Slovenian Nuclear Safety Administration Foreign Operating Experiences System

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ABSTRACT

The Slovenian Nuclear Safety Administration (SNSA) has established a structured system for the review and evaluation of foreign operating experience (FOE) to ensure continuous improvement of nuclear and radiation safety. The system provides a systematic approach for the identification, screening, assessment, and regulatory follow-up of operating experience from foreign nuclear installations, international reporting systems, and relevant regulatory bodies. FOE information is collected through multiple channels, including international organizations, bilateral exchanges, vendor communications, and publicly available databases. Events and findings are screened based on predefined safety significance criteria and applicability to domestic facilities. Relevant FOE is subject to in-depth technical review to identify potential safety implications, lessons learned, and the need for regulatory actions. The outcomes of the review process are documented, tracked, and communicated to licensees, with follow-up activities ensuring timely implementation and verification of corrective measures where necessary. This system supports proactive regulatory oversight, strengthens defense-in-depth, and contributes to harmonization with international nuclear safety practices.

***Keywords**: foreign operating experience, event review, lessons learned, regulatory oversight*

1 INTRODUCTION

The monitoring and systematic evaluation of foreign operating experience (FOE) is a fundamental pillar of the regulatory approach to nuclear and radiation safety. International experience shows that many safety-significant events do not result from unknown technical phenomena, but from insufficient learning from past events, inadequate knowledge transfer, or failure to recognise weak signals and emerging trends.

The importance of systematic collection, screening, evaluation, and feedback of operating experience within regulatory oversight processes is emphasised by international organisations such as the International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency (OECD/NEA). This approach not only prevents the recurrence of known deficiencies, but also enables early identification of potential risks and contributes to the continuous strengthening of safety culture, in accordance with IAEA safety standards and guidance.

This paper presents the organised and structured approach implemented at the SNSA for the monitoring, assessment, and application of FOE, as defined in an internal organisational instruction. The complete process, encompassing information collection, preliminary screening, detailed

analysis, decision-making on further regulatory actions, reporting to international databases, and the long-term archiving and management of acquired knowledge is described.

2 OPERATING EXPERIENCE AND INTERNATIONAL FRAMEWORK

In the international context, operating experience (OE) refers to the structured collection, evaluation, and application of information from operational events, near misses, analytical findings, inspection results, and examples of good practice. OE includes both internal and external sources and aims to ensure that lessons learned are systematically identified, shared, and incorporated into safety improvements.

The IAEA defines operating experience as a key feedback process for the continuous improvement of safety at nuclear and radiological facilities. In particular, the IAEA Specific Safety Guide SSG-50 emphasises that an effective OE programme should support the early identification of adverse trends, the prevention of event recurrence, and the proactive management of safety-significant issues. The guide highlights the importance of a systematic, documented, and graded approach, as well as clearly defined roles and responsibilities for both operators and regulatory bodies.

The OECD/NEA further underlines the essential role of regulatory authorities in ensuring that operating experience is adequately analysed, disseminated, and incorporated into regulatory requirements and oversight activities. According to OECD/NEA practices, regulators should not only verify the effectiveness of licensees' OE programmes, but also actively use domestic and international operating experience to inform inspections, regulatory decisions, and long-term safety strategies.

Within this framework, internationally recognised terminology is commonly used, including concepts such as feedback of experience, risk-informed decision-making, and regulatory learning. These terms reflect a regulatory philosophy based on continuous improvement, knowledge management, and the integration of safety insights into decision-making processes. This paper adopts this terminology in line with international recommendations and systematically incorporates it within the SNSA framework, ensuring consistency with globally accepted principles while addressing national regulatory responsibilities.

2.1 Types of Foreign Operational Experience

FOE covers a wide range of information related to nuclear installations, radiation facilities, lower-risk radiation practices, and the use of radiation sources. In line with the IAEA approach, this experience is not limited to reportable events but also includes precursor events, weaknesses identified through analyses or inspections, and positive examples of good practice that contribute to continuous safety improvement.

The SNSA adopts a comprehensive and systematic approach to monitoring FOE, drawing on a wide variety of information sources, including:

- International databases and reports maintained by the IAEA, such as the Incident Reporting System (IRS), the International Nuclear and Radiological Event Scale (INES), and IAEA TECDOC publications;
- Event reports classified according to the INES scale, providing insight into safety significance and underlying causes;
- Publicly available documents and reports issued by foreign nuclear and radiation safety regulatory authorities;
- Reports and position papers produced by industry organisations, international bodies, and professional or technical associations;
- Peer-reviewed scientific and technical journals, research reports, and other publicly accessible sources.

The diversity of these sources supports a graded, risk-informed evaluation of operating experience and enables the identification not only of individual safety-significant events but also of broader trends and recurring issues related to system reliability, ageing management, human and organisational factors, regulatory effectiveness, and safety culture.

By systematically reviewing and analysing information from multiple complementary sources, the SNSA strengthens its ability to recognise weak signals at an early stage, anticipate potential safety challenges, and incorporate relevant lessons learned into regulatory oversight, inspection planning, and decision-making processes.

2.2 Organization and responsibility of SNSA

The internal process for monitoring foreign operating experience is based on clearly defined roles, responsibilities, and lines of authority, consistent with the IAEA approach to effective regulatory management systems. The process owner plays a central role, coordinating the overall workflow, ensuring the proper functioning of the supporting information system, and maintaining consistent implementation of the established procedure.

The process involves several functional roles, including screeners in nuclear and radiation safety, technical evaluators, coordinators for individual international databases, division heads, and the inspection function. Each role contributes to a specific phase of the process, from initial identification and screening to detailed technical assessment and regulatory decision-making.

This organisational arrangement enables multi-level expert review and ensures that conclusions and decisions are based on sound technical justification and regulatory considerations. A graded and risk-informed approach is applied, allowing the depth of analysis and allocation of resources to be commensurate with safety significance.

2.3 Process for Monitoring and Evaluation of Operating Experience

The FOE process [1] implemented by SNSA is designed as a closed-loop system for continuous improvement and is fully aligned with the IAEA approach to learning from experience. The process begins with the proactive identification and systematic collection of information from predefined international and publicly available sources, followed by a preliminary screening to assess safety significance and relevance to the national context.

Operating experience identified as potentially relevant is entered into the SNSA information system, assigned an initial status, and made fully traceable within the regulatory management framework. This ensures transparency, documentation, and compliance with IAEA requirements for knowledge management and record-keeping.

The results of the preliminary screening are periodically consolidated and presented at the SNSA quarterly FOE meeting, which serves as a formal decision-making and coordination forum. During this meeting, screened FOEs are reviewed, their regulatory relevance is confirmed, and priorities for further evaluation are agreed. The meeting also provides a structured platform for discussing open regulatory actions, ongoing follow-up activities, and planned future actions arising from previously evaluated FOEs.

FOEs confirmed as relevant proceed to an in-depth technical evaluation by qualified experts, where the assessment focuses primarily on the identified causes, their applicability to NEK, and their consequent impact on improving nuclear safety..Based on the evaluation results and conclusions endorsed during the quarterly meeting, decisions are taken regarding further regulatory actions. These may include regulatory requirements, recommendations, or requests for information to operators, as well as thematic reviews or targeted inspection activities. All actions are implemented using a graded and risk-informed approach and are tracked to completion.

Through this structured feedback loop—supported by regular quarterly management review—the SNSA ensures that lessons learned from foreign operating experience are systematically

evaluated, transparently discussed, and effectively incorporated into regulatory oversight, inspection planning, and continuous safety improvement.

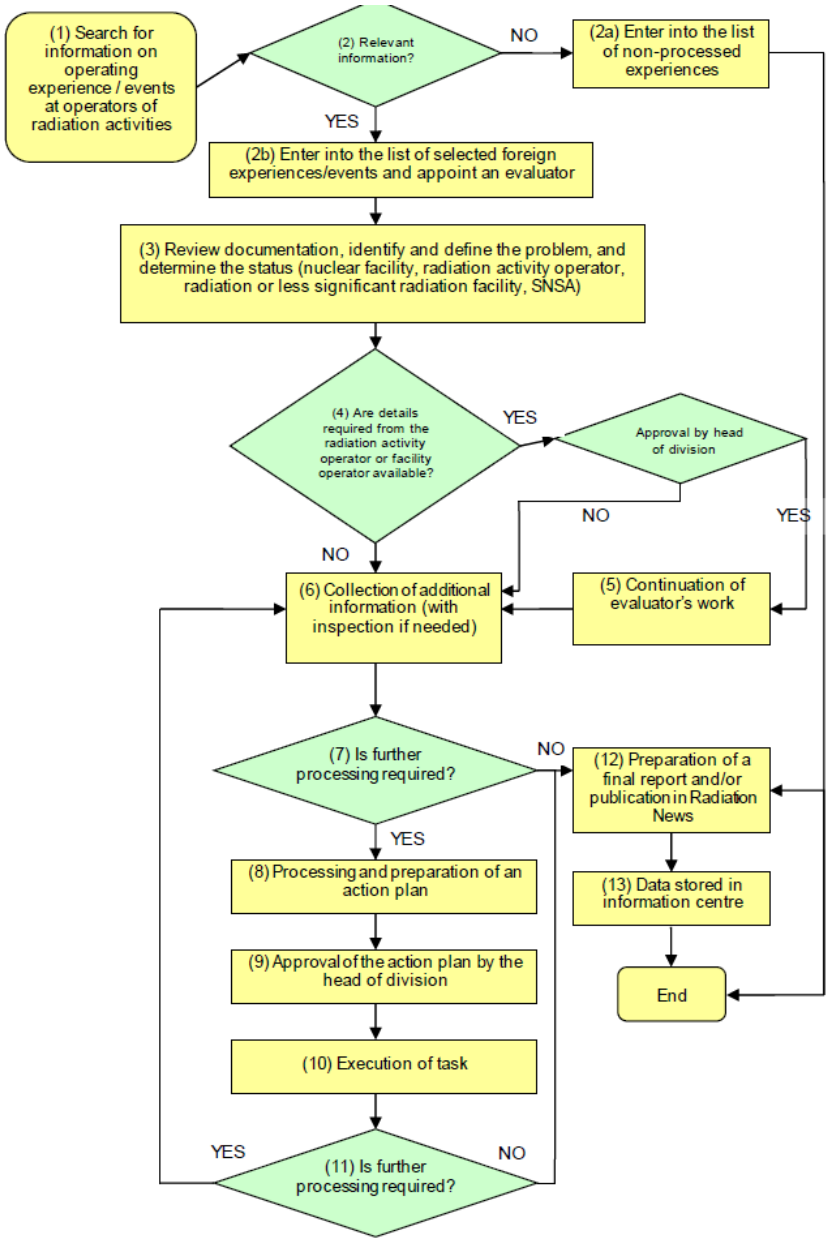

Figure 1: FOE Process at SNSA [1]

2.4 Reporting and International Cooperation

An important element of the FOE process is reporting to international databases such as the International Reporting System (IRS), INES, and other platforms operated by the International Atomic Energy Agency and the OECD Nuclear Energy Agency. Through these activities, the Slovenian Nuclear Safety Administration actively contributes to international information exchange and the strengthening of global nuclear and radiation safety.

International reporting is regarded not merely as a formal obligation but as a key mechanism for collective learning. By sharing relevant experience, regulatory insights, and lessons learned, regulatory bodies support the identification of common challenges, emerging trends, and good practices across countries and technologies.

The reporting process includes the preparation of draft reports, technical review and alignment with facility operators, and the necessary internal and external approvals. Particular

attention is given to the clarity of event descriptions, identification of root and contributing causes, and the presentation of corrective actions, in line with international guidance.

In this context, SNSA's international cooperation was further demonstrated in 2025 through the submission of an IRS report addressing a leak in a safety injection pipe. The report provided a detailed description of the event, its safety significance, root cause analysis, and corrective measures, enabling other regulators to benefit from the experience and reinforcing transparency and mutual learning within the international nuclear safety community.

2.5 Information Support and Traceability

An integrated information system serves as the central tool supporting the FOE process within the Slovenian Nuclear Safety Administration. It enables end-to-end traceability, systematic documentation of decisions, and efficient management of responsibilities. The system also supports structured data collection, reporting, and long-term knowledge management.

Within this framework, the system captures and tracks FOE identified as applicable for national use. On average, approximately 31 FOE per year were identified by SNSA as applicable and selected for detailed regulatory review and assessment during the period from 2015 to 2025. This functionality allows consistent prioritisation, in-depth technical assessment, and monitoring of follow-up actions over time.

By integrating key process steps into a single platform, the system improves coordination, reduces administrative burden, and supports informed regulatory decision-making. Overall, it plays a crucial role in enhancing efficiency, data reliability, and compliance with organisational and regulatory requirements, while ensuring the systematic use of international operating experience in national regulatory oversight.

3 CONCLUSIONS

The systematic monitoring and evaluation of foreign operating experience is a key element of effective regulatory oversight and continuous improvement in nuclear and radiation safety. As demonstrated in this paper, the SNSA has established a comprehensive FOE process aligned with international guidance.

Relevant FOE is proactively identified, consistently screened, and analysed using a graded, risk-informed approach. Clearly defined responsibilities, documented procedures, and an integrated information system ensure transparency, traceability, and accountability. Lessons learned are translated into regulatory actions, inspections, and communication with licensees, thereby strengthening defence-in-depth and supporting the early identification of emerging safety issues.

Active participation in international reporting mechanisms further enhances global learning and harmonisation. Overall, the SNSA's FOE programme improves the effectiveness, consistency, and credibility of regulatory oversight and demonstrates the value of structured learning and international cooperation.

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