Australian Government
Australian Radiation Protection and Nuclear Safety Agency

INSPECTION REPORT

Licence Holder: ANSTO Open Pool Australian Light Water Reactor (OPAL)	**Licence Number:** F0157
Location inspected: Lucas Heights, Sydney	**Date of inspection:** 7 to 11 March 2016
	Report No: R16/02685

An inspection was conducted under Part 7 of the *Australian Radiation Protection and Nuclear Safety Act 1998* (the Act). The purpose of the inspection was to assess compliance with the Act, applicable regulations, and licence conditions. The inspection was conducted as part of ARPANSA's baseline inspection program.

The scope of this inspection covered assessment of performance in the area of event protection of OPAL reactor operation and relevant ANSTO support services.

The inspection was carried out against the ARPANSA Event Protection Performance Objectives and Criteria (PO&Cs). All findings are based on factual evidence obtained during the inspection. The inspection consisted of a review of documentation and records, a facility walkdown, and interviews of personnel and management.

Background

The ANSTO OPAL facility is a 20 MW, multipurpose research reactor that provides a variety of benefits to the community including production of radioisotopes for nuclear medicine, silicon for semiconductors, sealed sources for industrial use, and neutron scattering research. Consideration was given to extreme conditions, e.g. bush fires, extreme weather conditions, earthquake, structural impact and other relevant effects, and the implementation of adequate arrangements and practices to minimise the potential impact of such conditions.

Observations

Generally, the processes and practices were in place to prevent and mitigate the potential effects of extreme conditions. Event Protection arrangements were found acceptable, and aligned with the relevant ARPANSA PO&Cs. However, observations were made that identified areas for improvement.

Control of Combustible Material

The Performance Criterion BM 5.1.1 specifies that combustible materials should be appropriately minimised and kept away from safety significant systems. The procedures and instructions to control hazardous and chemical materials are developed and used at the facility. The chemicals are appropriately classified, registered and stored in dedicated areas according to local, Australian and relevant international standards. The OPAL Reactor Business Management System (BMS) specifies that amounts of hazardous materials have to be limited or restricted inside the reactor containment. This includes flammable substances used for maintenance and reactor utilisation purposes.

The process was found to be effective to control ingress of hazardous and restricted materials into the containment. It also appropriately defines conditions of storage. However, it was less effective at monitoring the actual amount of the materials present. Therefore, decisions to allow the additional material to enter the area may not be informed by the actual amount of the material held in the

containment. This could potentially result in exceeding the hazardous and restricted material limits.

The personnel requesting introduction of a hazardous and restricted materials to the containment must seek authorisation from the Shift Manager according to the relevant OPAL BMS procedure. Aspects related to hazardous and restricted substances are covered by the Safe Work Permit process used on the ANSTO site. An inconsistent use of signs at the containment ingress areas was observed during the inspection. The signs on the doors are to alert the personnel of the process applied in order to control amount of hazardous and restricted materials within the containment. On some access doors the signs were not displayed. The appropriate signage is considered to be an additional layer of defence in depth and is aligned with NOHSC: 2017 (2001) which states: *"*In addition to the placarding and labelling requirements of NS 34–39, safety signs should be used where the risk assessment process identifies a need to provide prominent instructions and/or warnings. Safety signs may be used to highlight or reinforce such matters as:

(a) the proximity of hazards;
(b) the nature of hazards;
(c) the control of risk factors;
(d) the protection of risk control mechanisms
(e) operating instructions and procedures;
(f) the location of emergency equipment and materials; and
(g) emergency instructions and procedures."

The process was also found less effective for combustible materials not specifically limited or restricted in the BMS documents. The walkdown inspection identified some combustible materials located in the containment, the allowable amount of which was not specified. For example, the L13 ventilation room contained a large plastic box and there were a significant number of Tyvec/Tychem suits found stored in a metal chest of drawers in the Reactor Hall, not rated for fire resistance.

OPAL procedure OP 18 describes how hazardous and restricted materials are managed at the facility. Among the materials controlled by the procedure are clear/pink plastic sheets and plastic bottles. However, the procedure describes the control mechanism for the purpose of the nuclear safety, not the fire protection viewpoint. Therefore, it was not clear how much of the materials noted during the inspection are allowed to be stored in the area in order to comply with the fire load limits.

Severe weather threat preparedness

ANSTO manages the prevention of, timely detection of and mitigation of bush fire events through the primary document ANSTO Emergency Management: Bush Fire Response Sub Plan AG-5944. ARPANSA reviewed evidence that the Building Warden Bush Fire Preparedness Campaign had been completed for the current year and that the Emergency Operations Manager (EOM) Fire Rescue New South Wales and Rural Fire Service had been engaged to assess the Lucas Heights Science and Technology Centre (LHSTC) asset protection zone external to the perimeter fence line. ARPANSA obtained evidence that the actions such as widening breaks or thinning vegetation to minimise fuel load are being appropriately managed via the ANSTO SAP maintenance system.

The consequences of severe weather events were covered generically under the Crisis Management Plan and the Site Emergency Response and Evacuation Plan. However there was no procedure included in the existing documentation which would capture a planned response to be taken upon receipt of a notification of a severe weather threat (e.g. high wind), as outlined by the ARPANSA's PO&C BM *5.3 – Procedures and instructions are in place to reduce the vulnerability of the facility to external threats*. This is particularly pertinent in light of the recent tornado touchdown in nearby Kurnell in December 2015.

Corrective action programme

Performance Objective and Criterion (PO&C) CC-3 denotes that facilities have corrective action programmes that can effectively identify, analyse, prioritise, assign, track, and close conditions involving trends, events, human error, and equipment failures so that defence in depth is maintained.

The OPAL reactor uses a number of systems to manage actions arising from various activities and work groups. For example, the Reactor Operation Event Management System (ROEMS) is used for event tracking and actions arising from events, and the computerised maintenance management system SAP is used for maintenance tasks and some housekeeping actions. Safety related actions and some housekeeping actions are logged using the site-wide action tracker INFRA. In addition, several spreadsheets (e.g. the Periodic Safety Review actions, and the maintenance priority lists) are also used as management tools for activity prioritising, and action tracking. These individual systems are used within the relevant work groups.

However these tools are not consolidated, and it was observed that the use of multiple systems makes the holistic management of conditions, events and actions, including trending and tracking capabilities time consuming and potentially difficult. For instance, the inspection team was unable to locate an integrated formal trending process such that repeat or similar conditions can be labelled, identified, assigned actions, and closed in a timely manner.

Another example of the poor integration of the tracking systems occurred when the maintenance backlog of OPAL fire protection items in the ANSTO site-wide SAP programme was requested. The inspection team was informed that SAP cannot easily do this. This difficulty was exacerbated by divided management of certain maintenance tasks between OPAL Reactor Maintenance and ANSTO Facility Management (FM). It was noted that to make the maintenance task management more effective, the OPAL reactor is currently transferring all relevant tasks managed by the ANSTO FM under the OPAL SAP system as part of continuous improvement of maintenance management. In addition, ANSTO is planning to upgrade the SAP system to improve the maintenance management.

ANSTO has recognised the opportunity to improve action tracking integration and implemented a site-wide project to deliver the Governance Risk and Compliance (GRC) software. The implementation has been ongoing from 2011 and it is currently used to track audit and inspection findings. The GRC is an action tracking and trending system that could perform some functions of a corrective action programme when its implementation is complete. However, the inspection team was unable to evaluate the relevant capabilities at the time of the inspection.

Once this system is implemented a review of the functionality as an effective corrective action program against the requirements in *IAEA SAFETY STANDARDS SERIES No. NS-R-4* will be conducted as part of the ongoing ARPANSA inspection schedule. *IAEA SAFETY STANDARDS SERIES No. NS-R-4 Safety of Research Reactors Safety Requirements 2005* and *IAEA-TECDOC-1458 Effective Corrective Actions to Enhance Operational Safety of Nuclear Installations July 2005* refer to corrective action. *IAEA-TECDOC-1458* states*, "*As a minimum, an effective corrective action programme contains the following elements: addressing the root causes, selecting corrective actions, conservative decision making, prioritization, corrective action implementation, tracking of corrective action effectiveness, prevent repetition, rally commitments, indicators, self-assessment, peer review, and benchmarking*."*

Timeliness of action implementation

The majority of actions arising from various management systems were found to be implemented in a timely manner. However, this was not the case for the actions arising from the safety review of the OPAL reactor in the light of the Fukushima Dai-ichi Nuclear Power Plant accident.

The OPAL reactor staff conducted a preliminary assessment of the accident against the OPAL safety case in 2011 and updated it in 2012. There were no significant safety concerns identified. The recommendations were entered into the ROEMS for tracking. Some of the recommendations were found to be implemented.

In 2014, the IAEA published the *Safety Reports Series No 80 Guidance Safety Reassessment for Research Reactors in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant,* which represents best international practice. The OPAL reactor has been carrying out another safety re-assessment which has been based on the IAEA guideline. This safety re-assessment was initiated in 2014 and internally reviewed by the ANSTO safety committee. A draft of the safety re-assessment was provided to ARPANSA at that time. The draft did not suggest any safety significant problems. The internal review raised about a hundred comments. However, the review has not been finalised, and therefore, no formal actions have been identified to date.

As no finalised safety re-assessment has been completed, it was unclear to what extent the lessons learned from the Fukushima Dai-ichi Accident are understood and applied to OPAL. Whilst it is accepted that the IAEA Guide No 80 did not include a recommended time limit for completing a safety reassessment, the delay (16 months) to complete the ANSTO safety committee process is not considered to be "timely" under the ARPANSA Performance Objective and Criterion CC 3.4.4 - *Investigations are undertaken of unexpected conditions or performance in a timely manner with due consideration of safety and security risks.*

Other observations

A formal management observation process does not exist at the facility at this time. Work is underway for a safety observation process. The intent of a management observation process is for management to interact with workers on a periodic basis to provide positive feedback and improvement comments. Collection of management comments in a "no blame" format allows the identification of improvement opportunities.

Workers noted that senior management are present during work mainly during start-ups and shutdowns, but that they receive little on the job performance feedback whilst in the field. Audits are conducted, yet self-assessments are not a routine part of the facility vocabulary. Self-assessments are an IAEA recommendation in Safety Guide NS-G-2.11.

Based upon discussion with OPAL staff, it was evident that the cross cutting PO&Cs for Safety Culture (SC), Performance Improvement (PI), and Human Performance (HP) have not consistently been integrated into the work culture. PO&C CC-2 HP states, *"*HP standards are defined, established and verified. Standards are incorporated into an organisation's programs, process and training.*"* However, based upon discussions with OPAL personnel and observation of a daily meeting, HP standards are not written or reinforced on a regular basis. Personnel were not aware of best practice in this area, such as standardised level of use of safety related procedures. Stop-Think-Act-Review principles have been communicated and reinforced to the staff, but other HP tools such as pre-job briefs, place-keeping, flagging, and phonetic alphabet are not consistently used for work on safety related systems according to staff. OPAL Operations has taken the lead with efforts related to HP and progress will be assessed as part of the ongoing ARPANSA inspection process.

Findings

The licence holder complied with the Act, applicable regulations, and licence conditions.

ANSTO OPAL's performance may be improved by addressing the following performance deficiencies in the areas of Event Protection.

Performance Deficiencies:

1. The process for control of hazardous and restricted materials in the reactor containment was not fully effective due to the lack of an accountancy system to determine the inventory of the materials in the containment.
2. Planned response to a severe weather threat notification e.g. high winds, was not included in the existing ANSTO emergency response documentation.
3. The corrective action programmes were not consolidated. A number of individual action tracking systems were found to be in use by various work groups with no consistent action categorisation, prioritisation and tracking capabilities.
4. The review and actions arising from the OPAL reactor “post-Fukushima” safety assessments have not been completed in a timely manner.