Decommissioning of Norwegian Nuclear Facilities

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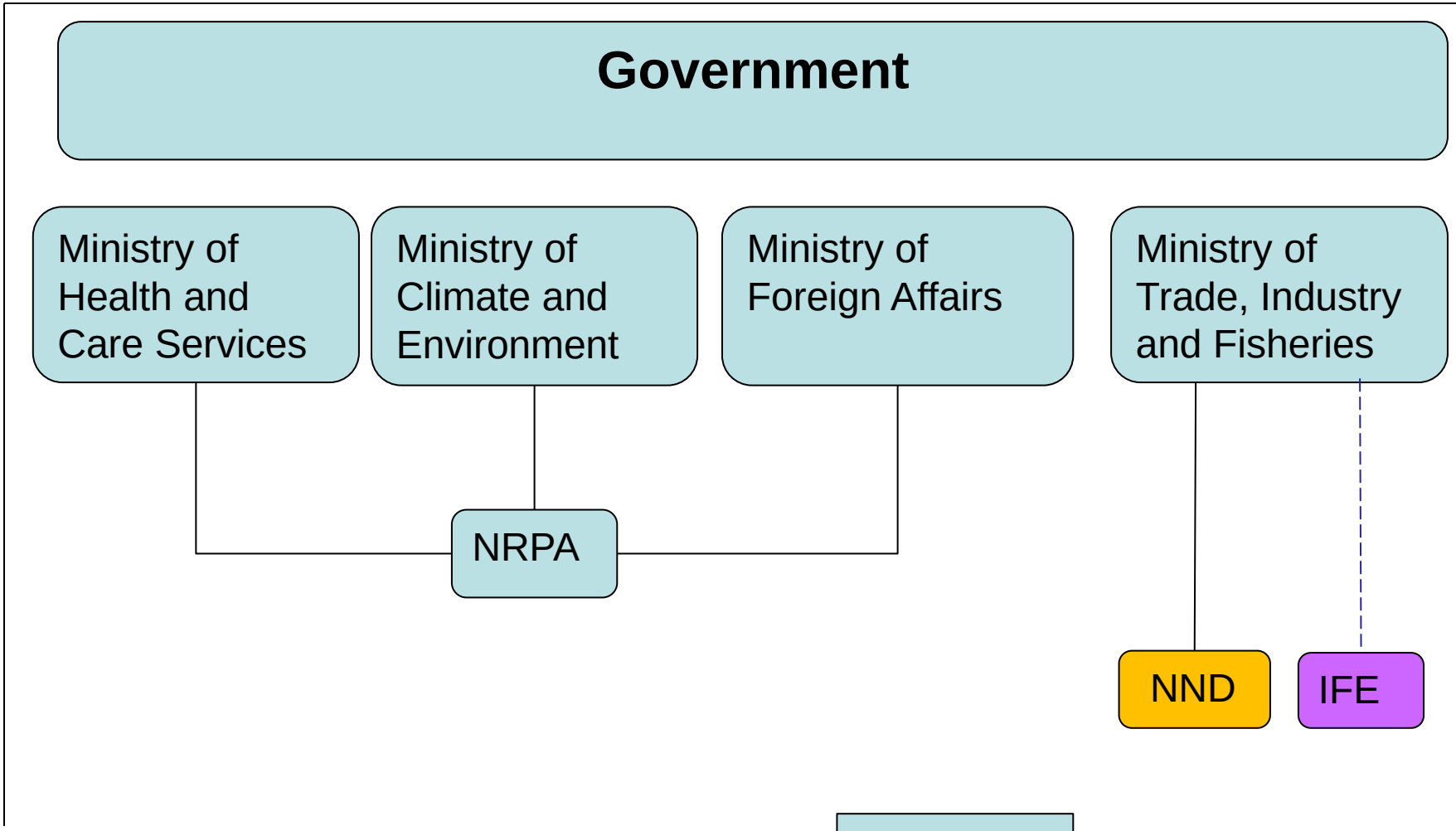
Statens strålevern
Norwegian Radiation Protection Authority

www.nrpa.no

Presentation Outline

- Background
- Legal framework
- Decommissioning of Norwegian nuclear facilities
- Current and future challenges
- Summary

Organizations in Norway



Norwegian Radiation Protection Authority

- 1993 – Norwegian Radiation Protection Authority as independent regulatory body
  - Staff 125 persons

- Responsible for nuclear safety and security; environment; radiation protection; and emergency preparedness & response.

Name change – January 2019

Norwegian Radiation and Nuclear Safety Authority

DSA

In Norwegian: Direktoratet for strålevern og atomsikkerhet

New website address will be ***www.dsa.no***

New mailaddress : ***name.surname@dsa.no*** *(only details after @ will be changed)*

Legal Framework

- **Act No. 28 (12 May 1972) on Nuclear Energy Act**
  - Regulations No. 1809 (2 November 1984) on Physical Protection of Nuclear Material and Nuclear Installations
  - Regulations No. 433 (12 May 2000) on possession of nuclear material and use of equipment

- **Act 13 March 1981 concerning Protection against Pollution and Concerning Waste (Pollution Control Act)**
  - General regulations (1 June 2004) on the waste management, chapter 16 on radioactive waste.
  - Regulations, 1 Nov. 2010 on the application of the Pollution Control Act on Radioactive Pollution and Radioactive Waste

Decommissioning - Legal Framework

- **Nuclear Energy Act**
  - Nuclear energy act § 4 demands a licence to possess and operate a nuclear facility during a decommissioning period
  - As per § 15-2 and 3, the licensee is obliged to perform all necessary measures of decommissioning such that the decommissioned site becomes safe to general public after decommissioning. These measures have to be approved by NRPA
  - For reactor in operation decommissioning plans need to be updated periodically
- **Pollution Control Act**
  - Has a provision about reactor stop and decommissioning demanding licensee to perform necessary actions counteracting the pollution.
  - The authorities can put further conditions on decommissioning measures taken to hinder the pollution. The licensee can be asked for guarantees to cover the future costs in this regard.
  - If reactor stop can generate further pollution problems, it should be shared with NRPA
  - NRPA will impose terms and conditions on decommissioning and dismantlement to counteract the radioactive pollution and safe radioactive waste handling.

Decommissioning - Legal Framework

- **Radiation Protection Law**
  - Sets conditions on the working environment

- **Act on planning and building (Plan og bygningsloven)**
  - While performing the decommissioning of nuclear reactors, environmental impact assessments shall be performed.
  - This should give a complete picture of the alternate solutions and environmental impact assessments of decommissioning.
  - NRPA (HOD and KLD) will be the regulating authorities

- NRPA is working on General Safety Guidlines that also covers decommissioning requirements.

Institute for Energy Technology (IFE)

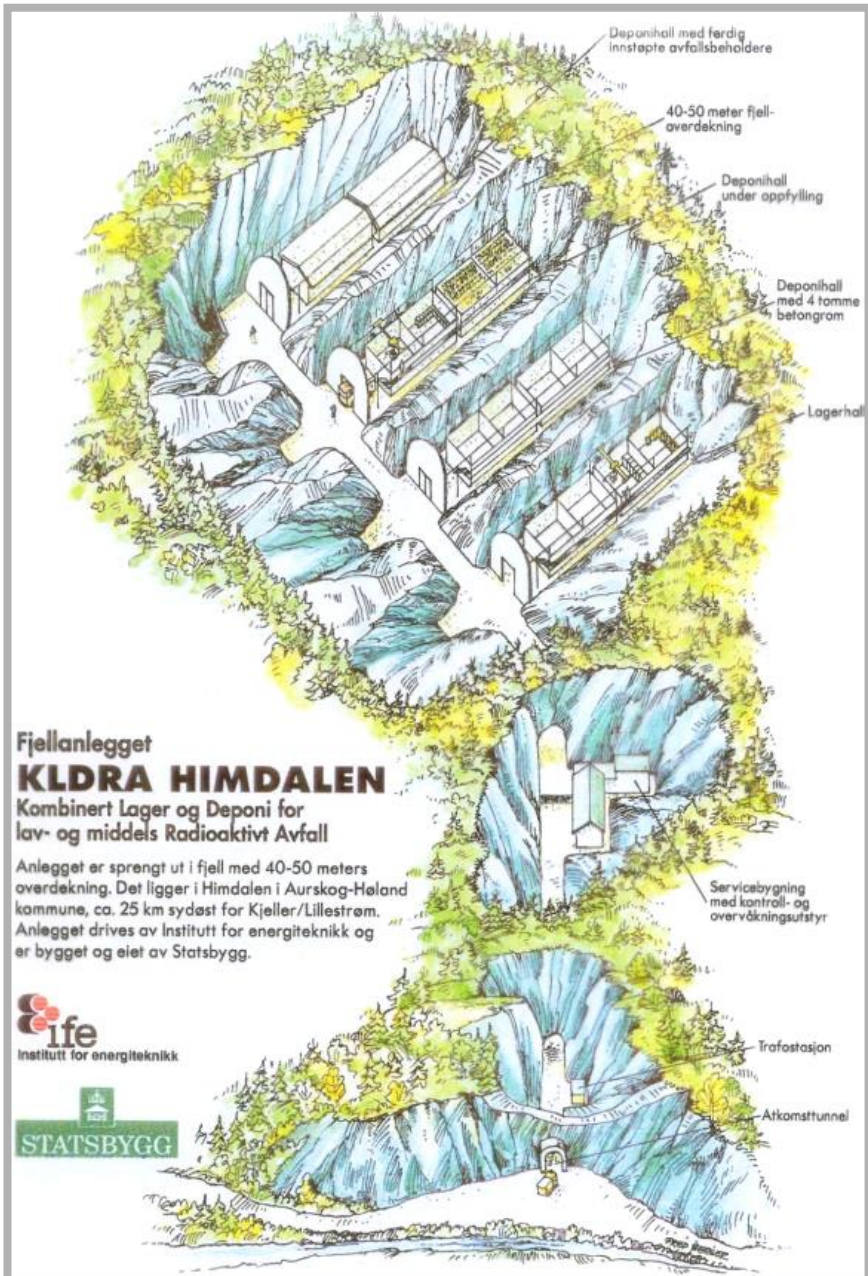
- Independent research foundation
  - Staff ~ 550

- 1959 – HBWR, 25 MW (Halden)
  - Operational licence expires in Dec. 2020
  - Reactor is permanent shut down since June 2018.

- 1966 – JEEP II, 2 MW (Kjeller)
  - Operational licence expires in Dec. 2018
  - NRPA has put forward its recommendations to the HOD for a new license 2019 - 2028

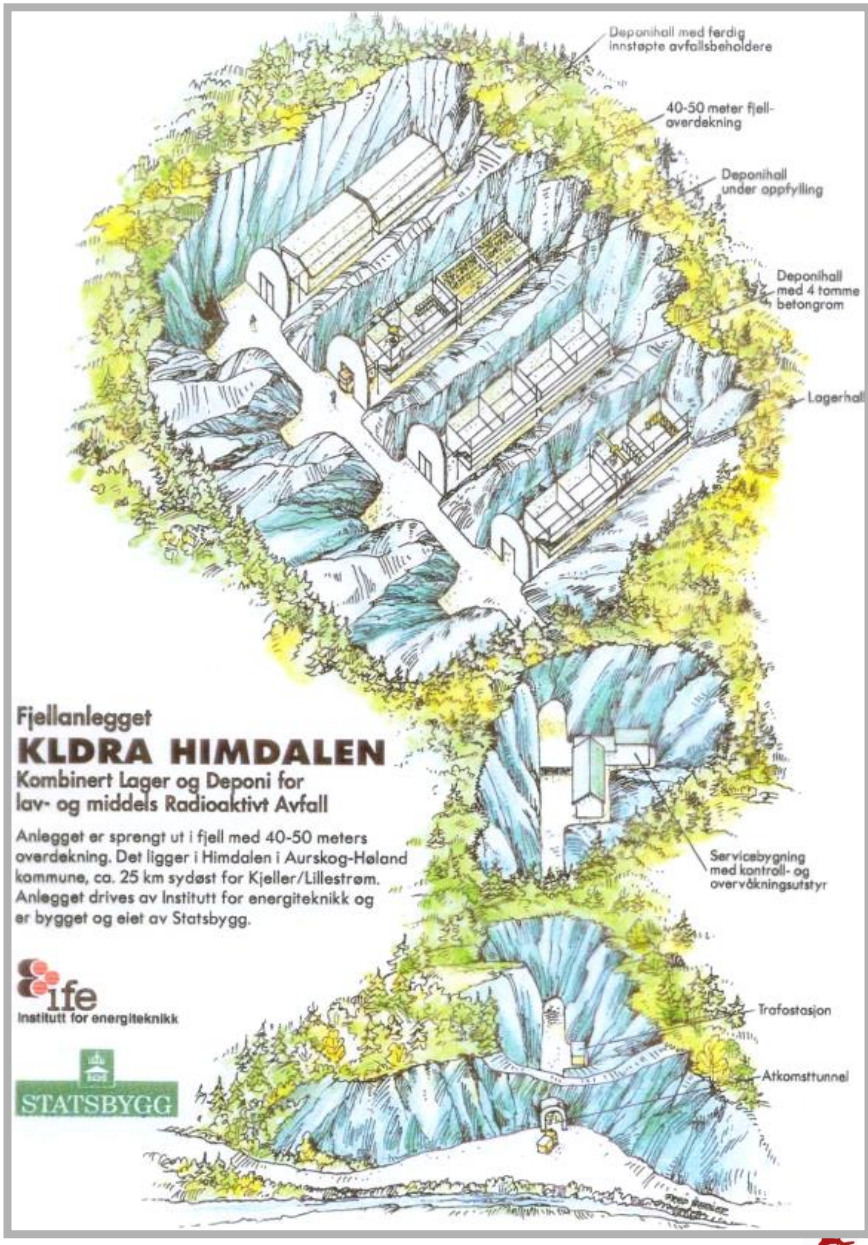
KLDRA - Himdalen

- 1998 – LILW facility at Himdalen
  - Operational licence til 2028
- The facility is built in crystalline bedrock
- Total capacity 2000 m^3 (10,000 210 l drums) – ca 62% is exhausted
- Need new KLDRA or extension of existing facility
- IFE is the operator of the facility as per today
- Future operator will be Norwegian Nuclear Decommissioning (NND)



KLDRA - Himdalen

- Owner - Directorate of Public Construction and Property (Statsbygg)
  - State owned organization: State's central adviser in construction and property matters, builder, property manager and property developer.
- The NFD has given a task to the Statsbygg regarding the initiation of the study on conceptual design, localization analysis and cost estimate for a new repository or expansion of the existing repository for LILW.
- Above task will be followed-up by NND.
- Future owner of the new KLDRA facility (LILW repository).



Governmental Concept Evaluation Studies - Present national strategy

- Development of national strategy based on various governmental studies conducted since 2000:

  – In 2015 two governmental concept studies were presented on :
    - The future decommissioning of nuclear facilities in Norway.
    - Finding solutions for handling spent fuel and radioactive waste.

  – In 2016 the above mentioned studies were quality assured by third party organisations.

National Strategy highlights

- Ensure safe interim storage of SF
- Assess the possibility of repatriation of SF
- Initiate the consideration of reprocessing of SF
- Assess other possible options other than reprocessing
- Establish an independent radioactive waste management organization
- Ensure the application polluter pays principle in relation to SF and radioactive waste.
- Initiate the planning of increased capacity of the LILW repository.
- Assess the possibility for international cooperation on deep geological repository for the SF.
- Assess alternative repository solutions in Norway.

Establishment of Norwegian Nuclear Decommissioning

- Norwegian Nuclear Decommissioning (NND) was established by a Royal decree 12. February 2018.
- The NND is established under The Ministry of Trade, Industry and Fisheries (NFD)
- The NND – organization responsible for radioactive waste management and decommissioning
- Fully operative within 2020 – 2021
- Will be regulated and inspected by NRPA

Main responsibilities of NND

- Planning and performing decommissioning of the Norwegian nuclear facilities.
- Planning and performing the safe handling and management of spent fuel
- Handling of other radioactive waste from the industry
- Taking part in relevant international forums to build competence, cooperation and knowledge sharing

Decommissioning end state and cost estimation

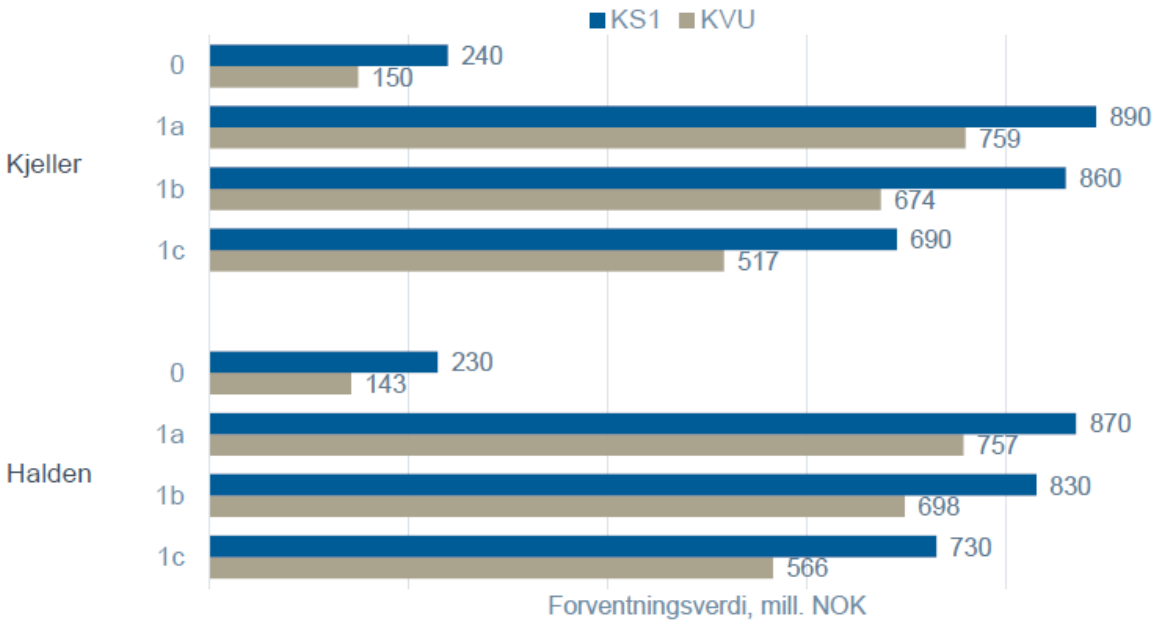
Decom End-state

Controlled area

- 0 = No new use
- 1C = Nuclear industry
- 3 = Entombment

Uncontrolled area

- 1A = Green field
- 1B = Non-nuclear industry



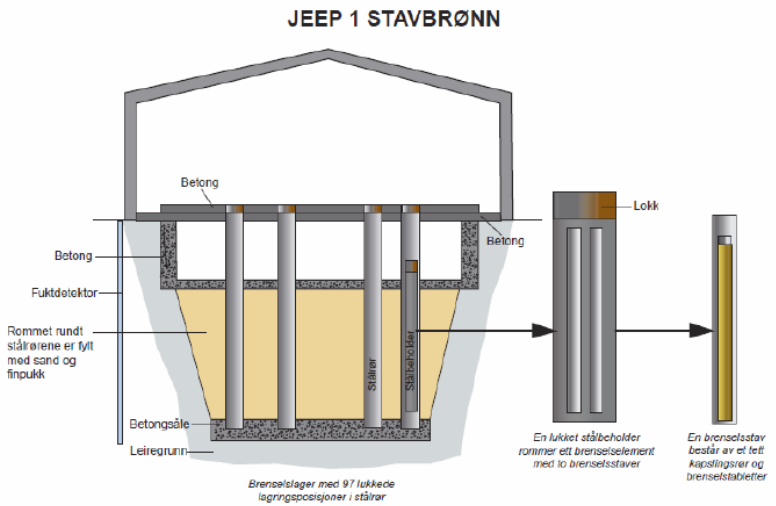
Recommendation:
The immediate dismantling to “Green field”.

Decommissioning Process

- IFE's decommissioning plans – ongoing
- Financing of decommissioning:
  - The Government will finance the decommissioning cost.
  - IFE was instructed to establish a decommissioning fund for the IFE facilities (300 K€/year).
- Concept study: new KLDRA + no restrictions on use after decommissioning
- IFE will apply for a new license to continue their activities …..

Safety of SF Management

- Total SF > 17 metric tons
  - ~145 kg SF generated each year
- IFE – responsible for spent fuel management.
- NND – Will be responsible for the spent fuel management
- SF currently stored on site – Kjeller and Halden



Progress in a national strategy for the disposal of SNF and RW

- The Ministry of Trade, Industry and Fisheries are following up the concept study, which has formed the present national strategy.
- Concept study/present national strategy identified reprocessing as one of the main options for unstable metallic SF.
- Alternate options are also under consideration.
- Additional studies are underway on the stabilization of the metallic fuel and options of the final disposal of the spent fuel; HLW; and long lived radioactive waste.
- The finale decision on the management of the SF and RW will be formulated on the finalization of this work.

Challenges of Decommissioning

- Transfer of knowledge and other human aspects of decommissioning
- Handling the spent fuel including legacy fuel of JEEP I and first charge of HBWR
- Long term management of SF and RW
- Further development of the national strategy and final decision on the disposal of SF and RW

Summary

- HBWR is in permanent shutdown state since June 2018
- Two conceptual studies, as a part of national strategy on the nuclear decommissioning and the management of SF and rad. waste.
- NND has been established, which is under development.
- As part of national strategy, Statsbygg has initiated a study to increase the capacity of LILW repository.
- The safe and long term management of spent fuel and RW is a challenge for Norway.

Thank you for your attention!