Advisory Committee on Nuclear and Radiation Safety

Advice to Director (DSA) regarding periodic safety review and licence duration for the combined storage and disposal facility for radioactive waste at Himdalen (KLDRA Himdalen)

BACKGROUND

Introduction

The Norwegian Radiation and Nuclear Safety Authority (DSA) has established the Advisory Committee on Nuclear and Radiation Safety (the Committee) to *"...as requested by the Chair or the Director of DSA, or on its own initiative, provide DSA with strategic and technical advice on the safety of nuclear and radiation facilities and activities..."*[1].

Ahead of the Committee Meeting 12 - 14 May 2025, DSA requested advice from the Committee regarding matters specific to the planned periodic safety review (PSR) of the combined storage and disposal facility for low- and intermediate level radioactive waste at Himdalen (KLDRA Himdalen). In addition, DSA sought advice regarding the duration of a licence, potentially to be issued to NND (Norwegian Nuclear Decommissioning Agency) to own and operate KLDRA Himdalen. NND's licence application is currently under DSA's review and constitutes the second step in a planned three-step licence-transfer (relicensing) process for facilities operated by IFE (Institute for Energy Technology) to NND. The first licence transfer (relicensing of the nuclear facilities at Halden) took effect on 1 April 2025. In a third step, relicensing of the nuclear facilities at Kjeller will be considered, in due course.

Issues raised by DSA

The advice sought by DSA and the rationale behind the request was summarised by DSA in an explanatory note, which, *inter alia*, stated:

> *"In 2023 DSA instructed IFE to perform a periodic safety review (PSR) of the repository and its functions. This work will be continued by NND when they become a licensee. IFE, together with NND and consultants delivered their plan for carrying out the PSR in March 2025* [...]. *Following the 2023 inspection, DSA has also instructed IFE to take immediate actions to improve the conditions at the facility and to apply for an additional permit under the Pollution Control Act to store waste already placed in the facility that has not been disposed of due to the stop in disposal* [...] *DSA is currently processing the application for a permit to store the waste that is already placed in the facility, and this licence must be granted to IFE before NND gets a licence."*

Specifically, DSA sought the Committee's advice in relation to the following questions (quoted from the explanatory note):

1. The Committee members' experience or knowledge about PSRs for disposal facilities that could apply to the KLDRA Himdalen case?

[1] Terms of Reference and minutes from previous meetings are available on The Advisory Committee on Nuclear and Radiation Safety - DSA

2. Do the Committee members see any potential shortfalls or challenges/issues with the PSR plan?
3. How to manage the challenges of carrying out a PSR (and the following SAR) without knowing the future operation, decommissioning and/or closure of the facility?
4. Issues related to NND's (potential) plan of modifying Hall 1 to be a dedicated authorised store that would accept more waste for storage while decisions were taken separately about the disposal part of KLDRA?
5. Any specific licence conditions for the facility that DSA should recommend?

DSA also raised the following matter for discussion (from the explanatory note).

6. Duration of licence: NND has applied for a licence with a 10-year duration, but wish DSA to consider giving a licence with an indefinite duration similar to that for the licence application for the Halden facility.

The Committee's handling of the matter

The Committee has been apprised of the relicensing of the nuclear facilities in Norway over the past few meetings (see footnote 1) and has had opportunities to discuss safety matters with operating and managing staff of both IFE and NND. The Committee visited the Himdalen site on 19 November 2024. Documentation on KLDRA Himdalen has been provided to the Committee, including - for the meeting of 12 – 14 May 2025 - the above-mentioned note from DSA, NND's *PSR Plan for KLDRA Himdalen*, and the report from DSA's inspection on 10 December 2024.

On 12 May 2025, Committee members received presentations from IFE and NND on the PSR and discussed the PSR with IFE, NND and DSA staff. The Committee developed preliminary advice *in camera* and presented it to senior DSA staff on 14 May.

This document constitutes the final advice to the Director, DSA. It has been unanimously endorsed by all members[2]. A draft was circulated on 17 June 2025 for members' review and - for information - to members of DSA's senior executive.

CONSIDERATIONS AND ADVICE

Question 1: The Committee members' experience or knowledge about PSRs for disposal facilities that could be applied to the KLDRA Himdalen site?

Periodic safety reviews are common practice in nuclear safety of operational nuclear installations. Although this terminology is not commonly adopted for waste facilities, it is recognised as an important mechanism for recurrent assessments of safety; it is both retrospective (critical assessment of safety performance and operational experience) and prospective (development of an action plan for improvements and consideration to any anticipated changes on how the facility will be operated in the future), and aims at providing confidence in the currency of the licensing basis and in the safety of operations until and beyond the next PSR[3].

[2] Committee member Allison Macfarlane was unable to attend the meeting in full but has stated her endorsement of the advice contained in this document.

[3] IAEA Specific Safety Requirements No. SSR-4, Safety of Nuclear Fuel Cycle Facilities, states "*Requirement 5. "The operating organization shall conduct systematic safety assessments of the facility, in accordance with regulatory requirements, throughout the lifetime of the facility. On the basis of the*

Given the challenges, described by DSA and NND, on local community concerns relating to Himdalen, the Committee noted that the findings of a PSR may also be used for the purpose of communication and consultation with interested parties (including the public) regarding the continued safe operation of the facility.

The Committee fully supports DSA's decision to request a PSR for KLDRA Himdalen.

The Committee is aware that there is little specific guidance available internationally for conducting a PSR for a facility such as KLDRA Himdalen, including suitable frequency of performing PSRs. The IAEA *safety series* includes detailed guidance for conduct of PSRs for power reactors[4]. The *safety report series* includes guidance on PSRs for research reactors[5] and more general advice for fuel cycle facilities.[6]. However, KLDRA Himdalen may fall outside the scope of available guidance, unless it is argued that the facility is covered under the somewhat vague category "ancillary facilities"[7]. That said, there is, in the Committee's view, no doubt that the PSR methodology can be adapted to KLDRA Himdalen and that the objective of a PSR[8] is as relevant to KLDRA Himdalen as it is to (other) nuclear fuel cycle facilities.

The Committee is aware that safety assessments have been performed in several countries for storage/disposal facilities after several years of operation. If not necessarily referred to as PSRs, they have been carried out with similar intent. Facilities in Sweden, Finland and the UK were mentioned. These facilities are generally larger and designed to accommodate waste from the operation of power reactors. Notwithstanding this difference, the Committee advises that liaison with regulatory bodies in the countries mentioned above could provide valuable input to the conduct, review and assessment of the PSR for KLDRA Himdalen.

Question 2: Does the Committee see any potential shortfalls or challenges with the PSR Plan?
Question 3: How to manage the challenges of carrying out a PSR (and the following SAR) without knowing the future operation, decommissioning and/or closure of the facility?

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results of such periodic safety reviews, the operating organization shall implement any necessary corrective actions and shall consider the need for modifications to enhance safety."

[4] IAEA Specific Safety Guide No. SSG-25, Periodic Safety Review for Nuclear Power Plants.

[5] IAEA Safety Report Series No. 99, Periodic Safety Review for Research Reactors.

[6] IAEA Safety Report Series No. 124, Periodic Safety Review for Nuclear Fuel Cycle Facilities.

[7] Safety Report Series 124 states: "The NFCFs that are within the scope of this publication are those that are covered in SSR-4 [1], including the facilities for processing, refining, conversion, enrichment and fabrication of nuclear fuel, storage of spent nuclear fuel and reprocessing of spent nuclear fuel, as well as nuclear fuel cycle research and development (R&D) facilities and the supporting ancillary facilities in which radioactive material is handled."

[8] The purpose of a PSR is outlined in IAEA SSG-25: *The objective of PSR is to determine by means of a comprehensive assessment:*

- *The adequacy and effectiveness of the arrangements and the structures, systems and components (equipment) that are in place to ensure plant safety until the next PSR or, where appropriate, until the end of planned operation …*
- *The extent to which the plant conforms to current national and/or international safety standards and operating practices;*
- *Safety improvements and timescales for their implementation;*
- *The extent to which the safety documentation, including the licensing basis, remains valid*."

Question 4: Issues related to NNDs (potential) plan of modifying Hall 1 to be a dedicated authorised store that would accept more waste for storage while decisions were taken separately about the disposal part of KLDRA?

These questions are relevant to the purpose and conditions for operation and for future considerations regarding potential closure. The issues are dealt with thematically below and as discussed by the Committee.

'Decoupling' of the review and assessment of NND's application for a license to own and operate KLDRA Himdalen, from the PSR.

The application of a licence to own and operate KLDRA Himdalen was submitted simultaneously with the licence applications for the facilities at Halden and Kjeller. With the licence transfer for Halden now completed, and given the resources available to DSA, the Committee agreed with DSA's strategy to now prioritise work on the relicensing of KLDRA Himdalen, unless there are pressing safety concerns that require work to be prioritised differently. Establishing NND as the licensee for KLDRA Himdalen, and thus bringing the second step of the three-step relicensing process to closure, will enable greater focus and continuity to be placed on the current management of the facility including consideration of future operating options, of which the PSR is only one element, albeit an important one

PSR plan, point of departure

The licensing basis constitutes the 'point of departure' for a PSR. In the case of KLDRA Himdalen, there are elements of uncertainty regarding what was built in relation to what was *planned* to be built; that is, elements of the licensing basis are not entirely clear. The safety case for the facility was described as having not being reviewed or updated for a considerable period of time with significant uncertainty regarding its current status and application. Likewise, there are questions regarding whether all systems, structures and components (SSCs) perform as intended (for example, drainage issues to be addressed). The PSR will shed light on the performance but as much information as possible must be collected in order to fully understand and appraise the performance against the licensing basis. Interviews with staff (current and previous) at Statsbygg as well as IFE and DSA who had a role in the licensing process should be a priority. Efforts have been made to collect information but it is not clear to the Committee how that information has been verified and evaluated by the current owner (Statsbygg), operator (IFE), prospective owner and operator (NND), and DSA.

Uncertainties remain regarding the inventory, which must be resolved as best possible, in particular in relation to post-closure safety.

Notwithstanding the above, and the deficiencies reported by DSA regarding house-keeping and ageing management that are now being rectified, the Committee considers KLDRA Himdalen as a national asset that serves an important function in the national system for radioactive waste management. In the Committee's view, the facility has the potential to serve as a storage facility for a time yet to be determined and which will be informed, *inter alia*, by the outcomes of the planned PSR. In addition, the facility already contains waste for which no authorisation for storage has been granted, and DSA has indicated that a permit under the Pollution Control Act to store this waste must be issued before NND can be granted a licence for the facility. Given the above-mentioned uncertainties and the potentially long timescales to establish a full understanding of all the issues, it may be useful to stage the PSR with an initial focus on storage, as further elaborated on below.

Consider staging the PSR with an initial focus on continued use of KLDRA as a storage facility

In light of the above, a staging of the PSR with an initial focus on storage could be beneficial and should, in that case, give consideration to the following:

- initial evaluation of the safety related SSC's and relative importance of the different safety factors in relation to storage
- DSA could consider providing guidance and requirements for interim storage *separately from assessment for disposal* (disposal can be considered at later stage).
- inclusion of DSA in the PSR development process, development of milestones and implementation of follow-up mechanism which involves DSA
- DSA should develop a focused inspection routine based on PSR results and associated milestones
- DSA should strengthen its involvement with stakeholders, focusing on safety, including municipalities (elected officials as well as the general public).

Retrieval and disposal

Storage of waste often precedes a decision on the ultimate fate of the waste. This means that waste in a storage facility – unless it can be disposed of *in situ* at closure of the facility – may have to be retrieved for different purposes, including conditioning for disposal at the storage site or elsewhere. The ability to retrieve stored waste should be considered a normal step in waste management but is sometimes understood by those concerned over the management of radioactive waste as an indirect indication of the hazard to health and the environment posed by the waste. Against this backdrop, the Committee advises that DSA may consider the following in its communication and interaction with stakeholders:

- provide clarity for stakeholders on what the 'end game' is for storage – if that includes retrieval of the waste, it is because it constitutes an intermediate step towards disposal, and that disposal can only be authorised if supported by a strong safety case
- disposal at the KLDRA Himdalen site will only be authorised if supported by the safety case and after regulatory review and assessment
- criteria – national generic criteria (e.g. dose constraints and criteria for clearance) could usefully be developed based on international practice and subject to an appropriate optimisation process.
- regular interaction with stakeholders as suggested for the PSR, but also in subsequent steps, with a focus on safety.

Question 5: Any specific licence condition that DSA should recommend?

The General Licence Conditions provide coverage of many aspects of safety and performance of relevance to KLDRA Himdalen. Specifically for the facility, and informed by its history so far, the Committee suggests that DSA proposes licence conditions on:

- maintenance and periodic testing of equipment necessary for retrieval of stored waste (excluding waste drums that have been immobilised), for the purpose of maintenance of

the facility, conditioning of the waste, or ultimate disposal of the waste (either on site or off site)

- provision of an ageing management plan within a certain time frame, and regular updates of the plan at intervals that DSA decides.

Question 6: Duration of licence: NND has applied for a licence with a 10-year duration, but wish DSA to consider giving a licence with an indefinite duration similar to that for the licence application for the Halden facility.

The Committee refers to the reasoning and advice on the duration of the licence for the Halden facility, in which the Committee concluded that an indefinite licence duration was appropriate[9]. For the KLDRA Himdalen facility, the Committee considers a licence covering the phase until final closure, but without any specific time limitation, appropriate. That is, relicensing should be triggered by repurposing of the facility (including closure), whereas for the operational phase, no limitation of the duration of the licence appears necessary.

Also, and as concluded in the previous advice regarding the Halden facility, DSA is in possession of a 'regulatory toolbox' that enables prevention of, or, as necessary, halting activities considered unsafe, and to enforce rectification of unsafe practices or conditions. This also gives DSA the authority to request a new PSR, should that be deemed necessary, although this is not foreseen at this time.

On behalf of the Advisory Committee on Nuclear and Radiation Safety

Carl-Magnus Larsson

Chairman

[9] AdCom Meeting November2024_Minutes Final.pdf