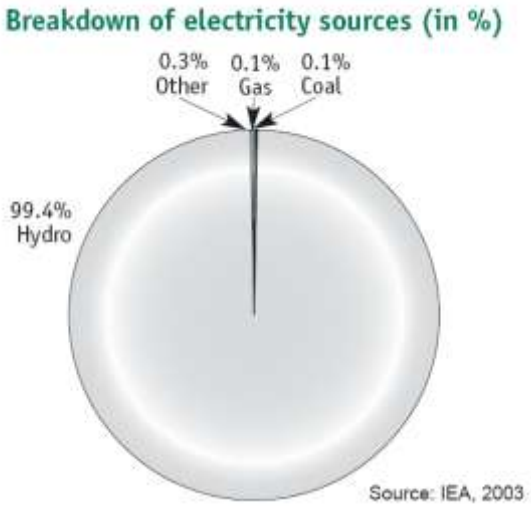
RADIOACTIVE WASTE MANAGEMENT PROGRAMMES IN OECD/NEA MEMBER COUNTRIES

NORWAY
[2005]

NATIONAL NUCLEAR ENERGY CONTEXT

The Norwegian nuclear programme started in 1948 with the creation of the Institute for Atomic Energy, known since 1980 as the Institute for Energy Technology (IFE). The original goal had been to initiate a nuclear power programme but, in 1980, the Norwegian Government decided that the use of nuclear energy was not relevant for the foreseeable future. This decision was made in light of domestic technological developments and an assessment of foreign nuclear technologies. The core of nuclear activity in Norway therefore remains the research reactor programme, currently comprising the 2 MW JEEP II reactor at Kjeller, which started up in 1967, and the 25 MW Halden boiling water reactor (HBWR) in Halden, which was built in 1959 and is used by the OECD Halden Reactor Project.



SOURCES, TYPES AND QUANTITIES OF WASTE

In Norway, radioactive wastes are generated by way of research reactor operations and by the use of radioactive materials in medical, research and industrial applications. Norwegian legislation does not currently prescribe criteria for classification of radioactive waste, but the International Atomic Energy Agency system, as described in "Classification of Radioactive Waste" (SS. No 111-G.1.1), is applied as far as reasonably practicable.

In general, most of these wastes contain only low or medium levels of activity consisting mainly of short-lived radionuclides and are categorised as low- and intermediate-level radioactive waste (LILW). Other types of waste are long-lived LILW.

In addition to this is the spent nuclear fuel from the research reactors.

Low- and intermediate-level waste

The annual rate of arising of LILW is about 120 drums (210 litres).

The cumulative quantity of LILW, by the end of 2003, consists of 3 600 drums (210 litres) with a total activity of 183 TBq (including 158 TBq of tritium), held in the National Combined Disposal and Storage Facility for LILW (KLDRA) in Himdalen, and a further 100 drums (210 litres) in IFE storage facilities in Kjeller.

Spent nuclear fuel

The cumulative quantity of spent nuclear fuel by the end of 2003 was about 16.28 tonnes held in IFE's storage facilities.

RADIOACTIVE WASTE MANAGEMENT POLICIES AND PROGRAMMES

Waste management policies

Norwegian policy on management of spent nuclear fuel has undergone various developments. In the 1960s, reprocessing of spent fuel for recovery of use-able material was an emerging technology. Against this background, part of the spent fuel from the first Norwegian research reactor, JEEP I, which operated from 1951 until 1967, was used as feed material for an experimental reprocessing plant at the Kjeller site. This plant operated from 1961 until 1968 and is now fully decommissioned. The rest of the spent fuel from the JEEP I reactor is stored at Kjeller, together with spent fuel from the NORA reactor, which operated from 1961 until1968, and from the JEEP II reactor, which is still in operation.

The first HBWR core loading was stored on-site and the second was reprocessed in Belgium in 1969. Since then all the subsequent HBWR spent fuel is being stored on-site.

All Norwegian LILW has been conditioned and stored at Kjeller since the IFE facilities were commissioned in 1948, including LILW from the HBWR, which has been routinely transported to Kjeller. In 1970, about 1 000 drums of LILW were disposed of by burial in a 4 metre-deep trench, covered with clay, on the IFE site at Kjeller. Discussion of final disposal options for LILW resulted in establishment in 1999 of the Combined Disposal and Storage Facility for LILW (KLDRA) in Himdalen, approximately 26 km southeast of the Kjeller site.

The conditioned LILW stored at IFE in Kjeller has now been moved to Himdalen, and the waste buried originally at Kjeller, as described above, has been excavated, reconditioned and has been disposed of or stored in this new facility. The present policy is to use the Himdalen facility for disposal of LILW, excluding those wastes that are radioactive because they contain technically enhanced levels of naturally occurring radioactive materials (TENORM). Some LILW waste, mainly historic waste, will be stored in a section of the Himdalen facility waiting for a final decision on whether to relocate it or to encapsulate it in concrete for disposal. The disposal facility is designed to have sufficient capacity to meet disposal requirements until 2030. Before that time a decision will be made on whether or not to convert the associated storage section into a disposal facility.

Programmes and projects

The Himdalen facility for LILW

The Combined Disposal and Storage Facility in Himdalen is about 40 km east of Oslo. It is owned by the Directorate of Public Construction and Property *(Statsbygg)*, and operated by the Institute for Energy Technology (IFE). The facility consists of four large halls excavated in a mountain, three of them for disposal and one for storage. The total capacity is equivalent to 10 000 drums (210 litres). A total of 3 600 waste containers had been placed in the facility by the end of 2003 and filling of the first and nearly half of the second of the three repository halls is complete. Since operation started, there have been no accidents or public protests.

Spent nuclear fuel from the IFE research reactors

In December 1999, the Government granted a new 9-year licence for continued operation of the research reactors in Halden and Kjeller. The spent fuel from these reactors is now safely stored at their respective sites but no decision has been made for its long-term storage and disposal, and the public and political focus was on this point. Consequently, the Government appointed an independent expert group to discuss these questions and report on the strategies and options for the future storage and disposal of the spent nuclear fuel. The group delivered its report to the Ministry of Trade and Industry in December 2001.

The group concluded that there is a need for interim storage for at least 50 years. The group did not discuss the specific siting of the facility, but stressed that the siting procedure must be transparent and must involve all stakeholders. The group also noted that wastes other than spent fuel will require storage in such a facility and that the quantities of such waste should be investigated.

The expert group report was sent for a public hearing, and comments were to be received by the Ministry of Trade and Industry by May 2002. Some of the recommendations are followed up by the establishment of working group(s) to plan the way forward.

RESEARCH AND DEVELOPMENT

Research

At present, there is no substantial research on radioactive waste management in Norway. At a later stage, however, research may have to be carried out on development of a national repository for spent fuel and long-lived waste. Decommissioning activities may require enhanced research activities.

Development

Contaminated sediments in the Nitelva River, near the IFE site at Kjeller, were removed in 2000 and 2001. The most contaminated portions of the sediments, with locally elevated plutonium concentrations of the order of 100-1 000 Bq/g, have been conditioned in waste packages and disposed of in the Himdalen facility.

DECOMMISSIONING AND DISMANTLING POLICIES AND PROJECTS

Radioactive waste management

It is anticipated that all the LILW generated from decontamination and dismantling of IFE nuclear facilities will be conditioned at the Radioactive Waste Treatment Plant at Kjeller and then transported to the disposal facility in Himdalen.

Spent fuel from the research reactors will be stored in the existing, specially designed IFE storage facilities until long-term arrangements for its management have been implemented, as described under "Programmes and projects". IFE will deliver a report with their plans for decommissioning and estimations of waste generation to NRPA by December 2004.

Funding

Decommissioning of the research reactors and other nuclear facilities will be financed mainly by way of Government funds.

TRANSPORT

Transport of radioactive waste is carried out by road. The transport shipments consist primarily of:

- Radioactive waste to the IFE at Kjeller from hospitals, industrial and research facilities and the IFE Halden research reactor.

- Conditioned waste packages to the disposal facility in Himdalen from the IFE waste treatment plant at Kjeller.

- Irradiated nuclear fuel and experimental fuel is transported between the IFE's Halden and Kjeller sites.

The Directorate for Civil Protection and Emergency Planning (DSB) is the responsible body for land transport of all dangerous goods. The safety standards laid down in national regulations are based on the International Atomic Energy Agency "Regulations for the Safe Transport of Radioactive Material". In regard to implementation of the regulations for radioactive waste transport, the Norwegian Radiation Protection Authority (NRPA) is the competent authority.

COMPETENT AUTHORITIES

The **Ministry of Health** is responsible for licensing applications. Based on NRPA's recommendations to the Ministry, licenses are granted by the King in Council. Legislations are issued by the ministry.

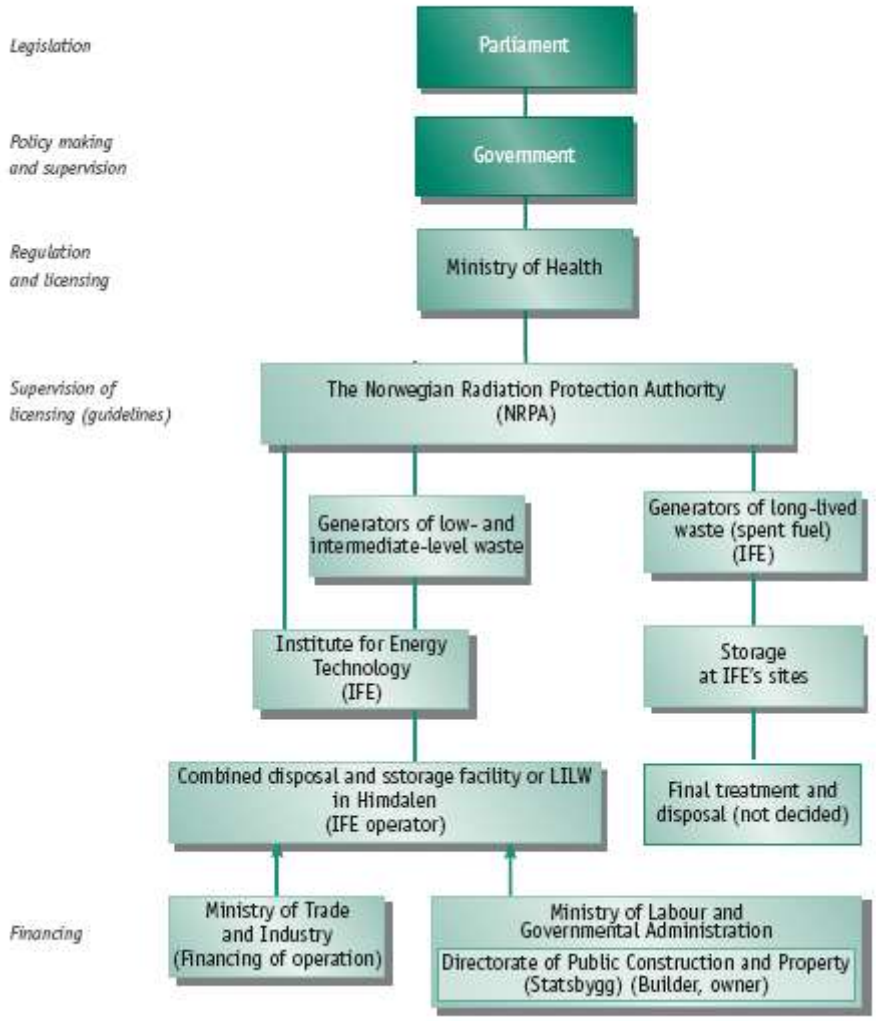
The **Ministry of Trade and Industry** provides financial resources for the research reactors operation, radiation protection, environmental monitoring and radioactive waste treatment at IFE, and for operation of the facility in Himdalen.

The **Institute for Energy Technology (IFE)**, with facilities in Halden and at Kjeller, is the second largest technical research institute in Norway, and the only nuclear research institute. It operates the national Radioactive Waste Treatment Plant at its Kjeller site, the Combined Disposal and Storage Facility in Himdalen, and the storage facilities for spent fuel from its research reactors.

The **Norwegian Radiation Protection Authority (NRPA)** is a directorate under the Ministry of Health. It is the regulatory body for radiation protection, nuclear safety and security, and nuclear emergency preparedness. It also performs supervision, handling of license applications, granting permits and issuing of guidelines.

The Directorate of Public Construction and Property (Statsbygg) is a Directorate under the Ministry of Labour and Governmental Administration and is owner and builder of the Himdalen facility.

Main bodies involved in radioactive waste management in Norway



FINANCING

As explained above, the Ministry of Trade and Industry is responsible for financing the national aspects of radioactive waste management in Norway, and legal provision for this is made by way of Acts of Parliament concerned with *Nuclear Energy Activities* and *Radiation* Protection and the Use of Radiation. As regards costs, the annual turnover (2003) for normal operation of the Radioactive Waste Treatment Plant at Kjeller was about 3.5 million NOK (€ 410 000) and for the facility in Himdalen about 5.0 million NOK (€ 590 000).

PUBLIC INFORMATION

Norwegian laws require openness and possibility for active public involvement in the whole process of radioactive waste management. The operator must supply information to the public about procedures, safety and environmental aspects. The NRPA will supply information about legal aspects and about the findings of evaluations and inspections.

Further information may be obtained from the addresses given below.

Government Research

NRPA (The Norwegian Radiation Protection Authority)
P.O. Box 55, NO-1332 Østerås
Website: http://www.nrpa.no
E-mail: nrpa@nrpa.no

IFE (Institute for Energy Technology)
P.P. Box 40, NO-2007 Kjeller and NO-1751 Halden
Website: http://www.ife.no
E-mail: firmapost@ife.no