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Best Practices in Identifying, Reporting and Screening Operating Experience at Nuclear Power Plants

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BEST PRACTICES IN IDENTIFYING, REPORTING AND SCREENING OPERATING EXPERIENCE AT NUCLEAR POWER PLANTS

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FOREWORD

IAEA Safety Standards Series No. SF-1 entitled Fundamental Safety Principles: Safety Fundamentals states the need for operating organizations to establish a programme for the collection and analysis of operating experience in nuclear power plants. Such a programme ensures that operating experience is analysed, events important to safety are reviewed in depth, lessons learned are disseminated to the staff of the organization and to relevant national and international organizations, and corrective actions are effectively implemented.

This publication has been developed to provide advice and assistance to nuclear installations, and related institutions including contractors and support organizations to strengthen and enhance their own feedback process through the implementation of best practices in identifying, reporting and screening processes and to assess the effectiveness of the above areas.

To support a proactive safety management approach the nuclear installations are enhancing the operating experience feedback (OEF) processes. For this purpose, the nuclear industry is striving to collect more information on occurrences that are useful to address the early signs of declining performance and improve operational safety performance. In this environment a strong reporting culture that motivates people to identify and report issues is an important attribute. As a consequence, the number and diversity of issues identified increases, and there is a need to set thresholds of screening for further treatment. Thus, the establishment of an effective identification, reporting and screening process is very beneficial to streamline the efforts, and ensure that major incidents and latent weaknesses are being addressed and that operating experience is treated according to its significance. This leads to improved safety and production.

This publication was written to complement the publication IAEA Services Series No. 10 — PROSPER Guidelines — Guidelines for Peer Review and for Plant Self-assessment of Operating Experience Feedback Process. This publication is intended to form part of a suite of publications developing the principles set forth in the PROSPER guidelines. Other publications of these suite have already been published, namely IAEA-TECDOC-1477, Trending of Low Level Events and Near Misses to Enhance Safety Performance in Nuclear Power Plants and IAEA-TECDOC-1458, Effective Corrective Actions to Enhance Operational Safety of Nuclear Installations.

The IAEA wishes to thank all participants and their Member States for their valuable contributions. The person responsible for the preparation of this publication was F. Perramon of the Division of Nuclear Installation Safety.

EDITORIAL NOTE

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1. INTRODUCTION

1.1. Background

Operating experience is a valuable source of information for learning and in the process improving the safety and reliability of nuclear power plants. One of the main elements of this process is the collection of event information in a systematic way that conforms with agreed reporting thresholds. The reported information than needs to be screened to ensure that all significant matters relevant to safety are considered and that all applicable lessons learned are taken into account. This screening process should be used to select events for detailed investigation and analysis.

The IAEA Safety Fundamental Publication, Fundamental Safety Principles [1] states the need for operating organizations to establish a programme for the collecting and analysis of operating experience. Such a programme includes identifying, reporting and screening operating experience in order to collect and feedback the lessons learned.

The IAEA Safety Requirements Publication NS-R-2 Safety of Nuclear Power Plants: Operation [2] establishes in paragraph 2.24 that "all plant personnel shall be required to report all events and shall be encouraged to report on any 'near misses' relevant to the safety of the plant".

The IAEA Safety Guide NS-G-2.11 "A system for the feedback of experience from events in nuclear installation' [3] states in paragraph 10.4 that operating experience should be reported in a timely manner to facilitate learning from events". To this end, operating organization should put in place the necessary arrangements to ensure that all events that occur during operation of the plant are systematically reported and analyzed.

Reference 3 in paragraph 3.1 also specifies that "screening process should be used to select events for detailed investigation and analysis". This should include prioritization according to safety significance and the identification of adverse trends.

This event reporting and screening are the starting points in the operating experience process and play a major role in success of this process in a plant.

Every nuclear utility/NPP has its own operating experience (OE) process. This OE process encompasses internal and external experience and is able to incorporate the consequent lesson learned, in order to enhance the operational performance of the plant. Below is a flow chart of a typical OE process.

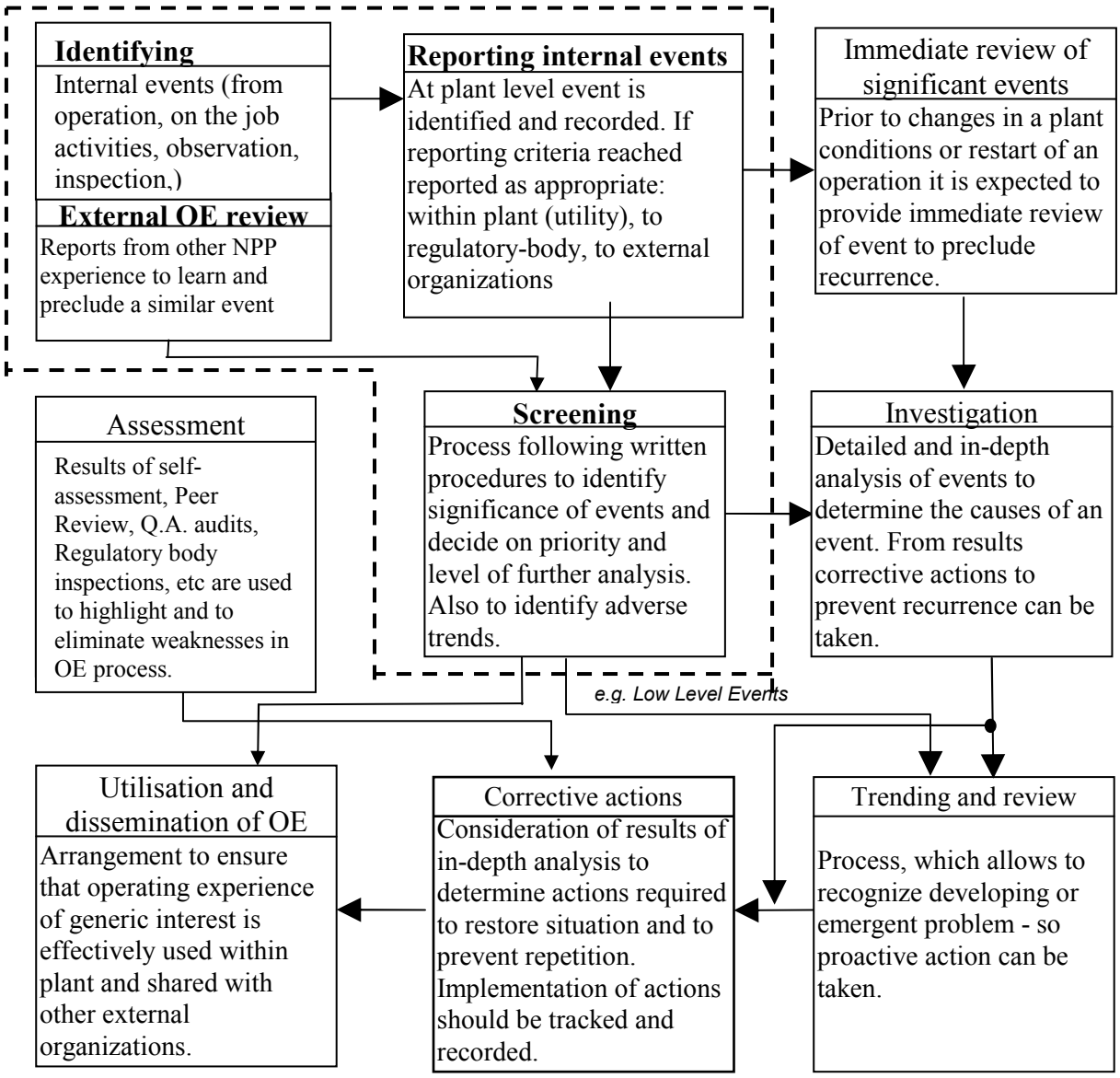


FIG. 1. Flow chart of a typical OE process.

In order that the OE process of the NPP is effective, a set of key activities has to be carried out (Fig. 1). Each of these activities is regarded as essential and the OE process will not be effective if any one of them is omitted or inadequately performed.

The areas of identifying, reporting and screening are one of the initiating areas of this process. The identifying, reporting and screening are a timely process. In the fig.1, these areas are highlighted within a dotted line. The present publication focuses on the effectiveness of these particular areas. This publication describes best practices regarding identifying, reporting and screening of operating experience issues such as significant events, low level events, near misses as well as good practices and suggestions for improvement.

The other areas of the Fig.1 flow chart located beyond the doted line are treated in separate IAEA TECDOCS [4, 5] that form part of the suit of publications developing the principles set forth in the PROSPER guidelines [6].

1.2. Objective

This publication has been developed to provide advice and assistance to nuclear utilities, individual nuclear plants and other relative institutions especially to support regulatory organizations, vendors, owners groups and contractors, fuel fabrication facilities and research reactors to strengthen and enhance their own OE feedback process through the implementation of best practices in identifying, reporting and screening processes in order to improve overall nuclear safety, radiological safety, industrial safety and operational reliability.

The content of this publication encompasses a collective experience of best practices from member states participants that may be taken into consideration by each organization when designing its own specific process. Solutions that best fit the existing processes may be adopted. It is recognized that alternative means may exists to achieve the overall performance objective.

The purpose of this publication is to provide guidance, recommendations, suggestions and good practices in developing and implementing identifying, reporting and screening issues to ensure subsequent satisfactory performance, prevention of adverse trends and to assess the effectiveness of the above areas during the lifetime of the plant.

1.3. Scope

This publication is intended to form part of a suit of documents developing the principles set forth in the PROSPER guidelines [6]. While focussed in nuclear power plants, the principles in this publication apply to other nuclear installations as well.

This publication is not intended to cover other relevant stages of operating experience programme as for example investigation and analysis, trending and review, corrective actions, etc. (Fig. 1).

The key issues developed in this publication are:

— What to identify, report and screen;
— How to identify, report and screen;
— Establishing the thresholds;
— Practical examples and use of standard formats;
— Reviewing effectiveness of the processes (identifying, reporting and screening).

Finally, this publication stresses that true success in the area of identifying; reporting and screening can only be achieved with strong management support. Management plays a vital role in (a) setting the standards of expectations (b) fostering an environment where workers feel free to identify and reporting issues, (c) providing feedback, continuous direction, and examples and (c) overseeing the programme to ensure that effective improvement is achieved.

1.4. Essential management characteristics

The operating organization has the responsibility to assure that operating experience is used effectively to promote safety within his organization and installations. Therefore it is

important for the operator to have an active programme for identifying, reporting and screening operating experience in order to collect and feedback the lessons learned.

The operating experience function plays a vital role in the nuclear regulator's safety oversight responsibilities and therefore it is important that it is a well defined component of the regulator's management system. In this context, the management of activities related to what to report to the regulator, how to report and establishing thresholds of reporting are essential to effectively oversee the operator's activities.

An effective operating experience programme relies on certain essential characteristics that provide support and enhance programme effectiveness. The main characteristics related to the identifying, reporting and screening process are highlighted in the following paragraphs.

1.4.1. Overall characteristics

The identifying, reporting and screening process will not be effective unless the following overall characteristics are adequately addressed:

Policies are established by management to align the organization to effectively implement the process, to establish thresholds and to set criteria for expectations and priorities.

— Problem identifying is strongly encouraged and reinforced at all levels in the organization, including contractors;
— Events and issues are timely notified and reported to enable the facts to be communicated and recorded properly so as to ensure that learning opportunities can be extracted and followed through;
— Collection of information is sufficiently comprehensive so that no relevant data is lost (this requires broad reporting criteria and low detection thresholds);
— The information collected is screened effectively to ensure that all important safety related issues, that should be reported and analysed with priority, will actually be identified (this requires clear ranking criteria);
— Employees who identify problems receive feedback on decision made;
— Appropriate resources (personnel, equipment, funds) are allocated by the management to streamline the process;
— Management of the process is focused on improvement of plant safety, reliability and performance.

The management of the plant ensures that these activities are addressed and that a satisfactory OE process is established and effectively implemented in a timely manner. Although the regulatory body has its own internal system for collecting and screening operating experience, this is not a substitute for the need for the operator to have an effective identification, reporting and screening programme. To evaluate how mentioned activities are applied and timely implemented, a self-assessment to review their effectiveness is carried out periodically.

1.4.2. Role of management

— Management at all levels demonstrate ownership for identifying, reporting and screening processes by directing, promoting, prioritising, and sufficiently staffing programme activities. The success depends, in large part, on the leadership shown by

plant management. Executive management closely follows the thoroughness with which events are reported and the consistency in which events are selected by screening.

— Management decision regarding the reporting level criteria and screening threshold is a balance between the search for improvement, the timeliness of the process, and resource allocation considerations. The most effective balance depends largely on the continuous improvement programme strategy to focus on the actual needs and the effectiveness of the progress. Management periodically review this balance and adjust the programme as needed.

— Management and plant personnel recognize that minor problems are often precursors or contributors to more significant events. Consequently, the identifying and reporting includes lower level events and near misses. However, at this level the particular management effort is mainly focussed on trends that detract from safe and reliable plant operation.

— Managers avoid a punitive approach to errors made in good faith and do not reach defensively to suggestions for improvement. A non-blame reporting policy while maintaining an accountability environment, a self-criticism attitude, a continuous improvement effort, a rigorous approach and a good communication are important factors to reach a successful identifying and reporting programme.

— Management encourages identifying, reporting and screening of human performance events. Typically 60–65% of event root causes are related to human factor involving individuals, team leaders, supervisors and managers. Due to its complexity, this has been one of the most difficult areas to identify and feedback. The IAEA TECDOC entitled “Effective Corrective Actions to enhance Operational Safety of Nuclear Installations” [2] from the PROSPER series provides further assistance on this subject.

— Management recognizes that people are fallible and even the best may make mistakes. Industry experiences show that almost every significant event is influenced by human errors of different types (slips, lapses, mistakes, violations) made by different people (designers, constructors, managers, operators, maintenance personnel, etc.). Hence, properly identifying human errors is essential to improve at all levels.

— Management encourages identifying and reporting of human errors related to weaknesses in corporate or plant organization and management direction. Weaknesses in these areas are influenced by two general components related to safety culture. The first is the management establishing the organizational framework and implementing the requirements consistently. The second is the attitude of staff at all levels in responding to and benefiting from the framework. In any important activity the manner in which people act is conditioned by the example set up at a high level. Identifying management weaknesses, accepting criticism and developing listening attitudes are some of the attributes conveying a strong safety culture. Nevertheless, experience shows that effectiveness of this message depends not only on how it is set and disseminated by management but also on how it is exemplified and perceived by the staff.

— Failures and near misses are considered as opportunities that can be used to avoid more serious events. There is a strong drive to ensure that all events, which have the potential to be instructive, are reported and that timely feedback is given on the findings, trends

and remedial actions. The staff is positively motivated to report all the necessary details in order to instruct the lessons and to determine effective correction actions.

— Expanding the reporting criteria to low level events and near misses is managed hand to hand with the evolution of the organizational culture and continuous improvement. It is essential to:

- Consider the existing related initiatives in the organization;
- Communicate and motivate people — create ownership by all;
- Develop training, plan application of training and retraining;
- Anticipate dealing with thousands of inputs, e.g. screening, database, analyzing, grouping by causes, trending;
- Plan and make resources available;
- Provide feedback to the persons providing the information;
- Follow up implementation, get feedback; adapt the process as necessary.

— In summary, management provides continuous direction, oversight and example in order to ensure that the identifying reporting and screening process is effective. In particular:

- Develop expectations and goals for the process;
- Ensure the personnel is trained to understand and correctly implement the procedures;
- Develop a blame free environment;
- Encourage the reporting of human performance;
- Develop a sense of ownership for the installation;
- Develop inquisitive attitude and attention to detail listening attitudes;
- Maintain listening attitudes and attention to problems of the staff;
- Avoid complacency and getting used to endemic deficiencies and low standards;
- Enhance standards through continuous improvement;
- Ensure the process is simple, easy to understand;
- Ensure the process enjoys wide support;
- Ensure the process is align to generate meaningful results.

To best ensure that the plant arrangements meet international standards and good practices, management promotes benchmarking and peer reviews in order to compare actual performance with the best performance and practices in the industry.

2. IDENTIFYING

2.1. Purpose

Today the nuclear industry is striving for collecting more information on occurrences that could improve the operational safety performance. To achieve this ability to identify issues is being enhanced and the threshold to the operating experience programme is being lowered from incidents to anomalies with minor or no impact to safety. Other minor issues affecting areas such as reliability, environmental protection, transportation, radiological protection, industrial safety and human performance are also included. This will provide an insight on precursors, which provide information in determining advance warnings of an increased probability that a significant event may occur.

To reinforce this concept it is recognised that the identifying ability will become more demanding as performance improves. Nevertheless, this ability is essential for sustaining continuous improvement. Also, the operating experience programme is being increasingly used to identify good practices and good lessons learned in-house and abroad to improve business performance, paving the shift from a reactive event reporting mode, to a proactive event prevention progress.

The first key activity of the OE process is to identify issues, either events or good practices. The purpose of the identifying is to feed the OE process with information for further evaluation and corrective actions to reduce potential for occurrence or recurrence, as well as to promote improvement by the implementation of good practices.

In the OE process, an ‘event’ is defined as an unwanted, undesirable situation or unintended occurrence (change, abnormality, deviation, deficiency, anomaly, etc.) in the state of systems, or components, or human/organizational conditions (administrative controls, behaviours, environment, or health, etc.) that exceeds or deviates from established criteria.

The OE process includes issues on human, organizational and technological performance. An enhanced OE process includes also near misses and opportunities for improvement. It includes the results from self-assessment and benchmarking initiatives.

Identifying includes also the capability of personnel to recognize deficiencies or potential/actual adverse conditions and suggestions for improvements, as well as the capability to recognize good practices.

The purpose of this section therefore, is to provide guidance, recommendations and suggestions in developing and implementing identifying activities to ensure that issues, either events or good practices, related to equipment, human performance, and organizational (including documentation), are being identified at an appropriate threshold and are entered into the identifying and reporting process.

2.2. Objectives

One of the primary goals of this section is to specify how plants/utilities identify the events, issues and good practices at an appropriate threshold and enter them into their OE programme.

This section provides information on how personnel can identify events, issues and good practices, in particular:

— What to identify;
— How to identify;
— Establishing the thresholds;
— Reviewing the quality of identifying.

The identifying activities involves each one of the persons working at the plant, either utility or contractor personnel.

The scope of the identifying includes:

— On the job activities;
— Observation of the plant;
— Organization.

For the on the job activities: each person identifies any difficulties encountered while performing assigned tasks, as well as any deficiencies observed in equipment operation and condition, or found in the materials conditions, tools, procedures, documentation (drawing, diagrams, etc.) to perform the job, and in the inspection and test performed during the job.

For the observation of the plant: each person is attentive to observe and identify any abnormality or deficiency existing or occurring at the plant.

For the organization: each person identifies any difficulties encountered involving organizational structure and interfaces and related human performance and communications challenges.

Identifying includes also good practices and positive things to learn from or to use as noteworthy example.

The plant organization provides the necessary resources and tools (administrative or communications) to record and inform the organization of the identified events or deficiencies or good practices.

2.3. Identifying process

Management has the responsibility to create a climate that fosters the identifying of equipment and human errors, an atmosphere of questioning attitude and attention to details that support a culture of striving for achieving high standards of safety and performance.

Management are responsible for active promotion of event reporting and the implementation of the plant policy on blame free reporting by maintaining constant communication with plant personnel.

Plant personnel is assured that their efforts to identify issues are worthwhile and valued. The results are therefore feedback to the person who initiated the report and all other relevant personnel where appropriate.

Plant personnel develop a feeling of ownership of the plant in order to be sensitive to detecting failures of components and systems, and also failures in (own) human behaviour and in the organization.

In the environment of a continuously improving safety and performance, low level events, small degradations and near misses are identified, including suggestions for improvements, good practices and good examples. Plant personnel understand how their efforts to identify issues contribute to the improvement of safety and performance.

In the course of performing their work, plant personnel and contractors have a responsibility to identify and promptly report events, adverse conditions and near misses. In case an event with safety hazard is identified, where possible, the plant or hazard is made safe promptly through authorized people. If an event could not be identified in the course of performing work, i.e. an event is not identified or identified later during other activities that may imply the deficiency in self-checking or lack of supervision.

Plant personnel inform their management of known potential or apparent concerns and take actions to correct any adverse condition if possible.

It is important that periodic training of personnel includes lessons and practical exercises on how to recognise and identify deficiencies, degraded performance, etc. Personnel have to be aware of the significance of the operating experience process in place, and as a good practice definitions of such common used terms as identifying, reporting, screening, is familiar and clearly understood by the involved personnel at all levels.

The essential aspects of event identifying are reflected in the following steps (2.3.1.–2.3.3). Satisfactory performance within these steps provides reasonable assurance of effective OE identifying process.

2.3.1. Identifying thresholds

Management establish and communicate the expectations on the threshold for identifying events. Experiences show that causes of low level events and near misses are similar or even the same as causes of significant events. Therefore, it is important that the threshold is established at an appropriate level of detail to identify any unwanted, undesirable situation or unintended occurrence (including near misses) that may be useful to prevent reoccurrence and to improve plant and personnel safety, reliability and performance.

It is imperative that the threshold for identifying should be set as low as practically achievable. For example, the threshold should capture any condition in the three key areas — plant systems and equipment, human performance, and organizational (including documentation) — which would require corrective action or any other form of intervention.

The identifying includes work practices and areas of activities where good and effective performance is achieved, to be proposed as potential good practices.

The communication of the expectations is performed by setting the standards through written instructions, continuous example, and training.

2.3.2. What to identify

All events, however minor, present learning opportunities to improve standards of safety and performance, mitigate errors and avoid repeat issues. Good practices, either external or internal, are also opportunities to emulate for improving safety and performance.

Identifying activities are focussed in what is wrong (the gap or deviation between 'what is' and 'what should be') and what needs to be improved. They include also any concern, regardless of whether it is a potential, suspect or actual problem. Identifying activities are also focussed in what is very good and worth to emulate.

Identifying activities are focussed on all areas of the nuclear installation such as: organization, procedures, human performance, plant systems, structures and components.

Identifying includes issues from on-site rules that are difficult to achieve, inflict excessive burden, etc, with the aim of contributing to build an easy to understand, effective and achievable rule system.

In general, identifying includes the following overall issues:

— Actual operating events, such as plant transients with their associated equipment failures, human errors or other inappropriate actions, anomalous conditions and contributors either technical, organizational, procedural or human performance;

— Actual failures of systems, structures or components, or human errors, that may or may not have caused a plant transient;

— Adverse safety or reliability conditions such as design weaknesses, degraded safety or reliability equipment or aging effects that could lead to failures of systems, structures or components;

— External challenges such as vulnerability to severe weather, flooding, high winds or security threats;

— Organizational or human factor issues with their associated failures or contributors such as degraded safety culture, high human error rates, weak quality assurance, inadequate procedures, inadequate training or inadequate control of contractors at site;

— Vulnerabilities or unreviewed safety issues showing a previously unknown weakness in a safety systems or inconsistencies;

— Other reliability issues, lower level events and near misses, either safety or not safety related, that can be useful to identify early signs of declining performance and to alert the operating organization from antecedents and precursors for more serious events.

In a more specific way, the types of occurrences to be identified include, but are not limited to, the following:

a) Events with consequences on nuclear safety and plant reliability:

- Events with consequences on control of reactivity;
- Loss or degradation of reactor core cooling;
- Loss or degradation of barrier integrity;
- Events affecting nuclear fuel (transportation, handling etc);
- Plant transients — reactor scrams, reactor coolant pump trip, turbine trip;
- Degradation of steam generators feedwater supply, actuation of a safety system, loss of power supply etc;
- Foreign material intrusion events.

b) Events with consequences on radiological protection:

- Unplanned exposures;
- Contamination or release of active medium inside the plant;
- Release of active medium outside the plant;
- Loss of radioactive source/material;
- Lack of individual RP protection devices/equipment, etc.

c) Equipment failures/damages:

- Inoperability of a safety system equipment;
- Equipment failure resulting in production loss;
- Equipment damage;
- Common-mode and common cause failures, etc.

d) Industrial safety events — injuries, fatalities;
e) Environmental events — unplanned releases of toxic materials/ chemicals, or releases beyond legal limits;
f) Fires, explosions at the plant;
g) Security events — threats, attacks;
h) External events — earthquake, heavy rains, abnormal temperatures, tornados, degradation of intake cooling water condition. etc., as well as outside fires, a fall of a plane, aircraft overflying, etc.;
i) Safety analysis deficiencies, insufficient safety analysis;
j) Computer application failures — hardware, software — either related to plant process or management organization, which may influence the safety or reliability of the installation;
k) Quality assurance, quality control and self-assessment issues — deviations, non conformances, adverse conditions, non compliance reports, audit findings, self assessment recommendations;
l) Plant/equipment design inadequacies;
m) Human performance, staff attitudes and behaviours, negative safety culture;
n) In addition to the above mentioned list of events and abnormalities, the conditions to be identified include, but are not limited to, any undesired situation or suggestion for improvement in following areas:

- Operating practice of systems and equipment;
- Equipment condition, equipment reliability;
- Condition of tools and materials;
- Human capabilities versus task demands;
- Human and technical risks, pitfalls, shortcuts, workarounds;
- Personnel work practices;
- Quality and adequacy of procedures;
- Quality and adequacy of on the job training;
- Abnormal trend of a performance indicator;
- Configuration control of systems;
- Documentation inconsistencies;
- Scope and application of management policies and programmes and/or organizational weaknesses;
- Missing, incomplete or deficient programmes compared with international experience and IAEA safety standards.

o) Near misses: Examples of near misses to be identified:

- A plant transient could have occurred if the near miss occurred under different conditions;
- Equipment could have been damaged;
- Personnel could have been injured;
- An incorrect work could have been specified or performed;
- Error likely situations could have been provoked;
- A human slip or lapse occurred while performing critical steps of a task without consequences;
- An event has not occurred, but the action may lead to unwanted hidden situations where the probability of failure in demand is increased or a function impaired;
- A system/equipment could have been in a status not in accordance with expectation/requirement (fire protection barrier would have been affected, a system valve would have been in incorrect position, etc.).

Suggestions for improvements from personnel, good practices, good performances and good examples are also identified.

The activities for identifying operating experience issues include also the review of information contained in other accessible sources, either internal or external. During safety review missions, the existence of a very broad range of separate processes to deal with minor issues has often been identified. Unless good internal communication exists, they may then not be considered in the operating experience programme, and so the lessons learned may be lost or not integrated into the overall process. If they are identified and reported into another process, they need to be linked to the operating experience process.

For internal sources, operating experience issues may be identified under other process such as work management system for maintenance, testing reports, design change and configuration control process, quality control inspections, quality assurance audits, self-

assessments, post-outage activity critiques, plant walkdown observation reports, human performance reports, etc.

For external sources of operating experiences typical examples are: good practices, event reports provided by other plants in the same country, from countries with plants that have the same vendor, and from other international organizations; experiences of other utilities with their safety programmes (e.g. Q.A., ageing, and surveillance); research results directly applicable to resolve safety issues; and benchmarking reports.

Identifying of relevant operating experience information includes the review of these internal and external sources, such as:

- International organizations - WANO, INPO, IAEA etc.;
- Owners groups — WOG, FROG, COG, GEOG;
- Nuclear Safety Regulators;
- Vendors — national or international manufacturers of plant equipment or components;
- National level organization audits and peer reviews;
- Utility level information, or utility to utility exchange;
- Plant to plant exchange – both national and international;
- International conferences, workshops, seminars etc.;
- Specialized press publications and periodicals — Nucnet, Nucleonic week;
- Research and development organizations.

Another source of useful external OE information can be the international good practice information programmes, e.g. WANO peer reviews, IAEA OSMIR database, outputs from internal utility inspections (audits) transferred to other operating organizations.
Some plant operating organizations recognized that improvements can also be gained from lessons learned by companies involved in industries other than nuclear. These industries include aviation, navy, heavy industry, etc. This information is combined with other generic issues, such as human factor failures, deficiencies in organization, improper management practices, design failure of components and so forth.

Examples of publications related to external OE information are:

- WANO OE programme — ENR (Event Notification Report), EAR (Event Analysis Report), MER (Miscellaneous Event Report), ETR (Event Topic Report), SER (Significant Event Report), SOER (Significant Operating Experience Report), Good practices, Just-in-Time and Peer Review Strengths- web based;
- INPO SEE-IN programme — Significant Event Evaluation;
- IRS reports — joint IAEA and OECD/NEA services;
- IAEA Nuclear Event Web System (NEWS);
- Vendors Publications and Bulletins — Service Information Letters (SILs), Technical Bulletins (TBs), Nuclear Safety Advisory Letters (NSALs), etc.;
- Regulatory Body documents;
- Owners Group reports;
- Plant to plant event reports and exchange of information;
- Press publications and periodicals;
- IAEA-NEWS/WANO/INPO Web-based forum for discussion.

2.3.3. How to identify

The identifying process may be made more comprehensive if it is undertaken by more than one individual, an initial identifier and a subsequent reviewer who will provide added value as appropriate.

Identifying of events and deficiencies can be performed by the following means:

— Routine monitoring and surveillance;
— Pre-job briefings and post-job debriefings;
— Independent third party inspections and review;
— Process mapping and analysis;
— Observation of plant indications and alarms;
— Material and equipment inspections and test;
— Plant tours both routine and sporadic;
— Directly identifying through on the job activities;
— Operation malfunctions;
— Periodic reviews and assessments;
— Benchmarking.

Identifying may be enhanced by:

— Event-prevention techniques as for example questioning attitude, attention to details, self criticism;
— Reinforcing expectations in pre-job briefings and post-job debriefings;
— Preplanning of field observation activities;
— Preparation and training of personnel in advance;
— Management observations while performing tours and walkdowns.

Managerial tours and plant walkdowns are also useful to:

— Identify consistency of the criteria implemented at different levels;
— Communicate expectations by example;
— Countercheck and verify the attention to detail and questioning attitude as prevailing in the field;
— Raise awareness of the management in the status of the plant;
— Identify good practices in the field by noting consistent good performance and assessing personal satisfaction.

Cross-comparison of the results of plant walkdowns performed by different groups may provide additional insight to improve the quality of identifying activities.

2.4. Quality review

When performing the identifying of a particular issue, it must be reviewed against its nature and significance (or potential significance). The following are examples of attributes to be considered in the check list to review the identifying quality:

— Has the issue been identified in a timely manner commensurate with its significance and ease of discovery?

— Are the affected areas, systems, equipment, documentation and people involved identified?
— Is the status of the plant and other relevant data identified?
— Is the extent of condition, generic implications clearly identified?
— Is the identification supported with sufficient details, so as to enable subsequent monitoring of adverse trends in different areas of the plant, and to help in understanding generic deficiencies?
— Are the consequences or potential consequences noted?
— Are the benefits of suggestions and good practices noted?

2.5. Examples of identifying

Example 1
Valve maintenance with system pressurized involving risk of valve stem ejection
Work was performed on a motor-operated feedwater isolation valve following its failure due to a suspected broken valve stem. Maintenance was assigned to remove the motor-operator with the system pressurized. Since the valve stem might have been broken, a stem-retaining device was installed to hold the stem in place. When excessive force was applied to remove the stem-retaining nut of the motor operator, the lead technician suspected a problem and discontinued removal efforts, and informed the supervisor. It was subsequently noted that the stem had pressure on it and was being pushed out as the nut was loosened even with the stem-retaining device installed. Had the removal effort continued, the stem could have ejected resulting in personnel injuries.

Comments:

1. Significance of identifying: The event was identified by a lead technician, otherwise it may lead to the stem ejection resulting in personnel injuries.
2. What to identify: The event belongs to a near miss with potential personnel threat.
3. How to identify: The event was identified through on the job direct identification and the identification was enhanced by the technician's experience and questioning attitude.

Example 2
The setting of a safety related valve what was not mentioned in the text of the SO
Within preparation for equipment securing according to a secure order (SO), the unit supervisor (in MCR) found out when checking the steps of the given SO that the setting of a safety related valve according to the steps of the given SO (open/disconnection of energy from the motor) would influence technical specifications (TS), what was not mentioned in the text of the SO. The unit supervisor ordered to secure the valve in the closed position (i.e. a position allowed by technical specifications) and he wrote this change to the SO.

Comments:

1. Significance of identifying: The event was identified by a unit supervisor, otherwise the TS would be challenged.
2. What to identify: The event belongs to a near miss with potential threat on the safety status of plant systems and equipment.
3. How to identify: The event was identified through on the job direct identification and the identification was enhanced by the unit supervisor's experience and questioning attitude.

Example 3

Misinterpretation of a work order for pump maintenance

There was a morning telephone call from a field operator to inform the MCR about a work order for a low pressure injection pump. The maintenance team was on the way to the pump room. The MCR operators immediately ordered the field operator to stop the maintenance team. The maintenance team had in fact gone to the wrong reactor unit — there are two identical reactor units. The work order was for the reactor unit that was on a refuelling outage. The work order was written in an appropriate way and correctly identified the reactor unit on outage. But neither the maintenance team nor the field operator paid the necessary attention to the written details contained in the work order. The result could have been injuries to personnel and nuclear safety related equipment being out of service.

Comments:

1. Significance of identifying: The event was identified and stopped by a MCR operator, otherwise it may have lead to injuries to personnel and nuclear safety related equipment being out of service.
2. What to identify: The event is associated with a near miss category with potential threat to personnel and it could have compromised a nuclear safety system.
3. How to identify: The event was identified through ‘on the job direct identification’ and the identification was enhanced by the MCR operator’s experience and questioning attitude.

Example 4

Inadequate isolation of a demineralised water system valve

During a refuelling outage a contractor's workers obtained authorization from the MCR for overhaul of a demineralised water system valve located in the nuclear auxiliary building. As per instructions written in the authorization, the contractor's operatives started work with the permission of the local area operator who performed the necessary isolation of the equipment.

When the valve was being detached, water started flowing out which prompted the contractor's operatives to question the valve isolation status. The local area operator however confirmed that it is just the water left inside the length of inclined pipe work. So that it was advised to let the water completely discharge before further work.

Thereafter when the valve was removed for overhaul and preparations were underway for installing a blind flange, heavy flow of cold water suddenly started flowing onto the contractor's operatives. The local area operator then recognized inadequate isolation as a remotely located pump on this line was left in auto start mode.

1. Significance of Identifying: The event delayed work and sprayed the contractor's operatives with cold water producing the potential for injury to personnel.
2. What to Identify: The event belongs to a low level incident category and serves to provide an illustration of an indication of weakness in the isolation procedure caused by inattention to detail and a lack of a questioning attitude.
3. How to Identify: The event was identified through 'on the job direct identification'.

Example 5
Loose part identification
During normal operation an alarm of the loose part monitoring system in one of the steam generators was activated. While discussing about its significance the alarm disappeared. The operators assumed that the sensor was spuriously activated. The operation continued. Several hours later the alarm was again activating and disappearing several times. The operators found on this a confirmatory signal of the spurious performance of this sensor. After several hours the two sensors of the loose part monitoring system were activated. The operators decided to shutdown the plant.

After opening the steam generator, two pieces (a nut and a pin) were found. The pieces became loose from the vessel internals and traveled to the steam generator water box. Some tubes of the steam generator were damaged at their tube-to-tube sheet seal weld and expanded zone.

1. Significance of identifying: The delay in properly identifying the event delayed the shutdown of the plant, increased the time in which a component of the vessel internals operated with a broken piece, and damaged parts of the pressure barrier (primary pressure boundary) of a primary equipment (steam generator).
2. What to identify: The event constitutes a significant issue and provides an illustration of an indication of a lack of questioning attitude. Also, it is an indication of an insufficient capacity to properly identify and a weakness in the conservative approach.
3. How to identify: The event was identified by the operators while on shift through the alarms of the loose part monitoring system.

3. REPORTING

3.1. Purpose

The IAEA Safety Requirements for Operation [2], in para 2.24 states that "All plant personnel shall be required to report all events and shall be encouraged to report on any near misses" and the IAEA Safety Requirements on Legal Governmental and Infrastructure [7] in para 2.6 (12) states that "…the regulatory body shall have the authority to make available, to other governmental bodies, national and international organizations, and to the public, information on incidents and abnormal occurrences, and other information, as appropriate".

Operating organizations develop publications outlining appropriate reporting criteria specific to the type of plant being operated and consistent with national regulatory requirements. These criteria specify the types of events and incidents, including problems, potential problems, non-consequential events, near misses and suggestions for improvement. These events and incidents are collected and reported internally and some of them are reported externally.

Reporting is the process of communicating an identified issue by notifying the relevant information to the supervisory level and to the appropriate internal and external organizations.

The purpose of this section is to provide detailed guidance, recommendations, suggestions and good practices in developing and implementing reporting activities to ensure that equipment, human performance, procedural and organizational issues are being reported at an appropriate threshold, to the adequate level of supervision, with the adequate level of detail and entered into the reporting process. The issues reporting process includes distribution as appropriate

within the plant, to regulatory body or to external organizations according to the corresponding procedures and criteria.

3.2. Objectives

The primary goal of the present section is to provide information on the reporting process, in particular:

— What to report;
— How to report;
— Establishing the thresholds;
— Use of a standard format (paper or electronic with required areas to be filled out and with a required path for review and approval);
— Reviewing the quality of reporting.

Operating experience is identified and reported in a timely manner according to well established criteria and procedures.

Problem identifying and reporting is strongly encouraged and reinforced at all levels in the organization through encouragement methods such as non blame policy; timely feedback to staff, recognition of worthy findings, or improvement suggestions, etc. Non reporting denies a learning opportunity.

Initial reporting within the plant involves all persons working at the plant, (e.g. utility, vendor or contractor personnel). Access to the event reporting system must be easy and simple to use, i.e. the reporting process does not overload an individual by placing other important duties/tasks on the individual relating to follow up of the issues, which cause conflict with their regular duties.

For the purpose of reporting and distribution to regulatory body or to other external organizations the plant usually nominates a responsible person(s) that works as the coordinating interface and contact point between the plant/utility and the external organization, such as a regulatory body.

3.3. Reporting process

Reporting provides the link between identification and other parts of the OE process. The input to the reporting process is the output from the identification process. There are also inputs from other parts of the OE process; e. g. screening and analysis. The process itself conveys information on an identified issue to allow other OE processes to engage, e.g. screening, immediate review of significant events and trending. The process output is documented as formal information about an identified issue.

The process of reporting may require several steps to be completed. It starts with the initial notification and prompts reporting after identifying, is progressing with the additional collection of information and is completed with a comprehensive reporting after screening and investigation. For the purpose of trending low level events and near misses the process is often sufficiently completed with the information collected for initial reporting.

Operating experience is reported in a timely manner in order to facilitate learning from events. Prompt notification is also needed to ensure that immediate issues are corrected and the process to extract lessons learned to prevent recurrence is initiated as soon as possible. To this end operating organizations put in place the necessary resources to ensure that issues at all levels identified during operation of the plant are systematically reported. Resources includes, funding, trained staff and the necessary database(s) and documentation, plus an internal culture that supports and reinforces the use of operating experience.

In a plant with a strong safety culture the operating experience programme will capture and report on all internal events, near misses, deviations (from accepted procedures, standards, operating/maintenance practices or behaviors), and good practices or opportunities for improvement. Those events or conditions that impact regulatory documents or requirements, or will be reported externally.

Management must foster an environment where people (plant personnel and contractors) develop a feeling of responsibility in order to be sensitive to detecting failures of components and systems, and also failures in (own) human behaviour and in the organization.

Even when this sensitivity is already established, people may be not willing to report for the following reasons:

— The reporting tools are too cumbersome (e.g. complicated forms to be filled);
— The report is not taken into consideration, no feedback is provided;
— The reporting is ‘superfluous’ because the person himself can take care of the situation;
— The outcome of reporting is not visible (the report seems to fall into a ‘black hole’);
— When reporting own errors the reporting individual is not sure whether there will be personal consequences (blame free environment);
— Where reporting creates an additional unplanned work programme (i.e. duties in addition to normal work activities which may conflict or add to regular duties and may cause an individual’s performance rating to be affected when measured against their regular targets);
— Human nature — reporting of individual mistakes can be embarrassing or cause an apparent loss of face;
— Group interaction — reporting on others mistakes may cause embarrassment or friction between individuals or groups;
— Reporting on long term standing problems, adverse conditions or workarounds may cause significant loss of credit for the organization, especially when the condition has been present for some time;
— Fear regarding public/media/journalist/stock market response may prevent plants from reporting.

The above reasons can be summarized in four basic groups: fear, uselessness, acceptance of risk and practical reasons. All these reason, when present with more or less intensity, may affect transparency and undermine the reporting process.

The management has the responsibility to create a climate of openness and transparency that fosters the reporting of equipment failures and human errors, a climate that supports a culture of continuous improvement and striving to achieve high standards of safety and performance. Reporting is performed not only to those who will investigate to determine corrective actions, but also more widely for awareness.

Open communication means that problems are brought to light and are not minimized. In order to make this possible, an atmosphere of mutual trust and confidence is established, maintained and supported by blame and sanctions free environment. In this environment blame and sanctions are used only when strictly necessary to set the example in the face of willful neglect, malevolent or falsification acts.

In the environment of a continuously improving safety and performance, low level events, small degradations and near misses are reported, including good practices and positive examples. They are taken as a valuable source of information for a learning organization. Plant staff understands and believe that their efforts to report these issues are worthwhile and useful to contribute to the improvement of safety and performance. Also they believe that the self-reporting of errors will not have negative consequences for the reporting person.

To encourage reporting the report forms are easy to fill and personnel motivation is maintained by communication feedback and by showing appreciation using for example publications such as the plant newsletter to nominate the best report of the quarter, the best report of the year and highlighting the benefits obtained. Also the best reports are displayed in visible places with explanations of how the plant has benefited from them.

The essential aspects of event reporting are reflected in the following steps (3.3.1 — 3.3.3). Satisfactory performance within these steps provides reasonable assurance of effective OE reporting process.

3.3.1. Reporting threshold

Reporting includes issues identified according to the guidelines included in previous Section 2 Identifying. To maintain a robust OE process, the information on the identified issues must be adequately documented.

To help in establishing the criteria for the reporting thresholds, account should be taken of considerations included in Section 2.3.1. “Identifying threshold”. This is necessary in order to ensure consistency and continuity between identification and reporting activities. Also, In addition, to help in establishing the criteria for the reporting thresholds, Appendix I and Appendix II provides a conceptual view of low level events and near misses in relation to more significant events.

The threshold for reporting to the regulator and other authorities is defined in the rules issued by the authorities of each country. For this reason, what is reportable to one country or authority may not be reportable to another country or authority.

The threshold for reporting to the industry is mutually defined in agreements with owners groups and nuclear associations and institutes, such as WANO, INPO, Owners groups, etc. An additional criteria to determine if an in-house event is to be shared externally with the industry, is if your plant would have liked to be informed and learn from it in case the event would have happened at another plant.

The threshold for reporting within the utility is established by the corporate organization. As a general rule the sharing is directed to avoid recurrent failures at other stations, improve plants safety and reliability, support the human performance improvement programme, shield the company fleet from generic deficiencies and help to become a learning organization.

Low level events and non significant near misses are reported within the plant, and not necessarily, individually reported outside. Nevertheless it is recommended as a good practice to share within the nuclear industry the lessons learned from in-house collective analysis of low level events and near misses, and identified trends. These will contribute to alert operating organizations from antecedents, precursors, pitfalls, and early signs of declining performance. The lessons learned can be used to avoid more serious events, provide defence in depth targets, and implement action programmes for improvement.

3.3.2. What to report

As a good practice, reporting activities have been expanded to all situations described under Section 2.3.2 of the present publication, entitled 'What to identify'. In a plant with a strong safety culture the operating experience programme will capture and report on all internal events, near misses, deviations (from accepted procedures, standards, operating/maintenance practices or behaviors), and good practices or opportunities for improvement. Employees are encouraged to report any concern regardless of whether it is a potential, suspect or actual problem.

Regarding the reporting of low level human errors and near misses, often are immediately corrected by the person who has committed the error or experienced the near miss. Therefore these errors or near misses may no longer be accessible for analysis, if they are not reported, and a wealth of information is lost. Plants/utilities establish requirements to capture near miss information in pre and post job debriefings and in other areas such as work reports. There are two major advantages in reporting this information: the person who has committed the error or near miss may have knowledge about the causal factors, and since there was no negative consequence, a free discussion about the origin, lessons learned and potential corrective actions is possible.

The importance of near miss reporting is also that if they are not recognized, latent organizational weaknesses and error traps are left unresolved, and will lay dormant waiting for a potential event to re-occur. One indication of a strong safety culture attitude can be where workers self report events or near misses by challenging themselves with the question of 'do I want my co-worker to face the same situation'? Management establishes a means of tracking the number of near misses and communicating these as 'good news stories' within the organization as a means of encouraging this behavior.

3.3.3. How to report

The operating organization develops detailed procedures for the reporting of issues. Such a procedure ensures that events with major safety significance are communicated timely and to the appropriate organizations both internally (at the site) and externally to the utility headquarters, regulatory body, the industry, owners groups, world nuclear associations, and any other relevant organization.

The process of reporting may require several steps to be completed. For most of significant events the reporting is organized in three steps. First step is initial notification and prompt reporting after identifying, the second step consist in completing the initial report with additional information that is being collected in the short term, and the third step is comprehensive reporting after screening and investigation. For low level events and near

misses the process is often sufficiently completed with the information collected for initial reporting.

Due to availability constraints and timely requirements, (the event occurs during night shift, urgent notification to authorities, etc.) a succinct immediate notification may be needed to be conducted immediately, before collection of information is organized and screening takes place. In practice, the level of detail of the report depends on the delay of reporting, from an initial notification and prompt report to a comprehensive report in accordance with the progress of the collection of information. A plant procedure stipulates the sequence and the time limits for reporting events, the format for the type of reports and the related administrative arrangements for its distribution and dissemination. As a general rule the events are to be reported as quickly as possible after discovery or recognition of the condition, for example, notifying in less than one hour, prompt reporting mostly within 24 hours.

In order to assure a simple process and to comply with requirements of timeliness adequate tools for reporting are easily available, e.g. Intranet initiation forms, redundant communication facilities with diversity of supports, use of e-mail and use of databases to support retrieval.

The content of the comprehensive report includes sufficient technical details, and whenever appropriate, human factor data for an understanding of the event, i.e. sufficient enough without the need for additional information. Mandatory information requirements are specified, that is, which information is required or critical information to be entered. The content of the report is commensurate with the importance of the event. The language used for reporting clearly distinguishes the condition as a problem to be corrected or as an item to be improved upon. Report authors bear in mind the need for understanding by people at other locations. Local terminology and abbreviations are avoided and acronyms explained.

Nuclear installations, such as NPPs, are already obliged to report to the Regulatory organizations certain levels of events. Some installations use these reports to inform to other plants. The adequacy of these reports to inform other plants to share operating experience may or may not be sufficient. Plants evaluate this adequacy and may consider using a different presentation or format to share the OE among plants. In many cases the content is expanded including not only descriptive and compliance information but also other practical information, such as flow diagrams, layout sketches of the affected areas and organization practices to manage the event.

Appendix III includes an example of initiation report form used by some plants to be filled by the originator and to report internally the issue to the immediate supervisor. Some plants use the computer intranet system to report. Appendix IV includes a personnel statement form used by some plants to complete the immediate information for an event.

3.3.3.1. Content of a high level and a significant event report

Before a comprehensive report is submitted, a prompt initial report with the basic information and description may be needed as soon as possible, to inform the Regulator within the required timing or to be sent to the screening process for the purpose of defining the level of analysis, selection and further operating experience communication. These reports may need to be kept update with additional developing information for reasons such as:

— Further degradation in the level of safety of the plant;
— Major changes in the perception of the significance of the event as a result of additional evaluation;
— Discovery of new information;
— The need to correct factual errors.

The prompt initial report is developed into a comprehensive report, within specified timelines, including the results of the analysis and actions and being updated with further root cause investigations and complementary actions.
The comprehensive report includes the following:

— Basic information;
— Narrative description;
— Safety assessment (consequences and implications);
— Causes and corrective actions (taken or/and planned);
— Lessons learned;
— Graphic information to better understand the event(if necessary);
— Guide words with their codes.

a) Basic information
This includes such items as:

— Title of the event;
— Date of occurrence;
— Plant name, site, unit;
— Plant type and rated power output;
— Plant status (normal operation, outage, startup, shutdown);
— Abstract containing a brief statement describing the major occurrences during the event, including all actual component or system faults and failures that contributed to it, all relevant personnel actions or violations of procedures and any significant corrective action taken or planned as a result of the event. It also includes (as examples) how the event was detected, individual injuries, radiation doses received, radioactive material released, significance of the event, information for INES scale classification, etc.

b) Narrative description
The narrative description explains exactly what happened and what was discovered in the event. Emphasis is put on how the plant responded and how structures, systems, components, and operating personnel, performed. A description of what the operator saw, did, understood or misunderstood is important, as is how the event was discovered. Unique characteristics of the plant which influenced the event (favorably or unfavorably) are described. The following specific information is included:
— Plant status prior to the event;
— Event sequence in chronological order;
— System and component faults;

— Operator actions/procedural controls;
— Recurrent events.

This description includes beneficial or adverse actions, the use of procedures and any procedural deficiencies, and any aspect of the human machine interface that contributed to the event. This information helps to detect and diagnose safety problems that were triggered by the event.

c) Safety assessment

The safety assessment focuses on the safety consequences and implications of the event. The primary aim is to ascertain why the event occurred and whether the event would have been more severe, under reasonable and credible alternative conditions, such as different power levels or operating modes. The safety significance of the event and consequences are pointed out. An immediate safety assessment may be performed before screening takes place. A deeper safety assessment is performed once the process of investigation and analysis is completed in accordance with the depth defined during the screening meeting.

d) Causes

The direct, root causes and causal factors of the event are clearly described. Causes include reasons for equipment malfunctions, human performance problems, organizational weaknesses, design and manufacturing deficiencies and other facts. Whenever appropriate, the cause analysis methodology used is referenced in the report.

Where an event investigation reveals shortfalls in human performance, in order to make the lessons learned readily transferable, in addition to the technical details, it is important to specify the inappropriate human actions, i.e. the effects, and also the causes. Human performance is greatly affected by the management systems that are put in place to help workers perform well, e.g. (among other things) planning and scheduling of work, training, supervision, written instructions and the work environment. When there are latent weaknesses in any of these systems, conditions exist that are likely to lead to error. To enable others to learn effectively from experience, event reports usually contain clear explanations of what the weaknesses are, how they were detected and the measures taken to remove similar weaknesses.

e) Corrective actions

All corrective actions are listed and described in sufficient detail, primarily to allow readers to determine their applicability to their plants. It is good practice to include the following aspects:

— Nature of the corrective action (recovery, short term or long term) and any target dates set for implementation;
— Department responsible for authorizing corrective actions (e.g. operating organization);
— Group responsible for implementing corrective actions (e.g. operation, maintenance, analysis group, etc.);
— Cross-reference to the identified causes to help the assessment of adequacy and effectiveness of the corrective action.

f) Lessons learned

The report clearly identifies learning points. The communication of lessons learned results in enhanced safety, positive changes in working practices, management change, increased reliability of equipment, and improvements in the procedure. In addition to implementing effective corrective actions, the sharing of operating experience lessons learned is one of the most valuable parts of the feedback process.

g) Anonymity

All the information concerning persons involved is de-personalized in order to maintain the privacy of the individuals. If the persons interviewed are made aware of the privacy of their information, the quality of the report will be improved.

3.3.3.2. Content of a low level event and near miss report

For a low level event and a less significant near miss the report may be very succinct and contain only the descriptive information and direct causes, in order to be codified and introduced in the data base to perform the trending analysis of collective in-house events. The objective is to identify antecedents, precursors and pitfalls, which can be used to alert the operating organizations to avoid more serious events.

Often the reporting of the low level events and near misses is performed directly by each worker using the formats of the task to document the work. In this post-work format it is a good practice to include a specific paragraph in order to report the feedback about problems, precautions and lessons learned after performing the work. Information includes the inappropriate act and an indication of the suspected direct or apparent causes contributing to the event.

3.3.3.3. Use of drop boxes for easy reporting

Some plants use drop/suggestion boxes installed at different convenient locations along with problem report forms for easy reporting of events, issues and suggestions for improvement. With these boxes, all plant personnel irrespective of his position can highlight any plant problem and suggest improvement actions. The reporting can be anonymous.

Feedback is provided to the persons that have reported through the drop box system to thank them for the information, to confirm the good receipt and to inform of the follow up. This practice helps to maintain an effective use of the drop boxes and raises the confidence in the drop box reporting system.

Although the use of drop box is recognized as a good practice, management monitor the utilization of this reporting channel, because too much reporting through the drop boxes and the frequent use of the anonymous reporting may be a sign that the main line reporting procedure is not sufficiently effective and the non blame reporting culture is not yet fully perceived by the personnel.

3.4. Quality review

The reporting products are reviewed to ensure quality of reporting. The level of revision and content of the check list are adapted to the level of reporting. The following are examples of attributes for consideration in the check list:

— Is the information complete, concise and clearly describes the condition (or opportunity for improvement)?
— Are standard formats templates or databases being correctly used?
— Is the description satisfactory to understand what the issue is?
— Has the issue been reported in a timely manner?
— Is the extent of condition reported? Are the affected areas, systems, equipment, documentation and people involved identified?
— Is the status of the plant and other relevant data reported?
— Is the extent of condition, generic implications clearly reported?
— Is the reporting supported with sufficient details, so as to enable subsequent monitoring of adverse trends in different areas of the plant, and to help in understanding generic deficiencies?
— Are the consequences or potential consequences reported?
— Are the benefits of suggestions and good practices reported?
— Have appropriate notifications been made (whether internal or external)?
— If the event is one involving human performance, has the appropriate human performance staffs been notified?
— Has the report been and screened by the OE screening committee and submitted to other organizational safety committees? Have their comments/clarifications been considered/included?

3.5. Examples of reporting

Example 1
A tool left at the working place
The plant was at shutdown conditions preparing to start up after refuelling. Maintenance work was conducted by an electrician with the main circulating pump (MCP) motor. After completing the maintenance activities he collected the tools and left the work place. He reported to the barrier control attendant that he finished his job. Several hours later he realized that one of the tools (chisel) is missing from his tool kit. He suspected that it could have been left at the working place near MCP motor. A search was made for the missing tool and it was found at the MCP motor casing. This event was reported in the plant.

Comments:

1. Reporting threshold and what to report: This event is just an undesired situation concerning condition of tools and personnel work practices. From this example we can see that the reporting threshold is becoming stricter as performance improves at each plant/utility therefore an insight on precursors of a significant event may be provided. It is not necessary to report this event to the industry or even within the utility, but the trending analysis could be shared with other plants.

2. How to report: The event is reported directly by the electrician who directly carried out the work. The content is succinct and contains only the descriptive information in order to be codified and introduced in the database to perform the trending analysis of collective in-house events.

Example 2

Explosion of a cell in a battery bank

A worker was cleaning the cells in the battery room with a paper tissue soaked in white spirit to remove the grease and spots of sealing compound left after the refurbishment of the cell. While cleaning the top of the cell in a battery bank it exploded. Fortunately, the man was not injured. The event was reported immediately by the worker. It was later demonstrated that a static electrical charge of 12kV could be generated by vigorous rubbing of a battery top with a tissue soaked in white spirit.

Recommendations given by plant experts as a result of study of the above message are the following: we were not aware of the fact that such a strong electrical charge is generated as a result of rubbing battery terminals with spirit soaked tissue paper. It was recommended to add a precautionary note in the battery cleaning procedure, not to use any chemical for battery cleaning. The event was reported according to the procedures and predefined format.

As a result the following entry was added in the precaution column: ‘Don't use spirit or any other chemical for cleaning battery terminals. Only a paper tissue soaked in demineralised water or soapy water could be used to remove grease, etc.’.

Comments:

1. Reporting threshold and what to report: The event caused an equipment damage (explosion of a cell in a battery bank) and release of toxic materials (gas and liquid from the cell). It is also an event which is related to quality and adequacy of procedures. It might be reportable to the regulator depending on national requirements. It might be a significant event reportable to the industry or a significant event to be shared within the utility for reference to other plants or preventing reoccurrence.
2. How to report: The event was reported immediately within the plant. Main components of initial report included: title of event, abstract, direct cause (rubbing battery terminals with spirit soaked tissue paper). A later report suggested a potential root cause (deficiency on quality and adequacy of procedures) for further investigation and analysis, after which a final report confirmed the root cause and determined corrective actions (add a precautionary note in the battery cleaning procedure, not to use any chemical for battery cleaning). The information provided above is just an example. In a comprehensive report, more detailed information is included.

Example 3

Steam generator tube rupture

The plant was operating at 100% power. High radiation alarm occurred on the air ejector discharge gaseous radiation monitor. Turbine runback due to decreasing pressure. Pressurizer pressure and level were low. Standby charging pump started. Reactor tripped and safety injection activated due to ‘low pressurizer pressure ‘. Investigating of the event showed that the SG tube rupture is caused by mechanical wear due to a foreign material.

Comments:

1. Reporting threshold and what to report: This event is a high level event which reportable to the regulator, because it is related to radiological safety (High radiation alarm occurred on the air ejector discharge gaseous radiation monitor), it is an equipment failure with break of primary circuit barrier.
2. How to report: The event should be reported to the regulatory body in the form of notification, prompt report and comprehensive report. This report has been also disseminated to other nuclear power plants.

Example 4
Post-job report: Skip wash basket and sump cleaning operations
During Rotary Skip Wash basket and sump clearing operations in the radiation controlled area two incidents occurred: a) a hose was damaged due to a deficient work practice contaminated water, resulting in a need for stop the work and evacuate the area for cleaning b) contaminated liquor dropped from the tongs being used, resulting in a slight personal contamination of an operator.

Subsequent investigations showed common contributors for both incidents, mainly: deficient work practices; work planning not including a full risk assessment of all aspects of the job and an ALARA plan; the project file was not regularly updated to reflect the current status of the job; the training of personnel and pre-job debrief did not include information on access control, use and storage of long tools, and response to personal contamination; operators failed to realize that they were no longer working within the routine operating envelope and that therefore their routine assumptions were no longer valid; contingency plans and built-in regular ‘time-outs’ to capture learning and refine the plan were not established.

Comments:

1. Reporting threshold and what to report: the event might be reportable to the regulator depending on national requirements. For this particular case, due to limited consequences the events were not reportable to the regulator, and were not significant to be reportable to the industry. The events was reported within the utility and investigated as a significant event to determine the root causes.
2. How to report: The event was reported immediately within the plant. Main components of initial report included: title of event, abstract, location, system, plant status, discipline, direct cause (puncture of a hose with a tool). A later report suggested a potential root cause for further investigation and analysis, after which a final report confirmed the root cause and determined corrective actions.

4. SCREENING

4.1. Purpose

Screening is the process to determine if an item is to be included in the OE programme, the kind of treatment to follow, and the priority of the activities to be carried out.

The purpose of the screening process is to implement a graded approach to operating experience. Screening assigns the level of investigation and analysis to the events (full root

cause analysis, simplified analysis, trending, etc). Screening includes prioritization according to safety significance, recurrence and recognition of adverse trends.

Screening provides an overall significance and quality check on all reported issues occurring at nuclear installations. This can be achieved by screening all events, taking a representative sample or by initially selecting those that may require further detailed investigation and analysis. It is important to recognize that screening takes place at various steps as an event report is being developed. This means that the findings during the investigation may change the screening conclusions, i.e. classification of events.

The purpose of this section is to provide detailed guidance, recommendations, suggestions and good practices in developing and implementing screening activities to ensure that equipment, human performance, programmed and organizational issues are being screened through an appropriate threshold criteria, prioritized according to recurrence and recognition of adverse trends, and distributed as appropriate for information and further action within the plant, to regulatory body or to external organizations.

4.2. Objectives

In the previous section information was provided on how to report concerns and issues. Once these concerns and issues have been reported they are subject to screening.

The primary goal of the present section is to provide information on how to screen the reported issues and concerns, in particular:

— what to screen;
— how to screen;
— establishing the thresholds;
— reviewing the effectiveness of the screening process.

All organizations involved in the OE process screen information on events bearing in mind their own needs.

— Operating organizations screen the events with the final objective of improving safety, plant availability and commercial performance, by identifying and correcting the causes of events and thereby avoiding their recurrence. These include evaluating the applicability of good practices used by others and exemplifying the applicability of those identified in house. Also, the level of notification and dissemination to external organizations is determined.

— Regulatory bodies review the events to gain insights that can be used to inform their inspection programme, licensing activities, elaboration and updating of regulations and safety standards, and requirements for safety backfits.

— Industry organizations, owners groups and nuclear world associations screen the events according to their own policies, to enhance the exchange of operating experience among utilities and promote the consideration of generic implications and lessons learned.

— Vendor companies use the OE data to improve their design and manufacture of structures, systems and components. Similarly, research establishments may use the OE data in support of their research goals and programmes.

The scope of the screening includes all the reports concerning operating experience received or produced at the plant, originated either internally, from external sources or as a result of benchmarking programmes.

Screening participants bear in mind when performing the screening that an important objective of the operating experience, in addition to fixing the problem and prevent recurrence, is analyse the trending, to feedback the lessons learned and to be proactive in learning from the cumulative experience.

4.3. Procedure for screening

a) Overall attributes

Plants develop procedures for screening. The procedures comply with the following attributes:

- Operating experience information is appropriately screened, to select and prioritize the information for further investigation.
- Screening criteria for internal and external OE is clearly established and the subsequent level of investigation and distribution is defined.
- The screening is performed in a systematically and timely manner. The sources for screening and their corresponding frequency of screening are defined.
- Screening is performed by individuals with a broad knowledge of plant operations or by a multidisciplinary group including human performance staff. A high level representative chairs the meeting. In any case, in order to avoid dismissing important issues, analysis and decision are not based on only one individual. Collective/group review is recommended.
- Complete information is available for the screening process in order to ensure participants' preparation.
- The identifying, reporting and screening are a timely process. That means the steps are expected to be performed as soon as possible once the event has been identified. This may require in some cases to convene urgent/especial screening meetings.
- Conclusions of screening are adequately tracked.

An effective screening process is also aimed at selecting appropriate information related to potential precursors in order to take timely measures to prevent significant events.

Some large corporate or national organizations may consider useful to have two levels of screening: one at the plant level and one at corporate level. Some utilities with several sites have established an OE Review Group (OERG). The OERG provides a forum for the OE coordinators to address OE programme related items and to promote the sharing of internal OE programme among the sites. During the OERG meetings a review of the OE activities is performed that can be helpful in determining the applicability of OE to specific locations, reinforcing desired behaviours, promoting the use of human performance tools, alerting from common weaknesses and helping to shield the fleet from generic events.

Some large corporate or national organizations may consider it useful to set an organization to perform the screening and initial evaluation of the overall national or international OE. In this case these screening considerations also apply. These organizations perform also the translation of the selected information into the national language.

Not all events need a full root cause analysis. The effective utilization of resources within the plant depends on the appropriate screening of event reports. For low level events, a categorisation (coding) of the event information may be decided by the screening committee. This task may be performed by a designated experienced person without a need for in-depth analysis. Only in the case of more complicated or more significant events are additional analysis and detailed investigation necessary. However, for near misses with the potential of significant consequences, in-depth root cause analysis may be needed to learn the lessons and prevent reoccurrence or even leading to a significant event.

All events, independently of the significance of their consequences, are coded and collected in the event data base for future collective analysis and trending, to identify antecedents and precursors. This database can also be used for training, future use of lessons learned, preparation of pre-job briefings and streamline of practices and procedures. For low level events, coding may be possible based on the event description and the direct or apparent causes provided to the screening committee or to the OE coordinator, although in some cases, screening committee or OE coordinator may require sufficient relevant data to ensure correct threshold classification and coding.

b) Screening committee

The screening process usually involves multidisciplinary groups or committees of broad experience personnel with integrated knowledge within the group of technical, human performance, programme and organizational perspective. People with broad knowledge on operation, maintenance, radiological protection, safety requirements, human factors, are essential.

The quality of screening depends not only on engineering and operating judgment, but also on human performance assessment. Many of the basic causes of events contain an element of human factors. It follows therefore, that selected OE emanating from events arising in the plant or at other plants, is scrutinized by personnel not only from the engineering, operating and scientific perspective, but also by those with knowledge of human performance and behavior.

The OE coordinator may perform a pre-screening in preparation for the screening committee. It is a good practice to nominate an OE liaison in each group to serve as the point of contact within the respective organization and to help in the screening activities and the corresponding follow up.

The identifying, reporting and screening are a timely process. That means the steps are expected to be performed as soon as possible once the event has been identified. In many organizations the Screening committees meet once a week, except when important events require an urgent immediate meeting.

Screening committee meeting frequency will depend on the number and type of events being generated at a plant/utility. Where the reporting criteria are very strict and a large number of

events are being reported, a daily screening may take place. A combination of a daily screening and a weekly screening committee meeting could be considered as a screening frequency. A package containing all the events is developed the day before each meeting. Each Department has a dedicated resource that will have pre-screened the issues occurring in their Department; will have assigned a preliminary rating on the relative importance of the event; and, the suggested level of investigation. The screening committee will approve or modify their input.

The screening committee (whatever the meeting frequency) may also act as an approval body for investigation report and corrective action plan. The committee may also recommend or refer these to other established oversight committees (such as safety committees, where the composition may be more senior or more focussed on the specific topic).

External OE screening process should follow the same considerations as internal OE. The screening responsible bear in mind that best use of external OE is to find similarities that might be applicable to the plant good practices and opportunities to learn, not to find differences to justify that is not applicable and to refuse their consideration and application.
The screening committee consider how or by which sort of combinations or unfortunate situations an event of this kind could happen at the plant. In most cases the type of design of the plant, type of supplier or contractor are not the main reasons to determine if the OE is applicable or not to your plant. Questions related to human factors, human attitudes, management, ways of training and writing or using procedures, materials composition, generic components, etc. are the ones that are the most decisive.

4.3.1. Screening thresholds

Screening criteria provide clear thresholds between what has to receive a deep root cause analysis, a simplified root cause analysis and a trend analysis of the apparent causes.

Screening criteria can be used to determine if an event needs to be notified to the regulatory body and other governmental authorities and utility representatives. The activities to fulfil the notification requirement to regulatory and off-site authorities and utility representatives may be considered in parallel to the screening process if necessary to comply with the requirements concerning the time delays for prompt notification.

For this purpose, depending of the frequency of the screening meetings, some organizations find it more convenient to associate the required prompt notification activities with the reporting process, leaving to the screening process the task of determining if additional communication and distribution is necessary.

A screening criteria used to determine if an event should be shared with other plants and organizations is by simply asking oneself if the plant would have liked to be informed in case that the same event would have happened to another plant. If the answer is yes, then the event is communicated to others. This is also true when deciding the extent/detail of information to include for the event.

The criteria for the screening threshold system is based on a graded approach with enough tiers to the significance of issues. Using enough tiers allows the OE system to have enough defence in depth levels to identify precursors at one level before they reach a higher level.

The following is an example of screening categories. It is important to ensure consistency between reporting and screening thresholds:

— High level events reportable to the regulator;
— Significant events reportable to the industry;
— Significant events to be shared within the utility;
— Low level events;
— Near misses.

Note: Based on the significance of the potential consequences some near misses may be considered of particular importance for learning and are subject to special treatment.

High level events reportable to the regulator and other authorities are defined by the National Regulatory Organization and detailed in the country rules and regulations. High level events include those events, accidents or incidents that have impact or are related to environmental, nuclear or radiological safety, with off site impact, on-site impact or defence in depth degradation, or violation of nuclear safety regulatory rules. When reporting events outside the plant/utility additional screening/review will ensure the correct facts are communicated.

Significant events reportable to the industry are mutually defined in agreement with Owners Groups and Nuclear World Associations. Significant events are defined as events that are consequential and in most cases have an impact on safety, reliability or performance.

Some events of the above categories may require to be reported to the public, either directly or through the corresponding authorities. Use of INES (International Nuclear Event Scale) classification may be useful for this purpose. When the public may be notified it is wise to use spokespersons or departments dedicated to public affairs if available.

Significant events to be shared within the utility are usually defined by the corporate organization in order to share the experience and lessons among the different own plants, to avoid recurrent failures, improve plants safety and reliability, support the human performance improvement programme, shield the company fleet from generic deficiencies and help to become a learning organization.

Low level events are undesirable occurrence or series of occurrences with minimal consequences, which do not reach the threshold of significant event.

Near misses are any occurrence or event that could have resulted in undesirable consequences but did not due to fortunate circumstances. If the occurrence continued unabated or if the conditions had been slightly different, it could have resulted in significant or less significant adverse consequences.

Low level events and non significant near misses are reported within the plant, coded and directly introduced in the data base for trending, and are not necessarily, individually reported outside. Nevertheless it is recommended as a good practice to share within the nuclear industry the lessons learned from in-house collective analysis of low level events and near misses, and identified trends.

Screening is also used to establish priorities. The criteria for priority is generally established on the basis of a well established criteria such as the risk (risk = probability x consequences)

that a similar event could happen at the plant. A qualitative evaluation may also be used for this purpose. Some plants use the following priorities:

— High priority: requires immediate attention. Nuclear safety, personnel safety or plant reliability is affected.

— Moderate priority: need resolution in short time. Only availability of the plant may be affected.

— Routine priority: items not classified as high or moderate priority, but attention is required to review and determine recommended actions.

Setting screening threshold categories and pre-defined levels of treatment during screening may be approached in a number of ways. Appendix V provides examples of categorization and the corresponding pre-defined treatment during screening. Pre-defined systematic approach is used as guidance and may require to be confirmed or complemented by the multidisciplinary judgement performed during the screening meeting.

For external OE screening details are presented in Section 4.3.3.2.

4.3.2. What to screen

The scope of the screening includes all the reports concerning operating experience received or produced at the plant, originated either internally, from external sources or as a result of benchmarking programmes.

Scope of the Screening of internal OE includes the plant events, as above stated in sections 2 Identifying and section 3 Reporting, including low level events, near misses and opportunities for improvement. Events include: those affecting plant nuclear safety, radiological conditions, industrial safety, environmental conditions, safety of transport and fuel storage, fires at the plant, outage events, and other abnormal or unusual events, etc. such as failures, deficiencies, deviations, malfunctions, procedure errors, human errors, near misses, non-conservative decision making.

Scope of the screening of external events includes information proceeding from the sources of OE that the plant uses. The screening committee ensures that appropriate sources of external information are used and if necessary define additional sources of OE that the plant should use.

4.3.3. How to screen

The operating organization and other organizations involved in screening develop detailed procedures for the screening of events. The process of screening has a screening criteria and levels of screening very well defined. Clear policies and procedures exist to provide for this definition. These procedures provide at least separate criteria between what has to receive a deep root cause analysis and what has to receive a trend analysis of the apparent causes. The screening process is useful to optimise the use of resources so that the events receive the required attention according to their significance.

To establish the screening priorities to review the OE solely on the basis of certain kinds of OE publication or certain kinds of OE sources may prevent from other more important OE events reported through other sources to be revised timely.

4.3.3.1. Screening of internal OE

Level of event is determined according to the characteristics of an event, such as:

— Safety significance;
— Level of priority (immediate hazards, operability concerns. etc.);
— Generic impact.

Then the following items are determined:

— If more or deeper analysis is necessary to determine the significance of the event;
— The level of the analysis to perform;
— If additional communication and distribution is necessary and to whom externally and internally;
— If the associated adverse trending from history should be analysed including the potential trends that may develop in the future.

4.3.3.2. Screening of external events

Identify the lessons learned from other plants and to transfer these lessons learned into actions at the own organization that will contribute to improve the own safety and the reliability. The screening determines if the information is applicable to the plant and recommends a priority for a more detailed or deeper evaluation/analysis. The screening material is then sent to relevant personnel for review.

The screening of external OE is based on applicability, significance, and the potential occurrence of the event at the own house.

The screening process identifies the questions and proposed actions that need a deeper evaluation or should be added, either technical, human, procedural or organizational, and to transfer them into the own house culture. It is critical that these responsibilities are assigned in the plant organization and are tracked to conclusion.

The screening also decides the final level of communication and distribution within the organization.

To determine whether an external event is applicable for the plant, the screening includes consideration of aspects such as:

— Generic implications which apply to the plant;
— Similar equipment at the plant;
— Similar practices that predispose the plant to similar events;
— Similar management policies;
— Similar human attitudes;
— Similar ways of writing procedures;

— Similar ways of training;
— Potential combinations or unfortunate situations (including climatic situations) that may lead to the same event;
— The prior occurrence of a similar event;
— Reported actions which are applicable to the plant.

The screening also determines if the information can be utilized:

— As a good practice;
— To study and modify a system;
— To improve human performance;
— To change organizational structure;
— To modify procedures;
— To improve technical knowledge;
— To discuss within a working group;
— To use in training;
— To record future application.

External operational events are considered in sufficient detail to arrive at a thorough understanding. This implies sometimes getting additional information primarily from the plant at which the event occurred, but also from other organizations (e.g. other plant of the same type, utility headquarters, international organizations) if necessary. After completing this step, a decision is made on whether the information needs analysis in depth.

The screening provides also target dates for the process.

4.3.3.3. Use the process described in the following steps to screen for the significance:

a) Is the event associated with:

- Nuclear or radiological safety;
- Mitigating system;
- Barrier integrity;
- Defense in depth degradation;
- Operability – justification for continued operation required;
- Degradation of a fire protection feature;
- Security;
- Common cause failures;
- Other degraded conditions that could influence public or employee safety or security;
- Environmental threat.

b) Is the event associated to a failure to meet:

- Regulatory requirements;
- Technical specifications/safety analysis report;
- Plant safety (or non-safety) procedures;
- Industrial safety;

- Plant security;
- Radiation work permit;
- ALARA occupational doses;
- Actual event emergency declaration;
- Effluent monitoring;
- Environmental monitoring programme;
- Nuclear material control.

c) Does the event involve:

- Violation or malevolent acts;
- Natural phenomenon;
- Security threats;
- Failure to provide accurate information to authorities;
- Failure to follow procedures and shortcuts;
- Document inconsistencies or deficiencies;
- Material condition;
- Housekeeping;
- Personal injury;
- Human factors;
- Fitness for duty;
- Drill or exercise critiques;
- Training and qualification deficiencies.

d) Is the event:

- Consequential;
- Near miss;
- Recurrent or repeat event.

Appendix VI provides an alternative example of a list of factors that may also be used to perform screening for significance.

Appendix VII provides an alternative example of a detailed process for screening after an issue has been identified and reported.

4.3.3.4. Following is a list of considerations to be taken in the screening process:

— Screen for the significance: consider the questions included in Section 4.3.3.3.
— Establish the priority of the evaluation (consider safety, reliability, human factors, probability of occurrence, status mode of the plant, etc.).
— Review if a similar event has been screened or analysed before. If yes, review the previous conclusions, including the success of the lessons learned and corrective actions. Think before closing a screening process on the basis that it was already screened before, because you may be wasting history or loosing an opportunity to add better actions.
— If the event is recurrent, discuss the causal factors that allow the event to repeat or the new factors not previously identified. Include this fact in the scope of

evaluation/analysis, with additional focus on determining why the previous corrective actions had not been effective. For this purpose the IAEA publication Effective Corrective Actions [2] may be useful.

— Review if similarities exist with other events in-house or external. Include this fact in the scope/focus of evaluation.
— If OE is external: identify the reasons why it is applicable or why not (don't forget to think positively, not only to justify why it is not applicable). Ask the same questions stated above for internal events.
— Establish the appropriate level, responsibilities and priority for investigation/analysis/trending.
— Assign the responsibilities for the subsequent actions — enter the actions into the appropriate action tracking system.
— Identify what has to be communicated internally and externally — assign this responsibility.

4.4. Quality review

The screening decisions are reviewed to ensure quality of screening. The level of revision and content of the check list are adapted to the level of the issues. The following are examples of attributes for consideration in the review:

— Were the required levels of multidisciplinary expertise present during the screening?
— Was the screening package adequate to allow meeting preparation?
— Have the screening thresholds been applied consistently?
— Are the priorities adequately established?
— Are the decisions making regarding reporting to regulatory authorities, other external authorities, utilities and other plants, etc. consistent with applicable criteria and appropriately implemented?
— Are the significance ratings appropriate and consistently applied?
— Are the rating procedures consistently applied?
— Are the decided levels of investigation/analysis/trending adequate?
— Are the assigned responsibilities for further processing clear, accepted and tracked to completion?

4.5. Examples of screening

Example 1
Valve maintenance with system pressurized involving risk of valve stem ejection
Work was performed on a motor-operated feedwater isolation valve following its failure due to a suspected broken valve stem. Maintenance was assigned to remove the motor-operator with the system pressurized. Since the valve stem might have been broken, a stem-retaining device was installed to hold the stem in place. Due to the fact that the system was pressurized, contingency measures have been established to provide for adequate protection of the personnel, as per plant industrial safety procedures. When excessive force was applied to remove the stem-retaining nut of the motor operator, the lead technician identified a problem and discontinued removal efforts, and informed the supervisor. It was subsequently noted that

the stem had pressure on it and was being pushed out as the nut was loosened even with the stem-retaining device installed. Had the removal effort continued, the stem could have ejected resulting in further damages of equipment. There is no similar event happened before.

Comments:

1. Screening threshold and what to screen: The event was a near miss with low potential consequences and is reported within the plant. Trending analysis is needed. Root cause analysis is not necessary. Routine priority is given to this event.

2. How to screen: Screening is carried out in the following steps:

    a) Significance considering the questions included in Section 4.3.3.3: low potential significance;
    b) Priority of the evaluation: Low priority because of its low significance;
    c) Level of investigation/analysis/trending: only trending is needed;
    d) Review if a similar event has been screened or analysed before: No;
    e) If the event is recurrent (in-house or external) or not: No;
    f) Identify what has to be communicated internally and externally: The event report is communicated internally. Lessons learned from trending analysis (together with other events) and potential precursors determined through collective analysis may be communicated externally.

Example 2
Misclosing of a steam valve causing potential possibility of reactor scram
The two units were operating on full power (unit1) and ready to start up (unit2) respectively. The operator was trying to test the heating steam valve for one of the low pressure feedwater heaters of unit 2. Since the controllers of heating steam valves for unit 1 and unit 2 are located on the same platform, the operator closed the valve of unit 1 while he was supposed to operate the one on unit 2. Fortunately, he realized his mistake immediately and opens the unit 1 valve in seconds. The water level of the heater of unit 1 decreased but not reaching the reactor trip setpoint and resumed to normal level later.

Comments:

1. Screening threshold and what to screen: The event was categorized as a significant near miss because although there was no impact on the unit, the potential significance is the reactor scram. The event was not classified as significant event which should be reported to the regulatory body but due to its significance, the screening committee decided that it should be reported and shared in the industry. Event investigation and root cause analysis was decided to be performed because of the potential significance.

2. How to screen: Screening is carried out in the following steps:

    a) Significance considering the questions included in paragraph 4.3.3.3: high significance (related to operability: reactor trip);
    b) Priority of the evaluation: High priority because of its potential safety significance (potential reactor trip);
    c) Level of investigation/analysis/trending: full investigation and root cause analysis;
    d) Review if a similar event has been screened or analysed before;

e) If the event is recurrent (in-house or external) or no;
f) Identify what has to be communicated internally and externally: The event report is communicated externally to other plants.

Example 3
Steam generator tube rupture
The plant was operating at 100% power. High radiation alarm occurred on the air ejector discharge gaseous radiation monitor. Turbine runback due to decreasing pressure. Pressurizer pressure and level were low. Standby charging pump started. Reactor tripped and safety injection activated due to 'low pressurizer pressure '. Investigating of the event showed that the SG tube rupture is caused by mechanical wear due to a foreign material.

Comments:

1. Screening threshold and what to screen: The event was categorized as a high level event which should be reported to the regulatory body. Event investigation and root cause analysis are necessary. High priority should be given to this event. The event affects plant nuclear safety and radiological conditions.

2. How to screen: Screening is carried out in the following steps:

    a) Significance considering the questions included in Section 4.3.3.3: high significance (related to radiological safety and operability: reactor trip, break of primary barrier);
    b) Priority of the evaluation: High priority because of its high safety significance;
    c) Level of investigation/analysis/trending: full investigation and root cause analysis are needed;
    d) Review if a similar event has been screened or analysed before;
    e) If the event is recurrent (in-house or external) or no;
    f) Identify what has to be communicated internally and externally: The event report is communicated externally to regulatory body and other plants.

Example 4
Demineralized water leak
During plant operation the pressure of one of the demineralised water production systems suddenly dropped. It was found that due to the break of several flange bolts, demineralized water was leaking from a flange. Direct investigation showed that although torque wrench was prescribed in procedure, bolts were probably overtorqued in previous maintenance causing weakness of their strength.

Comments:

1. Screening threshold and what to screen: The event was a low level event. Trending analysis is needed. Root cause analysis is not necessary. Routine priority is given to this event.

2. How to screen: Screening is carried out in the following steps:

    a) Significance considering the questions included in Section 4.3.3.3: low potential significance.

b) Priority of the evaluation: Low priority because of its low significance.
c) Level of investigation/analysis/trending: only trending is needed.
d) Review if a similar event has been screened or analysed before: No.
e) If the event is recurrent (in-house or external) or not: No; however, some weeks later, a similar event occurred to some bolts of one flange of the steam auxiliary boiler, which produced a steam leakage. When asked why a calibrated torque wrench was not used, a worker stated that frequently there wasn't any available. As a result a deeper investigation was requested during the screening meeting.
f) Identify what has to be communicated internally and externally: The event report is communicated internally. Lessons learned from trending analysis (together with other events) and potential precursors determined through collective analysis (such as training, following procedures, pre-job briefing, calibration of torque wrench, etc.) may be communicated externally.

5. PERIODIC EFFECTIVENESS REVIEW

5.1. Self assessment

A self-assessment performed by the operating organization periodically reviews the effectiveness of the identifying, reporting and screening process. The purpose of the self-assessment is to recommend remedial measures to resolve any weaknesses identified. Indicators of identifying, reporting and screening effectiveness are developed.

The assessment frequency is established based on management's concerns of programme effectiveness. A typical periodicity is annually.

Personnel familiar with the assessment of operating experience information perform the review of effectiveness. Consideration is given to using personnel from other stations or utilities on a reciprocal basis to assist the review.

If significant weaknesses are identified, consideration is expected to be given to benchmarking the identifying, reporting and screening processes against good practices in the industry.

5.1.1. Self assessment of identifying process

This review examines, in part, a sample of identifying issues to provide an indication of weaknesses in overall questioning attitude and attention to detail when identifying issues.

Questions/ attributes to be considered in a self-assessment of identifying process:

— Review the setting of management expectations and thresholds in the area of identifying, and how they are communicated to and understood by the personnel.

— Assess whether identifying is performed in a timely, complete and accurate manner:

- Issues are identified in a timely manner commensurate with its significance and ease of discovery.
- Affected areas, systems, equipment, documentation and people involved are identified.

- Extent of condition, generic implications is identified.
- Status of the plant is given.
- Benefits in the case of suggestions or good practices and the consequences of bad practices are noted.
- Verify the consistency (in scope, deepness, devoted attention, etc.) of identifying activities among the different areas.
- Assess if identifying of low level events and near misses is carried out and supported with sufficient details.
- Perform an on the job observation to review the identifying of a problem by personnel, where possible.
- Do personnel identify possible ways for improving safe and reliable plant operation, personal safety as well as plant processes (administrative and technical) optimization?
- Are good practices, good performance and good examples identified?
- Use benchmarking to develop possible improvements in the identifying process.

5.1.2. Self assessment of reporting process

Self assessment of reporting is directed to review that the issues identified are being reported timely, problem reporting is strongly encouraged, reporting activities are consistent throughout the plant and dissemination of the operating experience reports is timely performed.

Management monitors the volume of reports entering the system and watch for declining values. The ongoing quality of the reports is monitored to check that it is not declining.

Periodically management considers the use of employee questionnaires or surveys to get feedback about the level of satisfaction or difficulties in the reporting activities, such as why near misses may not be being reported, or, what difficulties employees may face in reporting near misses.

Questions/attributes to be considered in a self-assessment of reporting process. (The following has been extracted from OSART Guidelines Section 3.6 [8]):

(1) Is event and deviation reporting comprehensive? Is minor, low level and near miss reporting actively encouraged? Review the internal and external reporting criteria and confirm that the reporting threshold is low enough to accumulate sufficient material to draw realistic conclusions. Confirm that precursors and near misses are reported.
(2) Is reporting of deviations, events, precursors, etc. carried out by all the different levels of personnel, sections, departments, etc. throughout the plant organization? Do all staff contribute?
(3) Is the reporting process user friendly? Are the relevant plant personnel fully aware of the process?
(4) Are the reporting requirements communicated to plant personnel during initial and refresher training? What other methods are used to convey management's expectations on reporting?
(5) Is there a tendency in reporting either equipment, procedural or personnel deficiencies?

(6) Is there physical evidence in the plant of unreported deficiencies, event precursors or error likely situations (e.g. defective equipment, poor material condition, poor or unsafe working practices, un-controlled operator aids, lack of document control, etc.)?
(7) Is feedback of field activities captured and introduced in as build work information in order to report the lessons learned after performing the work? (by means e.g. specific paragraph in the post-work format).
(8) Review that important problems that should be in the higher level of operating experience and corrective actions, are not being reported instead in the lower level and near misses programme.
(9) How comprehensive is event reporting and is information centralized?
(10) Is there a declared policy of no-blame reporting in an accountability environment? What is the staff perception is it considered punitive?
(11) Are the employees who identify problems receiving feedback on the decision made?
(12) How accessible is the event report information to plant personnel?
(13) Check that applicable OE information has been disseminated to appropriate personnel in a timely manner. Check whether the workers/engineers have received this information and considered it.
(14) Do the criteria for reporting to external organizations (regulatory authorities, utility and international organizations, etc.) comply with the requirements of external organizations in ensuring learning opportunities are maximized? Is off-site reporting adequate? Are there events that should have been reported off-site that were not? Have events been reported off site that was not appropriate?
(15) Confirm that recent plant events were shared with the external nuclear community. Determine if the sharing was voluntary or forced by national authorities. From the review of operational history see if there were any obvious events that should have been shared and follow through to see if they were.
(16) Verify the timeliness of the sending report to regulatory authorities. Ask for the ratio of plant late reporting to the regulator.
(17) Verify the timeliness of the sharing events to external community. (e.g. international industry reference uses as reporting time objective 4 weeks following a significant event and 20 weeks for reporting the results of the analysis).
(18) Are reports tracked to ensure analysis is complete and corrective action taken?
(19) Are deviations identified by relevant review programmes (e.g. QA, surveillance testing, management tours, etc.)?
(20) Do the results of routine managerial plant walkdowns reflect the deviations/events/issues reported by plant personnel into the OE process? Do the results of the mission plant walkdown reflect the results of recent managerial walkdowns?
(21) Are the deviations/events/issues etc. reported by plant personnel reflected in QA non-conformance reports?
(22) Is the plant pro-active or re-active in its failure prevention programme? Is the plant able to determine how many events are detected/reported through surveillance programmes (prior to being put into service, by preventive maintenance or surveillance) versus operational failures?
(23) Is the plant able to determine how many deviations are reported as a result of quality verification prior to service? How many deviations are reported as a result of surveillance programmes to detect unforeseen degradation in service? Are measures taken to prevent deterioration in service?

5.1.3. Self assessment of screening process

Questions/attributes to be considered in a self-assessment of identifying process. (The following has been extracted from OSART Guidelines Section 3.6 [6]):

(1) Are screening criteria for in-depth investigation and root cause analysis established? Are there clear responsibilities for this decision making?
(2) Is timely screening for report or assessment of effect on plant evident? Is there evidence of dissatisfaction from receivers (e.g. regulatory bodies and other off-site authorities, utility, international organizations, etc.) regarding timeliness of reporting? Is there a backlog of events to be analysed — if so, how significant are they?
(3) Is there a threshold for exclusion/inclusion of events? If so, is that threshold appropriate?
(4) Are the plant reporting criteria adequately defined and are they comprehensive?
(5) Comment on the comprehensiveness of the screening criteria for reporting to the regulatory body — do they cover all safety significant events?
(6) Comment on the comprehensiveness of the screening criteria for reporting to other external bodies (Health and Safety, Environmental, etc.) — are all relevant deviations covered?
(7) Are all reported safety relevant deviations currently identified in the screening process and analysed to learn the lessons — does the plant comply with its criteria?
(8) When screening criteria are met is the priorities and action to be taken specified in writing?
(9) Determine how external experiences are made known to the plant. If a pre-screening is done outside the plant, for example by a corporate office organization or national utility group organization, determine what criteria they use. This is necessary to ensure all Are external OE reports screened adequately? Is too little (or too much) information introduced into the plant OE process? Can it be digested or on the contrary are there missing opportunities?
(10) Are the personnel responsible for screening suitably experienced? Do they have adequate resources to conduct their duties?
(11) How do the staff determine whether the external operating experience report is relevant to the plant? Are relevant external OE reports adequately assessed and timely circulated for information?
(12) Review the screening process of in-house events and verify the screening includes low level events, near misses and precursor events.
(13) Applicable information is forwarded to the plant.

5.2. Peer reviews of identifying, reporting and screening process

5.2.1. The purpose of a peer review is to determine whether the identifying, reporting and screening process meets internationally accepted standards and to identify areas for improvement. The peer review:

— Assesses the comprehensiveness of the plant self assessment and offer comment and recommendations to further enhance the conclusions of the self assessment.
— Compares, as far as possible, the identifying with guidance and equivalent good practices elsewhere.
— Focuses on process performance so that it is possible to accept different approaches to the implementation of the identifying, reporting and screening activities.

5.2.2. Some of the criteria typically used during a peer review for assessing the effectiveness of the identifying, reporting and screening process are:

— The plant continuous improvement policy and strategies and the identifying, reporting and screening process are mutually consistent and in agreement with international best practices, in particular regarding the balance of priorities, thresholds and allocation of resources.
— Identifying, reporting and screening of problems are complete, accurate and in a timely manner commensurate with its significance and ease of discovery.
— Extent of condition is identified, including generic implications.
— Personnel identifies possible ways for improvements of plant safe and reliable operation, personal safety as well as plant processes (administrative or technical) optimization.
— Good practices, good performance and good examples are identified, reported and screened

5.2.3. Review availability and accessibility by the plant operating experience group and by other departments of the internal and external sources of OE and assess how they are taken into account effectively in the identifying, reporting and screening process for consideration in the OE programme. In particular:

— Review material, such as shift operating logs, for events that should have been considered in the OE programme.
— Review availability and accessibility of information on limited conditions for operation, justification for continued operation, and information on retests, and reworks.
— Review availability and accessibility by the plant operating experience group and by other departments of source products such as: quality reports, reports and data from operation activities, maintenance testing and in-service inspection, post-work reports of lessons learned, post outages critiques, results from self assessments, training feedback.
— Review the consideration by the operating experience group and by other departments of evolution of the plant performance indicators and plant parameters as possible information source of areas where identifying issues could effectively contribute in the search for opportunities for improvement.
— Review the relationship between utility/plant and national/international groups such as IAEA/NEA, WANO/INPO, national regulatory body, owners groups. Review the availability of and accessibility to publications such as IRS, generic letters, bulletins, notices, vendors and manufacturers problem information, engineering designer problem information, utilities and industry event reports.

5.2.4. Peer reviews include a follow-up on the results of previous reviews to determine if the intended corrective actions and recommendations were implemented and effective. The plant organization provide to the peer review team adequate insight and request special focus and attention to recurring issues of previous self-assessments and peer reviews.

5.3. Performance indicators

A set of relevant performance indicators is developed for the operating organization to monitor the effectiveness of the identification, reporting and screening processes. These indicators provide a structural approach for the evaluation of the identification, reporting and screening processes, and give the operating organization the opportunity to assess the actions taken by dedicated personnel within the process as well as to understand strengths and weaknesses of the programme.

Based on the OE process designed for an operating organization a set of typical indicators related to identification, reporting and screening, are applied to monitor the effectiveness of OE.

Examples of these indicators are:

— Number of events reported in each category (High level reportable to the regulator, significant reportable to the industry, significant to share within the utility, low level and near misses).
— Number of external OE events collected.
— Timeliness of reporting.
— Average time for initial screening of OE documents.
— Number of recurrent NPP events where previous OE was available.
— Ratio of total events screened for evaluation versus total number of events identified.
— Ratio of events classified by screening at a certain level related to total number of events.
— Ratio of events classified by screening at a certain priority related to total number of events.
— Number of reports communicated to national safety regulatory body.
— Number of reports communicated to outside organizations.

These indicators are trended in order to identify the evolution of the performances.

5.4. Examples of assessment recommendations

Example 1
Issue:
While the preparation of some events reports are covered by administrative procedures, there is no overall guiding policy to advice staff as to which events are reportable. Therefore only events such as licensee event reports and reactor trip reports become part of a fully managed system. Other events such as turbine trips, runbacks, near miss accidents and non radiological environmental releases are judged by the operations or maintenance managers as being reportable or not. Systematic programme and procedures for identifying and reporting low level events and near misses are not in place to capture human factors related issues.

A programme to learn from low level events and near-miss events was under consideration some time ago, but no decision has been taken to implement such a programme. Without a programme to learn from low level and near-miss events, valuable information which could help prevent future events with more serious consequences will not be developed.

Suggestion:
Consideration should be given to the development of a policy for reporting of events and extending managed systems to include them.

Recommendation:
The in-house operational feedback programme should be improved by lowering the threshold to identifying and reporting low level events and near misses to capture human factors related issues and precursors.

The management should review his decision regarding the implementation of a programme to learn from low level events and near-miss events with the objective of developing valuable information which could help prevent the occurrence of future events with more serious consequences.

Example 2

Issue:
The operating experience feedback programme is not sufficiently comprehensive to reduce occurrence of events or avoid their recurrence. The high threshold for event reports, the lack of reporting of deficiencies in safety significant equipment and failure to report near misses limits the opportunity to take all possible corrective actions to prevent recurrence of incidents. Such actions could include the identification and elimination of incident precursors so that plant safety performance can be continuously improved. In addition, the safety equipment failure statistical report does not include those failures which have been repaired without the need to take the equipment out of service.

Recommendation:
The plant should lower its threshold for reporting significant events and include in the safety equipment failure report all failures involving safety equipment. In addition, a strategy to systematically collect and analyse near misses should be established and promoted among the plant staff.

Suggestion:
Consideration should be given to lowering the threshold for internal reporting and in-depth analysis of the plant's events and to implementing a near misses programme for all departments. As experience is gained with root cause analyses, the plant should consider if the threshold should be lowered further. Industry experience has shown that lessons learned from minor events and near misses are useful in preventing more serious events.

Example 3
Issue:
In some areas, there is the potential for low level adverse conditions, especially involving human performance not to be reported into the Operating Experience Programme.

Strong emphasis has been placed on the need to report low level events and event precursors into the operating experience programme by the Station management. Numbers of adverse conditions reported is consistent with world standards. However there are some anomalies.

Operations supervisors are required to record field observations from Observation and Coaching Tours that are scheduled once per week to identify and correct inappropriate or

inadequate performance. It was observed that several observation forms recorded behaviours that fell below acceptable standards. These adverse conditions had been corrected in the field, however many of the observation record forms contained no references of these issues in the appropriate fields of the operating experience database.

By not reporting deviations from station expectations into the operating experience database the station may lose some opportunities to enhance the evaluation of adverse condition trends that could lead to more significant or serious issues. Human Performance issues are being identified as major causal factors in the adverse conditions being recorded; however, a larger amount of information from low level events would allow the station to more accurately assess developing degraded performance areas.

Suggestion:
The plant should consider enhancing, through coaching, oversight and promotion, the importance of the reporting requirements, especially in recording low level adverse condition information, to staff at all levels of the operating and contracting organizations. The plant should consider to recording in the appropriate fields of the operating experience database the reference of the identified and corrected anomalies in the field.

Example 4
Issue:
The nuclear power station is missing opportunities for assisting the wider nuclear industry in learning from their events by not reporting all events of interest and possible application to other nuclear power plants. The plant is a member of WANO. Since the commissioning there have been many safety related events. Of these only four have been reported to WANO and there are other events satisfying the WANO criteria that have not. The nuclear industry will not be able to fully benefit from the sharing of events until all plants contribute to the database of events on an equal basis

Suggestion:
Consideration should be given to sharing all internal events of interest to others. One way in which this could be done is the more rigorous application of the WANO reporting criteria. This should result in an increase in the number of internal events shared with the rest of the nuclear industry.

Example 5
Issue:
The plant has several systems for collecting details of ‘low level’ events on-site. However, these are distributed around departments, and although extensive data is collected more effective use could be made of it. Although the site has a variety of data collection initiatives for low level precursor events, the extensive information they generate is not fully used. This is collected in several systems which are individual to different sections and departments, as well as a system of reporting cards for plant issues available around the site in general. These systems provide a valuable source of information that, at present is not being fully used since it does not receive the appropriate level of selection, analysis and trending to maximize its value.

Industry experience indicates that most events can be traced back to precursors, which if detected and addressed in a timely manner could result in the full event being avoided. Consequently, access to such information is highly desirable from a safety perspective.

Additionally, by involving the workforce in reporting low level events, and then encouraging them by demonstrating good use of the information they have provided, 'ownership' is strengthened. The information provided by a fully effective system such as this provides both a useful indicator to management, and a positive influence on safety culture.

Recommendation:
A review of information from the various 'low level' event reporting systems around site should be undertaken and methods implemented to optimize those systems and improve the level of analysis and use of that data to avoid more serious events and support safety. Other plants have found it useful to maintain a common database to serve the site, usually administered by a single group.

Example 6
Issue:
Active participation in operating experience activities at the coordination level and systematic-implementation of field procedures at the field level are not adequate to capture and promote the operating experience feedback.

A central committee on operating experience is implemented for OE process management. Resource allocation to this committee is a part time dedication of a representative in each discipline promoting and expediting operating experience activities inside the department. The level of dedication, responsiveness and commitment varies very much from group to group in the operating experience committee meeting.

For example: a chart presented by the staff on frequency of attendance to the operating experience committee meeting shows that out of 13 department representatives, two did not attended any meetings in the first quarter, four attended one meeting and six attended all meetings. Attendance in January was 69%, decreasing to 62% in February and 54% in March.

Without active participation by all departments and systematic implementation of the programme, some opportunities to learn from experience may be lost.

Suggestion:
Active participation in operating experience activities at coordinating level and systematic implementation of field procedures at field level should be enhanced to effectively capture and promote the operating experience feedback.

Example 7
Issue: In depth trending of all events reporting information is not consistent across the station departments.

The event reporting information is expected to be available for trending purposes to identify overall degrading performance. This is conducted through a coding process at station level and also through the use of line defined coding by each department. The line defined codes being utilized by the various departments have been developed individually by each department to their identified particular needs and do not always consider the overall needs of the station. This is especially relevant when identifying human performance issues.

For example there is only one code for human performance in the maintenance department line defined codes, whereas in operations this has been further split down to allow the

identification of event free day reset, event, precursor, reportable event, violation, procedure non-compliance, self checking, communication, etc.

The use of non-integrated department line defined codes may lead to difficulties in identifying overall station adverse trends especially in human performance and hence the opportunity to learn lessons from the available information may be lost.

Suggestion:
The plant should review the various department line codes to consider the establishment of a set of rationalized and integrated line defined codes that enables the station to receive maximum benefit from its event reporting programme in enhancing safety performance.

Example 8
Issue:
Operating experience may not be managed effectively. Plant personnel indicate that there is an excessive burden placed on them in terms of screening and evaluating incoming information. The large amount of incoming operating experience information requires extensive resources by the plant for adequate review. Although the corporate office provides some support when plant resources appear to be insufficient, the plant, with limited man power, may not be able to manage operating experience effectively.

Suggestion:
Consideration should be given by the utility to establishing a centralized operating experience screening system at corporate level. This will prevent repetition of similar tasks in other NPPs and will result in increased effectiveness of operating experience feedback groups at individual plants.

APPENDIX I: INAPPROPRIATE ACTION PROGRESSION

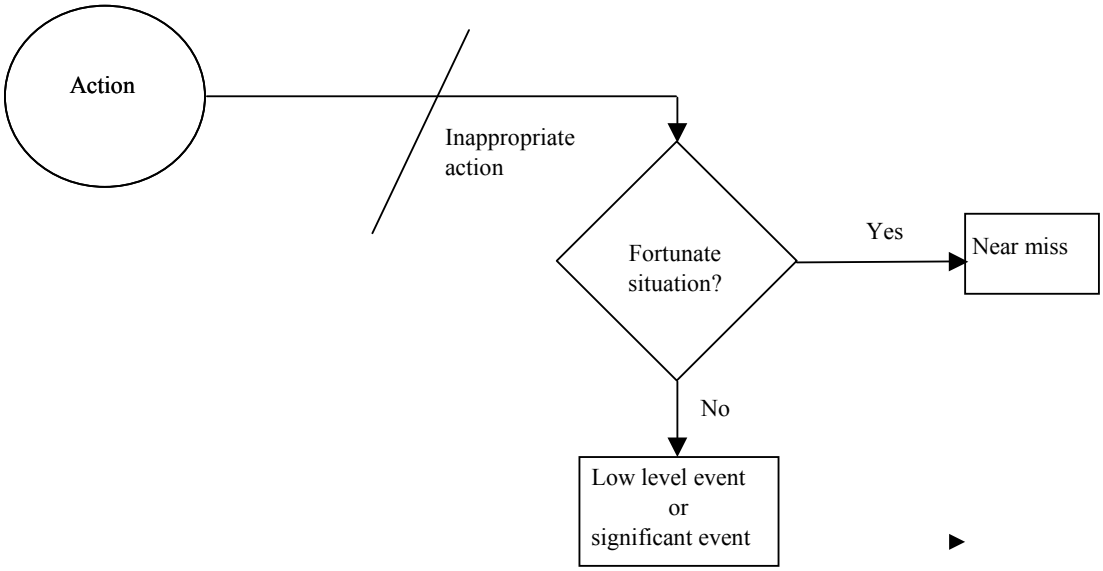


FIG. 2. Identifying the progression of an inappropriate action.

APPENDIX II: LOGIC DIAGRAM FOR SCREENING OF EVENTS

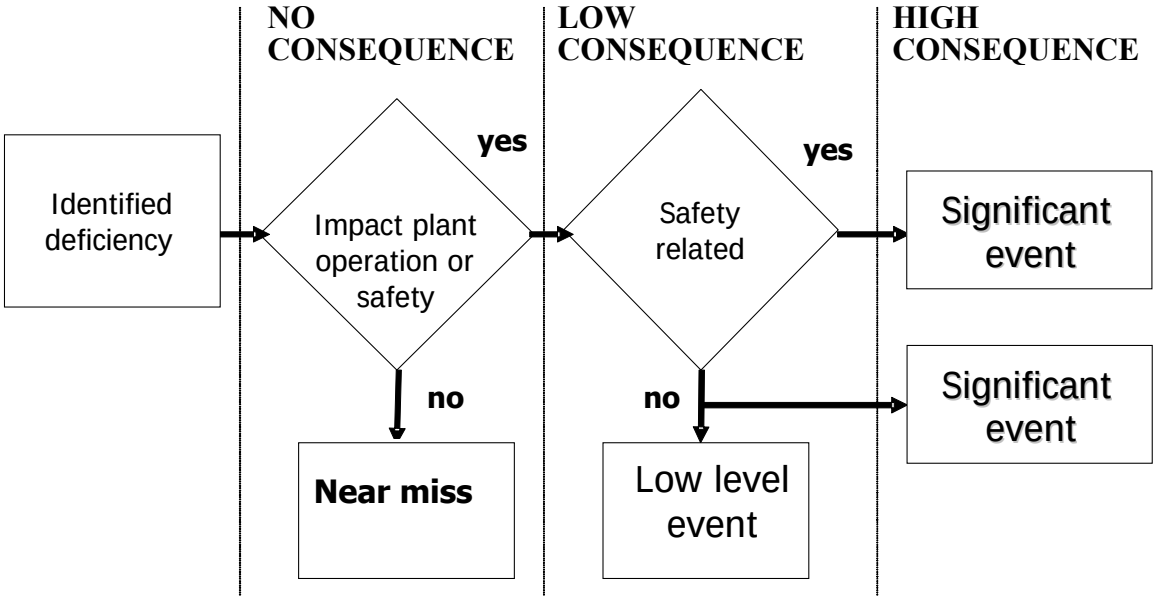


FIG. 3. Screening of events general logic diagram.

APPENDIX III: EXAMPLE OF AN INITIATION REPORT

INITIATION REPORT	Plant: Unit:

Part 1. To be completed by the initiator

Initiator: Date:	Organization identifying Condition: Person Identifying Condition:	System: Location: Plant status:	Event date: Event time:

Condition description:

Potential operability, reliability, or reportability concern: [ ] Yes: promptly notify immediate Supervisor and Ops Manager — Shift Supervisor [ ] No	[ ] Correction [ ] Improvement [ ] Organization issue [ ] Human Performance

Part 2. To be completed by Supervisor

Condition valid: [ ] Yes [ ] No : provide basis in comment block	Potential operability, reliability, or reportability concern: [ ] Yes: promptly notify Ops Manager — Shift Supervisor [ ] No

Further investigation required: [ ] Yes [ ] No If no, why?	Maintenance Rule applicable component: [ ] Yes [ ] No [ ] Correction [ ] Improvement [ ] Organization issue [ ] Human Performance

Recommended owner:	Supervisor: Organization: Date/Time:

Comment:

Example of an initiation report form page 1/2

Part 3. To be completed by Operations Manager – Shift Supervisor or Designee

Part 3 is to be filled out only if an Operability, Reliability or Reportability concern has been identified. Operability assessment: [ ] Equipment operability not affected [ ] Equipment inoperable but operability restored [ ] Equipment currently inoperable [ ] Equipment potentially inoperable [ ] Reliability affected Operability determination assigned to:	Immediate reportable: [ ] Yes [ ] No

Operations Manager – Shift Supervisor or Designee	Date/Time:

Comment:

Part 4. Pre-screening by OEC Coordinator:

[ ] High level event reportable to the regulator [ ] Significant event reportable to the industry [ ] Significant event to be shared within the utility [ ] Low level event [ ] Near miss [ ] Improvement	[ ] Equipment [ ] Organization [ ] Human Performance [ ] Task [ ] Documentation

Type:	Discipline :	Plant:
Location:	Functional area:	Unit:
System:	Cross functional area:	Plant Status:

Recurrent event [ ] Yes [ ] No [ ] Full root cause analysis [ ] Simplified root cause analysis [ ] Direct cause confirmation [ ] Trending	OE Coordinator: Date/Time:

Comment:

Example of an initiation report form page 2/2

APPENDIX IV: EXAMPLE OF AN EVENT PERSONNEL STATEMENT

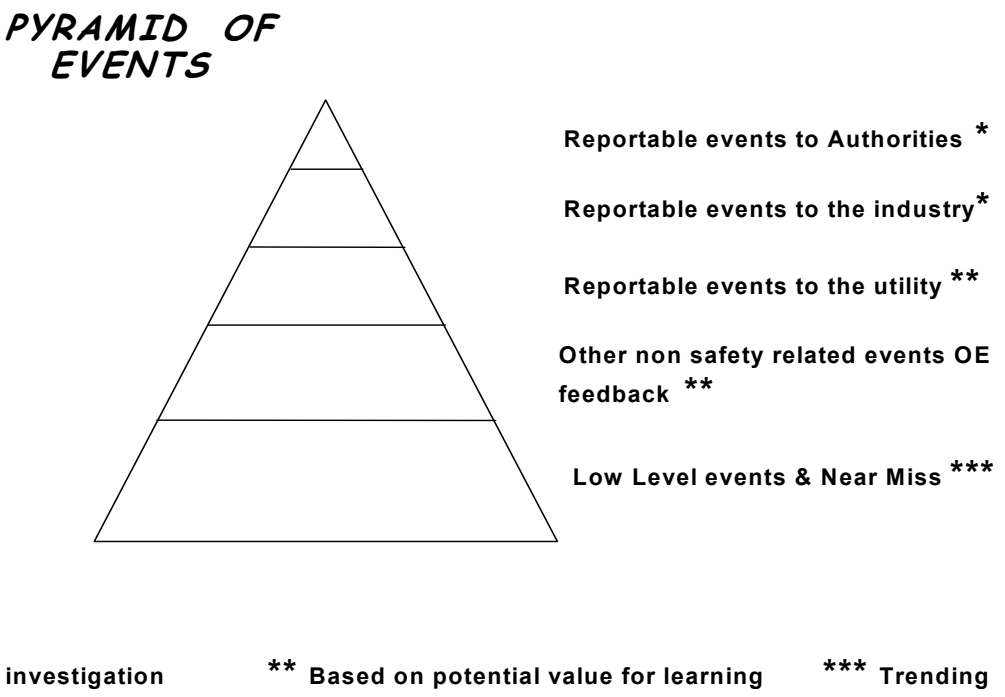
Event Date/Time:	Date/Time of the Statement:
Subject/Title:	
Task or evolution in progress:	
Statement of: (Name)	
Job position, role and responsibilities during task evolution:	
Problem description (Why is this an event/adverse condition/area of concern/improvement?	
What happened?	
What was expected?	
How was the problem discovered?	
Knowing what happened, what would you do recommend be done differently?	
Signed:	

An alternate form or document may be used
Conditions may be reported anonymously

Example of an event personnel statement form

APPENDIX V: EXAMPLES OF CATEGORIZATION THRESHOLDS DURING SCREENING

Example A of categorization threshold in screening



Note: Based on the significance of the potential consequences some near miss may be considered of particular importance for learning and are subject to special treatment.

Example of graded approach for the above categories:

Type of Event	Level of Investigation	Cause Analysis
Reportable events to Authorities	Full	Root causes and contributors
Reportable events to industry	Full	Root causes and contributors
Reportable events to the utility	Simplified	Apparent causes and main contributors
Other non-safety related events OE feedback	Simplified	Apparent causes and main contributors
Low Level events and Near Misses	Trending	Collective causes and precursors
Events that display similar attributes	Collective analysis	Common causes

Example B of categorization thresholds during screening

Categorization:

Category 1: A significant event that causes a major reduction in the margin of safety to the public or to station personnel and/or which has a major impact on the environment or production. RCA within 60 days is required. It is reportable to the regulator as per reporting criteria.

Category 2: A significant event that causes some reduction in the margin of safety to the public or to station personnel and/or which has some impact on the environment or production. Discretionary RCA within 60 days for management. It may also be reportable to regulator as per reporting criteria.

Category 3: An event or adverse condition which is not significant by itself but which has the potential to be more significant or which may be the precursor to a more significant event. Apparent cause investigation within 60 days to satisfy station requirements for cause identification.

Category 4: A minor condition adverse to quality, which does not require evaluation or an event that will help to identify by means of trend analysis, those areas that need more attention. The condition is straightforward, direct cause is clear. No investigation is required. Immediate action is considered sufficient to solve the problem. Items are recorded for trending only. This category includes low level events and near misses.

Pre-assigned evaluation:

— Root cause analysis for category 1 events;

— Root cause or apparent cause analysis for category 2 events as per discretion of screening committee;

— Apparent cause analysis or study for category 3 events;

— No investigation for category 4 events only trending. However, for some special cases study may be recommended;

— Evaluation for categories 1, 2 & 3 to be completed within 60 days.

Example C of categorization thresholds during screening

Categorization:

Category 1: High significant event that causes:

— Major reduction in the margin of safety to the public or to station personnel;
— Uncontrolled radioactivity release to the environment;
— Major impact to the environment, workers or production;
— Impact/exposure to the public;
— Serious injury of a worker;
— Overexposure of a worker;
— Activation of the emergency plan (external or internal).

Category 2: Significant event that causes:

— Damage to the fuel components;
— Damage to the internals, control rods or control guide tubes;
— Damage to a primary barrier or a primary sealing weld;
— Significant spread of contamination;
— Limited overexposure of a worker;
— Limited injury of a worker;
— Limited impact in the environment;
— Major risk of radiological consequential hazards to the installation or to the workers;
— Major risk of serious injury for the people/worker;
— Major risk of impact in the environment;
— Functionality/availability of a safety system/component affected;
— Scram/loss of generation.

Category 3: An event or adverse condition, non-safety related, that causes:

— Failure of a non-safety system performing control functions;
— Low risk of serious injury for the worker/people;
— Minor risk of radiological hazards;
— Failure of a non-safety system/component without affecting its availability;
— Low risk non compliance with environmental control requirements.

Category 4: Minor conditions with clear direct causes and without consequences (near miss) or with low consequences (low level event). Immediate action is considered sufficient to solve the problem.

— Minor condition adverse to quality;
— Minor non-conformances, minor quality deficiencies;
— Human errors or procedural inadequacies without or with low consequences.

Upgrading factors:

Consider upgrading the event to the next higher category if:

— The event history is recurrent and the previous corrective actions have been ineffective to prevent it;

— The affected safety structure/system/component was already subject to/influenced by other related deviations, deficiencies, anomalies or compensatory actions, not yet fully closed, that could potentially increase the consequences (synergy factors);

— It is difficult to proof functionality/reliability of affected structure/system/component;

— It is difficult to inspect and test the affected structure/system/component before continuing its operations or restart;

— May involve safety culture or human performance issues for lessons to be learned.

Pre-assigned evaluation:

— Category 1: Root cause analysis;

— Category 2: Root cause analysis;

— Category 3: Apparent cause analysis;

— Category 4: Investigation not required, only trending. However, for some special cases study may be recommended;

— Evaluation for categories 1, 2 & 3 to be completed within 60 days.

Reportability:

— Category 1: Reportable to the authorities. Reportable to the industry and to the utility/corporate;

— Category 2: Reportable to the authorities as per reporting criteria. Reportable to the industry and to the utility/corporate;

— Category 3: Reportable to the utility/corporate;

— Category 4: Coded and recorded in the data base for trending. Periodic results of trending analysis and common causes reported to management. Periodic collective analysis of precursors reported to the utility/corporate.

Example D of categorization thresholds during screening

As	- Event to be reported based on laws, regulations, and safety agreements. - Events having significant impact on plant performance and safety. - Particularly significant events among those having external impact (national government and municipalities). - Other events that should be treated in the same way as those in category As.

A	- Significant non-conformity events with respect to quality assurance, requirements, not in conformity with requirements of examination/inspection/test standards with significant impact in the system. - Events having external impact (national government and municipalities). - Non-conformity events that resulted in a failure in inspections witnessed by the national government. - Non-conformity events concerning the safety regulations. - Event having significant impact on the annual inspection schedule. - Events concerning publications with official seals (president, superintendents, general managers). - Events concerning monetary losses (both giving and suffering damage). - Other events that should be treated in the same way as those in category A.

B	- Non-conformity events with respect to quality assurance requirement with impact in the system. - Events having limited external impact (national government and municipalities). - Non-conformity events pointed out in inspections by the national government (successful inspections). - Non-conformity events that have judged to be in need of certain measures. - Events having impact on other internal departments (with budgetary and contractual changes, etc.). - Events requiring enhancement of the monitoring by the shift teams. - Other events that should be treated in the same way as those in category B.

C	- Insignificant non-conformity events with respect to quality assurance requirement without impact in the system. - Events that should be notified for sharing information and raising attention - Other events that should be treated in the same way as those in category C

D	- Specific non-conformity events that have been identified as non-problematic in the course of processing within the group based on the actual record of the past history. - Event that should be pointed out to improve knowledge and information although no action may be necessary. - Events in the aspect of systems and equipment that are coped with regular maintenance. - Other events that should be treated in the same way as those in category D.

Pre-assigned evaluation:

— Categories As and A: Root cause analysis;

— Category B: Apparent cause analysis. However, for some special cases a root cause analysis (full, simplified or with partial scope) may be recommended;

— Categories C and D: Investigation not required, only trending. However, for some special cases study may be recommended;

— Evaluation for categories A, and B to be completed within 60 days.

Reportability:

— Category As and A: Reportable to the authorities. Reportable to the industry and to the utility/corporate;

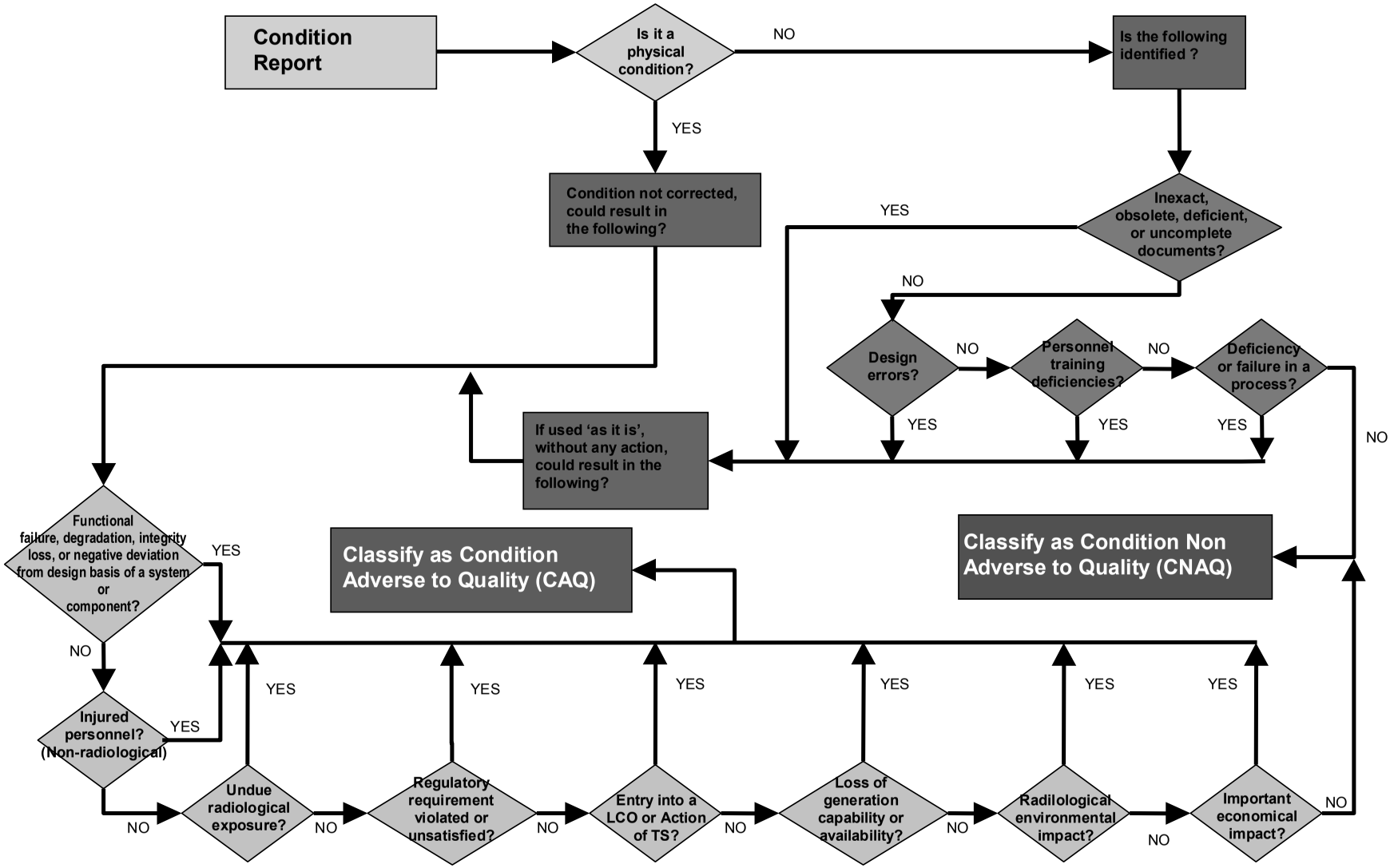
— Category B: Reportable to the authorities as per reporting criteria. Reportable to the industry and to the utility/corporate;

— Categories C and D: Coded and recorded in the data base for trending. Periodic results of trending analysis and common causes reported to management. Periodic collective analysis of precursors reported to the utility/corporate.

APPENDIX VI: EXAMPLE OF SCREENING FOR SIGNIFICANCE FACTORS

1. The event has (or could have) an impact on nuclear safety or reliability.
2. The event has (or could have) an impact on core reactivity management.
3. The event has (or could have potential for) impact on major or important equipment failures.
4. The event has (or could have) potential for plant transient.
5. The event has (or could have) importance to plant availability.
6. The event has (or could have potential for) repetitive component failures.
7. The event has (or could have) any relationship to the root causes of more serious events.
8. The event has any relationship to the recurring plant problem.
9. The event has (or could have potential for) any unplanned radiation exposure, personnel contamination or personnel injury.
10. The event has (or could have potential for) impact on physical protection (security) of the plant.
11. The event has (or could have potential for) common mode/common cause failures.
12. The event involves (or could have potential for) uncontrolled release of radioactivity to the environment.
13. The event has (or could have) adverse effect on plant equipment/systems' performance.
14. The event carries facts and figures important for learning and knowledge.
15. The event involves (or could have involved) deteriorated performance or unexpected equipment and/or human behaviour.
16. The event has revealed failure of two or more important physical, administrative, procedural or other control barriers.
17. The event has produced damage to a primary barrier or primary sealing weld.
18. The event that is judged to be occurred by improper or non-conservative decision(s) of operator(s) or plant management that reduced the margin of nuclear safety and/or plant availability.
19. The event relates to the severe violation of plant policies, practices or work routines.

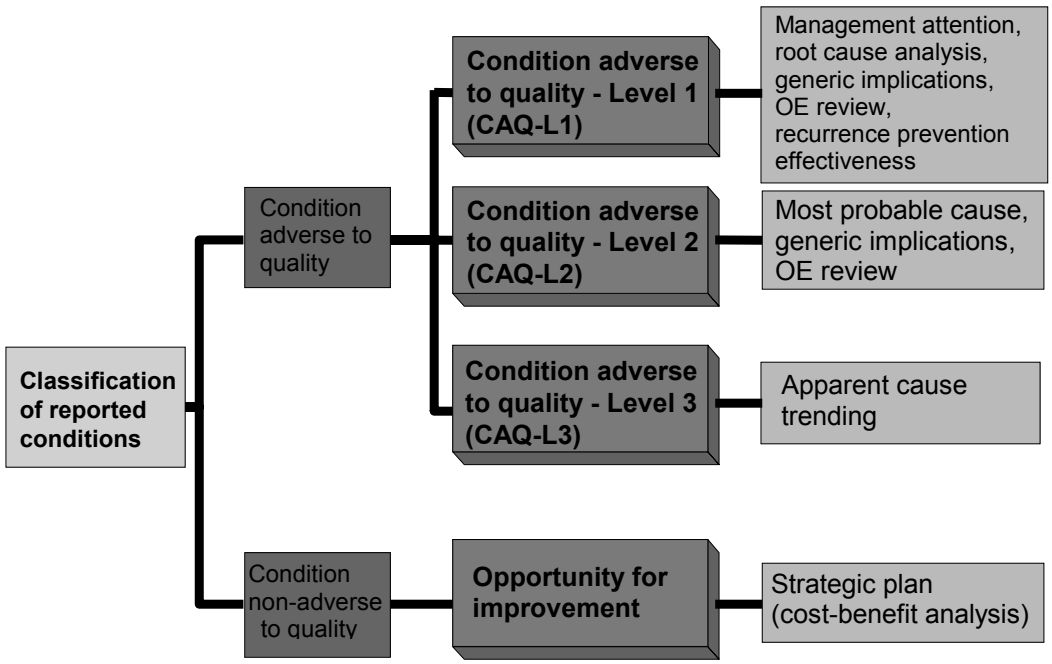
APPENDIX VII: EXAMPLE OF SCREENING OF CONDITION REPORTS FOR CATEGORIZATION



APPENDIX VII (cont'd.)

The logic flow diagram included in this appendix provides an alternative example of a detailed process of screening for categorization after an issue has been identified and reported, generating a condition report. The process is divided in two paths, depending on the condition, whether it is related to a physical condition or to an administrative condition. The result of this process is a condition adverse to quality (CAQ) or a condition non-Adverse to quality (CNAQ).

After the issue is considered as CAQ or CNAQ the condition is treated in the following subprocess (see diagram hereunder) in order to define the appropriate level of attention. The most significant adverse conditions are categorized Level 1, going down in significance to Level 2, Level 3, and opportunities for improvement. Good practices are identified and treated in a separate process.



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Rodriguez, A.	Comision Nacional de Seguridad Nuclear, Mexico
Song, S.H.	International Atomic Energy Agency
Strandberg, L.	Forsmark Nuclear Power Plant, Sweden
Teodor, V.	Cernavoda Nuclear Power Plant, Romania
Tillet, P.	Electricité de France, France
Toth, A.	International Atomic Energy Agency
Tsuda, H.	Japan Nuclear Energy Safety Organization, Japan
Werdine, H.	International Atomic Energy Agency
Zahradka, D.	Mochovce Nuclear Power Plant, Slovakia

Consultants Meeting

Vienna, Austria: 6–10 September 2004

Technical Meeting

Vienna, Austria: 20–24 June 2005