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OPERATING EXPERIENCE FEEDBACK FOR NUCLEAR INSTALLATIONS

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FOREWORD

by Director General

To be integrated after approval by Committees

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1. INTRODUCTION

BACKGROUND

1.1. The Safety Requirements publications Safety of Nuclear Power Plants: Commissioning and Operation, IAEA Safety Standards Series No. SSR-2/2 (Rev. 1) [1], Safety of Research Reactors, IAEA Safety Standards Series No. SSR-3 [2], Safety of Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSR-4 [3], Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2 [4] and Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1) [5] establish safety requirements, based on the Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1 [6], for the feedback of operating experience. International conventions such as the Convention on Nuclear Safety [7] (in Article 19) and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management [8] (in Article 9) also emphasize the importance of the feedback of operating experience. Both the safety standards and conventions stress the importance of establishing programmes to collect and analyse relevant operating experience and of acting on the results.

1.2. In 1989 the IAEA issued a Safety Guide on Systems for Reporting Unusual Events in Nuclear Power Plants (Safety Series No. 93)[1]. It presented a recommended scheme for the management of safety related operating experience in nuclear power plants that was based on available national practice at the time. In 2006 the IAEA issued a Safety Guide on A System for the Feedback of Experience from Events in Nuclear Installations, IAEA Safety Standards Series No. NS-G-2.11[2] . This constituted an update and extension of, and superseded, the previous Safety Guide.

1.3. The current publication is a revision of the previous Safety Guide NS-G-2.11, and supersedes it. The revision includes updating the recommendations on meeting the obligations, principles and requirements established in international conventions, the Fundamental Safety Principles and the Safety Requirements. It also extends the scope to cover feedback of operating experience throughout the lifetime of nuclear installations from design to decommissioning, and provides additional guidance on analysing and reporting operating experience, including good practices.

OBJECTIVE

1.4. The objective of this Safety Guide is to provide recommendations for establishing, implementing, assessing and continuously improving an operating experience programme for nuclear installations to prevent or minimize the risk of future events[3].

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[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Systems for Reporting Unusual Events in Nuclear Power Plants, IAEA Safety Series No. 93, IAEA, Vienna (1989).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, A System for the Feedback of Experience from Events in Nuclear Installations, IAEA Safety Standards Series No. NS-G-2.11, IAEA, Vienna (2006).

[3] In this Safety Guide an ‘event’ is, as defined in the IAEA Safety Glossary [9], “any occurrence unintended by the operator,

1.5. This Safety Guide is primarily aimed at operating organizations and regulatory bodies responsible for nuclear installations, and describes their roles and responsibilities in the overall operating experience programme. However, it is also of relevance to other organizations involved in the design, construction, commissioning, operation and decommissioning of nuclear installations, including technical support organizations, vendor companies (e.g. designers, engineering contractors, manufacturers), research establishments and universities providing research and safety related services to the nuclear industry.

SCOPE

1.6. This Safety Guide is applicable to all types of nuclear installation that are part of the nuclear fuel cycle, except facilities for the mining or processing of uranium ores or thorium ores and disposal facilities for radioactive waste. This includes: nuclear power plants; research reactors (including subcritical and critical assemblies) and any adjoining radioisotope production facilities; storage facilities for spent fuel; 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.

1.7. This Safety Guide is applicable to the design, construction, commissioning, operation and decommissioning stages in the lifetime of nuclear installations.

1.8. This Safety Guide does not address the arrangements for notification and sharing of information established under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency [10], which place specific obligations in relation to a nuclear or radiological emergency on the States Parties to the Conventions and on the IAEA. The Safety Requirements publication Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7 [11] further addresses the requirements on notification and assistance related to a nuclear or radiological emergency.

1.9. This Safety Guide does not address operating experience related to nuclear security. Some information in the operating experience programme may be subject to confidentiality requirements for security or other reasons established under the Amendment to the Convention on the Physical Protection of Nuclear Material [12]. Guidance on information security is outside the scope of this Safety Guide; such guidance is provided in the IAEA Nuclear Security Series publications Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13 [13] and Security of Nuclear

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including operating error, equipment failure or other mishap, and deliberate action on the part of others, the consequences or potential consequences of which are not negligible from the point of view of protection and safety." This includes initiating events, accident precursors, near misses, accidents and unauthorized acts. Operating experience includes, but is not limited to, experience from such 'events'.

Information, IAEA Nuclear Security Series No. 23-G [15].

STRUCTURE

1.10. Section 2 provides recommendations on the operating experience programme to be established and implemented in the operating organization. Section 3 provides recommendations on operating experience processes for the regulatory body. Additional detailed guidance is provided in the Appendix. Descriptions of the operating experience systems operated by the IAEA are given in the Annex.

2. FEEDBACK OF OPERATING EXPERIENCE IN OPERATING ORGANIZATIONS

GENERAL

2.1. All organizations with responsibilities for safety should foster mutual understanding and respect through honest and open communication on operating experience as part of a strong safety culture. As indicated by Requirement 12 of GSR Part 2 [4], these communications should include reporting any deficiencies with potential adverse effects on safety even if they are not covered by formal reporting requirements.

2.2. All organizations with responsibilities for safety should implement or participate in an effective operating experience programme. A graded approach should be applied so that the participation in such a programme is commensurate with the risks associated with the activities at the installation and with the role of the organization.

2.3. Requirement 24 of SSR-2/2 (Rev. 1) [1] states that: "The operating organization shall establish an operating experience programme to learn from events at the plant". Paragraph 5.27 of SSR-2/2 (Rev. 1) [1] states further that: "It shall obtain and evaluate available information on relevant operating experience at other nuclear installations to draw and incorporate lessons for its own operations. Relevant lessons from other industries shall also be taken into consideration, as necessary." Similar requirements apply to research reactors (Requirement 88 and para. 7.126 of SSR-3 [2]) and to nuclear fuel cycle facilities (Requirement 73 and para. 9.133 of SSR-4 [3]). Operating experience from other industries with stringent safety requirements (e.g. chemical plants, air or sea transport) should be used, as far as such information can be obtained with commensurate effort.

2.4. An effective operating experience programme should include the following main elements:

(a) Identification and reporting of internal operating experience;

(b) Collection of external operating experience[4];

[4] In the context of this Safety Guide, external operating experience is experience from outside the installation,

(c) Screening of operating experience and immediate review of events of specific interest;

(d) Investigation and in-depth analysis of relevant operating experience;

(e) Trending and review for timely recognition of developing issues;

(f) Management of corrective actions resulting from investigation and analysis of operating experience, including approval, implementation, tracking and evaluation of their effectiveness;

(g) Use, dissemination and exchange of operating experience, including through national and international reporting systems;

(h) Review of the effectiveness of the operating experience programme;

(i) Maintenance of a storage, retrieval and documentation system for operating experience.

2.5. A schematic diagram of a typical operating experience programme containing the recommended elements is shown in Fig. 1.

whether from within the same State or another State, from installations that use similar technologies or those that use different ttechnologies.

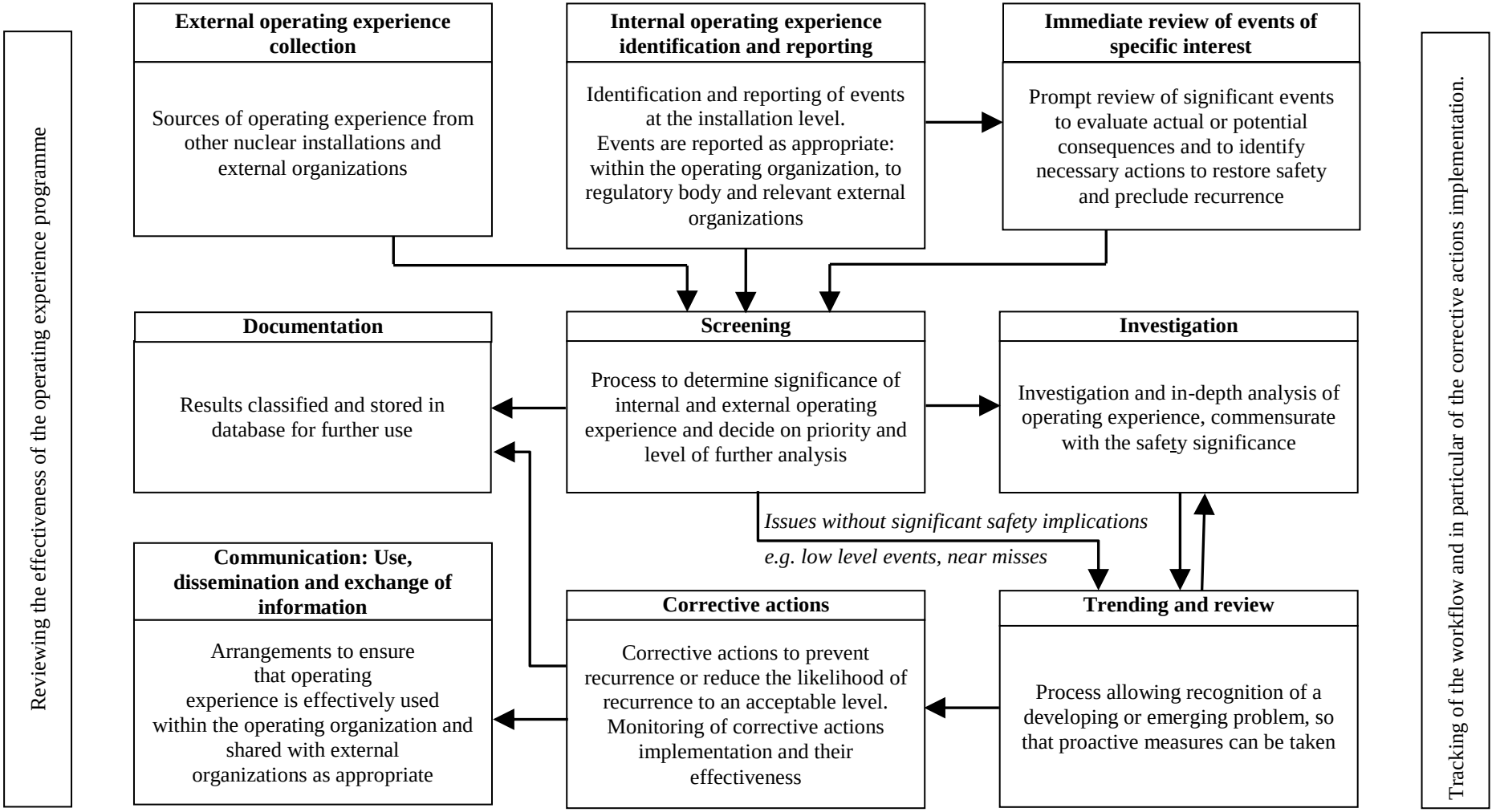

FIG. 1. Schematic diagram of a typical operating experience programme.

2.6. The organizational framework for an operating experience programme will depend on the operating organization's structure. An operating organization with a single nuclear installation should perform all functions of the operating experience programme for that installation. An operating organization that has multiple installations may judge it appropriate to centralize some of the operating experience functions such as:

(a) Coordination of and support for the handling of internal operating experience to ensure compliance with the organization's processes;
(b) The screening and analysis of external operating experience and dissemination among the relevant installations;
(c) Training of personnel on the operating experience programme;
(d) Independent investigation of significant events as necessary.

2.7. The exchange of experience with national and international systems for the feedback of operating experience may be supported by external organizations (for example, there may be industry organizations or other national organizations through which reporting might be routed).

THE MANAGEMENT SYSTEM AND THE ROLE OF MANAGEMENT

2.8. In support of Requirement 13 on measurement, assessment and improvement of the management system, GSR Part 2 [4] states that:

> "The management system shall include evaluation and timely use of … Lessons from experience gained and from events that have occurred, both within the organization and outside the organization, and lessons from identifying the causes of events … [and] Lessons from identifying good practices".

2.9. Within the management system, management should plan and establish an operating experience programme at the beginning of lifetime of the installation so that relevant operating experience can be collected, analysed and disseminated throughout the lifetime of the installation including decommissioning. Management should ensure that the findings of operating experience are used for learning at all levels of the organization and in all areas important for safety.

2.10. The management system should include procedures for activities at the installation for the feedback of operating experience as part of the operating experience programme to prevent recurrence of events and to enhance safety.

2.11. The responsibility of management for fostering a strong safety culture includes a requirement to advocate and support "reporting of problems relating to technical, human and organizational factors and reporting of any deficiencies in structures, systems and components to avoid degradation of safety, including the timely acknowledgement of, and reporting back of, actions taken" (GSR Part 2 [4], para. 5.2). Paragraph 5.31 of SSR-2/2 (Rev. 1) [1] states further that:

> "The operating organization shall be responsible for instilling an attitude among plant personnel

that encourages the reporting of all events, including low level events and near misses[5], potential problems related to equipment failures, shortcomings in human performance, procedural deficiencies or inconsistencies in documentation that are relevant to safety."

2.12. Management should foster a 'just culture'[6] in which shortcomings in human performance are used as learning opportunities. Open reporting of potentially useful experience and a questioning attitude should be encouraged and reinforced at all organizational levels.

2.13. Management's decisions regarding the operating experience programme should be driven by maintaining and improving safety performance to meet the overriding priority of protecting people and the environment against radiation risks.

2.14. Management should proactively help to highlight at the organizational and management levels the importance of operational safety issues.

2.15. Management should foster a positive environment for creating, maintaining and continuously improving the operating experience programme.

2.16. Management should ensure that the operating experience programme has sufficient dedicated, suitably trained and qualified, and experienced staff.

2.17. Management should ensure that the operating experience programme is adequately supported, including with the necessary infrastructure and information technology tools to allow all staff easy access to relevant operating experience information.

2.18. Management should ensure that there are adequate resources to support the continued operation and development of the operating experience programme.

2.19. Management should ensure that all personnel are informed about the objectives of the operating experience programme and their role in its implementation. Expectations for identifying and reporting of events, performance weaknesses or negative trends, and of opportunities for improvement and good practices, should be communicated effectively to ensure they are followed by everyone at the installation, including contractors. Communication of the expectations should be through formal means such as briefings and group meetings, written instructions and training, through informal means such as newsletters and information systems, and by example, supervision and coaching.

2.20. Management should ensure that corrective actions resulting from the operating experience programme are given appropriate priority within budgetary and staffing plans to ensure that that are

[5] A 'near miss' is an event that could have become significant as a result of a sequence of occurrences that actually occurred, but did not become significant owing to the conditions prevailing at the time at the installation.

[6] A just culture is an organizational culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated

implemented, with follow-up to review their effectiveness.

2.21. Management should ensure that records of the operating experience programme are maintained, are easily retrievable and are retained for an appropriate period (if necessary for the life of the installation).

2.22. Management should monitor and review the effectiveness of the operating experience programme on a regular basis, at a frequency commensurate with the type of installation and the number and significance of operating experience issues arising.

IDENTIFICATION AND REPORTING

2.23. Operating organizations should identify and feed into their operating experience programme all issues such as events (including low level events and near misses), potential problems related to equipment and human performance, safety related concerns, situations that are likely to give rise to errors and need to be addressed to prevent undesired effects, procedural deficiencies and inconsistencies in documentation, as well as opportunities for improvement and good practices that are relevant to safety.

2.24. The sources of operating experience should include: documentation relating to the design, construction and decommissioning of the installation, the fabrication, installation, and dismantlement of equipment and the procurement and testing of goods and services; operational, maintenance and audit records; and results from regulatory inspections and reviews, training sessions, walk-downs, trending, surveillance, benchmarking, peer reviews, self-assessments and safety and risk analyses. Issues involving non-conforming, counterfeit, fraudulent or suspect items or parts should also be identified and reported within the operating experience programme.

2.25. Operating organizations should develop procedural guidelines outlining reporting criteria appropriate for the type of installation being operated and consistent with national regulatory requirements. Further guidance on reporting is given in the Appendix.

2.26. Issues should be identified and reported promptly to facilitate timely screening and follow-up.

2.27. Identification and reporting of low level events and near misses should be encouraged and included into the operating experience programme, since such events can provide valuable lessons to help avoid more significant events.

2.28. Everyone in the operating organization should be able to report any issues that they encounter. The operating experience reporting system should be easily accessible to all personnel within the operating organization, and should be user friendly, and computerized wherever possible. Contractor personnel should have access to operating experience reporting system when relevant for them. Anonymous reporting should be possible.

2.29. Individuals who report issues should receive feedback, due acknowledgment and recognition

from management to encourage future reporting. Good examples of reporting should be widely communicated within the installation to encourage future reporting and a questioning attitude.

2.30. A process should be put in place to ensure that preliminary reports on issues and events that challenge (or have the potential to challenge) safety are reported to designated individuals in the operating organization, to the regulatory body and to relevant external organizations in a timely manner.

SCREENING

2.31. In order to apply a graded approach to operating experience, identified issues should be screened in a timely manner to evaluate their significance based on their actual or potential consequences for safety. Written guidance with established criteria for significance should be used for the screening process. The screening process should determine the type of investigation or level of analysis for all reported issues, and necessary compensating or mitigating actions should be initiated commensurate with the significance of the issues.

2.32. Management should assign a suitably experienced, knowledgeable, multidisciplinary team to the screening task. The team should include personnel with knowledge of relevant technical matters and of human and organizational factors. The screening team should have management support and the authority to allocate the responsibilities necessary to carry out the investigation and analysis of the issues or events.

2.33. Screening criteria should include the actual or potential consequences of reported issues for nuclear safety, radiation protection, protection of the environment and non-radiation-related safety.

2.34. Screening should include consideration of possible implications of an issue for other areas of the installation or the operating organization from those in which the issue was reported.

2.35. Screening should include identifying and prioritizing any immediate actions that might be necessary, in accordance with the safety significance and potential for recurrence of a particular issue or to the significance of a developing adverse trend.

2.36. Screening of operating experience should also take into account relevant information from other interested parties (e.g. vendors, suppliers, designers and research institutions).

2.37. External operating experience (from other nuclear installations and other organizations) should also be identified and screened for applicability to the installation (as well as significance for safety). Such operating experience should not be dismissed, for example, solely on the basis of differences in design or equipment; all relevant aspects should be considered. Screening for applicability should include consideration of aspects such as:

(a) Whether there are generic implications that may apply to the installation;
(b) Whether there is similar equipment at the installation;

(c) Whether there are similar practices at the installation;

(d) The possible occurrence of a similar event at the installation;

(e) Whether reported corrective actions are applicable to the installation.

2.38. In operating organizations with nuclear installations based in several locations, a centralized group may be considered to conduct screening of external operating experience.

2.39. When external operating experience is determined to be significant but not applicable to the installation, the basis for this decision should be documented.

2.40. The results from screening of all operating experience (internal and external) should be recorded and may be used for evaluation in subsequent self-assessments, periodic safety assessments or peer reviews. Investigation

INVESTIGATION

2.41. Paragraph 5.28 of SSR-2/2 (Rev. 1) [1] states that:

> "Events with safety implications shall be investigated in accordance with their actual or potential significance. Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organizational factors. The results of such analyses shall be included, as appropriate, in relevant training programmes and shall be used in reviewing procedures and instructions. Plant event reports and non-radiation-related accident reports shall 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."

Similar requirements apply to research reactors (para. 7.127 of SSR-3 [2]) and to nuclear fuel cycle facilities (para. 9.134 of SSR-4 [3]).

2.42. The operating organization should implement procedures with criteria 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 likelihood of its recurrence. Events should be investigated using appropriate analysis techniques.

2.43. The level of investigation and analysis applied should be commensurate with the significance of the event. For example:

(a) In the case of an event with the potential to provide major lessons (e.g. an event with severe actual or potential consequences, or significant consequences and a high likelihood of repetition), a formal root cause analysis, tailored to the type of the event, should be performed. The root cause analysis should be conducted by a team with appropriate skills and knowledge relevant to the nature of the event;

(b) For an event providing fewer and/or less important lessons (e.g. an event with moderate actual or potential consequences), the apparent causes should be identified and corrected;
(c) Adverse trends, including those consisting of minor issues, should be reviewed for safety significance and, where necessary, investigated using appropriate techniques to identify causes and generic implications.

2.44. Management should assign to investigations individuals with the necessary technical knowledge and with skills in investigation techniques. At least one individual on each team conducting root cause analysis should have received formal training in root cause analysis, regular retraining and have recent experience in the conduct of root cause analysis in investigations.

2.45. Procedures should be developed and implemented setting out how investigations should be conducted, including defining the scope and mandate of the investigation, the methodology to be followed, the timeframe, specific techniques and tools to be used, the composition of the investigation team and the format of the final report.

2.46. Investigations should be performed without undue managerial or organizational influence over the results. Events with significant implications for safety should be investigated by a team with sufficient independence from the line management to identify and address organizational issues objectively.

2.47. The investigation should be started as soon as practicable, consistent with maintaining the safety of the installation, to ensure that important information is not lost, invalidated or removed..

2.48. In the case of events for which root cause analysis is necessary, the analysis should document the following:

(a) The complete event sequence (what happened, including how the event developed);
(b) A cause analysis identifying human, technology and organizational factors and other contributing factors (why it happened);
(c) The assessment of the safety significance (what could have happened);
(d) An evaluation of the immediate or compensatory actions taken;
(e) Corrective actions identified to prevent recurrence;
(f) A strategy for the determination of effectiveness of the corrective actions;
(g) An evaluation of the extent to which similar conditions are present in other structures, systems and components or processes at the installation, or in human performance in the organization (‘extent of condition’);
(h) An evaluation of the extent to which similar specific root or underlying causes could affect the safety of other structures, systems and components or processes at the installation, or in human performance in the organization (‘extent of cause’).

2.49. Relevant internal and external operating experience should be reviewed in an investigation to

identify any other similar events and to learn from industry experience. If a previous similar event is found to have occurred at the installation, then the corrective actions taken then should be reviewed to identify why the event recurred and to identify more effective corrective actions.

2.50. Issues identified in the investigation but not relevant to the causes of the event should be documented and reported through the established reporting system.

2.51. In cases where root cause analysis has been carried out, a multidisciplinary management team should review the completed investigation to provide additional assurance that all causes and organizational issues have been identified and that corrective actions have been developed to address the causes.

2.52. The level of analysis applied to external operating experience should be commensurate with the significance of the operating experience and its applicability to prevent similar events or reduce the likelihood of their occurrence at the installation.

TRENDING AND REVIEW

2.53. Paragraph 5.29 of SSR-2/2 (Rev. 1) [1] states that: "Information on operating experience shall 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." Similar requirements apply to research reactors (para. 7.128 of SSR-3 [2]) and to nuclear fuel cycle facilities (para. 9.136 of SSR-4 [3]).

2.54. The operating organization should establish a trending and review process to allow recognition of developing or emerging problems, so that proactive measures can be taken before serious conditions arise. Trending and review should be performed at the installation level and at the operating organization level.

2.55. Operating experience data should be collected and stored in a database to enable the timely identification and review of adverse trends and recurring themes. Attributes of each event or issue should be coded on the basis of, as a minimum, the affected structures, systems and components, the identified causes and the actual or potential consequences for safety.

2.56. Such codes should be assigned by designated individuals with appropriate skills and knowledge to ensure consistency in coding. Where applicable, the coding system should be harmonized between the installations of an operating organization, and may be harmonized with coding systems used in other national or international databases of operating experience, to facilitate the exchange of information.

2.57. The types of trend (including trends in low level events and near misses) that should be identified and reviewed include the following:

(a) Recurring issues occurring in several relevant reported events;

(b) Events or issues arising particularly in certain operating modes or during certain activities;
(c) Recurring failures or degraded performance of particular systems or components;
(d) Trends in causes of identified events or issues;
(e) Adverse trends in human and organizational performance;
(f) Trends involving small incremental changes over a long period of time;
(g) Trends identified by comparing current performance to a previous similar operating condition (for example comparing two outages);
(h) Positive trends.

2.58. An appropriate review should be conducted in response to identified adverse trends. The level of analysis in the review should be based on the significance for safety of the events or issues and the nature and speed of the changes that constitute the trend. For significant trends, root cause analysis should be conducted. Reviews should identify generic issues and derive generic lessons.

2.59. Operating experience trend reports should be provided to an appropriate level of management at regular intervals for review and action to prevent higher level events from occurring.

CORRECTIVE ACTIONS

2.60. Paragraph 5.30 of SSR-2/2 (Rev. 1) [1] states that:

> "As a result of the investigation of events, clear recommendations shall be developed for the responsible managers, who shall take appropriate corrective actions in due time to prevent recurrence of the events. Corrective actions shall be prioritized, scheduled and effectively implemented and shall be reviewed for their effectiveness. Operating personnel shall be briefed on events of relevance and shall take the necessary corrective actions to make their recurrence less likely."

2.61. Recommendations on corrective actions resulting from analysis of external operating experience should be developed to prevent similar events or reduce the likelihood of their occurrence at the installation.

2.62. Corrective actions should be prioritized on the basis of safety considerations. Safety should not be compromised by any corrective action.

2.63. The line management responsible for implementation of a corrective action should be included in its development. Personnel at the appropriate management level should be held accountable for the effective implementation of corrective actions.

2.64. Senior management should review and approve important corrective actions resulting from internal and external operating experience. Important corrective actions may include those to prevent recurrence of significant internal events and those to address significant external operating experience of particular relevance to the installation.

2.65. A periodic evaluation should be carried out to review the status of corrective actions that have not been completed and the effectiveness of those that have.

2.66 Important corrective actions that have not been completed should be assessed periodically in aggregate to check whether the risk to the installation is still acceptable. Extensions to deadlines for, or modification or cancellation of important corrective actions should be minimized, and only with the approval of senior management of the installation. The effectiveness of important corrective actions should be reviewed after their completion.

2.67. If recommended corrective actions will take a long time to implement, interim or compensatory corrective actions should be put in place to minimize the risk.

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

COMMUNICATION: USE, DISSEMINATION AND EXCHANGE OF INFORMATION

2.68. Paragraph 5.27 of SSR-2/2 (Rev. 1) [1], para. 7.126 of SSR-3 [2] and para. 9.133 of SSR-4 [3] state that the operating organization "shall also encourage the exchange of experience within national and international systems for the feedback of operating experience."

2.69. Paragraph 5.32 of SSR-2/2 (Rev. 1) [1] states that:

> "The operating organization shall maintain liaison, as appropriate, with support organizations (e.g. manufacturers, research organizations and designers) involved in the design, construction, commissioning and operation of the plant 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."

Similar requirements apply to research reactors (para. 7.129 of SSR-3 [2]) and to nuclear fuel cycle facilities (para. 9.137 of SSR-4 [3]).

2.70. Relevant operating experience should be shared with other organizations in a timely manner at appropriate levels (e.g. at the level of designers, constructors, installations or operating organizations, or national and international organizations). Recipients for different specified types of information may include organizations with planned or ongoing nuclear power programmes, technical support organizations in the nuclear field, vendor companies including designers, engineering contractors and manufacturers, regulatory bodies, and centralized international reporting systems.

2.71. Lessons learned from internal and external operating experience should be used by the operating organization in relevant activities such as training, revision of procedures, work management, design and modification of the installation.

2.72. Personnel should understand how to use operating experience and should apply the lessons from operating experience to improve safety and prevent events. This use should be actively encouraged and reinforced by management.

2.73. Relevant operating experience should be made readily accessible in a user friendly form (with due regard for the sensitive nature of certain information) to all operating organization personnel for use in their work, for example in pre-job briefings, management meetings, and planning outages.

2.74. Legal requirements and commercial interests may restrict the dissemination of some information. 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. In particular, information that could affect nuclear security should be identified and its confidentiality should be protected as required by national law or regulation. Guidance on information security can be found in the Implementing Guide on Security of Nuclear Information, IAEA Nuclear Security Series No. 23-G [14].

REVIEWING THE EFFECTIVENESS OF THE OPERATING EXPERIENCE PROGRAMME

2.75. Paragraph 5.33 of SSR-2/2 (Rev. 1) [1] states that: "The operating experience programme shall be periodically evaluated to determine its effectiveness and to identify any necessary improvements."

2.76. The effectiveness of the operating experience programme should be assessed using methods such as self-assessment, benchmarking and independent peer review[7]. Such assessment should be carried out by teams of experienced personnel who are familiar with the operating experience programme.

2.77. Criteria and performance indicators for assessing the effectiveness of the main elements of the operating experience programme should be developed and implemented. Performance indicators should include both process based and result based indicators.

2.78. The operating organization should issue a periodic report that summarizes the results of effectiveness reviews of the operating experience programme, and should identify in that report areas for improvement to address the issues identified. The report should also include the results of evaluations of the implementation of the lessons from operating experience and effectiveness of corrective actions.

DOCUMENTATION

2.79. The operating organization should establish and maintain a system for the storage, retrieval and searching of operating experience. Effective searching of the system should be possible using an appropriate coding or keyword system.

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

2.80. Relevant operating experience information should be retained for use throughout the installation's operating lifetime, including as input for periodic safety review, probabilistic safety assessment and ageing management.

ROLE OF THE REGULATORY BODY IN OPERATING EXPERIENCE FEEDBACK

GENERAL

3.1. The regulatory body and all other organizations with responsibilities for safety should foster mutual understanding and respect through honest and open communication, including on operating experience. Such communication should include safety related issues that are not covered by formal reporting requirements, consistent with Requirement 21 of GSR Part 1 (Rev.1) [5] and Requirement 12 of GSR Part 2 [4]. Specifically, such communication may also include good practices and positive occurrences.

3.2. All regulatory bodies with safety related responsibilities should establish and implement an effective operating experience process. A graded approach should be used to apply the process in a manner commensurate with the risks associated with the activities at the regulated installation(s).

3.3. The regulatory body should develop national regulations requiring operating organizations to establish and maintain operating experience programmes and ensure that operating experience is appropriately analysed, that lessons to be learned are disseminated, and that appropriate records related to the safety of facilities and activities are saved and are available. The regulatory body should ensure that such programmes are in place at operating organizations. Such programmes should be consistent with the recommendations in Section 2.

3.4. The regulatory body should also establish and implement an internal operating experience programme. The regulatory operating experience programme should include operating experience reported by operating organizations and regulatory experience. In accordance with Requirement 15 of GSR Part 1 (Rev. 1) [2], "The regulatory body shall make 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 and for their use by authorized parties, the regulatory body and other relevant authorities". The information disseminated should include information that is not necessarily captured by the individual operating experience programmes for installations (e.g. information from research and development activities, inspection findings, international forums, licensing activities and regulatory peer review missions, and regulatory experience from other industries) but which could be useful in improving the regulatory framework.

3.5. The regulatory body should ensure that the operating experience process is suitable not only for the types of event typically experienced but also for very significant or major events (such as severe accidents at nuclear installations).

3.6. In accordance with Requirement 22 of GSR Part 1 (Rev. 1) [5], the regulatory body should ensure that regulations and regulatory procedures and arrangements relating to operating experience are stable and consistent as well as practicable. The basis for proposed changes in regulatory requirements should be discussed with interested parties before implementation.

3.7. The focus and specific arrangements of the operating experience process may differ depending on the regulatory body's particular responsibilities. Nevertheless, the regulatory operating experience process should include the following:

(a) Collection of domestic operating experience (from within the State), other national operating experience (from other States) and international operating experience (from international reporting systems);
(b) Screening of operating experience and immediate review of events of specific interest;
(c) Investigation and analysis of relevant operating experience, commensurate with its significance for safety;
(d) Trending and review for timely recognition of developing issues;
(e) Identification and enforcement of appropriate corrective actions to be taken by the operating organization to prevent recurrence of events and to improve safety;
(f) Identification and implementation of corrective actions to improve regulatory body processes based on operating experience;
(g) Dissemination and exchange of information, including through international systems;
(h) Periodic review of the effectiveness of the operating experience process;
(i) Maintenance of a system for the storage, retrieval and documentation of operating experience.

3.8. A schematic diagram of a typical regulatory operating experience process containing the recommended elements is shown in Fig. 2.

3.9. The regulatory operating experience programme should be managed by appropriately trained, experienced and knowledgeable personnel, and where possible supported by experts from different disciplines, to facilitate the determination of appropriate regulatory response to an issue.

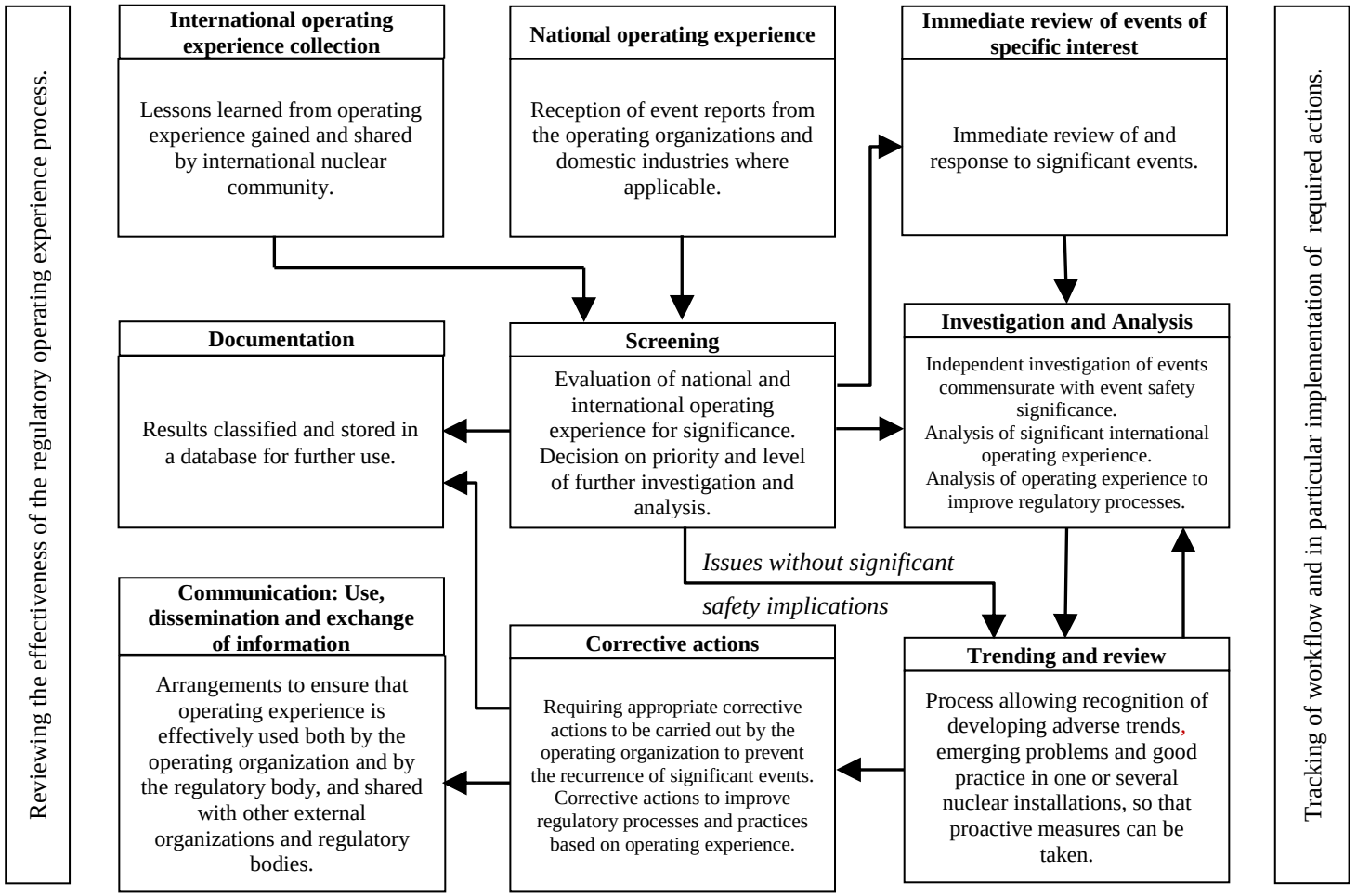

FIG. 2: Schematic diagram of a typical regulatory operating experience process.

THE MANAGEMENT SYSTEM

3.10. Paragraph 6.7 of GSR Part 2 states that: "The management system shall include evaluation and timely use of … lessons from operating experience, both within the organization and outside the organization, and lessons from identifying the causes of events". This should include domestic operating experience, other national operating experience and international operating experience.

3.11. The regulatory body's management system should provide for lessons from operating experience to be incorporated into the relevant regulatory processes. Regulations and guides should be reviewed and revised as necessary to keep them up to date, with due consideration of relevant operating experience gained.

3.12. The regulatory body's operating experience process should be adequately resourced and all personnel should be trained appropriately for their roles in the process in order to meet the operating experience programme objectives.

REPORTING

3.13. The regulatory body should specify criteria for determining which events operating organizations are required to report to it, and requirements for the reporting to be provided for such events. The criteria and the requirements should apply a graded approach based on the actual or potential consequences for safety.

3.14. The minimum criteria indicating events that should be required to be reported to the regulatory body are provided in para. I.1 of the Appendix.

3.15. The reporting criteria should cover the stages of the nuclear installation's lifetime including design, construction, commissioning, operation and decommissioning. They should also include consideration of subjects such as occupational protection, fire safety and protection of the environment if such events would not be reported under other regulations.

3.16. The regulatory body should specify requirements for the types of event report, the timing of reporting and the format and content of the different reports. Paragraphs I.2–I.7 of the Appendix provide details of appropriate reporting requirements.

SCREENING

3.17. In addition to operating experience reported by the operating organizations, other relevant information should be included in the regulatory body's screening process. This other information may include reports on operating experience produced by other regulatory bodies or by international forums, relevant information from the databases of international operating experience reporting systems (e.g. those described in the Annex) and the results of other international topical studies.

3.18. Screening should be based on the actual or potential significance of the event for safety. The screening process should be formalized such that the results can be explained on the basis of

established criteria.

3.19. The screening of reports from operating organizations regulated by the regulatory body should include confirming the accuracy, completeness and timeliness of the report and its consistency with the prescribed reporting criteria and requirements. The regulatory body should obtain clarification or further information from the operating organization if necessary.

3.20. The screening process may identify information for onward dissemination, a need for further investigation of the issue or further trending, or necessary regulatory actions.

INVESTIGATION

3.21. The regulatory body should establish requirements for the investigation of events reported by the operating organization, commensurate with the safety significance of the event. Criteria for requiring investigations should include, in addition to safety significance, the presence of novel causes, the existence or likelihood of repeat occurrences, and the potential for generic lessons to be identified.

3.22. The regulatory body should establish procedures for its own independent investigation of events at an installation, and for the analysis of international operating experience. Investigations and analyses should be carried out using a graded approach in accordance with the findings of the screening process. Such investigations may include reactive inspections.

TRENDING AND REVIEW

3.23. The regulatory body should analyse the information from reported events, investigations and other sources of operating experience to identify trends and patterns. As appropriate, these analyses may also include consideration of information on issues not meeting criteria for formal reporting, such as low level events and near misses.

3.24. Reviews of operating experience should include evaluation of potential generic issues and should draw generic lessons from investigations and analyses of significant operating experience when applicable.

CORRECTIVE ACTIONS

3.25. Based on the results of independent investigations, analyses and reviews of operating experience, the regulatory body should require appropriate corrective actions to be taken by the operating organization when they are considered necessary to improve safety and prevent recurrence of events with significance for safety. The requirements imposed by the regulatory body should be commensurate with the significance for safety, in accordance with a graded approach.

3.26. The regulatory body should monitor the operating organization’s implementation of the required corrective actions to ensure that it is effective.

3.27. The regulatory body should identify corrective actions to improve its management system, regulatory requirements and regulatory practices where relevant to address applicable lessons from operating experience.

COMMUNICATION: USE, DISSEMINATION AND EXCHANGE OF INFORMATION

3.28. Requirement 15 of GSR Part 1 (Rev.1) [5] states that: "The regulatory body shall make arrangements for … the dissemination of the lessons [from operating experience] and for their use by authorized parties, the regulatory body and other relevant authorities." Paragraph 3.5A of GSR Part 1 (Rev.1) [5] states that: "Relevant information and lessons from operating experience and regulatory experience shall be reported in a timely manner to international knowledge and reporting networks."

3.29. Legal requirements and commercial interests may restrict the dissemination of some operating experience. 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. In particular, information that could affect nuclear security should be identified and its confidentiality should be protected as required by national law or regulation. Guidance on information security can be found in Ref. [14]. Particular care should be taken when disseminating information not to jeopardize ongoing technical assessments or investigations.

3.30. The regulatory body should put procedures in place to review operating experience from other States and from international reporting systems and share it with domestic operating organizations where applicable. Procedures should also be put in place for sharing domestic operating experience with the international community, for example through international reporting systems (e.g. those described in the Annex) as well as through working groups and regular contacts with other regulatory bodies. These activities can also be enhanced through bilateral and multilateral agreements between States. The information shared should include details of any cases in which regulatory experience was used to make enhancements to the regulatory framework in accordance with Requirement 15 of GSR Part 1 (Rev.1) [5].

REVIEWING THE EFFECTIVENESS OF THE OPERATING EXPERIENCE PROGRAMME

3.31. The regulatory body should periodically inspect operating organizations to ensure that their operating experience programmes are effective and consistent with the recommendations in Sections 2 and 3. The regulatory body should verify that operating experience has been adequately used where appropriate. Additional inspections of the operating experience programme or parts thereof should be undertaken if shortcomings are identified relative to regulatory requirements.

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

DOCUMENTATION

3.33. The regulatory body should establish and maintain a system for the storage, retrieval and searching of operating experience. Effective searching of the system should be possible using an appropriate coding or keyword system.

APPENDIX

TYPES OF EVENT REPORT, TIMING, FORMAT AND CONTENT

A.1. The regulatory body should specify the criteria for the types and severity of events that are required to be reported by operating organizations. As a minimum, these should cover the following types of event:

(a) Any installation shutdown required by the operational limits and conditions;
(b) Any operation or condition prohibited by the operational limits and conditions;
(c) Any event or abnormal condition that resulted in the condition of the installation, including its principal safety barriers, being seriously degraded;
(d) 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;
(e) Any event or abnormal condition that resulted in the manual or automatic operation of a protection system or of other engineered safety features;
(f) Any event in which a single cause or condition caused a significant loss of operability of a safety system;
(g) 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;
(h) Any event that posed an actual threat to the safety of the installation or that significantly hampered site personnel in the performance of duties necessary for safe operation, including fires, releases of toxic materials and radioactive releases;
(i) Declaration of an emergency class [11, 16] as specified in the emergency plan;
(j) 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;
(k) Any event that results in the death of or serious injury to personnel at the installation.

A.2. As a minimum, the reporting requirements should include:

(a) A preliminary report, providing information relating to events that challenge (or have the potential to challenge) safety, or other events as specified by the regulatory body. Acceptable communication methods and timeframes for the preliminary report should be specified by the regulatory body;
(b) A main report, providing a detailed report of events after sufficient time has passed to allow for completion of investigations, or to notify the regulatory body of changes compared to the preliminary report. As a minimum, the main report should include: description of the event sequence including all failures, identification of direct causes and root causes, contributing

factors, analysis of the potential for common cause or common mode failures, analysis of the extent of conditions and extent of cause, and description of short, medium and long-term corrective actions. Lessons from any previous related occurrences either at the same installation or at others should be captured. The report should include consideration of technical, human and organizational aspects and external factors;

(c) If new facts come to light or now insights are gained, the main report should be complemented by follow-up reporting;

(d) Periodic reporting of operating experience information, provided routinely, or as specified by the regulatory body, on regular, agreed timescales (e.g. results of trend analysis of low level events or other trending data, periodic safety assessment reports).

A.3. The preliminary report should contain:

(a) Identification of the installation affected;

(b) Descriptions of the status of the installation at time of the event and at present;

(c) The date and time of the event and its detection;

(d) A brief description of the event sequence;

(e) Details of any radiation exposure or injury to personnel and any radioactive release;

(f) Descriptions of any immediate actions taken;

(g) An initial assessment of the actual and potential safety consequences and implications of the event;

(h) Contact details for enquiries or further information.

A.4. It may also contain a provisional International Nuclear and Radiological Event Scale (INES) rating for those States that use INES [17, 18].

A.5. The preliminary report should be followed by a brief written confirmation, as appropriate, to ensure that adequate information has been transferred. Before the main report is submitted, additional information may need to be submitted for reasons such as the following:

(a) Further degradation in the level of safety of the installation, or recovery from a degraded level of safety;

(b) Major changes in the assessed significance of the event, as a result of developments or of further evaluation;

(c) New information;

(d) The need to correct factual errors.

A.6. A main report should then be prepared by the operating organization. This report should be submitted to the regulatory body (and possibly other organizations, such as technical support organizations, in accordance with 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, a follow-up report should be submitted to

finalize the main report.

A.7. 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:

(a) Basic information (e.g. the date of identification of the event, method of detection, extent of condition as appropriate, the manufacturer, component model or part number of relevant equipment) and confirmation of the information transmitted in the preliminary report);
(b) A narrative description of the course of the event;
(c) The assessment of significance for safety (consequences and implications);
(d) Explanation of the direct and root causes and any other causal factors;
(e) Description of any corrective actions taken and/or planned;
(f) Lessons identified;
(g) Keywords with their respective codes for classification of the event in databases.

A.8. The operating organization should include in the main report sufficient technical detail for persons familiar with the design of the 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 relevant international reporting systems [18, 19, 20] may be considered for adoption in national systems for the feedback of operating experience, to link national and international systems more effectively.

A.9. 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 if the regulatory body requests such information and assessments to complete its understanding of an event. When such a request is made by the regulatory body, 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 is gained from further investigations, 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 as possible information to be exchanged internationally.

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ANNEX

INTERNATIONAL SYSTEMS FOR THE FEEDBACK OF OPERATING EXPERIENCE

A–1. Intergovernmental and international nongovernmental organizations support the activities of their members, including regulatory bodies and operating organizations. One function of these organizations is to facilitate and promote sharing of operating experience among their members. Some of these organizations maintain databases for recording, storage and retrieval of operating experience by their respective members. This Annex describes three such databases maintained by the IAEA: the International Reporting System for Operating Experience (IRS); the Incident Reporting System for Research Reactors (IRSRR); and the Fuel Incident Notification and Analysis System (FINAS).

A–2. Such organizations may arrange forums, working groups, and technical meetings to exchange, evaluate and document information on operating experience and on the programmes that manage operating experience.

A–3. Such organizations may also provide training for their members on the effective use and exchange of operating experience.

A–4. The IRS, IRSRR and FINAS are all included in a web-based common platform for incident reporting on the IAEA's Nucleus web portal. The system allows access to the authorized users only.

INTERNATIONAL REPORTING SYSTEM FOR OPERATING EXPERIENCE (IRS)

History of the IRS

A–5. The International Reporting System for Operating Experience (formerly the Incident Reporting System) (IRS) is operated jointly by the IAEA and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), and is a 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 for root causes analyses and lessons learned to be disseminated worldwide. A similar system has been created by the World Association of Nuclear Operators (WANO), which also provides its members with various briefings and reports based on reported events. The WANO system includes a web-based event reporting system that provides a flexible and efficient tool for operators to exchange information. The resilience of these systems has proven that feedback on international operating experience is possible and can lead to remedial action taken by States to improve nuclear safety.

A–6. The Incident Reporting System was created in 1979/1980 by the Committee on the Safety of Nuclear Installations of the NEA/OECD as a reaction to deficiencies in operating experience feedback highlighted by the Three Mile Island accident. The IRS was intended to be a system used by regulatory bodies that is open to operators and the nuclear industry. The objective of the IRS was the

timely exchange of information on operating experience in nuclear power plants to:

(a) Avoid the recurrence elsewhere of incidents taking place in one State;
(b) Facilitate analysing general safety issues and the sharing of experience;
(c) Assist in developing a larger data bank for potential analysis purposes;
(d) Contribute to the better regulation of nuclear power plants;
(e) Provide additional guidance for safety research programmes.

A–7. The IRS has functioned in accordance with guidelines agreed to by national nuclear regulatory bodies of the participating States. These guidelines can be summarized as follows:

(a) Participating States report any incidents in their nuclear power plants that are significant from a safety point of view;
(b) A detailed description of the incident is provided through the IRS, so that nuclear regulatory bodies can evaluate its technical significance;
(c) The IRS reports are distributed through the IRS coordinators designated by their participating States.

A–8. Reporting was based on two types of report; short reports to be provided within one month of the event and more detailed reports to be submitted within three months. To fulfil the objectives of the IRS, it was expected that, for all events, a detailed report would be sent to the IRS. Although reporting criteria had been established, selection of events to be reported to the IRS was mainly subject to the judgment of the coordinators, with the minimum reporting rate of one report per unit per year.

A–9. During the 1980s 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. experts in human factors and probabilistic safety assessment. 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 version of the database was created. More demanding requirements developed regarding the content of IRS reports, and particularly the quality of information in the reports, and therefore the requirements on reporting time were relaxed. However, it became increasingly difficult to fulfil the expectations of each interested party.

A–10. In 1994, the Convention on Nuclear Safety entered into force and gave a more formal 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."

A–11. With the creation of the first comprehensive database on the IRS, the Advanced Incident Reporting System (AIRS), in 1995, the responsibility for processing and reviewing reports (including quality checking) was transferred to the IAEA.

A–12. In 2006 the web-based IRS was created to facilitate efficient data input and report availability. 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. Each IRS report becomes part of this web-based system. Users are officially registered and appropriate levels of access are assigned to individuals in accordance with their roles, to maintain the security of the system. When a new report is posted on the web-based IRS, the users are automatically informed by email.

A–13. In 2010, the name of the system was changed to the 'International Reporting System for Operating Experience' to reflect the expanded view and use of operating experience feedback. The system kept the abbreviated name 'IRS'.

Description of the IRS

A–14. The objectives of the IRS are: to exchange important lessons learned from operating experience gained in nuclear power plants; to promote feedback on events of safety significance; to help prevent occurrences or recurrences of serious incidents or accidents; and to inform the international nuclear community of potentially safety significant issues.

A–15. The IRS is a worldwide system, containing events of safety significance only, reported on a voluntary basis, in a timely manner, and in English. Although such analysis may be possible, the IRS, is not intended to be a source for statistical studies nor component reliability studies.

A–16. The effectiveness of the IRS system, including timely sharing of important lessons learned from operating experience and ensuring proper feedback on those lessons learned, depends on national regulatory bodies. The primary users are the regulatory bodies and their technical support organizations. Operating organizations, utilities, vendor companies (design firms, engineering contractors, manufacturers, etc.), research establishments and universities can also be given access to help them in prevention of similar events.

A–17. Guidelines [I-1] and a coding manual [I-2] are available for the users and national coordinators of the IRS. The guidelines and the coding manual provide guidance on event report preparation, submission to the IRS, and specifically on the coding element of IRS reports, in order to ensure uniform coding of reported events. The guidelines and the coding manual support the national coordinators in achieving a consistent and high level of quality in their IRS reports. Once an event report is transmitted to the IRS system, it is the responsibility of national coordinators to decide on its further distribution for official use within their State.

A–18. The IRS increases worldwide awareness of potential and actual problems in nuclear power plant operations. It draws attention to those incidents that, if not dealt with in a timely fashion, could escalate to more serious events. 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.

Use of the IRS

A–19. 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 bodies. That database also contains preventive information as a result of corrective actions taken at other plants both inside and outside of the reporting 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.

A–20. 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 [I–3] 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.

A–21. Another potential use of IRS data is the application of operational feedback in the design of the next generation of nuclear power plants. Operating experience from nuclear power plants has demonstrated that design modifications documented in IRS reports can have a significant impact on safety.

A–22. More than 30 States are participating in IRS, including the large majority of those with operating nuclear power plants. In the framework of the operation of the IRS, regular technical meetings are organized to exchange information on safety related events, to discuss the operation of the IRS and to advise the IAEA on further improvements.

INCIDENT REPORTING SYSTEM FOR RESEARCH REACTORS (IRSRR)

History of the IRSRR

A–23. The Incident Reporting System for Research Reactors (IRSRR) is a system for collecting, maintaining and disseminating reports on events that are received from States participating in the

system. The objective of the IRSRR is to improve the safety of research reactors through the exchange of operating experience.

A–24. The IRSRR was established in 1997 to facilitate the exchange of information between research reactor facilities about events and the causes of and lessons from these events, to avoid recurrence of similar events in other facilities. The IRSRR is a web based system administered by the IAEA and available through on its Nucleus web portal. Access to the IRSRR database is restricted to the nominated national and local coordinators.

A–25. The participating States benefit through the exchange of information on events worldwide, the lessons learned and the corrective actions taken by the operating organization. This heightens the awareness among the participating States to take actions to prevent similar events in their research reactors and can help in identifying appropriate actions.

A–26. The participating States also use the IRSRR for identifying trends and safety deficiencies of a generic nature. The analysis of events helps in identifying and implementing measures to mitigate the consequences of the events. 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. IRSRR data on operating experience can also be used in the design of the new research reactors.

Description of the IRSRR

A–27. Each participating State designates a national coordinator who is responsible for event reporting to the IRSRR. Reporting to the IRSRR is voluntary. Guidelines[8] for the IRSRR system and a user manual[9] are available from the IRSRR pages on the Nucleus web portal. Events that meet one or more of the following criteria could be considered as appropriate for reporting to the IRSRR:

(a) The event identifies important lessons that may allow the international research reactor community to prevent a recurrence of a similar event or to avoid the occurrence of a more serious event; or
(b) The event itself had significant consequences for safety or reduced the defence in depth significantly; or
(c) The event is a recurrence of similar events previously reported to IRSRR, but provides new lessons.

A–28. The report can be submitted in preliminary form, containing the known details at the time of reporting, in which case a subsequent 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

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[9] INTERNATIONAL ATOMIC ENERGY AGENCY, User Manual on Incident Reporting System for Research Reactors, IAEA, Vienna (2009)

submitted.

A–29. The report contains the date of the event, an abstract, narrative description of the event, a preliminary assessment of safety significance (including identification of the direct causes, consequences and implications), results of any root cause analysis and details of any corrective actions and lessons learned. The written report is often supported by drawings, sketches or other means of illustration. The national coordinator also identifies the categorization codes for the important aspects of the event in accordance with the codes listed in the IRSRR guidelines, and assigns the report as 'specific' or 'generic'.

Use of the IRSRR

A–30. Biennial meetings of national (and local) coordinators are 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 likelihood of similar events. Experts also provide training to the participants on event investigation techniques.

A–31. Access to IRSRR reports is restricted to the authorized national coordinators of the participating States. Information contained in the reports is technical, and may be proprietary, and is not intended for distribution to the general public. This restriction encourages openness among the participating States to disclose the event details.

A–32. More than 50 States are participating in IRSRR.

FUEL INCIDENT NOTIFICATION AND ANALYSIS SYSTEM (FINAS)

History of FINAS

A–33. The objective of the Fuel Incident Notification and Analysis System (FINAS) is to provide an international focal point for operating experience for nuclear fuel cycle facilities worldwide with the aim of improving the safety of such installations. 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. The collection, evaluation and dissemination of event reports help to prevent the occurrence or recurrence of events of adverse significance for safety.

A–34. Following the establishment of an early prototype of the FINAS system at the OECD, operation of the web-based system was transferred to the IAEA in 2006. The overall system is now managed jointly by IAEA and NEA in accordance with the wishes of the national coordinators who constitute its steering committee.

Description of the FINAS

A–35. FINAS has about 30 members, representing around 90% of the world's nuclear fuel cycle facilities. The database covers events at nuclear fuel cycle facilities dating back to 1992.

A–36. Membership of FINAS is open to States with:

(a) One or more nuclear fuel cycle facilities in operation; or
(b) A nuclear fuel cycle facility that is not in operation but has not been decommissioned; or
(c) A project to build a nuclear fuel cycle facility.

A–37. The scope of FINAS includes any type of installation in the nuclear fuel cycle other than nuclear power plants, research reactors and radioactive waste disposal facilities. Associated activities relating to facilities in the scope of FINAS, such as radioactive waste management and decommissioning, are included. Facilities in the scope of FINAS include, but are not necessarily limited to:

(a) Uranium and thorium mines and mills;
(b) Refining facilities;
(c) Conversion facilities;
(d) Enrichment facilities;
(e) Fuel fabrication facilities;
(f) Radioisotope production facilities;
(g) Radioactive waste treatment and conditioning facilities;
(h) Nuclear fuel handling and intermediate storage facilities;
(i) Nuclear reprocessing facilities;
(j) Nuclear fuel cycle related research and development laboratories.

A–38. The transport of nuclear fuel is currently not considered a part of the reporting system (although individual States may make their own determination to report on specific cases).

Use of the FINAS

A–39. Information in FINAS is restricted, which means that authorized users can access and distribute information within their own organizations, but bulk copying or publication is prohibited. Users can access FINAS through the IAEA's Nucleus web portal. Users can be officially nominated by their national coordinator or by their government. National coordinators are also responsible for advising the IAEA when a user's access is to be terminated.

A–40. Guidelines for the FINAS system have been published [I–4] and a user manual is available from the FINAS pages on the Nucleus web portal.

A–41. National coordinators in 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 authorized personnel and feed back to FINAS when preventive and corrective actions are implemented in national fuel cycle facilities as a result of event reports from other States.

A–42. The IAEA and OECD/NEA take turns 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.

REFERENCES TO THE ANNEX

[I–1] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, IRS Guidelines: Joint IAEA/NEA International Reporting System for Operating Experience, IAEA Services Series No. 19, IAEA, Vienna (2010).

[I–2] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, Manual for IRS Coding: Joint IAEA/NEA International Reporting System for Operating Experience, IAEA Services Series No. 20, IAEA, Vienna (2011).

[I–3] INTERNATIONAL ATOMIC ENERGY AGENCY, OECD NUCLEAR ENERGY AGENCY, Nuclear Power Plant Operating Experience from the IAEA/NEA International Reporting System for Operating Experience 2009–2011, NEA No. 7120, OECD, Paris (2012).

[I–4] 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).

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