European Commission

JRC TECHNICAL REPORTS

Quarterly report on NPP events

January – March 2019

A. Ballesteros
G. Manna
M. Peinador
M. Strucic
J. Vegh

2019

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Foreword

In the European Union, a regional network, the European Clearinghouse on Operating Experience Feedback for Nuclear Power Plants, has been established to enhance nuclear safety through improvement of the use of lessons learned from operating experience.

The European Clearinghouse is composed mainly of European nuclear safety regulatory authorities and their technical support organisations. It is operated by dedicated staff from the European Commission´s Joint Research Centre.

Abstract

This newsletter provides Feedback on Operating Experience (OEF) from significant safety related events at nuclear power plants (NPPs) worldwide, compiling the NPP events that were reported publicly in January - March 2019.

1 Introduction

This newsletter provides Feedback on Operating Experience (OEF) from significant safety related events at nuclear power plants (NPPs) worldwide, every three months. It is intended to provide timely information to the Clearinghouse members about recent significant events, with a real or potential impact on nuclear or radiation safety. The report is intended to be complementary to other international reporting systems such as the International Atomic Energy Agency (IAEA) IRS, rather than duplicate the information provided by it. Usually the information used to prepare the report is publicly available and the information is notified promptly, in advance of other reporting systems. Only events that are considered to be likely to have lessons applicable to EU NPPs are selected.

Event selection for reporting in this newsletter is a two stage process. All the information found on relevant web sites is initially screened and the events that match at least one of the following criteria are short-listed for further consideration:

- Unplanned or unexpected automatic or manual reactor trips;
- Events rated at INES Level 2 or above;
- Significant radiological events;
- Real or potential challenges to nuclear safety or defence in depth; including recurrent events and actuation of systems;
- Events with common cause failure aspects;
- Events with lessons learned worth being disseminated;
- Events requiring the entry into emergency operating procedures

Furthermore staff may occasionally short-list other events based on other criteria.

The final selection of the events is made by the JRC Clearinghouse Selection Committee. The following criterion is adopted to guide the Committee's final selection:

- Level of actual or potential effect on safety;
- Events rated at INES Level 2 or above; and
- Significance of lessons learned for EU NPPs.

Clearly the criteria above are open to a degree of interpretation and judgment and the selection committee is comprised of suitably qualified and experienced personnel who by applying engineering judgment and through consensus, arrive at the final selection.

Finally, no comparison should be made among countries with regards to the number and significance of events, as the number of nuclear power plants, the reporting criteria and, most significantly, the information made available to the public, varies widely among countries.

2 Events short-listed

Gathering event information for short-listing involves searching potential sources of operating experience information including relevant world-wide websites. When NPP related event reports are identified as potential candidates for the shortlist the information is translated into English for the purpose of screening and possible inclusion in this newsletter. The sources of the event information are referred to in an event list compiled for the purposes of screening which then results in the initial short-list.

The short-list of events considered for inclusion in this quarterly report are drawn from NPPs world-wide and can be found in the database on our website, accessible to Clearinghouse members. The following information is collected: title of the event; date of event or date of reporting if date of incident not available; event description; INES level (if available) and name of the NPP.

3 Events selected

Three events were selected from the short-list for this Newsletter:

1. 31/12/2018: External corrosion affecting multiple systems on a power reactor (UK / DUNGENESS B).
2. 16/12/2018: Borated water storage tank level transmitter out of tolerance due to reaching end of expected life (US / DAVIS BESSE 1).
3. 19/02/2019: Secondary containment airlock doors opened at the same time resulting in a condition prohibited by technical specifications (US / FERMI 2).

The information provided is extracted from publicly available and other authorised sources. More detailed information on these events may become available in due course, either from the original source or through international operating experience sharing systems.

3.1 External corrosion affecting multiple systems on a power reactor

DUNGENESS B – 31/12/2018

In September 2018, as part of a regulatory intervention on external corrosion management, the UK nuclear safety regulator (Office for Nuclear Regulation (ONR)) issued a direction for Dungeness B nuclear power station to carry out a review and reassessment of safety addressing the corrosion of concealed systems that fulfil a safety function. Inspections carried out by the site nuclear licence holder (licensee) in response to this direction identified that seismic restraints, pipework and storage vessels associated with several systems providing a safety function were found to be corroded to an unacceptable condition. This condition would have been present whilst the reactor was at power, although, the affected systems were not called upon to perform their safety function.

Rectification of the degradation has now been undertaken whilst the units have been shut down for maintenance. The rectification work required more than 300m of pipework associated with reactor cooling systems to be renewed, along with renewal of numerous seismic pipework supports and remediation of carbon dioxide storage vessels. Both reactors at Dungeness B are currently (January 2019) shutdown as part of the licensee's ongoing recovery program. The licensee has identified a number of additional commitments that will be fulfilled prior to returning either reactor to service. ONR continues to engage with the licensee to monitor progress against commitments. The licensee has an on-going investigation underway to establish the causes of this issue.

There were no safety consequences to people or the environment as a result of this event. The event related to the erosion of the normal levels of defence in depth associated with the operation of a nuclear power station in the UK, and was therefore rated as INES level 2.

Editor´s comment *– This event has been highlighted because of its INES 2 rating.*

The wide extent of the damage to piping in safety systems clearly shows the relevance of the ageing issues related to concealed piping. It must be recalled that ageing programs applied to concealed piping (understood as «piping important to safety buried in soil, encased in concrete or laid in covered trenches») was included in the scope of the recent Topical Peer Review conducted in the European Union in compliance with the directive 2014/87/EURATOM. As more information on the causes of this occurrence becomes available, regulatory authorities may find interesting to review the good practices, expected levels of performance and challenges identified in the topical peer review in the light of this event.

3.2 Borated water storage tank level transmitter out of tolerance due to reaching end of expected life

DAVIS BESSE 1 – 16/12/2018

During a walkdown with the station operating at full power, it was noted that a level transmitter in the Borated Water Storage Tank (BWST) was reading lower than expected. The instrument, part of one of the four ESFAS channels, was tripped upon discovery in accordance with the technical specifications. A review of plant computer data identified this transmitter had been reading lower than expected starting more than 7 hours prior to discovery, which is a condition prohibited by the Technical Specifications.

The BWST level channels are used to generate a permissive interlock (with a 2 out of 4 logic) when the tank level is too low in order to protect the emergency core cooling pumps.

The cause of the degradation was determined to be the transmitter reaching the end of its expected service life, as the transmitter was installed approximately 42 years ago during original plant construction.

After the event, the plant operator calibrated the instrument and returned it to service, however it was replaced soon afterwards, as it began to show a negative trend. The transmitter in another channel also showed erratic behaviour a few weeks after this event, and was also replaced. The operator has scheduled the replacement of the level transmitters in the remaining two channels for June 2019.

Editor´s comment *– This event has been highlighted because of the potential significance of its lessons to be learned.*

A maintenance strategy of «run to failure» applied to safety related instrumentation should be carefully assessed against the potential for common cause failure. In this case, if the transmitter negative trends had remained unnoticed, the low signals from two transmitters would have possibly prevented the use of all the available BWST volume in case of accident.

3.3 Secondary containment airlock doors opened at the same time resulting in a condition prohibited by technical specifications

FERMI 2 – 19/02/2019

With the reactor at full power, plant personnel notified the Main Control Room that both doors in the Secondary Containment airlock on the Reactor Building were opened and could not close. The airlock doors were opened simultaneously for a period of approximately five minutes.

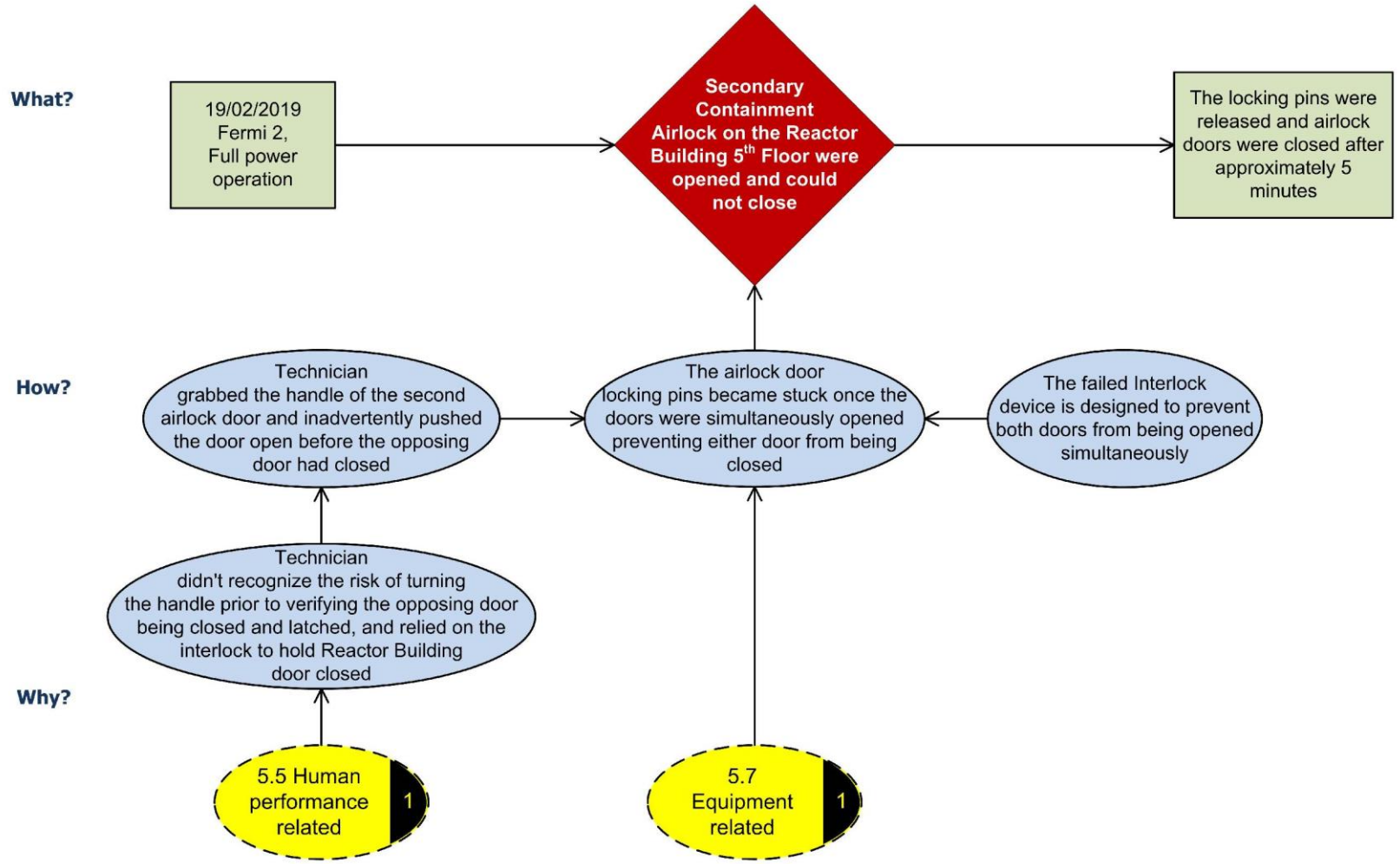
A technician had opened both air lock doors simultaneously when he egressed through first door and grabbed the handle of the second airlock door and inadvertently pushed the door open before the opposing door had closed. The interlock device for the doors had failed. The interlock is designed to prevent both doors from being opened simultaneously. The maximum Secondary Containment (SC) pressure observed during that time remained within limits.

There were no radiological releases associated with this event.

Editor´s comment *– This event has been highlighted because of the potential significance of its lessons to be learned.*

The Clearinghouse staff has noted that events similar to this one are reported often (71 reports concerning airlocks have been recorded on the Clearinghouse database in the last five years, with one plant reporting five incidents during one single outage). While the duration of the period when both doors are open simultaneously is typically very short and therefore the safety significance of the individual occurrences is negligible, the high

Secondary Containment Airlock Doors Opened at the Same Time Resulting in a Condition Prohibited by Technical Specifications



number of events reported points at a certain «normalization of deviance» phenomenon, deserving due attention.

Besides troubleshooting, improved surveillance tests, procedure revisions and training, usual corrective actions include:

- *Install signs instructing personnel how to access or leave the airlock.*
- *Introduce a time delay, which allows additional time for the interlock mechanism to actuate and prevent the other door from being opened.*
- *Review of airlock door operating practices.*
- *Assign designated door operators.*
- *Establish backup door indication verification technique prior to re-commencing reactor building entries.*
- *Redesign the airlock components (like the latching mechanism) to avoid manual actions by airlock's' users.*
- *Coach the individuals involved with respect to the use of airlock doors.*

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