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Supplementary Information

Renseignements supplémentaires

Presentation from Helmy Ragheb

Présentation de Helmy Ragheb

In the Matter of the

À l'égard de la

New Brunswick Power Corporation, Point Lepreau Nuclear Generating Station

Société d'Énergie du Nouveau-Brunswick, centrale nucléaire de Point Lepreau

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Application for the renewal of NB Power's licence for the Point Lepreau Nuclear Generating Station

Demande de renouvellement du permis d'Énergie NB pour la centrale nucléaire de Point Lepreau

Commission Public Hearing
Part 2

Audience publique de la Commission
Partie 2

May 10 to 12, 2022

10 au 12 mai 2022

Canada

Renewal of NB Power's licence for the Point Lepreau Nuclear Generating Station

Part-2 of the CNSC public hearing
May 11-12, 2022

Helmy Ragheb, PhD, P.Eng.

Two Issues

- Validity and Integrity of the Safe Operating Envelope
- Deterministic Safety Analysis for Hazards may not be in Compliance with REGDOC 2.4.1

Issue #1

Validity and Integrity of the Safe Operating Envelope (SOE)

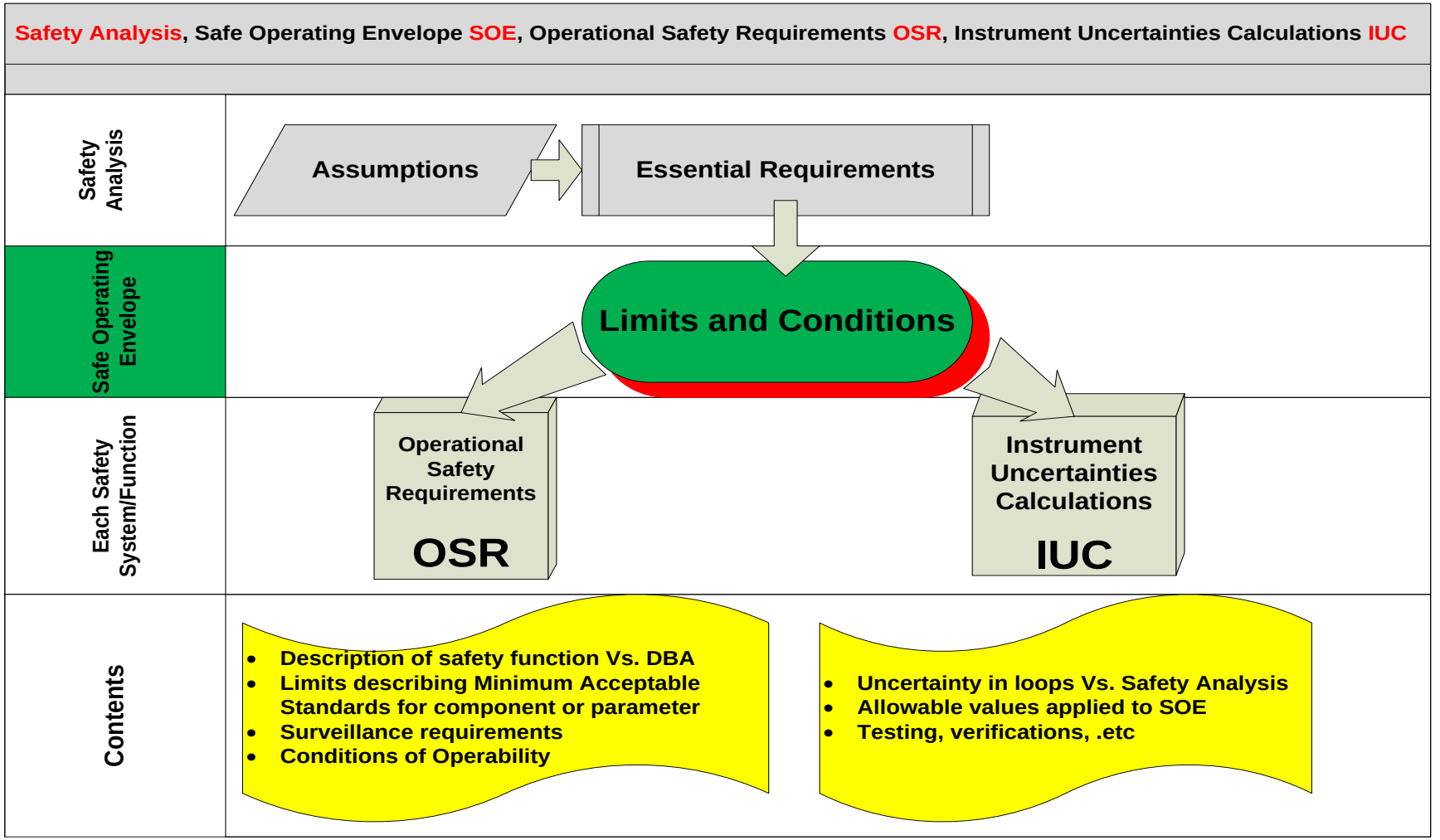
What is Safe Operating Envelope (SOE)?

- Refers to those safety analyses limits or operational requirements for parameters or system conditions within which operation of the nuclear facility has been shown to meet the regulatory requirements and public risk limits
- The safety limits are used to define the hardware functional requirements
- Limits must be routinely verified throughout the life of the plant, usually by hardware surveillance.

How is the SOE Aligned with the Safety Analysis results?

- All relevant documents , such as operational documents, must be updated based on the results of the new or updated analysis
- To address this challenge, NPPs usually consolidate all requirements and limits derived from the safety analysis in one controlled document called Operational Safety Requirement (OSR)
- NB Power’s application does not provide information on how the SOE document consolidation is achieved.

Process of Alignment of SOE with Safety Analysis Limits



Risks of Operation Outside the SOE

- The accumulation over the years of plant changes, if combined with less-than-adequate processes to implement the impact of the changes, may have resulted in a situation where the SOE is not aligned with the safety analysis results.
- In this case, its likely that some of the safety systems may not be effective in performing there intended function when called upon.
- For example, shutdown systems may not have sufficient negative reactivity depth inserted within the required timing as assumed in the safety analysis.

Point Lepreau Station May Have Unknowingly Operated Outside the SOE?

- The discovery, in the September 2020 reported event, of the safety limits of the Shutdown System 2 (SDS2) not in alignment with the safety analysis limits, does not provide assurance of the effectiveness of the SOE maintenance program at Point Lepreau station.
- I am particularly concerned about the apparent weakness reported by NB Power in managing the safety analysis. The Aggregate Finding Resolution Plan (AFRP-16) erroneously describes the SOE maintenance process in reverse: It calls on the staff and vendors to use the correct values from the SOE documentation as **input to the safety analysis**, instead of using the safety analysis results as **input to SOE documentation**

Recommendation # 1

Licence Conditions Handbook (LCH) should include a condition that NB Power conduct a rigorous review, system by system, of all safety analysis-based limits imposed on safety systems and implement the required changes in the SOE documents on a high priority basis.

Issue #2

Deterministic Safety Analysis for Hazards not in Compliance with REGDOC 2.4.1

Regulatory Requirements for the Safety Analysis of Earthquake Event

REGDOC 2.4.1 requires that

- Deterministic safety analysis should be performed for events caused by natural common-cause events. The frequency of these events should be identified by the Probabilistic Safety Assessment (PSA).
- The “Design-basis earthquake” should be considered among the externally initiated common-cause events.
- It shall be classified within the Design-basis (DBA) class.

DBE Deterministic Analysis Appears to be Missing

- The NB Power application states in section 5.2 “Hazard Analysis” that the hazard screening was updated in 2016 including additional analyses performed on seismic, high wind and tsunami hazards.
- They incorporated the earthquake events within the **PSA** version finalized in 2016.
- But there was no mention of performing any **deterministic safety analysis** for the Design-basis Earthquake (DBE) as required by REGDOC 2.4.1.

Consequences of Not Performing DBE Analysis

- We do not have assurance that the public dose limits, are not exceeded following an Earthquake.
- Some consequential failures may subject systems to harsh conditions or result in flooding which may prevent mitigating operator actions in these areas.
- Containment penetrations may not be seismically qualified. Conservative analysis is necessary to quantify radioactivity releases (especially during online refueling).

Recommendation #2

It is recommended that NB Power be required – in a licence condition – to perform deterministic safety analysis for the design-basis earthquake event and for other external hazards in compliance with the current REGDOC 2.4.1.