

Regulatory Review and Assessment of SNF Encapsulation and Disposal Facility Construction License Application in Finland

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In 1983 the Government made a strategy decision on the objectives and target time schedule for the research, development and technical planning of nuclear waste management. The decision gave the timeline for the milestones on the way to an operating disposal facility by around 2020. This has been a long-term project with over 30 years of parallel development of the project and the regulatory approach to SNF management.

Posiva, the implementer, submitted the construction license application and supporting documentation to the authorities at the end of 2012. The Radiation and Nuclear Safety Authority of Finland (STUK) started the review and assessment with an initial review in early 2013 and STUK's assessment of the adequacy and acceptability of Posiva's CLA will be presented to the Finnish government around January 2015. The CLA and STUK's review cover aspects of safety, security and nuclear safeguards. The scope of application is operational safety of facilities and post-closure safety of disposal.

In the pre-CLA phase STUK implemented a comprehensive process of preparations, which included resource and competence build-up, preparation of internal review plan and review of Posiva's draft CLA documentation. In parallel with the CLA review process STUK has implemented an inspection program focusing on the applicant's management system and readiness for construction. To support regulatory decision making, STUK has used a wide range of national and international experts in the CLA review process.

I. THE FINNISH DISPOSAL PROGRAMME

Finland is one of the foremost countries in the world in developing the disposal of spent fuel. The Construction License application (CLA) for the Olkiluoto spent fuel disposal facility has been submitted to the authorities at the end of 2012 and the facility is expected to start operation around 2020. This has been a long-term project with over 30 years of parallel development of the repository project and the regulatory approach to spent fuel management.

In 1983 the Government made a strategy decision on the objectives and target time schedule for the research, development and technical planning of nuclear waste management. While an export and international disposal solution was still the preferred option, this decision required the licensees without this possibility to prepare for disposal in Finland and it also gave the timeline for the milestones on the way to an operating disposal facility by around year 2020.

The licensing procedure for a disposal facility has several steps that are similar to all nuclear facilities in Finland and are defined in Nuclear Energy Act [1] and Degree [2]. These licensing steps are (Fig. 1):

- Decision in Principle (DiP) is required for a nuclear facility having considerable general significance. This is essentially a political decision: the government decides if the construction project is in line with the overall good of society. The decision can be applied for one or more sites, the host municipality has a veto right and the parliament has the choice of ratifying or not ratifying the decision.
- Construction License is granted by the Government and authorizes the construction of the disposal facility. The actual construction is regulated by STUK and includes several review and approval steps, hold points and viewpoints.
- Operating License is granted by the Government and authorizes the operation of the facility for a certain period. The operating license is needed before nuclear waste can be disposed.

The first step in the licensing process was reached at the end of 1999 when Posiva Ltd, the current implementer of the disposal program, submitted the application for a Decision-in-Principle [3] for a spent fuel disposal facility in the Olkiluoto. The DiP was made by the government in late 2000, approved by the host municipality and ratified by the parliament in early 2001. It gave Posiva the authorization to start to construct an underground rock characterization facility, to the depth of actual planned disposal, as required by regulation.

Posiva, the implementer, submitted the construction license application and supporting documentation to the authorities at the end of 2012. The Radiation and Nuclear Safety Authority of Finland started the review and assessment with an initial review in early 2013. STUK has performed thorough review and assessment (R&A) against safety requirements and the outcome will be documented in STUK's safety evaluation report. This assessment of the adequacy and acceptability of Posiva's CLA will be presented to the Finnish government in early 2015. The CLA and STUK's review cover aspects of safety, security and nuclear safeguards. The scope of application is operational safety of facilities and post-closure safety of disposal.

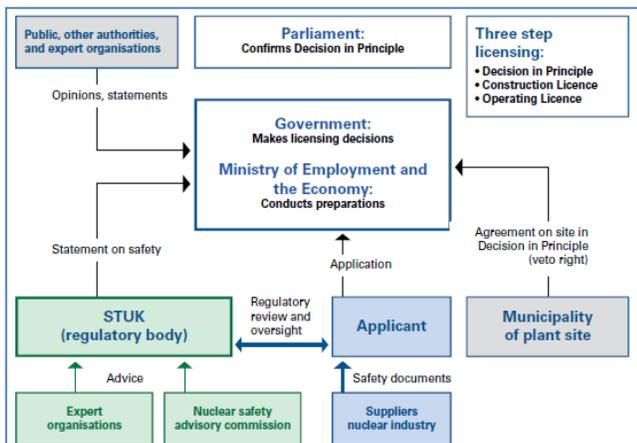


Fig. 1. Licensing process for nuclear facilities in Finland.

II. STUK PREPARATORY WORK FOR LICENSE APPLICATION REVIEW

The regulatory approach taken by STUK has been to closely follow Posiva's safety case development and to perform reviews of draft safety case documents. Another aspect has been to follow Posiva's R&D activities which are described in programs submitted to regulatory review every three years. In practice this has been implemented through regular visits to research laboratories, factories and workshops where safety related studies or demonstrations has been performed.

Posiva has submitted preliminary documentation of safety argumentation for regulatory review since the DiP was ratified in 2001. These draft parts has supported the development of license application documentation. STUK has already been reviewing and assessing for 11 years how the developing safety documentation meets regulatory safety requirements. STUK's preliminary findings have been communicated to Posiva and the target has been to identify and address the main safety related concerns as early as possible. Parts of the safety case was

updated for authorization of Onkalo construction and submitted to STUK in 2003. This documentation included:

- URCF design requirements and layout
- Description of site baseline characteristics
- Assessment of construction disturbances
- Description of monitoring program for construction period

The Ministry of Employment and Economy required Posiva to submit preliminary (draft) license documentation by the end of 2009. The reasoning was to have a regulatory review of the status of construction license application development. STUK reviewed the draft safety case and the process was used as an exercise for the actual license application review. In STUK this was seen as a possibility to test review process, review organization and assessment of preliminary safety case status.

The aim of the step-wise review, close follow-up and regular meetings with Posiva has been to identify the safety relevant issues and especially key safety concerns already before Posiva finalizes and submits the construction license application. During the license application preparatory phase STUK had a process for collecting and updating the position of key safety concerns with regular dialogue between STUK and Posiva. However after a while it was acknowledged that addressing single safety concerns did not in many cases lead to better overall understanding and sometimes the linkage to safety was not very clear. From this experience a need for more structured R&A process was seen necessary.

III. THE PLANNING FOR THE REVIEW AND ASSESSMENT OF CONSTRUCTION LICENSE APPLICATION

The review process, organization, time schedule and resources are described in a STUK's internal project plan for the license application review. The main element of the project is of course the review of the extensive safety documentation. The assessment of safety requirement fulfillment and implementer organizations readiness for construction activities is supported with STUK inspection program for pre-construction phase. The inspection program is broadened later for construction inspection program for encapsulation and disposal facility construction oversight.

The regulatory assessment of safety is, of course, done against regulatory safety requirements. As mentioned above STUK's approach was initially safety issue oriented and a bottoms-up assessment. However for having a more regulatory requirement oriented and safety

related review basis for the detailed R&A, STUK started the development of the so called review plan. This review plan contains a collection of earlier regulatory observations and expectations for the construction license application that were derived from and linked to regulatory safety requirements. The review plan is used as guidance for all experts participating in STUK's review. It is also planned to be the structure for STUK's safety evaluation report.

STUK has allocated for the project waste management and nuclear facility expertise we have in-house. Important parts of the safety case focus on the post-closure safety and the related safety assessments are wide and need to be carefully assessed in a timely manner. For this reason STUK has signed agreements with Technical Research Centre of Finland (VTT) and several international experts for supporting its review and to conduct independent modeling. The total number of experts participating in STUK's review during 2013-14 ranged between 60-70 persons and has been on the order of 10 man years per year.

IV. REGULATORY REVIEW OF CONSTRUCTION LICENSE APPLICATION

According to the Nuclear Energy Act and Decree when applying for a construction license, the applicant shall submit the following to STUK: [1, 2]

- The preliminary safety analysis report, which shall include the general design and safety principles of the nuclear facility, a detailed description of the site and the nuclear facility, a description of the operation of the facility, a description of the behavior of the facility during accidents, a detailed description of the effects that the operation of the facility has on the environment, and any other information considered necessary by the authorities.
- A probabilistic risk assessment of the design stage.
- A proposal for a classification document, which shows the classification of structures, systems and components important to the safety of the nuclear facility on the basis of their significance with respect to safety.
- A description of quality management during the construction of the nuclear facility, showing the systematic measures applied by the organizations that take part in the design and construction of the nuclear facility in their operations affecting quality.
- Preliminary plans for the arrangements for security and emergencies.

- A plan for arranging the safeguards control that is necessary to prevent the proliferation of nuclear weapons.

In addition to the documentation concentrating mostly on operational safety the regulation for nuclear waste disposal requires licensee to submit a safety case concentrating on post-closure safety. [4] This is in practice the widest part of construction license application documents. STUK YVL regulations give more details for the content of these documents.

STUK's task in the license application process is to R&A the fulfillment of all applicable radiation and nuclear safety requirements. STUK shall also prepare a statement and safety evaluation report for the Government. In the appraisal STUK has the possibility to highlight issues that need further attention or propose license conditions.

During the first quarter of 2013 STUK performed the first initial review phase. The aim of the initial phase, sometimes compared to docketing, was to check that the license application contained all main elements requested in STUK YVL regulations. In other words, to check that the content of the application is adequate for detailed safety review. During the detailed R&A phase STUK has made several requests for additional information in areas where further information or clarification has been needed. STUK is finalizing decisions about PSAR and post-closure safety and is aiming to submit statement and safety evaluation report to the Government in early 2015.

The assessment of safety requirement fulfillment and implementer organizations readiness for construction activities is supported with STUK inspection program for pre-construction phase. The inspection program is broadened later for construction inspection program, for encapsulation and disposal facility construction oversight.

The objective of the inspections performed by STUK during the pre-construction phase is to support the review and decision making process by verifying the license applicant's processes and procedures and also technical issues described in the license application documentation. Through these inspections STUK will have realistic view of the status of the licensee's activities and progress of its development work. STUK focuses the inspections on the license applicant and the organizations responsible for the nuclear facility's design and any organizations involved in the project whose work can be deemed to have major implications on safety. The main topics for these Rs&As are the management system of the organization concerned, in particular the organization of operations and management of resources, competence management, management system processes and procedures,

management of non-conformances, interface management and reporting, and supply chain management as well as data security. STUK's inspections have covered all the main processes and major parts of sub- processes defined in the license applicant's management system.

After passing the construction license step STUK will have oversight over the detailed design, construction, fabrication and pre-operational testing, which will be followed by the review of the operation license application. It is also seen that STUK's review and assessment of CLA will raise several safety related topics, where STUK needs to follow Posiva's further work before operation license application will be submitted. Posiva has already submitted to STUK a concept development program that shows Posiva's commitment for addressing safety related issues. Another important plan is Posiva's plan for preparing post-closure safety case supporting operating license application. STUK will follow closely the implementation of this TURVA2020 plan.

V. CONCLUSIONS

At the end of 2012, Posiva submitted to the Finnish Government a license application for the encapsulation and disposal facility construction at the Olkiluoto site. Therefore the disposal project has entered into a new phase. This long-term project with over 30 years of parallel development of the repository project and the regulatory approach to SNF management has been enabled through the key features of the Finnish waste management framework that consists of:

A clear licensing process

- Long term political commitment to resolve the nuclear waste issue
- National strategy and discipline in implementation
- Stepwise licensing and implementation including veto-right for the local community regarding hosting the repository
- Timely and focused communication to public

Early establishment of a national framework

- Well defined liabilities and roles
- Early on established funding system

Active regulatory work

- Development of a regulatory approach parallel with R&D and in analogy with nuclear plant safety regulations
- Regular regulatory follow-up of progress in the SNF disposal program

STUK has carried out comprehensive preparations for its review related license application. The preparatory work has included close monitoring of Posiva's activities,

review of preliminary safety documentation, planned increase of STUK's own competence and resources and preparation of internal review guidance. At the moment STUK is performing thorough R&A against applicable safety requirements, which will be documented in the authority's pending safety evaluation report. The aforementioned review is planned to be finalized in early 2015.

REFERENCES

1. Nuclear Energy Act, 990/1987, Helsinki (1987)
2. Nuclear Energy Degree, 161/1988, Helsinki (1988)
3. Decision in Principle, DiP. Valtioneuvoston periaatepäätös 21 päivänä joulukuuta 2000 Posiva Oy:n hakemukseen Suomessa tuotetun käytetyn ydinpolttoaineen loppusijoituslaitoksen rakentamisesta, Helsinki 2000. In Finnish.
4. Government Decree on the safety of disposal of nuclear waste 27.11.2008/736.