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Nuclear Licensing in Slovenia

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Abstract

The article presents the approach to nuclear licensing in Slovenia. The paper describes, the initialization, internal authorization and review process in the Krško NPP. The overall process includes preparation, internal independent evaluation, the Krško Operating Committee and the Krško Safety Committee review and internal approval.

In addition, the continuation of the licensing process is discussed which includes independent evaluation by an authorized institution and a regulatory body approval process. This regulatory body approval process includes official hearing of the licensee, communication with the licensee, and final issuance of a license amendment.

The internal evaluation, which follows the methodology of US NRC (defined in 10 CFR 50.59 and NUMARC 125) is described. This concept is partially implemented in domestic legislation.

1.0 Introduction

Slovenian utility operates only one nuclear power plant that is the Krško NPP. The plant construction was started in seventies and commissioned in early eighties. The basic licensing document is the Safety Analysis Report (SAR) which has 17 chapters. Those plant modifications (design and procedure changes or test and experiments) which have implications on the SAR are subject to a safety evaluation. The level and extent of the safety evaluation depends on safety implications which should be assessed at the very beginning of the process. Responsibility for all initiatives related to the SAR changes and safety assessment are primarily on the licensee side which is in accordance with the premise that the licensee has the prime responsibility for nuclear safety.

By definition the SAR contains information which is important for the plant safety.

Having that in mind, SAR has a role also as an information source during the licensing process. Therefore, it is natural that the SAR represents a starting point of safety assessment of any change or plant modernization program during the licensing process. This paper concentrates on the licensing and regulatory review of the SAR of the Krško NPP.

2.0 Legislation Framework for Safety Analysis Report and other licensing documents

At present the Slovenian regulatory system is mainly based on laws and regulations issued in the past by the former Yugoslavia and maintained in force in the Republic of Slovenia following its independence. With regard to the licensing of the NPP design modifications and consequently the SAR changes, the following laws and regulations are applicable:

1. *Act on Radiation Protection and the Safe Use of Nuclear Energy (Off. Gaz. SFRY, 62/84)*
The law requires Preliminary SAR for construction permit and final SAR for operating permit. The law provides general statements on the safe operation of the plant. More specifically it states that national regulations and technical standards may be applied and, when not available, regulations and technical standards of the country of origin can be applied, subject to the approval of a regulatory organization.
2. *Regulation on Safety Analysis Reports (Off. Gaz. SFRY, 68/88)*
This regulation provides detailed statements that the SAR is the basic licensing document for nuclear installation with respect to nuclear safety. The SAR shall be supplemented during the plant life with data and analyses on all changes, which were done at a nuclear plant. This regulation establishes 3 categories of changes to the SAR. The first category requires a notification to the SNSA after the completion of modifications. The second category requires a notification to the SNSA before implementation. The third category requires an approval by the SNSA before implementation.
3. *Regulation on Siting and Construction and Operation of Nuclear Facilities (Off. Gaz. SFRY, 52/88)*
This regulation requires that licensee monitors and analyzes the level of nuclear safety, whereby he must take into account the experience of other nuclear facilities and new technological developments. This regulation establishes, beside others, that for Technical Specification (TS) changes a third part independent evaluation, performed by organizations authorized by the SNSA, is mandatory. The arrangements to perform this independent evaluation are implicitly under the responsibility of the licensee.
4. *Act on Administrative Procedures (Off. Gaz. SFRY, 47/86)*
This regulation establishes the general licensing procedure adopted in Slovenia and also establishes the procedure to manage appeals of the licensee against the Regulatory body.

3.0 Krško NPP Internal Process for Licensing

The internal licensing process is divided into several steps:

- Preparation of Proposed Change (plant modification, Safety Analysis Report (SAR) Change, Technical Specifications Change)
- Safety Evaluation Screening preparation and internal independent review
- Safety Evaluation preparation and internal independent review
- Krško Operating Committee Review
- Krško Safety Committee Review
- Approval of Engineering and Nuclear Oversight Director
- Licensing package preparation

After the package is sent to the licensing and analysis department, and independent review of Safety Evaluation Screening and Safety Evaluation is done, the package is sent to the Krško Operating Committee. After positive review of KOC the package is sent to the Krško Safety Committee. If the package fulfilled all necessary requirements, the Director of Engineering and Nuclear Oversight internally approves the package.

Since there are no criteria for categorisation of plant changes, the Krško NPP implemented the 10 CFR 50.59 rule. For that purpose, the new procedure ESP-2.303, AUTHORIZATION OF CHANGES, TESTS AND EXPERIMENTS (10 CFR 50.59 REVIEWS) was developed. The adoption of that rule in the specific case of the SAR changes is shown on the flow chart (Figure 1.) in the Safety Evaluation Screening and the Safety Evaluation preparation step.

The current practice is: if an unreviewed safety question appears, the whole external licensing process starts; if there are no unreviewed safety questions, the regulatory body is informed about the modification or other activities which involve the SAR change, and the SAR Change Package is sent to the Regulatory Body (SNSA) for review before the SAR change is implemented. The Regulatory Body may by its discretion request licensing process even if there is no unreviewed safety question.

4.0 Licensing Process and Practice

At present more detailed requirements for the licensee on the management of the SAR changes and plant modifications (i.e. criteria to categorize them, content of application document, independent review, documents updating etc.) are not established neither in regulations nor in the operating licence. Therefore, on the basis of the legal framework mentioned above, the NPP Krško follows the criteria established in the regulation (i.e. 10 CFR 50.59) of the vendor country (USA) and notifies all design modifications to the SNSA.

Technical specifications determine that the plant is obliged to submit the report on planned modifications, tests and experiments on the plant 45 days prior issuing a licence by the SNSA.

The NPP Krško submits to the SNSA for approval every change of the plant Technical Specifications. The plant is obliged to submit also the report, independent expert opinion about the change, written by Technical Support Organization (TSO). TSO's have to be authorized by the SNSA. Therefore, the SNSA approval process is thus supported by independent third party assessment.

TSO's have developed QA procedures for the area of expertise for which they are authorized. Joint (SNSA and NPP Krško) QA audits are carried out on approximately two year period basis.

As mentioned before the Krško NPP provides to the SNSA all safety evaluations of plant changes which have impact on SAR. On the request NPP Krško submits to the SNSA the safety evaluation screening of plant changes which have no impact on SAR, based on the screening results. The Krško Operating Committee and the Krško Safety Committee approve the safety evaluation change before it is sent to the SNSA for approval.

The formal administrative procedures (according to the *Act on Administrative Procedure*) are obeyed in the following cases:

- major modifications,
- when safety assessment shows the elements of unreviewed safety question,
- changes in the organization structure (organizational chart, definition of responsibilities, communication lines, etc),
- technical specification changes,
- changes of important programmes and procedures (such as ISI Programme, Fire Protection Programme, Radiation Monitoring Programme, etc.) which are defined in the SAR, but are not a part of the SAR.

Typical submittal documentation of the SAR change for approval should involve: proposed SAR change, licensee's safety assessment report, licensee's safety analysis or safety analysis justification report (if necessary), technical/working report packages, and the TSO report - positive independent expert opinion about the change. During the process of regulatory review, safety evaluation and decision making at least one hearing takes place where both sides, the plant representatives and the SNSA representatives, consider and discuss open issues. The process concludes with the SNSA's formal decision on the changes of the SAR and other licensing conditions.

At the end of licensing process, the SNSA issues the Licensing Amendment.

5.0 SAR Regulatory Review Concept

The SAR regulatory review for operating plant is carried out as a part of the licensing process which is related mainly to the following typical situations:

- SAR changes due to plant design or procedure changes,

- SAR existing content evaluation due to gained new knowledge based on experience or research,
- SAR existing content evaluation due to changes in the plant which are not explicitly described in the SAR but may have impact on nuclear safety.

From the above it is clear that the regulatory review of the SAR is connected to the licensing process, but sometimes it could be part of the relicensing safety assessment and analysis due to some change or due to some new information which may have impact on plant safety as described in the SAR.

The review of the SAR and associated supporting documents requires from the regulatory body the competence of integrated approach of the safety assessment review.

The main objectives of adopting such safety assessment are:

- to maintain an up-to-date view of the overall safety of the plant,
- to promote a balanced implementation of the “defense in depth” principle,
- to assure the correct exploitation of interfaces (i.e. among plant systems during different plant conditions, among different competencies during the design and review process),
- to assign priority to safety issues, assessment and inspection activities, etc.

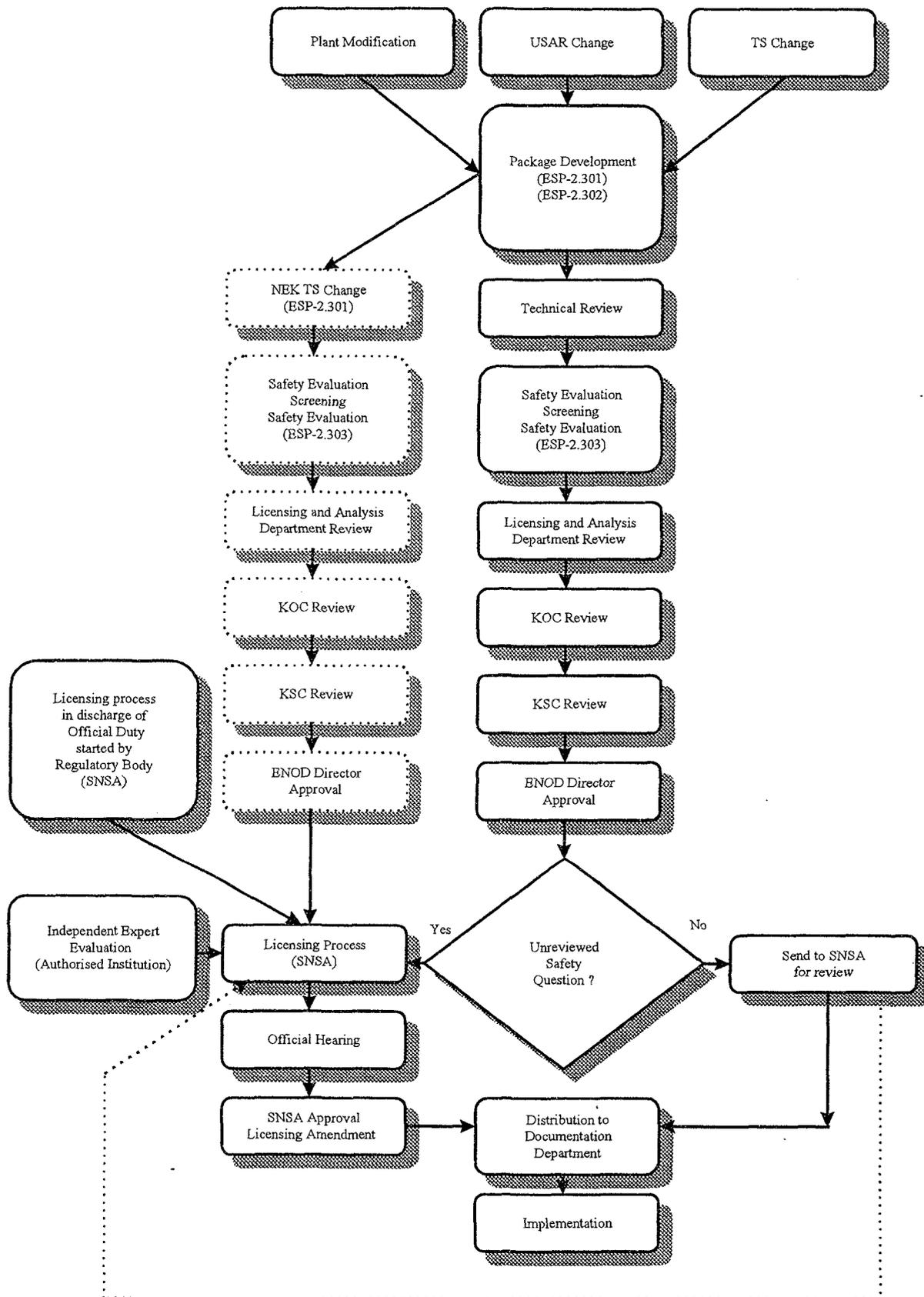
Table 1. shows some most important assessment elements of licensing process and the SAR review, organized on a hierarchical manner. Not all levels and details are described. Furthermore, all elements are not always applicable. Therefore the table should be understood as an indicative guidance.

Beside the integrating competence for licensing and SAR review other competence is also important especially in the areas of safety analysis and evaluation such as: neutron and thermal hydraulic analysis, structural and mechanical analysis, PRA analysis, power supply and I&C evaluation, severe accident analysis, etc.

Table 1.: Safety assessment framework during licensing and SAR review

	TOP LEVEL	SECOND LEVEL	THIRD LEVEL
OBJECTIVES AND CHARACTERISTICS	<ul style="list-style-type: none"> - to maintain an up-to-date view of the overall safety of the plant, - to promote a balanced implementation of the "defense in depth" principle, - to assure the correct exploitation of interfaces, - to prioritize safety issues, assessment and inspection activities. 	<ul style="list-style-type: none"> - evaluation of plant design basis and its compliance with safety objectives and design limits in different plant conditions, - verification of correct liaison between safety objectives, general design criteria and design requirements at system and components level, - evaluation of the integrated plant response to normal and abnormal events, - evaluation of correct exploitation of technical interfaces among different competencies during review process 	<ul style="list-style-type: none"> - inherently questioning attitude, - top bottom thinking approach, - reluctance to get lost in not relevant details, - prone to catch priorities, - proactive character, - prominent attitude to synthesis,
PLANT DESIGN BASIS ASSESSMENT ELEMENTS	Identification and evaluation of applicable rules and standards,	First level regulations and standards	<ul style="list-style-type: none"> - national laws and regulations, - USA regulations, - selected international rules and guides (IAEA), etc.
		Second level regulation	<ul style="list-style-type: none"> - USNRC regulatory guides, - ANS/ANSI standards - IEEE criteria, etc.
		Third level rules	<ul style="list-style-type: none"> - ASME code, - NFPA codes, etc.
	Plant design basis evaluation,	Definition of plant safety objectives,	<ul style="list-style-type: none"> - radioprotection criteria, - risk criteria in different levels,
		Identification of plant reference conditions and design limits,	<ul style="list-style-type: none"> - definition of four conditions and internal events grouping into defined plant conditions, - functional requirements for each plant conditions, - dose limits for each plant conditions, - safety limits for each plant conditions, - design codes and standards for SSC-s
		Identification and classification of design basis events,	<ul style="list-style-type: none"> - internal events (main basis is RG 1.70) - external events (natural and man made events), - area events,
		Identification of safety functions,	<ul style="list-style-type: none"> - reactor subcriticality, - core cooling, - heat sink, - integrity of pressure boundary, - inventory, - containment,
		Design requirements for plant structures, systems and components,	<ul style="list-style-type: none"> - Safety classification and quality groups, - Seismic classification, - QA classification, - Design load combination, - Redundancy, independency, separation, diversity and qualification requirements, - Protection against area events,
	Design basis compliance assessment	System analysis and interfaces evaluation	<ul style="list-style-type: none"> - safety function assigned to the system, - applicable regulations to the system design, - system and components classification
		Transient and accident analysis review: - transient and analysis objectives, - analysis methodology, - adequacy of adopted assumptions	<ul style="list-style-type: none"> - netronic and thermal hydraulic analysis, - PRA analysis, - Instrumentation and control, - mechanical and structural analysis, - radiological consequence evaluations,
	Identification of major safety issues	Information sources: - analysis of operating experience, - results of systematic evaluations programs, - inspection findings,	
	Major interfaces in the safety assessment process	<ul style="list-style-type: none"> - PRA analysis - power supply and I&C evaluation - neutronic and thermal hydraulic analysis, - SSC structural analysis, - radiological consequence evaluation, - reactor safety research, - Inspection 	

Figure 1. shows the flow chart of entire licensing process.



6.0 Conclusion

The review of licensing documents and the review of associated safety evaluations and analyses represent the key part of licensing process. It is important to develop the adequate competence at both levels, integrated safety assessment and specific areas of safety analyses. Technical support organizations could provide the capabilities in areas of safety analyses.

For the correct regulatory management of plant modifications and SAR reviews it is necessary to establish more precise regulation on requirements to the licensee and to develop internal written procedures related to the assessment of the documentation presented by the licensee.

To assure a high quality and effective process, the experience shows that it is worth respecting as much as possible the following premises of safety culture:

- open communication channel at different levels between licensee and regulator,
- early involvement of regulator in open issue resolution process including the presence of regulatory representatives on routine in-plant meetings related to the matter in question,
- follow the rules of reporting with slight tendency of "over-reporting",
- maintain good documentation,
- discuss reports and resolve open issues early.

7.0 References

- [1] »Act on Radiation Protection and the Safe Use of Nuclear Energy«, Off. Gaz. SFRY 62/84,
- [2] »Regulation on Safety Analysis Reports«, Off. Gaz. SFRY 68/88;
- [3] »Regulatory Review of Safety Analysis Report«, paper presented by Miroslav Gregrič, Director of SNSA at the CONCERT Group Meeting in Ljubljana on June 18, 1998;
- [4] »Regulation on Siting and Construction and Operation of Nuclear Facilities«, Off. Gaz. SFRY, 52/88;
- [5] ESP-2.303 "Authorisation of changes, tests and experiments (10 CFR 50.59 reviews)";
- [6] ESP-2.301 "Technical Specification Changes and Licence Amendment";
- [7] ESP-2.302 "Administration of changes to the USAR";
- [8] Regulatory Guide 1.70, Rev. 1 and Rev.3;
- [9] Title 10 Code of Federal Regulations;