DS479-Draft
Date: 27. October 2015

IAEA SAFETY STANDARDS

for protecting people and the environment

OPERATING EXPERIENCE FEEDBACK FOR NUCLEAR INSTALLATIONS

DRAFT SAFETY STANDARDS SERIES SSG
DS479

Status: Step 7 – Approval by the relevant safety review committees for submission to Member States for comments

IAEA
International Atomic Energy Agency

COPYRIGHT NOTICE

To be integrated after approval by Committees

FOREWORD

by Director General

To be integrated after approval by Committees

NOTE BY THE SECRETARIAT

To be integrated after approval by Committees

Contents

1. INTRODUCTION

Background

1.1. In 1989 the IAEA issued a Safety Guide on A System for Reporting Unusual Events in Nuclear Power Plants (Safety Series No. 93). The Safety Guide presented a recommended scheme that was based on available national practice and was applicable to the management of safety related operating experience[1] in nuclear power plants. The Safety Guide consisted of two parts: Part I, A National System, and Part II, the IAEA Incident Reporting System. The Incident Reporting System was developed in the early 1980s by the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD) and has been a single system jointly operated by the IAEA and OECD/NEA since 1998. The joint IAEA/NEA Incident Reporting System Guidelines have been published by the IAEA. They superseded Part II of Safety Series No. 93.

1.2. The IAEA Safety Standards Series publications “Safety of Nuclear Power Plants: Commissioning and Operation” [1] and “Governmental, Legal and Regulatory Framework for Safety” [2] set out safety requirements for the feedback of operating experience based on “Fundamental Safety Principles” [3]. In Article 19 of the “Convention of Nuclear Safety” [4] and Article 9 of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [5] the importance of the feedback of operating experience is fully recognized with emphasis on ~~by~~ the importance of establishing programmes to collect and analyse relevant operating experience and acting on the results ~~that the results are acted upon~~.

1.3. The IAEA Safety Guide NS-G-2.11, “A System for the Feedback of Experience from Events in Nuclear Installations” was published in 2006. This revised IAEA Safety Guide provides guidance on meeting the requirements as established in International Conventions, Fundamental Safety Principles as well as General Safety Requirements. It ~~and~~ constitutes an update and provides an extension to cover the life cycle of nuclear installations[2] from design to decommissioning. It also adds information ~~and takes account~~ for analysing and reporting ~~of~~ operating experience, including good practices.

Objective

1.4. The objective of this Safety Guide is to define the minimum recommendations of an Operating Experience (OE) system. It highlights contact points between ~~all~~ relevant organizations and their respective responsibilities in the OE system. The guidance provides the key recommendations ~~of~~ for establishing and maintaining an effective OE system, that if followed should minimize the risk of future events.

1.5. This Safety Guide is applicable to all relevant organizations and all phases of nuclear installations, from design through to decommissioning.

1.6. This Safety Guide describes the roles and responsibilities of operating organizations[3] and regulatory bodies and their involvement in the overall OE system.

---

[1] Operating experience (OE) is information that is pertinent to the safe design, construction, commissioning, operation, decommissioning of a nuclear installation. OE includes for example reportable and non-reportable (including low level) events, operational records, near misses, good practices and all other information pertaining to the nuclear installation. Issues involving non-conforming, counterfeit, fraudulent or suspect items or parts are also to be identified and reported within the OE system. OE is a valuable source of information for learning about and improving the safety and reliability of nuclear installations. It is essential that OE information collection efforts be systematic to ensure completeness and accuracy of records. This enables the effective analysis and utilization of the information.

[2] ~~A nuclear installation is a nuclear fuel fabrication plant, research reactor (including subcritical and critical assemblies), nuclear power plant, spent fuel storage facility, enrichment plant or reprocessing facility.~~

[3] An operating organization is either an organization applying for authorization or authorized to operate an authorized facility and responsible for its safety, or an organization (and its contractors) which undertakes the siting, design, construction and/or operation of nuclear facility.

Scope

1.7. This Safety Guide is applicable to all types of nuclear installations. This includes nuclear power plants, research reactors (including subcritical and critical assemblies) and any adjoining radioisotope production facilities, spent fuel storage facilities, facilities for the enrichment of uranium, nuclear fuel fabrication facilities, conversion facilities, facilities for the reprocessing of spent fuel, facilities for the predisposal management of radioactive waste arising from nuclear fuel cycle facilities, and nuclear fuel cycle related research and development facilities.

1.8. This Safety Guide applies to all relevant organizations that are involved in the nuclear industry, such as regulatory bodies, technical support organizations, operating organizations with ongoing, phased out or planned nuclear programmes, vendor companies (designers, engineering contractors, manufacturers, etc.), research establishments and technical universities with studies in the nuclear field.

1.9. This Safety Guide does not deal with the specific reporting procedures under the Convention on Early Notification of a Nuclear Accident [6] or those that may be necessary under emergency conditions (including those required consistently with GSR Part 7 [7], GS-G-2.1 [8]), or where applicable, those under the International Nuclear and Radiological Event Scale [9].

1.10. Under the Amendment to the Convention on the Physical Protection of Nuclear Material [10] the Fundamental Principle L concerning Confidentiality should be respected in the OE process. More guidance can be found in ~~the Amendment to the Convention on the Physical Protection of Nuclear Material [10]~~ Nuclear Security Recommendation on Physical Protection of Nuclear Material and Nuclear Facilities [14] This Safety Guide does not deal with nuclear security aspects in detail.

1.11. The IAEA produces a wide range of technical publications [11] that complement the recommendations provided by this Safety Guide.

Structure

1.12. Chapter 2 covers the OE systems of operating organizations. Chapter 3 outlines the involvement of the regulatory body in the OE systems. Additional detailed guidance is provided in Appendix I. Descriptions of the principal systems operated by the IAEA are given in Annex I.

2. OPERATING EXPERIENCE SYSTEMS FOR OPERATING ORGANIZATIONS

General

2.1. All organizations associated with nuclear and radiological safety should foster mutual understanding and respect through honest and open communication on operating experience. As a good practice these communications should also include occurrences that are not covered by formal reporting requirements in the sense of requirement 21 of GSR Part 1 [2].

2.2. All organisations involved in nuclear safety related activities should implement or participate in an effective OE system. A graded approach should be used in line with the risks associated with the activities at the installation.

2.3. The operating organization should establish and implement a programme to report, collect, screen, analyse, trend, document and communicate OE in a systematic ~~way~~ manner. It should obtain and evaluate information on relevant OE at other nuclear installations and applicable industries to draw lessons for its own operations. It should also encourage the exchange of experience within national and international systems for the feedback of operating experience. Relevant lessons from other industries should also be taken into consideration, as necessary. The OE system should include the following:

- Identification and recording of internal OE;
- Collection of external OE[4];
- Screening of OE — primarily on the basis of actual or potential safety significance;
- Investigation and in-depth analysis, including causal analysis;
- Recommended actions resulting from the investigation and analysis, including approval, implementation, tracking and evaluation;
- Wider consideration of trends;
- Dissemination and exchange of information, including by the use of international reporting systems;
- Continuous monitoring and improvement of processes by use of OE;
- A storage, retrieval and documentation system for OE.

A flowchart of a typical operating experience process containing the recommended elements is shown in Fig. 1.

[4] External operating experience is experience from outside the installation, either from within the same State or from another State, from nuclear installations that utilize similar technologies or from those that utilize different technologies.

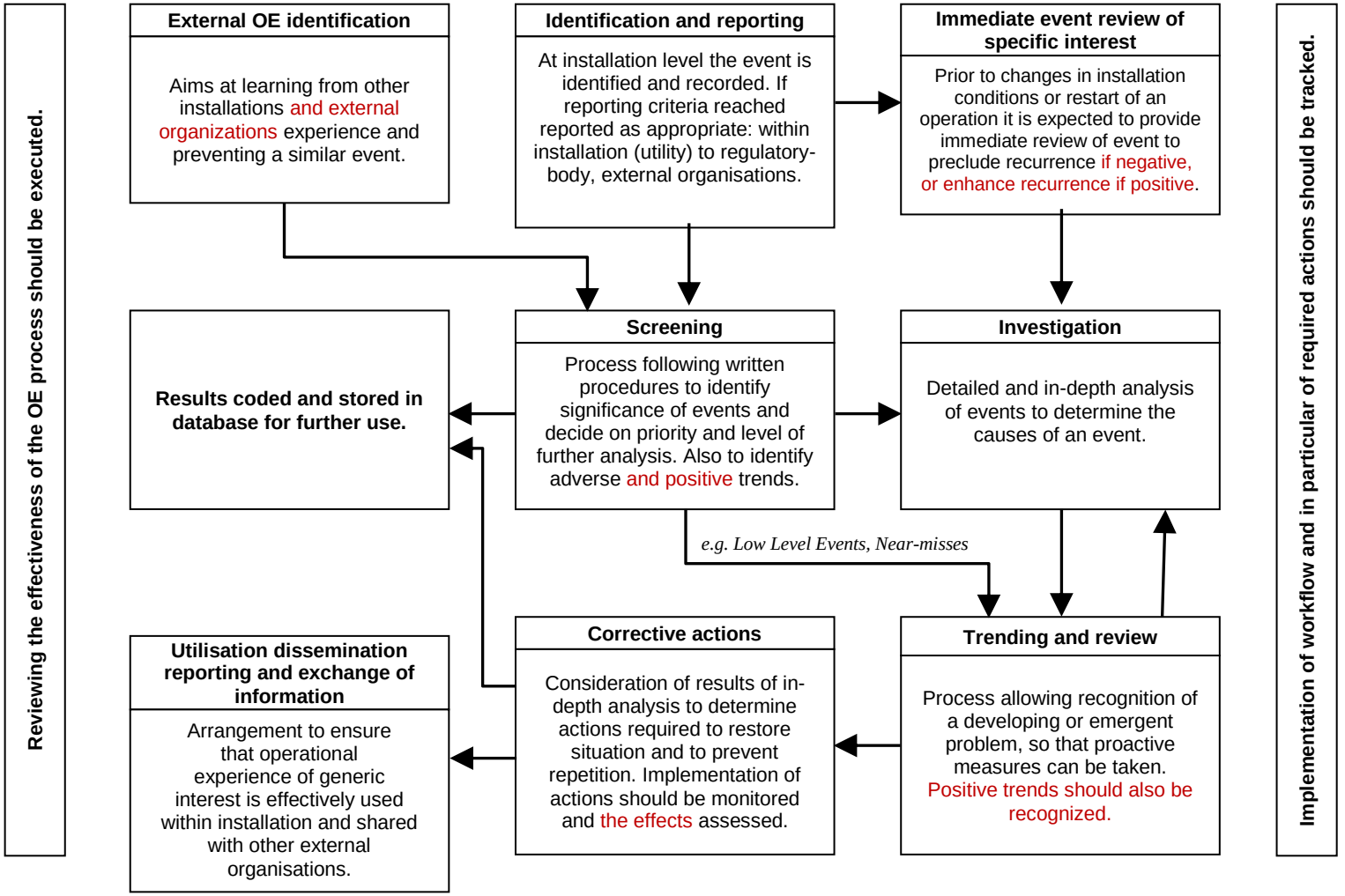


FIG. 1. Flow chart of a typical operating experience process.

2.4. The organizational framework for an OE programme will be dependent on the operating organization's structure. Operating organizations with a single nuclear installation should perform all functions of an OE programme.

Operating organization's that have multiple installations may have a centralized OE system that ~~is~~ governs various aspects of the OE process. These functions may also include:

- The coordination and support of internal OE to ensure compliance to the process;
- The screening, analysis, and distribution of external OE among the relevant installations;
- Training on the OE programme for personnel;
- ~~Providing~~ Independent investigation of significant events as required.

Management System

2.5. "The management system … has to ensure the promotion of a safety culture, the regular assessment of safety performance and the application of lessons learned from experience" as stated in para. 3.12 under Principle 3 of SF-1 [3].

2.6. Management should establish an OE programme at the start of the lifecycle of the installation so that relevant operating experience can be gathered and disseminated throughout the lifecycle of the installation including decommissioning. The management should ensure that the findings of OE are used for corrective actions at all levels important for nuclear safety.

2.7. The OE programme should include procedures for the control of activities at the installation for the feedback of operating experience.

2.8. Management of operating organizations should instil a~~n attitude~~ safety culture among installation personnel that encourages the reporting of all events, including low level events and near misses, potential problems related to equipment failures, shortcomings in human performance, non-conformance procedural deficiencies and inconsistencies in documentation and best practices that are relevant to safety in the sense of requirement 24, para. 5.31. of SSR-2/2 [1].

2.9. Management should foster a 'just-culture[5]' in which reporting is encouraged and reinforced throughout the organization, ~~fostering~~ where ~~as~~ the safety culture traits of continuous learning and ~~a~~ questioning attitude ~~and learning culture~~ are encouraged.

2.10. Management's decisions regarding the activities of the OE programme should be driven by maintaining and improving safety performance as the overriding priority.

2.11. Management should foster a positive environment in order to create, maintain and continuously improve an OE programme such that it is an integral part of the management system and of the safety culture of the installation.

2.12. Management should ensure sufficient, dedicated, suitably qualified, and experienced staff are appointed to deliver the defined scope of the OE programme.

2.13. Management should ensure that the training programmes adequately inform all staff about the role and expectations of the OE programme.

[5] A 'just-culture' is a culture where front line operators and others are not punished for actions, omissions or decisions taken by them, that are commensurate with their experience and training, and second victims of events (people who could be blamed for the event and could suffer psychological damage due to the investigation amplifying the guilt) are cared for, but where gross negligence, willful violations and destructive acts are not tolerated.

2.14. Management should ensure that the OE programme is adequately supported with the necessary infrastructure and information technology (IT) tools to permit all staff easy access to OE information.

2.15. Management should ensure that there are adequate resources to support the continued operation and development of the OE programme.

2.16. Management should ensure that corrective actions resulting from the OE programme are given priority within the short and long term budget and staffing plans.

2.17. Management should ensure that OE programme records are maintained, easily retrievable, and retained for the life of the installation.

2.18. Management should proactively help to identify issues on operational safety at the organisational / management level.

2.19. Management should meet on a regular basis (commensurate with the type of installation and number of OE issues arising) to analyse, review and oversee the OE process.

2.20. Management should ensure adherence to the expectations for identifying events, poor performance, degrading trends and good practices by everyone at the installation including contractors (see paragraph 1.8~~7~~). The communication of the expectations should be performed by setting the standards through written instructions, continuous example, training, supervision and coaching.

Identification and Reporting

2.21. Operating organisations should identify and enter into their OE programme all events (including low level events and near misses), potential problems related to equipment failures, shortcomings in human performance, error likely situations ~~and opportunities~~ that need to be addressed to prevent undesired effects, procedural deficiencies, inconsistencies in documentation as well as identify opportunities for improvement and good practices that are relevant to safety ~~and enter them into their OE programme~~.

2.22. The sources of information on OE should comprise for instance operational records, maintenance records, results from reviews, installation walk-down, trending, surveillance programme, benchmarks, peer reviews and self assessments. A system should be developed for issues involving non-conforming, counterfeit, fraudulent or suspect items (NCSFI) or parts that should also be identified and reported within the OE system.

2.23. Operating organizations should develop documentation outlining appropriate reporting criteria specific to the type of installation being operated and consistent with national regulatory requirements.

2.24. OE issues should be promptly reported to ensure timely screening and follow-up.

2.25. Low level events and near misses should be identified, processed at installation level and reported because they may lead or contribute to more significant events.

2.26. Everyone in the operating organization should be empowered to report ~~identified issues~~.

2.27. The method for reporting of issues should be user friendly, and computerized ~~whenever~~ wherever possible.

2.28. Although information can be captured in different information systems, they should be integrated into one OE reporting system. The installation's OE reporting system should be easily accessible to all the operating organization~~s~~ personnel.

2.29. Feedback should be given to the person who initiated the report and all other relevant personnel where appropriate. Examples of a strong reporting culture should be widely communicated within the installation to encourage reporting, questioning attitude and promote a 'just-culture'.

2.30. Prompt notification and reporting of significant issues and events should ensure that they are reported to relevant internal and external organizations. Designated individuals should be responsible for the reporting of significant events to the relevant external organizations.

Screening

2.31. The information on OE should be examined by competent persons for any precursors to adverse conditions for safety, or trends illustrating such circumstances, so that any necessary corrective actions can be taken before serious conditions arise in the sense of requirement 24 para. 5.29 of SSR-2/2 [1].

2.32. Potentially relevant external operating experience should be entered into the ~~operating organisation~~ OE programme of the operating organization.

2.33. A screening process should be implemented to ensure a graded approach to processing of operating experience information. Written guidance with established significance level criteria should be utilized for the screening process. This should determine the type of investigation or level of analysis for all reported issues.

2.34. Significance level criteria should consider consequences or potential consequences with regard to nuclear safety, radiological safety, environment issues and non-radiation related safety.

2.35. A suitably experienced, knowledgeable, and multi-disciplinary team should be assigned to the screening task. The team should include personnel with knowledge of relevant technical matters and matters concerning human performance and organisational factors.

2.36. Screening should be performed in a timely manner to ensure that appropriate investigation and compensating/mitigating actions are taken and that appropriate follow-up is initiated.

2.37. Screening should consider generic implications of the issue being screened and how it can affect other areas of the installation or utility.

2.38. Screening should include prioritization for the follow-up actions, according to safety significance, potential for recurrence and recognition of developing adverse trends.

2.39. The screening team should have management support with high enough authority to allocate responsibilities necessary to carry out the investigation and analysis of the issues or events.

2.40. Screening of OE should include a review of national and international external OE information for relevance to the installation. Such information should be reviewed in a timely manner to determine whether it is applicable to the installation; OE should not be dismissed, for instance, only on the basis of equipment or design differences; all aspects should be considered. This review should include consideration of aspects such as:

- Generic implications that apply to the installation;
- Whether there is similar equipment at the installation;
- Whether there are similar practices at the installation that predispose it to similar events;
- The possible ~~prior and~~ reoccurrence once or more times of a similar event;
- Reported actions taken that are applicable to the installation.

2.41. Screening of OE should also include relevant information from all relevant stakeholders (e.g. vendors, suppliers, designers and research institutions).

2.42. When significant OE information is determined to be not applicable, the basis for this decision should be documented.

2.43. The results of external event screening ~~of events~~ at the installation level should be recorded and may be used for evaluation in subsequent periodic self-assessments or peer reviews.

2.44. In operating organizations with nuclear installations based in several locations, a centralized group may be considered to conduct screening of national and international operating experience (this may be a joint undertaking involving several utilities).

Investigation

2.45. Investigations should be performed without undue managerial or organizational pressure and with enough independence, within the investigation team mandate and procedures.

2.46. Events with

- Safety implications should be investigated in accordance with their actual or potential significance;
- Significant implications for safety should be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organizational factors.

Installation event reports and non-radiation-related accident reports should identify tasks for which inadequate training may be contributing to equipment damage, excessive unavailability of equipment, the need for unscheduled maintenance work, the need for repetition of work, unsafe practices or lack of adherence to approved procedures in the sense of requirement 24 para. 5.28 of SSR-2/2 [1]. Such event reports should be fed back to the training system.

2.47. The operating organization should have procedures in place with criteria for specifying the type of investigation that is appropriate for any category of event. The type of investigation should be commensurate with the actual or potential consequences of an event, ~~and~~ the frequency of recurring[6] events and ~~take into account~~ the complexity of the event.

2.48. Investigations of events should be commensurate with the significance of the event. For example:

- In the case of a single serious event a formal root cause analysis (RCA) with extensive use of root cause analysis techniques applicable to the type of event should be performed;
- For an event with moderate consequences the apparent causes should be identified and corrected; C113
- Adverse trends, including those consisting of minor issues , should be investigated;
- Events involving human or organisational performance issues should be investigated using relevant tools.

2.49. Procedures should outline the conduct of an investigation in terms of scope, mandate, methodology, timeframe, techniques and tools, composition of the investigation team, and the format of the final report.

[6] A recurring event is an event with actual or potential safety significance that is the same or is very similar to important aspects of a previous nuclear industry event(s), and has the same or similar cause(s) as the previous event(s). Additionally, for an event to be considered as recurring, there should exist prior operating experience with corrective actions either

- identified but not specified, or
- not adequately specified, or
- not implemented, or not implemented in a timely manner by the responsible organisation.

2.50. Investigations should be initiated in a timely manner to ensure the preservation of data or other important information necessary to their successful conduct.

2.51. Root Cause Analysis (RCA) should document the following:

- Establishment of the complete event sequence (what happened including how the ~~problem~~ event developed);
- Cause analysis – root causes and contributing causes (why it happened);
- Assessment of the safety significance (what could have happened);
- An evaluation of the immediate or compensatory actions taken;
- Identification of corrective actions to prevent recurrence or ways to promote best practice;
- Strategy for the determination of effectiveness of the corrective actions;
- Appraisal of extent of condition[7];
- Assessment of extent of cause[8].

2.52. Investigators should search ~~appropriate~~ in internal and external event databases to identify other similar events, to determine which previous corrective actions taken were ~~not~~ effective at preventing recurrence.

2.53. The on-site investigation should be commenced as soon as practicable to ensure that information is not lost or diminished and evidence is not invalidated or removed. It is vital that the on-site investigation be performed in a timely manner and should not affect the safety of the installation.

2.54. Issues identified during the investigation but not relevant to the causes of the event should be documented and reported.

2.55. Individuals performing investigations should be knowledgeable in investigation techniques. At least one individual on the team performing root cause or apparent cause analysis should have received formal training, regular retraining and have recent experience in the conduct of investigations.

2.56. A multi-disciplinary group composed of suitably trained, experienced and knowledgeable personnel, including management, should be assigned to review the completed investigations to ensure all causes have been identified and that corrective actions have been developed to address the causes.

2.57. Organizational issues should be investigated by an independent group to ensure objectivity with the results of the investigation.

[7] Extent of condition is the extent to which similar conditions are present across the organization in other systems, equipment, programmes, processes, or human performance. Extent of condition evaluations are usually done soon after an accident to decide if additional immediate actions are needed to address the risk of additional failures while a cause analysis is being conducted.

[8] Extent of cause is the extent to which similar specific root or underlying causes can affect performance elsewhere across the organization in other systems, equipment, programmes, processes, or human performance.

Corrective Actions

2.58. As a result of the investigation of events, clear recommendations should be developed for the responsible managers, who should take appropriate corrective actions in due time to avoid any recurrence of the events. Corrective actions should be prioritized, scheduled and effectively implemented and should be reviewed for their effectiveness. Operating personnel should be briefed on events of relevance and should take the necessary corrective actions to make their recurrence less likely in the sense of requirement 24 para. 5.30 of SSR-2/2 [1].

2.59. Adequate corrective actions should be addressed to all causes.

2.60. At the time corrective actions are being specified, a review of open corrective actions should be performed to preclude a possible conflict.

2.61.The person responsible for implementation of ~~the~~ a corrective action should be involved in its development.

2.62. Senior Management should review and approve important corrective actions.

2.63. A periodic evaluation should be carried out to review the pending corrective actions. Incomplete corrective actions should be assessed periodically in aggregate to check whether the risk to the installation is still acceptable.

2.64. Due date extensions, modification, or cancellation of important corrective actions should be minimised and should be approved by Senior Management of the installation.

2.65. When recommended corrective actions take a long time to implement, interim or compensatory corrective actions should be put in place to raise awareness and minimize the risk.

2.66. Personnel at the appropriate management level within the nuclear installation should be held accountable for the effective implementation of corrective actions.

2.67. Corrective actions affecting safety should be given the highest priority.

2.68. Corrective actions should be tracked to completion and close-out.

2.69. An effectiveness review of corrective actions should be performed after completion.

Trending and Review

2.70. OE information should be examined by competent persons for any precursors to, or trends in, adverse conditions for safety, so that any necessary corrective actions can be taken before serious conditions arise in the sense of requirement 24 para. 5.29 of SSR-2/2 [1].

2.71. To allow further trending and identification of recurring themes, the OE databases should provide a comprehensive coding system covering for instance affected systems, components, causes, safety consequences.

2.72. Experienced individuals should assign and check the trend codes to ensure consistency and accuracy of the codes.

2.73. A comprehensive and detailed coding system should be applied to make the data easily searchable and consistent that enables all reported issues to be characterized to identify recurring themes. Attributes of each event or issue should be coded in the OE database.

2.74. An installation's coding system should be harmonized between the installations within an operating organization, and may be harmonized with other national or international OE programmes to facilitate the exchange of information.

2.75. Information from all reported issues including low level events and near misses should be trended. The following types of trend should be identified and reviewed:

- Recurring issues derived from all reported events;
- Abnormal trends relating to work groups of the installation;
- Abnormal trends in certain operating modes and during certain activities;
- Recurring failures or degrading performances of systems and components;
- Overall trends in Organisational and Human Performance;
- Short term trends that develop quickly;
- Trends that have developed over a longer period of time;
- Trends that compare the current performance to a previous similar operating condition (for example comparing two outages to one another).

2.76. Trend analysis should be performed systematically so that an investigation of deteriorating performance can be initiated and corrective actions taken to prevent higher level events from occurring.

2.77. Data from all relevant installation databases should also be trended to obtain a broader perspective of strengths and weaknesses. For example, trending of information from industrial safety reports, radiological contamination reports, records of maintenance work, quality assurance reports can provide useful insights.

2.78. Once an abnormal trend has been identified it should be treated similarly to an event, and the established reporting programme should be used to initiate an appropriate analysis. The level of the analysis should be based on the significance and potential consequences of the events and significant changes in trends of the events ~~of the trend and its potential consequences~~. For significant trends, a RCA should be conducted so as to identify causal and contributing factors to explain why a trend is occurring.

2.79. OE Trend reports should be provided to appropriate levels of managers at regular intervals for review and action. Organizations with more than one nuclear installation, should ensure trend reports are provided to each installation.

2.80. Trending should be performed at the installation level and utility level.

2.81. Reviews of OE should be performed to investigate generic issues and to draw generic lessons.

Utilization, Dissemination, Reporting and Exchange of Information

2.82. The operating organization should maintain liaison, as appropriate, with support organizations (manufacturers, research organizations and designers) in order to feed back information on operating experience and to obtain advice, if necessary, in the event of equipment failure or in other events in the sense of requirement 24 para. 5.32 of SSR-2/2 [1].

2.83. The operating organization should obtain and evaluate information on relevant operating experience at other nuclear installations to draw lessons for its own operations. It should also encourage the exchange of experience with the national and international systems for the feedback of operating experience. Relevant lessons from other industries should also be taken into consideration, as necessary in the sense of requirement 24 para. 5.27 of SSR-2/2 [1].

2.84. The results of analyses of operating experience should be included in relevant programmes such as training, procedure revision, work management, design and modification in the sense of requirement 24 para. 5.28 of SSR-2/2 [1].

2.85. Operating experience information should be made readily accessible and user friendly with due regard for the sensitive nature of certain information ~~(user friendly)~~ to all operating organization personnel for use in various work processes such as pre-job briefings, management meetings, and outage planning.

2.86. Personnel should use OE information to improve performance and prevent events. This should be actively encouraged and reinforced by management.

2.87. Relevant OE information should be shared with other organizations in a timely manner. This should occur at appropriate levels (e.g. the constructor level, installation level, the operating organization level, and the national and international level). A list of recipients for different types of information may include: organizations with planned or ongoing nuclear programmes, technical support organizations in the nuclear field, vendor companies including design firms, engineering contractors and manufacturers, regulatory bodies, and centralized international reporting systems.

2.88. Legal requirements and commercial interests may restrict the dissemination of some information. The regulatory body and the operating organization should make the necessary arrangements with the organizations concerned to ensure that any restrictions on the information to be disseminated are minimized. Moreover, information which could affect nuclear security should be identified and protected according to the regulation.

Reviewing the Effectiveness of the Process

2.89. The operating experience programme should be periodically evaluated to determine its effectiveness and to identify any necessary improvements in the sense of requirement 24 para. 5.33 of SSR-2/2 [1].

2.90. The effectiveness of the OE programme should be assessed using the following methods:

- Self-assessment;
- Benchmarking;
- Independent peer review[9].

2.91. The effectiveness should be assessed by experienced individuals familiar with operating experience programmes.

2.92. Indicators of the effectiveness of all phases of the operating experience programme should be developed and utilized. These indicators should include both process and result based indicators.

2.93. The operating organization should issue a periodic report that summarizes the effectiveness of the OE process and should identify areas for improvement and corrective actions taken to address the issues identified. That report should also emphasise the implementation of the lessons learned and effectiveness of corrective actions.

[9] The IAEA provides for the application of this Safety Guide through its PROSPER service (peer review of the effectiveness of the operational safety performance experience review process) upon request by the State. PROSPER missions perform a combination of two types of peer review: (a) a programmatic review of the overall effectiveness of the OE feedback process for the installation or utility; and (b) a review focused on unresolved significant safety issues or specific events. PROSPER is available to all countries with nuclear power plants under commissioning or in operation.

3. INVOLVEMENT OF THE REGULATORY BODY

General

3.1. All bodies associated with nuclear and radiological safety should foster mutual understanding and respect through honest and open communication on operating experiences. As a good practice these communications should also include occurrences that are not covered by formal reporting requirements in accordance ~~to~~ with requirement 21 of GSR Part 1 [2].

3.2. All regulatory bodies involved in nuclear safety related activities should implement or participate in an effective OE system. A graded approach should be used in line with the risks associated with the activities at the installation.

3.3. The regulatory body should ensure that a system for operating experience is in place at the operating organization. This system should be consistent with the criteria discussed in ~~paragraph~~ chapter 2. ~~3.~~

3.4. The regulatory body should establish an OE process. The regulators programme should include OE from operating organizations and regulatory experience, including making arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience including experience in other States and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities in accordance with GSR Part 1, requirement 15 ~~[4]~~ [2]. The information disseminated should include other information that is not necessarily captured by the operating experience programmes (e.g. actions pursuant to research and development activities, inspection findings, international forums, licensing activities, Integrated Regulatory Review Service Mission findings, regulatory experience from other industries, etc.) but which would result in improving the regulatory framework.

3.5. The regulatory body should ensure stability of OE regulations, procedures and arrangements as well as their practicability. It is a good practice to discuss modifications to regulations, procedures and arrangements with stakeholders before implementation according to requirement 22 of GSR Part 1 [2].

3.6. The regulator's OE process should include screening, investigation, analysis, evaluation, review, inspection, utilization, dissemination, reporting, storage and retrieval of OE. The focus and specific arrangements of the OE process may differ ~~in line with an~~ depending on the organization's / regulatory body's tasks and responsibilities. Nevertheless, the OE system should reflect the following:

- Collection of domestic and external OE;
- Screening of OE — primarily on the basis of actual or potential safety significance;
- Investigation and in-depth analysis, including causal analysis;
- ~~Supervision~~ Oversight activities and recommended actions resulting from analysis, including approval, implementation, tracking and evaluation;
- Wider consideration of trends and review;
- Dissemination and exchange of information, including by the use of international systems;
- Continuous monitoring and improvement of OE related processes;
- A storage, retrieval and documentation system for OE.

A flowchart of a typical operating experience process containing the recommended elements is shown in Fig. 2.

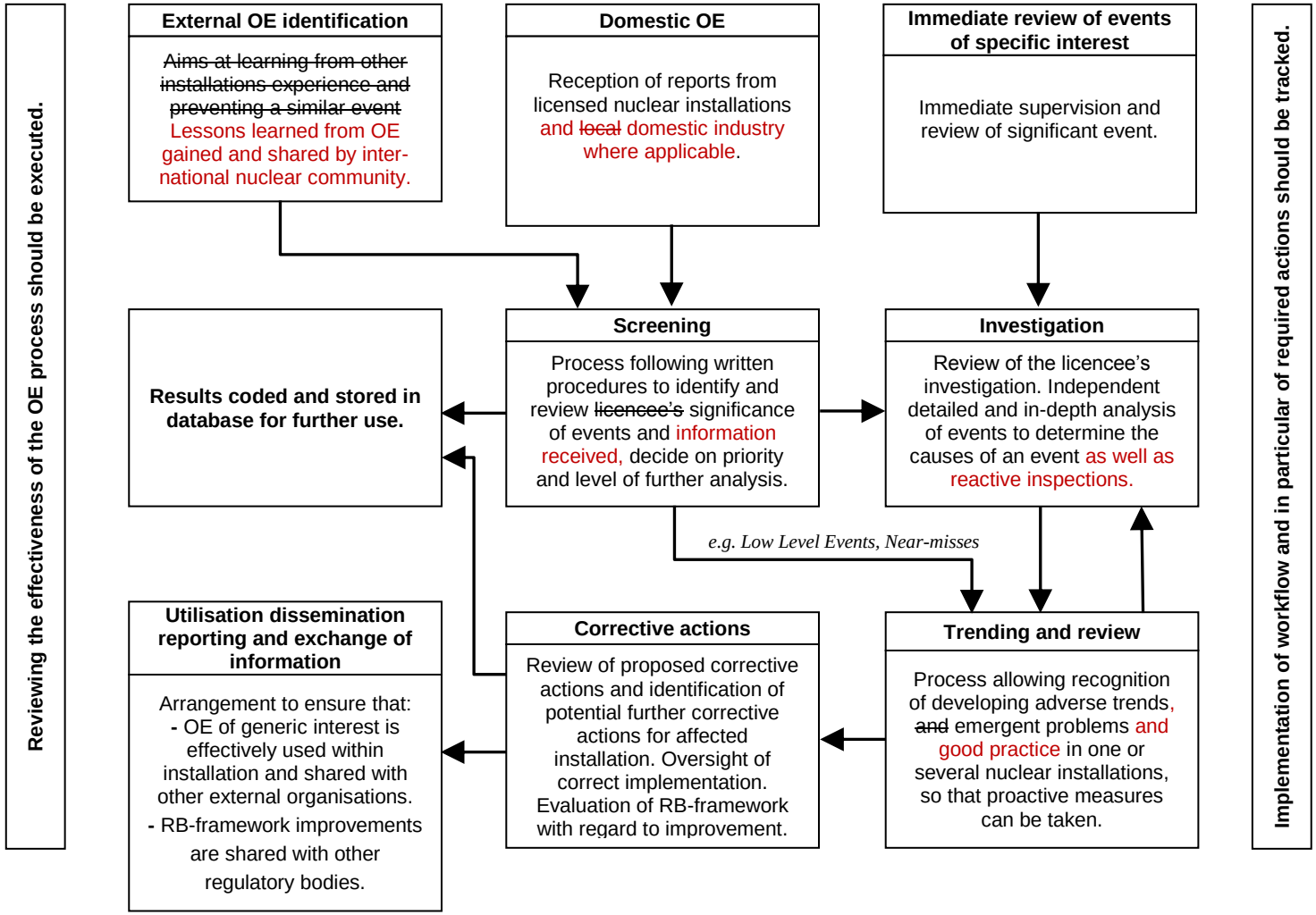


Fig 2: Flow chart of a typical Regulatory Body (RB) operating experience process.

3.7. The OE programme should be executed by appropriately trained, experienced and knowledgeable personnel, and where possible from different disciplines, to facilitate the determination of appropriate regulatory response to an issue.

Management System

3.8. The regulator's management system should integrate the outcomes of the OE in the regulatory processes. The international exchange of OE should be encouraged. "The regulatory body shall establish, implement and assess and improve a management system that is aligned with its safety goals and contributes to their achievement", as stated in requirement 19 of GSR Part 1 [2].

3.9. The regulatory body's OE process should be adequately resourced in order to effectively execute the OE programme objectives.

3.10. "The management system … has to ensure the promotion of a safety culture, the regular assessment of safety performance and the application of lessons learned from experience", as stated in para. 3.12 under principle 3 of SF-1 [3].

Reporting

3.11. The regulatory body should specify the reporting ~~arrangements~~ requirements for events, incidents or accidents considered significant to safety and security. The ~~arrangements~~ criteria should apply a graded approach based on the potential impact on nuclear or radiological safety.

3.12. As a minimum, the ~~arrangements~~ reporting requirements should include:

- Early Notification; Information relating to events that challenge~~d~~ (or have the potential to ~~affect~~ challenge) nuclear or radiological safety, or other events as specified by the regulatory body. Time-frames for these notifications and the communication method (i.e. telephone call, fax, email, written report) should be specified by the regulatory body;
- Follow Up Reporting: Detailed reporting of early notification events after sufficient time has passed to allow for completion of investigations, or to notify the regulatory body of changes to early notifications. As a minimum, these reports should include: description of the event sequence including all failures, direct causes and root causes, contributing factors, potential for common cause / mode failures, extent of conditions/cause analysis of actual and potential safety significance, and short, medium and long-term corrective actions. The lessons learned from previous related occurrences either at the same site or at other installations should be captured. The report should consider technical, human and organizational aspects and external factors;
- Supplementary Reporting; OE information provided routinely, or ~~that~~ as specified by the regulatory body, provided in-line with regular, agreed upon time-scales (e.g. analysis of low level events, trending data, periodic installation reports, etc).

3.13. The regulatory body should specify the criteria for the types and severity of events that have to be reported. As a minimum, these should cover the following types of events, incidents and accidents.

- An installation shutdown, abandonment of service or suspension of activity as required by the operational limits and conditions;
- An operation or condition prohibited by the operational limits and conditions;
- Any event or abnormal condition that resulted in the condition of the nuclear installation, including its principal safety barriers, being seriously degraded;
- Any natural phenomenon or other external condition that posed an actual threat to the safety of the nuclear installation or that significantly hampered site personnel in the performance of duties necessary for safe operation;
- Any event or abnormal condition that resulted in the manual or automatic operation of a protection system or of other engineered safety features;
- Any event in which a single cause or condition caused a significant loss of operability of a safety system;

- Any liquid or airborne releases of radioactive material to unrestricted areas in excess of authorized limits (generally as specified in the operational limits and conditions), or exposure of site personnel in excess of authorized limits;
- Any event that posed an actual threat to the safety of the nuclear installation or that significantly hampered site personnel in the performance of duties necessary for safe operation, including fires, releases of toxic gases and radioactive releases;
- Declaration of an emergency class [7] [8] as specified in the emergency plan;
- Any problem or defect in the safety analysis, design, construction, manufacturing, supply chain, installation or operation that results in, or could result in, an operating condition that had not previously been analysed or that could exceed design basis conditions;
- Any event that results in the death of or serious injury to personnel at the installation;
- Any other event that could affect the safety of the installation and is deemed significant by the authorized party or regulatory body.

3.14. These reporting criteria should cover the phases of the installation life cycle including design, construction, commissioning, operation and decommissioning.

3.15. These reporting criteria should cover events related to worker safety, fire safety, radiation protection, environment etc. if not reported under other regulations.

Screening and Analysis

3.16. In addition to the information discussed in chapter 2, other relevant information should be included in the screening process. ~~These~~ This may include: reports produced by regulatory bodies, international forums, Safety Performance Indicators, OE databases (International Reporting System for Operating Experience / Incident Reporting System for Research Reactors / Fuel Incident Notification and Analysis System) and other international topical studies.

3.17. Screening determinations should be made against the actual and / or potential safety significance of the event. The process should be transparent and formalized such that the results are justifiable and repeatable.

3.18. The ~~first step in the~~ screening of reports from domestic operating organizations ~~involves the regulatory body~~ should include confirm~~ing~~ation of the accuracy, completeness, and timeliness of ~~that~~ the report and that it satisfies the prescribed reporting criteria~~, its accuracy and completeness in due time~~. The regulatory body should contact the operating organization where clarification or further information is required.

3.19. Outcomes of the screening process may include: identification of information for onward distribution; ~~performing~~ performance of a detailed analysis of the issue; further trending, and identification of necessary regulatory action, or that no further action is required.

Investigation

3.20. The regulatory body should establish the requirements for investigation of events, undertaken by the operating organization, commensurate with the safety significance of the event or condition. Criteria for initiating investigations should include safety significance, novel causes, repeat occurrences, and generic lessons to be learned.

3.21. The regulatory body should establish procedures for their own independent investigations. Investigations should be carried out using a graded approach in-line with the findings of the screening process. Investigations may be performed in the framework of a reactive inspection.

Trending and review

3.22. The regulatory body should analyse the information provided from reported events, investigations and other OE sources to identify trends and patterns. These analyses may also ~~recognise~~ include information about low level events, ~~and~~ near misses when available and best practices.

3.23. Reviews of OE should ~~be performed to investigate~~ include evaluation of potential generic issues and ~~to~~ draw generic lessons from investigations of significant events, when applicable.

OE Effectiveness Review

3.24. The regulatory body should periodically inspect operating organizations to ensure their OE programmes are effective and satisfy the criteria set out in Chapters 2 and 3. The regulatory body should verify that the feedback of OE has been adequately used. Additional inspections of the OE programme or parts of it should be undertaken when gaps ~~to licence~~ in regulatory requirements and standards are identified.

Regulatory Effectiveness

3.25. The regulatory body should use OE and regulatory experience to support and enhance ~~their~~ its own regulatory strategy, ~~own~~ processes, rules, regulations and standards in accordance with GSR Part 1, Requirement 15 [2].

3.26. The regulatory body's own OE process should be monitored by appropriate means to determine its effectiveness as well as to identify and to implement necessary improvements. The OE process should be periodically subjected to internal and external reviews.

Dissemination and Utilization

3.27. The regulatory body should implement a system for storage, retrieval and searching of OE. An effective search should be possible via an appropriate coding system or keywords.

3.28. The regulatory body should set arrangements for disseminating OE information (including generic letters) to relevant organizations and interested stakeholders.

3.29. Legal requirements and commercial interests may restrict the dissemination of some information. The regulatory body should make the necessary arrangements with the organizations concerned to ensure that any restrictions on the information to be disseminated are minimized.

3.30. The regulatory body should have ~~arrangements~~ procedures in place to collect international OE and share with domestic operating organizations. ~~Arrangements~~ procedures should also be in place for sharing domestic OE with the international community through international databases (e.g. IRS / IRSRR / FINAS etc.) as well as through working groups ~~and databases (e.g. IRS / IRSRR / FINAS etc)~~, meetings, and through regular contact with other regulatory bodies, etc. These activities can also be enhanced through bi-lateral and multi-lateral agreements between countries. The information shared should include what, if any, regulatory experience that was used to make enhancements the regulatory body's regulatory framework in accordance with GSR Part 1, Requirement 15 [2].

APPENDIX I

Types of Events Report, Timing, Format and Content

I.1. The preliminary report (sometimes termed the early notification or prompt report) should be submitted by the operating organization to the regulatory body electronically or by telephone or facsimile.

The preliminary reports should contain

- Installation affected;
- Status of the installation at time of the event and at present;
- Date and time of event and detection;
- Brief narrative of the event sequence;
- Any personnel exposure injury and radioactive release;
- Immediate actions taken;
- ~~First~~ Initial risk perception;
- Contact details.

~~and~~ It may also contain a provisional INES rating for those Member States that use INES [9], [12].

These preliminary reports should be followed by a brief written confirmation, as appropriate, to ensure that adequate information is transferred. Before a detailed written report (herein-after termed the main report) is submitted, additional information may be needed for reasons such as the following:

- Further degradation in the level of safety of the installation or recovery from a degraded level of safety;
- Major changes in the perception of the significance of the event as a result of a subsequent evaluation;
- New information;
- The need to correct factual errors.

I.2. A main report should then be prepared by the operating organization.This report should be submitted to the regulatory body (and possibly other organizations like technical support organization according to national practices) as soon as practicable, within a period of time to be defined by the regulator. The main report should be marked as provisional if additional information is to be gathered later for evaluation and, if necessary, submitted in a follow-up report to finalize the main report.

I.3. The main report should be as comprehensive as possible and should be set out in an orderly and consistent manner. The main report should include the following:

- Basic information (like date of identification, method of detection, extent of condition as appropriate, manufacturer, component model/part number, including confirmation of the information transmitted in the preliminary report);
- Narrative description;
- Safety assessment (consequences and implications);
- Direct and root causes or causal factors;
- Corrective actions (taken and/or planned);
- Lessons learned;
- Guide keywords with their respective codes.

I.4. The operating organization should prepare the main reports in sufficient technical detail for persons conversant with the design of the nuclear installation. In addition to technical details, whenever appropriate the reports should contain data on human factors necessary for an understanding of the event without the need for additional information. The standard format and contents of reports to the IAEA/NEA International Reporting System ~~on~~ for Operating Experience~~s~~ [13], to the IAEA Incident Reporting System for Research Reactors [15], and to the IAEA/NEA Fuel Incident Notification and Analysis System [16] may be considered for adoption in national systems for the feedback of operating experience, to link national and international systems more effectively.

I.5. The operating organization should submit follow-up reports if the initial report is known to be incomplete or if significant additional information becomes available. The operating organization should also submit specific additional information and assessments as it considers necessary, or at the request of the regulatory body if the regulatory body finds it necessary for a complete understanding of an event. When such a request is made, the information and assessments should be provided within an agreed time period. If, after the main report is submitted, significant further corrective actions are taken or more information gained from further investigations becomes available, this should be reported to the regulatory body as follow-up information. Reports should, wherever possible, be communicated and disseminated widely to relevant bodies and should be considered for serving as the basis for information to be exchanged internationally.

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Commissioning and Operation, SSR-2/2, IAEA, Vienna (2011)

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety IAEA Safety Standards, GSR Part 1 (Rev. 1) IAEA, Vienna (~~2010~~ 2015).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Fundamental Safety Principles, SF-1, IAEA, Vienna (2006)

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Nuclear Safety, INFCIRC/449, IAEA, Vienna (1994)

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Joint Convention on the Safety of Spent Fuel Management and on the Safety of radioactive Waste Management, INFCIRC/546, IAEA, Vienna (1997)

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Legal Series No. 14, IAEA, Vienna (1987)

[7] COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA Vienna (in preparation)

[8] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards, GS-G-2.1, IAEA, Vienna (2007)

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, INES: The International Nuclear and Radiological Event Scale User's Manual, 2008 Edition, IAEA, Vienna (2013).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Amendment to the Convention on the Physical Protection of Nuclear Material, IAEA International Law Series No. 2, IAEA, Vienna (2006)

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Homepage [http://www-pub.iaea.org/books/]

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, The Use of the International Nuclear and Radiological Event Scale (INES) for Event Communication, IAEA, Vienna (2014)

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, IAEA/NEA International Reporting System (IRS) Guidelines, IAEA Services Series No. 19, IAEA, Vienna (2010).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, Vienna (2001)

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Guide on Incident Reporting System for Research Reactors, IAEA, Vienna (2000).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, IAEA/NEA Fuel Incident Notification and Analysis System (FINAS) Guidelines, IAEA Services Series No. 14, IAEA, Vienna (2006).

ANNEX I

International Systems for the Feedback of Operating Experience

International organizations support the activities of regulatory bodies and operating organizations. One purpose of these organizations is to facilitate and promote sharing of operating experience among their members. These organizations may provide databases (e.g., IRS, IRSRR, FINAS, WANO Event Database) for recording, storage and retrieval of OE by their respective members.

These organizations may arrange forums, working groups, and technical meetings to exchange, evaluate, and document operating experience information and programs that manage operating experience.

These organizations may provide training on the effective use and exchange of operating experience for their members.

INTERNATIONAL REPORTING SYSTEM FOR OPERATING EXPERIENCE (IRS)

Introduction

Formerly Incident Reporting System (IRS), operated jointly by the IAEA and the OECD/NEA, is an essential mechanism for providing feedback on international operating experience for nuclear power plants. Its objective is to provide proper reporting and feedback of safety significant events for nuclear power plants for use by the international community. This information is to promulgate root cause analysis and lessons learned to be disseminated worldwide. A similar system has been created by the WANO, which also provides its members with various briefings and reports based on reported events. The resilience of these systems has proven that feedback on international operating experience (OE) is possible and can lead to remedial action taken by the Member States to improve nuclear safety.

History of the IRS

The Incident Reporting System was created in 1979/1980 by the Committee on the Safety of Nuclear Installations CSNI of the NEA as a reaction to deficiencies identified in operating experience feedback (OEF) highlighted by the Three Mile Island (TMI) accident. The IRS was intended to be a system utilized by regulators which is open to operators and the nuclear industry. The objective of the IRS was the timely exchange of information on OE in nuclear power plants (NPPs) to:

1. Avoid incidents taking place in one country from recurring elsewhere;
2. Facilitate the analysis of general safety issues and the sharing of experience;
3. Assist in developing a larger data bank for potential analysis purposes;
4. Contribute to the better regulation of NPPs and;
5. Provide additional guidance for safety research programmes.

The IRS functioned according to guidelines agreed to by the international nuclear regulatory authorities. These guidelines can be summarized as follows:

1. Participating countries report any incidents in their NPPs which are significant from a safety point of view;
2. A detailed description of the incident is provided through the IRS, so that nuclear regulatory authorities can evaluate its technical significance;
3. The IRS reports are distributed through the IRS Coordinators designated by their participating countries.

Reporting was based on two types of reports; short reports to be provided within one month of the event and more detailed reports to be submitted within 3 months. To fulfil the objectives of the IRS, it was expected that for all events, a detailed report should be sent to the IRS. Though reporting criteria had been established, selection of events to be reported to the IRS was mainly subject to the judgment of the coordinators with a target-reporting rate of one report per unit per year.

During the 1980's the original objectives of the IRS remained practically unchanged. But the importance of

lessons learned was emphasized and additional interest groups were granted access, e.g. HF and PSA experts. Thus, the objectives and expectations with respect to the IRS became broader. Also, to support access to and use of the information reported to the IRS a CD-ROM database was implemented. Both developments led to more demanding requirements regarding the content of IRS reports. As a consequence it was decided that the content and quality of information in the report were more important than timeliness. Thus, the requirements on reporting time were relaxed. But it became obvious that the IRS could have difficultly to fulfil the expectations of each interested party.
As part of the history of the development of worldwide OE exchange it should be mentioned that in the meantime (in 1989) the World Association of Nuclear Operators (WANO) was established. This organization developed an extensive OE programme including a web-based event reporting system that provides a very flexible and efficient tool for the operators to exchange information.
In 1994, the Convention on Nuclear Safety came into force and gave an official international basis for operating experience feedback. Article 19 of the convention states:
"Each Contracting Party shall take the appropriate steps to ensure that:

vi. Incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

vii. Programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies."

With the creation of the first comprehensive database on the IRS, Advanced Incident Reporting System (AIRS), in 1995, the responsibility of processing and reviewing reports (including quality checking) was transferred to the IAEA
In 2006 the web-based IRS was created to facilitate efficient data input and report availability. Each IRS report becomes part of this web-based system. Users are officially registered and appropriate levels of access are allocated to individuals, thus ensuring a high level of security. Once a new report is posted on the web-based IRS, the users are automatically informed by email. With the creation of the web-based system, easy access to the information was expanded to utilities and plant staff, and the need for CD distribution and hard copies was eliminated.
In 2010, the name of the system was revised to "International Reporting System for Operating Experience" to reflect the evolution of the "Incident Reporting System" to one which includes an expanded view/use of operating experience feedback ~~the name of the system was revised to "International Reporting System for Operating Experience"~~. The system kept the term "IRS".

Description of the IRS
The objectives of the IRS are a) to exchange important lessons learned from operating experience gained in the NPP, b) to ensure proper feedback on events of safety significance, c) to help prevent occurrences or recurrences of serious incidents or accidents and d) to inform the international nuclear community of potentially safety significant issues.
The characteristics are a) it is a worldwide system, b) with events of safety significance only, c) reported on a voluntary commitment, d) intended to be provided in a timely manner, and e) in English. The IRS, although it may be possible, is not intended to be a source for statistical studies nor component reliability studies.
The IRS is a system created by the regulators. The first users are the regulators and their technical support organizations. Utilities, vendor companies (design firms, engineering contractors, manufacturers, etc.), research establishments, universities, etc., can also be given access.
The IRS increases worldwide awareness of potential and actual problems in nuclear plant operations. It draws attention to those incidents, which, if not dealt with in a timely fashion, could escalate to more serious events ~~through subsequent equipment of human response failures~~. The heightened awareness from operational feedback has resulted in numerous improvements to plant equipment, procedures and training in many nuclear power plants, thereby reducing the potential for subsequent failures that could result from unusual events.
The IRS database contains specific reports that are detailed descriptions and preliminary analyses of the events causes that may be relevant to other plants. The analysis may lead to corrective action by plant management or regulatory authorities. That database also contains preventive respectively corrective actions taken as a result at other NPPs within or outside the reporting Member State. The analysis of IRS reports can also assist in determining whether a particular event is generic or recurring in nature. Recurring events

may reveal several types of problems related to the safety of nuclear power plants.
The IRS scope includes topical studies of events of particular interest. Topical studies constitute a major component of the IRS related activity. Such studies are intended to provide the basis for generating in-depth evaluations and to identify topical or generic issues by a team of nuclear experts. These studies have focused on the importance of human actions, common mode failures or fires, plant shutdown procedures and low power operation modes and the need for constant vigilance during plant improvements and modifications. The IAEA and the NEA also produce a common report, called the "Blue Book". The Blue Book usually covers a period of three years and highlights important lessons learned from around 300 events reported to the IRS. This report is primarily aimed at senior officials in industry and government who have decision-making roles in the nuclear power industry.
Another potential use of IRS data is the application of operational feedback in the design of the next generation of nuclear power plants. Nuclear power plants operating experience has demonstrated that design modifications documented in IRS reports can have a significant impact on safety.

THE INCIDENT REPORTING SYSTEM FOR RESEARCH REACTORS (IRSRR)

What is IRSRR
The International Atomic Energy Agency (IAEA) has, in its current programme on research reactor safety, an Incident Reporting System for Research Reactors (IRSRR). The IRSRR collects, maintains and disseminates reports on events which are received from IAEA Member States participating in the system. The objective of the IRSRR is to improve the safety of research reactors through the exchange of operating experience.
The systematic collection and evaluation of operating experience with unusual events is a very useful way to improve operational safety.
The IRSRR was established in 1997 to facilitate the exchange of information, between research reactor facilities about events and share the causes and the lessons learned from these events, hoping to avoid the re-occurrence of this or similar events in other facilities. The IRSRR is a web based system on IAEA/NUCLEUS and is administrated by the Research Reactor Safety Section within the Division of Nuclear Installation Safety (RRSS/NSNI/IAEA). The access to the IRSRR database is restricted to the nominated national and local coordinators.
Participating countries

Argentina	DR of Congo	Italy	The Netherlands	Slovenia
Australia	Egypt	Jamaica	Nigeria	South Africa
Austria	Finland	Japan	Norway	Sweden
Bangladesh	France	Jordan	Pakistan	Syria
Belgium	Germany	Kazakhstan	Peru	Thailand
Brazil	Ghana	Korea	Philippines	Tunisia
Bulgaria	Greece	Latvia	Poland	Turkey
Canada	Hungary	Libya	Portugal	Ukraine
Chile	Indonesia	Malaysia	Romania	United Kingdom
China	Iran	Mexico	Russian Federation	USA
Czech Republic	Iraq	Morocco	Serbia	Vietnam

Currently 55 Member States are participating in IRSRR. In the framework of the operation of the IRSRR, regular technical meetings are organized to exchange information on safety related events, to discuss the operation of the IRSRR and to advise the IAEA on further improvements.
Provisions on incident assessment and reporting are included in IAEA Safety Standard NS-R-4 which states in paragraph 7.10 "It shall be the responsibility of the operating organization to ensure that… (i) Information on reportable incidents, including any assessments of such events and the corrective actions intended, is submitted to the regulatory body".
The Code of Conduct on the Safety of Research Reactors also states in paragraph 20 that: "The regulations

and guidance established by the State or the regulatory body according to national arrangements should:… (p) require the operating organization to report the occurrence of events significant to safety in accordance with criteria established by the regulatory body;" and in paragraph 32 that "The operating organization should:… (e) report events significant to safety to the regulatory body, analyse the events and act upon the findings to improve safety in a timely manner."

Benefits of IRSRR

Being a platform for sharing the operating experience of research reactors worldwide, the overall benefit of the IRSRR is in the safety improvement of research reactors. The participating countries are benefitted through the exchange of information on the events, the lessons learned and the corrective actions taken by the operating organization. This heightens the awareness among the participating countries to take advance actions for preventing similar events in their research reactors.

The participating countries also use the IRSRR for identifying trends and safety deficiencies of generic nature. The analysis of events helps in identifying and implementing measures to mitigate the consequences of the events.

Another use of IRSRR data is the application of operational feedback in the design of the new research reactors.

The IRSRR is a global contact network and forum that enables research reactor community to share and review information on lessons learned from reported events. The system can be used to obtain information on various issues having safety significance and to assist in the prioritization of the areas where further resources or research can be directed.

How does IRSRR work?

Event reports

Each participating country designates national coordinator who is responsible for event reporting to the IRSRR. Reporting the event to the IRSRR is voluntary. Guidelines and user's manual are available for the users of the IRSRR. Events that meet one or more of the following criteria could be considered as appropriate for reporting to the IRSRR:

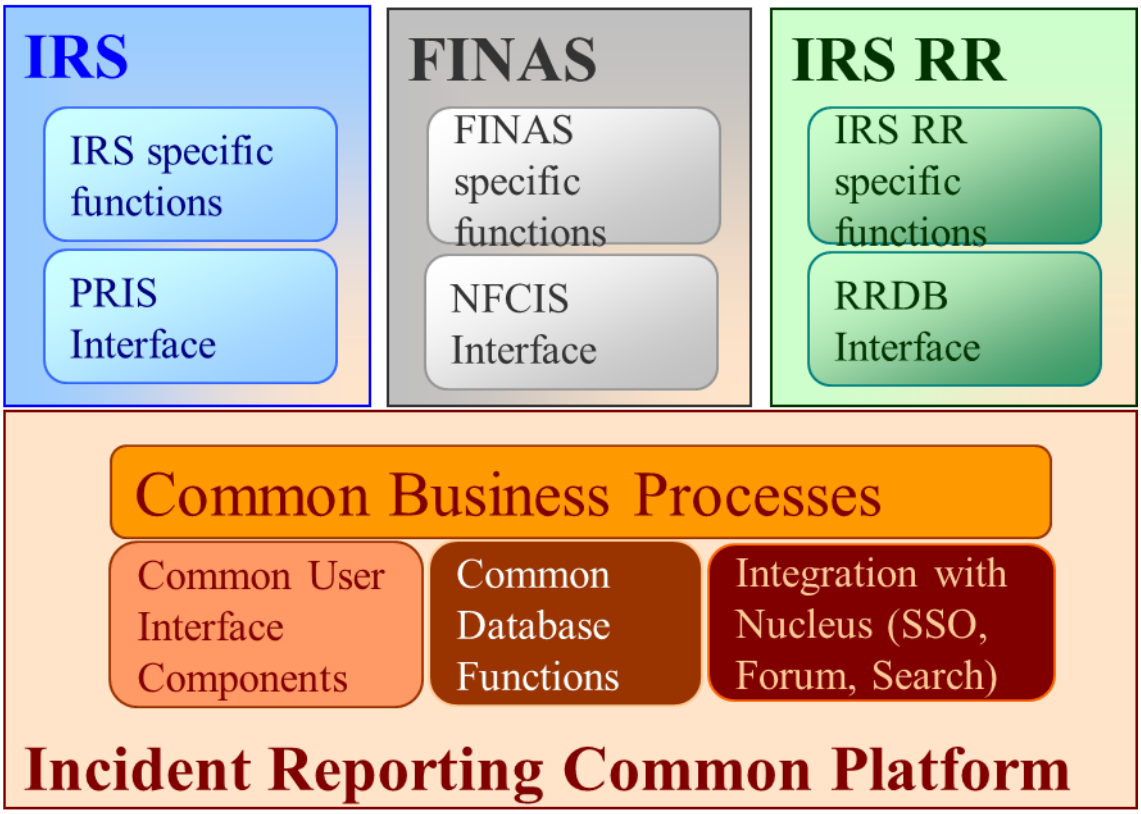
- The unusual event identifies important lessons learned that allow the international research reactor community to prevent a recurrence of a similar event or to avoid the occurrence of a more serious unusual event in terms of safety, or;
- The unusual event is itself (potentially) important or serious in terms of its safety implications or whether it (potentially) reduces the defence in depth significantly, or;
- The unusual event is a repercussion of similar events previously reported to IRSRR, but which identifies new lessons learned.

The report can be submitted as preliminary, which can contain the known details at the time of reporting. Subsequently, a main report is prepared that replaces the preliminary report. If additional information becomes available at a later stage, a follow-up report can be generated and submitted.

The report contains the title and the date of the event, an abstract, narrative description of the event, preliminary safety assessment (what were the direct causes, consequences and implications), root cause analysis, corrective actions and lessons learned. The written report is often supported by drawings, sketches etc. The national coordinator also identifies the categorisation codes for the important aspects of the event as per the coded watch-list of the IRSRR guidelines and assigns the report as "specific report" or "generic report".

Sharing information

IRSRR is a part of the web-based incident reporting common platform of IAEA-Nucleus. The system allows access to the authorised persons only. The user manual has detailed information on the use of the system. Once a new report is posted on the IRSRR, the registered users are informed by an email and can then view the reports.



How is the IRSRR used?

Meeting of national coordinators

Biennial meeting of national (and local) coordinators is held to exchange information on reported events. The participants also discuss the ways to improve the functioning of the IRSRR. These meetings serve to strengthen the mechanisms for the exchange of experience in the assessment of events and in improvements made to reduce the frequency of similar events. Experts also provide training to the participants on event investigation techniques.

Restricted access

Access to IRSRR reports is restricted and is limited to the authorised coordinators of the participating countries. Information contained in the reports is technical and is not intended for distribution to the general public because of its proprietary nature. This restriction encourages openness among the participating countries to disclose the event details. The main purpose of the system is to benefit from the exchange of the experience among the participating countries.

Other activities

The IAEA and NEA also jointly maintain the International Nuclear and Radiological Event Scale (INES). The INES was introduced in 1990. Its primary purpose is to facilitate communications and understanding among the nuclear community, the media and the public on the safety significance of events occurring at nuclear installations. It is expected that events reported to INES would be included in the IRSRR.

What has been achieved?

Currently 55 countries with interest in research reactors are participating in the IRSRR. However, the reporting of the events is rather limited. Until September 2013, there are 181 event reports in the IRSRR database. The oldest report being from an event that occurred in 1947 and the most recent report is dated March 2013. In order to maximize the benefits from IRSRR, it is necessary that the participating countries submit the events that have an element of lesson to be learned including precursor events or near misses.

Over the years, IRSRR has developed from a source of information exchange on the events to becoming a source for analysis, detailed discussion on the events, refining the event investigation techniques and meetings for the exchange of information related to operating experience.

Eight biennial technical meetings of the coordinators have been held till 2013 and the participation in the

meetings has been excellent. As a result of the discussion in the meetings, several improvements have taken place, which include the publication of the guidelines and the user manual. The analysis of the events is also used to determine generic and common causes for the events and to find directions for defining IAEA programmes on research reactor safety.

THE FUEL INCIDENT NOTIFICATION AND ANALYSIS SYSTEM (FINAS)

Background

The General Conference of the IAEA encourages Member States to provide feedback on safety-related events at nuclear sites to the international community and encourages the IAEA to support and coordinate these activities, through resolutions such as ~~GC(57)~~ GC (59) Resolution 9 articles 39 and ~~92~~ ~~(2013)~~ 102 (2015). Presenting this view in its 23rd report, the senior IAEA experts group INSAG called for event-reporting to be connected to programmes that transform lessons learned into risk reducing measures, such as improvements in design management of plant operations and ageing, operator training, operating procedures and safety culture.

The fundamental objective of FINAS is to support these activities with the aim of improving the safety of nuclear fuel cycle facilities worldwide. This objective can be achieved by providing timely and detailed information on both technical and human factors related to events of safety significance which occur at these facilities. Such collection, evaluation and dissemination of event reports helps to prevent the occurrence or recurrence of events.

Following the establishment of an early prototype of the FINAS system at the OECD, operation of the web-based Fuel Incident Analysis System (FINAS) was transferred to the IAEA in 2006. The overall system is now managed jointly by IAEA and NEA according to the wishes of the National Coordinators who comprise its steering committee.

Scope of FINAS

FINAS ~~now~~ at the date of the report has 28 member countries out of a total eligible 39 and FINAS Member States now cover 88% of the worlds' declared nuclear fuel cycle facilities.

Membership of FINAS is open to Member States with

- One or more nuclear fuel cycle facilities in operation, or
- A nuclear fuel cycle facility which is not operated but is not decommissioned, or
- A project to build a nuclear fuel cycle facility.

The database covers events at nuclear fuel-cycle facilities going back to 1992.

The types of facilities included in FINAS are defined as any type of installation dealing with the nuclear fuel cycle other than nuclear power plants and research reactors or waste disposal ~~repositories~~ facilities. Associated activities related to these facilities such as radioactive waste management and decommissioning, are included. These include such facilities as, but not limited to:

1. Uranium and thorium mines and milling;
2. Refining facilities;
3. Conversion facilities;
4. Enrichment facilities;
5. Fuel fabrication facilities;
6. Radioisotope production facilities;
7. Waste treatment and conditioning facilities;
8. Fuel handling and intermediate storage facilities;
9. Reprocessing facilities;
10. FCF research and development laboratories.

Fuel transportation aspects are currently not considered a part of the reporting system (although individual Member States may make their own determination to report on specific cases). FINAS does not address incidents or events related to fuel that occur at nuclear power plants, since these are taken into account by the IAEA/NEA IRS.

Use and Access to FINAS

Information in FINAS is restricted, which means that users can access and distribute information within their own organisations, but bulk-copying or publication is prohibited. Users can access FINAS through the web-based portal called Nucleus, which hosts most of the IAEA technical databases. Users can be officially nominated by their national coordinator or by their government. National coordinators are also responsible for advising the IAEA when a username is no longer required.

Published FINAS guidance documents include “IAEA/NEA Fuel Incident Notification and Analysis System (FINAS) Guidelines”, Services Series 14, IAEA Vienna (2006), and a user manual. Both are available from the FINAS database web-pages in Nucleus and elsewhere.

National Coordinators in Member States enter event reports into the web-FINAS system, which are then checked by the FINAS event review group. The reports are made available to all users when approved. National coordinators are then responsible for the distribution of learning from these reports to authorised personnel and feed back to FINAS if preventive respectively corrective actions were implemented in national fuel cycle facilities as a result of event reports from other Member States.

Technical Meeting of National Coordinators

The IAEA and OECD/NEA each take it in turn to host technical meetings of National Coordinators. These meetings provide an opportunity for exchange of information and enhanced learning from the reports provided, and to guide further development of the FINAS database.

CONTRIBUTORS TO DRAFTING AND REVIEW

Bernard-Bruls, X.	International Atomic Energy Agency
Chiarelli R.	World Association of Nuclear Operators, United Kingdom
Fotedar, S.	International Atomic Energy Agency
Garmon, D.	United States Nuclear Regulatory Commission, USA
Gater, R	International Atomic Energy Agency
Heitsch, M.	European Union - Clearinghouse
Hillery, A.	(ONR) Nuclear Installations Inspectorate,United Kingdom
Kaijanen, M.	Radiation and Nuclear Safety Authority, Finland
Kobetz, T.	International Atomic Energy Agency
Lipár, M.	International Atomic Energy Agency
Maqua, M.	Gesellschaft für Anlagen- und Reaktorsicherheit, Germany
Murray, P.	Consultant, United States of America
Nichols, R.	Consultant, United Kingdom
Noel, M.	European Union - Clearinghouse
Poulet, B.	Canadian Nuclear Safety Commission, Canada
Prohaska, G.	International Atomic Energy Agency
Rao, D.	International Atomic Energy Agency
Zahradka, D.	International Atomic Energy Agency

4. BODIES FOR THE ENDORSEMENT OF SAFETY STANDARDS

To be integrated after approval by Committees