Basisdocument PSR LTO-2

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Basisdocument PSR LTO-2

Hoofdafdeling	Staf directie
Afdeling	PBV
Archiefnummer	Volgt
Inhoud	Basisdocument PSR LTO-2
Kopie voor	Archief, betrokkenen
Classificatie	Openbaar

Projectnummer	LTO2
Referentie	LTO2_[redacted]_R240022
Revisie	1.0
Datum	12-9-2025
Bijlage(n)	-
Status	Definitief

Samensteller	NRG
Datum	11-9-2025

Gecontroleerd safety factors	Functie EPZ experts/eigenaren
Datum	-

Gecontroleerd	Naam [redacted] Functie
Datum	11-9-2025

Goedgekeurd	Naam Functie
Datum	12-9-2025

N.V. Elektriciteits-Productiemaatschappij Zuid-Nederland EPZ

BASIS DOCUMENT PERIODIC SAFETY REVIEW LTO-2

KCB Subsequent Long Term Operation

Basis document PSR(LTO-2)

Kernenergie Centrale Borssele Subsequent Long Term Operation

Confidential

Commissioned by EPZ

Author(s)	Reviewer	Approved
[redacted]		

Reference number	Revision	Status	# pag.	Date
2.7355/25.316204	1.0	Draft	135/135	12-Sep-25

Revision table

Revision no.	Date	Description change
0.5	23-6-2025	First draft
0.8	11-7-2025	Second Draft
1.0	11-9-2025	Version 1.0

Glossary

Term	Dutch Equivalent	Description
LTO-1	-	the period between 01-01-2014 and 31-12-2033.
LTO-2	-	intended as the period between 01-01-2034 and 31-12-2053.
LTO-2 Justification Project	-	is intended as the set of activities, managed according to a project management approach, that lead to the obtainment of a modified operating licence.
LTO-2 Safety Demonstration	-	is intended as the set of activities that are carried out to demonstrate that KCB can be safely operate for the intended period of LTO-2 by means of an effective management of physical and non-physical ageing.
Non-Compliance	-	Deviation from the Regulatory Framework
Non-Conformance	-	Deviation from the Assessment Framework.
Mandatory Measure	-	Actions for addressing findings, aimed to maintaining the actual currently licensed safety level of KCB.
(Opportunity for) Safety Improvement	-	measures that can increase the safety level of KCB beyond the currently licensed safety levels (e.g. strengthen defense-in-depth)
Regulatory Framework	Wettelijk kader	The set of obligations that the licensee must comply with. This is formed by the Nuclear Energy Act and underlying decisions and regulations, requirements such as the licensing regulations.
Assessment Framework	Toetsingskader	Consists of (documents with) requirements that must be met to operate the installation in a permanently safe manner, in accordance with the latest insights and the state of the art in nuclear safety. Deviations from the assessment framework lead to areas for improvement compared to the state of the art.
Reference Framework	Referentiekader	Contains of documents that mainly contain guidelines rather than requirements, and also examples of a good implementation of requirements from other documents.
Good Practice	-	Guidance given at IAEA SSG level (or equivalent) based on commons consensus among member states.
Proven Practice	-	Guidance given at IAEA SRS level (or equivalent) based on practices adopted by at least one member state and operationally sound.
Safety Requirement	-	Requirement from IAEA General or Specific Safety Requirements standards.
Safety Improvements Implementation Plan	-	intended as the set of commitments to be realized in order to improve the plant safety according to the feasible opportunities arising by the PSR for LTO-2. In the 'Plan van aanpak (voorbereiding) aanvraag LTO 2-vergunning referred to as 'Implementatieplan veiligheidsverhogende maatregelen'.
LTO-2 (mandatory measures) Implementation Plan	-	intended as the set of commitments to be realized in order to ensure that the currently licenced safety level is maintained during the LTO-2 period. In the 'Plan van aanpak (voorbereiding) aanvraag LTO 2-vergunning is referred to as 'Implementatieplan verplichte maatregelen'

Abbreviations

Abbr.	Meaning
10EVA	10 jaarlijkse evaluatie (Periodic Safety Review)
ALARA	As Low As Reasonably Achievable
AMP	Ageing Management Programme
AMR	Ageing Management Review
ANVS	Autoriteit Nucleaire Veiligheid en Stralingsbescherming (National Regulatory Body)
BDSD	Basis Document of the Safety Demonstration
COMSY	Condition Oriented Ageing Management System
DEC	Design Extension Condition
DSA	Deterministic Safety Analysis
EPZ	Elektriciteits-Produktiemaatschappij Zuid-Nederland
EQ	Equipment Qualification
EQDBA	Qualification of Design Base Accident resistant electrical Equipment
GSR	General Safety Requirements (IAEA)
IAEA	International Atomic Energy Agency
IGALL	International Generic Ageing Lessons Learned (IAEA)
IMS	Integrated Management System
IRS	Incident Reporting System (IAEA/NEA)
ISI	In-Service Inspection
KCB	Kernenergie Centrale Borssele (Borssele NPP)
KeW	KernEnergieWet (Dutch Law on use of nuclear energy)
KTA	Kerntechnischer Ausschusses (German nuclear code)
LTO	Long Term Operation
LTO-1	Initial Long Term Operation (between 01.01.2014 and 31.12.2033)
LTO-2	Subsequent Long Term Operation (between 01.01.2034 and 31.12.2053)
LTO-2 IP	LTO-2 (mandatory measures) Implementation Plan
MM	Mandatory Measure
MTSI	Maintenance, Testing, Surveillance and Inspections
NEA	Nuclear Energy Agency
NPP	Nuclear Power Plant
NVR	Nucleaire Veiligheids Regels – Nuclear Safety Requirements
OECD	Organisation for Economic Co-operation and Development
PSA	Probabilistic Safety Assessment or Analysis
PSR	Periodic Safety Review
SALTO	Safety Aspects for Long Term Operation
SAR	Safety Analysis Report
SF	Safety Factor
SIIP	Safety Improvements Implementation Plan
SOER	Significant Operating Event Report
SPI	Safety Performance Indicators
SRS	Safety Report Series (IAEA)
SSC(s)	Structure(s), System(s) or(and) Component(s)
SSG	Specific Safety Guide (IAEA)
STRAT	EPZ Strategy report
SVS	Services Series (IAEA)
TECDOC	Technical Document (IAEA)

Abbr.	Meaning
TIP	Technical Information Package
TLAA	Time Limited Ageing Analysis
WANO	World Association of Nuclear Operators

Contents

1 Introduction

The Borssele Nuclear Power Plant (Kernergie Centrale Borssele, KCB) was built between 1969 and 1973 and started commercial operation in October 1973. The original design lifetime of 40 years for KCB expired on 31 December 2013. In 2006 KCB operating organization and the Dutch Government agreed on a covenant that intended to extend the operating life of KCB up to 1 January 2034. KCB performed an LTO-1 Justification project to extend the design lifetime up to 60 years and to update the Safety Report. Regulatory approval for the request of licence change was granted by the regulatory body in September 2012 allowing KCB to enter the Long Term Operation (LTO-1) phase on 1 January 2014. Part of the covenant was to stop operation with KCB by 1 January 2034. As there was no legal opportunity to limit the operating life of a nuclear power plant, in 2010 a change in the Dutch Nuclear Energy Act (KeW) [3] became effective. This change legally limits the operating life time (period for production of nuclear energy) of KCB to 31 December 2033. Furthermore, it stipulates that licence applications that aim at extending the operating lifetime of KCB beyond this date have to be rejected. In 2020, the Minister of Economic Affairs and Climate decided to aim at extending the operating lifetime of KCB beyond 31 December 2033 citing the preservation of critical knowledge and of the role of nuclear energy in the country's energy mix as strategic elements. Extended operating lifetime beyond 31 December 2033 will be indicated as LTO-2 phase. A procedure has been started to modify the Nuclear Energy Act. A phase-1 Environmental Impact Assessment (EIA) has been performed and a proposal for changing the Nuclear Energy Act has been formulated that enables extension of the operating time of KCB under the condition that a modification of the nuclear operating licence is granted. Based on the legislative proposal, the licence application must include at least an updated Safety Report and studies on the impact on the environment.

As detailed in the 'Plan van Aanpak (voorbereiding) aanvraag LTO-2 vergunning' [4], the preparatory work to the justification of KCB LTO-2 is based on the satisfaction of Requirement 16 of SSR 2/2 Rev.1 [1]. To fulfill this requirement a safety assessment is conducted consisting of two parts:

1. Safety Demonstration (SD) aimed at demonstrating that EPZ can maintain the licensed safety level during LTO-2 by means of an effective management of physical and non-physical ageing. [9]
2. A PSR (LTO-2) aimed at defining reasonably practicable safety improvements for LTO-2. The PSR for LTO-2 is the topic of this basis document.

In the Plan van Aanpak [4] it is defined that the assessment framework ('toetsingskader') for the performance of the PSR(LTO-2) is composed by article 11, comma 4 of the Rnvk [25] and by the Req.12 of the IAEA Safety Standard SSR 2/2 (Rev.1) [1]. The reference framework for the performance of the PSR(LTO-2) is composed by:

- the Handreiking tienjaarlijkse evaluaties voor nucleaire installaties [26] for defining the PSR(LTO-2) process steps;
- IAEA SSG-25 [8] to ensure a complete scope of the evaluation (e.g. which Safety Factors and what evaluation topics);
- IAEA SRS-121 [21] to orient the PSR to the use in support of Long Term Operation.

The Plan van Aanpak [4] is agreed with the regulatory body.

1.1 Purpose of the document

This document serves as the Basis Document for the Periodic Safety Review (PSR) of the Borssele Nuclear Power Plant (NPP), developed in the framework of the safety assessment required (Req. 16 par. 4.53 [1]) to support the justification of safe and reliable Long Term Operation of the plant beyond 31 December 2033 (LTO-2).

As mentioned in par. 4.6 of SSG-25 Periodic Safety Review of Nuclear Power Plants [8], the Basis Document PSR(LTO-2) is an essential instrument that governs the conduct of the PSR and the regulatory review of the PSR(LTO-2) results.

The Basis Document PSR(LTO-2) assumes the role of a formal and documented agreement (par. 4.5 [8]) with the national regulatory body (hereafter referred to as ANVS) concerning:

- the scope and objectives of PSR(LTO-2);
- the current national and international standards and codes to be used (regulatory, assessment and reference frameworks);
- the major milestones and cut-off dates;
- the general methodology for the conduct of the PSR(LTO-2);
- the Safety Factors to be reviewed;
- the structure of the delivered documentation;
- the process for categorizing, prioritizing and resolving findings.

1.2 Structure of the document

This document is composed by four chapters and six Appendices. Chapter 1 gives an introduction to the PSR(LTO-2) and the structure of the document and the covering of the contents of a basis document for PSR as advised by SSG-25 [8]. Chapter 2 gives a broad overview on the PSR(LTO-2) including the rationale for the performance of the PSR(LTO-2), the framework for its realization, cut-off dates and the role of the PSR within the LTO-2 justification project. Chapter 3 describes more in detail the systematic approach to the performance of the PSR(LTO-2) including the list of the Safety Factors, the methodology for the review of the Safety Factors (including the determination of the assessment and reference frameworks and reporting), the global assessment (including grading of findings and reporting), and the implementation plans. Chapter 4 describes the PSR(LTO-2) project structure including organization, planning, and lines of communications (internal and external).

Appendix A presents the Safety Factors review methodology for each Safety Factor (including objectives, insights from SRS-121 [21], specific research questions, interactions with the Safety Demonstration, additional evaluation activities, assessment & reference framework, and documentation sources). Appendices B and C present the Safety Factor review and the Global Assessment report templates, respectively. Appendix D shows how the PSR(LTO-2) satisfy article 11 comma 4 of the RNVK [25] and Req.12 of the IAEA Safety Standard SSR 2/2 (Rev.1) [1]. Appendix E presents the regulatory framework for the review of the Safety Factors. Appendix F reports the current licensing basis.

SSG-25 [8] provides in Appendix II (par. II.2) the recommended contents of a PSR Basis Document. In Table 1 it is shown how this PSR(LTO-2) Basis Document fulfills the guidance of par. II.2 [8]

Table 1 How this PSR(LTO-2) Basis Document covers the recommended contents of a PSR according to SSG-25 [8]

Recommended content of a PSR Basis Document according to SSG-25 [8] par. II.2 (Appendix II)	**Covered by PSR(LTO-2) Basis Document in chapter:**
General	
Scope and objectives (including covered period)	2.2
Plant licensing basis at the time of initiation	2.5, Appendix F
Cut-off dates	2.6
Relevant regulatory requirements	Appendix E
List of Safety Factors to be reviewed	3.1.2
Systematic review approach to be used	3.1.3
Process for identification, categorization, prioritization and resolution of findings	3.2
Process for ensuring that any immediate significant risk identified is addressed without delay;	3.2
Methodology used for the global assessment	3.2
Planned document structure of the global assessment report	3.2
Guidance for the preparation for the integrated implementation plan of safety improvements	3.3
Systematic method used for recording outputs of the review including formats for the Safety Factor reports, the global assessment report and the final PSR report including the implementation plan.	Appendices B & C

Recommended content of a PSR Basis Document according to SSG-25 [8] par. II.2 (Appendix II)	Covered by PSR(LTO-2) Basis Document in chapter:
Safety Factors	
Objective and scope of the review	Appendix A
Applicable regulatory, assessment and reference framework and their relevance and hierarchy.	Appendix A
The input documents and processes to be reviewed	Appendix A
The specific methodologies and tasks to be used for the review	Appendix A
Project plan	
Organization of the project including roles and responsibilities	4.1
Time schedule including any major milestones and cut-off dates	4.2
Project and quality management processes	4.3
Processes for ensuring consistency between separate Safety Factors	4.3
Training	4.3
Internal communication	4.2
The plan for communicating and interfacing with the regulatory body	4.4

2 PSR(LTO-2) overview

This chapter presents the PSR(LTO-2) describing:

- The PSR(LTO-2) rationale
- The PSR(LTO-2) scope and objectives
- The framework and basis for the realization of the PSR(LTO-2)
- The role of the PSR(LTO-2) within the KCB LTO-2 justification project
- The interactions with previous assessments
- The PSR(LTO-2) cut-off dates
- The plant licensing basis

2.1 Rationale for PSR(LTO-2)

The Plan van Aanpak [4] details the rationale behind the performance of the PSR(LTO-2).

- The preparatory work for the justification of KCB LTO-2 is based on the satisfaction of Requirement 16 of IAEA SSR 2/2 Rev.1 [1]. Requirement 16 of SSR 2/2 Rev.1 [1] prescribes that a the justification for long term operation shall utilize results of periodic safety review and that the comprehensive programme for long term operating shall address safety upgrading. EPZ has carried out and completed in 2023 the periodic safety review 10EVA23. 10EVA23, however, did not include any consideration on possible Long Term Operation.
- To fully comply with Requirement 16, EPZ will therefore conduct a Periodic Safety Review focused on LTO 2 to support the justification with the necessary PSR results and identify safety upgrades for LTO-2.

The terminology Periodic Safety Review is used for sake of simplicity when referring to the methodology used. However, PSR(LTO-2) is a 'one-time safety assessment' which is not to be confused with the licence requirement of performing a periodic (every ten years) safety evaluation (Article C.19 of the operating licence [24]). These periodic safety evaluations are named 10EVAs.

The decision of EPZ to use the PSR methodology as a part of the safety assessment for KCB LTO-2 justification finds support in SSG-25 [8]. In par. 2.10 and 3.3 it is stated that a PSR (and its findings) can be used in support of the decision making process for LTO. In par 3.5 it is further elaborated that any necessary safety improvement to ensure that the licensing basis remains valid during LTO period should be identified. In par. 3.6 and 3.7 it is stated that the scope of certain Safety Factors could be adapted to determine the feasibility of LTO and that, in any case, the PSR should cover the entire period of intended LTO. Finally, SSG-25 [8] states that the safety improvements identified in the PSR should be used as inputs to the decision as to whether to approve LTO.

2.2 PSR(LTO-2) scope and objectives

2.2.1 Objectives

The objectives for the PSR(LTO-2) follow from the defined assessment and reference framework:

- To identify reasonably practicable safety improvements for the LTO-2 period by comparing with state of art and taking into account the foreseeable future challenges that the plant will face.
- To determine implementation plan(s) (including the timescales) for the implementation of the safety improvements identified.
- To determine the extent to which the plant meets the requirements that shall become part of the licensing basis for LTO-2, as described in Chapter 2.5.
- To determine the adequacy and effectiveness of the arrangements and the SSCs that are in place to ensure plant safety for the LTO-2 period.
- To determine the extent to which the plant conforms to the current national and/or international safety standards and operational practices.
- The extent to which the safety documentation remains valid for LTO-2.

2.2.2 Scope

According to par. 4.1 of SSG-25 [8] the scope of the PSR should include all safety aspects of a nuclear power plant and should be agreed with the regulatory body. The review should cover all facilities and SSCs on the site covered by the operating licence (including, if applicable, waste management facilities, on-site simulators, etc.) and their operation, together with the operating organization and its staff.

SRS-121 [21] adds that, if a PSR is used for LTO justification, the PSR scope is extended in accordance with Req. 16 of IAEA SSR-2/2 Rev. 1 [1]. This extended PSR requires:

- A review of the preconditions for LTO, which covers programmes and documents relevant for ageing management;
- A review of ageing management and its alignment with SSG-48 [2], especially with regard to scope setting, including special attention to SSCs that are to be included in the scope, in accordance with para. 5.16(b)1 of SSG-48 [2]

The scope extension mentioned in SRS-121 is covered by the Safety Demonstration [9] within the KCB LTO-2 justification project. Available results of the safety demonstration are included in the PSR (LTO-2).

The scope of the PSR(LTO-2) is a comprehensive assessment of the safety of the plant in relation to the prolongation of the operating life into the LTO-2 period.

2.2.3 Timeframe

The PSR(LTO-2) is a comprehensive safety assessment in support of the decision making for KCB LTO-2 (par. 2.10 [8]). As prescribed in par. 3.7 of SSG-25 [8], in case the PSR process is used to support LTO the entire planned period of long term operation should be considered. This means that the temporal horizon of the PSR(LTO-2) is up to 31 December 2053.

2.3 PSR(LTO-2) within KCB LTO-2 justification project

The KCB LTO-2 justification project is a complex project covering many aspects of the KCB operation and licensing. A detailed description of the parts of the project is given in the Plan van Aanpak [4]. An overview of the different parts of the LTO-2 justification project is described in Figure 1.

The Safety Demonstration together with the PSR(LTO-2) forms the safety assessment in support of KCB LTO-2 justification. The main interaction of the PSR(LTO-2) within the KCB LTO-2 justification project is therefore with the Safety Demonstration.

The Safety Demonstration serves as an information source for the PSR(LTO-2). The results from the Safety Demonstration:

- Define the scope of SSCs for LTO-2 according to SSG-48 [2] and as advised in SRS-121 [21]. This scope of SSCs is directly used in Safety Factors 1 to 4.
- Provides information to (partially) answer research questions of several Safety Factors. Particularly Safety Factors 2 (Actual Condition of SSCs), Safety Factor 3 (Equipment Qualification), Safety Factor 4 (Ageing), Safety Factor 10 (Organization), and Safety Factor 12 (Human Factor). These results are used in the PSR(LTO-2) to answer relevant research questions. The contribution from the safety demonstration is detailed for each Safety Factor in Appendix A.
  The PSR captures the safety situation at the moment of the review. It is expected that some open points from the Safety Demonstration will be present at the time when the PSR review will be concluded, as the Safety Demonstration includes the performance of detailed technical assessments and activities (including inspections, testing, calculations), some of which have a long lead time. The presence of open points from the Safety Demonstration is not an obstacle to the conclusion of the PSR(LTO-2) because open points will be captured during the Safety Factor reviews as findings. Furthermore, the open points from the Safety Demonstration will be solved within the framework of the Safety Demonstration in a timeframe beyond the completion of the PSR(LTO-2) review.
- Include potential safety improvements and mandatory measures that are introduced in the PSR(LTO-2) process in order to be considered in the Global Assessment (see Chapter 3.2).
  Findings from the Safety Demonstration that lead to mandatory measures for maintaining the actual currently licensed safety level of KCB participate in the global assessment but are not affected by it (i.e. they cannot be compensated for by good practices found in other Safety Factors). It is not expected that all mandatory measures from the Safety Demonstration will have been fully developed at the time of the Global Assessment, but EPZ strives to have the picture for the Global Assessment as complete as possible[1]. Mandatory measures are included in the LTO-2 Implementation Plan.

Interaction with the environmental impact assessment is expected to be less extensive. The results of the PSR(LTO-2) will be input for the environmental impact assessment (EIA). According SRS-121 [21] the environmental impact assessment can benefit from the outputs from the PSR, particularly from Safety Factor 1, 8 and 14.

[1] This holds particularly for required replacements identified in the Safety Demonstration. Having the picture as complete as possible allows for a more complete assessment of the costs and benefits of potential Safety Improvements. In case of replacements identified in the Safety Demonstration after the Global Assessment of the PSR(LTO-2), the modification procedure will evaluate different alternatives taking into account the potential Safety Improvements that have been discarded in the global assessment of the PSR LTO-2 (see Chapter 3.2, 'list of discarded Safety Improvements').

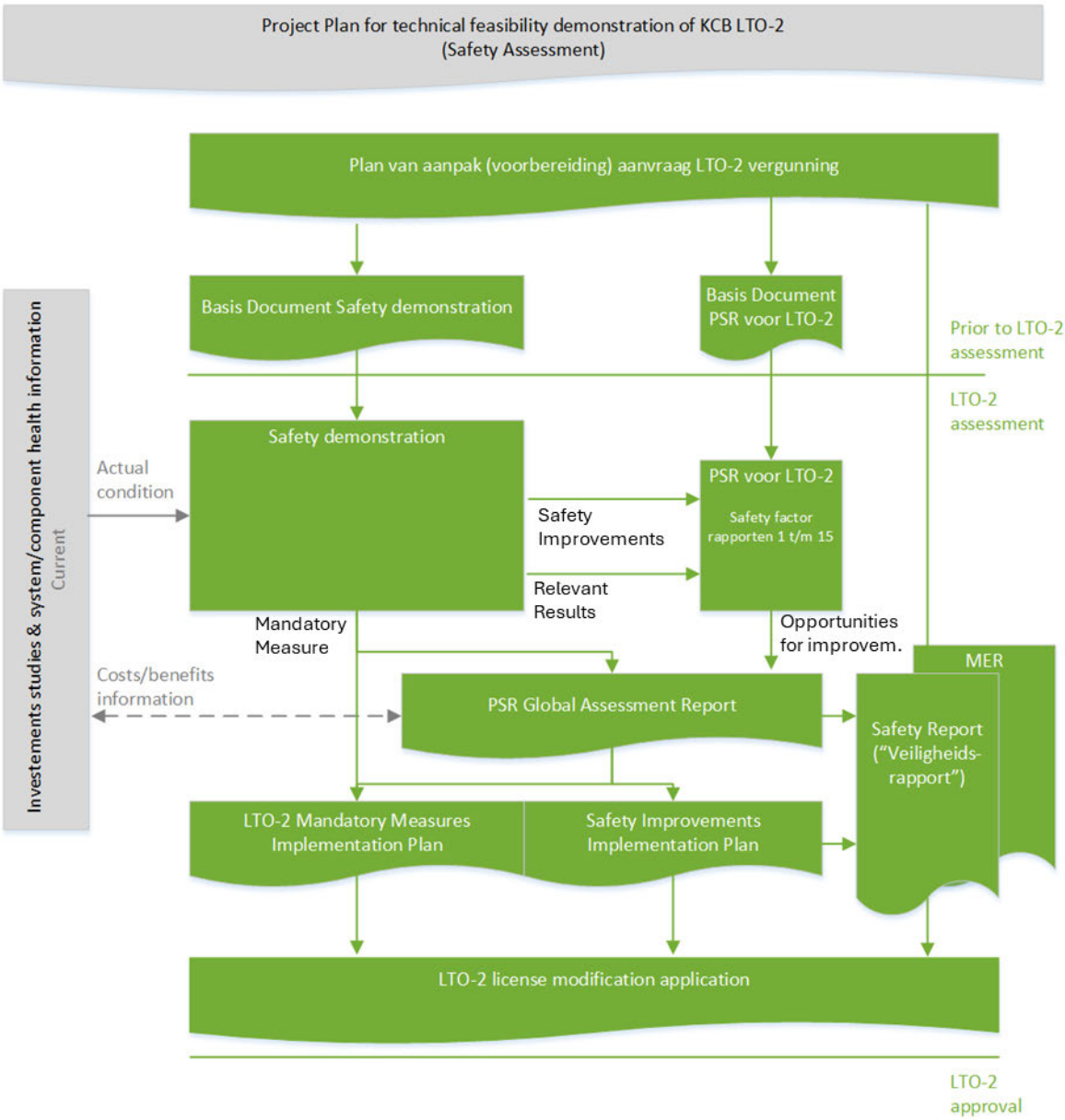

Figure 1 PSR(LTO-2) in relation with different parts of the LTO-2 justification.

2.4 Results from previous assessments to be considered for PSR(LTO-2)

Multiple assessment, peer reviews and audits have been recently performed at KCB. These assessments can provide useful input for achieving the PSR(LTO-2) objectives in an efficient way since the results are available for the Safety Factor evaluations. The assessments that are being considered are:

- 10EVA13: 10EVA13 was the fourth periodic safety evaluation prescribed by the Dutch regulatory framework and by article C.19 of KCB operating licence [24]. The 10EVA13 was performed with the goals to identify the effect of changes in regulations, codes, and standards occurred between 2003 and 2012 and identify safety improvements up to the next 10EVA (up to 2022). The 10EVA13 paid particular attention to the revalidation of

the deterministic safety analyses and external hazards including the lessons-learned from the post-Fukushima accident. On the output of 10EVA13 a review of the TIP and of the Safety Report (VR) was performed. 15 Safety Factors (the 14 currently present in SSG-25 [8] plus Radiation Protection which was considered as separate Safety Factor) were evaluated.

- 10EVA23: It was the fifth periodic safety evaluation prescribed by the Dutch regulatory framework and by article C.19 of KCB operating licence [24] and the first to be carried out during a regime of Long Term Operation. At the time of its conception and realization this 10EVA was supposed to be the last periodic safety evaluation before the end of operation foreseen for the end of 2033. 10EVA23 was performed with the goals to identify the effect of changes in regulations, codes, and standards that occurred between 2013 and 2022 and identify up to the next 10EVA (up to 2032). 16 Safety Factors (14 according to SSG-25 [8] plus Radiation Protection and Security considered as separate Safety Factors) were evaluated
- Peer review(s): The goal of Peer Reviews is to assist stations in achieving the highest standards of excellence in nuclear plant operation. The areas for improvement are raised against best practice, rather than minimum acceptable standards or requirements and, are not necessarily indicative for unsatisfactory performance.
- IAEA OSART (2023/2025): the purpose of an OSART mission is to review the operational safety performance of a nuclear power plant against the IAEA safety standards, make recommendations and suggestions for further improvement and identify good practices that can be shared with NPPs around the world. The 2023 OSART mission reviewed 11 areas: Leadership and Management; Training and Qualification; Operations; Maintenance; Technical Support; Operating Experience Feedback; Radiation Protection; Chemistry; Emergency Preparedness & Response; Accident Management, and Use of PSA for Plant Operational Safety Improvements. A follow-up mission has been held in 2025.
- IAEA Pre-SALTO (2024): KCB has hosted a pre-SALTO IAEA mission in November 2024. The pre-SALTO was oriented to assess the preparedness of KCB to LTO-2 in the early stage of preparation.

2.5 Plant Licensing Basis

The licensing basis for KCB is formed by all those documents upon which the operating licence of KCB [24] is based. Currently the licensing basis includes the codes, standards and regulations reported in Appendix F .

EPZ demonstrates the compliance of the licensing basis as part of the 10EVAs, last completed during 10EVA23. Furthermore, the operating licence at B.12 foresees that EPZ proves the way it fulfills the requirements of the operating licence by means of ‘nalevingsoverzichten’.

The ANVS has informed EPZ that, before the LTO-2 related changes to the operating licence are approved, the current set of Nucleaire VeiligheidsRegels (NVR) that are part of the licensing basis and are based on obsolete IAEA safety standards will be replaced by a set of modern IAEA Safety Standards containing Safety Requirements through an ‘ambtshalve vergunningswijziging’ initiated by the authority. This change is expected by Q3 2025.

Because compliance with the current licensing basis was recently demonstrated and the licensing basis will change, the PSR (LTO-2) will not contain a detailed compliance assessment of the current licensing basis but instead focus on the assessing the validity of the licensing basis for LTO-2. The new IAEA requirements, for example, will be part of the assessment framework for this PSR. During the PSR(LTO-2), if evidence of non-compliance with the current licence basis is found (e.g. from nalevingsoverzichten, open regulatory findings) and this finding is also relevant for the modified permit after the ‘ambtshalve vergunningswijziging’ mentioned, then the above mandatory actions will be formulated to ensure compliance.

2.6 PSR(LTO-2) cut-off dates

The cut-off dates for PSR(LTO-2) are as follow:

- The cut-off date for Codes and Standards used in the assessment and reference frameworks and operating experience is set at 1st July 2025. In case the Codes and Standards are already used in the Safety Demonstration, the cut-off dates reported in the Basis Document of the Safety Demonstration (BDSD) [9] are used. In case the

Codes and Standards are part of the ‘ambtshalve vergunningswijziging’ mentioned in 2.5, the versions of Codes and Standards specified in this permit change are used.

- The cut-off dates for the operating organization documentation are set within the Safety Factor reports by referencing version numbers.

3 PSR(LTO-2) Systematic approach

The PSR(LTO-2) follows a systematic approach based on SSG-25 [8] guidance. It is noted that this approach is based on the guidance given in the Handreiking tienjaarlijkse evaluatie nucleaire installaties [26]. The approach, schematically illustrated in Figure 2 and comparable to Figure 1 of [26], starts with the preparation to the PSR. The preparation to the PSR includes all the necessary agreements made with the regulatory body and results in the Basis Document for the PSR(LTO-2) (the present document). The Basis Document is approved by the regulatory body.

The next step is the review of the Safety Factors forming the scope of the PSR(LTO-2). Each Safety Factor review is documented in a Safety Factor review report. The results of the review of the Safety Factors are findings.

All the findings subsequently undergo the process of Global Assessment, which is meant to determine the combined effect of all findings from the Safety Factors review, and results in the identification of safety improvements that are reasonable and practicable and, if applicable, mandatory measures that are required to maintain the currently licenced safety level.

The safety improvements and the mandatory measures are recorded in the Safety Improvements Implementation Plan (SIIP) and in the LTO-2 Mandatory Measures Implementation Plan (LTO-2 IP) , respectively.

The Global Assessment report, the LTO-2 Implementation Plan and the Safety Improvements Implementation Plan are deliverables of the KCB LTO-2 justification project and are therefore submitted for assessment to the regulatory body

In the following paragraphs detail is given to the approach for:

- Review of Safety Factors;
- Global Assessment process; and
- Implementation Plans.

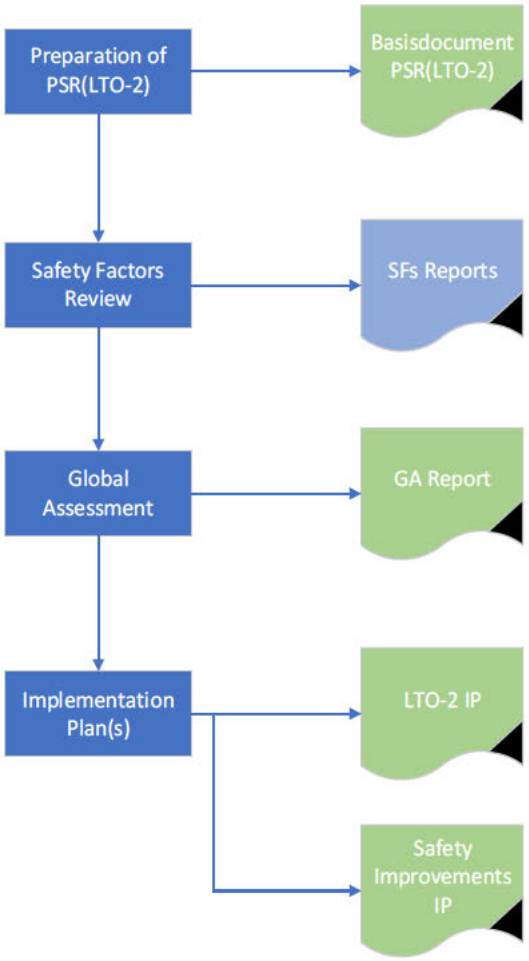

Figure 2 Schematic PSR(LTO-2) process and deliverables (in green the deliverables that are submitted for assessment the regulatory body). The Safety Factor reports are submitted to the regulatory body for information and reaction.

3.1 Review of Safety Factors

SSG-25 [8] and the Handreiking tienjaarlijkse evaluaties [26] foresee the use of Safety Factors to distribute the review tasks and cover the scope of PSR. SSG-25 [8] foresees the use of 14 Safety Factors (par 2.13). Next to these 14, SSG-25 [8] foresees the possibility that Radiation Protection, normally an aspect considered in several Safety Factors, might be considered separately.

The review of the Safety Factors should cover a period up to the end of planned operation (par. 5.4 of SSG-25 [8]). For the case of PSR(LTO-2) it follows that (as per par. 3.7) the review of the Safety Factors (SF) covers the entire LTO-2 period. Particularly it must assess the anticipated future safety challenges and identify the related practicable safety improvements for the period of LTO-2.

3.1.1 Focus on safety during LTO-2

The goal of IAEA SRS-121 [21] is to provide specific guidance on the use of the PSR in support of Long Term Operation of Nuclear Power Plants. Particularly, the guideline describes in detail the amendments of PSR strategy and methodology

(for the relevant SFs) when the PSR is used for support of LTO. As such, the guideline is used in PSR(LTO-2) where relevant to steer the focus of the Safety Factor review on the needs of LTO-2.

3.1.2 Safety Factors for PSR(LTO-2)

SSG-25 [8] allows for variations in the Safety Factors number or grouping to accommodate specific needs of the operating organization or owing to particular aspects of the nuclear power plant under review as long as completeness is ensured.

The PSR(LTO-2) utilizes the 14 Safety Factors (SFs) advised in SSG-25 [8] par. 2.13 as demonstrated in Table 2.

For the PSR(LTO-2), and in line with previous 10EVAs, the list of SFs is extended to include Radiation Protection as a separate Safety Factor (SF15).

The 'relevance for LTO-2' mentioned in Table 2 is intended as a qualitative evaluation of the expected impact:

- that the results of the Safety Factor review will have on LTO-2 decision making process and LTO-2 related modification;
- that the Long Term Operation (e.g. longer operating lifetime and consequent site characteristics changes) will have on the scope of the Safety Factor review.

This evaluation is based on the assessment of the contents of SRS-121 (e.g. the combined insights from Tables 2, 5, and 7).

Each Safety Factor specific review methodology, assessment and reference framework and corresponding review sources of information are provided in Appendix A.

Table 2: Scope of the PSR for LTO-2.

ID	Safety Factor	Relevance for LTO-2 (from SRS-121)
Safety Factors relating to the plant		
1	Plant Design	High
2	Actual Condition of Systems, Structures, and Components	High
3	Equipment Qualification	High
4	Ageing	High
Safety Factors relating to Safety Analysis		
5	Deterministic Safety Analysis	Medium
6	Probabilistic Safety Analysis	Medium
7	Hazard Analysis	High/Medium
Safety Factors relating to Performance and Feedback from Operating Experience		
8	Safety Performance	Low
9	Use of Experience from other Plants and Research Findings	Medium
Safety Factors relating to management		
10	Organization, the management system and safety culture	High/Medium
11	Procedures	Low
12	The Human Factor	High
13	Emergency Planning	Medium
Safety Factors relating to Environment		
14	Radiological Impact on the Environment	Medium
Safety Factors relating to Radiation Protection		
15	Radiation Protection	Low

3.1.3 Systematic approach to Safety Factors review

The approach for the systematic review of the Safety Factors is schematically represented in Figure 3. The review of the Safety Factor begins with the definition of the review objective. Guidance for the Safety Factors' review objectives is given in SSG-25 [8]. The Safety Factor's review objectives are adapted for LTO-2 to match the PSR(LTO-2) global objectives.

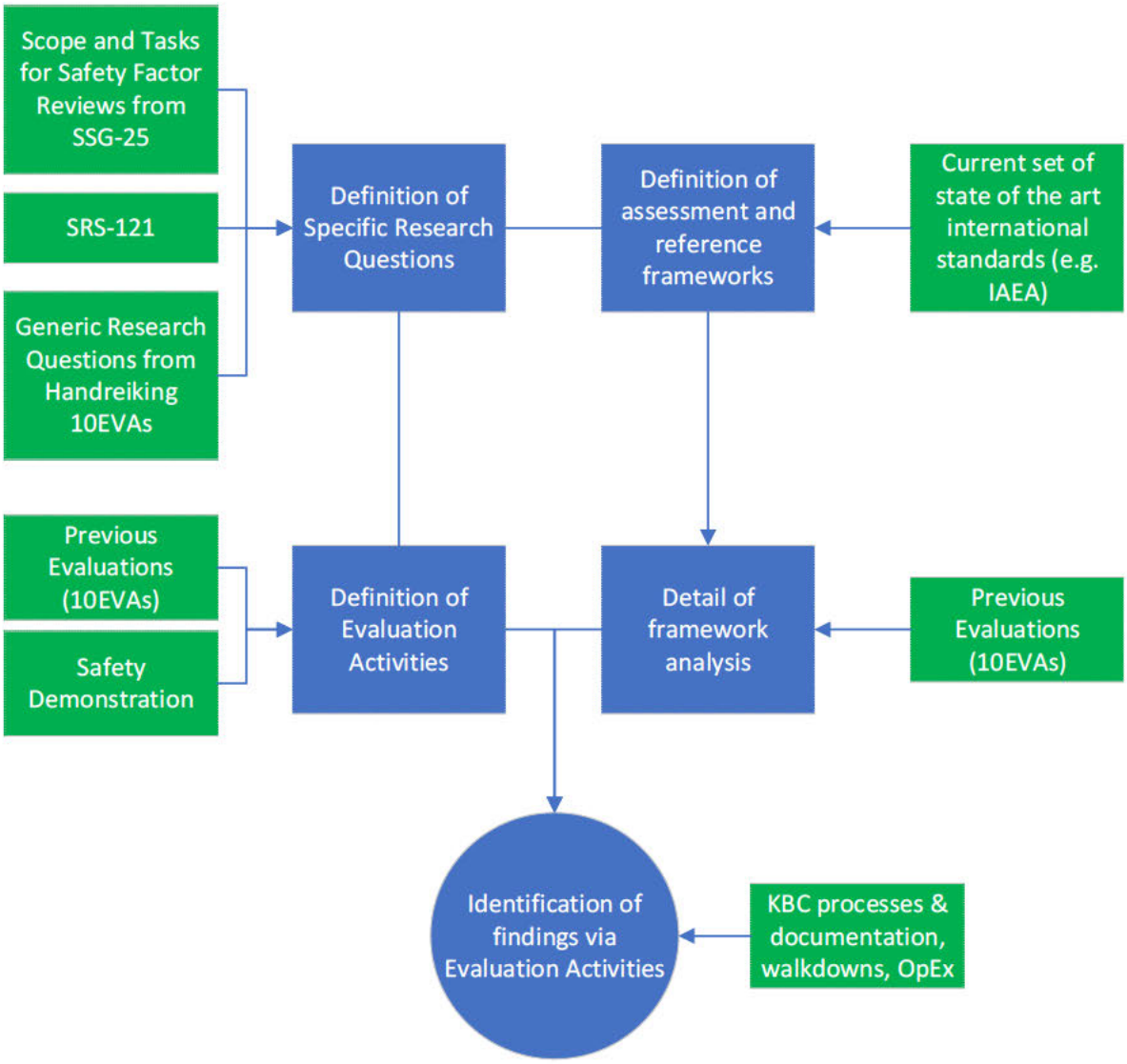

Figure 3 Steps for the review of the Safety Factors.

Scope and tasks for Safety Factor Review

The scope and tasks of the Safety Factor review is given in SSG-25 [8] for each Safety Factor.

Definition of specific and generic Research Questions

In order to conform to the guidance in the Handreiking 10EVAs [26], once the objective of the Safety Factor review is defined, the scope and tasks described for each Safety Factor in SSG-25 [8] are translated in one or more specific Research

Questions (RQ – 'Onderzoeksvraag' in Dutch). The formulation of the specific Research Questions is guided, where possible, by the insights given in SRS-121 [21].

The Handreiking 10EVAs [26] differentiates between generic and specific research questions. The Handreiking 10EVAs [26] proposes four generic questions that are applicable to all Safety Factors that are reviewed. These generic Research Questions are:

- ***To what extent do the technical, organizational and/or administrative arrangements for ensuring nuclear safety conform to the assessment, and reference framework for the Safety Factor in question?***
  For each Safety Factor, the review contains the assessment of the operating organization's arrangements against the identified assessment and reference framework.
- ***What relevant (internal or external) operational experiences and internal signals from employees are there that indicate a possible threat to the Safety Factor?***
  Insights from operating experience (internal and external) and signals from employees are collected during the review, particularly from Safety factor 8, 9 and 10 and included in the applicable safety factor review where relevant. For each Safety Factor, the review foresees assessing external experience (e.g. from other reactors of similar age, design and situation with regard to subsequent lifetime extension) where relevant.
- ***What new, relevant developments and insights in the field of nuclear safety are there within the field of the Safety Factor, for example from international working groups and research programs?***
  Insights from research results of international working groups and research programmes related to subsequent LTO will be utilized during each Safety Factor review, particularly for review from Safety Factor 9.
- ***What improvement measures are possible to prevent accidents and/or limit the consequences, or to improve defence in depth?***
  Each activity performed in the framework of the PSR, including the Safety Factor reviews, has the intent to identify reasonably practicable safety improvements helping to prevent and/or to mitigate accidents or to improve defence in depth.

The generic Research Questions will be captured in the proposed specific Research Question and Evaluation Activities

Definition of regulatory, assessment and reference frameworks & review detail (state-of-the-art)

The regulatory, assessment, and reference frameworks are determined based on the guidance given in the Handreiking 10EVAs [26] and proposed in Figure 4.

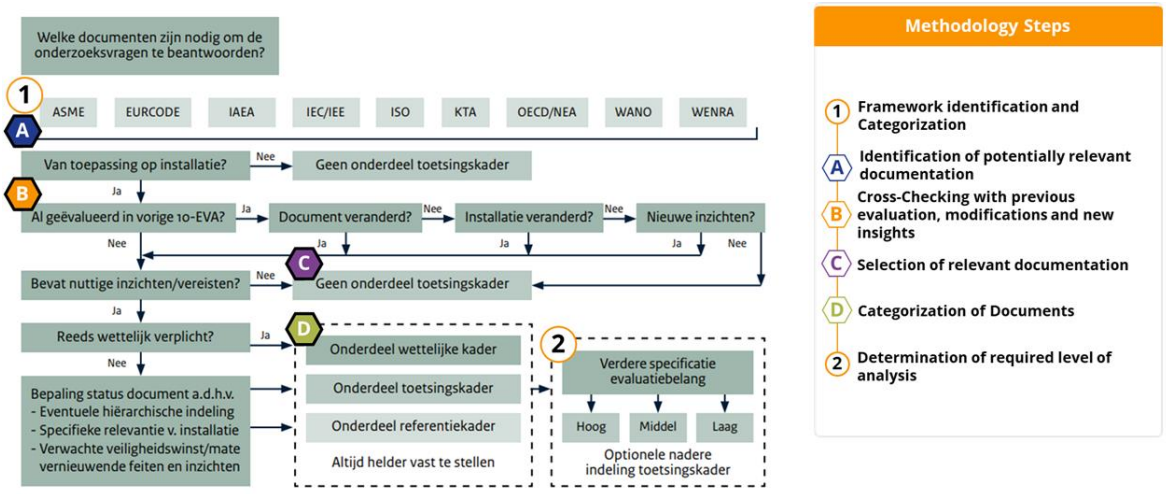

Figure 4 Selection of regulatory, assessment, and reference framework

As shown in Figure 4:

1. The relevant codes and standards are identified and categorized into regulatory, assessment and reference frameworks:

a. From the pool of typical codes and standards (e.g. IAEA, KTA, WANO, WENRA) used in the nuclear industry, an initial selection is made of the potentially relevant documents (using, where applicable, the experience of previous safety reviews). At this stage only the documents that are applicable to KCB are selected (e.g. codes and standards relate to ageing management of research reactors are not selected).
b. For each selected code and standard it is checked whether it was evaluated in previous safety reviews and when it was, the following considerations are made:
    i. Has the document changed from previous safety reviews?
    ii. Has the part of the installation under scrutiny changed from previous safety review?
    iii. Are there new insights (including longer timeframe of reactor operation) that might justify the re-assessment of the document?

    In case the document was never previously assessed, the document is assessed during the PSR(LTO-2). In case one or more of the previous points (i, ii, iii) is applicable, the document will be reassessed based on the occurred changes (e.g. if a new chapter is introduced and the rest is untouched, the new assessment will only focus on the new chapter).
c. Based on the previously mentioned criteria, a set of codes and standards is selected that are relevant for answering the Research Question.
d. The selected codes and standards are categorized in regulatory, assessment and reference framework based on the definitions given in the Handreiking 10EVAs [26] and adopted for the PSR(LTO-2).

2. The required level of analysis of codes and standards is defined according to Figure 5.

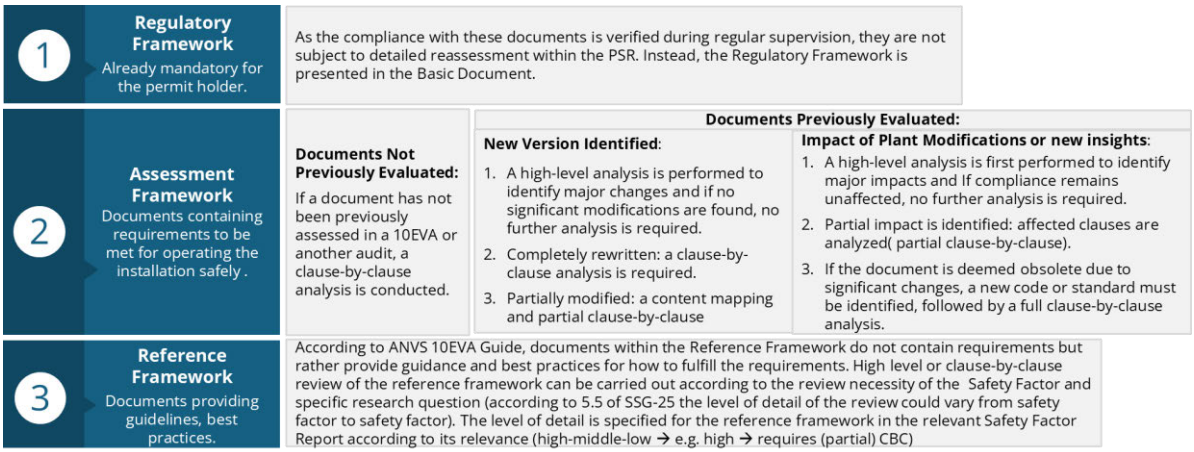

Figure 5 Level of analysis detail for Regulatory, Assessment and Reference frameworks.

The Assessment and Reference frameworks are used to identify opportunities for improvement and are specific to each Safety Factor. Appendix A identifies, for each Safety Factor and for each document, the use made in 10EVA13 and 10EVA23. In addition, it indicates a relevance category of each document for the PSR (LTO-2), together with the expected level of review.

Considering Figure 5 above, the following relevance categories are defined. Table 3 explains the logic for assigning each category to a document and specifies the corresponding level of analysis required.

Table 3. Relevance Categories for the Assessment and Reference Framework

Relevance	Logic	Possible use	Note
High	Assessment framework	Full Clause-By-Clause (CBC)	
		Partial Clause-By-Clause (CBC)	The relevant clauses for the Safety Factor are identified and used for a CBC assessment
Middle	Reference framework at SSG level or particularly relevant documents for the achievement of the Safety Factor objective	High Level (HL) + Partial Clause By Clause	The document is reviewed at high level to identify the most relevant sections for achieving the objective of the Safety Factor. These sections are reviewed Clause By Clause.
		High Level	The document is reviewed at high level to gather insights that might identify opportunities for improvement
Low	Reference framework at lower level than SSG.	High Level	The document is reviewed at high level to gather insights that might identify opportunities for improvement

Definition of additional Evaluation Activities

For each Research Question identified for PSR(LTO-2), one or more Evaluation Activities (EAs) are identified. The process for the identification of the Evaluation Activities follows the process in Figure 6.

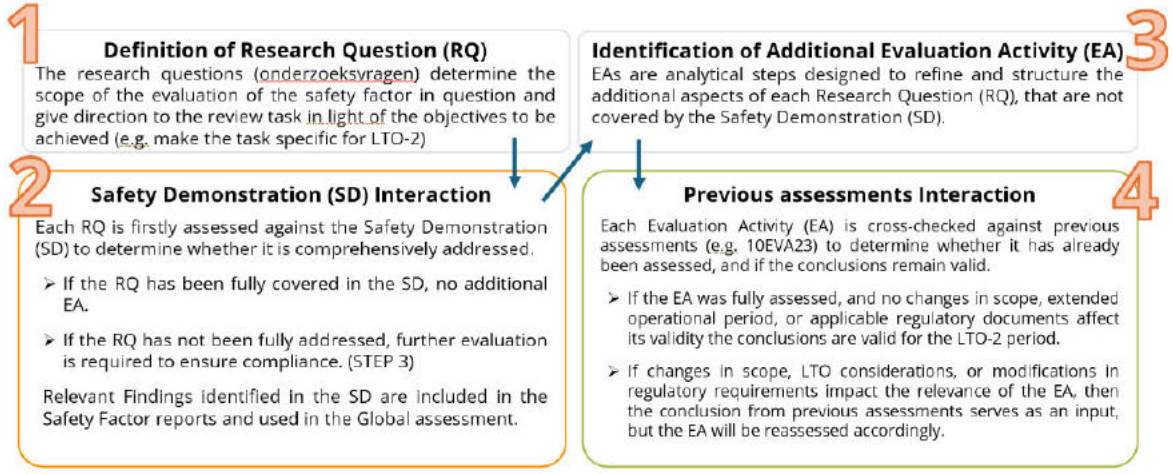

Figure 6 Process for identification EAs and assessment interactions with SD and previous evaluation

For each identified Research Question, an initial verification is made with the Safety Demonstration (SD) scope. If the Research Question is fully and timely addressed by the assessment activities carried out in the Safety Demonstration [9] no additional Evaluation Activity is necessary as the necessary evaluation results required to answer the research question will follow from the Safety Demonstration. The Research Question is considered addressed, and the relevant results from the Safety Demonstration and information sources are included in the relevant Safety Factor report. If additional assessments are necessary, or if the Research Question is not addressed by assessment activities of the Safety Demonstration, additional Evaluation Activities are developed based on the input from the relevant guidelines (e.g. SSG-25 [8], SRS-121 [21]). The Evaluation Activities specify how the Research Question will be answered. They define clear and delimited assessment activities to be performed by the reviewing team.

For answering the Research Questions, it is made use of the conclusions and results (including discarded safety improvements) from previous safety evaluations (i.e. 10EVAs).

First it is assessed how the Research Question was covered by 10EVA23 or 10EVA13 (if 10EVA23 did not address a specific aspect of the Research Question).

Second the conclusions from previous 10EVAs are assessed against the following questions:

- Have TOPA changes taken place since the previous 10EVAs that impact the conclusions of the review?
- Have changes in the assessment or reference framework used in previous 10EVAs occurred (e.g. new versions of the standards) that impact the conclusions of the review?
- Does the longer operating time frame and broader scope have an anticipated impact on the conclusions of previous 10EVAs?

Some Research Questions can be answered by demonstrating that LTO-2 has no impact on the conclusions of previous 10EVAs. If any of the previous questions have a positive answer the conclusions of previous 10EVAs are re-assessed to evaluate the impact of changes or longer operating time.

Identification of findings

By reviewing the Safety Factor according to the specific Research Question, performing the Evaluation Activities, and using the selected assessment and reference frameworks, findings are identified. Findings will generally be opportunities for improvement.

3.1.4 Safety Factor Report

According to the Handreiking 10EVAs [26] the Safety Factor Report describes the Safety Factor review process and results. For each Safety Factor, the Safety Factor Report includes:

- Objective of the review: the objective of the review is formulated based on the guidance from SSG-25 [8] taking into account the context (support of KCB LTO-2 justification) and the general objectives of the PSR(LTO-2).
- The general regulatory framework applicable for the Safety Factor.
- The specific assessment and reference frameworks.
- The Research Questions and related Evaluation Activities.
- Information sources (including plant and external documentation, results of walkdowns of own NPP or other NPPs, and interviews with relevant personnel).
- Evaluation methodology and discussion of the results.
- Findings (including from Safety Demonstration).

A template for the Safety Factor Report is found in Appendix B.

3.2 Global assessment

The goal of the Global Assessment is to identify reasonably practicable safety improvements that are to be implemented based on a balanced assessment of all findings, identified during the Safety Factors review. During the Global Assessment the combined effect of all findings on nuclear safety is considered. This includes an analysis of the interfaces, overlaps and omissions between Safety Factors [8], to ensure that all the findings are analyzed from all relevant points of view.

The interface analysis makes use of the interfaces matrix presented in Table 1 of Appendix I of SSG-25 [8].

The Global Assessment ensures that [8]:

- The combined effects of findings that might be individually acceptable are reviewed to confirm acceptability.
- The weaknesses in certain Safety Factors are reviewed against the strengths of other Safety Factors to identify possible compensations.

The methodology for performing the Global Assessment is shown in Figure 7 and explained here:

1- The findings are gathered from the individual Safety Factor reports.
2- The findings are gathered in a database that allows the relevant interfaces to be determined, based on the Table 1 of Appendix 1 of SSG-25 [8]. The interface findings are considered from the point of view of the (potentially) affected Safety Factors to identify overlaps and potential omissions during the Safety Factor review.
3- This analysis allows clustering the findings that have similarities (such as same cause or same solution). Clustering the findings allow the organization to focus its resources on a number of significant potential safety improvements
4- The findings are graded based on their regulatory relevance, impact on the nuclear safety and/or radiation protection. Based on this grading, the findings are subdivided in major findings and minor findings.

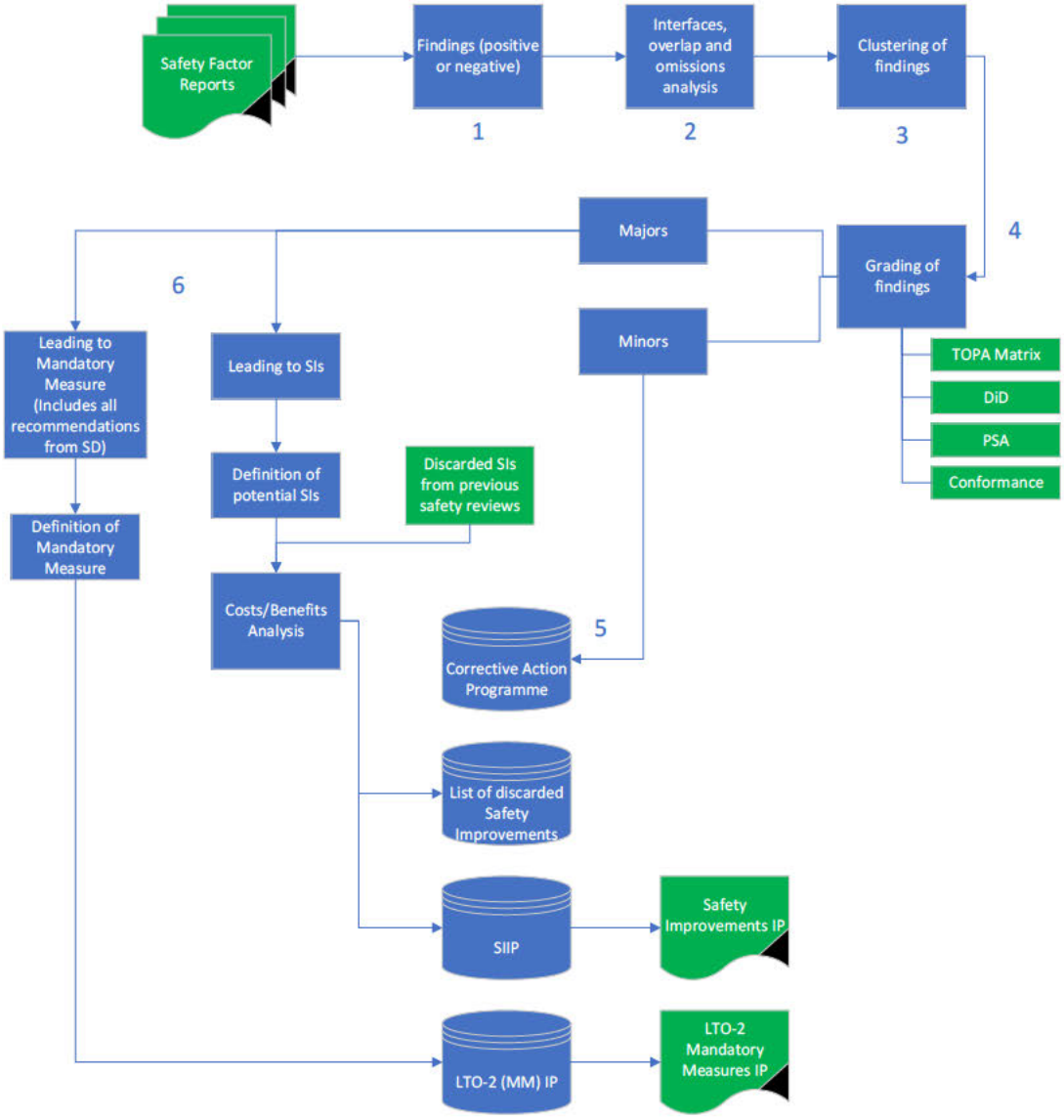

Figure 7 Process of Global Assessment

3.2.1 Grading of findings

The grading of findings is based on the following concepts:

- Defence in Depth;
- Risk matrix (deterministic and probabilistic); and
- Compliance/conformance to licenced safety level;

Defence in depth

The concept of defence in depth is used to determine the possibility of improvement to the nuclear safety related to a finding. The defence in depth makes use of the defence lines as illustrated in Figure 8. Findings in the global assessment are connected to the defence lines.

Levels of defence in depth	Associated plant condition categories	Objective	Essential means	Radiological consequences
Level 1	Normal operation	Prevention of abnormal operation and failures	Conservative design and high quality in construction and operation, control of main plant parameters inside defined limits	Regulatory operating limits for discharge
Level 2	Anticipated operational occurrences	Control of abnormal operation and failures	Control and limiting systems and other surveillance features	
Level 3[16]	Level 3.a Postulated single initiating events	Control of accident to limit radiological releases and prevent escalation to core melt conditions[17]	Reactor protection system, safety systems, accident procedures	No off-site radiological impact or only minor radiological impact
	Level 3.b[18] Postulated multiple failure events		Additional safety features, accident procedures	
Level 4	Postulated core melt accidents (short and long term)	Control of accidents with core melt to limit off-site releases	Complementary safety features to mitigate core melt, Management of accidents with core melt (severe accidents)	Limited protective measures in area and time
Level 5	-	Mitigation of radiological consequences of significant releases of radioactive material	Off-site emergency response Intervention levels	Off-site radiological impact necessitating protective measures

Figure 8 Defence in depth and defence lines

Risk reduction (deterministic approach)

For Technical, Organizational, Personnel-related and Administrative (TOPA) provisions the risk matrix (Figure 9) can be used to determine the improvement in safety related to the resolution of a finding. The risk matrix makes use of the defence in depth concept for the assessment of the effects of the potential safety improvement on the installation, processes and personnel related safety. The concept is used by determining the realistic potential effects of the safety improvement on the availability of one or more defence lines. The risk matrix can be used by defining:

- Effects: the effects are subdivided by relevant area:
  - Installation: technological barriers and control;
  - Process: procedures, documentation, analyses;
  - Personnel: knowledge and behavior;
  - Radiation: personnel, working location, environment.
- Likelihood of occurrence: the likelihood of the expected occurrence of the effect based on operating experience (if available) or an assessment of reasonable likelihood
- Risk class: associated to effects and frequency, five risk classes are determined:
  - Very low: no action required

- Low: perform risk evaluation considering ALARA;
- Middle (or medium): attention required considering a costs/benefits analysis;
- High: measures required for risk reduction, cost/benefits analysis;
- Very High: measures required for risk reduction, MT decide on approach.

Risk reduction (probabilistic approach)

The probabilistic approach to nuclear safety is assessed using Probabilistic Safety Analysis results to assess the impact of changes in the installation based on the frequency of core melting (average and instantaneous) and on the individual risk.

The probabilistic approach is intended to assess the safety gain from opportunities for safety improvement.

The five risk categories apply also for the probabilistic approach (Figure 10).

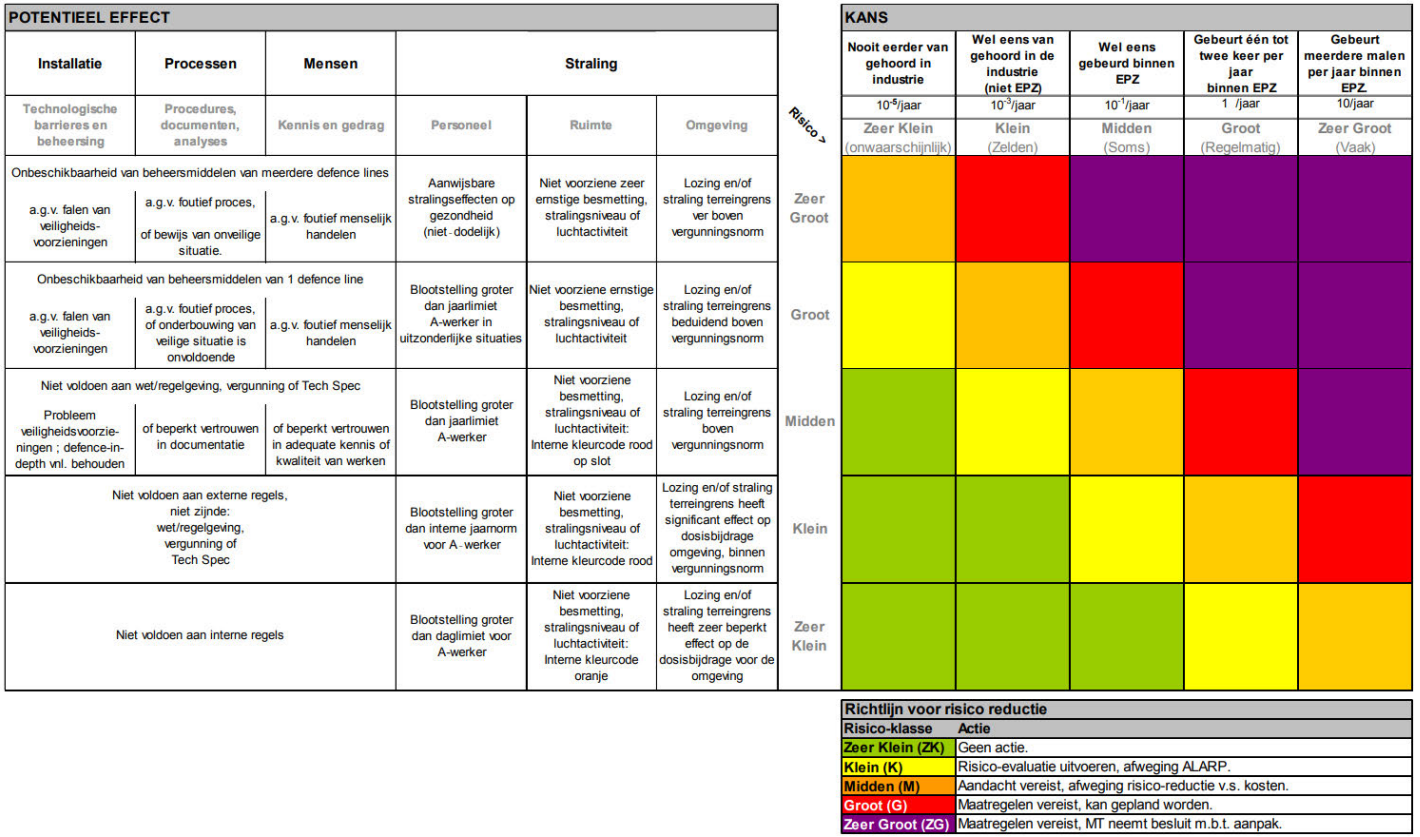

Figure 9 Risk matrix (deterministic)

POTENTIEEL RISICO				
Kernsmelt-frequentie	**Individueel Risico**	**Momentane kernsmeltfreq.**		
Delta TCDF (gemiddeld /jr)	Delta IR (gemiddeld /jr)	Overschrijding Interne norm: CDF > 1E-04/jr		
Zeer grote invloed (>250%)	Zeer grote invloed (>250%)	Meerdere malen per jaar bij EPZ	Zeer Groot	
Grote invloed (25-250%)	Grote invloed (25-250%)	1 à 2 maal per jaar bij EPZ	Groot	
Significante invloed (5-25%)	Significante invloed (5-25%)	Wel eens gebeurd bij EPZ (0,1 /jaar)	Midden	
Beperkte invloed (1-5%)	Beperkte invloed (1-5%)	Wel eens gebeurd in de industrie (10^{-3}/jaar)	Klein	
Verwaarloosbare invloed (0,2-1%)	Verwaarloosbare invloed (0,2-1%)	Nooit gebeurd in de industrie (10^{-5}/jaar)	Zeer Klein	

Richtlijn voor risico reductie	
Risico-klasse	**Actie**
Zeer Klein (ZK)	Geen actie.
Klein (K)	Risico-evaluatie uitvoeren, afweging ALARP.
Midden (M)	Aandacht vereist, afweging risico-reductie v.s. kosten.
Groot (G)	Maatregelen vereist, kan gepland worden.
Zeer Groot (ZG)	Maatregelen vereist, MT neemt besluit m.b.t. aanpak.

Figure 10 Risk matrix (probabilistic)

Compliance/conformance to licenced safety level

If a finding implies a non-compliance with the prescriptions of the operating licence, as specified after the 'ambtshalve wijziging' mentioned in 2.5, it is a major finding and requires mandatory measures.

As described in the Basis Document of the Safety Demonstration [9] non-conformance to the safety requirements identified in the assessment framework of the Safety Demonstration are considered equivalent to the rank of non-compliance and the finding is considered major and requires mandatory measures.

If replacement/modifications of SSCs or modification of the ageing management programme is necessary to maintain the licenced safety level (e.g. to control ageing degradation or cope with changed environmental conditions under LTO-2), it is considered major and requires a mandatory measure.

1. Major findings are those:
    - related to (very) high to middle risk reduction in the TOPA matrix (deterministic nuclear safety);
    - leading to (very) high to middle probabilistic risk reduction (probabilistic nuclear safety);

- representing non-compliances with the licence basis
- Requiring Measures to maintain the licenced safety level (e.g. Technical Recommendation from Safety Demonstration [9]),
- important safety improvements based on engineering judgement (major opportunities for improvements).

2. Minor findings are those:
   - associated with low to very low risk reduction for nuclear safety or radiation protection (deterministic or probabilistic);
   - related to daily/regular activities;
   - safety improvements of low importance (minor opportunities for improvements).
3. Minor findings are collected into EPZ's Corrective Action Programme and will follow the process as described in the Integrated management system.
4. Major findings are subdivided into two categories:
   - Leading to safety improvements (SIs): For these, the possible safety improvements are identified and subsequently assessed with a cost/benefits analysis. Safety Improvements: aim to increase the level of safety from the currently licenced safety level. The cost/benefits analysis includes the expected gains in terms of nuclear safety against the costs. Based on the costs/benefits analysis a decision is made whether to include the safety improvement in the Safety Improvements Implementation Plan (SIIP) for LTO-2 or if it is moved to the list of discarded Safety Improvements to be re-assessed at a later moment (e.g. following major results, such as mandatory replacements, coming from long lead time assessment activities of the Safety Demonstration). When considering safety improvements, the discarded major safety improvements from previous 10EVAs are considered. Previously identified safety improvements that had been discarded based on costs/benefit considerations might prove interesting considering the LTO-2 timeframe. The cost analysis of previously discarded major safety improvement will be reviewed accounting for LTO-2.
   - Leading to mandatory measures (MMs): For these, the mandatory measures are determined. Those mandatory measures that are not implemented before its approval will be included in the LTO-2 (Mandatory Measures) Implementation Plan. Mandatory measures are required to maintain the licenced safety level. This might be due to a discovered noncompliance or due to a future foreseeable degradation of the safety level (e.g. due to changing external conditions or ageing degradation the current safety provision becomes inadequate to maintain the current safety level).

3.2.2 Cost/benefit analysis

As seen in Figure 9 and Figure 10 where the anticipated risk reduction is Very High ('Zeer groot') the finding needs to be addressed immediately and requires Management team involvement in the decision. For the High ('Groot') and Middle ('Midden') findings a cost/benefit analysis of the safety improvements is carried out. The costs might be of a financial nature, however other types of costs need to be considered such as, introduction of excessive complexity, required outage extension, expected radiation exposure (e.g. high dose during implementation of safety improvements), production of radioactive waste, organizational impact and capabilities, or interference with security provisions:

Not all criteria will be applicable to all cases. Choices related to the cost/benefit analyses will be justified in a transparent way and detailed in the Global Assessment report.

3.2.3 Findings Database

A central database is used to collect and track all findings from the Safety Factor reviews, including those originating from the Safety Demonstration. Each finding is characterized by key information such as the associated Safety Factor, the basis for the finding, and any proposed improvements. The database also tracks the implementation status of corrective actions and supports consistency across all Safety Factors. A preview of the database's graphical user interface (GUI) is shown in Figure 11 below.

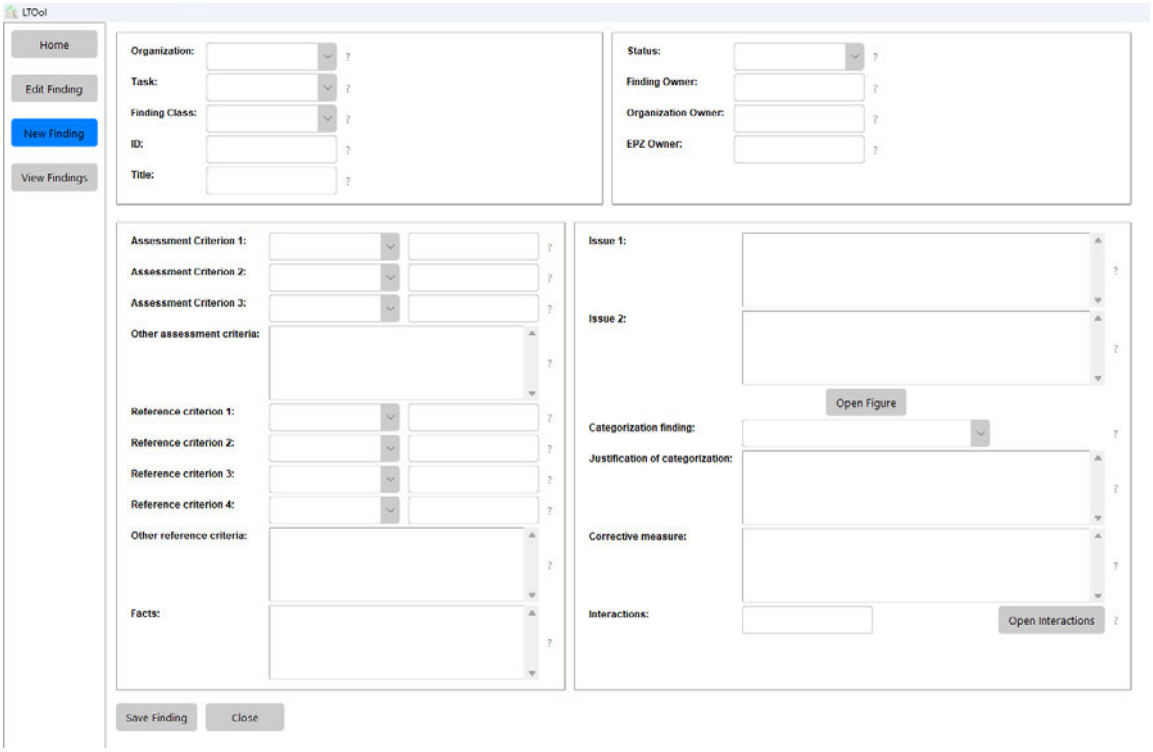

Figure 11 Findings database GUI.

3.2.4 Global Assessment report

The advised contents of the Global Assessment report are specified in SSG-25 [8] and reported here below:

- Significant PSR outcomes;
- Analysis of interfaces, overlaps and omissions between Safety Factors and between individual findings;
- An overall analysis of the combined effects of the findings;
- The category, ranking and priority of safety improvements proposed to address findings;
- An assessment of defence in depth;
- An assessment of the overall risk;
- Justification for proposed continued operation in both the short term and long term (see para. 6.8 of SSG-25 [8]).

A format for the Global Assessment report of the PSR(LTO-2) is given in Appendix C.

3.3 Implementation plans

The safety improvements and mandatory measures resulting from the global assessment are introduced in two implementation plans as described in the Plan van Aanpak [4]:

- The Safety Improvement Implementation Plan (SIIP): will collect the approved proposal for further safety improvement during the LTO-2 period.
- The LTO-2 (mandatory measures) Implementation Plan (LTO-2 IP): will collect the mandatory measures that need to be implemented to maintain the plant actual safety level during the LTO-2 period.

The implementation plans specify the measures/safety improvements and the related commitments, including the schedules for the implementation The level of detail of the implementation plans is commensurate with the level of detail required

for the update of the safety report and environmental impact assessment, comparable to what is called the conceptueel verbeterplan in recent 10EVAs.

It is intended that the PSR(LTO-2), and the Safety Demonstration, are processes that produce results from their early stages. It is expected that a number of findings will be addressed before the end of the PRS(LTO-2). These findings will not be included in the implementation plans. The findings, and the related measures/safety improvement status will be tracked using the findings database. This will remain auditable for the regulator at any time.

A final summary of the PSR(LTO-2) will be prepared to be used as an appendix to the licence modification request.

4 PSR(LTO-2) Project Plan

The PSR(LTO-2) project plan describes the provisions made for guaranteeing a complete, comprehensive, consistent and systematic PSR(LTO-2). The contents of this chapter are in line with the contents suggested in SSG-25 [8]:

- Organization of the project, including roles, responsibilities and internal communication;
- Time schedule including any major milestones and cut-off dates;
- Project and quality management processes;
- Processes for ensuring consistency between separate Safety Factor reviews,
- Training;
- Internal communications;
- The plan for communicating, interfacing with and gaining relevant assessments, approvals or agreements from, the regulatory body.

4.1 PSR(LTO-2) organization structure and responsibilities

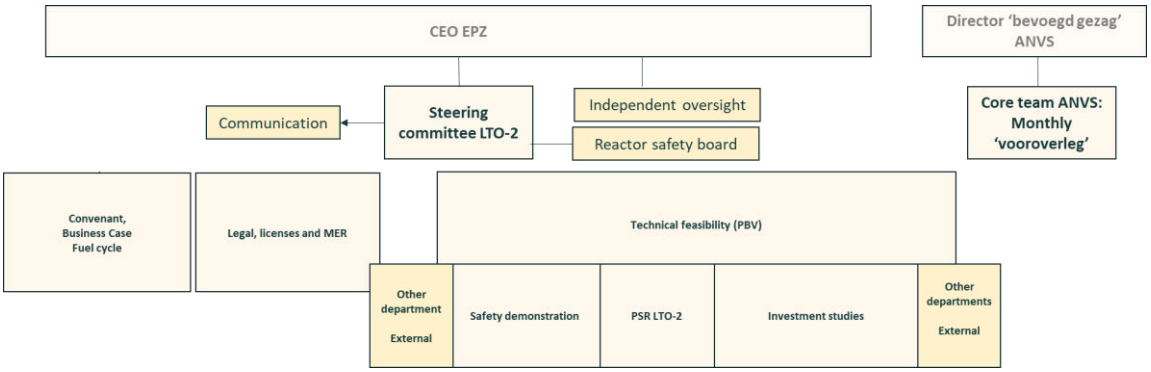

Figure 12 PSR(LTO-2) project organization. The project organization is comprised of three work streams. Technical feasibility (PBV), legal, license and MER, and covenant business case and fuel cycle. Each with a manager and project team.

Figure 12 shows that the PSR(LTO-2) is carried out under the responsibility of the manager for the technical feasibility studies. The technical feasibility studies also include the Safety Demonstration [9] and investment studies. Clear and direct lines of communication are established between the teams contributing to the technical feasibility studies, which ensures that necessary information for the completion of the PSR(LTO-2) is provided efficiently.

All LTO-2 work streams – including technical feasibility – report directly to the CEO of EPZ through the LTO-2 steering committee. The steering committee is formed by the responsible managers of the different work streams, and relevant and experienced members of the operating organization. In this way, it is ensured that the overall LTO-2 preparation achieves the policy objectives for the preparation of LTO-2, priorities are set accordingly, lines of authority remain clear, necessary resources are allocated, escalations are done appropriately and operational performance is not compromised by the LTO-2 preparations.

The internal communications department is involved in the project to ensure stakeholders are properly informed by applying the internal communication processes for major projects.

A large part of the work will be carried out by subject matter experts from external organizations. This favors the use and implementation of an independent perspective during the Safety Factor reviews. Controls (see 4.3) from EPZ are in place to ensure completeness, correctness and consistency of the evaluation results. This ensure that knowledge is transferred to the EPZ organization and EPZ retains final responsibility.

The project organization is responsible for:

- Timely delivery of deliverables of the PSR (LTO-2) project;
- Applying the controls that ensure the quality of the project results and reports;
- Communication with stakeholders.

Project independent oversight (see 4.3), purchasing, planning and financial reporting are carried out by the relevant departments. Any proposed design changes are authorized by the design authority as required by the integrated management system of EPZ.

4.2 PSR(LTO-2) project planning

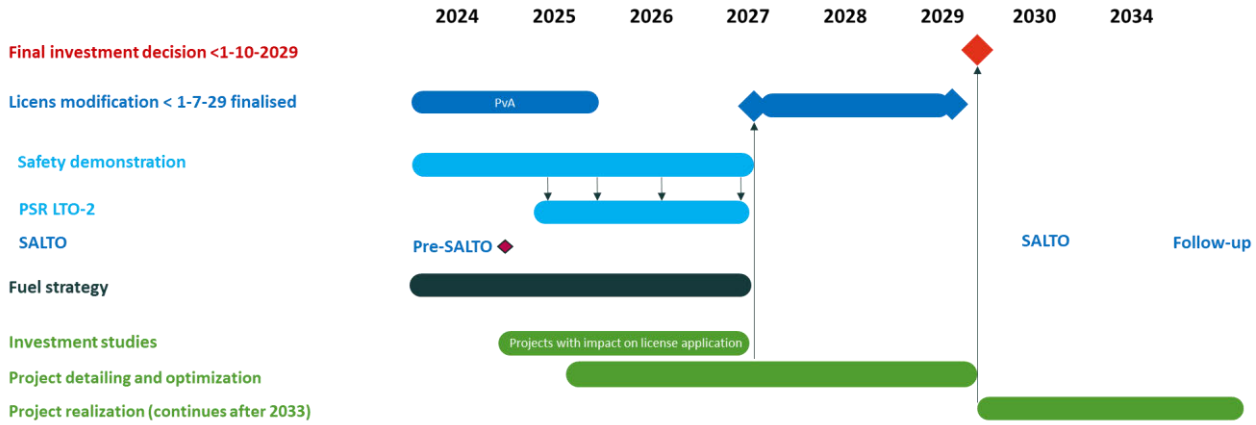

Figure 13 Summary of the overall LTO-2 project planning, indicating the interaction between the two safety assessments (safety demonstration and PSR) and the licence modification.

The PSR(LTO-2) project planning, as depicted in Figure 13, is influenced by two principal factors:

- The fact that PSR(LTO-2) is part of the process for the preparation of a licence modification request for LTO-2. The milestone for the licence application is 1-7-2027. The results and documentation from the PSR(LTO-2) will therefore be needed in useful time for the application.
- The interaction with the Safety Demonstration. From SRS-121 [21] it is clear that the major point of attention for a PSR to be used in support for the justification of LTO are the review of SFs 1, 2, 3, 4 and 12. Within the Safety Demonstration a whole range of assessment activities is performed that provide results to answer research questions of SFs 2, 3, 4 and 12 (see [9])[2].

The findings from the Safety Demonstration are included in the relevant Safety Factor reviews. The results of several activities of the Safety Demonstration are needed as input for the performance of the reviews of other SFs (e.g. the results of the scope setting according to SSG-48 [2] is used in SF1). The activities of the Safety Demonstration and of the PSR(LTO-2) occur, partly, in parallel. To ensure effective and efficient information exchange between the safety demonstration and the PSR the both assessments are managed by the same team (PBV).

In Figure 14 the (high level) planning for the PSR(LTO-2) is given.

[2] It is to be noted that the Safety Demonstration related activities might extend further than the given timeframe. All the necessary activities from the Safety Demonstration are started within the given timeframe. It is expected that most of the Safety Demonstration activities will be concluded successfully in useful time to provide input to the PSR(LTO-2). However, some technical results (e.g. from TLAAs revalidation, inspections) might not be available in useful time due to the inherent duration of the process. The absence of these results will be captured as findings in the relevant SFs.

Milestone	Deliverables	Timeline
Conceptual setup of PSR (LTO-2)	Opzet PSR ten behoeve van de vergunning aanvraag voor LTO 2 N240008 Technical meetings with ANVS	March 2025 April 2025
PSR (LTO-2) basisdocument	Basis document PSR (LTO-2), LTO2/AJvW/XLs/R240022 0.9 Preliminary reaction ANVS Basis document PSR (LTO-2) 1.0 Final assessment ANVS including public consultation Basis document PSR (LTO-2) 2.0	July 2025 August 2025 September 2025 Oktober/november 2025 November 2025
Safety factor reviews	Safety factor reports for information once ready Reaction ANVS Incoprate comments and finalize SF report	Q4 2025-Q2 2026 Q3 2026
Global assessment Or 'samenvattend beoordelingsrapport'	Global assessment Assessment by regulator Final Global assessment	Q4 2026 Q1 2027
Implementation plan Summary for license application	Implementation plan Summary for license application	Q1 2027 Q2 2027

Figure 14 High level planning for the PSR(LTO-2) project

Some additional comments regarding the foreseen interaction with ANVS on the high level planning shown in Figure 14.

- A draft version of the PSR(LTO-2) Basis Document was submitted to ANVS in July 2025 for a preliminary reaction. After accounting for any comments, the final version will be submitted for assessment ('ter beoordeling'). ANVS will also consult the public before providing their final assessment.
- The review of the Safety Factors, including the realization of the Safety Factor Reports, will occur in less than one year and is scheduled to be completed by Q2 2026. The Safety Factors will be handed over to ANVS for information, questions and answers. This is to ensure assessment by the regulator of the Global Assessment can proceed more effectively because questions will have been clarified beforehand.
- The PSR (LTO-2) is concluded with the implementation plan and summary for the licence application. As detailed in the Plan van Aanpak [4] the summary is part of the licence application and the implementation plan is an appendix.

4.3 Quality Assurance and training

With regard to the general requirements and control measures, the recommendations and direction of IAEA SSG-25 [8] are followed.

As described in the Plan van Aanpak [4], to ensure quality of the LTO 2 preparation process, the organization is established in accordance with the requirements of the integrated management system of EPZ (including policy, defined tasks, responsibilities, authorities and interfaces, decision-making, sufficient competent staff, training, etc.).

The Safety Factor reviews are mostly performed by external organizations to ensure:

- completeness, comprehensiveness, correctness and consistency of the results;
- that knowledge is transferred to EPZ;
- that EPZ retains final responsibility;

The following provisions are taken:

- Reviewers have access to the same input data.
- The results are recorded in a project documentation system, which enables supervision and traceability.
- All Safety Factor results are independently reviewed by the responsible experts of EPZ.
- Reviewers will receive training in the systematic review of Safety Factors, finding information, the use of the risk matrix and use of findings database. Training material was developed for 10EVA13 and will be updated as appropriate.

Additionally:

- Preparation for the licence modification (including PSR (LTO-2)) is subjected to internal independent oversight.
- Any proposed changes to the design are authorized by the design authority.
- Results of the PSR are reviewed (‘ter beoordeling’) by the internal reactor safety board (RBVC).

4.4 Communication with ANVS

Progress is reported monthly to the core team of ANVS through the monthly progress meeting. (‘vooroverleg’).

The deliverables and expected dates are reported in this meeting to allow ANVS ample time to prepare for assessment activities.

When the need arises, technical meetings are scheduled to allow a more in depth discussion.

Any strategic topics are discussed between the CEO and ‘directeur bevoegd gezag’ in the ‘directieoverleg’ as necessary.

List of Tables, and figures

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References

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[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Equipment Qualification for Nuclear Installations, IAEA Specific Safety Guide No. SSG-69, IAEA, Vienna (2021).

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Nuclear Installations, IAEA Specific Safety Guide No. SSG-89, IAEA, Vienna (2024).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, IAEA Specific Safety Guide No. SSG-75, IAEA, Vienna (2022).

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, IAEA Specific Safety Guide No. SSG-50, IAEA, Vienna (2022).

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Note: Documents considered for the assessment and reference framework are described in the corresponding section for each Safety Factor in Appendix A and are not separately included in this list of references.

Appendix A Safety Factors

This Appendix presents the 15 Safety Factors forming the scope of the PSR(LTO-2).

For each Safety Factor the same structure is followed and information is given on:

1. Objective: the objective of each Safety Factor is reported in alignment with the SSG-25. The objective is formulated in a way to be specific for LTO-2.
2. Insights from SRS-121: summary of the analysis of the relevant paragraphs related to each Safety Factor from SRS-121 [21]. It provides guidance on the relevance of the Safety Factors for LTO-2 and suggests areas of focus for certain review activities.
3. Specific Research Questions, Interactions with the Safety Demonstration and additional Evaluation Activities: for each Safety Factor a set of specific Research Questions (Research Questions) is developed ad reported. The Research Questions aim to cover the scope and tasks of SSG-25 [8] while orienting the review activities to the needs of the PSR(LTO-2). For the relevant Research Questions, the interactions with the Safety Demonstration are highlighted. For each Research Question, the methodology for satisfying the Research Questions is further elaborated with the identification of additional Evaluation Activities (indicated as SF'X'-EA'Y').

   For each Safety Factor a summary table presents for each specific Research Question:

   - Input from SD: presents the coverage of the Specific Research Question guaranteed by the activities performed within the framework of the Safety Demonstration [9]. In case coverage is full there is not the necessity for additional evaluation activities. Results and findings from the Safety Demonstration are introduced in the review of the Safety Factor. It is always ensured that the research question is fully addressed
   - Input from previous 10EVAs: indicates whether (part of) the Specific Research Question was covered in previous 10EVAs.
   - Reassessment previous 10EVAs: indicates whether the re-assessment of previous 10EVAs conclusion is performed to give answer to the Specific Research Question. In case there is an impact of LTO-2 on the conclusions of previous 10EVAs this impact is quantified and the conclusions from previous 10EVAs modified accordingly (e.g. by developing new findings).
   - Additional Evaluation Activities: indicates whether the Specific Research Question requires additional evaluation activities not related to the conclusions of previous 10EVAs reassessment or to the Safety Demonstration. These activities might be related to specific assessment deriving from SRS-121, specific requests from the ANVS, or specific concerns from the operating organization.
   - Input from other Safety Factor reviews: indicates the expected interaction for each Specific Research Question with other Safety Factors. The basis for this expected interaction is Table 1 of SSG-25. When indicated with "*" the interaction is necessary for the completion of the evaluation activities, in all other cases the interaction could occur.

4. Regulatory, Assessment and Reference Framework: as per the Handreiking tienjaarlijkse evaluaties nucleaire installaties [26] the regulatory body assumes that the operating organization fulfill the regulatory framework at any time and also ensures the operating organization fulfills this framework by regulatory oversight. As such during 10EVAs the regulatory framework is not used as the principal tool for assessment. The same is valid for the PSR(LTO-2). The regulatory framework for the review is reported in Appendix E.
5. The Assessment and Reference framework are used to identify opportunities for improvements and are specific to each Safety Factor. For each Safety Factor, modern codes and standards that might be used to the goal of improving nuclear safety are reported as described in chapter 3.1.
6. Source Documentation: for each Safety Factor an initial selection of the documentation from which the information necessary to the review is drawn is reported. It is noted that, in agreement with para 5.6 of SSG-25 [8], *´If further documents are identified as being relevant during the PSR process, these should be reviewed too*'.

Where in the Source Documentation a process or a high level document is indicated as e.g. *"N17…"*, it is intended that the relevant underlying documentation (e.g. STRAT, PU-, PO- documents) will be assessed as necessary.

A.1 SF-1: Plant Design

A.1.1 Objective of the review

The objective of the review of this Safety Factor is to determine the adequacy of the design of KCB and its design documentation for the LTO-2 period by assessment against national and international standards, requirements and practices.

A.1.2 Insights from SRS-121

Safety Factor 1 is considered amongst the most relevant for LTO-2. The review of this Safety Factor is crucial to the identification of additional safety improvements necessary to ensure that the licensing basis remains valid during the period of LTO-2. Such improvements might include refurbishment, the provision of additional SSCs, safety features and/or additional safety analysis and engineering justifications.

Examples of aspects of an LTO programme covered by Safety Factor 1 include, among others, a review of the list of SSCs important to safety, including its design documentation, and the compliance of the SSCs' actual status with the plant design (configuration management). Continuous plant processes in scope for this Safety Factor, such as configuration management, modification management and configuration management of the design basis (e.g. TIP and veiligheidsrapport) are preconditions for an LTO programme (these are also aspects of the Safety Demonstration). In cases where the PSR is used in support of LTO, the list of in-scope SSCs and out of scope SSCs specified in paras 5.16 and 5.17 of SSG-48 [2] is used. This list and other relevant documentation are used to establish the compliance of current design basis with current nuclear safety standards, as well as to identify differences. In the review of Safety Factor 1, according to para. 5.19 of SSG-25 [8], a clause by clause review of the listed standards is to be performed.

Benchmarking the design against other similar installations of comparable age can identify possible modifications to improve plant safety. In the specific case of a PSR supporting LTO, such a benchmarking could focus on NPPs that have already undergone an LTO assessment.

The main contribution from the PSR to support the justification of LTO regarding both codes and standards obsolescence would be provided primarily from Safety Factor 1 and Safety Factor 7.

The review of Safety Factor 1 can identify obsolescence related design weaknesses (e.g. defence in depth, independence, diversity, provisions for design extension conditions) and deficiencies of the plant design against latest codes and standards.

A.1.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question, the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that, where possible, the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. It is further expected that results from SF5, SF6, SF8 will provide inputs to SF1. Figure 15 shows the complete process for the review of SF1 for the PSR(LTO-2). Table 4 gives a summary of the SF1 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF1-1: Does the list of SSCs important to safety align with the scope setting criteria described in SSG-48 [2]?

An important contribution from the Safety Demonstration to SF1 (and SF2, SF3, and SF4) is the determination of the scope of SSCs for LTO-2 based on the methodology of SSG-48 [2], which, according to the guidance from SRS-121 [21], is to be used to determine the review scope of the above-mentioned Safety Factors. The results from the Safety Demonstration fully cover this Research Question. No additional evaluation activities are required to cover this research question.

SRQ-SF1-2: Assess the extent to which the plant design, design documentation, and other design characteristics meet the requirements for plant safety and performance from the assessment and reference framework for all plant conditions and during the LTO-2 period, and identify weaknesses and opportunities for improvement, considering the following elements:

- **The prevention and mitigation of events (faults and hazards) that could jeopardize safety;**
- **The application of defence in depth and engineered barriers for preventing the dispersion of radioactive material (integrity of fuel, cooling circuit and containment building);**
- **Safety requirements**
- **Modern nuclear safety and design codes and standards.**
- **The adequacy of the design basis documentation.**
- **Compliance with plant design specifications.**
- **The safety analysis report or licensing basis documents following plant modifications and in light of their cumulative effects and updates to the site characterization.**
- **Plant SSCs important to safety to ensure that they have appropriate design characteristics and are arranged and segregated in such a way as to meet modern requirements for plant safety and performance, including the prevention and mitigation of events that could jeopardize safety**

The assessment framework identified for this Safety Factor identifies the Safety Standards containing design related Safety Requirements. The Safety Requirements will be used to assess KCB design and design documentation, and identify possible improvements. **(SF1-EA1).** The safety demonstration and previous 10EVA already provide part of this assessment.

An analysis of the applicable reference framework was performed on now partially outdated standards during 10EVA13 [28] and again with more current standards during 10EVA23 [29]. The latest version of the relevant standards have been identified in the reference framework of this Safety Factor. The conclusions from previous 10EVAs regarding the aspects mentioned in the Research Question will be revalidated for LTO-2. The KCB design and design documentation will be reviewed against the identified reference framework (according to their relevance) and, where practicable, opportunities for improvements will be identified **(SF1-EA5)**. As mentioned in 5.17 of SSG-25 [8] it is expected that the scope of this review will depend (and in this case will be limited by) on the extent of changes in standards and/or the licensing basis since the previous PSR or the start of operation.

The regulatory body has notified EPZ that a new version of the VOBK [30] will be published in 2025 to be better aligned with IAEA SSR 2/1 Rev.1. The VOBK is meant for the design of new NPPs (e.g. generation III or III+ NPPs). A clause by clause analysis will be made for IAEA SSR 2/1 Rev.1 as this will likely be part of the licensing basis for LTO-2. The respective articles of the VOBK will be matched to the requirements and an analysis will be carried out to identify the areas where realistic design improvements can be expected, taking into account already available results from previous 10EVA evaluations, DSA PSA and operating experience.

SRQ-SF1-3: What is the impact of the foreseeable obsolescence of guidelines, codes and standards relevant to the plant design on nuclear safety during the LTO-2 period?

The anticipated obsolescence of design related guidelines, codes and standards is a specific point of attention for LTO-2 and will be assessed using the known information (e.g. KTA stop development). Scenarios will be elaborated and the anticipated impact during LTO-2 on the design and nuclear safety assessed. Preliminary studies for alternative solutions will be carried out (**SF1-EA6**).

SRQ-SF1-4: Are the Configuration and Modification Management process properly implemented to ensure that all safety-relevant documentation will consistently be updated and traceable throughout the LTO-2 period?

This research question is covered by the safety demonstration. Within the Safety Demonstration programmes, processes, procedures and documentation relevant for LTO-2 are assessed against the assessment and reference framework (good practices) identified in the BDSD [9]. Among these, the Configuration and Modifications management programmes are reviewed. Therefore, no additional evaluation activity is required to cover this research question.

SRQ-SF1-5: What is the impact of the produced waste on the fuel management strategy for LTO-2 and are current facilities adequate to manage the spent fuel storage?

The impact of LTO-2 on the fuel cycle is investigated in the LTO-2 justification project as described in the Plan van Aanpak [4]. The actual condition of the fuel storage facilities is assessed in the framework of the Safety Demonstration. The impact of the actual condition on the spent fuel storage management strategy is assessed in SF2. Based on this input, the design of the spent fuel storage facilities will be assessed for LTO-2 **(SF1-EA9).**

SRQ-SF1-6: What are the foreseeable impacts on the plant design and operating condition from foreseeable changes in the site characteristics during LTO-2?

In SF7 the anticipated site conditions during LTO-2 are identified considering new NPPs on site, rising heat sink temperatures, rising sea level, and extreme weather. The anticipated site conditions will be used to identify anticipated weaknesses during LTO-2 in the KCB design and identify opportunities for improvement (SF1-EA8).

SRQ-SF1-7: Is the current situation related to the use of different types of specifications at KCB and its relation to the safety classification of SSCs adequate for LTO-2?

KCB has currently a diversified set of specifications used for different SSCs. As part of the review of SF1 the use of these specifications, and its relation to the safety classification will be reviewed with the goal of improving the use of specifications (e.g. uniformity) for the LTO-2 programme. To do so it will also be assessed whether the current safety classification should be improved (i.e. re-assessing the conclusions from 10EVA23 in light of a longer operating lifetime) **(SF1-EA7)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified by benchmarking with newer designs, with NPPs of similar age/design/subsequent lifetime extension, and with research related to subsequent long term operations. Particularly:

- A benchmark will be carried out considering the design of newer NPP designs such as of EPR-II and Konvoi. Improvements to the KCB design, where practicable, will be identified (**SF1-EA2**). Results from previous evaluations are available to support this activity.
- A benchmark with NPPs of similar age, design and/or subsequent LTO situation (i.e. that are already in second lifetime extension or that are preparing for it) is performed in the framework of SF9 to gain information on good practices and practicable improvements at KCB. SF1 uses the benchmark to identify potential design improvements coming, from the modification that other NPPs have (or plan to) carried out in preparation of or because of the subsequent LTO (**SF1-EA3**).
- The OECD/NEA has run a research project aimed to identify the challenges that plants should address during their subsequent lifetime extension. The project has delivered a comprehensive report: ‘LTO Beyond 60 years’. The results of this research project are analyzed in SF9. SF1 uses the results of this research programme to identify criticalities in the design to be addressed, if any (**SF1-EA4**).

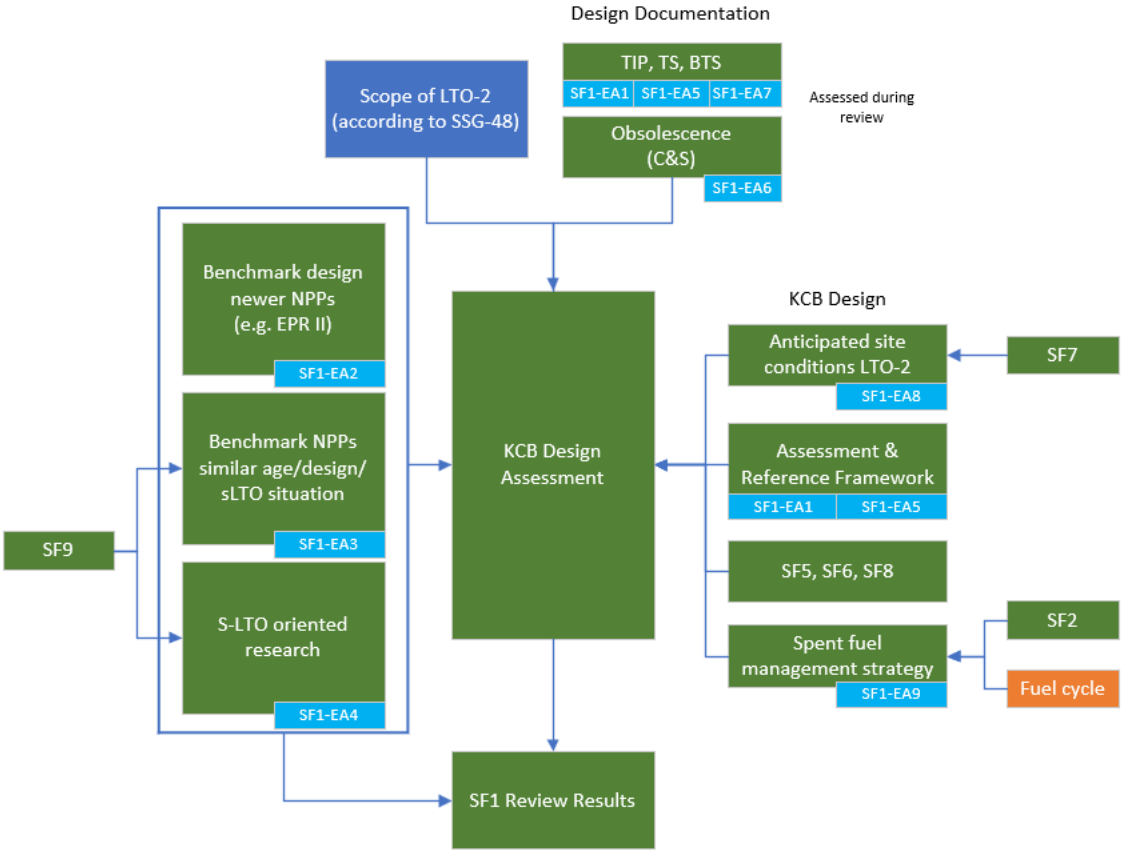

Figure 15 Safety Factor 1: in blue the Safety Demonstration, in green the PSR(LTO-2), in orange inputs from other streams in the KCB LTO-2 project, in light blue the evaluation activities.

Table 4 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF1-1	Full	-	-	-	SF5, SF6,
SRQ-SF1-2	Partial	Yes	Yes	Yes	SF3, SF5, SF6 SF7, SF8, SF12, SF13
SRQ-SF1-3	No	No	No	Yes	-
SRQ-SF1-4	Full	-	-	-	SF14, SF15
SRQ-SF1-5	Partial (via SF2)	No	No	Yes	SF2*, SF4
SRQ-SF1-6	-	Yes	Yes	Yes	SF7*
SRQ-SF1-7	-	No	No	Yes	SF2, SF3, SF4, SF5

A.1.4 Regulatory Framework

See Appendix E.

A.1.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	No	No	Yes	Assessment	High	(partial) CBC
IAEA	SSR-1	Site Evaluation for Nuclear Installations	2019	No	No	Yes	Assessment	High	(partial) CBC
IAEA	GSR Part 4 (Rev 1)	Safety Assessment for Facilities and Activities	2016	GS-R-4 (2009)	High	Yes	Assessment	High	(partial) CBC
WENRA	SRL Issue E	Design Basis Envelope for Existing Reactors	2020	Previous version	High	Yes	Assessment	Low	HL
WENRA	SRL Issue F	Design Extension of Existing Reactors	2020	Previous version	High	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
ANVS	VOBK	Veilig Ontwerp en veilig Bedrijven van Kernreactoren	2025	No	No	VOBK 2021	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-53	Design of the Reactor Containment and Associated Systems for Nuclear Power Plants	2019	NS-G-1.10	High	Yes	Assessment	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-68	Design of Nuclear Installations Against External Events Excluding Earthquakes	2021	NS-G-1.5	High	NS-G-1.5	Assessment	Middle	HL+ (partial) CBC
IAEA	SSG-39	Design of Instrumentation and Control Systems for Nuclear Power Plants	2016	NS-G-1.1	High	Yes	Assessment	Middle	HL
IAEA	SSG-63	Design of Fuel Handling and Storage Systems for Nuclear Power Plants	2020	NS-G-1.4	High	NS-G-1.4	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-56	Design of the Reactor Coolant System and Associated Systems for Nuclear Power Plants	2020	NS-G-1.9	High	Yes	Assessment	Middle	HL
IAEA	SSG-67	Seismic Design for Nuclear Installations	2021	NS-G-1.6	High	NS-G-1.6	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-64	Protection against Internal Hazards in the Design of Nuclear Power Plants	2021	NS-G-1.7	High	NS-G-1.7	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-90	Radiation Protection Aspects of Design for Nuclear Power Plants	2024	NS-G-1.13	High	NS-G-1.13	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-51	Human Factors Engineering in the Design of Nuclear Power Plants	2019	No	No	No	No	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-89	Evaluation of Seismic Safety for Nuclear Installations	2024	NS-G-2.13	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-77	Protection Against Internal and External Hazards in the Operation of Nuclear Power Plants	2022	NS-G-2.1	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-61	Format and Content of the Safety Analysis Report for Nuclear Power Plants	2021	GS-G-4.1	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-73	Core Management and Fuel Handling for Nuclear Power Plants	2022	NS-G-2.5	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-40	Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors	2016	NS-G-2.7	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-79	Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations	2023	NS-G-3.1	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-30	Safety Classification of Structures, Systems and Components in Nuclear Power Plants	2014	WENRA RL G	Low	No	No	Middle	HL + (partial) CBC
IAEA	SSG-88	Design Extension Conditions and the Concept of Practical	2024	No	No	No	No	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
		Elimination in the Design of Nuclear Power Plants							
IAEA	SSG-25	Periodic Safety Review for Nuclear Power Plants (obsolescence of codes & standards)	2013	No	No	No	No	Low	HL
IAEA	SSG-71	Modifications to Nuclear Power Plants	2022	NS-G-2.3	High	No	No	Low	HL
KTA	-	All relevant design codes used at KCB (obsolescence)		Yes (older versions)	Low	No	No	Low	HL
IAEA	SRS-65	Application of Configuration Management in Nuclear Power Plants	2010	(TECDOC 1335)	Middle	No	No	Low	HL
IAEA	TECDOC-2043	Evaluation of Design Robustness of Nuclear Installations Against External Hazards	2024	No	No	No	No	Low	HL
IAEA	TECDOC-1770	Design Provisions for Withstanding Station Blackout at Nuclear Power Plants	2015	No	No	No	No	Low	HL
IAEA	TECDOC-2091	Waste Minimization During the Life Cycle of Nuclear Power Plants	2025	No	No	No	No	Low	HL
IAEA	SRS-103	Methodologies for Seismic Safety Evaluation of Existing Nuclear Installations	2020	No	No	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SRS-86	Safety Aspects of Nuclear Power Plants in Human Induced External Events: General Considerations	2017	No	No	No	No	Low	HL
IAEA	SRS-46 (rev.1)	Assessment of Defence in Depth for Nuclear Power Plants	2024	SRS-46	High	No	No	Middle	HL
IAEA	TECDOC-2018	Design Basis Reconstitution for Long Term Operation of Nuclear Power Plants	2023	No	No	No	No	Low	HL
IAEA	TECDOC-1787	Application of the Safety Classification of Structures, Systems and Components in Nuclear Power Plants	2016	No	No	No	No	Low	HL
IAEA	TECDOC-1894	Experiences in Implementing Safety Improvements at Existing Nuclear Power Plants	2020	No	No	Yes	Reference	Low	HL
IAEA	TOP401	Technological Obsolescence Management Programme	2014	No	No	No	No	Low	HL
IAEA	TECDOC-1944	Fire Protection in Nuclear Power Plant	2021	No	No	No	No	Low	HL

A.1.6 Source Documentation

Source	Type	Name
EPZ	VR15	Veiligheidsrapport (Safety Report)
EPZ	TIP 03-02	Classification of SSCs
EPZ	TIP 01-04	Safety Concepts
EPZ	TIP…	Technical Information Package (‘Safety Analysis Report’) documentation
EPZ	PU-N12-50-201	Scope Setting Methodology and results for LTO-2
EPZ	TS-1000-5000	Technical Specification
EPZ	BTS-1000-5000	Bedrijfstechnische specificities (‘Operational Technical Specifications’)
EPZ	VRS-001	Safety relevant setpoints
EPZ	FHP en NBP	Functieherstel- en noodbedieningsprocedures
EPZ	SAMG	Severe Accident Management Guidelines
EPZ	EDMG	Extreme Damage Mitigation Guidelines
EPZ		Fuel Manaement Strategy
External		Relevant peer reviews (e.g. from WANO, IAEA).

A.2 SF-2: Actual Condition of structures, systems and components (SSCs) important to safety

A.2.1 Objective of the review

The objective of the review of this Safety Factor is to determine whether the actual condition of SSCs important to safety are capable and adequate to meet design requirements during LTO-2 extended period. In addition, the review should verify that the condition of SSCs in-scope for LTO-2 is properly documented, as well as reviewing the ongoing maintenance, surveillance and in-service inspection programmes, as applicable.

A.2.2 Insights from SRS-121

Safety Factor 2 is considered amongst the most relevant for LTO-2. The review of this Safety Factor determines the actual condition of in-scope SSCs and assesses whether they are adequate and capable of meeting design requirements at the end of LTO.

Examples of aspects of an LTO programme covered by Safety Factor 2 include, among others, the list of in-scope SSCs, their classification and intended function, a review of the in-scope SSCs' functional capability, a review of in-service inspection, maintenance, surveillance and monitoring programmes, and the assessment of the current physical status of in-scope SSCs.

Plant programmes are in scope for Safety Factor 2, meaning that the review of this Safety Factor has to be performed for the verification of preconditions when the PSR is used to support LTO. Plant programmes are checked against the nine attributes of an effective AMP provided in table 2 of SSG-48 [2].

SSG-25's review tasks [8] for SF2 include: the review of the current condition of SSCs (para. 5.30), the review of the adequacy of plant programmes that support confidence in the condition of SSCs (paras. 5.31, 5.32), the review of the alignment between the current condition of SSCs and their design basis (paras 5.35, 5.36).

SRS-121 [21] describes in detail in 3.1.1 how the outputs of an LTO programme developed according paras 7.1 to 7.41 of SSG-48 [2] (e.g. plant programmes and documentation evaluation, AMR process, AMPs development) can be used directly to support an assessment of SF2.

SF2 reviews include technology related obsolescence of current in-scope SSCs' and dependence on obsolete equipment due to loss of supply chain.

The review of SF2 benefits of the review of the design basis and of the list of in-scope SSCs from SF1.

A.2.3 Specific Research Questions, interactions with the Safety Demonstration and Additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that, where possible, the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Figure 16 shows the complete process for the review of SF2 for the PSR(LTO-2). Table 5 gives a summary of the SF2 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF2-1: Has the actual condition of SSC's within the scope of LTO-2 been documented, considering the following aspects?

- **Existing or anticipated ageing processes;**
- **Plant programmes that support ongoing confidence in the condition of the SSC;**
- **Significant findings from tests of the functional capability of the SSC;**
- **Results of inspections and/or walkdowns of the SSC;**
- **Maintenance and validity of records;**
- **Evaluation of the operating history of the SSC;**
- **The condition and operation of spent fuel storage facilities and their effect on the spent fuel storage strategy for the nuclear power plant.**

The Safety Demonstration, covers most of this research question. Within the Safety Demonstration the actual condition of the SSCs in scope for LTO-2 is determined as part of the Ageing Management Review by means of the results of the activities (e.g. inspections) of plant programmes such as maintenance, surveillance, in-service inspection, equipment reliability, equipment qualification, technological obsolescence management, and water chemistry. The procedures, processes, programmes and documentation supporting the determination of actual condition of SSCs are assessed in the Safety Demonstration, against the assessment and reference framework (good practices) identified in the BDSD [9]. Operational experience is assessed and used as part of the Safety Demonstration to improve the processes leading to the determination of the actual condition.

The impact of the actual condition of the fuel storage facilities on the long term fuel management strategy is assessed. Anticipated degradation of the actual condition (i.e. due to ageing) will be considered. The results of this evaluation activity **(SF2-EA4)** will be an input for SF1 (SRQ-SF1-6).

SRQ-SF2-2: Are SSCs within the scope of LTO-2, capable to meet their design requirements until the end of the extended operating period, considering the following aspects?

- **Operational limits and conditions,**
- **Implications of changes to design requirements and standards on the actual condition of the SSC since the last PSR (for example, changes to standards on material properties),**
- **Verification of the actual state of the SSC against the design basis.**

In the framework of the Safety Demonstration, the actual condition of SSCs is determined and SSCs at risk of (potential) degradation are identified. The necessary actions will be then taken to ensure that the SSCs continue to meet the design requirements during the LTO-2 period (e.g. replacement, inspections, programmes modification). No further activities are necessary, the Safety Demonstration completely answers this Research Question.

SRQ-SF2-3: Is the impact of obsolescence assessed including the following aspects?

- **Current state of the SSC with regard to its obsolescence,**
- **Dependence on obsolescent equipment for which no direct substitute is available,**
- **Dependence on essential services and/or supplies external to the plant.**

Within the Safety Demonstration, the Technological Obsolescence Management Programme undergoes programmatic assessment against the 9 attributes of an effective ageing management. The Technological Obsolescence Management Programme ensures a process for the continued gathering and resolution of technological obsolescence issues during LTO-2.

Technological obsolescence is particularly relevant for safety when concerning SSCs that need to be available either during shut down state or in an incident/accident situation. In the framework of SF2, review of the impact of known and anticipated obsolescence issues on these system will be systematically assessed. Potential weaknesses (e.g. lack of diversity) will be identified **(SF2-EA6)**.

The supply chain criticalities identification falls outside of the scope of the Safety Demonstration. An assessment of the current suppliers of critical services, hardware and software will be identified and their status assessed on the basis of the available information, including national and international situation. Possible interactions with SF10 should be considered. The (potential) impact of the identified criticalities on the technological obsolescence management programme and on the operating organization. SF1, SF3, SF5, SF6 and SF12 might be impacted by the results of this evaluation activity **(SF2-EA5).**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement (e.g. of the processes used to determine the actual condition of SSCs) will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices in the determination of the actual condition of SSCs. Input from Safety Factor 9. **(SF2-EA1)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF2- EA2)**
- a review of the reference assessment and framework identified for SF2 to identify proven practices that can improve KCB processes for the determination of the current condition of SSCs. **(SF2- EA3)**

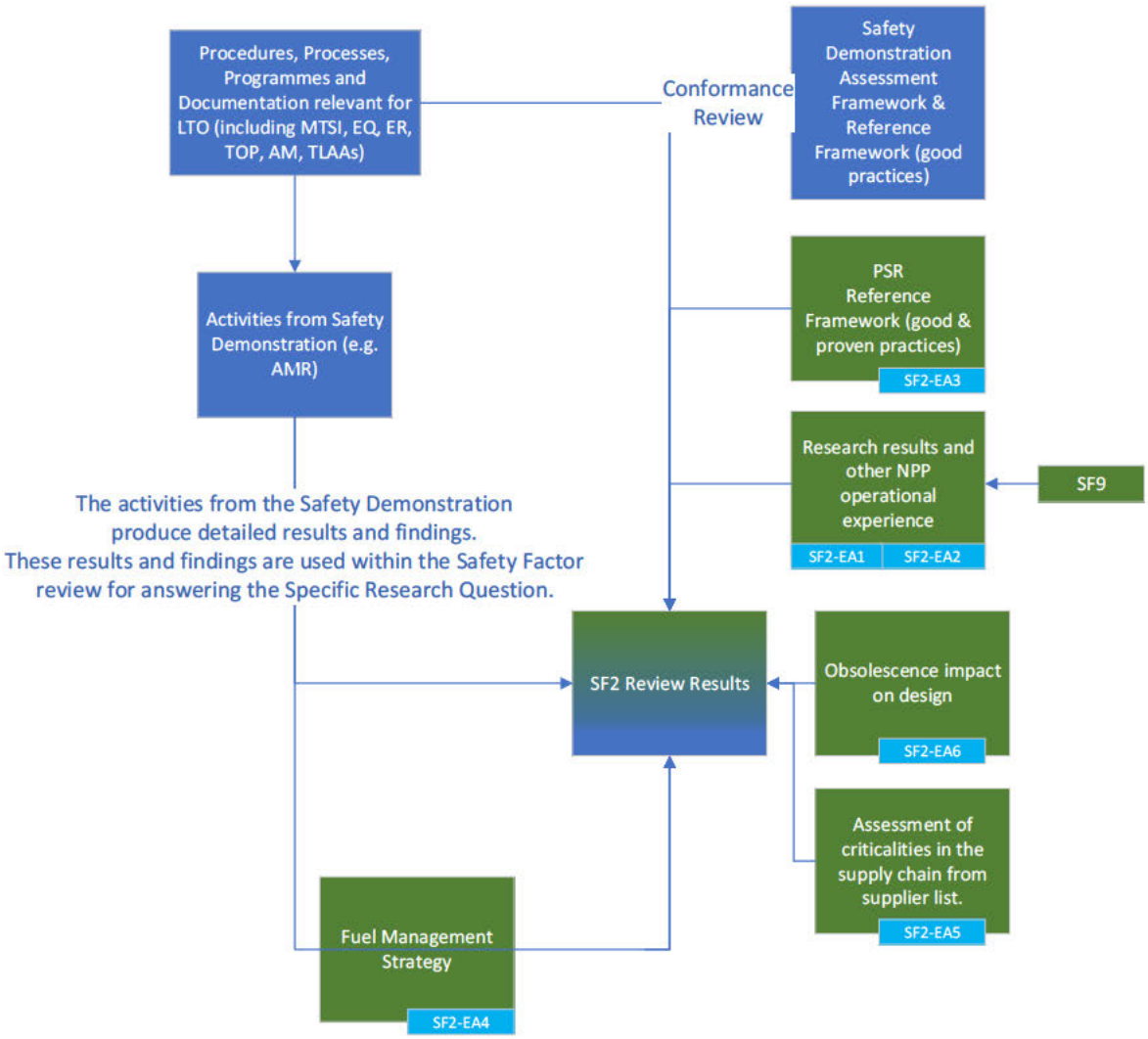

Figure 16 Safety Factor 2: in blue the Safety Demonstration, in green the assessments of the PSR(LTO-2)

Table 5 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF2-1	Partially	Yes	Yes	Yes	SF4, SF8, SF15
SRQ-SF2-2	Fully	-	-	-	SF1, SF3, SF4, SF5
SRQ-SF2-3	Partially	Yes	Yes	Yes	SF10

A.2.4 Regulatory Framework

See Appendix E.

A.2.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2	High	Yes	Assessment	High	CBC (relevant)
WENRA	SRL Issue I	Ageing Management	2020	No	No	No	No	Low	HL
WENRA	SRL Issue K	Maintenance, In-Service Inspection and Functional Testing	2020	Previous version	High	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-70	Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants	2022	NS-G-1.2	High	No	No	Low	HL
IAEA	SSG-74	Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants	2022	NS-G-2.6	High	No	No	Middle	HL (where not covered by Safety Demonstration)
IAEA	SSG-48	Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants	2018	No	No	Yes	Assessment	Middle	CBC (where not covered by Safety Demonstration)
IAEA	TOP401	Technological Obsolescence Management Programme	2014	No	No	Yes	Reference	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SPP-402	Spare Parts Storage Programme	2019	No	No	Yes	Reference	Middle	HL
IAEA	SRS-82 (Rev.2)	Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)	2024	No	No	No	No	Low	HL
IAEA	SRS-106	Ageing Management and Long Term Operation of Nuclear Power Plants: Data Management, Scope Setting, Plant Programmes and Documentation	2022	No	No	No	No	Middle	HL
IAEA	SSG-13(Rev.1)	Chemistry Programme for Water Cooled Nuclear Power Plants	2024	No	No	No	No	Middle	HL (where not covered by Safety Demonstration)
IAEA	NR-T-3.34	Management of Ageing and Obsolescence of Instrumentation and Control Systems and Equipment in Nuclear Power Plants and Related Facilities Through Modernization	2022	No	No	No	No	Middle	HL
IAEA	TECDOC-1853	Improvement of Effectiveness of In-Service Inspection in Nuclear Power Plants	2018	No	No	No	No	Low	HL
IAEA	NP-T-3.21	Procurement Engineering and Supply Chain Guidelines in Support of Operation and	2016	No	No	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
		Maintenance of Nuclear Facilities							
IAEA	TECDOC-1400	Improvement of in-service inspection in nuclear power plants	2004	No	No	No	No	Low	HL

A.2.6 Source Documentation

Source	Type	Name
EPZ	VR15	Veiligheidsrapport (Safety Report)
EPZ	TIP 03-02	Classification of SSCs
EPZ	TIP…	Technical Information Package (‘Safety Analysis Report’) documentation
EPZ	PU-N12-50-201	Scope Setting Methodology and results for LTO-2
EPZ	TS-1000-6000	Technical Specifications
EPZ	BTS-1000-5000	Bedrijfstechnische specificities (‘Operational Technical Specifications’)
EPZ	N12…	Documentation related to the process ‘instandhouding’, including STRAT documents
EPZ		System Health Reports
EPZ	N04…	Chemical programme

A.3 SF-3: Equipment qualification

A.3.1 Objective of the review

The objective of the review of equipment qualification is to determine whether plant equipment important to safety has been properly qualified (including for environmental conditions) and whether this qualification is being maintained through an adequate programme of maintenance, inspection and testing that provides confidence in the delivery of safety functions during the LTO-2 period.

A.3.2 Insights from SRS-121

Safety Factor 3 is considered amongst the most relevant for LTO-2. The environmental qualification has been identified as a time limited ageing analysis (TLAA). TLAAs are re-evaluated for the planned period of LTO. The revalidation is to demonstrate that the equipment will maintain an adequate safety margin until the end of LTO.

Examples of aspects in an LTO programme covered by Safety Factor 3 include, but are not limited to, the review of the qualification status of in-scope SSCs, review of the equipment qualification programme and an evaluation of activities for preserving the equipment qualification (e.g. environmental monitoring). Continuous plant processes in scope for this Safety Factor that can be used for justification of LTO are programmes for the plant's lifetime management, the proactive obsolescence programme and programmes for the replacement of major components.

SRS-121 [21] describes in 3.1.2.4 how the outputs of an LTO programme developed according paras 5.14 to 5.21 of SSG-48 can be used directly to support an assessment of SF (e.g. an LTO programme includes a comprehensive review of the equipment qualification programme preservation of equipment qualification is a precondition for LTO.)

The results of the re-evaluation of the TLAA related to equipment qualification may impact the initial assumptions (e.g. seismic, environmental parameters, electromagnetic interference) used for establishing the equipment qualification.

The evaluation of Safety Factor 3 may also identify obsolescence (e.g. equipment qualification is no longer valid because of a lack of qualified spare parts).

A.3.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed.. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 6 gives a summary of the SF3 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF3-1: Have SSCs within the scope of LTO-2 (including cables), that are credited to be qualified, been qualified for environmental conditions that could exist during both normal and predicted accident conditions (including seismic conditions, vibration, temperature, pressure, jet impingement, electromagnetic interference, irradiation, corrosive atmosphere and humidity, fire and combinations thereof) , considering the following aspects?

- **Whether installed equipment meets the qualification requirements;**
- **The adequacy of the records of equipment qualification;**
- **Surveillance and maintenance programmes and feedback procedures used to ensure that ageing degradation of qualified equipment remains insignificant;**

- **Monitoring of actual environmental conditions and identification of 'hot spots' of high activity or temperature;**
- **Protection of qualified equipment from adverse environmental conditions.**
- **The effects of ageing degradation of equipment during service and of possible changes in environmental conditions during normal operation and predicted accident conditions.**

In the framework of the Safety Demonstration the EQ programme clause-by-clause assessment against SSG-69 and the assessment of the EQ programme against the 9 attributes of effective ageing management programmes ensures that all SSCs that should be qualified undergo qualification for the LTO-2 period. All aspects named are part of SSG-69. Furthermore, SSCs that should be qualified until LTO-2 that cannot be qualified or that have not been yet qualified are identified. No additional evaluation activities are required.

SRQ-SF3-2: Assess the adequacy of the EQ programme (including for maintaining the qualified status of components through LTO-2 period considering the following aspects:

- **The process should take into account plant and equipment ageing and modifications, equipment repairs and refurbishment, equipment failures and replacements, any abnormal operating conditions and changes to the safety analysis.**
- **Procedures for updating and maintaining qualification throughout the service life of the equipment,**
- **Procedures to assess the impact of modifications on the qualified status of impacted qualified SSCs,**

In the framework of the Safety Demonstration the EQ programme clause-by-clause assessment against SSG-69 ensures that adequate procedures support the maintenance of the qualified status of SSCs for the LTO-2 period. No additional evaluation activities are required.

SRQ-SF3-3: Has equipment qualification been identified as a TLAA and can the TLAA be revalidated for the LTO-2 period?

In the framework of the Safety Demonstration the TLAA EQDBA identified during the first lifetime extension (LTO-1) is revalidated for the LTO-2 period. No additional evaluation activities are required.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices in equipment qualification processes for subsequent LTO. Input from Safety Factor 9. **(SF3-EA1)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF3- EA2)**
- a review of the reference assessment and framework identified for SF3 to identify proven practices that can improve KCB processes of Equipment Qualification. **(SF3- EA3)**

Table 6 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF3-1	Fully	-	-	-	SF2, SF5, SF6, SF7, SF13
SRQ-SF3-2	Fully	-	-	-	SF1, SF4, SF8
SRQ-SF3-3	Fully	-	-	-	SF4

A.3.4 Regulatory Framework

See Appendix E.

A.3.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC (relevant)
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	CBC (relevant)
WENRA	SRL Issue I	Ageing Management	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue G	Safety Classification of Structures, Systems and Components	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-69	Equipment Qualification for Nuclear Installations	2021	SRS-3	High	SRS-3	Reference	Middle	CBC
IAEA	SSG-74	Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants	2022	NS-G-2.6	High	No	No	Middle	HL (where not covered by Safety Demonstration)
IAEA	SRS-82 (Rev.2)	Ageing Management for . Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)	2024	No	No	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SRS-106	Ageing Management and Long Term Operation of Nuclear Power Plants: Data Management, Scope Setting, Plant Programmes and Documentation	2022	No	No	No	No	Middle	HL
NRC	50.49	Environmental qualification of electric equipment important to safety for nuclear power plants	2021	No	No	No	No	Low	HL
NRC	Reg. Guide 1.89 (Rev.2)	Environmental Qualification of certain electric equipment important to safety for nuclear power plants	2023	No	No	No	No	Low	HL
IAEA	NR-T-3.31	Challenges and Approaches for Selecting, Assessing and Qualifying Commercial Industrial Digital Instrumentation and Control Equipment for Use in Nuclear Power Plant Applications	2020	No	No	No	No	Low	HL

A.3.6 Source Documentation

Source	Type	Name
EPZ	VR15	Veiligheidsrapport (Safety Report)
EPZ	TIP 03-02	Classification of SSCs
EPZ	TIP	Technical Information Package (‘Safety Analysis Report’) documentation
EPZ	PU-N12-50-201	Scope Setting Methodology and results for LTO-2
EPZ	TS-1000-5000	Technical Specification
EPZ	BTS-1000-5000	Bedrijfstechnische specificities (‘Operational Technical Specifications’)
EPZ	N12	Documentation related to the process ‘instandhouding’, including STRAT documents
EPZ		System Health Reports
EPZ	N04	Chemical programme

A.4 SF-4: Ageing

A.4.1 Objective of the review

The objective of the review of ageing is to determine whether ageing aspects affecting SSCs important to safety are being effectively managed and whether an effective ageing management programme is in place so that all required safety functions will be delivered for LTO-2.

A.4.2 Insights from SRS-121

Safety Factor 4 is considered amongst the most relevant for LTO-2. The review of this Safety Factor determines whether the ageing aspects affecting in-scope SSCs are effectively managed and whether an effective AMP is in place so that all required safety functions will be delivered until the end of LTO. The review of this Safety Factor identifies any plant programme enhancements needed to ensure that the structures or components will be able to perform their intended functions during LTO. The review of this Safety Factor also assesses whether the plant obsolescence management programme will remain effective for the period of LTO. TLAAs can be revalidated within this Safety Factor for the planned period of LTO. The revalidation demonstrates that the equipment will maintain its safety margin at the end of LTO.

Examples of aspects of an LTO programme covered by PSR relating to Safety Factor 4 include, but are not limited to, review of the ageing management strategy, review of AMPs and revalidation of TLAAs. If the PSR is used to support justification of LTO, the review of the ageing management strategy of the organization has to take into account a systematic approach described in SSG-48 [2].

Within the PSR, the cumulative effects of ageing on NPP safety, the effectiveness of AMPs and the need for improvements to AMPs, as well as technological obsolescence and the systematic identification of anticipated technological obsolescence of SSCs, are all covered and reviewed in Safety Factor 4 (ageing).

The programme for LTO demonstrates that ageing effects will be adequately managed for each in-scope SSC in such a way that their intended function(s) will be maintained throughout the planned period of LTO. Therefore, the existing plant programmes used for ageing management and existing AMPs are reviewed to ensure that they will remain effective in managing the effects identified for the planned period of LTO (see para. 7.26 of SSG-48 [2]).

In 3.1.3 SRS-121 [21] describes in detail how the outputs of an LTO programme developed according to SSG-48 [2] can be used directly to support an assessment of SF4.

A systematic review of the existing plant programmes ensures that all required activities related to ageing management are implemented and effective. The recommended method of review and evaluation of AMPs and plant programmes is to check their consistency with the nine attributes of an effective AMP as described in SSG-48 [2].

The assessment of TLAAs is typically not part of the scope of a PSR based on SSG-25 [8]. However, a review of their revalidation is included if the PSR is to be used in support of LTO (see para. 3.6 of SSG-25 [8]).

The attainment of LTO requires an in depth review of ageing management. Part of this review concerns the effectiveness of the proactive identification of obsolescence in advance and the corrective actions taken to address it. A comprehensive technological obsolescence management programme is expected to be in place to identify, prioritize and implement solutions to the obsolescence of SSCs, particularly those important to safety. The obsolescence review in Safety Factor 4 can impact Safety Factors 2, 8 and 10.

A.4.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 7 gives a summary of the SF4 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF4-1: Is the Ageing Management at KCB programmatic and technically effective for the LTO-2 period considering the following aspects:

- **The timely detection and mitigation of ageing mechanisms and/or ageing effects;**
- **The comprehensiveness of the programme, i.e. does it address all SSCs important to safety?**
- **The effectiveness of operating and maintenance policies and/or procedures for managing the ageing of replaceable components;**
- **Evaluation and documentation of potential ageing degradation that may affect the safety functions of SSCs important to safety;**
- **Management of the effects of ageing on those parts of the nuclear power plant that will be required for safety when the nuclear reactor has ceased operation, for example the spent fuel storage facilities;**
- **Performance indicators;**
- **Record keeping.**
- **Ageing management methodology;**
- **The operating organization's understanding of dominant ageing mechanisms and phenomena, including knowledge of actual safety margins;**
- **Availability of data for assessing ageing degradation, including baseline data and operating and maintenance histories;**
- **Acceptance criteria and required safety margins for SSCs important to safety;**
- **Operating guidelines aimed at controlling and/or moderating the rate of ageing degradation;**
- **Methods for monitoring ageing and for mitigation of ageing effects;**
- **Awareness of the physical condition of SSCs important to safety and any features that could limit service life;**
- **Understanding and control of ageing of all materials (including consumables, such as lubricants) and SSCs that could impair their safety functions;**
- **Obsolescence of technology used in the nuclear power plant.**

In the framework of the Safety Demonstration all aspects of the ageing management as described in SSG-48 [2] are assessed with a clause-by-clause approach (Conformance Review) against the relevant assessment and reference framework. Furthermore all aspects of ageing management are reviewed from a technical point of view (e.g. the scope for LTO-2 is determined according to the method of SSG-48 [2], plant programmes are reviewed programmatically and for technical effectiveness, effectiveness of programmes related to ageing is checked against the 9 attributes of an effective AMP, the AMR is reviewed content-wise and new AMRs and AMPs are developed as necessary, TLAAs for LTO-2 are identified and revalidated). The Safety Demonstration assesses programmes such as the operational experience feedback programme and the corrective actions programme. Each programme relevant for ageing is assessed regarding how operational experience (e.g. malfunctions, trending) are communicated, implemented, and used to improve the programme's effectiveness. A full description of the approach to the assessment of ageing management is found in the Basis Document of the Safety Demonstration [9]. No additional evaluation activities are necessary to cover this research question.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices in the management of physical and non-physical ageing of SSCs. Input from Safety Factor 9. **(SF4-EA1)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF4- EA2)**
- a review of the reference assessment and framework identified for SF3 to identify proven practices that can improve KCB processes of ageing management. **(SF4- EA3)**

Table 7 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF4-1	Fully	-	-	-	SF1, SF2, SF3, SF5, SF6, SF7, SF8, SF10, SF11

A.4.4 Regulatory Framework

See Appendix E.

A.4.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC (relevant)
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	CBC (relevant)
WENRA	SRL Issue I	Ageing Management	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue G	Safety Classification of Structures, Systems and Components	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-48	Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants	2018	No	No	Yes	Assessment	High	CBC
IAEA	TOP401	Technological Obsolescence Management Programme	2014	No	No	Yes	Reference	Middle	HL
IAEA	SRS-82 (Rev.2)	Ageing Management for . Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)	2024	No	No	No	No	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SRS-106	Ageing Management and Long Term Operation of Nuclear Power Plants: Data Management, Scope Setting, Plant Programmes and Documentation	2022	No	No	No	No	Middle	HL
IAEA	NP-T-3.24	Handbook on Ageing Management for Nuclear Power Plants	2017	No	No	No	No	Low	HL
IAEA	NR-T-3.32	Fatigue Assessment in Light Water Reactors for Long Term Operation: Good Practices and Lessons Learned	2023	No	No	No	No	Low	HL
IAEA	NR-T-3.34	Management of Ageing and Obsolescence of Instrumentation and Control Systems and Equipment in Nuclear Power Plants and Related Facilities Through Modernization	2022	No	No	No	No	MIddle	HL
IAEA	NR-T-3.33	Asset Management for Sustainable Nuclear Power Plant Operation	2021	No	No	No	No	Low	HL
IAEA	NP-T-3.18	Plant Life Management Models for Long Term Operation of Nuclear Power Plants	2015	No	No	No	No	Low	HL
EPRI	1003317	Cable System Aging Management	2002	No	No	No	No	Middle	HL

A.4.6 Source Documentation

Source	Type	Name
EPZ NRG PALLAS Framatome	Various	Documentation produced during the Safety Demonstration.
EPZ	N12-50…	Documentation related to the process 'verouderingsbeheersing' ('ageing management'), including STRAT documents
EPZ	N12…	Documentation related to the process 'instandhouding', including STRAT documents
EPZ	COMSY	Database

A.5 SF-5: Deterministic safety analysis

A.5.1 Objective of the review

The objectives of the review of this Safety Factor is to determine to what extent the existing DSA remain complete and valid for LTO-2 when the following aspects are taken into account:

- Actual plant design including modification of SSCs since last update TIP or last PSR;
- Current operating modes and fuel management;
- Actual condition of SSCs important to safety and their predicted state at the end of LTO-2;
- The use of modern, validated compute codes;
- Current deterministic methods;
- Current safety standards and knowledge including research;
- Existence of adequate safety margins.

A.5.2 Insights from SRS-121

Safety Factor 5 is considered as a Safety Factor whose review can benefit from the outputs of an LTO programme.

As the PSR is used in support of LTO justification, it follows in Table 7 of SRS-121 [21] that the Safety Factor 5 review should determine to what extent existing Deterministic Safety Analyses remains valid for the period of LTO.

The review of this Safety Factor determines to what extent the existing DSA is complete and remains valid, taking into account the actual plant design, the actual condition of SSCs important to safety and their predicted state at the end of LTO, and the existence and adequacy of safety margins.

An updated safety analysis report reflects the configuration of the plant that will operate during LTO. These updates include design changes such as replacements and upgrades of plant systems, new analyses and calculations using ageing related data, revalidation of TLAAs and other time limited assumptions (e.g. update of pressurized thermal shock analysis).

Given that the PSR is used as a licensing tool, It follows from para. 7.38 of SSG-48 [2], that the safety assessment performed for Safety Factors 2–5 should consider the entire planned period of LTO.

A.5.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 8 gives a summary of the SF5 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF5-1: Are the conclusions from previous 10EVAs (i.e. 10EVA13 and 10EVA23) still valid in light of LTO-2 new timeframe and scope when considering:

- **The application of analytical methods, guidelines and computer codes and how they compare with current standards and regulations;**
- **The completeness of the set postulated initiating events with consideration given to the feedback of operational experience from plants of similar design;**

- **The validity of the assumptions made in light of the actual plant condition and their adherence to current regulations and standards;**
- **The capability of the actual operational conditions to meet the acceptance criteria for the design basis;**
- **Validation of whether the assumptions used in the deterministic safe analysis are in accordance with current regulations and standards;**
- **The application of the concept of defence in depth;**
- **The use of appropriate methods for the development and validation of emergency operating and accident management procedures;**
- **The capability of the plant to meet regulatory requirements regarding the calculated radiation doses and the release of radioactive material in accident conditions (for normal conditions release see Safety Factor 15) ;**
- **The adequacy and reliability of the SSCs, the impact of internal and external events (SF7), SSCs failure and human errors on safety**
- **The adequacy and effectiveness of engineering and administrative measures to prevent and mitigate accidents.**

During the Safety Demonstration the Deterministic Safety Analyses (DSA) are not part of the scope. The DSA have been extensively reviewed during previous 10EVAs, lastly in 2023. Since the last PSR there has been no design modification requiring a re-assessment of the DSA. The conclusions of previous 10EVAs will be reassessed considering the impact of longer operating lifetime and the new LTO-2 scope impacts. **(SF5-EA4)**

SRQ-SF5-2: Do the analysis tools (software, methods) and related knowledge remain adequate during the LTO-2 period?

Para. 5.55 of SSG-25 [8], advises a systematic review of how (a.o.) changes in analysis and modelling techniques affect safety at the nuclear power plant. In order to assess the continued adequacy of the current analytical methods, modelling techniques (including tools) and knowledge for the period of LTO-2, the current set of DSA will be assessed according to the known and foreseen future availability of supported software, standards, and knowledge. This activity will have interactions with both SF12 (knowledge and competence management) as well as SF1 (obsolescence of Codes and Standards). Potential weaknesses will be identified **(SF5-EA5).**

SRQ-SF5-3: Are ageing and other LTO related aspects correctly included in the Deterministic Safety Analyses? And which projected ageing effects can be modelled in the DSA revalidations for LTO-2 (e.g. embrittlement vessel)?

The available results from the Safety Demonstration activities (i.e. necessary replacements, projected ageing effects, TLAAs results), from site re-assessment (SF7) and SFs 2, 3 and 4 are analyzed to identify if improvements of the DSA are necessary for the LTO-2 period. **(SF5-EA6)**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices in the use of DSA for subsequent LTO. Input from Safety Factor 9. **(SF5-EA1)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF5-EA2)**
- a review of the reference assessment and framework identified for SF3 to identify proven practices that can improve KCB processes of ageing management. **(SF5- EA3)**

Table 8 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF5-1	No	Yes	Yes	No	SF6, SF7, SF11, SF13

SRQ-SF5-2	No	No	No	Yes	SF1*, SF8, SF12*
SRQ-SF5-3	Yes	No	No	Yes	SF2*, SF3, SF4*, SF7*

A.5.4 Regulatory Framework

See Appendix E

A.5.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC (relevant)
IAEA	GSR Part 4 (Rev 1)	Safety Assessment for Facilities and Activities	2016	GS-R-4 (2009)	High	Yes	Assessment	High	CBC (relevant)
WENRA	SRL Issue E	Design Basis Envelope for Existing Reactors	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue F	Design Extension of Existing Reactors	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-2 (Rev.1)	Deterministic Safety Analysis for Nuclear Power Plants	2019	SSG-2	High	Yes	Assessment	Middle	HL
IAEA	TECDOC-2031	Advancing the State of the Practice in Uncertainty and Sensitivity Methodologies for Severe Accident Analysis in Water Cooled Reactors of PWR and SMR Types	2023	No	No	No	No	Low	HL
IAEA	SRS-46 (rev.1)	Assessment of Defence in Depth for Nuclear Power Plants	2024	SRS-46	High	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-88	Design Extension Conditions and the Concept of Practical Elimination in the Design of Nuclear Power Plants	2024	No	No	No	No	Low	HL

A.5.6 Source Documentation

Source	Type	Name
EPZ	TIP-07-02-…	TIP documentation on Deterministic Analyses
EPZ	TIP-01-04	Safety Concepts

A.6 SF-6: Probabilistic safety assessment

A.6.1 Objective of the review

The objectives of the review of the PSA are to determine:

- The extent to which the existing PSA study remains valid as a representative model of the nuclear power plant during LTO-2;
- Whether the results of the PSA show that the risks remain sufficiently low and well balanced for all postulated initiating events and operational states;
- Whether the scope (which should include all operational states and identified internal and external hazards), methodologies and extent (i.e. Level 1, 2 or 3) of the PSA are in accordance with current national and international standards and good practices;
- Whether the existing scope and application of PSA are sufficient for LTO-2.

A.6.2 Insights from SRS-121

The review of this Safety Factor determines the extent to which the existing PSA study remains valid as a representative model of the NPP, whether it reflects the latest plant configuration and identifies weaknesses in the design and operation of the plant and whether it evaluates and compares proposed safety improvements in the global assessment. An adequate and up to date PSA model is an important precondition for appropriate selection of SSCs for the LTO scope setting. Obsolescence of used standard might affect Safety Factor 6 when new hazards are identified or existing hazards are reviewed.

A.6.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 9 gives a summary of the SF6 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF6-1: Are the conclusions from previous 10EVAs (i.e. 10EVA13 and 10EVA23) still valid in light of LTO-2 new timeframe and scope when considering:

- **The existing PSA, including the assumptions used, the fault schedule, the representations of operator actions and common cause events, the modelled plant configuration and consistency with other aspects of the safety case;**
- **Whether accident management programmes for accident conditions (design basis accident conditions and design extension conditions) are consistent with PSA models and results;**
- **Whether the scope and applications of the PSA are sufficient;**
- **The status and validation of analytical methods and computer codes used in the PSA;**
- **Whether the results of PSA show that risks are sufficiently low and well balanced for all postulated initiating events and operational states, and meet relevant probabilistic safety criteria;**
- **Whether the existing scope and application of the PSA are sufficient for its use to assist the PSR global assessment, for example, to compare proposed improvement options.**

In order to assess the adequacy of the current PSA for the LTO-2 period, the conclusions of previous 10EVAs will be reassessed considering the impact of longer operating lifetime and the new LTO-2 scope impacts (e.g. including demographic development from SF7). Where deemed necessary a more detailed assessment of the relevant guidelines will be carried out (e.g. due to new insights). For guidelines not assessed in the framework of previous 10EVAs a high level review will be carried out. Where practicable, improvements will be identified**. (SF6-EA1)**

SRQ-SF6-2: Do the analysis tools (software, methods) and related knowledge remain adequate during the LTO-2 period?

In order to assess the continued adequacy of the current analytical methods, tools and knowledge for the period of LTO-2 and to identify anticipated weaknesses. The current PSA will be (re)assessed according to the known and foreseen future availability of supported software, methods and knowledge. This activity will have interactions with both SF12 (knowledge and competence management) as well as SF1 (obsolescence of Codes and Standards) **(SF6-EA2).**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices in the use of PSA for subsequent LTO. Input from Safety Factor 9. **(SF6-EA3)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF6-EA4)**

Table 9 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF6-1	No	Yes	Yes	No	SF2, SF3, SF4, SF5, SF7*, SF11, SF12, SF13
SRQ-SF6-2	No	No	No	Yes	SF1*, SF8, SF12*

A.6.4 Regulatory Framework

See Appendix E

A.6.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC (relevant)
IAEA	GSR Part 4 (Rev 1)	Safety Assessment for Facilities and Activities	2016	GS-R-4 (2009)	High	Yes	Assessment	Middle	CBC (relevant)
WENRA	SRL Issue O	Probabilistic Safety Analysis (PSA)	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue F	Design Extension of Existing Reactors	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-3 (Rev.1)	Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants	2024	SSG-3	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-4	Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants	2010	SSG-4	High	No	No	Low	HL
IAEA	TECDOC-2081	Experience in the Development and Application of Level 2	2025	No	No	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
		Probabilistic Safety Assessment for Nuclear Power Plants							
IAEA	SRS-103	Methodologies for Seismic Safety Evaluation of Existing Nuclear Installations	2020	No	No	No	No	Low	HL
IAEA	SRS-92	Consideration of External Hazards in Probabilistic Safety Assessment for Single Unit and Multi-unit Nuclear Power Plants	2018	No	No	No	No	Low	HL
IAEA	TECDOC-1937	Probabilistic Safety Assessment for Seismic Events	2020	No	No	No	No	Low	HL
IAEA	SRS-88	Safety Aspects of Nuclear Power Plants in Human Induced External Events: Margin Assessment	2017	No	No	No	No	Low	HL

A.6.6 Source Documentation

Source	Type	Name
EPZ	TIP-07-02-…	TIP documentation on Deterministic Analyses
EPZ	TIP-01-04	Safety Concepts

A.7 SF-7: Hazard analysis

A.7.1 Objective of the review

The objective of the review of hazard analysis is to determine the adequacy of the protection of the nuclear power plant against internal and external hazards for the period of LTO-2, with account taken of the plant design, site characteristics, the actual condition of the SSCs important to safety and and their predicted state at the end of LTO-2, and current analytical methods, safety standards and knowledge.

A.7.2 Insights from SRS-121

Safety Factor 7 is considered as a Safety Factor whose review can benefit from the outputs of an LTO programme.

The main contribution from the PSR to support the justification of LTO regarding both codes and standards obsolescence would be provided primarily from Safety Factor 1 and Safety Factor 7.

In Table 3 of SRS-121 [21] it is specified that the review of this Safety Factor demonstrates the adequacy of protection against internal and external hazards, with account taken of the plant design, site characteristics, actual condition of the in-scope SSCs important to safety and their predicted state at the end of the LTO period. A comprehensive site reassessment could be required for justification of LTO.

A.7.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 10 gives a summary of the SF7 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF7-1: Is the set of identified internal and external hazards complete taking into account the foreseeable changes (e.g. in site characteristics) during LTO-2?

In order to identify the anticipated site characteristics for the LTO-2 period and identify related potential new hazards a review of the site characteristics (TIP-04-01-01 to TIP-04-10-01) will be performed (SF7-EA1) considering the projection during LTO-2 for the parameters relevant to the evaluation of the magnitude of internal and external hazards:

- Seismic data;
- Meteorological data (i.e. related to climate change);
- Transport and industrial activities in the surrounding;
- Hydrogeological data;
- Hazardous material storage in the installation building;
- Demography.

The projections will make use of the available data from external sources and database (e.g. KNMI, TNO, governmental instances). For external hazards the changes in the frequence of occurrence and worst case scenarios (extreme values) will be considered.

The set of internal and external hazards (TIP-05-09-01 and TIP-05-10-01) will be checked for completeness against the set identified by the relevant guides and standards considering the anticipated site characteristics **(SF7-EA2).**

SRQ-SF7-2: Does the NPP protection against the identified internal and external hazards remain adequate during LTO-2, taking into account:

- **The credible magnitude and associated frequency of occurrence of the hazard;**
- **Current safety standards;**
- **Current understanding of environmental effects;**
- **The capability of the plant to withstand the hazard as claimed in the safety case, based on its current condition and with allowance given to predicted ageing degradation;**
- **The appropriateness of procedures to cover operator actions claimed to prevent or mitigate the hazard.**

Based on the outputs from the determination of anticipated site characteristics for the LTO-2 period **(SF7-EA1)** the adequacy of the current protection measures will be assessed **(SF7-EA3).** For this specific research question interactions with the Safety Demonstration, SF1, SF2, SF3, SF4, SF5, and SF11 are expected. The assessment for the adequacy of the protection of the installation is based on:

- The actual design;
- The actual condition of the safety relevant SSCs (during LTO-2);
- The site characteristics (during LTO-2);
- The relevant codes and standards.

The actual design has been assessed in 10EVA23 and is described in the TIP. The actual conditions and projected degradation (including technological obsolescence) of the SSCs are determined for the LTO-2 scope in the framework of the Safety Demonstration. The current relevant guidelines, codes and standards are analyzed in **SF7-EA4** to assess the analysis methods.

In case new hazards for the LTO-2 period are identified an analysis of the protection adequacy will be carried out.

The impact of changes in the site characteristics, in the actual condition of SSCs during LTO-2, and in the relevant guides, codes and standards will be assessed for each of the existing analyses to determine if the analyses need to be revalidated.

SRQ-SF7-3: Are the current analysis methods in line with the current international standards?

Within 10EVA13 an extensive review of the standards relevant for the analysis of internal and external hazards was carried out. Most documents that have been evaluated in 10EVA13 have been superseded by new guidelines, codes and standards. A review of the changes occurred will be made. The impact of the changes on the analysis of internal and external hazards will be assessed and where necessary improvements will be identified **(SF7-EA4)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices dealing with internal and external hazard changes due to subsequent LTO (e.g. due to climate change). Input from Safety Factor 9. **(SF7-EA5)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF7-EA6)**

Table 10 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review

SRQ-SF7-1	No	Yes	No	Yes	SF1, SF8, SF13
SRQ-SF7-2	No	Yes	Yes	Yes	SF1*, SF2*, SF3*, SF4*, SF5*, SF6, SF11*, SF12, SF13, SF14
SRQ-SF7-3	No	Yes	Yes	Yes	SF1

A.7.4 Regulatory Framework

See Appendix E

A.7.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	NS-R-1 (2000)	High	Yes	Assessment	High	CBC
IAEA	SSR-1	Site Evaluation for Nuclear Installations	2019	No	No	Yes	Assessment	High	(partial) CBC
IAEA	GSR Part 4 (Rev 1)	Safety Assessment for Facilities and Activities	2016	GS-R-4 (2009)	High	Yes	Assessment	Middle	(partial) CBC
WENRA	SRL Issue SV	Internal Hazards	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue TU	External Hazards	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue E		2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
ANVS	VOBK	Veilig Ontwerp en veilig Bedrijven van Kernreactoren	2025	No	No	VOBK 2021	Assessment	Middle	HL + (partial) CBC
IAEA	SSG-77	Deterministic Safety Analysis for Nuclear Power PlantsProtection Against Internal and External Hazards in the Operation of Nuclear Power Plants	2022	NS-G-2.1	High	No	No	Middle	HL + (partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-18	Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations	2011	NS-G-3.4, NS-G-3.5	High	Yes	Assessment	Middle	HL
IAEA	SSG-68	Design of Nuclear Installations Against External Events Excluding Earthquakes	2021	NS-G-1.5	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-68	Design of Nuclear Installations Against External Events Excluding Earthquakes	2021	NS-G-1.5	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-9 (Rev.1)	Seismic Hazards in Site Evaluation for Nuclear Installations	2022	SSG-9	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-68	Seismic Design for Nuclear Installations	2021	NS-G-1.6	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-64	Protection against Internal Hazards in the Design of Nuclear Power Plants	2021	NS-G-1.7, NS-G-1.11	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-89	Evaluation of Seismic Safety for Nuclear Installations	2024	NS-G-2.13	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-79	Hazards Associated with Human Induced External Events in Site Evaluation for Nuclear Installations	2024	NS-G-3.1	High	No	No	Middle	HL + (partial) CBC
IAEA	SRS-116	Tsunami and Seiche Hazards in Site Evaluation for Nuclear Installations	2025	No	No	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SRS-88	Safety Aspects of Nuclear Power Plants in Human Induced External Events: Margin Assessment	2017	No	No	No	No	Low	HL
IAEA	TECDOC-2042	Optimization of Safety Measures for Protection of Nuclear Installations Against External Hazards	2024	No	No	No	No	Middle	HL
IAEA	TECDOC-2043	Evaluation of Design Robustness of Nuclear Installations Against External Hazards	2024	No	No	No	No	Middle	HL
IAEA	SRS-120	Assessment of High Wind and External Flooding (Excluding Tsunami) Hazards in Site Evaluation for Nuclear Installations	2024	No	No	No	No	Low	HL
IAEA	TECDOC-1944	Fire Protection in Nuclear Power Plants	2021	No	No	No	No	Low	HL
KTA	2101	Fire Protection in Nuclear Power Plants	2015	KTA 2101 (2000)	Low	No	No	Low	HL
KTA	2103	Explosion Protection in Nuclear Power Plants with Light Water Reactors (General and Case Specific Requirements)	2022	KTA 2103 (2000)	Low	No	No	Low	HL
KTA	2201.1	Design of Nuclear Power Plants against Seismic Events; Part 1 Principles	2011	KTA 2101.1 (2005)	Low	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
KTA	2206	Design of Nuclear Power Plants Against Damaging Effects from Lightning	2022	KTA 2206 (2009)	Low	No	No	Low	HL
KTA	2207	Flood Protection for Nuclear Power Plants	2022	KTA 2207 (2004)	Low	No	No	Low	HL
KTA	2501	Structural Waterproofing of Nuclear Power Plants	2022	KTA 2501 (2004)	Low	No	No	Low	HL

A.7.6 Source Documentation

Source	Type	Name
EPZ	TIP-07-…	Safety Analyses
EPZ	TIP-04-…	Site Characteristics
EPZ	TIP-05-09-01	Robustness against internal hazards
EPZ	TIP-05-10-01	Robustness against external hazards
KNMI		Datacenter
KNMI	WR-23-02	KNMI National Climate Scenarios 2023 for the Netherlands

A.8 SF-8: Safety performance

A.8.1 Objective of the review

The objective of the review of safety performance is to determine whether the plant's safety performance indicators (SPI) and records of operating experience, including the evaluation of root causes of plant events, indicate any need for safety improvements.

A.8.2 Insights from SRS-121

The review of Safety Factor 8 determines whether the plant's safety performance indicators and records of operating experience, including the evaluation of root causes of plant events, are effective or indicate any need for safety improvements, and whether extrapolation of safety performance trends has been considered for the whole LTO period. The review includes identification of the drivers, which may include obsolescence, for replacement of in-scope SSCs and the adequacy of the methodologies in place to trend, analyze and act upon these data.

A.8.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 11 gives a summary of the SF8 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF8-1: Do the processes for the routine recording, evaluation, and trending of safety related operating experience remain appropriate for the LTO-2 period? The review includes:

- **Safety related incidents, low level events and near misses;**
- **Safety related operational data;**
- **Maintenance, inspection and testing;**
- **Replacements of SSCs important to safety owing to failure or obsolescence;**
- **Modifications, either temporary or permanent, to SSCs important to safety;**
- **Unavailability of safety systems;**
- **Compliance with regulatory requirements.**

The following aspects are not considered, in line with previous 10EVAs, under SF8, but under SFs 14 and 15.

- **Radiation doses (to workers, including contractors) (SF15);**
- **Off-site contamination and radiation levels (SF14);**
- **Discharges of radioactive effluents (SF14);**
- **Generation of radioactive waste (SF14);**

The goal is to assess if the processes for the routine recording, evaluation, and trending of safety related operating experience remain appropriate during LTO-2 and if the processes are conform to the assessment framework. During previous 10EVAs the scope of the research questions has been assessed for their effectiveness and against the available sources of comparison for completeness, effectiveness and improvements. The 10EVA23 has assessed external experience from WANO sources ('vraag 3'of SF8).

In the framework of the Safety Demonstration the operating experience feedback processes for the programmes relevant to ageing management and the corrective action programme are reviewed against the assessment and reference frameworks defined in the BDSD [9].

The conclusions from previous 10EVAs will be re-assessed in light of a longer operating lifetime. Where deemed necessary a review of the assessment and reference frameworks will be carried out **(SF8-EA1).**

SRQ-SF8-2: Does the current set of Performance Indicators remains complete and effective for the period of LTO-2?, and do the projections (covering the LTO-2 period) of the Performance Indicators trending indicate potential threats?

The conclusions from previous 10EVAs will be re-assessed in light of a longer operating lifetime **(SF8-EA1).** The existing Performance Indicators will be projected of SPI's to end LTO-2 where possible and the completeness of the set of Performance Indication will be reviewed for LTO-2 **(SF8-EA2)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the operational experience from other NPPs of similar age and/or design entering subsequent lifetime extension will be assessed to identify applicable proven practices the use of KPI, trending and performance reviews for subsequent LTO. Input from Safety Factor 9. **(SF8-EA2)**
- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF8-EA3)**

Table 11 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF8-1	No	Yes	Yes	Yes	SF1, SF2, SF10, SF11, SF12
SRQ-SF8-2	No	Yes	Yes	Yes	SF7

A.8.4 Regulatory Framework

See Appendix E

A.8.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Reference	High	(Partial) CBC
IAEA	GSR Part 2 (Rev 1)	Leadership and Management for Safety	2016	GS-R-2 (2009)	High	Yes	Assessment	Middle	(partial) CBC
WENRA	SRL Issue J	Internal Hazards System for Investigation of Events and Operational Experience Feedback	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue K	Maintenance, In-Service Inspection and Functional Testing	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-74	Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants	2022	NS-G-2.6	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-50	Operating Experience Feedback for Nuclear Installations	2018	NS-G-2.11	High	Yes	Assessment	Middle	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-72	The Operating Organization for Nuclear Power Plants	2022	NS-G-2.4	High	No	No	Middle	HL + (partial) CBC
IAEA	TECDOC-1653	Best Practices in the Management of an Operating Experience Programme at Nuclear Power Plants	2010	No	No	No	No	Low	HL
IAEA	TECDOC-2080	Performance Indicators to Monitor, Assess and Improve Knowledge Management Programmes in Nuclear Organization	2025	No	No	No	No	Low	HL
IAEA	SRS-82 (Rev.2)	Ageing Management for . Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)	2024	No	No	No	No	Low	HL

A.8.6 Source Documentation

Source	Type	Name
EPZ	A27…	Continuous improvement process and related yearly reports
EPZ	N12…	Instandhouing process and related yearly reports
EPZ	N07…	Bedrijfsvoering (‘Operation’) process and related yearly reports
EPZ	N13	Configuratiemanagement process and related reports
EPZ	PU-A27-04	Dealing with deviations
EPZ	PU-N07-03	Management of corrective actions
EPZ	PU-A27-02	Analysis and evaluation of internal and external events and deviations and learning from external experience
EPZ	PU-N12-19	Analysis and evaluation of ageing management notifications
EPZ	PU-A01-05	Operational cycle plan
IAEA	OSART	Rapport OSART 2023
WANO	—	Performance Indicators quarterly reports

A.9 SF-9: Use of experience from other plants and research findings

A.9.1 Objective

The objective of the review of this Safety Factor is to determine whether there is adequate feedback of relevant experience from other nuclear power plants and from the findings of research, and whether this is used to introduce reasonable and practicable safety improvements at the plant or in the operating organization.

A.9.2 Insights from SRS-121

The review of Safety Factor 9 determines whether there is adequate feedback from relevant experience at other nuclear power plants, as well as from research findings and events at non-nuclear installations. The focus is on identifying the latest international operating experience and research related to long-term operation (LTO). Additionally, the review analyses past deficiencies in the evaluation of operating experience from other plants concerning ageing, obsolescence, and other safety issues, in order to determine their applicability to KCB and to prevent potential safety concerns.

A.9.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 12 gives a summary of the SF9 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF9-1: Does the process for routinely recording and evaluating external operating experience ensure that relevant information are effectively assessed during the LTO-2 period and that corresponding actions are taken where necessary?

For SSC important to safety this question is addressed in the safety demonstration.

Additionally, it will be reassessed if the process for gathering and evaluate operating experience from other NPPs and research findings are adequate for LTO-2, by reassessing the conclusions from previous 10EVAs in light of a longer operating lifetime (e.g. including the review of PU-A27-02). Where deemed necessary an assessment of the assessment and reference frameworks will be carried out **(SF9-EA1).**

SRQ-SF9-2: Identify the latest research and relevant operating experience from other NPPs related to (subsequent) Long Term Operation

The principal research effort aimed to tackle the challenges for subsequent LTO is the OECD/NEA LTO Beyond 60 years project. The OECD/NEA report will be reviewed to assess if the findings from the research project are applicable to KCB. **(SF9-EA2).**

Furthermore a benchmark will be performed by reviewing and inventorying the operational experience relevant to subsequent Long Term Operation (e.g. significant degradations, preventive replacements, investments, modifications) for reactor of similar age, situation and design (PWR)

The benchmark will be based on the publicly available information and, where practicable, on the direct experience from the NPPs (e.g. by means of workshops,) **(SF9-EA3).**

Table 12 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF9-1	No	Yes	Yes	No	SF11
SRQ-SF9-2	No	No	No	Yes	SF1, SF10

A.9.4 Regulatory Framework

See Appendix E.

A.9.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Reference	High	(Partial) CBC
WENRA	SRL Issue J	Internal Hazards System for Investigation of Events and Operational Experience Feedback	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-50	Operating Experience Feedback for Nuclear Installations	2018	NS-G-2.11	High	Yes	Assessment	High	HL
IAEA	SSG-72	The Operating Organization for Nuclear Power Plants	2022	NS-G-2.4	High	No	No	Middle	HL + (partial) CBC
IAEA	TECDOC-1653	Best Practices in the Management of an Operating Experience Programme at Nuclear Power Plants	2010	No	No	No	No	Low	HL
IAEA	SRS-82 (Rev.2)	Ageing Management for . Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)	2024	No	No	No	No	Low	HL

A.9.6 Source Documentation

Source	Type	Name
EPZ	A27…	Continuous improvement process and related yearly reports
EPZ	PU-A27-02	Analysis and evaluation of internal and external malfunctioning and deviations and learning from external experience
EPZ	PU-N12-19	Analysis and evaluation of ageing management notifications
IAEA	OSART	Rapport OSART 2023
WANO	SOER	Significant Operating Experience Reports
WANO	WER	Wano Event Reports
IAEA	NEWS	Database
IAEA/NEA	IRS	Database
OECD/NEA		LTO Beyond 60 years

A.10 SF-10: Organization, the management system and safety culture

A.10.1 Objective

The objective of the review of this Safety Factor is to determine whether the organization, management system and safety culture remain adequate and effective for ensuring the safe operation of the nuclear power plant during LTO-2.

A.10.2 Insights from SRS-121

The review of Safety Factor 10 determines whether the organization, management system, and safety culture are adequate and effective to ensure the safe operation of the NPP. This Safety Factor is a key precondition for safe LTO. The review evaluates whether an adequate LTO policy is in place and whether dedicated organizational structures and sufficient resources will be available throughout the LTO period.

To prepare and implement the LTO programme, the operating organization is expected to stablish a comprehensive organizational arrangement that includes the following aspects:

Para. 3.1.4 of SRS-121 [21] describes the expected extension of the scope of the review of Safety Factor 10 to include LTO related aspects for the following subjects: safety policy, management system, documentation, human resources.

The review of Safety Factor 10 includes the review of aspects of obsolescence of knowledge as well as obsolescence of codes and standards.

The results of the review of these aspects provide the supporting evidence for the justification of LTO: that the plant can be operated safely beyond the original time frame established in the licence conditions, design limits, safety standards and/or regulations.

A.10.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 13 gives a summary of the SF10 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF10-1: Are the following elements of the organization and management system of EPZ aligned with the latest national and international standards?

- **Policy statements of EPZ.**
- **Documentation of the management system.**
- **The adequacy of arrangements for managing and retaining responsibility for activities or processes important to safety that have been outsourced (e.g. maintenance and engineering services and safety analysis).**
- **The roles and responsibilities of individuals managing, performing and assessing work.**
- **The processes and supporting information that explain how work is to be specified, prepared, reviewed, performed, recorded, assessed and improved.**

And do they include the following elements?

- **Adequate processes for managing organizational change.**
- **Adequate control of documents, products and records and this information is readily retrievable.**
- **Adequate control of purchasing of equipment and services where this affects plant safety, including processes to check the quality of suppliers' management systems that are intended to ensure that equipment and services supplied to the nuclear power plant are fit for purpose and provided in an effective and efficient manner.**
- **Adequate communication policies.**
- **Adequate processes for feedback of operating experience to the staff, including experience relating to organizational and management failures.**
- **Suitable arrangements in place for maintaining the configuration of the nuclear power plant and operations are carried out in accordance with the safety analysis of the plant.**
- **Programmes for ensuring continuous improvement, including self-assessment and independent assessment.**

The following elements are not considered, in line with previous 10EVAs, under SF10, but under SF12:

- **A human resource management process that ensures the availability of adequate, qualified human resources, including succession planning.**
- **Adequate facilities for training and well-structured training programmes.**
- **Formal arrangements in place for employing suitably qualified internal and external technical, maintenance or other specialized staff.**

In the Safety Demonstration the following aspects are reviewed against the assessment and reference frameworks defined in the BDSD [9]:

- KCB LTO-2 Programme and Organizational Arrangements for KCB LTO-2.
- Configuration Management and Management of Modifications.
- Human Resources, competences and knowledge management for KCB LTO-2.

The Conformance review ensures that the following elements related to SF10 comply with the state of the art in nuclear safety:

- The roles and responsibilities of individuals managing, performing and assessing work.
- Adequate control of documents, products and records and this information is readily retrievable.
- Suitable arrangements in place for maintaining the configuration of the nuclear power plant and operations are carried out in accordance with the safety analysis of the plant.

Next to the activities carried out within the Safety Demonstration the conclusions of previous 10EVAs will be reassessed in light of a longer operating lifetime. Particular attention will be given to the supply chain as this is of great importance for a successful LTO-programme. Where deemed necessary a review of the assessment and reference frameworks will be carried out **(SF10-EA1).**

SRQ-SF10-2: Has the safety culture in place at EPZ been reviewed to verify the following aspects are considered?

- **The safety policy states that safety takes precedence over production and is effectively implemented.**
- **Nuclear and radiation safety are properly controlled and that appropriate measures are applied consistently and conscientiously by all staff.**
- **A questioning attitude exists and conservative decision making is undertaken in the organization.**
- **There is a strong drive to ensure that all events that may be instructive are reported and investigated to discover root causes and that timely feedback is provided to appropriate staff on findings and remedial actions.**
- **Unsafe acts and conditions are identified and challenged in a constructive manner wherever and whenever they are encountered by plant employees and contractors.**
- **That the organization has a learning culture and that it strives continuously for improvements and new ideas, and benchmarks against and searches out best practices and new technologies.**

- **That there is an established and effective process for communication of safety issues.**
- **That there is a process in place for prioritization of safety issues, with realistic objectives and timescales, that ensures that these issues receive proper resources.**
- **That there is a method in place for achieving and maintaining clarity of the organizational structure and managing changes in accountability for matters affecting safety.**
- **That there is adequate training in safety culture, particularly for managers.**

The conclusions from previous 10EVAs will be re-assessed in light of a longer operating lifetime (including projection of SPI's to end LTO-2 where possible and consideration of completeness for LTO-2). Where deemed necessary a review of the assessment and reference frameworks will be carried out **(SF10-EA1).**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF10-EA2)**
- A benchmark with NPPs of similar age, design and/or subsequent LTO situation (i.e. that are already in second lifetime extension or that are preparing for it) is performed in the framework of SF9 to gain information on good practices and practicable improvements at KCB. SF10 uses the benchmark to identify potential enhancements, such as lessons learned from other NPPs regarding organizational and management system adjustments, and safety culture improvements to support safe operation during the LTO-2 period. (**SF10-EA3**).

Table 13 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF10-1	Partly	Yes	Yes	No	SF2, SF8, SF11, SF12
SRQ-SF10-2	No	Yes	Yes	No	SF5, SF6, SF14, SF15

A.10.4 Regulatory Framework

See Appendix E.

A.10.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	(Partial) CBC
IAEA	GSR Part 2 (Rev. 1)	Leadership and Management for Safety	2016	GS-R-3	High	Yes	Assessment	High	CBC
IAEA	GSR Part 4 (Rev. 1)	Safety Assessment for Facilities and Activities	2016	NS-G-1.2 (2002) GSR Part 4 (2011)	High	No	No	High	(Partial) CBC
WENRA	Issue A	Safety Policy	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue B	Operating Organisation	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue C	Leadership and Management for Safety	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue D	Training and Authorization of NPP Staff (Jobs with Safety Importance)	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue K	Maintenance, In-Service Inspection and Functional Testing	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue P	Periodic Safety Review (PSR)	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue Q	Plant Modifications	2020	2008 version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-72	The Operating Organization for Nuclear Power Plants	2022	NS-G-2.4	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-75	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants	2022	NS-G-2.8	High	No	No	Middle	HL + (partial) CBC
IAEA	SRS-83	Performing Safety Culture Self-assessments	2016	No	No	Yes	Reference	Low	HL
IAEA	NP-T-3.21	Procurement Engineering and Supply Chain Guidelines in Support of Operation and Maintenance of Nuclear Facilities	2016	No	No	Yes	Reference	Low	HL
KTA	1201	Requirements for the Operating Manual	2015	2009	Medium	No	No	Low	HL
IAEA	GS-G-3.1	Application of the Management System for Facilities and Activities	2006	GS-G-3.1	High	No	No	Middle	HL

A.10.6 Source Documentation

Source	Type	Name
EPZ	TIP-03-01-01	Organization of safety processes
EPZ	TIP-03-02-01	Safety Culture
EPZ	TIP-03-03-01	Quality Management
EPZ	TIP-04-08-01	Evaluation of the location
EPZ	A01-25-N004	Procedure van Operationele besluitvorming (‘Operational Decision Making’) (ODM) BS30
EPZ	A22-00-001	Reglement reactorbedrijfsveiligheidscommissie (RBVC) of N.V. EPZ
EPZ	STRAT	BSST - Strategy
EPZ	HB	HB – Hand books
EPZ	BD-HP	Managementverwachtingen HP-technieken (‘Management Expectations’)
EPZ	TS-5000	Technical specifications, Governance and management system
EPZ	TS-5200A	Organizational underpinnings.
IAEA	OSART	Rapport OSART 2023
WANO	SOER	Significant Operating Experience Report
NEA	WGOE	Opex Reports
IAEA	NEWS	Database
IAEA/NEA	IRS	Database
OECD/NEA		LTO Beyond 60 years

A.11 SF-11: Procedures

A.11.1 Objective

The objective of the review of procedures is to determine whether the operating organization's processes for managing, implementing and adhering to operating and working procedures and for maintaining compliance with operational limits and conditions, and regulatory requirements are adequate and effective to ensure plant safety during LTO-2.

A.11.2 Insights from SRS-121

The review of Safety Factor 11 determines whether the operating organization's processes for managing, implementing and adhering to operating and working procedures, as well as for maintaining compliance with operational limits, conditions and regulatory requirements, are adequate and effective and ensure plant safety for the period of LTO.

Moreover, the review of Safety Factor 11 identifies deficiencies in effectiveness of procedures that exacerbate the risk of knowledge obsolescence deficiencies.

A.11.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 14 gives a summary of the SF11 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF11-1: Are the procedures in scope for review (see Source Documentation) adequate for achieving the processes goals, preserving knowledge, and ensure that interfaces between processes are effective? Are the procedures in scope for review (see section Source Documentation) regularly reviewed, updated, and improved to represent the actual processes and the relevant assessment, and reference framework?

Within the Safety Demonstration several procedures related to ageing management relevant processes (e.g. N12, parts of N13 and A00 and A11) are assessed to ensure conformance with the intended assessment, and reference framework. Improvements to the adequacy of the procedures assessed within the Safety Demonstration are proposed.

During previous 10EVAs the adequacy of the procedures of NV-1 (highest safety class) processes has been assessed. The conclusions from previous 10EVAs will be reassessed in light of a longer operating lifetime **(SF11-EA1)**. For those processes that were not covered during 10EVA23 a high level assessment will be performed to ensure that the procedures are adequate. For each process in Table 15 a representative samples of operational procedures, templates procedures and (work)instructions will be assessed whether they align with the processes goals and the minimum contents required. It will be furthermore assessed if the procedures are regularly updated and improved **(SF11-EA2)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9**. (SF11-EA3)**

Table 14 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF11-1	No	Yes	Yes	Yes	All SFs.

A.11.4 Regulatory Framework

See Appendix E.

A.11.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	(Partial) CBC
IAEA	SSR 2/1 (Rev.1)	Safety of Nuclear Power Plants: design	2016	No	No	Yes	Assessment	High	CBC
IAEA	GSR Part 2 (Rev 1)	Leadership and Management for Safety	2016	No	No	No	No	Middle	(partial) CBC
WENRA	SRL Issue C	Leadership and Management for Safety	2020	Previous version	Low	Yes	Assessment	Low	HL
WENRA	SRL Issue LM	Emergency Operating Procedures and Severe Accident Management Guideline	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-50	Operating Experience Feedback for Nuclear Installations	2018	No	No	Yes	Assessment	Middle	HL
IAEA	SSG-72	The Operating Organization for Nuclear Power Plants	2022	NS-G-2.4	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-76	Conduct of Operations at Nuclear Power Plants	2022	NS-G-2.14	High	No	No	Middle	HL + (partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	GS-G-3.1	Application of the Management System for Facilities and Activities	2006	GS-G-3.1	High	No	No	Middle	HL

A.11.6 Source Documentation

It is important to notice that not all of KCB processes are reviewed by this Safety Factor. The processes at KCB are classified according to their safety relevance. It is assumed that NV-1 (highest safety relevance) processes will need to remain effective during LTO-2. Next to these processes a selection of processes significant for LTO is made (e.g. for knowledge management) as shown in Table 15.

Table 15 Processes scope of Safety Factor 11 review.

Source	Type	Name
EPZ	N03	Splijtstofmanagement (Fuel Management)
EPZ	N04	(Radio)chemische bedrijfsvoering (Radio-Chemical Operations)
EPZ	N06	Radioactief afval behandeling (Radioactive Waste Management)
EPZ	N07	Productie (Production)
EPZ	N12	Instandhouding (MTSI+Ageing Management)
EPZ	N13	Configuration Management
EPZ	N14	Incident- en ongevalbeheersing (Incidents and accidents management)
EPZ	N17	Stralingsbescherming (Radiation Protection)
EPZ	N23	Brandveiligheid/-bestrijding (Fire Safety and Fire Fighting)
EPZ	A27	Voortdurend verbeteren (Continue Improvement)
EPZ	N16	Stop Management
EPZ	A05	Inkoop & Logistic (Procurement and Logistic)
EPZ	A11	Personnel Management
EPZ	A31	Opleiden en kennismanagement (Trainings and Knowledge Management)
EPZ	A02	Beheer IMS (Management of the IMS)

A.12 SF-12: Human factors

A.12.1 Objective

The objective of the review of this Safety Factor is to evaluate the various human factors that may affect the safe operation of the nuclear power plant during LTO-2 and to seek improvements that are reasonable and practicable.

A.12.2 Insights from SRS-121

The review of Safety Factor 12 evaluates the various human factors that may affect the safe operation of the NPP and seeks improvements that are reasonable and practicable for the whole period of LTO-2. Issues related to the availability of sufficiently qualified staff, including the effective knowledge and competence management necessary for the LTO-2 period, are included in the review of this Safety Factor

Moreover, the review of Safety Factor 12 identifies deficiencies in understanding obsolescence management, staffing, competence, knowledge retention, management and training.

A.12.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 16 gives a summary of the SF12 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF12-1: Are the procedures and processes related to human factors in place at the nuclear power plant to ensure the that following elements for the LTO-2 period?

- **Adequate staffing levels exist for operating the plant, with due recognition given to absences, shift working and restrictions on overtime.**
- **Qualified staff are available on duty at all times.**
- **Adequate programmes are in place for initial training, refresher training and upgrading training, including the use of simulators.**
- **Operator actions needed for safe operation have been assessed to confirm that assumptions and claims made in safety analyses (for example, PSA, deterministic safety analysis and hazard analysis) are valid.**
- **Human factors in maintenance are assessed to promote error-free execution of work.**
- **Adequate competence requirements exist for operating, maintenance, technical and managerial staff.**
- **Staff selection methods (for example, testing for aptitudes, knowledge and skills) are systematic and validated.**
- **Appropriate fitness for duty guidelines exist relating to hours, types and patterns of work, good health and substance abuse.**
- **Policies exist for maintaining the know-how of staff and for ensuring adequate succession management in accordance with good practices.**

And do the following aspects related to the human-machine interface remain robust for the LTO-2 period?

- **Design of the control room and other workstations relevant to safety.**
- **Human information requirements and workloads.**

- **Clarity and achievability of procedures.**

Within the Safety Demonstration a human factors relevant for organizational readiness for safe LTO-2 are assessed, which covers a large part of this research question.

During 10EVA23 the NV-1 processes related to human factors and A11, A30 and A31 programmes and processes were assessed. The conclusions from previous 10EVAs will be reassessed in light of a longer operating lifetime **(SF12-EA1)**. For those elements that were not covered during 10EVA23 (e.g. The design of the control room and workstations relevant to safety with respect to the human–machine interaction) a high level assessment will be performed to ensure that the external and internal operational experience is taken into account and that procedures and processes are adequate compared with the assessment and reference framework. Results from recent reviews will be used to support the Safety Factor review **(SF12-EA2)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvement will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF12-EA3).**
- A benchmark with NPPs of similar age, design and/or subsequent LTO situation (i.e. that are already in second lifetime extension or that are preparing for it) is performed in the framework of SF9 to gain information on good practices and practicable improvements at KCB. SF12 uses the benchmark to identify potential enhancements, such as lessons learned from other NPPs regarding adjustments to procedures and processes related to human factors, to support safe operation during the LTO-2 period. (**SF12-EA4**).

Table 16 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF7-1	Partly	Yes	Yes	Yes	SFs from 1 to 11.

A.12.4 Regulatory Framework

See Appendix E.

A.12.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	(Partial) CBC
IAEA	GSR Part 2 (Rev 1)	Leadership and Management for Safety	2016	GS-R-3 (2011)	High	Yes	Assessment	High	(partial) CBC
WENRA	Issue A	Safety Policy	2020	2008 version	Low	Yes	Assessment	Low	HL
WENRA	Issue B	Operating Organisation	2020	2008 version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-51	Human Factors Engineering in the Design of Nuclear Power Plants	2019	No	No	No	No	Middle	HL + (partial) CBC
IAEA	SSG-72	The Operating Organization for Nuclear Power Plants	2022	NS-G-2.4	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-75	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants	2022	NS-G-2.8	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-76	Conduct of Operations at Nuclear Power Plants	2022	NS-G-2.14	High	No	No	Middle	HL + (partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	NG-T-2.7	Managing Human Performance to Improve Nuclear Facility Operation	2014	No	No	Yes	Reference	Low	HL
IAEA	NG-T-6.10	Knowledge Management and Its Implementation in Nuclear Organizations	2016	No	No	Yes	Reference	Low	HL
IAEA	IAEA-TECDOC-1917	Assessing Behavioural Competencies of Employees in Nuclear Facilities	2020	No	No	Yes	Reference	Low	HL
IAEA	IAEA-TECDOC-2068	Effective Work Management for Sustaining Operational Excellence at Nuclear Power Plants	2024	No	No	No	No	Low	HL

A.12.6 Source Documentation

Source	Type	Name
EPZ	TIP-09-06-01	Qualification and training of personnel
EPZ	HP-A11 HB-A11	Personnel management Staff and Training
EPZ		Accountability framework for personnel policy EPZ-NO
EPZ		Management Expectations (incl. A09-26-N009)

A.13 SF-13: Emergency Planning

A.13.1 Objective

The objective of the review of emergency planning is to determine (a) whether the operating organization plans, staff, facilities and equipment for dealing with emergencies remain adequate throughout the LTO-2 period; and (b) whether the operating organization's arrangements have been adequately coordinated with the arrangements of local and national authorities and are regularly exercised.

A.13.2 Insights from SRS-121

Due consideration of changes at the plant site, its surroundings, the status of equipment and facilities used for emergency preparedness and capabilities for severe accident management are provided by the review of this Safety Factor to confirm their pertaining adequacy during LTO.

A.13.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 17 gives a summary of the SF13 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF13-1: Assess the impact of anticipated changes to the site and its surroundings on the current emergency planning considering the following aspects:

- **the continued adequacy of on-site technical and operational support centres;**
- **the efficiency of communications in the event of an emergency, in particular the interaction with organizations outside the plant;**
- **the content and efficiency of emergency training and exercises and check records of experience from such exercises;**
- **the arrangements for the regular review and updating of emergency plans and procedures;**
- **the effects of any recent residential and industrial developments around the site.**

During 10EVA23 (e.g. 'vraag 7' of SF13 of 10EVA23) the emergency response programme was assessed against the identified assessment framework. The conclusions from previous 10EVAs will be re-assessed in light of a longer operating lifetime. Where deemed necessary a review of the assessment and reference frameworks will be carried out **(SF13-EA1).**

Furthermore, the emergency response plan will be reviewed taking into account the relevant anticipated site changes (using inputs from SF7) **(SF13-EA2).**

SRQ-SF13-2: Assess the impact of anticipated ageing and obsolescence of emergency equipment and facilities and related changes in the maintenance and storage.

In the framework of the Safety Demonstration some of the components and facilities used for emergency response are investigated for what concerns ageing and obsolescence (e.g. intercom).

The components/facilities necessary during emergency response will be inventoried and checked against the scope of the ageing management programme. For components/facilities outside the scope of the ageing management programme an assessment of anticipated ageing degradation and obsolescence will be made **(SF13-EA3).**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvements will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF13-EA4)**

Table 17 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF13-1	No	Yes	No	Yes	SF1, SF5, SF6, SF7*, SF8, SF11
SRQ-SF13-2	Partly	No	No	Yes	SF2*, SF4*

A.13.4 Regulatory Framework

See Appendix E.

A.13.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	GSR Part 7 (Rev 1)	Preparedness and Response for a Nuclear or Radiological Emergency	2016	GS-R-2 (2009)	High	Yes	Assessment	High	(partial) CBC
WENRA	SRL Issue R	On-site Emergency Preparedness	2020	Previous version	Low	Yes	Assessment	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-76	Conduct of Operations at Nuclear Power Plants	2022	NS-G-2.14	High	No	No	Middle	HL + (partial) CBC
IAEA	GSG-11	Arrangements for the Termination of a Nuclear or Radiological Emergency	2018	No	No	No	No	Low	HL

A.13.6 Source Documentation

Source	Type	Name
EPZ	TIP-12-01-01	Alarm Response Organization KCB
EPZ	N14…	Incident- en ongevalbeheersing (Incidents and accidents management) relevant documentation.
WANO	SOER	Significant Operating Experience Report

A.14 SF-14: Radiological Impact on the Environment

A.14.1 Objective

The objective of the review of this Safety Factor is to determine whether the programme for monitoring the radiological impact of the plant on the environment, established by the operating organization, which ensures that emissions are properly controlled and are as low as reasonably achievable, remains adequate and effective for the LTO-2 period.

A.14.2 Insights from SRS-121

The monitoring programme needs to ensure that emissions and discharges are adequately controlled and are as low as reasonably possible. This has to be taken into account both in the preparation for LTO and during LTO. The operating organization may identify potentially new sources of radiological impact by examining relevant plant modifications and the actual condition of in-scope SSCs.

The monitoring programme is reviewed for LTO to confirm whether it remains appropriate and sufficiently comprehensive to demonstrate that the radiological impact of the plant on the environment remains within the prescribed limits for the period of LTO.

A.14.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 18 gives a summary of the SF14 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF14-1: Assess the continued effectivity of the radiological surrounding measurement programme ('radiologisch omgevingsmeetprogramma'), environmental monitoring programme, and of the radioactive waste management (process N06) during LTO-2 including the impact of anticipated changes is site conditions and usage.

The programmes and processes named were assessed in previous 10EVAs. The conclusion from previous 10EVAs will be reassessed in light of a longer operating lifetime. The assessment and reference identified in this document framework will be reviewed **(SF14-EA1).**

The site conditions and usage anticipated changes during LTO-2 are identified in Safety Factor 7. The impact of these changes on the above mentioned programmes and processes will be assessed **(SF14-EA2).**

SRQ-SF14-2: Assess the radiological impact since the last 10EVA.

The radiological data between 2023 and 2025 are analyzed and compared to those of the period 2013-2022 **(SF14-EA4).**

SRQ-SF14-3: Assess the possibility of reduction during LTO-2 of:

- **Production of radioactive waste necessitating of transport to other locations;**
- **Released quantity of radioactive material in air and water;**
- **Measured contamination and radiation level in the surrounding of KCB;**

The possibilities for a reduction of these radiological impacts has been assessed in 10EVA23. Several possibilities for reducing the radiological impacts of waste handling and transport, releases, and contamination and radiation levels were identified. The conclusions from 10EVA23 will be reassessed in light of a longer operating lifetime **(SF14-EA5).**

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvements will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF14-EA6).**
- A benchmark with NPPs of similar age, design and/or subsequent LTO situation (i.e. that are already in second lifetime extension or that are preparing for it) is performed in the framework of SF9 to gain information on good practices and practicable improvements at KCB. SF14 uses the benchmark to identify potential enhancements, such as lessons learned from other NPPs regarding KCBs programme for monitoring the radiological impact of the plant to support safe operation during the LTO-2 period. (**SF14-EA7**).

Table 18 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF14-1	Yes	Yes	Yes	Yes	SF1*, SF7*, SF11
SRQ-SF14-2	No	Yes	Yes	Yes	-
SRQ-SF14-3	No	Yes	Yes	No	SF1, SF2, SF6,

A.14.4 Regulatory Framework

See Appendix E.

A.14.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	(Partial) CBC
IAEA	GSR Part 3	Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards	2014	No	No	Yes	Assessment	High	(Partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
KTA	1503.1	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 1: Monitoring the Discharge of Radioactive Matter with the Stack Exhaust Air During Specified Normal Operation	2022	Previous version (2002)	High	No	No	Middle	HL + (partial) CBC
IAEA	SSG-40	Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors	2016	NS-G-2.7	High	No	No	Middle	HL + (partial) CBC
KTA	1301.2	Radiation Protection Considerations for Plant Personnel in the Design and Operation of	2022	Previous version (2008)	High	No	No	Low	HL

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
		Nuclear Power Plants; Part 2: Operation							
KTA	1501	Stationary System for Monitoring the Local Dose Rate within Nuclear Power Plants	2022	Previous version (2010)	High	No	No	Low	HL
KTA	1502	Monitoring Volumetric Activity of Radioactive Substances in the Inner Atmosphere of Nuclear Power Plants	2022	Previous version (2005)	High	No	No	Low	HL
KTA	1505	Suitability Verification of the Stationary Measurement Equipment for Radiation Monitoring	2022	Previous version (2003)	High	No	No	Low	HL
IAEA	GSG-8	Radioprotection of the Public and the Environment	2018	No	No	No	No	Low	HL

A.14.6 Source Documentation

Source	Type	Name
EPZ	N17…	Stralingsbeschermingsprogramma (‘Radiation Protection Programme’)
EPZ	N06…	Radioactief afvalbehandeling. (‘Radioactive Waste Management’)
EPZ	TIP-04-11-01	Monitoring Environmental Aspects
EPZ	TIP-13-01-01	Nuclear Environmental Aspects
EPZ	TIP-14-01-01	Radioactive Waste

A.15 SF-15: Radiation Protection

A.15.1 Objective

The objective of the review of Safety Factor 15 is to assess whether the radiation protection programme of the operating organization remains adequate and effective during LTO-2 in limiting the dose and risk of contamination for employees as well as contractors according to the ALARA principle.

A.15.2 Insights from SRS-121

SRS-121 [21] does not consider Radiation Protection as separate Safety Factor (in agreement with SSG-25 [8]).

As per SSG-25 [8] para 5.2: "*Radiation protection is not regarded as a separate Safety Factor in this Safety Guide since it is related to most of the other Safety Factors. The arrangements for radiation protection and their effectiveness should generally be reviewed as specific aspects of the Safety Factors relating to: plant design; actual condition of SSCs important to safety; safety performance; and procedures*".

The relation of SF15 with Safety Factors important for LTO such as Safety Factor 1 and Safety Factor 2 implies that the review of Safety Factor 15 is also relevance for LTO.

A.15.3 Specific Research Questions, interactions with the Safety Demonstration and additional Evaluation Activities

To cover the SSG-25's review scope [8], the generic Research Questions described in chapter 3.1, and align with the objective of the PSR for LTO-2, specific Research Questions have been developed. For each specific Research Question the review methodology, including the contribution from the Safety Demonstration if applicable, is reported. It is noted that where possible the conclusions of previous periodical evaluations will be used as input and, if necessary, reviewed to take into account a broader scope of SSCs and a longer operating lifetime. The results and findings from the Safety Demonstration will be used during the review of the Safety Factors and will be included in the Safety Factor review report. Table 19 gives a summary of the SF15 interactions with the Safety Demonstration and previous 10EVAs.

SRQ-SF15-1: Assess the continued adequacy and effectivity of the radiation protection programme (N17) during LTO-2 including the.

The radiation protection programme was assessed in previous 10EVAs. The conclusion from previous 10EVAs will be reassessed in light of a longer operating lifetime. The assessment and reference identified in this document framework will be reviewed **(SF15-EA1).**

SRQ-SF15-2: Assess the radiation doses as well as the contaminations to employees and contractors since the last 10EVA.

The data between 2023 and 2025 are analyzed and compared to those of the period 2013-2022 **(SF15-EA2)**.

SRQ-SF15-3: Assess the possibility of reduction of dose and contamination risk for employees and contractors for the LTO-2 period with particular attention to the possibility of source term reduction.

With a review of historical data (last 15 years) the contributors (e.g. activities, locations) to the personnel and contractor dose and contamination will be identified. For achieving this, analyses from previous evaluations (e.g. 10EVAs) will be taken into account. For the identified major contributors the possibilities of impact reduction will be considered including reduction or removal of radiation sources, engineered measures for protection and shielding, modifications to working procedures or personal protective equipment **(SF15-EA3)**.

Other additional evaluation activities for the identification of opportunities for improvement

Next to the above mentioned questions, opportunities for improvements will be identified using:

- the research results from the OECD/NEA LTO Beyond 60 years research project will be reviewed for applicability to KCB. Input from Safety Factor 9. **(SF15-EA4)**
- A benchmark with NPPs of similar age, design and/or subsequent LTO situation (i.e. that are already in second lifetime extension or that are preparing for it) is performed in the framework of SF9 to gain information on good practices and practicable improvements at KCB. SF14 uses the benchmark to identify potential enhancements, such as lessons learned from other NPPs regarding KCBs radiation protection programme to support safe operation during the LTO-2 period. (**SF15-EA5**).

Table 19 Summary of activities and interactions

Specific RQ	Input from SD	Input from previous 10EVAs	Re-assessment 10EVAs conclusions	Additional Evaluation Activities	Input from other SFs review
SRQ-SF15-1	Yes	Yes	Yes	Yes	SF11
SRQ-SF15-2	No	Yes	Yes	Yes	-
SRQ-SF15-3	No	No	No	Yes	SF1, SF2

A.15.4 Regulatory Framework

See Appendix E.

A.15.5 Assessment and reference framework

Assessment Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSR 2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and operation	2016	NS-R-2 (2000)	High	Yes	Assessment	High	(Partial) CBC
IAEA	GSR Part 3	Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards	2014	No	No	Yes	Reference	High	(Partial) CBC
IAEA	GSR Part 5	Predisposal Management of Radioactive Waste	2009	No	No	Yes	Reference	High	(Partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
IAEA	SSG-90	Radiation Protection Aspects of Design for Nuclear Power Plants	2024	NS-G-1.13	High	No	No	Middle	HL + (partial) CBC
KTA	1503.1	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 1: Monitoring the Discharge of Radioactive Matter with the Stack Exhaust Air During Specified Normal Operation	2022	Previous version (2002)	High	No	No	Middle	HL + (partial) CBC
KTA	1503.2	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates;	2022	Previous version (1999)	High	No	No	Middle	HL + (partial) CBC

Reference Framework									
Source	**Name**	**Title**	**Version**	**10EVA13**	**Rel. 10EVA13**	**10EVA23**	**Ass/Ref 10EVA23**	**Relevance PSR(LTO-2)**	**Use**
		Part 2: Monitoring the Discharge of Radioactive Matter with the Vent Stack Exhaust Air During Design-Basis Accidents							
KTA	1503.3	Monitoring the Discharge of Radioactive Gases and Airborne Radioactive Particulates; Part 3: Monitoring the Non-stack Discharge of Radioactive Matter	2022	Previous version (1999)	High	No	No	Middle	HL + (partial) CBC
KTA	1508	Instrumentation for Determining the Dispersion of Radioactive Substances in the Atmosphere	2022	Previous version (2006)	High	No	No	Middle	HL + (partial) CBC
KTA	1505	Suitability Verification of the Stationary Measurement Equipment for Radiation Monitoring	2022	Previous version (2003)	High	No	No	Middle	HL + (partial) CBC

A.15.6 Source Documentation

Source	Type	Name
EPZ	N17…	Stralingsbeschermingsprogramma (‘Radiation Protection Programme’)
EPZ	N06…	Radioactief afvalbehandeling. (‘Radioactive Waste Management’)
EPZ	TIP-11-01-01	Radiation Protection Programme
EPZ	TIP-11-02-01	Radiation Sources
EPZ	TIP-11-03-01	Design aspects of radiation protection

Appendix B Safety Factor Report template

1. Objective of the review
2. Regulatory framework
3. Assessment and Reference frameworks
4. List of Research Questions and related Evaluation Activities
5. Review
    - 4.1 Research Question 1
        - 4.1.1 Interaction with Safety Demonstration
        - 4.1.5 Review methodology
        - 4.1.4 Information sources for RQ1
        - 4.1.6 Discussion of review results
        - 4.1.7 Findings
    - 4.X Research Question X
        - 4.X.1 Interaction with Safety Demonstration
        - 4.X.5 Review methodology
        - 4.X.4 Information sources for RQ1
        - 4.X.6 Discussion of review results
        - 4.X.7 Findings
6. Summary of findings

Finding ID	From (PSR/SD)	Relevant Sources	Description	Safety Relevance

7. Conclusion
8. References
9. Appendixes

Appendix C Global assessment template

1. Global assessment methodology
2. Grading of findings methodology
3. Analysis of interfaces, overlaps and omissions between Safety Factors and between individual findings
4. List of clustered findings and their grading[3][4]
5. Analysis of potential measures
    - 5.1 (Cluster) finding 1
        - 5.1.1 Potential mandatory measures or safety improvements
        - 5.1.2 Analysis of benefits of potential measures/improvements based on safety gains on the basis of probabilistic and deterministic safety (e.g. effects on defence lines and fundamental safety functions, PSA results, risk matrix)
        - 5.1.3 Costs/benefits analysis (where applicable)
        - 5.1.4. Justification (choice of potential measure/improvement is justified, justification is given for continued operation in the short term. If none of SIs is feasible the continued operation it's justified in the long term.)
    - 5.X (Cluster) finding X
        - 5.X.1 Potential mandatory measures or safety improvements
        - 5.X.2 Analysis of benefits of potential measures/improvements based on safety gains on the basis of probabilistic and deterministic safety (e.g. effects on defence lines and fundamental safety functions, PSA results, risk matrix)
        - 5.X.3 Costs/benefits analysis (where applicable)
        - 5.X.4. Justification (choice of potential measure/improvement is justified, justification is given for continued operation in the short term. If none of SIs is feasible the continued operation it's justified in the long term.)
6. Conclusion[5]
7. References
8. Appendixes

[3] Significant PSR outcomes can be determined based on the grading of the findings.
[4] This will cover an overall analysis of the combined effects of the findings. Th grading considers defence in depth and the assessment of the overall risk.
[5] Includes justification for proposed continued operation in both the short term and long term.

Appendix D Coverage of RNVK article 11 comma 4 and SSR-2/2 Req. 12 within the PSR(LTO-2)

- **RVNK article 11 comma 4**

Original	*Onderdeel van de veiligheidsevaluatie, bedoeld in het derde lid, zijn in elk geval:* a) *de technische, organisatorische en administratieve voorzieningen met inbegrip van de procedures ter waarborging van de nucleaire veiligheid van de kerninstallatie;*
Translation	The safety assessment referred to in the third paragraph (of RNVK article 11) shall in any case include: a) the technical, organisational and administrative provisions, including the procedures for ensuring the nuclear safety of the nuclear installation;
PSR(LTO-2)	The PSR(LTO-2) covers all safety factors which in turn cover all technical, organizational and administrative provisions for ensuring nuclear safety. In particular, the technical provisions to ensure nuclear safety are assessed in SF1, SF2, SF3 SF4, and SF7. The organizatorial and administrative provisions are assessed in SF10, SF11, SF12, SF13.
Original	b) *de veroudering van de kerninstallatie*
Translation	b) the ageing of the installation.
PSR(LTO-2)	The PSR(LTO-2) assessment covers all aspects related to ageing of the installation. In particular SF1 (codes & standards), SF2, SF3, SF4 (physical and non physical) and SF12 (knowledge). The PSR(LTO-2) makes use of the results from the Safety Demonstration [9] to cover (parts of) SF2, SF3, SF4 and SF12.
Original	c) *de operationele ervaringen en de interne signalen van de werknemers;*
Translation	c) the operational experience and the internal signals of the employees.
PSR(LTO-2)	The PSR(LTO-2) assess operational experience and internal signals of employees. In particular in SF8, SF9, SF10.
Original	d) *de relevante informatie verkregen bij andere kerninstallaties in binnen- en buitenland, de relevante ontwikkelingen en inzichten op het gebied van nucleaire veiligheid en de relevante resultaten uit onderzoeksprogramma's;*
Translation	d) obtain the relevant information from other nuclear installation home and abroad, the relevant developments and insights on the area of nuclear safety and the relevant results of research programmes.
PSR(LTO-2)	The PSR(LTO-2) assess the operational experience of other nuclear installations and relevant research programmes in SF9 and SF1 (design specific). The information gathered is used in other Safety Factor reviews.

Original	e) *de maatregelen die zijn genomen ter voorkoming van ongevallen en de verdere beperking van de gevolgen ervan en de voorzieningen die zijn getroffen met het oog op verdediging in de diepte.*
Translation	e) the measures taken to prevent accidents and to further limit their consequences and the provisions made for defence in depth.
PSR(LTO-2)	In PSR(LTO-2) the provisions taken to prevent and cope with accidents and the provisions made for defence in depth are assessed several safety factors. In particular in SF1, SF5, SF6, SF7, SF10 and SF13. The primary objective of the PSR (LTO2) is to identify reasonably practicable improvements to strengthen these measures.

- **SSR-2/2 Req.12: Periodic Safety Review**

Requirement description	**Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources.**
Paragraph 4.44	Safety reviews such as periodic safety reviews or safety assessments under alternative arrangements shall be carried out throughout the lifetime of the plant, at regular intervals and as frequently as necessary (typically no less frequently than once in ten years). Safety reviews shall address, in an appropriate manner: the consequences of the cumulative effects of plant ageing and plant modification; equipment requalification; operating experience, including national and international operating experience; current national and international standards; technical developments; organizational and management issues; and site related aspects. Safety reviews shall be aimed at ensuring a high level of safety throughout the operating lifetime of the plant.
PSR(LTO-2)	PSR (LTO-2) supports the justification for the second period of Long Term Operation (LTO-2), and is based on IAEA SSG-25 [8], Handreiking tienjaarlijkse evaluaties nucleaire installaties [26], and incorporates best practices from SRS-121 [21]. The PSR(LTO-2) covers the Safety Factors advised in SSG-25 [8] and reviews the consequences of the cumulative effects of plant ageing and plant modifications; equipment requalification; operating experience, including national and international operating experience; current national and international standards; technical developments; organizational and management issues; and site related aspects.
Paragraph 4.45	The operating organization shall report to the regulatory body as required, in a timely manner, the confirmed findings of the safety review that have implications for safety.
PSR(LTO-2)	The deliverables of the PSR(LTO-2) to the regulatory body are specified in chapter 2 of this document. Other lines of communication to the regulatory body are agreed as described in 4.4.

Paragraph 4.46	The scope of the safety review shall include all safety related aspects of an operating plant. To complement deterministic safety assessment, probabilistic safety assessment (PSA) can be used for input to the safety review to provide insight into the contributions to safety of different safety related aspects of the plant.
PSR(LTO-2)	The PSR (LTO-2) of KCB covers the Safety Factors advised in IAEA SSG-25 [8] and considers best practices from SRS-121 [21]. Probabilistic safety assessment (PSA) will be used as input to identify improvements and to assess the contribution to the risk reduction related to the proposed safety improvements in the global assessment.
Paragraph 4.47	On the basis of the results of the systematic safety assessment, the operating organization shall implement any necessary corrective actions and reasonably practicable modifications for compliance with applicable standards with the aim of enhancing the safety of the plant by further reducing the likelihood and the potential consequences of accidents.
PSR(LTO-2)	Practicable Safety Improvements and Mandatory Measures will be implemented according to the corresponding Implementation Plans, as outlined in Section 3.3 of this document.

Appendix E Regulatory Framework

Part	Document
Laws	Kernenergiëwet Wet aansprakelijkheid kernongevallen
Decrees	Besluit basisveiligheidsnormen stralingsbescherming Besluit kerninstallaties, splijtstoffen en ertsen (Bkse) Besluit vervoer splijtstoffen, ertsen en radioactieve stoffen Besluit registratie splijtstoffen en ertsen Besluit vergoedingen Kernenergiewet
Ministerial regulation	Regeling basisveiligheidsnormen stralingsbescherming Regeling nucleaire veiligheid kerninstallaties (Rnvk) Regeling nucleaire drukapparatuur Regeling stralingsbescherming beroepsmatige blootstelling 2018 Regeling buitengebruikstelling en ontmanteling nucleaire inrichtingen (Rboni)
ANVS-Regulations	Verordening basisveiligheidsnormen stralingsbescherming ANVS-Verordening nucleaire drukapparatuur, beveiliging en ontmanteling
Licences	Current Licensing Basis (See Appendix F)

Appendix F Current Licensing Basis

- Nuclear Safety Rules (NVRs) and Directives:
  - NVR. NS-R-1 (reasonably)
  - NVR. NS-R-2 and NVR. NS-R3
  - NVR. GS-R-2 to NVR. GS-R-4
  - NVR. NS-G-1.1 to NVR. NS-G-1.13 (reasonable)
  - SSG-30
  - NVR. NS-G-2.1 to NVR. NS-G-2.15
  - NVR 3.2.1
  - NVR. NS-G-3.1 to NVR. NS-G-3.6
  - NVR-GS-G-2.1
  - NVR. GS-G-3.1 to NVR. GS-G-3.5
  - NVR. GS-G-4.1
  - NVR. SSG-2 to NVR. SSG-4
  - NVR. SSG-9
- WENRA Reference levels for existing reactors:
  - C7.3
  - F4.2, F4.3 and F4.6
  - LM2.4, LM2.5, LM3.4, LM3.5, LM4.1, LM6.1, LM6.2 and LM6.4
  - R2.3, R3.2, R3.6, R3.7, R4.4, R5.1, R5.3 and R5.4
  - T5.1, T5.3, T5.6, T6.1 and T6.3
- Nuclear Ausschuss (KTA):
  - KTA 1508 (or a similar guideline)
  - KTA 1503 (or a similar guideline)
  - KTA 1504 (or a similar guideline)
- Netherlands Standardization Institute:
  - NEN 1010:2015 nl, NEN-EN-IEC 60079-19:2011/A1:2015,
  - NEN 3140+A1:2015 nl and NEN 3840+A1:2015 nl
  - NEN 1014
  - NEN-EN-IEC 62305 series (reasonable).
- Safety Report:
  - N13-60-VR15: Veiligheidsrapport 2015, Versie 1. 2016.
- Operating licence:
  - V-KERN, Versie 16. 2022.