

Supporting Member States in establishing effective operating experience and performance improvement programmes

Nuclear Safety and Security Programme



Nuclear
Safety and
Security



Operating experience feedback is a key element in maintaining and improving the safety of nuclear installation operations. It is an important source of information for the design of new plants and the improved performance of

existing ones. Thus, obtaining reliable feedback on operating experience for safety is of high significance to licensees, regulators, technical support organizations and vendors. IAEA guidance establishes the need for adequate collection and dissemination of operating experience and lessons learned in the nuclear industry to strengthen safety.

The IAEA *SF-1 Fundamental Safety Principles* states the need for operating organizations to establish a programme for the collection and analysis of operating experience (OE) in nuclear power plants. The IAEA *SSR 2/2 Safety of Nuclear Power Plants: Commissioning and Operation* furthermore defines requirements for the establishment of an operating experience programme to learn from events at the plant as well as events in the nuclear industry and other industries worldwide. Recommendations for the establishment of an effective OE programme are provided in the IAEA *Safety Guide SSG-50 Operating Experience Feedback for Nuclear Installations*. The Operating Experience Programme of the Operational Safety Section seeks to assist Member States in meeting these goals through a variety of services that assist in establishing an effective operating experience programme at their nuclear installations.

Lydie Evrard

IAEA Deputy Director General and Head of the Department of Nuclear Safety and Security

Operating Experience Programme related services

International Reporting System for Operating Experience (IRS)

The International Reporting System for Operating Experience (IRS) is an international system jointly operated by the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency of the Organisation for Economic Cooperation and Development (OECD/NEA), through which participating countries can improve the safety of nuclear power plants by sharing and using event reports on operating experience and unusual events considered important for safety.

The aim of the IRS is to increase the effectiveness in analysing and communicating operational safety experience.

Timely sharing of operating experience provides information that is useful for preventing similar occurrences at other plants. It supports determining actions that can be used to mitigate the potential consequences of discovered design or operating weaknesses should an event occur. The lessons learned may also be incorporated into new designs for future generations of nuclear power plants.

This system is further explained in two publications dedicated to documenting the system. These are IAEA Services Series 19 – ‘IRS Guidelines’ and IAEA Services Series 20 – ‘Manual for IRS Coding’.

Peer Review of Operational Safety Performance Experience (PROSPER)

PROSPER stands for Peer Review of the Operational Safety Performance Improvement Programme. The aim of this IAEA service is to provide advice and assistance to Member States to enhance the safety of nuclear power plants throughout their operational life cycle, from construction and commissioning to decommissioning via establishing an effective operating experience and performance improvement programme established to identify, analyze and correct gaps between current levels of performance and management and industry standards of excellence.

The purpose of PROSPER missions is to provide the host organization with:

- An opportunity to review its conformance with the IAEA Safety Standards by conducting a self-assessment without external oversight and enhance the operating experience and performance improvement programme;
- An objective assessment of the status of the operating experience and performance improvement programme with respect to the IAEA Safety Standards by an external team of experts;
- Recommendations and suggestions in areas where the operating experience and performance improvement programme does not meet the IAEA Safety Standards.



The Temelin Nuclear Power Plant in the Czech Republic
(Photo: Vadim Mouchkin/IAEA)

PROSPER service is designed for nuclear power plants, however, in principle any nuclear installation may apply for it. PROSPER missions may be requested by governments, regulatory authorities and licensees of nuclear installations.

PROSPER missions are conducted by a team of internationally recognized experts (usually 3–4 experts) led by IAEA. The PROSPER guidelines are used as a basis for systematic assessment of OE and performance improvement programme performance. Results of the mission are summarized in a mission report provided to the host at the end of the mission. Results of such missions are confidential unless otherwise decided by the hosting organization.

For a more in depth review of the PROSPER Guidelines service please refer to IAEA Services Series 10 – PROSPER Guidelines.

The PROSPER guidelines consists of the following elements:

- **Corrective Actions Programme** to identify causes of events with implications for safety, and implementation of corrective actions to prevent recurrence or reduce the likelihood of recurrence.
- **Operating Experience Programme** (internal and external) to improve performance and prevent recurrence of events.
- **Management Observations Programme** for reinforcing behavioural standards, and for identifying and closing human performance gaps.
- **Human Performance Programme** to improve error reduction skills of plant personnel;
- **Self-Assessment and Benchmarking Programme** to identify opportunities for improving performance;
- **Performance Indicator Programme** for monitoring performance and timely identification of trends;
- **Leadership and management for performance improvement**, including performance monitoring and assessment to ensure that high performance standards are established, effectively communicated, reinforced and followed and actions to improve safety performance are taken.

Capacity Building Activities

PROSPER Workshops

The IAEA offers PROSPER workshops and seminars to assist operating organisations and regulatory bodies in implementing an effective operating experience and performance improvement programme.

These efforts help stakeholders to have a better understanding on how to use PROSPER methodology with applicable Safety Standards.

Expert Missions (EM)

The purpose of expert missions is to assist nuclear installations in implementing an effective operating experience and performance improvement programme. Missions can be requested for any OE programme related topic such as PROSPER workshops.

Expert missions are typically conducted in the form of a plant self-assessment with support from IAEA experts. PROSPER methodology and applicable IAEA Safety Standards are used as a basis. The duration and programme is developed according to the requirements of the host organization, typically lasts 3–4 working days. PROSPER EM can be requested anytime.



Technical Meetings to Share Operating Experience

To foster enhanced operational safety at Member States' nuclear power plants, the IAEA organizes regular international workshops to share both lessons learned from events occurring in the nuclear industry and in improving operating experience programme effectiveness. Examples of such technical meetings are as follows:

- Joint IAEA – OECD/ NEA Technical Meeting of IRS national coordinators to exchange experience on recent events in NPPs;
- Joint IAEA – CANDU Owners Group meeting to share operating experience among CANDU operators;
- Joint IAEA – WANO meeting to share information on best practices in operating experience programme.

Training Courses

IAEA training courses relevant to operating experience and performance improvement programmes are intended for next leaders of nuclear installations, professional staff involved in relevant activities, personnel of technical support organisations and regulators. These courses are provided by IAEA professionals and internationally recognized experts. Examples of such activities include:

- Management and leadership of the Corrective Action Programme and Use of Operating Experience;
- Event investigation process and Root Cause Analysis techniques;
- Performance trending and assessment for timely identification and resolution of declining performance, e.g. self-assessment programme and use of performance indicators;
- Leaders in the field to observe and coach; Human Performance Improvement Programme.

Training courses may be requested by governments, regulatory authorities and licensees for nuclear installations.

IAEA Publications Providing Guidance on Topics Relating to Operating Experience and Performance Improvement Programme

Safety Reports Series No. 73 – Low Level Event and Near Miss Process for Nuclear Power Plants: Best Practices

provides nuclear power plant operators and regulatory organizations with an overview of best practices on the development, implementation and continuous improvement of low level events and near miss processes. Use of guidance and best practices, as described in this publication, will help the relevant organizations in recognizing emerging adverse trends by analysing lower level events and near misses. Correcting such adverse trends proactively may prevent occurrence of significant events, and thereby, enhance the safety and reliability of nuclear power plants.

INSAG Series No. 23 – Improving the International System for Operating Experience Feedback

intends to facilitate the dissemination of information on precursor events (which would nearly always precede a serious accident at a nuclear power plant), by means of an international system for the feedback of operating experience. A fuller understanding of precursor events would further reduce the probability of accidents, and information on such events would be particularly valuable for states in which there are only a small number of nuclear facilities. This publication describes the scope and objectives of a system for operating experience feedback, and the roles of both international and national organizations in understanding precursor events and preventing accidents.

TECDOC-1125 – Self-assessment of Operational Safety for Nuclear Power Plants

presents the basic approach to self-assessment. This publication sets out definitions, purpose and main attributes of self-assessment. These are based on experience gained during Operational Safety Review Team (OSART) missions, from organizations and utilities which have successfully implemented parts of a self-assessment programme and from meetings organized to discuss the subject.

TECDOC-1141 – Operational Safety Performance Indicators for Nuclear Power Plants

attempts to provide a framework for the identification of performance indicators which have a relationship to the desired safety attributes, and therefore to safe plant operation. The numerical value of any individual indicator may be of no significance if treated in an isolated manner, but may be enhanced when considered in the context of other indicator performances. On the other hand, specific indicator trends over a period of time can provide an early warning to plant management to investigate the causes behind the observed changes. In addition to monitoring the changes and trends, it may also be necessary to compare the indicators against identified targets and goals to evaluate performance strengths and weaknesses.

IAEA Nuclear Energy Series NG-T-2.7 – Managing Human Performance to Improve Nuclear Facility Operation

provides information on how the contribution of human performance to the occurrence of significant events and consequently to overall performance improvement in the nuclear field has been well documented. Nuclear industry experience shows that within nuclear power plants, 80% of significant events can be attributed to human error. Monitoring and continually improving human performance has now become one of the key challenges in the management of human resources for a nuclear facility. This publication provides practical guidance in this area and will assist Member States to review and improve the systems and process for improving human performance as a major contribution to sustaining and improving the performance of nuclear facilities.

IAEA Technical Publications (TECDOC) providing detailed guidance on a variety of topics:

TECDOC-1278 – Review of Methodologies for Analysis of Safety Incidents at Nuclear Power Plants

describes a Co-ordinated Research Project about the various event investigation methodologies suitable for use by nuclear power plant operators and regulatory bodies. The investigation of methodologies is divided into three main topics: to identify the characteristics of methodologies suitable for the investigation of safety events; to conduct a review of the methodologies available to the research participants for the analysis of event root causes; and finally to examine the effectiveness of operating experience feedback from safety events that had occurred at plants and had been subject to formal investigation.

TECDOC-1458 – Effective Corrective Actions to Enhance Operational Safety of Nuclear Installations

provides guidance on implementing corrective actions and ensuring their effectiveness, which are among the major steps of an operating experience feedback programme. In April 2003, the IAEA issued the peer review operational safety performance experience review (PROSPER) guidelines to provide advice and assistance to nuclear installations to strengthen and enhance their own operating experience programmes. The present publication develops the principles set forth in the PROSPER guidelines. It contains recommendations and good practices from the industry for successfully establishing effective corrective actions and preventing recurrence of events. It also provides a detailed methodology for effectively correcting and preventing recurrence of human errors. Use of the guidance provided by this publication will be helpful in prioritizing and implementing corrective actions in a timely manner that is compatible with the frequency and significance of the issue. These guidelines contain provisions to track the effectiveness of corrective actions following implementation and to periodically assess the overall performance of the corrective action programme.

TECDOC-1477 – Trending of Low Level Events and Near Misses to Enhance Safety Performance in Nuclear Power Plants

provides examples, methodologies and suggestions to NPP operators on how to implement a procedure to detect, select and process such events. International experience shows that the number of such events ranges from 2000 to 5000 per operating reactor year. Too many plants do not detect or report these low level events. However, these events are the submerged part of the iceberg and must be considered by the operating unit.

TECDOC No. 1479 – Human Performance Improvement in Organizations: Potential Application for the Nuclear Industry

is primarily intended for managers and specialists in nuclear facility operating organizations working in the area of human performance improvement. It is intended to provide them with practical information they can use to improve human performance in their organizations. While some of the information provided in this publication is based upon the experience of nuclear facility operating organizations, most of it comes from human performance improvement initiatives in non-nuclear organizations and industries.

TECDOC No. 1491 – Management of Continual Improvement for Facilities and Activities: A Structured Approach

explains how an approach of continual improvement can be implemented and how to conduct process improvements. It also describes good practices and the problems that may be encountered, based on experiences in a number of different organizations in the nuclear field. A number of case studies and a summary of some of the many improvement techniques available are provided. The methodology used in this publication contains steps and practices that are common to many of the continual improvement strategies. This publication will assist readers in successfully applying continual improvement in their own organizations in the pursuit of enhanced safety and improved performance.

TECDOC-1580 – Best Practices in the Utilization and Dissemination of Operating Experience at Nuclear Power Plants

provides guidance on how effective utilizing and disseminating operating experience are among the major elements of one of the major elements of an operating experience feedback programme. Although not recognised prior to the event, most subsequent investigations identify internal and external industry operating experience that, if applied effectively, would have prevented the event. The use of the guidance provided by this publication will be helpful to staff of 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 the utilization and dissemination process and to assess the effectiveness of the above area. This publication develops some of the principles set forth in the PROSPER guidelines issued by the IAEA in 2003 to provide advice and assistance to nuclear installations to strengthen and enhance their own operating experience programmes.

TECDOC-1581 – Best Practices in Identifying, Reporting and Screening Operating Experience at Nuclear Power Plants

provides recommendations and good practices from the industry for the successful establishment of an effective process to identify, report and screen operating experience. Its aims is to collect lessons learned and to prevent the recurrence of events. The use of the guidance provided by this publication will be helpful to staff of 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 operating experience at nuclear power plants. This publication develops some of the principles set forth in the PROSPER guidelines issued by the IAEA in 2003 to provide advice and assistance to nuclear installations to strengthen and enhance their own operating experience programmes.

TECDOC-1653 – Best Practices in the Management of an Operating Experience Programme at Nuclear Power Plants

outlines the key management attributes and characteristics for the successful implementation, review and continuous improvement of an operating experience programme at a nuclear utility company and individual nuclear power plants. It was developed to support successful management of an operating experience programme, various requirements of which are set forth in the IAEA Safety Requirements No. NS-R-2, Safety of Nuclear Power Plants: Operation. Implementation of these best practices will enable nuclear installations and related institutions to successfully strengthen and enhance their operating experience feedback process.

TECDOC-1756 – Root Cause Analysis Following an Event at a Nuclear Installation: Reference Manual

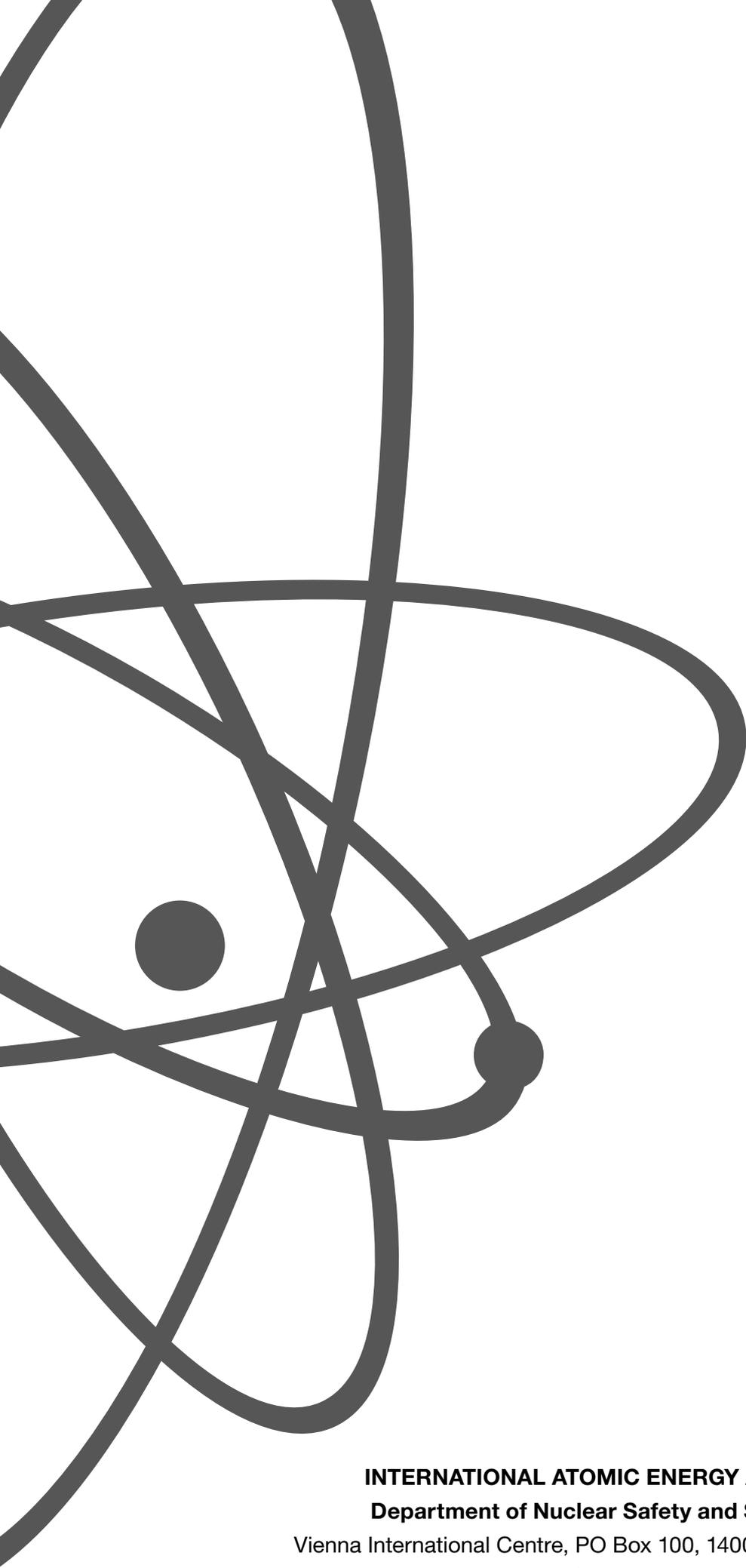
provides information on the importance to accurately determine the root causes of an event at a nuclear installation, in order to allow corrective actions to be implemented to address them and prevent their recurrence. There are different analysis tools, techniques and methods available which can be used to evaluate the root causes of events, and this publication presents a comprehensive reference manual for them and allows organizations to deepen their knowledge of these instruments. In addition, it also provides new organizations with a broad overview of the root cause analysis process. The present manual is also intended to provide guidance to all organizations establishing a new process for root cause analysis, especially in countries embarking upon a nuclear power programme.

All books are freely available to download at:
www.iaea.org/publications

For further information

WBIRS.Contact-Point@iaea.org

Operational Safety Section
Division of Nuclear Installation Safety
Department of Nuclear Safety and Security
International Atomic Energy Agency
Vienna International Centre, PO Box 100
1400 Vienna, Austria



INTERNATIONAL ATOMIC ENERGY AGENCY
Department of Nuclear Safety and Security

Vienna International Centre, PO Box 100, 1400 Vienna, Austria

www.iaea.org/ns | Official.Mail@iaea.org