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## Operating Experience Feedback System in France

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### **Abstract:**

Operation Experience feedback analysis is an essential factor in operating nuclear power plants under a safe condition. This paper concerns the French operating experience feedback system. French context is rather unique to the extent that only one operator is in charge of a large number of similar reactors which allows to collect and process an important amount of consistent information contributing to the experience gained from the operation of the plants. Firstly, a short description of the roles of the different actors involved in the French nuclear safety, namely the operator, the regulator and the technical support. It also gives details on the actions taken further to the reporting of events by the operator and also on the tools and data bases developed to manage the experience feedback. Secondly, the French OEF system also includes the processing of the international experience feedback covering two main points: the way the international experience is exploited in France and the criteria triggering the reporting of a French event to the IRS system of the IAEA. We may conclude that the operating experience feedback analysis is a very broad field that needs to be analysed correctly in order to prevent recurrence of events and possible occurrence of incidents of major importance.

### **1 NATIONAL OPERATING EXPERIENCE FEEDBACK (OEF)**

The objective of the French Safety Authority (ASN) is to assure that the nuclear utilities operate their plants in an acceptable safe manner. To guarantee that the operating experience is taken into account in order to achieve the objective of safe operation, the French regulator has the following requirements:

- To have an appropriate organization permitting to collect and analyse operating experience information,
- To carry out analysis of root causes and, actual and potential consequences,
- To provide reports on events,
- To present corrective actions.

The French context is rather unique: one organisation is operating a large number of identical or similar reactors. This context allows disposing of an extensive amount of consistent data, resulting in an enormous advantage for OEF.

## 1.1 Events notification

The operator, in charge of the safety of the plant, is requested to report significant events. Two types of events are distinguished : SSE and EIS.

Concerning French NPPs, the operator EDF reports each event occurred in the French PWR series in a database called SAPHIR.

### SSE:

The events presenting a more significant stake for safety are subjected to a specific notification to ASN. These events are called Safety Significant Event (SSE). An event is classified as SSE if it meets one of the following criteria established by ASN:

1. emergency shutdown, except in the context of a deliberate scheduled action or defects affecting the turbine,
2. actuation of an engineered safeguard system, except in the context of a deliberate scheduled action,
3. non compliance with the Operating Technical Specifications (OTS) or any incident that could have led to a non compliance of the OTS, had the plant been in a different state:
  - long-term unavailability or multiple inoperability,
  - overshooting certain thresholds or authorized values,
  - common mode failure or potential common mode failure (fire, onsite flooding, system interaction, design or construction error liable to concern several sets of equipment or several plants units...),
4. external hazard: earthquake or flooding, e.g.,
5. real or assumed malevolent acts,
6. fallback of the unit according to the OTS or accidental procedures following an unplanned behaviour of the plant,
7. event resulting or possibly resulting in multiple failures or affecting redundant trains,
8. event or anomaly affecting the primary or the secondary system,
9. design, manufacturing, on site assembly, anomalies related to all equipment that may lead to operation conditions taken into account neither by design nor by operating procedures,
10. any other event deemed sufficiently important by the operator or the French safety authority.

Currently, approximately 750 events are reported each year for 58 units, in which the radiation protection, environment and transport events account for 130 incidents.

For a SSE, the operator is requested to forward not only to the ASN and but also to its technical support IRSN primary notification within 2 days time (information provided by Fax) followed by a report, within 2 months time, containing event analysis and corrective actions to be taken.

## EIS

Events having an impact on safety but not in a serious manner are called Events of Interest for Safety (EIS). For the EIS, EDF sends information to the ASN and to its technical support IRSN. This information is sent by an event file extracted from the database SAPHIR. The criteria permitting to classify an event as an EIS were established by the operator in agreement with the ASN. The number of EIS declared is about 15 000 a year.

### **1.2 Role of the ASN**

The incidents are subjected to an immediate declaration by the owner and analysed by ASN.

The main function of the operating experience group of ASN is to:

- collect all reactor incidents in a database and elaborate a global view of events at the national level,
- to manage data required for ASN communication regarding NPP incidents (qualitative and quantitative),
- to coordinate analysis of operating experience at national level,
- to inform inspectors on recurring events,
- to identify topics to be considered more in depth and to participate in advisory committee,
- to maintain consistency in processing and analysis of incidents,
- to identify generic events.

The final classification of incidents on the INES scale is carried out by the ASN.

The incidents are immediately transmitted to regional inspectors for the definition of further actions to be taken (complementary requests, adjustment of corrective actions, inspections). For events beyond level 1 on the INES scale, information of the public is published on the internet website of ASN.

In complement of this analysis, a quarterly systematic meeting is scheduled with the operator to look further into the analysis of outstanding events and to examine the taking into account by the operator of the international experience feedback.

Finally the ten-yearly periodic safety reviews and the three-yearly analysis of the operation experience are further occasions to analyse lessons learnt from the experience feedback of incidents.

### **1.3 IRSN operating experience analysis**

Continuously, the IRSN carries out the analysis of the significant events which occur on the nuclear installations. The objectives of the event analyses are:

- the detection of precursor events,
- the identification of design and operating weakest points of NPPs,
- the examination of the effectiveness of the corrective actions implemented by the operator.

Moreover, IRSN examines OEF in the framework of the:

- definitive start up authorisation,
- the ten yearly periodic safety review,
- the periodic (every 3 years) analysis of OEF issues or trends to be presented to the Advisory Committee for Reactor Safety (GPR),

In addition, IRSN carries out:

- trend analyses that are actually significant due to the amount of data concerning similar units of the French NPPs,
- probabilistic quantification of precursors.

IRSN also participate actively the relevant international systems IRS, IRSRR and FINAS.

#### 1.3.1 SSE analysis:

Further to the receipt of an early notification concerning a SSE, IRSN performs the following actions within a week's time:

- checks the content of the fax report (is the information provided complete and correct),
- updates the IRSN database used to collect the SSE. This database is called SAPIDE
- asks more detailed information to the operator, if needed,
- holds a first meeting to identify outstanding or precursor events. The most important of these events are subjected to a probabilistic quantification aimed at estimation of the conditional probability of core damage.

After the receipt of the SSE report, IRSN:

- carries out an analysis to examine how the event took place, which safety functions were implicated, how operators and equipment behaved, what the consequences were, together with knowledge of any similar incidents which have already occurred. In addition, it is examined if, in other circumstances, the same incident would have had far more severe consequences,
- identifies the root causes of the event and examines if the same root causes applied to other equipment or systems might have induced different sequences with possible serious consequences could.
- looks for additional information for the most significant events. Despite the quality of the event report, the information usually supplied has to be supplemented by direct contacts with the plant operator or the relevant EDF head office departments and, in many cases, by on site visits of the operator or equipment concerned,
- completes the updating of the SAPIDE database. Moreover the engineer in charge of the site safety assessment carries out the first analysis of the event,
- holds every week a meeting, attended by all the engineers in charge of site safety assessment, for reviewing all the SSE reports received during the week before. The purpose of this meeting is to:

- inform all the engineers responsible for the sites safety assessment of events occurring in the reactors and initiate a debate on the issues raised by these events,
- decide on the next steps in terms of in-depth analyses and IRS reporting.

### 1.3.2 EIS analysis:

The access to the EIS constitutes an important contribution for the safety assessment of nuclear installation. It makes it possible to perform trend analyses, to detect the persistence of operational difficulties or the appearance of new issues. In addition, the databases are used to calculate reliability parameters of equipment and to provide the RECUPERARE tool developed by IRSN. Within the framework of its mission of evaluating safety, IRSN addresses each quarter to the ASN an analysis of the events considered of interest during the past period and which need a detailed attention and a treatment by EDF. This opinion also relates to the treatments implemented by EDF within the framework of the safety analyses. A quarterly technical meeting between ASN, IRSN and EDF allows technical discussions of the selected events.

## 1.4 Periodic analysis of the operating experience

Every 3 years IRSN performs the analysis of the OEF in order to present the issues to the Advisory Group for Reactor Safety (GPR). The objectives of this meeting are to put forward operating measures or modifications of equipment which result from in depth analysis of incidents (safety studies...). The choice of topics of the meeting is decided by the ASN after consultation with IRSN. The preparation of this meeting requires a technical instruction between EDF together with IRSN. At the end of this instruction, IRSN issues a report supporting the GPR meeting. This report concerns an in-depth analysis of significant events analyzing the files transmitted by the licensee and evaluating their acceptability, with respect to safety. It also examines the position of the owner and the possible provisions that are proposed. It generally concludes with recommendations that are frequently adopted by GPR and reformulated by the ASN in order to request corrective actions from the operator.

Further to the GPR meeting, the GPR members issue a statement on the safety of the operation of the NPPs and, if necessary, make recommendations.

## 2 INTERNATIONAL OEF

International OEF processing is divided into two parts.

### 1) Analysis of international events

EDF examines the events reported by other operators and gathered in the WANO database as well as the IRS reports.

Besides, ASN and IRSN also exploit other international feedback sources such as:

- IRS reports,

- Information Notices and Regulatory Guides produced by the American Nuclear Regulatory Commission (NRC),
- events declared in the International Atomic Energy Agency (IAEA) NEWS database,
- information exchanged in the context of international co-operation.

IRSN systematically analyses all the documents in its possession in order to exploit international feedback. The conclusions of this survey are gathered in a document submitted to the ASN, outlining briefly the main points to be noted from events occurring abroad. This document is succinct but does highlight in particular events that may be transposed to the EDF PWRs. These events are discussed during the quarterly meetings dedicated to the operating experience. If the analysis concludes that an event may be transposed directly or when the mechanism causing the event is likely to happen in France, an investigation is carried out. As a result, EDF may be requested to perform an in-depth analysis or to implement preventive measures.

Moreover, during the GPR meeting dedicated to the examination of OEF, the international operating experience is taken into account.

## 2) Reporting to other countries through the IRS system of the IAEA

As mentioned before, the decision to report an event to the IRS is made during the weekly meeting dedicated to the first analysis of the lessons to be learnt from events.

An event is reported to the IRS system when it meets the following criteria:

- Rated level 2 on the INES scale,
- Quantification concludes that the event is a precursor,
- New issue of interest,
- The event is a response to an event already occurred in another country.

## 3 CONCLUSION

The French OEF system covers a very large field : from collecting data up to the presentation of in depth analysis of the operation experience feedback to the advisory committee, it requires the development of various data bases and tools. On the other hand, it involves the use of probabilistic safety assessment and allows calculation of reliability of the equipment. The analysis performed independantly by both technical support and operator commonly leads to fruitful exchanges between these organisations. In addition, the examination of international experience widens the view of the operational experience by the actors involved. Despite many actions are engaged by the French organisations, new events are observed which proves the need to maintain a sustained effort in that field, in order to avoid as far as possible the occurrence of serious damages on the installations. One condition to reach that goal requires an active participation of other countries in the international systems of experience feed back, in order to make these systems as reliable as possible.