

EUROPEAN CLEARINGHOUSE – DEVELOPMENT AREAS AND PRIORITIES IN OPERATIONAL EXPERIENCE FEEDBACK FOR NUCLEAR POWER PLANTS

by

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Nuclear power plant operational experience has been used for many years in order to improve the safety of nuclear facilities throughout the world. In the European Union, a regional Clearinghouse on Operational Experience Feedback for Nuclear Power Plants has been established to enhance nuclear safety through improvement of the use of lessons learned from operational experience. The EU Clearinghouse is organized as a network operated by a centralized office located at the Joint Research Centre of the European Commission and currently gathering nine European Safety Authorities and two major European Technical Support Organizations. Two years of operation of the EU Clearinghouse have shown the benefits of the common initiative and further areas of development have been identified. Among them, the need for further development of in depth analyses of dedicated families of operational events has been highlighted. The present paper describes the history of the initiative, the current work areas being developed and corresponding priorities for further improvement of the use of lessons learned from operational experience in the European Union.

Key words: nuclear safety, operational experience, European Commission, Joint Research Centre

INTRODUCTION

Lessons learnt from the operational experience are extensively used to improve nuclear power plant (NPP) safety worldwide. In the USA, after the discovery of significant corrosion of the reactor vessel head at the David-Besse NPP in 2002 [1], initiatives have been taken to improve the effectiveness of the operational experience feedback process namely through the establishment of a centralised Operational Experience Clearinghouse at the US-NRC [2, 3]. At the conference on Improving Nuclear Safety through Operating Experience Feedback that was held in Germany 2006 [4], the EU countries operating nuclear reactors have suggested that at Community level EU countries may benefit from pulling together their efforts to enhance the effectiveness of the operational experience feedback (OEF) process and have discussed the possibility of establishing a similar mechanism for EU region.

Following that conference, the Finnish Nuclear Safety Regulatory Authority approached members of the Western European Nuclear Regulators' Associa-

tion (WENRA), Technical Support Organizations (TSO) of European regulatory authorities as well as the European Commission (EC), to encourage and explore the possibility of establishing a centralised European Clearinghouse for further improving NPP operational experience feedback.

Recognizing the importance of this safety issue, it was suggested by some EU member states (MS) that the Joint Research Centre (JRC) of the EC may play the central role in establishing and running of an EU Clearinghouse for Operational Experience Feedback for the benefit of all MS. It felt important to use well established JRC working mechanisms and means, as well as available EU countries and JRC technical expertise in the field in order to promote better co-operation, more effective use of the limited national resources of the MS and strengthening the EU capabilities for operational experience analyses and dissemination of the lessons learnt. In 2008, the EU Clearinghouse on OEF for NPP was launched and a centralised office was established at the JRC [5, 6].

Currently, regulatory authorities from Finland, Hungary, The Netherlands, Lithuania, Romania, Slovenia, and Switzerland are members of the EU Clearinghouse. Regulatory Authorities from Spain

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and the Czech Republic joined the EU Clearinghouse as observers as well as TSO from France and Germany (IRSN and GRS). Discussions are underway to involve other European safety authorities.

OBJECTIVES OF THE EU CLEARINGHOUSE

The creation of a centralised EU Clearinghouse provides an integrated approach to the research needed to strengthen the Community capabilities for assessment of operational experience of EU NPP and to promote development of tools and mechanisms for improved application of the lessons learned, with the following main goals:

- improvement of EU NPP safety through strengthening co-operation between EU regulatory authorities, TSO, and the international OE community to collect, evaluate, and share NPP operational events data and apply lessons learnt within the framework of a European network on NPP,
- establishment of European best-practice for assessment of NPP operational events, through the use of state-of-the-art methods, assessment tools and information gathered from different national and international resources, such as EU Regulatory Authority event reporting systems, NRC Operational Experience Clearinghouse, EU TSO, the Incident Reporting System (IRS) jointly operated by IAEA and OECD/NEA, *etc.*, and
- strengthening EU resources in OE, by provision of a permanent EU staff core group, which together with a number of representatives from interested EU regulatory authorities (assigned as detached national experts on a rotational principle and voluntary basis for a fixed period) ensures the cost effective analyses and implementation of operational experience feedback to the EU MS participating in the project. The establishment of international networking between experts who are involved in OEF, as well as direct links with interested EU regulatory authorities and the participation of EU TSOs is essential.

ORGANISATION OF THE EU CLEARINGHOUSE

The EU Clearinghouse is organised as a regional network gathering safety authorities from the EU region and operated by a centralised office located at the Institute for Energy of the Joint Research Centre (Petten, The Netherlands).

The work programme is prepared by the centralised office in co-operation with the safety authorities participating; it is approved by the safety authorities, and executed by the centralised office with the support of the safety authorities and TSO when necessary.

DEVELOPMENT AREAS AND PRIORITIES

In co-operation with the MS safety authorities participating to the EU Clearinghouse, areas where a community approach could lead to significant added value have been identified and prioritised. The result of this process is presented in detail hereunder:

statistical trend analysis of OE databases. In order to identify the major families of safety significant and recurring events, statistical trend analyses of several OE databases are being performed in order to identify the areas on which the efforts should be focussed in the future. This task will allow further refining the strategic approach of the EU Clearinghouse, and

preparation of topical studies providing in-depth assessment of preselected subjects related to NPP operational experience. In 2008, two topical studies have been performed. The IAEA/OECD/NEA Incident Reporting System (IRS) was chosen as a reference database for identification of events corresponding to the technical field scrutinised: disturbance in the grid with reference to the Forsmark event [7] and reactivity management events with reference to the Shika-1 criticality incident [8-10]. After approval by the EU Clearinghouse members, both reports have been made available in the IRS website by the IAEA. In 2009, two topical studies have been performed, covering:

- maintenance related events. Recent trend in NPP seemed to show that maintenance was a significant contributor to events. The in-depth study performed confirmed this opinion by showing that more than 1 event reported on 4 were maintenance related. Moreover, 25% of these maintenance related events involved common mode failures. The predominant root causes identified for maintenance related events were problems related to written procedures (missing/outdated/wrong/inadequate procedure or procedure not followed), problems related to the surveillance and testing programmes, the training and qualification of the staff, and the supervision of the work. The report addresses present challenges in maintenance, and gives recommendations taking into account the lessons learned from the events analysed, and
- fuel damaging events. An in-depth analysis of approximately 170 event reports over three decades was performed by the EU Clearinghouse. The scope of the study covered three main sub-families: in-core events (*i. e.* events with the fuel in the reactor core), fuel handling events and events related to the storage of fuel. As mentioned in [11], failures of fuel assemblies show that, in addition to leading to long shutdown and loss of electricity production, they may have potential serious consequences in terms of con-

tamination and nuclear safety. For in-core events, the study showed that fuel manufacturing and design improved a lot in the last decade, but also that more demanding operating conditions (higher burnups, mixed cores, *etc.*) often reduced the benefits of this positive evolution. For each of the three sub-families of fuel-damaging events, lessons learned have been identified and recommendations have been provided.

In December 2009, a decision was taken on an ambitious programme of new topical studies and supported by the MS safety authorities participating to the EU Clearinghouse. Among many potential topics, six topical families were prioritised on the basis of their safety significance and of their potential for generic lessons learned. As a result the following topical studies are currently under development:

- events related to construction and commissioning of NPP [12]. This study is strongly supported by countries embarking on the construction of new NPP units. It covers events detected both during on-going NPP constructions (Olkiluoto NPP unit 3, Flamanville NPP unit 3, others) and experience accumulated during construction of the past generations of NPP. In addition, this study will be used to support the work of the Working Group on the Regulation of New Reactors of the Nuclear Energy Agency (NEA) of the OECD,
- external events: the study uses a broad coverage of external events of both natural and man-induced origin. Recent data indicate that external hazards remain a significant source of events in NPP [13]. For this topical study, in addition to the database of the IRS, national OE databases of France (IRSN) and Germany (GRS) will be screened for relevant experience,
- event related to supply of NPP components. This report analyses events caused by issues in the supply chain of NPP. It will cover issues related to both the supply chain control at the level of the NPP and at the level of the suppliers. Several recent events, namely involving the problem of quality of supplied components or counterfeit parts, have increased the significance of this topic. This study was assigned a top priority among the different possible topics discussed with the safety authorities,
- events related to plant modifications. Plant modifications is a sensitive process in NPPs, and insights from recent studies, specialist meetings and workshops show that the management of plant modifications still leads to a significant amount of events [11]. This study was also assigned a top priority among the different possible topics discussed with the safety authorities,
- events related to ageing of NPP. As in the European Union many NPP are progressively approaching the end of their initial design life, and as

for some of them extension of the life is considered, ageing is definitely a current issue for European NPP. The Safety Authorities participating to the EU Clearinghouse naturally considered this topic as being a priority area to be developed, and

- loss of safety-classified electrical equipment due to generator high voltage peak: this study covers two events that recently occurred in Europe, showing strong similarities and having as initiator an overvoltage at the level of the generator.

Moreover, the safety authorities supported the idea of the development of a study analysing experience from NPP in decommissioning stage. However, preliminary work seems to show that the available information and data on this topic is rather low compared to NPP in operation and that the lack of available data could possibly jeopardize the study.

In addition to the IRS database, for some of the on-going topical studies, adequate databases of EU TSO have been selected in order to improve the overall size of the event reports sample and the subsequent expertise on the topic, with the support of the TSO concerned.

These seven topics correspond to the priorities for future development of in-depth analyses of families of events, as defined by the EU MS safety authorities participating to the EU Clearinghouse.

Contribution to improvement of quality of event reports submitted from the participating countries to the IRS: to all its members the EU Clearinghouse provides support for the drafting of high quality IRS reports. In 2008-2009, in support of the national activities of Clearinghouse members, 16 draft event reports were reviewed and enhanced for final reporting to the IRS, leading to a progressive harmonization of the reporting to the IRS-database. From this task, areas in which further improvements in the reporting could be sought have been identified (*e. g.* in identifying corrective actions to be taken by the regulatory bodies and ascertaining where further analyses may be required to address the root causes of an event, *etc.*) and recommendation to improve the reporting are being developed for the benefits of the safety authorities participating to the project. Quarterly OE report. In 2009, a quarterly report on OEF has been initiated in order to disseminate timely information on worldwide recent significant events in NPP. The report is based on screening of the available public information. Each report contains approximately 3 to 8 safety significant events having been reported during the last three months. Events are firstly shortlisted using basic criteria and the final selection is made by a selection committee in a Committee meeting, namely on the base of their real or potential safety significance and on the usefulness of the lessons

learned for European NPP. The quarterly report is published on the web site of the EU Clearinghouse [14].

Database: a European Clearinghouse centralised Data base has been developed in order to ensure long term storage of OE related information. The database allows storing of events reports (standard event reports but also low level events and near misses), feedback reports, and additional related documentation. It incorporates advanced investigative and analytical assessment capabilities facilitating the data analysis, trend identification tools and uses a user-friendly interface. The database is accessible to the Clearinghouse members using a restricted web portal.

A web site has been developed in order to enhance the communication and the sharing of information between the Clearinghouse members. It comprises a public part gathering general information about the project and documents open to external publication, and a working area restricted to the Clearinghouse members. The working area is used to disseminate the deliverables of the Clearinghouse to the MS safety authorities participating.

Further to these activities, the EU Clearinghouse is participating to several international cooperation projects on OE, mainly through the OECD-NEA working groups and the IAEA, in order to exchange information on operational experience and co-ordinate the work programme of the EU Clearinghouse with existing international activities.

CONCLUSIONS

In 2008, on request of several EU Member States, a regional Clearinghouse on OEF for NPP was created in Europe in order to enhance nuclear safety through improvement of the use of lessons learned from OE. There was a clear potential for enhancement of the European process used for the NPP operational experience feedback. The experience of US NRC has shown that the establishment of a centralized OE clearinghouse for a particular region in the world can yield significant benefits both in terms of optimized use of resources and improved feedback of significant lessons learnt at NPP. Due to specificity of the different regulatory regimes in the EU, significant diversity of the NPP designs and number of different languages used, the establishment of the EU centralized clearinghouse was more complicated and challenging and needed strong support and commitment from the EU regulators.

The EU Clearinghouse has now been launched and is in operation. A centralised office has been set up at the JRC and scientific and technical work has been initiated for the benefits of the safety authorities participating to the project. In 2009, an agreement was

achieved with EU TSO, leading to launch significant technical co-operation. The importance of the activities performed by the centralised office has been acknowledged by the Clearinghouse members. Two years of operation of the EU Clearinghouse have shown the added value of the initiative and further areas of development have been identified. As a result, an ambitious work programme was decided for 2010 and beyond by the MS safety authorities, and the priorities and further development areas have been defined. Among them, 7 topical families of events have been prioritised for 2010 and beyond: events related to construction and commissioning of new NPP, external events, events related to supply of NPP components, to plant modifications, to ageing, to loss of safety classified electrical equipment due to high generator voltage, and to decommissioning of NPP.

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**ЕВРОПСКИ ИНФОРМАЦИОНИ ЦЕНТАР – ОБЛАСТИ
РАЗВОЈА И ПРИОРИТЕТИ**

Погонско искуство стечено радом нуклеарних електрана годинама је коришћено да се побољша сигурност нуклеарних постројења у свету. У Европској Унији, ради повећања нуклеарне сигурности, установљен је регионални Информациони центар за повратни утицај погонског искуства на нуклеарне електране. Информациони центар Европске Уније урађен је као мрежа којом се управља из централе смештене у Центру здружених истраживања Европске Комисије, која сада окупља девет европских управа и две највеће европске организације за техничку подршку. После две године рада Информационог центра показале су се користи од заједничких и препознате су нове области развоја. Међу њима, наглашена је потреба даљег развоја дубљих анализа усмерених на фамилије погонских догађаја. У раду је описана историја ове иницијативе, области текућег рада које се развијају и одговарајући приоритети даљег побољшања коришћења научених лекција из погонског искуства у Европској Унији.

Кључне речи: нуклеарна сигурност, погонско искуство, Европска комисија, центар здружених истраживања