

THE IAEA/NEA INCIDENT REPORTING SYSTEM (IRS)

**Using Operating Experience
to Improve Safety**



IAEA



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OPERATING EXPERIENCE FEEDBACK

Operating experience feedback is a key element in maintaining and improving the safety of nuclear power plant operations. It also gives impetus to the design of new plants and the improved performance of existing ones. Thus, obtaining reliable feedback on operating experience is of high significance to licensees, regulators, technical support organizations and vendors.

Incident reporting has become an increasingly important aspect of the operation and regulation of all public health and safety related industries. Diverse industries such as aeronautics, chemicals, pharmaceuticals and explosives all depend on operating experience feedback to provide lessons learned about safety that can assist in improving safety performance.

WHAT IS THE IRS?

At the end of 1978, the OECD/NEA took the first initiative to establish an international system for exchanging information on safety related events in nuclear power plants (NPPs). In 1981 OECD countries formally approved the operation of the IRS and in 1983 the IAEA extended the system to all Member States with nuclear power programmes. Since that time the IRS has been jointly operated by the IAEA and the NEA. However, with the creation of the first comprehensive database on the IRS, Advanced Incident Reporting System (AIRS), in 1995, the responsibility of treating events (including quality checking) was transferred to the IAEA.

The IRS as a worldwide system is designed to complement national schemes. Information reported is assessed, analysed and fed back to operators to prevent similar occurrences. The ultimate objective is to enhance the safety of NPPs by reducing the frequency and severity of safety significant unusual events at NPPs worldwide.

The IRS is also interested in identifying ‘precursors’. These are events of apparent low safety significance, which, if not properly monitored, have the potential to escalate into more serious incidents. Through the analysis of data reported to the IRS, the identification of these precursors can be facilitated and appropriate actions taken to mitigate their consequences. It is also important to detect, and report on, low level events and near misses as well as recurrent events.

The IRS represents a systematic approach to provide feedback on lessons learned from operating experience, which is a key element of the ‘defence in depth’ philosophy used as a fundamental building block throughout the nuclear power industry.

WHAT ARE THE BENEFITS?

The IRS increases worldwide awareness of potential and actual problems in NPP operations. The heightened awareness generated by feedback from operating experience has resulted in numerous improvements to equipment, procedures and training in many NPPs, thereby reducing the potential for subsequent failures that could result from unusual events.

The analysis of IRS reports can also assist in determining whether a particular event is generic or recurring in nature. Recurring events may reveal several types of problems related to the safety of NPPs. A recurring event is defined as one with actual or potential safety significance that is the same as or similar to (a) previous nuclear industry event(s), and has the same or similar cause(s) as the previous event(s).

Examples could include: loss of residual heat removal while at mid-loop (PWR), service water degradations due to bio-fouling, BWR power oscillations/instability, PWR vessel head corrosion, and/or steam generator tube rupture.

The IRS database contains event reports that provide detailed descriptions and preliminary analyses of the event’s causes that may be relevant to other plants. The analysis may lead to corrective action by plant management or regulatory authorities. IRS resources include topical studies of events of particular interest. These studies have focused on the importance of human actions, common mode failures or fires, plant shutdown procedures and low power operation modes and the need for constant vigilance during plant operations, improvements and modifications.

Countries that participate in the IRS benefit from exchanging information related to the root cause analysis and lessons learned from incidents at NPPs. Feedback on how to adequately remedy, or avoid, possible precursors is of paramount importance to operational safety. For example, abnormal pipe thinning in short piping bends that is not identified in time could eventually lead to a pipe break, which, in turn, could result in an accident.

Another potential use of IRS data is the application of operational feedback in the design of the next generation of NPPs. NPP operating experience has demonstrated that design modifications documented in IRS reports can have a significant impact on safety.

HOW CAN THE IRS BENEFIT DECISION MAKERS?

Decision makers in the industry, regulatory bodies and nuclear organizations around the world face a challenging environment that includes deregulation, privatization, economic pressures and fierce competition in the market place. This new environment forces decision makers to seek new strategies and manage risks and resources with the objective of achieving, among other things, a common safety goal. The IRS can play a role in this regard by providing information on safety significant events from the global nuclear community.

In managing risks and resources, decision makers need credible and reliable systems information, in particular on areas of high risk, in order to prioritize their programmes. They need to receive early warning of deteriorating safety performance in the field in order to maintain an acceptable level of safety. They also need to share experience and lessons learned with others, thus making efficient use of their resources.

Regulators require the industry to report on hazards or the potential for hazards so that they can tailor effective requirements, guides or standards that address actual or potential hazards in a manner that limits the risk to the public.

The IRS is a global contact network and forum that enables safety experts around the world to share and review information on lessons learned from reported events. It can provide world experts with information on individual and generic issues of safety significance and advance information on deteriorating safety performance. The IRS can also be used, together with other databases, to prioritize those issues of safety significance that have been reported and to assist in the identification of areas where further resources or research is appropriate.

HOW DOES THE IRS WORK?

Event reports

Each of the 31 member countries with an operating NPP designates a national IRS coordinator. Reporting to the IRS is based on the voluntary commitment of the participating countries. An event report is submitted to the IRS when the event is considered by the national coordinator to be of international interest. Events of safety significance and events from which lessons can be learned are reported according to guidelines. Safety significance is defined as the following:

- The event itself is serious or important in terms of safety due to an actual or potential significant reduction in the plant's defence in depth;
- The event reveals important lessons learned that would help the international nuclear community to prevent its recurrence

as a safety significant event under aggravated conditions or to avoid the occurrence of a serious or important event;

- The event is similar to an event previously reported to the IRS, but highlights new important lessons learned.

When information is considered time sensitive, a short preliminary report can be distributed within one month of the event. Subsequently a main report is produced and in some cases a follow-up report is generated and distributed when additional relevant information becomes available.

The main event report contains basic information including the title and date of the event, characteristics of the plant and an abstract. It also includes a narrative description of the event, a preliminary safety assessment (what were the direct causes, consequences and implications), root cause analysis and potential corrective actions, lessons learned and guidewords containing the essential information that can be easily searched and retrieved. Often a written description of the event is supported by graphics (diagrams of affected parts of the plant, etc.).

When an event or series of events indicates a generic problem (e.g. pilot-operated valves), the national coordinator may produce what is known as a ‘generic report’.

Sharing information

Each IRS report becomes part of the web-based IRS, which was created to facilitate data input and report availability and speeds up access to information. Passwords are provided to users depending upon access level, thus ensuring a high level of security. Once a new report is posted on the web-based system the users will be informed by email. The routine receipt and distribution of reports on incidents form the basis for in-depth studies on implications and remedies, and assist in identifying safety issues common to NPPs.

The incident reports included in the IRS are selected because they are of particular interest for the international nuclear community – whether due to important lessons that can be learned from them, the identification of new safety concerns or the interrelationship of events.

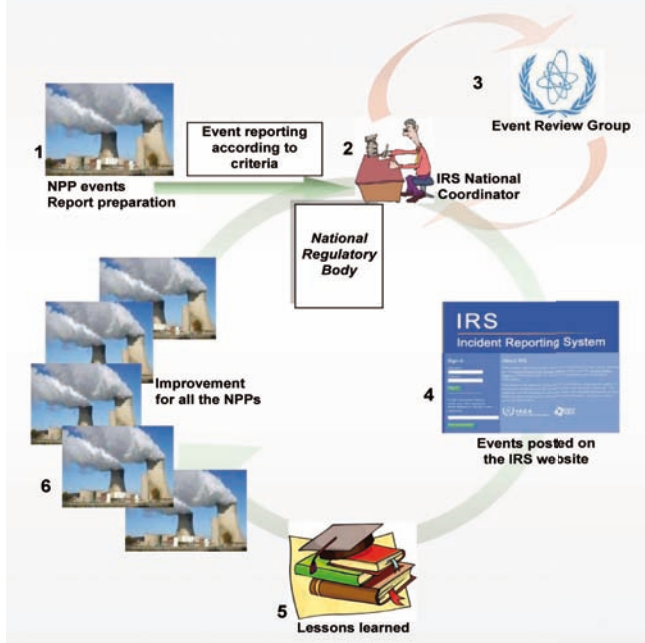
HOW IS THE IRS USED?

Topical studies

Topical studies constitute a major component of IRS related activities. Such studies are intended to provide the basis for generating in-depth evaluations and to identify topical or generic issues by a team of nuclear experts. These issues begin with a national assessment by the reporting country that is then studied in depth by experts at the international level, when warranted.

IRS Global Network

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Annual meetings

National coordinators meet each year to review the information received and the operation of the system in general. The committee of national coordinators selects topics and reports of those events that it considers to be of particular safety interest to the international community for further analysis. Conclusions of the committee are distributed to participating countries. Moreover, a joint IAEA/NEA meeting to exchange information on unusual events is also held annually. These meetings serve to strengthen the mechanisms for the exchange of experience in the assessment of incidents and in improvements made to reduce the frequency of similar events.

Restricted access

Access to IRS reports is restricted. Because the system is designed to be of value mainly to technical experts working in the nuclear power field, the information reported is not intended for distribution to the general public. This restriction encourages openness within the nuclear community, including the disclosure of incident details and related plant actions.

Other systems

The IAEA and NEA also maintain the International Nuclear Event Scale (INES). INES was introduced in 1990. Its primary

purpose is to facilitate communications and understanding among the nuclear community, the media, and the public on the safety significance of events occurring at nuclear installations. The scale was modified in 1992 to include any event associated with radioactive materials and/or radiation, including the transport of those materials. It is anticipated that events of safety significance reported to INES at level 2 and above would be included in the IRS.

Other activities

Activities within the IRS extend beyond the exchange and feedback of event information. Both the NEA and the IAEA have assigned expert working groups who meet annually and discuss the safety relevance of such events.

WHAT HAS BEEN ACHIEVED?

Currently 31 countries with a nuclear power programme participate in the IRS. There are now over 3,400 event reports within the system. Additional events are added at the rate of about 80 per year. The reports are now being made available in a user-friendly web-based system, with a full-text database and a powerful search engine allowing full-text searching. The capacity for data input, storage and access to written, numerical and graphical information is increasing the reporting and subsequent analytical capabilities and is making the IRS more effective in the enhancement of nuclear safety.

Over the years, the IRS has expanded from being primarily a vehicle for information exchange to becoming a source for analysis, in-depth discussions, generic studies and meetings for the exchange of information related to operating experience.

Recently, an Event Review Group (ERG) has been established within the IAEA's Division of Nuclear Installation Safety to review event reports for completeness, accuracy and consistency. The ERG meets regularly and works towards ensuring the quality of the reports posted on the web-based IRS.

Recent products from the IRS include the following:

- Nuclear Power Plant Operating Experiences from the IAEA/NEA Incident Reporting System (2002 - 2005)
- Analysis of Station Black-out Events Precursors
- Closing the Feedback Loop from Events to Definite Elimination of the Causes
- Maintenance Events Involving Quality Assurance
- Analysis of Cracking and Corrosion Issues in the Reactor Coolant System
- Operating Experience on Fuel Handling Events