019

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Sweden – Follow-up from 6th Review Meeting: Planned improvements

- Major effort to update regulations, currently partly overlapping and lacking integrated approach to safety and radiation protection.
  - Since 2018, SSM has undertaken major revisions and established an integrated approach to radiation protection, nuclear safety and security.
  - Regulations on 3 levels.
  - Regulations on basic provisions for all activities subject to licensing with ionising radiation, package of coordinated and integrated regulations on NPPs and regulations concerning RWM from NPPs

- Development of new fuel transport casks that comply with modern requirements. The casks are to be delivered during the period 2019–2021
  - The delivery of the first new fuel transport cask was planned for the spring of 2021 but has been delayed.

Sweden – Follow-up from 6th Review Meeting: Planned improvements

- Extension of SFR facility to accommodate decommissioning waste
  - In 2021 the Government licensed the extension of SFR facility for short-lived L&ILW

- Safety evaluation of the preliminary design of the planned repository for LL-LILW (SFL).
  - During the period 2015–2019, an evaluation of post-closure safety for the proposed repository concept has been carried out with the purpose to provide input to the subsequent, consecutive steps in the development of SFL including the design of engineered barriers, WAC and the site selection process.
  - Technological development of the repository concept for SFL will commence in the next few years and is planned to result in a choice of concepts for SFL by the mid-2020s. SFL is planned to be commissioned around 2045.

Sweden – Follow-up from 6th Review Meeting: Overarching issues

- Implementation of national strategies for spent fuel and radioactive waste management:
  - National strategies in place.
  - Stepwise progress in numerous parts of the program, including adjustments due to new decommissioning needs, updates of regulatory framework, continuing licensing for geological disposal, as well as other facilities.

- Safety implications of long-term management of spent fuel:
  - Progressing with the geological disposal program for its SF.

Sweden – Follow-up from 6th Review Meeting: Overarching issues (cont)

- Linking long term management and disposal of disused sealed radioactive sources:
  - Returned to manufacturer or disposed of in SFR or in interim storage pending disposal in the planned repository
  - To be disposed of in repositories for nuclear fuel cycle wastes, SFR or SFL (if not returned to the manufacturer)

- Remediation of legacy sites and facilities:
  - Remediation activities at the former Ranstad uranium mine and treatment facility were completed in 2019 with a decision to release the site from regulatory requirements.

Sweden –Challenges from 7th RM

- Improve the management of radioactive waste from outside of the nuclear fuel cycle (there could be a lack of robustness for the management of such waste (LL- L&ILW) while SFL is not yet in operation. Centralized storage only depends on the acceptance of one commercial owned company (Cyclife Sweden AB).

- Continue reinforcing a sustainable management of human resources and knowledge.

- Retrieve, characterize and handle non-conformities at the SFR facility related to the identified waste non-compliant with WAC

Sweden – Suggestions from 7th RM

- Establish a strategy for the management of all non-fuel cycle waste arising in Sweden

Sweden – Planned Measures to Improve Safety from 7th RM

- Continue developing concept for SFL for choice in mid 2030s
- Develop waste acceptance criteria for disposal in SFL (Long-lived L&ILW)
- Extend the storage capacity of Clab which may reach capacity by end of 2023
- Implement decommissioning plans as scheduled
- Host a full scope IRRS and ARTEMIS mission

Sweden – Areas of Good Performance from the 7th RM

- Remarkable commitment to implement solutions for SF and RW management as planned

- Modernization of RW and SF legislation demonstrates importance that governments, municipalities, industries, NGO's, including citizens place on this important policy issues. Sweden has also conducted an inquiry on revising and updating current legislation and regulations.

Sweden – Good Practices

- High ability to tackle very challenging issues submitting and obtaining a licence for KBS-3 Disposal system (encapsulation plant and geological disposal)

Sweden – Impact of Covid 19

- No impact on the safety of spent fuel management and on the safety of radioactive waste management.
- There has been extensive use of working from home
- Regulatory perspective - virtual inspection tools (inspections with meetings and interviews) were maintained with challenges related to assessing safety culture issues and observers/visitors restrictions which affected staff learning process
- For nuclear facilities (Clab and SFR). Teams for operating were kept separate and no rotation between personnel operations and maintenance of facilities, and the transport system were maintained without any impact on safety.

Sweden – Conclusions

Remarkable milestones achieved for licensing SF DGR, including encapsulation plant (Clink) and SFR (SL L&ILW) extension

Second country to receive a licence for a SF DGR

Long-term management plan for the next 70 years to attract and retain competent staff should be commended

Need to progress on strategy management of non-fuel cycle waste.