MANAGEMENT OF SPENT NUCLEAR FUEL IN FINLAND: POLICY, PAST AND PRESENT PRACTICES, PLANS FOR THE FUTURE

E. RUOKOLA
Radiation and Nuclear Safety Authority (STUK)
Finland

Abstract

In Finland, about 1700 tU of spent nuclear fuel has arisen from the operation of the four nuclear power units which were commissioned in late 1970’s - early 1980’s. Initially the spent fuel management policy was based on seeking for international centralised options because of the small size of the nuclear energy program. The amendment of the Nuclear Energy Act of 1994, however, revised the policy and disposal of spent fuel into the domestic bedrock is nowadays the only option.

About 330 tU from the Loviisa NPP has been shipped to the Mayak complex in Russia, but that practice was terminated in 1996 due to the legislative amendment referred to above. Nowadays all spent fuel is stored at the NPP sites until it will be disposed of. Only pool type storage technology is used and the operating experiences are good.

Finland has a determined and advanced spent fuel disposal program, which was started more than 20 years ago. A general authorisation, including designation of the disposal site, has been made by the Government and endorsed by the Parliament. In mid-2004, construction of an underground rock characterisation facility, which is intended to constitute a part of the repository, was commenced. The construction licence application for the encapsulation and disposal facility will be submitted in 2012 and the operating licence around 2020.

Though the Finnish fuel cycle policy is currently based on the once-through option, international developments in the fuel cycle technology are followed and regularly assessed, because the long storage period before permanent disposal leaves also other spent fuel management options open.

Keywords

spent nuclear fuel/fuel cycle policy/spent fuel storage/spent fuel disposal
1. Spent fuel from the nuclear energy programme

Four nuclear power units are currently in operation in Finland: the Loviisa NPP has two 488 MW(e) VVER units and the Olkiluoto NPP has two 840 MW(e) BWR units. These NPP units have been in operation for 23-27 years. The construction of the fifth reactor, EPR 1600 MW(e) to be located at the Olkiluoto site, is scheduled to be started in early 2005.

Spent nuclear fuel from the NPPs is stored on-site in pool-type interim storages. The total amount of stored spent fuel is about 1350 tU. Besides that, about 330 tU of spent fuel was earlier shipped to Soviet Union/Russia.

At the Finnish NPPs, lifetime extension programs are going on and the current estimates for their operational lifetime falls in the range of 50-60 years. Thus, up to about 2700 tU of spent fuel might further be generated by the existing NPPs. The new NPP unit would add about 2500 tU at most to the spent fuel arisings. The total quantity of spent nuclear fuel to be managed in Finland would then amount to 6500 tU at most.

2. Past policies and practices

The decisions on building the current NPPs in Finland were made in late 1960’s - early 1970’s. At that time, the prospects for nuclear energy were very promising and spent fuel was regarded as an asset due to the worth of its plutonium and uranium as nuclear fuel. Accordingly, the contract for the supply of the Loviisa NPP included clauses for the return of spent fuel to the supplier of the fresh fuel in Soviet Union. Though no such stipulations included in the supply contracts for the Olkiluoto NPP, it was taken obvious that the operator would later make contract with a French or British reprocessing company.

However, the prospects changed in mid-1970’s. The Western reprocessors elevated substantially their prices and adopted a contractual stipulation on the return of reprocessing wastes to the generator of the spent fuel. This implied that commercial reprocessing services were no longer an attractive option for a country with no fuel cycle industry like Finland. Consequently, the licensee of the Olkiluoto NPP, while followed prospects in reprocessing area, opted for extended interim storage of spent fuel and launched preliminary spent fuel disposal studies.

The national spent fuel management policy was formulated by the Governments Decision in Principle of 1983, stating: In dealing with spent fuel, international central repositories should be made use of where possible because the total amount of spent fuel arising from the operation of domestic nuclear power plants will remain small. The aim continues to be achievement of contractual arrangements through which the reprocessing waste or spent fuel can be transferred and disposed irrecoverably outside the domestic territory. However, in case of spent fuel for which this kind of contractual arrangements are not achieved, the licensees must provide preparedness for carrying out the final disposal in Finland in a safe and environmentally acceptable way.