Operational
Safety Review
Team

IAEA OSART

REPORT

OF THE

OPERATIONAL SAFETY REVIEW TEAM

(OSART)

MISSION

TO THE

HEYSHAM 2

NUCLEAR POWER PLANT

UNITED KINGDOM

2 TO 19 OCTOBER 2023

AND

FOLLOW-UP MISSION

26 TO 30 JANUARY 2026

DIVISION OF NUCLEAR INSTALLATION SAFETY
OPERATIONAL SAFETY REVIEW MISSION
IAEA-NSNI/OSART/220F/2026

PREAMBLE

This report presents the results of the IAEA Operational Safety Review Team (OSART) review of Heysham 2 Nuclear Power Plant, United Kingdom. It includes recommendations and suggestions for improvements affecting operational safety for consideration by the responsible United Kingdom authorities and identifies good practices for consideration by other nuclear power plants. Each recommendation, suggestion, and good practice is identified by a unique number to facilitate communication and tracking.

The inputs resulting from the follow-up mission can be found in the following chapters: last paragraph in the Executive Summary, self-assessment for the follow-up mission by the host organization and follow-up main conclusions by the IAEA follow-up team in the Introduction and Main Conclusions. In addition, the plant response/action and IAEA comments and Conclusion are under each Recommendation and Suggestion. The status of each issue is in the Summary of Status of Recommendations and Suggestions table, and the Follow-up team composition can be found at the end of the report.

The purpose of the follow-up visit was to determine the status of all proposals for improvement, to comment on the appropriateness of the actions taken and to make judgements on the degree of progress achieved.

Any use of or reference to this report that may be made by the competent United Kingdom organizations is solely their responsibility.

EXECUTIVE SUMMARY

This report describes the results of the OSART mission conducted for Heysham 2 Nuclear Power Plant (NPP), United Kingdom from 2 to 19 October 2023.

The purpose of an OSART mission is to review the operational safety performance of a nuclear power plant against the IAEA safety standards, make recommendations and suggestions for further improvement and identify good practices that can be shared with NPPs around the world.

This OSART mission reviewed ten areas: Leadership and Management for Safety; Training and Qualification; Operations; Maintenance; Technical Support; Operating Experience Feedback; Radiation Protection; Chemistry; Emergency Preparedness & Response; Accident Management.

The mission was coordinated by an IAEA Team Leader and Deputy Team Leader and the team was composed of experts from Brazil, Canada, Finland, France, Germany, Slovakia, Sweden, USA, and IAEA staff members. The collective nuclear power experience of the team was approximately 354 years.

The team identified 19 issues, eight of these are recommendations, and 11 of these are suggestions. Nine good practices were also identified.

Several areas of good practice were noted:

- The plant has implemented a system called “wall hound” to detect electromagnetic interference and radio frequency interference (EMI/RFI) emitted by mobile phones, laptops and smart watches raising an audible and visual cue/prompt.
- The use of hot connection indicators by the plant to monitor cable connections temperature.
- The use of chemistry preservation metric by the plant to monitor system status.

The most significant proposals for improvements identified were:

- The plant should improve its approach in setting and reinforcing expectations and challenge the site personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner.
- The plant should improve the material condition of some plant systems, structures, and components to further reduce the risk to plant safety and reliability.
- The plant should improve the control of fire doors and storage in the plant to further reduce fire risk to equipment and personnel safety.

Heysham 2 NPP management expressed their commitment to address the issues identified and invited a follow up visit in about eighteen months to review the progress.

At the time of the follow-up mission in January 2026, 27 months after the OSART mission, 32% of issues had been resolved, 63% were assessed as having satisfactory progress to date, and 1 issue was assessed as having insufficient progress.

CONTENT

INTRODUCTION AND MAIN CONCLUSIONS

INTRODUCTION

At the request of the government of the United Kingdom, an IAEA Operational Safety Review Team (OSART) of international experts visited Heysham 2 Nuclear Power Plant from 2 to 19 October 2023. The purpose of the mission was to review operating practices in the areas of Leadership and Management for Safety, Training and Qualification, Operations, Maintenance, Technical Support, Operating Experience Feedback, Radiation Protection, Chemistry, Emergency Preparedness & Response, and Accident Management. In addition, an exchange of technical experience and knowledge took place between the experts and their plant counterparts on how the common goal of excellence in operational safety could be further pursued.

The Heysham 2 Nuclear Power Plant (NPP) OSART mission was the 220th in the OSART programme, which began in 1982. The team was composed of experts from Brazil, Canada, Finland, France, Germany, Slovakia, Sweden, USA, and three IAEA staff members. The collective nuclear power experience of the team was 354 years.

Before visiting the plant, the team studied information provided by the IAEA and the Heysham 2 NPP to familiarize themselves with the plant's main features and operating performance, staff organization and responsibilities, and important programmes and procedures. During the mission, the team reviewed many of the plant's programmes and procedures in depth, examined indicators of the plant's performance, observed work in progress, and held in-depth discussions with plant personnel.

Throughout the review, the exchange of information between the OSART experts and plant personnel was very open, professional, and productive. Emphasis was placed on assessing the effectiveness of operational safety rather than simply the content of programmes. The conclusions of the OSART team were based on the plant's performance compared with good international practices.

The following report is produced to summarize the findings in the review scope, according to the OSART Guidelines document. The text reflects only those areas where the team considers that a Recommendation, a Suggestion, an Encouragement, a Good Practice or a Good Performance is appropriate. In all other areas of the review scope, where the review did not reveal further safety conclusions at the time of the review, no text is included. This is reflected in the report by the omission of some paragraph numbers where no text is required.

MAIN CONCLUSIONS

The OSART team concluded that the managers of the Heysham 2 NPP are committed to improving the operational safety and reliability of their plant.

The team found areas of good practice, including the following:

- The plant has implemented a system called "wall hound" to detect electromagnetic interference and radio frequency interference (EMI/RFI) emitted by mobile phones, laptops and smart watches raising an audible and visual cue/prompt.
- The use of hot connection indicators by the plant to monitor cable connections temperature.
- The use of chemistry preservation metric by the plant to monitor system status.

Several proposals for improvements in operational safety were offered by the team. The most significant proposals include the following:

- The plant should improve its approach in setting and reinforcing expectations and challenge the site personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner.
- The plant should improve the material conditions of some plant systems, structures, and components to further reduce the risk to plant safety and reliability.
- The plant should improve the control of fire doors and storage in the plant to further reduce fire risk to equipment and personnel safety.

Heysham 2 NPP management expressed their commitment to address the issues identified and invited a follow up visit in about eighteen months to review the progress.

HEYSHAM NPP SELF ASSESMENT FOR THE FOLLOW-UP MISSION

The Heysham 2 NPP management welcomed the insights of the OSART team providing some valuable feedback in the form of the recommendations and suggestions as well as identifying good practices. The insights provided have helped Heysham 2 continue its journey of continuous improvement. Helping to further strengthen its safety culture, leadership effectiveness, and operational resilience

Immediately following the OSART mission in 2023 the plant began analysing the recommendations and suggestions provided to the plant by the team aiming to look holistically at the recommendation and suggestion so that plans could be put in place that effectively dealt with the root cause and not just the symptoms. This has proved helpful in formulating the actions plans and resulted in some key initiatives and actions having taken place across Heysham 2 impacting the areas that had been reviewed during the mission with improvements including: -

- Launch of the Station Safety Essentials campaign, reinforcing four core safety behaviours.
- Relaunch of the Leaders in the Field (LiFE) programme and Leadership Steering Group to embed Human Performance (HU) behaviours.
- Introduction of the Leaders Dashboard to promote psychological safety, recognised as a WANO strength.

- Implementation of a new Time in the Field (TiF) strategy post-2025 outage, ensuring daily leadership presence.
- Enhanced field operator rounds with new training, technology (e.g., tablets with defect scanners), and area ownership models.
- Overhaul of the leak management process, including database upgrades, targeted maintenance, and time-lapse monitoring.
- Improvements in risk assessment quality, with increased Suitable Qualified and Experienced Personnel (SQEP) oversight and a focus on task-specific risk assessment and method statements
- Rollout of tiered safety training for all staff.
- Maintenance Fundamentals workshops addressing procedural adherence, bolt tightening, FME, and working at height.
- Enhanced simulator-based training and observation programmes for operators.
- Strengthened Severe Accident Guidelines training and integration into emergency exercises.
- Improved Deployable Backup Equipment checks and governance.
- Revised emergency dose reference levels and documentation to align with IAEA guidance.
- Reinforced contamination control standards and ALARP principles.
- Improved chemical compliance through audits and training.
- Improvements in the Organisational Learning processes to prioritise potential consequences, not just actual outcomes.
- Re-established Rework Review Boards and introduced paired observations to assess maintenance standards.
- Improvements in ageing management and equipment reliability validated by closing out WANO AFIs in those areas.
- Best-ever safety performance during the 2025 statutory outage.
- Significant reduction in oil leaks, improved seismic compliance, and enhanced housekeeping.
- Strengthened cultural maturity and psychological safety.

Heysham 2 is committed to continuing to improve safety and performance of the plant and looks forward to demonstrating the improvements it has made following the original mission to the OSART team during the follow-up mission.

OSART FOLLOW-UP MAIN CONCLUSIONS

An IAEA Operational Safety Review Follow-up team visited the Heysham 2 NPP site from 26th January to 30th January 2026. There was clear evidence that the plant had significantly benefited from the OSART process. The IAEA Safety Standards were used during the preparation and implementation of the detailed corrective action programmes.

The plant analyzed the OSART recommendations and suggestions and developed appropriate corrective action plans. In some instances, these corrective actions covered a broader scope than the original OSART recommendations and suggestions. The willingness and motivation of plant management to consider new ideas and implement a comprehensive safety improvement programme was evident and were a clear indicator of the leadership team's commitment to further improve the operational safety of the plant.

In 2023, the original OSART team developed 8 recommendations and 11 suggestions to further improve the operational safety of the plant. At the time of the Follow-up mission, 27 months after the OSART mission, 32% of the issues had been resolved, 63% were assessed as having made satisfactory progress to date and one issue was assessed as having made insufficient progress.

The plant had fully resolved the issues regarding effective control of activities related to fire doors and storage to ensure fire risks are minimized, strict implementation of seismic controls in seismically controlled areas, fully and timely completion and review of plant modifications to ensure that the plant configuration is always up to date, improving screening and prioritization of plant events to prevent recurrence, systematically evaluating the implementation of all functions of the response organization during exercises and improving guidance for preparation and review of severe accident guidelines and controls for staged equipment to ensure availability.

Issues where satisfactory progress towards resolution has been made but further work is necessary were as follows:

- Regarding the issue with leadership setting and reinforcing standards and expectations, the plant developed a vision and strategy to improve performance which served to align the organization. Notable actions involved strategic business planning, establishing a human and organizational performance oversight board to address performance gaps, enhancing the leaders-in-the-field programme, and conducting regular leadership coaching reviews. These initiatives aimed to reinforce standards, strengthen coaching, and ensure continuous improvement. To address organizational challenges the plant has filled open key leadership positions through succession planning, stabilized plant staffing losses, and successfully extended the plant’s operating license, all of which positively impacted organizational effectiveness. Despite progress, challenges remain with equipment reliability and rework that shifts the organizational focus from “Prevention” to “Correction”. Efforts are in progress to strengthen contractor understanding and compliance with plant standards which has been an ongoing challenge.
- Regarding the issue on industrial safety hazards and substandard behaviours the plant identified that shortcomings in industrial safety performance were driven by weaknesses in the Leadership-in-the-Field (LiFE) programme, insufficient training, and gaps in risk assessment. In response, the plant strengthened the LiFE programme, implemented comprehensive Institution of Occupational Safety and Health (IOSH) safety training for all personnel, and enhanced Risk Assessment and Method Statement (RAMS) reviews. The plant also established four “Safety Essentials” and utilized the fleet-wide “Life Saving Rules” to further strengthen industrial safety performance. These initiatives led to a significant reduction in the Total Recordable Incident Rate (TRIR) and exemplary safety performance during the 2025 outage. The team noted that while progress was made, several industry events occurred in 2025 including a lost time accident and several cases of working at height without proper fall protection. The team noted that strengthening worker-led safety advocacy and ongoing efforts to foster a culture of accountability and continuous improvement in safety practices will ensure sustainability.
- Regarding the issue on field operator rounds that are not always effectively identifying deficiencies in the field the plant has completed several trainings and established field observations objectives to further increase the performance of the field operators. A task force to remove incorrectly placed defect tags and new tools like tablets have helped to provide a more accurate picture of the actual defects in the field. Since 2023, the plant has made significant progress in the area of walkdown efficiency using several KPIs to monitor defects and leaks in the field. However, the operations business plan combined with the data analysis on low level field observations is expected to provide additional improvement for the field operator rounds.

- Regarding the issue related to maintenance activities not always prepared, implemented and controlled in a manner that prevents equipment failure, the plant initiated actions such as training activities and benchmarking. It also implemented a GDAR (Gaps, Drivers, Action taken, Results) improvement plan. However, maintenance rework has continued to occur over the past two years. The scope of the Rework Review Board was expanded in 2025 to include contractors and representatives of other departments. This expanded participation is intended to ensure that all relevant parties contribute to reviewing performance results and to decision making related to rework reduction. The board now tracks and trends rework causes across all departments and contractors and assigns responsibilities accordingly. This demonstrates increasing confidence in the plant's ability to better manage and control reworks in 2026.
- Regarding the issue on material conditions, actions have been implemented to manage the risk linked to leaks. Priorities have been reviewed, cleaning actions have been performed, and monitoring has been strengthened. Within the last 18 months, the number of "severe" oils leaks has significantly decreased from 9 to 0. In the same period, the total number of leaks has decreased from 170 to 134. According to an internal monitoring of the oil leaks performed by the maintenance department, the total number of oil leaks has significantly increased until July 2025. However, since July 2025, a decreasing target has been set, and oil leaks started to reduce according to the plan.
- Regarding the issue on improving the equipment reliability programme, the plant has taken several actions in the area of management of work and monitoring of long-standing plant health issues. The team noted that the overall number of defects has decreased since 2024 and there was a positive trend, however, the physical condition still remained an outstanding challenge for the plant and both preventive maintenance and maintenance schedule tasks in the second half of grace were still above plant expectations.
- Concerning the contamination control practices issue, the plant undertook extensive actions through the annual radiation protection action plan, including re-establishment of the ALARP committee, improved labelling and signage, strengthened entry checks, enhanced training for staff and contractors, and improvements to facilities and equipment in the radiation controlled area. These measures produced tangible improvements, including a notable reduction in personal contamination events from 2024 to 2025 and full achievement of statutory outage radiation protection targets. Further actions, particularly in the hot laundry facility, are planned for 2026. With further actions in place the issue is expected to be resolved within 2026.
- Regarding the issue on optimization of radiation protection processes, the plant identified gaps in hotspot management, EPD alarms practices, radiation protection standards, waste storage arrangements and routine survey information. Subsequent actions included enhanced hotspot monitoring, tracking of non-genuine alarms, improved waste storage practices, better posting of survey information, and refinement of temporary shielding design. Some improvements were confirmed during the team's observations, although few minor deviations were observed as well (isolated outdated postings). Ongoing actions planned for 2026 are expected to further reduce hotspots and plant documentation needs to be updated and approved. Overall, the plant has taken effective steps, supported by root cause analysis, and continues to progress toward full resolution of this issue.
- Concerning the control and labelling issue of auxiliary chemicals and substances, the plant improved awareness through additional training, communication campaigns, systematic walkdowns and annual inspections, as well as strengthened focus on material compatibility. While improvements were observed, the follow up mission identified deviations in a maintenance workshop, including unlabelled chemicals, missing mandatory information on

labels, and discrepancies between storage contents and inventory lists. Although such deviations are often corrected immediately, condition reports are not consistently raised. The plant's improvement actions plan requires more time to fully resolve the issue.

– Regarding the issue on dose limit deviation from the IAEA Safety Standards, the plant initiated and drafted an update of the fleet-level Generic Emergency Handbook to implement the required changes. Its approval is expected by the end of February 2026, and the plant committed to treating this activity as a priority and complete the corresponding training within a maximum of six months. The changes of the handbook include a requirement that all persons entering the incident receive a briefing from a health physicist on health risks associated with the assigned reference level if exceeding 20 mSv; emergency workers must volunteer to undertake activities that may entail doses in excess of 50 mSv and they must receive a briefing on potential consequences; and inclusion of a dose recording sheet that provides for acknowledging the briefing and accepting the risk of emergency exposure by the individuals.

– Regarding the issue related to the training and exercise programme requirements the plant took corrective actions to systematically align training and exercise activities and to ensure that each role holder receives regular training in every cycle. According to the plant's statement, tangible improvements have already been achieved in some areas, for example in first aid, where additional training was introduced based on a needs analysis. In other areas, however, the planned actions have not yet been fully implemented. The plant reviewed the list of station-level emergency training modules and identified those that are not covered by exercises and so require additional training activity. All of these modules have been incorporated into the planning and existing training sessions were expanded to include the missing topics. Following the initial implementation in 2026, the plant plans to finalize this approach based on the lessons learned.

– Concerning the issue on strengthening the Severe Accident Guideline (SAG) training across key accident management roles, Shift Manager, CCR Supervisor, Reactor Desk Engineer, and Duty Reactor Performance Engineer, the review confirmed that formal training (GEST 1507/1508), refresher sessions, and emergency drills are established. However, GEST1508 training is still in progress. Although the plant has ensured that Emergency Controllers at the plant have received SAG training, fleet established qualification requirements for this position do not require SAG training. It was also noted that Shift Managers who play an important role in SAG implementation only receive initial SAG training, there is no defined refresher training requirement. The plant has generated an action request and is working with the fleet to address these concerns.

– For the issue assessed as having made insufficient progress to date: the plant reviewed the existing programme and the corporate guide on ageing management, however there was no documented assessment made to evaluate that the plant's ageing management programme directly meets the IAEA safety standards. The plant review concluded that the current processes were adequate to support a comprehensive ageing management programme. Gaps in performance were identified and addressed in an action plan. Ageing management training was delivered to all engineering support personnel and improvements have been implemented in plant walkdown processes to capture degradation mechanisms. In the area of obsolescence management, a significant turnover of resolved components including mitigation of plant high risk items was made. Despite the actions taken in the area and the positive results that could be observed, the plant still has challenges due to ageing and has not demonstrated its ageing management related programmes directly meet the 9 attributes of an effective ageing management programme defined in the IAEA standard.

In 2023, the original OSART team developed seven recommendations and twelve suggestions to further improve operational safety of the plant. At the time of the follow-up mission in January 2026, 27 months after the OSART mission, 32% of issues had been resolved, 63%, were assessed as having satisfactory progress to date and one issue was assessed as having insufficient progress.

The team received full cooperation from the plant management and staff and was impressed with the actions taken to analyse and resolve the findings of the original mission. The team was able to verify all information considered relevant to its review. In addition, the team concluded that the managers and staff were very open and frank in their discussions on all issues. This open discussion made a significant contribution to the success of the review and the quality of the report.

1. LEADERSHIP AND MANAGEMENT FOR SAFETY

1.1. LEADERSHIP FOR SAFETY

The team identified that managers and supervisors are not always effectively setting and reinforcing expectations and challenging plant personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner to drive continuous safety performance improvement. For example: during the review the team observed the following, field operators were not systematically identifying and reporting all deficiencies, additional equipment/materials were left at work sites, without proper fire loading risk assessments, the need for a number of maintenance tasks to be reworked, material deficiencies open for long time periods due to large work backlogs, oil leaks on all diesel generators, unsecured items in seismically controlled areas, contamination and occupational exposure control shortfalls. The team made a recommendation in this area.

To complement the corporate leadership programme, the plant took several specific initiatives to support leadership development. Firstly, the plant took the initiative to support individuals interested in progressing into future leadership positions. This approach is being replicated at two other plants within the fleet. Secondly, professional actors creating realistic scenarios are used to support the Leadership Development Programme that provides key interventions including Performance Management, Meeting Effectiveness and Intrusive Leadership. All the leaders surveyed following the training said that the content was relevant. Thirdly, the plant uses a Personality Preferences Profile Programme with leaders to explore how they operate as part of a leadership team. This approach uses a simple four-colour model to help people understand their style, strengths and the value they bring to the team. This was rolled out to the executive team and several department lead teams. The team identified this as a good performance.

1.3. SAFETY CULTURE

The team did not undertake a detailed safety culture assessment at the plant. However, the collective experience of the team was used to capture safety culture attributes, behaviours and practices which help to shape and define the safety culture at the plant. With respect to the observed strength, the team identified that the plant has a good reporting culture enabled by a respectful work environment. The operating experience (OPEX) is well embedded and communicated: morning briefs involve all plant personnel and are customized if needed, the use of event briefs in pre-job briefs is relevant. In addition, the decision-making is rigorous and a conservative approach has been clearly demonstrated.

In contrast, the plant’s overall performance had been challenged in recent years by the change to off-load depressurized refuelling. In addition, the plant personnel turnover is bringing new challenges with respect to staff experience and coaching needs. Individual’s risk perception, compliance with rules and questioning attitude towards equipment deficiencies needs additional leadership focus. Deficiencies are not always promptly identified, fully evaluated, addressed and corrected in a timely manner. In some cases, deficiency backlogs are impacting equipment reliability. Maintenance rework and changes to the work cycle are bringing additional complexity in work planning and execution.

1.5. HUMAN FACTORS MANAGEMENT

The plant has implemented a system called “wall hound” to detect electromagnetic interference and radio frequency interference (EMI/RFI) emitted by mobile phones, laptops and smart watches by raising an audible and visual cue. The device is in 3 key locations of the plant: the entrance to the Radiological Controlled Area (RCA), the reactor building, and the entrance to the safety circuit/main control room. In 2023, the system detected about 300 devices per month with less than 2% found to be unauthorized for which subsequent actions were taken. The team identified this as a good practice.

1.6. NON-RADIATION-RELATED SAFETY PROGRAMME

The team identified that industrial safety hazards and unsafe behaviours are not always corrected to prevent personnel injuries. During the Unit 8 outage three injuries, two High Potential Events and five events associated with the process of plant isolation occurred in Operation and Maintenance groups. During observations of field activities in the plant, the team identified several unsafe conditions and inappropriate behaviours in the work being performed in the CO2 plant, the diesels generator rooms and a chemistry laboratory. The team made a recommendation in this area.

DETAILED LEADERSHIP AND MANAGEMENT FOR SAFETY FINDINGS

1.1.LEADERSHIP FOR SAFETY

1.1 (1) Issue: Managers and supervisors are not always effective at setting and reinforcing expectations and challenging plant personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner to drive continuous safety performance improvement.

The plant's overall performance had been challenged in recent years by the change to off-load depressurized refuelling. The plant is taking improvement actions recognising it has had high staff turnover and a number of industrial safety events and near misses. However, the team noted the following:

- During the review the team identified gaps in several areas such as industrial safety, fire safety, operations practices, conduct of maintenance, seismic control and radiological protection:
  - The team observed industrial safety hazards and unsafe behaviours not always being corrected.
  - Some gaps were identified with field operators not systematically identifying and reporting deficiencies during shift rounds.
  - The team observed unauthorized fire loads not being promptly removed in some areas of the plant and most notably in requiring a fire watch.
  - Gaps were observed in maintenance conduct leading in some cases to rework and material deficiencies impacting equipment reliability.
  - Gaps in seismic control where loose or unsecured items were observed in seismically controlled areas in plant.
  - In the radiological protection area, shortfalls were observed related to contamination control including boundaries and behaviours.
- During plant field visits, many leaks and material condition deficiencies were observed by the team both in radiological controlled areas (RCA) and non-RCA areas for safety-important equipment such as gas circulators, emergency diesel generators, cooling water pumps, and turbine generators. These were not identified by the plant staff, and most were in accessible areas that are frequently visited by walkdowns and shift rounds.
- On week 40 in 2023, the total non-outage defects and outage defect backlogs for both units were 434 and 368. In addition, the backlog of lower level deficiencies to be implemented within appropriate maintenance windows and/or use as fill in work when resources allow was 2455.
- On 26 September 2023 the DX Diesel Generator was started for a Maintenance Schedule (MS) test run and had to be subsequently shut down due to excessive smoke. On a second test run oil leaks were evident and due to the heat of the engine some of the leaking oil combusted creating a small flame, which quickly self-extinguished. The DX diesel generator was shutdown and subsequently declared unavailable for three days. The plant indicated that there had been one similar event in the past.
- The last outage was extended by four days due to an oil leak which contained some hydrogen resulting from inappropriate maintenance by a Specialist Turbine Maintenance Group. The same group improperly tightened a pilgrim bolt during the previous statutory outage on Unit 8 in 2020 leading to a four week forced shut down of the unit early 2023.
- On 6 June 2020, the BY diesel generator was documented to have excessive standing oil, with an indeterminate leaking component. The associated condition report suggested

"Routine cleaning is failing to maintain an acceptable standard in this diesel house" and stated "The work planned for the leak repair is over two years away – this is not acceptable." The cross-referenced work order for leak repair was originally scheduled for July 2022, however cancelled on 10 June 2022 when the leakage could not be identified during a test run. Subsequently, a work request was generated on 21 February 2023 when the leak reappeared. This work is scheduled during a BY diesel outage in 2024.

– Plant Surveys, Interviews from with managers, Nuclear Operation Support Team and Independent Nuclear Assurance (INA) have identified challenges to aligning workforce behaviours to expectations and the appropriate standards.

Without having managers and supervisors effectively setting and reinforcing expectations and challenging the site personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner the plant operational safety performance could be challenged.

Recommendation: The plant should improve its approach in setting and reinforcing expectations and challenge the site personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner.

IAEA Bases:

SSR-2/2 (Rev.1)

4.2. The safety policy shall stipulate clearly the leadership role of the highest level of management in safety matters. Senior management shall communicate the provisions of the safety policy throughout the organization. Safety performance standards shall be developed for all operational activities and shall be applied by all site personnel. All personnel in the organization shall be made aware of the safety policy and of their responsibilities for ensuring safety. The safety performance standards and the expectations of the management for safety performance shall be clearly communicated to all personnel, and it shall be ensured that they are understood by all those involved in their implementation.

4.35 Monitoring of safety performance shall include the monitoring of: personnel performance; attitudes to safety; response to infringements of safety; and violations of operational limits and conditions, operating procedures, regulations and licence conditions. The monitoring of plant conditions, activities and attitudes of personnel shall be supported by systematic walkdowns of the plant by the plant managers.

GSR Part 2

3.1. The senior management of the organization shall demonstrate leadership for safety by:
(c) Establishing behavioural expectations and fostering a strong safety culture;

3.2. Managers at all levels in the organization, taking into account their duties, shall ensure that their leadership includes:
(a) Setting goals for safety that are consistent with the organization's policy for safety, actively seeking information on safety performance within their area of responsibility and demonstrating commitment to improving safety performance;
(b) Development of individual and institutional values and expectations for safety throughout the organization by means of their decisions, statements and actions;

(c) Ensuring that their actions serve to encourage the reporting of safety related problems, to develop questioning and learning attitudes, and to correct acts or conditions that are adverse to safety.

3.3. Managers at all levels in the organization:
(a) Shall encourage and support all individuals in achieving safety goals and performing their tasks safely.
(b) Shall engage all individuals in enhancing safety performance.

4.36. The organization shall make arrangements for ensuring that suppliers of items, products and services important to safety adhere to safety requirements and meet the organization's expectations of safe conduct in their delivery.

GS-G-3.1

2.16. The actions of managers and supervisors or team leaders have a strong influence on the safety culture within the organization. These actions should promote good working practices and eliminate poor practices. Managers and supervisors or team leaders should maintain a presence in the workplace by carrying out tours, walkdowns of the facility and periodic observations of tasks with particular safety significance.

Plant Response/Action:

Root cause identification:

Heysham 2 has strengthened its safety culture and leadership capability. Through a series of targeted initiatives, collaborative learning, and continuous improvement, the station is building a resilient and proactive workforce committed to excellence.

A comprehensive self-assessment into safety performance during the 2023 Statutory outage was conducted by a highly experienced Technical and Safety Group Head. This inclusive review captured insights from across the station and laid the foundation for meaningful change. The outcomes, shared during the November 2023 Leadership Development Days, led to the creation of the Station Safety Essentials—a back-to-basics initiative reinforcing four core safety behaviours that are now embedded in daily operations.

These have been driven and re-enforced through Time in the Field and through safety briefings and safety messages. Safety Essentials positive recognition cards were also instrumental in reinforcing the right behaviours as part of this campaign. A strategy review in 2023 focused on learning from the Safety Self-Assessment and OSART review resulting in a focus on Oil leaks being incorporated into the 2024 Business Plan.

Actions Performed:

- The station has taken proactive steps to embed Human Performance (HU) Leadership Behaviours, developed by the Leadership Steering Group and actively promoted through the 2024 *Leaders in the Field* programme.
- Jan 2024 Station Leadership Steering Group was re-launched and Leadership Strategy re-issued to focus on Leadership Fundamentals, Development and HU Leadership.
- The newly launched Leaders Dashboard has been instrumental in fostering psychological safety and was recognised as a WANO strength during the 2025 peer review—an affirmation of the station's leadership excellence.

- 2024 saw the Leaders in the Field Programme relaunched with all leaders including contract partners participating in 2 LiFE programmes in 2024. This evolved into the Outage LiFE programme in Q1 2025.
- 2024 Business Plan was amended to incorporate learning from OSART and highlight need for improvement in Oil leak management and leak resolution.
- In 2024 the station had dedicated resource to focus on high-risk areas (Diesels, Gas Circs) to deep clean and begin to understand the issues causing the leaks and raise them through the organisation. Engineering support was brought it to assist with this and time lapse camera systems deployed for certain plant areas to pinpoint leak sources.
- A significant overhaul of the leak management database, led by Dalkia, has streamlined communications and accelerated response times—enabling more agile and effective management of plant conditions.
- The Operations department delivered configuration control training using a flow loop simulator and allowing operators to apply isolations and discuss best practices.
- The 2025 Outage LiFE programme marked a milestone in leadership engagement, with record participation and the safest outage performance to date. Executive leaders were fully immersed in plant walkdowns, reinforcing safety culture at every level.
- In April 2025 a new station Time in the Field (TiF) Strategy was implemented post outage to maximise opportunities for leaders to set and reinforce expectations and address substandard conditions to drive performance improvement. This was a streamlined version of the outage TiF programme as it included leaders in the field every day conducting paired walkdowns with safety professionals.

- Leadership Development Days in 2025 turned all leaders into Work Week Managers for the day to help them to understand the importance of and the impact they have to the delivery of the work week plans.
- 2025 Group Head away day reviewed the MoW GDAR and made changes to the process to support the ongoing delivery of effective work weeks.

Further actions to be taken:

Following a finding from the WANO Peer review, all contract partners will receive enhanced nuclear safety awareness training, this is being rolled out in Q4 2025.

The plant team have been working with the Leadership Steering Group to develop a scoring system to use with leaders and managers in the field to determine the delivery of standards and to allow some direction to be taken for correction.

A new standards and expectations document is being developed to define what “Excellence” looks like in oil leak management—translating OSART insights into actionable verification tools for leaders. This initiative will further empower leaders to uphold high standards during walkdowns and Time in the Field. This document is currently being compiled with a view to being issued in Q4 2025.

The station acknowledges that re-work remains a challenge, and a Gap, Driver, Action, Results action plan has been built and is in progress to address this with completion due end of November 2025.

The November Leadership Development Days focus on building a Continuous Improvement Culture at Heysham 2, these are currently planned for 5th and 19th November.

Results and Effectiveness:

The June 2025 MSM with WANO provided encouraging validation of the station’s leadership journey, with clear evidence of growing psychological safety and cultural maturity. WANO recognised Heysham 2 with strengths in both Leadership and the 100-day plan—underscoring the station’s momentum and commitment to continuous improvement.

During the 2025 statutory outage, Heysham 2 had the best outage safety performance to date and zero events related to Hot Work. The ongoing 2025 Time in the field programme has incorporated the best elements of the outage programme in order to drive performance improvement and includes safety professionals in the field each day.

The stations safety metrics (Tier 1 and Tier 2 key performance indicators) are stronger than they have been in recent years and reflect a station building on getting the right safety behaviours out in the field every day.

These efforts reflect a station-wide commitment to not only addressing past challenges but also building a sustainable culture of safety, leadership, and operational excellence. The journey continues with confidence and clarity.

IAEA comments:

The plant identified the primary cause of the performance deficiencies noted in the issue as shortcomings in leadership and team effectiveness in setting and reinforcing standards and expectations within the workforce.

Following the OSART mission the plant completed a comprehensive self-assessment of noted performance deficiencies and implemented an action plan which provided a clear vision and strategy to improve performance. While the assessment was primarily focused on reviewing performance during the 2023 statutory outage, it included actions on establishing and reinforcing compliance with fundamentals for key programmes and processes including industrial safety, risk management, leadership-in-the-field (LiFE), and establishing a foundation for continuous improvement.

It was noted during the initial OSART review that leadership and team effectiveness were influenced by high staff turnover, key leadership positions being filled on a temporary bases, and uncertainty on the timeline for plant life extension. Following the OSART mission actions were taken to fill key leadership positions through succession planning, stabilise workforce staffing, and extend the plant operating license to 2030. These actions have had a positive influence on organizational capacity and effectiveness.

The team identified the following noteworthy actions:

– Business planning initiatives have resulted in the identification of the desired culture that supports the vision and mission statements and includes clear goals that the organization wants to achieve and how to do it. The business and strategic planning process includes 100-day plans and longer term strategic plans for the life cycle and move towards decommissioning. Collectively, business plan actions strengthen leadership and team effectiveness and focus on improving plant performance.

– The plant implemented a Human & Organisational Performance Oversight Board (HOPOB) comprised of senior plant management. The board utilizes plant performance data to identify and improve human and organizational performance gaps with the objective of reinforcing the required behaviours to drive performance improvement. The December 2025 HOPOB identified and took actions on noted shortcomings in procedure quality and procedure use and adherence. The supporting analysis identified behavioural and organizational weaknesses that contributed to noted gaps and included actions to improve performance. The OSART follow-up review concluded that this process was effective and ongoing.

– A comprehensive strategy was developed to enhance the LiFE programme which included maximizing opportunities for leaders to be in the field to reinforce standards, provide positive reinforcement of noted performance strengths, and provide coaching to address noted performance shortfalls.

– The plant conducts monthly departmental Leadership Coaching Reviews (LCR) designed to systematically evaluate insights and trends from the LiFE observations. These reviews bring department leadership teams together to analyse common themes, behavioural patterns, and organizational factors influencing performance. The structured approach ensures that learning from LiFE observations are captured, shared, and aligned with plant improvement priorities.

– Prior to conducting field engagements, leaders are provided with focus areas to guide their observation and coaching interactions. These focus areas, along with specific walkdown expectations are supported by “What Excellence Looks Like” (WELL) sheets and associated checklists. This ensures a consistent understanding of performance standards and reinforces leaders’ ability to provide effective coaching to workers.

– A leadership dashboard was created which includes a matrix of all managers and includes their achievements in meeting key leadership attributes including their support of the LiFE programme, engagement with the workforce, and support of continuous improvement. It was noted that the development and use of this dashboard was recognized as a strength during external plant reviews by industry oversight groups.

During the review the team noted that the plant is still challenged by plant equipment issues that move the plant focus from a “Prevention Focus” to a “Correction Focus”. Some of these include:

– Maintenance rework;

– High number of PMs that are deferred;

- High number of PMs in the 2nd half of grace;
- Fuel transfer equipment issues;
- Graphite ageing challenges;
- High number of oil leaks.

During plant walkdowns, the team noted some shortcomings in compliance with standards:

- Poor housekeeping in some areas of the Turbine Building and Deaerator Room;
- Tools and cleaning equipment not properly stored;
- Small metal poles not properly secured near the main plant transformers during high wind conditions;
- Material handling without gloves.

While understanding of and compliance with plant standards have improved among the EDF workforce, discussions with plant staff members noted that eliminating shortcomings in this respect is an ongoing effort with some contractor workgroups. The plant has established plans to strengthen contractor work group performance. Discussions with several contractor workers noted that the plant is partnering with contractor groups to perform plant walkdowns and field observations and is actively sharing noted performance deficiencies with workers who use that as input in work preparation and execution.

Discussions with the plant staff identified an opportunity to further strengthen the LiFE programme by developing clear criteria for Coach-the-Coach mentoring of supervisors and managers performing field observations to better assess their understanding of fundamentals, worker engagement, and coaching and development of specific improvement plans designed to strengthen their capabilities.

Conclusion: Satisfactory progress to date.

1.5. HUMAN FACTORS MANAGEMENT

1.5 (a) Good practice: The plant has implemented a system called “wall hound” to detect electromagnetic interference and radio frequency interference (EMI/RFI) emitted by mobile phones, laptops and smart watches raising an audible and visual cue/prompt.

The device detects EMI/RFI (including Bluetooth) emissions from devices such as mobile phones, laptops, smart watches. The EMI/RFI system that works alongside the detectors logs all Media Access Control Addresses of devices detected. These are reviewed periodically.

If detected within the range (typically 0.3 - 5m) it gives an audible and visual cue. The sign lights up in red and plays an audible warning: “Mobile device detected”.

The plant has a set of personal key-less lockers nearby to store any devices if they are not removed prior to entry into the Radiation Control Area (RCA). The device can then be collected on the way back out of the RCA (or sensitive plant area).

The Wall Hound System was installed in 2020. The device is in 3 key locations on site: the entrance to the RCA, the reactor building, and in the safety circuit/main control room. Certain devices are authorized for use by the plant staff and provisions are established to determine whether detected items are allowed or prohibited.

When initially implemented, the system detected about 450 devices per month. In 2023, the system is detecting about 300 devices per month and about 5 devices per month were found to be unauthorized and required action to be taken.

The benefit of the Wall Hound System is the prompt detection of EMI/RFI which could impact sensitive plant equipment and possibly impair equipment function resulting in a transient or plant trip.

Figure 1.1: Picture of a Wall hound device

1.6.NON-RADIATION-RELATED SAFETY PROGRAMME

1.6 (1) Issue: Industrial safety hazards and substandard behaviours are not always effectively identified and corrected to help prevent personal injuries.

The team noted the following:

- The Total Recordable Injury Rate at the plant is 1.6 and the Industrial Safety and Focus Index (ISFI) composite and 3 months rolling index is showing red at the end of September 2023.
- Three injuries involving contractors were recorded during the last Unit 8 statutory outage.
- Two High Potential Events were reported during the last outage: a container weighing about 175kg fell from the forks of a forklift truck; during a lifting operation on the primary coolant bypass gas plant a cover weighing 4.7 kg failed and fell from height of 6 metre landing near workers.
- Five level 1 safety rule events associated with the process of plant isolation across both Maintenance and Operations occurred over six weeks at the end of the second quarter of 2023:
  - A vent valve was replaced on the Make Up Water Treatment Plant without the working party being signed onto the safety document to allow work to be carried out.
  - The General Provision (GP) #3 procedure was not followed during an open hole work on the pile cap. The control room desk engineer was not informed that a hole was to be made in the reactor vessel, by removal of a plug-unit, although it was requested by the GP3 procedure in order to prevent contamination spread.
  - A gas circulator test run was started without collecting the safety document.
  - During the release of a bung on a re-heater penetration during outage work, an unexpected pressure was discharged causing the ejection of the bung.
  - A drum screen anti-rotation device was damaged by the movement of the drum screen. The anti-rotation device was damaged whilst enacting work due to poor communications between team members.
- The OSART team identified during the plant tour several unsafe conditions and inappropriate behaviours such as:
  - A CO2 in air monitoring was out of order in the CO2 plant with insufficient mitigation put in place. The CO2 warning sign put as mitigation did not state the need for the use of separate Gas Monitoring Instrument (GMI) which would have been the appropriate mitigation measure.
  - In the conventional laboratory, five workers were observed without light eye protection although the laboratory is recognised by chemistry staff as a “light eye protection” area. The PPE safety requirements for wearing eye protection in this area are not clearly specified.

Without effectively addressing industrial safety hazards and correcting unsafe practices and behaviours, the likelihood of personnel injuries may increase.

Recommendation: The plant should effectively identify and address industrial safety hazards and correct substandard behaviours to help prevent personnel injuries.

IAEA Bases:

SSR-2/2 (Rev.1)

Requirement 23: Non-radiation-related safety
The operating organization shall establish and implement a programme to ensure that safety related risks associated with non-radiation-related hazards to personnel involved in activities at the plant are kept as low as reasonably achievable.

5.26. The non-radiation-related safety programme shall include arrangements for the planning, implementation, monitoring and review of the relevant preventive and protective measures, and it shall be integrated with the nuclear and radiation safety programme. All personnel, suppliers, contractors and visitors (where appropriate) shall be trained and shall possess the necessary knowledge of the non-radiation-related safety programme and its interface with the nuclear and radiation safety programme, and shall comply with its safety rules and practices. The operating organization shall provide support, guidance and assistance for plant personnel in the area of non-radiation-related hazards.

GS-G-3.5

5.73. A process that reflects the national industrial safety regulations should be established for all individuals, suppliers and visitors, and the process should refer to the rules and practices for industrial safety that are to be adopted. The process should include arrangements for the effective planning, organization, monitoring and review of the preventive and protective measures for industrial safety.

ILO-OSH 2001

3.10.1. Prevention and control measures
3.10.1.1. Hazards and risks to workers' safety and health should be identified and assessed on an ongoing basis. Preventive and protective measures should be implemented in the following order of priority:
(a) eliminate the hazard/risk;
(b) control the hazard/risk at source, through the use of engineering controls or organizational measures;
(c) minimize the hazard/risk by the design of safe work systems, which include administrative control measures; and
(d) where residual hazards/risks cannot be controlled by collective measures, the employer should provide appropriate personal protective equipment, including clothing, at no cost, and should implement measures to ensure its use and maintenance.

3.10.1.2. Hazard prevention and control procedures or arrangements should be established and should:
(a) be adapted to the hazards and risks encountered by the organization;
(b) be reviewed and modified if necessary on a regular basis;
(c) comply with national laws and regulations, and reflect good practice; and
(d) consider the current state of knowledge, including information or reports from organizations, such as labour inspectorates, occupational safety and health services, and other services as appropriate.

Plant Response/Action:

Root cause identification:

Previous station Time in the Field (TIF) programmes did not effectively provide regular leadership or safety professional presence in the field and there was no positive recognition to drive improvements in standards. Also, not all leaders or staff had received safety training from a recognised training body.

Also, the risk assessment process is currently overly complicated and Risk assessment and Method Statements (RAMS) are often too generic with regard to hazards and are not task specific. This results in an over reliance on the end user to identify risk through their Point Of Work Risk Assessment (POWRA).

Actions Performed:

The Safey Essentials were rolled out in 2024 in order to take safety ‘back to basics’ and set clear standards and expectations in four areas that everyone on station needs should adhere to. Positive recognition cards were also launched at the same time to help leaders promote, recognise and reward safety excellence.

An IOSH tiered training programme was rolled out to all EDF staff to improve safety knowledge and understanding and equip leaders with better skills to challenge and address poor behaviours. This training was delivered to all station personnel and tailored to the individual based on the level of the organisation the individual was at; working safely, managing safely or leading safely. (IOSH is the chartered body for health and safety professionals in the UK and recognised worldwide)

In 2025, the Safety Leadership TIF programme was developed based on the outage model that delivered the safest Heysham 2 outage with regard to actual harm. This programme results in leaders being visible every day of the week and safety professionals being part of each paired daily observation. The value of safety professionals being in the field all day during the outage was recognised and there is currently a full time Area Safety Co-ordinator seconded to the safety centre team.

Station enacted a Risk Assessment working group with engagement from multiple interested parties with the goal of driving the quality of task based risk assessments and removing the over reliance on the end user to identify risk. To further support this area, the station established two Significant Risk Permit working groups. These groups are focussing on the quality of confined space and working at height permit production. This ensures that the significant risk permits are fully aligned and reviewed against the risk assessment due to enhanced SQEP oversight. From the start of 2025, Heysham 2 have reviewed a minimum of 60% against a fleet minimum guidance of 10% of RAMs submitted onto the EDF RAMs Repository. The station has also seconded an Industrial Safety Engineer (ISE) to fleet for 6 months in order to drive improvements in risk assessment across the business.

Results and Effectiveness:

The safety leadership TIF programme was proven to work in the outage through a reduced number of potential events and no actual harm. It was supported by Area Safety Coordinators who spent the majority of their time in the field. In normal business the TIF programme has been built on the same principles but on a smaller scale.

IOSH training programme has supported staff in risk perception and identification, which is enabling leaders use this training to drive high standards and improve risk perception.

Where measuring the impact of safety essentials is relatively straightforward (PPE ,SAMs and handrail usage) mainly due to three of the areas being very easy to observe and coach and therefore reinforce has shown the campaign has had impact. With regard to fire doors behaviour there is some improvement, but we are still detecting some drift in standards. That is being addressed by continuing to be regularly reinforced through comms and coaching. There is a focus on this when leaders spend TIF and there is a large focus on fire doors at Zero Harm week in 2025.

Improving Risk Assessment and Method Statements (RAMS) continues to be focus at Heysham 2. Some recent events have identified that there is still work to be done at Heysham 2 and in the wider fleet to improve risk identification and mitigation moving from generic risk assessments to risk assessments that are more focused and therefore more valued at the point of work. Which will remove the over reliance on PJBs and POWRAs to manage risks. The work already carried out locally at Heysham 2 by the ISE has been recognised and has resulted in the HYB ISE seconded to fleet for 6 months to drive a Fleet Risk Assessment improvement plan. This support and focus will improve not just the OSART finding but address the recent WANO finding in this area.

IAEA comments:

The plant identified the contributing causes for shortcomings in industrial safety performance as weaknesses in the LiFE programme, not having a clear understanding of safety standards driven by insufficient training, and weaknesses in the risk assessment process during the preparation and conduct of work.

To address these areas the following key actions were taken:

– Strengthening the LiFE programme which included maximizing opportunities for leaders to be in the field to reinforce standards, provide positive reinforcement of noted performance strengths, and provide coaching to address noted performance shortfalls. The LiFE improvements included a strong focus on the reinforcement of industrial safety standards.

– Implemented the IOSH tiered training programme and provided this training to all plant personnel. The training provided an enhanced focus on working safely and managing safety performance.

– Strengthened Risk Assessment and Method Statement (RAMS) reviews which are used to assess and mitigate job hazards for contractor work. Established two Significant Risk Permit working groups which are comprised of qualified and experienced personnel. The initial focus of these groups was on significant safety risk activities such as working in confined spaces and working at height. The groups perform independent reviews to ensure that the risk permits are fully aligned and effectively manage identified risks.

– During the most recent statutory outage the plant implemented “Area Safety Coordinators” who spent the majority of their time in the field engaging and coaching workers. This concept proved to be effective, and the plant is implementing lessons learned to support on-line work activities.

– Established four “Safety Essentials” designed to focus the organization on key gaps noted during the OSART mission, including elements related to Personal Protective Equipment (PPE). The team noted that the Safety Essentials were broadly communicated and effectively reinforced. Discussions with the plant staff indicated a broad awareness of the Safety Essentials and how they applied to daily work activities.

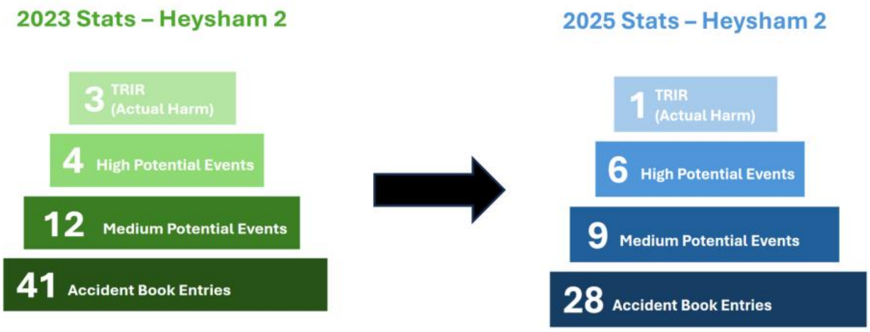
– The fleet has implemented a common set of “Life Saving Rules” which are designed to achieve “zero harm” to workers. These include 10 rules designed to mitigate the threats from high-risk industrial safety threats. It also includes six simple actions that establish acts and behaviours which support the effective management of industrial safety risk.

The team noted the following positive achievements:

– The Total Recordable Incident Rate (TRIR) is an industry performance indicator that monitors progress in improving industrial safety performance for all personnel at the plant, including both utility personnel and non-utility personnel. The indicator has improved from 1.6 in September 2023 to 0.43 in December 2025. While the industry goal of 0.2 has not yet been achieved, it reflects that initiatives undertaken by the plant have resulted in beneficial outcomes and will lead to top quartile industry performance.

– During the 2025 statutory outage, Heysham 2 had the best outage safety performance to date with no Lost Time Accidents.

The Safety Pyramid was used to compare safety performance from the time of the initial OSART mission in 2023 to December 2025. The comparison noted a reduction in the number of consequential injuries resulting from Lost Time Accidents and improved performance overall. However, events related to high potential industrial safety risk have increased.



A review of plant data provided the following examples of issues related to industrial safety risk in 2025:

– On 17/07/2025 an operator sustained a burn to the palm of the hand during a routine plant tour of the secondary shutdown storage compound. The operator inadvertently placed their hand on hot unlagged piping while checking a valve. The plant identified the cause as the absence of clearly defined control measures in the risk assessment to prevent hot piping from being exposed between tasks performed by different work groups. The hand injury resulted in 6 days of lost time at work.

– On 07/06/2025, trapped hot water and steam were released during zero energy checks ahead of planned work on a sample cooler valve. The isolation method did not account for changes in plant conditions or the need for an alternative vent route, as the valve to be overhauled was part of the isolation boundary. The event was classified as a Level 2 Safety Rules Event.

– On 04/04/2025, during an outage, a contractor worker was observed dismantling a scaffolding structure around the auxiliary cooling water pumps following completion of scheduled work without the required safety equipment and protective barriers in place. The event was classified as Noteworthy as there was a risk of falling approximately five meters to the ground below.

- On 18/01/2025, workers were observed to be working unsafely on the sea wall. The workers were undertaking preparatory outage work and were working in close proximity to the sea, with no safety mitigations in place. The cause was found to be inadequate procedures and planning which allowed the working party to choose their own method for undertaking the work. Although there were no actual consequences, there was the potential for the workers to fall into the sea as there were no fall mitigations in place.

During the OSART follow-up mission, team members performed several in the field walkdowns and observed plant work activities. No noteworthy issues were identified related to industrial safety risk management.

Discussions with the plant staff identified the potential benefit of driving behaviour-based safety from a management driven initiative to a worker led initiative in which workers demonstrate ownership and accountability for safety performance. As an example, creating worker level safety advocates that would ensure a strong focus on job hazard identification and mitigation during the preparation and performance of work. When utilized, plant work groups assign one of the workers for each job to be the “Safety Advocate” and the individual would lead discussions of job hazards and risk mitigation in the pre-job brief, lead the safety discussions during the “Take 5” review at the job site, and maintain a safety focus during the conduct of work. Where implemented, the use of work group led safety advocates have strengthened accountability through stronger peer-to-peer engagement and interactions.

Conclusion: Satisfactory progress to date.

2. TRAINING AND QUALIFICATIONS

2.1 ORGANIZATION AND FUNCTIONS

Training has begun to involve members of the Royal Air Force (RAF) to provide simulator observations and feedback. This feedback focuses largely on developing non-technical skills, such as communication, leadership and decision making. This framework, initially used in the aviation industry, is equally applicable to the nuclear industry, especially as it relates to stressful or emergent situations. The military training expertise and experience is used to reinforce teamwork behaviours and staying in role in an environment characterized by stress, ambiguity, time pressure and significant consequences for an error. As a result, this benefits operating crew's teamwork effectiveness during emergency situations. The team identified this as a good practice.

2.2 TRAINING FACILITIES AND MATERIAL

The plant adopted an effective method to use Closed Circuit Television (CCTV) in maintenance mock-up training facilities to improve evaluation and feedback from the training. CCTV cameras are installed in the maintenance mock-up training area, whereby Maintenance personnel (Leaders and Peers) observe via remote video and then provide coaching feedback and performance evaluation with the support of the instructors. The team recognized this as a good performance.

DETAILED TRAINING AND QUALIFICATION FINDINGS

2.1. ORGANIZATION AND FUNCTIONS

2.1 (a) Good practice: The plant has used military training expertise to develop high quality Crew Resource Management training.

After the plant identified ‘Crew Resource Management’ as an area requiring improvement, Training began to involve members of the Royal Air Force (RAF) to provide simulator observations and feedback. This feedback focused largely on developing non-technical skills, such as communication, leadership and decision making. This framework, initially used in the aviation industry, is equally applicable to the nuclear industry, especially as it relates to stressful or emergent situations.

The military training expertise and experience is used to reinforce teamwork behaviours and staying in role in an environment characterized by stress, ambiguity, time pressure and significant consequences for an error. As a result of the simulator observations and feedback from the RAF, individual performance diagrams are created for Duly Authorised Person (DAPs) to illustrate performance against the framework of Crew Resource Management. This information is then more widely used when looking at a shift teams’ composition, enabling management to build the most compatible teams and improve overall performance.

As a result, this benefits operating crew’s teamwork effectiveness during emergency situations.

Figure 2.1: Crew Resource Management

3. OPERATIONS

3.3 OPERATING RULES AND PROCEDURES

The team noted that a lack of clarity in some operating procedures had contributed to several recent operational events. The impact of lack of procedure clarity may be amplified by a large staff turnover where there is greater reliance on procedures over experience. The team encouraged the plant to enhance the clarity and periodic reviews of operating procedures.

3.4 CONDUCT OF OPERATIONS

The plant adopted a method of communicating contingency actions that may potentially be required to operating personnel across shift handovers. This works to identify the actions required in response to a fault that may develop while an abnormal equipment lineup is in effect, typically due to routine maintenance or an emergent issue. A contingency planning document is attached to the shift handover package and discussed between the Central Control Room Supervisor (CCRS) and the Unit Desk Engineer (UDE) at the start of shift. The team recognized this as a good practice.

The plant has installed Hot Connection Indicators over cables to give a warning of high temperature connections by changing colour, i.e., purple is normal temperature (OK), while pink indicates high temperature (Warning). These were installed as part of the lighting and small power inspection and testing programme. They allow a visual inspection without the need for monitoring equipment. The inspections can be carried out by any plant-based staff, to identify whether a previous overheating event has occurred and allow early signs of degradation to be identified outside of the planned routines. There had been numerous examples where hot connectors had changed colour, indicating early signs of degradation. These had been rectified in a timely manner before any medium or high-risk events occurred. The team recognized this as a good practice.

The team noted that although the field operators (FO) performed their prescribed plant parameter checks, their rounds are not always performed in a manner that ensures broader deficiencies in the field are effectively identified. Abnormal situations regarding seismic risks, water leaks or fire loading were not always identified by field operators conducting shift rounds. In addition, it was observed that an abnormal status alarm in a fire panel was not identified. The team made a suggestion in this area.

3.6. FIRE PROTECTION

The team observed that the plant does not always effectively control activities related to fire doors and fire loads in storage areas to ensure fire risks are minimized. The plant does not consistently through briefing or signage ensure that every worker is aware of the additional risks and expectations in an area subject to enhanced fire patrols. It was also observed that additional fire loads were present in several rooms without appropriate authorization. In addition, shortfalls were identified related to fire doors, including the expectations of manual closure or identifying defects. The team made a recommendation in this area.

3.7 CONTROL OF PLANT CONFIGURATION

The team noted that the plant had experienced several consequential configuration control events between 2020 and 2022. The plant has made improvements in the areas of safety-related and consequential plant misconfigurations. The team encouraged the plant to continue its effort to reduce low-level configuration control events.

DETAILED OPERATIONS FINDINGS

3.4. CONDUCT OF OPERATION

Good Practice: Use of hot connection indicators to monitor cable connections temperature.

Hot connection indicators are installed in the plant over cables to give a warning of high temperature connections by changing colour, i.e., Purple is normal temperature (OK), Pink indicates high temperature (Warning).

Figure 3.1: Cable hot connection indicators

These were installed as part of the lighting and small power inspection and testing programme. They allow a visual inspection without the need for monitoring equipment. The inspections can be carried out by any plant-based staff, such as staff from Maintenance or Operations.

Once the connector has detected overheating, the colour change is permanent and does not revert to the normal temperature colour. This identifies whether a previous overheating event has occurred.

In addition to the routine lighting and small power inspections, the indicators allow early signs of degradation to be identified outside of the planned routines.

There have been numerous examples where hot connectors have changed colour, indicating early signs of degradation. These have been rectified in a timely manner before any medium or high-risk events occur.

This was communicated to all plant staff via a number of different communication routes. This has been shared within the fleet, and it is now documented in the Corporate technical guidance note for safety of fixed low voltage equipment and the electricity at work regulations.

3.4 (b) Good practice: Contingency plans during routine maintenance or emergent issues

During routine start of work authorization or in response to emergent equipment issues, the Central Control Room Supervisor (CCRS) generates contingency planning documentation. This documentation is transmitted in the shift handover package to align crews on the impact and response to any subsequent failures given the initial abnormal equipment lineup. These contingency plans do not replace approved alarm response procedures or Station Operating Instructions (SOI); however they are used to complement them and support Operations' knowledge, monitoring and control of plant conditions. The contingency plans are saved for posterity and able to be replicated during future work.

For example, an electrical fault SOI would govern the crew response and recovery from a loss of the power supply. The contingency documentation instead would outline the effects of the loss of the power supply, given the initial abnormal equipment lineup, and the compensatory measures to be undertaken. As part of the shift handover brief, the Central Control Room Supervisor (CCRS) discusses the contingencies in effect with the Unit Desk Engineer (UDE) to confirm an aligned understanding in the event of a fault.

These pre-written contingencies have been implemented over the years with improved Operations performance as a result. One example involved a failure of a gas circulator variable frequency converter during an outage period and restoration of cooling to that reactor quadrant.

R7 Contingency briefs	
Issue	Actions
TG7 EHG Duplex PLC	HYB/ROTA/0303 – Until the next R7 ODR, please review page 2 of the ROTA, it lists the valves that would not be in control should the 2nd PLC of the DUPLEX system fail. Envisaged immediate actions: - **First Action** - The plc failure will close the TG7-WC-244. The valve will need to be opened by taking the Air off and venting any residual Air within the valve actuator. - The DA will then start filling once the WC-244 is open and level can be controlled by the desk using the WC-342. - **Second Action** - The SS-202 will open admitting high pressure steam to the glands, the SS-210 will also close (this will over pressurise the glands). Slowly close in the SS-201. - Because the SA-201 and SS-207 will open, Aux steam will then be packing on. - All the spray water valves for the de-super heaters will be affected and the manual valves will need to be adjusted. - The SS-244 will close, causing BLAST to trip. This could cause a drop in pressure whilst the Aux boilers fire up and could result in the SA-75 closing.
7DY 110v Essential UPS	Replacement of 7DY 110v Essential UPS system including Battery, Battery Charger, Inverter, DC Distribution Cubicle, Static Bypass and Maintenance Bypass. See HYB/OPS/ORAF/0143 for Risk and Mitigations. Primary risk: Loss of AC supplies to 110v AC Ess UPS Board 7DY. This will cause loss of supplies to: Safety Thermocouple Marshalling Cubicle Channel 4 (LEH 7/958) causing control rods to trip to manual.
Station Tx 7	<file:\\G:\Operate\Shift Operations\Contingencies\Active contingencies - Unit 7\Station Transformer 7.doc>

R8 Contingency briefs	
Issue	Actions

Common Plant Contingency briefs	
Issue	Actions
CCR H&V	If PLC fails emergency recovery procedure is PIOI 3.40.25/140.
8 MCW Sealing flushing	Standby Pump currently running hot. S/By pump in service. In the first instance start the Main Pump as it has been ran for ~10 hours before a noticeable temperature increase. Contingency TOI HYB/TOI/1800 to enact whilst the Main pump is in service and monitored

Figure 3.2: Examples of Contingency Briefs

3.4 (1) Issue: The field operator rounds are not always performed in a manner that ensures deficiencies in the field are effectively identified.

The team noted that although the field operators performed their prescribed plant parameter checks, the following deficiencies were not identified:

- In 7A quadrant of the reactor building, a laydown area does not comply with plant standards. The fire load assessment was dated to December 2021 and later additional materials were added, such as four plastic flammable baskets, which were not on the list of assessed fire load. In addition, a mobile scaffold, which was not attached or immobilised, was placed at the edge of the area, and was close to some valves. The plant seismic expectation prohibits the storage of any mobile equipment in this area without appropriate restraint.
- In 7A quadrant of the reactor building, some status alarms were flashing on a fire panel (LHDC PANEL RE1). However, this was not identified by the Field Operator who conducted the field walkdown. When asked, the Operator did not know the reason for those alarms and explained that he does not check the fire panels as part of the routine tour he was conducting at the time.
- In the 7ABX Decay Heat Condensate Cooling Water (DHCCW) pump room, a mobile crane hoist was hanging in the room, and it was not secured to prevent inadvertent free movement. When asked, the Field Operator explained that this should have been removed after a previous maintenance activity.
- In the 7C quadrant of the reactor building, a sampling valve was leaking and drops were collected in a tundish with a drain. The tundish was 70% full and the outlet drain was blocked. The dripping speed was about 40 drops/min.
- In the decay heat plant room of the reactor building, when the Field Operator performed a lamp test on the main ventilation panel, he did not notice that one of the alarm lamps was defective.
- In the unit 7 bypass gas plant control room, a valve label had become detached from the plant and was found lying on the floor.
- In the unit 7 bypass gas plant control room, a mobile scaffold was standing close to the control panel with only one out of four brakes applied. The plant expectation is that mobile equipment should be suitably restrained to prevent interaction with installed equipment.

Without effectively identifying deficiencies in the field during field operator rounds, deficiencies will go uncorrected for longer than necessary, and the risk of fire, personnel injury and equipment damage could increase.

Suggestion: The plant should consider improving the field operator rounds to effectively identify and report deficiencies in a timely manner.

IAEA Bases:

SSR-2/2 (Rev.1)

Requirement 28: Material conditions and housekeeping
The operating organization shall develop and implement programmes to maintain a high standard of material conditions, housekeeping and cleanliness in all working areas.

7.10. Administrative controls shall be established to ensure that operational premises and equipment are maintained, well lit and accessible, and that temporary storage is controlled and limited. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified and reported and deficiencies shall be corrected in a timely manner.

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4.38. Shift rounds should be conducted regularly by operating personnel to identify actual and potential problems and conditions that could affect the functioning of equipment. The frequency of equipment inspections should be determined on the basis of the safety significance of the failure of the item of equipment, and this frequency should be adjusted when operating conditions or maintenance conditions change. Shift rounds should also cover remote areas of the plant and items of equipment that are difficult to access.

4.40. Operating personnel who are assigned the task of conducting shift rounds should be made responsible for verifying that operating equipment and standby equipment operate within normal parameters. They should take note of any equipment that is deteriorating and of factors that might affect environmental conditions, such as water leaks, oil leaks, broken light bulbs and changes in building temperature or the quality of the air.

4.43. Operating personnel should check other indications, if possible, when unexpected readings are observed. Prompt action should be taken to investigate the causes of abnormal or unexpected indications so that prompt corrective action can be undertaken.
4.44. To ensure best practice in identifying and reporting deviations, specific training should be provided to the operating personnel undertaking shift rounds. In addition, supervisors should coach shift teams and individual operating personnel in achieving a consistent standard in identifying and reporting plant deficiencies.

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8.1. Control of materials and housekeeping can impact the progression of hazards and their consequences.

8.2. Hazard management should include specific plant walkdown procedures to be conducted periodically, as well as before and after an event. The results of these walkdowns should be properly documented. These walkdowns should ensure that the structures, systems and components needed for prevention, protection and mitigation of hazards and for coping with the impact of hazards are in place and kept operational. Some examples of walkdowns are the following:
(a) Ensuring that non-essential flammable materials, including ignition sources (e.g. flame cutting, welding), are removed from the vicinity of activities;
(b) Ensuring that fire extinguishing equipment is present on the site and operable;
(c) Ensuring that culverts are kept clear, as they can have a significant impact on the ability of the site drainage systems to dewater the site;
(d) Ensuring that loose materials (especially heavy objects) are cleared away or tied down, as they could create airborne missiles if extreme winds occur.

Some of these actions are of particular importance when an external hazard (e.g. extreme winds, flooding) is forecast, but proper housekeeping is required to be in effect at all times, even if some actions are particularly important only at times when an external hazard is forecast (see Requirement 28 of SSR-2/2 (Rev. 1) [1]).

Plant Response/Action:

Root cause identification:

A review of field operator rounds revealed several missed deficiencies in plant conditions, prompting an investigation into underlying causes.

Identified Root Causes:

- Initial and refresher training for plant tours could better support the importance of plant tours.
- Leaders not focusing their time in the field on plant tours reduces reinforcement of standards.
- High workloads including compensatory checks by operators can disrupt plant tours
- Weak engagement with housekeeping standards and no systematic approach to resolving issues.

Actions Performed:

- Training and Competency Development
  - Plant tour training intervention completed for all operators, led by the Shift Manager.
  - Flow Loop simulator training implemented to raise field standards and awareness.
  - Annual observation objective established: each operator to be observed once per year.
  - Plant tour authorisation programme planned for rollout in 2026.
- Technology Deployment
  - Tablets with defect scanners introduced for all operator plant tours, enabling photo and video capture.
  - Redundant defect tag reduction initiative completed to enhance plant status awareness.
- Organisational and Operational Improvements
  - “Pride in Our Plant” quarterly interventions conducted, focusing on leaks, seismic compliance, laydown, and general plant condition.
  - Area ownership model established, assigning specific plant areas to each shift team.
  - Seismic expectations MCP updated and communicated via a training package.
  - Leak management database fully reviewed and validated; weekly oversight meetings established.
  - Shift SQEP personnel rebalanced to enhance resilience and support for plant tours.
  - Daily Dalkia operative link established with duty shift to address overnight housekeeping and laydown issues.

Results and Effectiveness:

- Shift Manager report introduced at the Station Focus Meeting to enable increased operational sensitivity to housekeeping and seismic shortfalls on a daily basis.
- All leaks registered and monitored as per BEG SPEC requirements.

- Station wide reduction in oil leaks initiative
- Seismic & housekeeping issues identified and corrected during pride in our plant tours
- Improved Operational Focus Indicator (OFI) drive to deliver reduction in significant leaks and distractions.
- Reduction in operator distraction in R7 stat outage from 72 to 11
- Through observation and feedback supported by WANO Peer Assessors during the 2025 Peer Review process; good in-field behaviours were observed across several shifts and several individuals.
- A number of positive condition reports have been raised following the training:
  - All attendees provided positive feedback, noting increased confidence in plant operations.
  - Trainees valued the combination of classroom and simulator sessions, as well as insights from experienced leaders.
  - One trainee highlighted that simulator-based errors helped them avoid real-world error traps—demonstrating the simulator’s value.
  - Hands on use of HU tools and operator fundamentals.
  - Team specific content based on Heysham 2 experience.
- A number of condition reports have been raised where field operator plant tours have had a positive effect
  - A low-level alarm for the 7B CACS degasser was triggered and immediately cleared in the control room. During a plant tour, an operator noticed the level was still low and questioned the alarm status.
  - The new HU (Human Performance) flagging tool has been deployed to all shift operations technicians to support high HU standards. During a walkdown at the CW pumphouse, an operator technician used the HU flagging lanyard on the correct switchgear while troubleshooting a sump pump. This allowed safe coordination with the control room and maintenance technician, with a clear visual indicator left in place. The tool is praised as a valuable addition to existing HU tools.
  - A field operator was able to independently improve a control panel in the Make Up Water Treatment Plant (MUWTP) area to reduce HU error risk. This initiative was supported by main control room supervisors and Engineering, demonstrating proactive safety behaviour.
  - A fuel route operator noticed abnormal noise and a fluctuating gauge near a plate cooler—an area they were not checking at the time. The operator demonstrated strong fundamentals by identifying and reporting the issue.

IAEA comments:

The plant identified that the main factors causing the issue were a lack of engagement of managers in the field during plant tours to reinforce the standards, and a weak engagement with housekeeping standards with no systematic approach to resolving the issues.

The plant has completed a plant tour training for all operators, led by the Shift Manager. The training used classroom-based material to reset standards and a practical flow loop simulator to raise field standards and awareness. Second iteration of this training on the work was done in 2024 and further training was provided in 2025.

An annual observation objective has been established, and each operator is observed once per year as part of the 2026 business plan. Proficiency training and tool pouch training (training for minor maintenance activities done by field operators) is also planned for 2026 to further increase the performance of the field operators.

In addition, since 2024, all operators use tablets with tag scanners during plant tours, enabling photo and video capture. This has improved the detection of “defect tags” being still present on equipment which has been already repaired. As a result, more than 1000 incorrectly placed “defect tags” have been removed, providing a more accurate picture of the actual defects in the field. Tablets also help operators creating more accurate work requests thanks to the linked pictures or videos.

Leak management has been reinforced with “Pride in Our Plant” trainings that focus on leaks, seismic compliance, laydown, and general plant condition. Prior to this, a just in time refresher training is provided via the leader's forum on housekeeping standards, laydown, and seismic standards.

During the OSART follow-up mission, during a walkdown in the turbine hall no fire safety gaps have been observed and most of the leaks were found tagged (except one oil leak and one water leak). All diesel oil leaks observed by the team were tagged and monitored.

During a maintenance activity observation in the by-pass gas plant control room, the team observed an open bag with tools on the floor. The tools were used to assist valve operations and as part of the return to service operation of the by-pass gas plant. It belonged to operations personnel. In addition, a few housekeeping issues were observed in the control room (garbage and equipment tags on the floor).

Before 2025, each shift manager recorded all field observations and classified the deviation by operations fundamentals. From this list, each shift produced a leadership coaching review. The top three issues from each shift were then collated to create the top three departmental issues monthly to generate the departmental leaders coaching review (LCR). Since Q4 2025, the low-level field observations are tracked centrally allowing analysis and trending. Based on the analysis of performance indicators, the operations department expects that field observations will be optimized focusing on weaknesses of the department.

Even if the actions performed since 2023 (pride of our plant, use of tablets, expired tags removal...) have demonstrated their effectiveness, there is no solid evidence that results have been confirmed through a management review. The plant uses several KPIs to monitor defects and leaks, such as Fire Performance Indicator and Operational Focus Indicator. However, because these indicators primarily track defects, they may not provide early warning of declining walkdown performance, limiting the ability to intervene in a timely manner.

The operations business plan combined with the data analysis on low level field observations is expected to provide additional improvement for the field operator rounds.

Conclusion: Satisfactory progress to date.

3.6. FIRE PROTECTION

3.6 (1) Issue: The plant does not always effectively control activities related to fire doors and storage to ensure fire risks are minimized.

The team noted the following:

Fire load

- Workers assigned to a hot work and workers who request the creation of a laydown area were briefed on the additional risks and expectations regarding the fire load and storage requirements. However, other workers are not trained/ briefed to understand the specific risks and expectations across the plant and there was no specific signage.
- During a walkdown in areas where the fixed firefighting system was isolated for defect repairs, and where no additional fire loads or unauthorized storage were allowed, the team observed:
  - Four drums of oil were stored in the diesel generator AX/AY room without any label or authorization; and the same deviation had been raised 10 days before during another field walkdown but had still not been addressed.
  - There was a temporary storage area for painting the AY diesel day-tank room. The inventory list on the assessed fire load form did not comply with the stored material, which included additional combustibles such as plastic, tools, and trash.
  - There was another storage for painting materials in AX diesel day-tank room without any label or fire load assessment. Other flammable materials, such as papers and electrical equipment were also found in this room.
- A decay heat penetration maintenance toolbox used during outages was left in an unmarked storage area. Three containers each containing 2-3 litres of hydraulic oil and penetrating oil were placed inside the toolbox.
- Two large, open waste oil containers with about 20 litres of oil, each near to the cabinet with a sign “Shift Operation CW8 Store”, were stored on the same floor as the cooling water pump motor (8B and 8D) without a storage authorization and there was no visible indication that fire risk of the additional oil was assessed.
- The shift operation TG7 oil storage authorization document posted on the storage fire door did not include information on what category of flammable material could be stored in the cabinet and did not include information about the quantity of flammable material authorized to be stored in this cabinet.
- The shift operation TG7 oil storage had the authorization document posted on the door without information on who authorized the cabinet in this area.
- There was no surveillance inspection of the shift operation TG7 oil storage recorded on the tracking list since the authorization document was issued in 2017.

Fire doors

- In the AX day-tank room, a fire door was wedged open with a piece of vacuum cleaner without any risk assessment, as required by the Technical Guidance Note about fire doors.

- In essential supply building, at the 8-meter level, the fire door FD/0269 was found not fully closed. There was no defect raised for this deficiency with the door closing mechanism.
- The fire door leading to the Spent Fuel Pond room could not be automatically closed, and it was not checked closed when plant staff entered the room. The plant has clear expectation that fire door status must be checked when someone passes through.
- The fire door FD/0264 needed to be hand-closed by operators as it was found not fully closed owing to a defective closing mechanism.
- Two staff members have not checked the closure of the fire door when entering to the Central Control Room. This door did not latch fully closed due to a deficiency of the door closing mechanism.
- The shift operation TG7 oil storage fire door did not fully close because the closing mechanism located on the door was broken; moreover, it did not have a defect tag.

Without effective closure of fire doors and control/assessment of fire loading, the consequences of fire which could have an adverse impact on the safety of equipment and personnel could increase.

Recommendation: The plant should improve the closure of fire doors and control/ assessment of fire loads in the plant to minimize the consequences of fire to equipment and personnel safety.

IAEA Bases:

SSR-2/2 (Rev. 1)

Requirement 22: Fire safety
The operating organization shall make arrangements for ensuring fire safety.
5.21. The arrangements for ensuring fire safety made by the operating organization shall cover the following: adequate management for fire safety; preventing fires from starting; detecting and extinguishing quickly any fires that do start; preventing the spread of those fires that have not been extinguished; and providing protection from fire for structures, systems and components that are necessary to shut down the plant safely. Such arrangements shall include, but are not limited to:
(b) Control of combustible materials and ignition sources, in particular during outages;

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9.4. The maintenance, testing, surveillance and inspection for the site and plant should include general hazard protection measures as well as measures for protection against specific hazards. Hazard protection and mitigation features that should be inspected, maintained and tested include the following:
(e) Engineered structures, fittings and barriers (e.g. fire doors, watertight doors, dampers, penetrations);

9.5. Maintenance, testing, surveillance and inspection activities can be conducted during outages or on-line states of the plant. The on-site hazard protection measures should be complemented by alternative measures so that an appropriate level of defence in depth is continuously maintained during the off-line states of those original measures owing to

maintenance, testing, surveillance and inspection. Some examples of alternative measures are the following:
(a) Sustaining fire barriers, fire hazard monitoring equipment and firefighting equipment (e.g. assigning a fire watch during fire sensor repairs, securing water lines or fire extinguishers while fire water systems are partially isolated);

9.7. The operating organization should consider additional combustible materials and ignition sources during the maintenance and modification activities.

10.7. Familiarization and training for personnel responsible for the initiation or authorization of relevant work activities should cover specific topics regarding hazard prevention, protection or mitigation, including the following:

(a) For fire hazards:

- How to control combustible materials and ensure that area limitations on fire loads9 are met;
- The control of combustible materials and ignition sources and the potential impact of the materials and the sources on the permissible fire load in an area;
- The stipulations of the work permit system, the specific situations in which a fire watch is necessary, and the risk of introducing potential ignition sources into fire compartments11 containing structures, systems and components important to safety;
- Instructions on work implementation and general fire safety training so that the personnel can readily recognize various fire hazards at the plant and can understand the implications of introducing combustible materials or ignition sources into areas containing components important to safety;

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4.41. Any problems with equipment that is observed during shift rounds should be promptly reported to the control room personnel and corrective action should be initiated. Factors that should typically be noted and reported include the following:
(f) Any issues associated with the arrangements for fire protection (e.g. deterioration in fire protection systems or in the status of fire doors and dampers; deterioration of fire rated barrier penetration seals; accumulations of materials posing fire hazards such as wood, paper, refuse and oil), or with non-radiation related safety problems (e.g. leakages of fire resistant hydraulic fluid13, hazardous equipment, trip hazards)

Plant Response/Action:

Root cause identification:

Poor fire door behaviours have been observed despite known standards and expectations with regard to fire door closure This may be due to a lack of reinforcement of standards, tolerance of defects or a lack of knowledge of the risk associated with fire. There are also known areas with H&V imbalances which may result in substandard fire door conditions and acceptance of these conditions.

With regard to fire system isolations, often these areas are not treated any differently to areas without system isolations due to lack of communication about the impairment.

Actions Performed:

Fire door behaviours are now one of the 4 safety essentials which were launched in 2024. The standard was firmly reset across the whole station and since then it has been driven via multiple communication routes. Fire door behaviour expectations have been communicated via Fire safety messages, at Zero Harm Week in 2024 and 2025, leaders forums, x 2 monthly safety communication packs and pre-outage training. The safety essentials have also been a focus for leaders during Time in the Field and Area Safety Co-ordinators during the outage.

A document alignment review/update is currently underway of BEG/SPEC/FIRE/004 (impairment of fire protection systems), SI/F/004 (HYB safety instruction for the impairment of fire systems) and Fire System Manager under AR 1395054. This will include instruction to add local signage informing personnel of the local impairment and to not carry out hot work or increase the fire loading without an additional risk assessment.

A newly appointed laydown database lead has been created who provides enhanced oversight of the laydown process. Fire safety SQEP approval ensures that significant laydown requests are adequately assessed from a fire loading perspective.

Fire loading within the active waste facility was reviewed in 2025 with limits set to ensure fire loading is kept ALARP. Limits communicated and signage now in place.

Results and Effectiveness:

Fire door behaviours have been communicated via multiple routes on multiple occasions. Assessment of the impact of this shows improvement but further work is required. That is being addressed by continuing to regularly reinforce through comms and coaching. There is a focus on this when leaders spend TIF and there is a large focus on fire doors at Zero Harm week in 2025.

The assignment placed under AR 1395054 for the alignment review of BEG/SPEC/FIRE/004, SI/F/004 and Fire System Manager is yet to be complete. The effectiveness of this is currently unknown but it is anticipated that this will in the short term increase the burden on the Operations department to carry out more frequent fire watches and deployment (and remove) of localised signage. The station is working to be more proactive in the timely repair of fire defects and be less accepting of impaired systems with mitigating control measures. The station is also considering whether the Operations department will need additional support (potentially fire PA's) to assist with deployment of signage and fire walkdowns for impaired systems.

Good standards in laydown areas maintained, very few minor findings throughout the WANO review in relation to unauthorised/incorrect laydown.

Health Physics have noted that following the active waste fire loading limits being set, there has been a significant reduction in the storage of waste in this area.

IAEA comments:

The plant identified that the main factors causing the issue were a lack of reinforcement of standards, tolerance of defects or a lack of knowledge of the risk associated with fire.

An action plan has been launched with effective actions to change the "culture" related to fire door expectations and consequences of fire door defects. No unidentified fire door defects were observed in the field during the follow up mission.

The number of fire door defects has increased during the last 3 years (46 in 2023, 56 in 2024 and 93 in 2025). This has been assessed as a positive improvement in reporting culture. Behaviours, challenges and self-checks of fire doors closing were aligned with plant expectations during the follow-up mission field observations.

At the same time, the overall number of fire door-related CRs (mainly doors found open) has decreased from 30 in 2023 to 12 in 2024 and 9 in 2025.

In addition, fire barriers CRs are tracked and trended in the Business Objects data base. A monthly report is presented to the Fire Safety Task Team at fleet level. The metrics show good level of the plant performance amongst the fleet, including fire barriers indicator.

Conclusion: Issue resolved.

4. MAINTENANCE

4.5. CONDUCT OF MAINTENANCE WORK

The team observed that the plant maintenance activities are not always prepared, implemented and controlled in a manner that minimises the risks to equipment and personal safety. The plant has 34 instances of maintenance rework in the period of May 2023 to September 2023. For example, some equipment was observed where bolts that did not have at least two threads beyond the end of the outer face of the nuts, which is considered industry best practice. The team made a suggestion in this area.

4.6. MATERIAL CONDITION

The team identified that the material condition of some plant systems, structures, and components is not effectively maintained to minimise the risks to the safety and reliability of the plant. For example, the team identified that oil leaks of various amounts exist on all diesel generators. A number of oil leaks were identified in the reactor building basement underneath the lube oil coolers of 8A and 8B Gas Circulators. Cables were observed not fully secured and fixed on cable trays, and the sheaths of cables on the refuelling machine was also found damaged. The team identified a recommendation in this area.

The team also observed hoses in the storage container used for Decay Heat Feedwater Emergency Readiness in the Unit Loading Bay did not have FME covers. In addition, there were some pipes without FME covers in the CO2 Plant seismic storage and some pieces of old tape were placed 5cm away from the Spent Fuel Pond (SFP). The team encouraged the plant to improve in this area.

DETAILED MAINTENANCE FINDINGS

4.5. CONDUCT OF MAINTENANCE WORK

4.5 (1) Issue: The plant maintenance activities are not always prepared, implemented and controlled in a manner that prevents equipment failure.

The team noted the following:

- The plant has self-identified 34 instances of maintenance rework in between May 2023 to September 2023 when over 10000 maintenance activities were carried out during this statutory outage period. For example, after Unit 8 outage, five out of 32 secondary shutdown nitrogen trip valves have been found leaking following maintenance work resulting in chemistry parameter entering an action level.
- On low pressure turbine casings for both Unit 7 and Unit 8, it was observed that there were more than 20 bolts that did not have at least two threads beyond the end of the outer face of the nuts in accordance with best practice to ensure secure fastening and engagement.
- On several other occasions, such as the casing for the reactor sea water pump (8BY), none of the five bolts had at least two threads beyond the end of the outer face of the nuts to ensure secure fastening and engagement.
- The protective cover of a 110V DC terminal block, which was removed at the beginning of a job by a technician, was not returned to its original position after completion of the testing task on 3.3 Auxiliary Transformer 8DX 11 kV Unit board 8D. This was not identified after the final configuration was checked by a worker as well as by an independent verifier. When asked, the technician opened the cubicle again, found the protective cover at the bottom of the cubicle, and returned the protective cover to its original position.
- After corrective maintenance work of a drain plug leak on Forced Air Cooling Air Compressor, the maintenance technicians did not re-check the bearing casing drain plug to verify proper leak tightness before leaving the job site. They only visually checked the leak catcher installed beneath the bearing casing. A quick visual check of the oil catch, without a visual check of the drain plug itself, was not sufficient to ensure that the leak stopped.
- The maintenance technicians did not clean the job site floor of several oil drops that fell on the floor underneath their trolley after job completion, before leaving the job site of corrective maintenance work of the drain plug leak on Forced Air Cooling Air Compressor.
- In the reactor building of Unit 8, a scaffold from the last outage was touching the main steam piping insulation at several locations. A ladder mounted on the scaffold to reach the next elevation was touching the bypass steam valve actuator SS76Y2.
- In the Quadrants A and B area (main steam line area), several drain valve actuator extended spindles were in contact with the scaffolding erected for plant maintenance. The plant has clear expectations that scaffolding should not be in contact with plant systems, structures and components.
- In the Quadrant B area (main steam line area), three cables from the electrical cabinet for the drain valves were in contact with the erected scaffolding.
- Open ends on three temporary test instruments lines on Turbine 7 were observed, not protected against foreign material intrusion after the test instruments were removed.

– Disconnected low voltage cable ends were observed beside the 7MK149B gauge without insulation and a tag.

Without adequate preparation, implementation and control of maintenance activities, risk of equipment failure can increase.
Suggestion: The plant should consider improving its preparation, implementation and control of maintenance activities to reduce the risk of equipment failure.

IAEA Bases:

SSR-2/2 (Rev. 1)

4.30 The operating organization shall encourage plant personnel to have a questioning attitude and to make appropriate and conservative decisions, so as to minimize risk and to maintain the plant in a safe condition.

7.10 Administrative controls shall be established to ensure that operational premises and equipment are maintained, well lit and accessible, and that temporary storage is controlled and limited. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified and reported and deficiencies shall be corrected in a timely manner.

7.11 An exclusion programme for foreign objects shall be implemented and monitored, and suitable arrangements shall be made for locking, tagging or otherwise securing isolation points for systems or components to ensure safety.

Plant Response/Action:

Root cause identification:

Following the OSART suggestion, we conducted a detailed review of the facts to identify and trends and specific actions which could be taken to address the gaps. These fall into 4 area's covered by the following statements.

– Maintenance Technicians and Contract Partners are failing to follow standards for bolt tightening and electrical connections which is leading to rework events.
– The Maintenance Manager and Department leads have not ensured accountability for rework trends and have failed to prevent repeat events
– Workers are failing to adhere to Maintenance Fundamentals specifically focussing on PU&A and Work Area Standards (signage / laydown)
– Contractor supervision standards and oversight failed to prevent significant outage delays caused by rework events during the previous outage.

We also conducted benchmarking visits to other sites such as Torness to review Bolt-tightening standards and rework processes.

Actions performed:

– In May 2024 we conducted our first Maintenance Fundamentals workshop with all plant touchers from Maintenance and Contract Partners. This workshop covered several topics which had been identified by OSART as weaknesses. The topics covered were Risk Assessments, Work Area Standards, Procedure Use & Adherence, Foreign Material

Exclusion (FME) standards, The Provision and Use of Work Equipment Regulations (PUWER) , Pre Job Brief and Post Job Debriefs. (*FT3, FT4, FT5*)

- At the same time in May 2024, we also conducted a Working at Height Workshop with all plant touchers, including contract partners and operations. This was to address a trend in Working at Height issues and to reinforce the basic standards expected. (*FT2*)
- In December 24 / January 25 we conducted pre-outage training for all staff, this covered a variety of topics including a number of maintenance fundamental topics such as Procedural Use and Adherence, Backout Inspections, Housekeeping and Laydown as well as Working at Height and FME. (*FT3, FT4, FT5*)
- In September 2025 we conducted a second Maintenance Fundamentals workshop for all maintenance and contractor staff, this covered PUWER, Bolt Tightening, Risk Assessments, Process Safety, Electrical Safety and Building Fabric. (*FT1, FT6*)
- Following a number of rework events during the S13R7 statutory outage we conducted an independent Significant Adverse Condition Investigation (SACI) into our centre line work area which had a number of quality related events. This SACI is captured in our Corrective Action Programme (CAP) with actions in place to prevent re-occurrence, these actions will now be monitored via the rework review board. (*FT7*)
- In September 2025 we took all Mechanical Maintenance Technicians through specific bolt tightening training. This training has identified some areas for improvement within our process which we are currently working on through our improvement plan specifically around bolt tightening. (*FT1*). This improvement plan is best on the Gap Driver Actions Results (GDAR) principle
- We implemented an FME action plan in conjunction with the company Independent Nuclear Assessment (INA) group to close FME gaps from previous outage, this action plan was documented in CAP. In the 2025 Statutory outage we had a significantly improved FME performance with no findings from INA or the early outage safety review. (*FT3*)
- In September 2025 we conducted a benchmark of the Torness NPP and Heysham 1 NPP rework review process. These benchmarks have been built into our GDAR improvement plan around rework. We have utilised the Heysham 1 trending tool, backfitting our own data to this. (*FT7*)
- Following the observations regarding scaffolding touching plant, we carried out a stand down and toolbox talk for the whole scaffold team reinforcing the standards and expectations when working around plant when erecting scaffolds. (FT2)
- To ensure that scaffold does not touch plant, we ensure that scaffold teams are briefed at the point of work and all plant interactions thoroughly discussed. Supervisors visit and check the scaffold build as it progresses to completion and challenge the team to rectify any issues and then verify that the issue has been closed out. As per Altrad procedure every completed scaffold undergoes three checks, first by the work party, second by the supervisor and finally by the scaffold inspector and any issues found on these 3 checks to be rectified as soon as possible. (FT2)

Further Actions to be taken:

- Our rework GDAR improvement plan has a number of key actions which we are currently working through: -

  - Rework Review Board to be revitalised with contract partner engagement and chaired by the Maintenance Manager, this will improve our oversight, trending and ensure we have actions to close gaps tracked. (*FT7*)
  - Maintenance Bolt Tightening sub-group established to work through tooling and equipment required to ensure that when bolts are re-fitted torque figures are available and used at all times and a minimum of two threads is protruding. (*FT1*)
- Working with our fleet maintenance team we have agreed to establish a fleet rework review board, this will ensure that we have governance over the stations ensuring that the process is working consistently on all sites as well as looking for fleet level trends. (*FT7*)
- Maintenance Fundamentals paired observations, we are establishing a paired observation process between leaders and group heads/managers to spend time in the field and assess the leader's observation skills when it comes to maintenance fundamentals, this will be trended across the station and will enable targeted training. This process is being rolled out for Maintenance leaders and contract partner leaders. (*FT1, FT2, FT3, FT4, FT5, FT6*)

Results and effectiveness:

- Two facts relate to bolt tightening. (*FT1*)
- Three facts relate to scaffold touching plant. (*FT2*)
- One fact relates to FME standards. (*FT3*)
- Two facts relate to completeness and back out inspections when concluding work. (*FT4*)
- One fact relates to general housekeeping when completing tasks. (*FT5*)
- One fact relates to electrical connections (bag & tag). (*FT6*)
- One fact relates to rework trending data. (*FT7*)
- Bolt tightening working group has been established and is working through to ensure that from 2026 Statutory outage and beyond the standard of 2 threads visible is embedded. (*FT1*)
- No further issues have been identified with scaffold touching plant, there has been no findings in Early Outage Safety Review or WANO Peer Review in this area. (*FT2*)
- Significant improvement in FME standards, with this being highlighted as a positive by Early Outage Safety Review in 2025. (*FT3*)
- A significant improvement has been seen with scaffold standards. During the recent statutory outage there were no findings from the Early Outage Safety review of Scaffold touching plant. There were also no facts from the recent WANO Peer review of scaffold touching plant. (*FT4*)
- Work Areas Standards have been reset through Maintenance Fundamentals training, this is also being assessed through paired observations in the field. (*FT5*)
- Electrical Bag & Tag standards have been reset with teams, there have been no further issues recorded in Condition Reports (CR) or through Leadership Coaching Reviews (LCR). (*FT6*)
- The Maintenance rework review board has now been re-established with greater ownership by the Maintenance Manager, the board is maintaining oversight of rework actions to

prevent re-occurrence and is linked in with all departments on station including training to help close specific training gaps. (*FT7*)

IAEA comments:

The plant has not yet clearly identified the root causes of the issue. Instead, it has categorized relevant observations by topic. Based on these topics, the plant initiated actions such as training activities and benchmarking; however, maintenance rework has continued to occur over the past two years.

Between May and September 2023, the plant self-identified 34 instances of maintenance rework. During the same period in 2024, 30 instances were recorded, and 41 instances were identified in 2025.

The GDAR (Gaps, Drivers, Action taken, Results) Gap Improvement Plan has been in implementation only since 2025, more than one year after the OSART mission. As a result, no measurable performance improvements have been observed to date.

As part of the corrective actions, in 2025 the scope of the Rework Review Board—meeting every five weeks—was expanded to include contractors and representatives from training, operations, and engineering. Previously, the board operated solely within the maintenance department. This expanded participation is intended to ensure that all relevant parties contribute to reviewing performance results and to decision making related to rework reduction.

The board now tracks and trends rework causes across all departments and contractors and assigns responsibilities accordingly. The choice and definition of initial performance indicators presented to the team suggest increasing confidence in the plant’s ability to better manage and control reworks in 2026.

Conclusion: Satisfactory progress to date.

4.6. MATERIAL CONDITION

4.6(1) Issue: The material condition of some plant systems, structures, and components is not effectively maintained to minimise the risk to the safety and reliability of the plant.

The team noted the following:

- On the Pile Cap of Unit 8, hydraulic jacking equipment was leaking oil, creating a 5cm*5cm puddle approximately 10 cm from the top of the reactor floor. An oil pad beneath it was soaked with oil. No defect tag was present.
- CX and CY Diesel generators in the Northwest Diesel House had large amount of oil (about 2m*2m*0.01m) underneath, from leaks which were not identified and tagged by the plant. There were multiple minor oil leaks and traces along the diesel casing flange of these two diesels. It was later identified that all diesel generators have oil leaks to a different extent.
- There are a large number of oil leaks in the oil bund underneath the lube oil cooler of 8A and 8B Gas Circulators. Some of these are about 50cm*50cm. These leaks were not identified with deficiency tags. The plant indicated that the last outage of this Unit was completed in June 2023.
- Several oil leaks were observed underneath the bearings of Turbine Generators for Unit 7 and 8, the oil leaks were 20cm*30cm, and at least three such oil leaks were not identified by the plant.
- Oil leaks were observed underneath the coupling of Main Feed Water Pumps for Unit 7 and 8, at least two oil leaks were not identified by the plant.
- There were many electrical cables in the turbine building with oil trace, oil drops, oil and dust mixture on the surface.
- One electrical safety protective barrier of a 110V DC terminal block in a cubicle was seen missing at the beginning of an electrical maintenance job on the 3.3 Auxiliary Transformer 8DX 11 kV Unit board 8D. This was not recognized by the workers as a material condition or electrical safety gap and the workers did not raise the Work Request on this deficiency after the job completion. In another case, another electrical safety protective barrier of a 110V AC terminal block was seen missing in a cabinet at the beginning of the control and instrumentation job on calibration of thermocouple trip amplifier and loop check to post-trip sequencing equipment of train Y. This was not recognized by the plant workers as a material condition or electrical safety gap and they did not raise a Work Request on this deficiency after the job completion.
- Water leaks
  - There was a water leak with about 2 drops per second on the Main Feed Water Pump for Unit 7. This water leak was not identified by the plant.
  - There was water dripping from the ceiling at the location of CR0052HB in the Turbine Building, and no deficiency tag was apparent.
  - Turbine lubrication oil cooler 7C main flange was leaking sea water causing surface corrosion of the external surface of the cooler.
  - There was a water leak dripping from turbine ancillary systems affecting thermal insulation cladding on several pipes on the -9 m level below the Turbine 7.
  - Nine tubes of about one inch diameter located one above another were affected by sea water leaking from the top located pipe beside TG7ACW11C.

- The external CO_2 plant has not been designed with an appropriate drain, such that large paved areas were covered by water puddles, up to a few cm deep. This was adjacent to the open air high and low pressure CO_2 system components and pipework.
- Cable trays in the CO_2 plant along the fence, especially at the back fence, were completely corroded, and cables were exposed to environmental degradation. Large rust pieces were spalling from cable trays and conduits.
- In the south-west essential supply building, concrete spalling was observed on a 30cm x 15cm section of wall at floor level.
- Cable conditions detected by the team:
  - Cables were observed not properly secured and fixed in cable trays.
  - Sheathing of cables on the refuelling machine were damaged.
  - Thermal insulation of small bore instrument and gland pipework supplying 7B1 and 7B2 governor valves were significantly damaged and missing at some places.
  - Several electrical cables were routed across the sharp edge of an oil collection tray underneath 7B1 governor valve.
  - There was an untagged damaged cable under the Unit 8 generator near to the AD758661 (415 V) electric cabinet. The cable and some other cables around were not secured according to plant standards.

Without effectively maintaining the material condition of plant systems, structures, and components, there is an increased risk that the safety and reliability of the plant can be compromised.

Recommendation: The plant should improve the material conditions of plant systems, structures, and components to minimise the risk to plant safety and reliability.

IAEA Bases:

SSR-2/2 (Rev. 1)

7.10 Administrative controls shall be established to ensure that operational premises and equipment are maintained, well lit and accessible, and that temporary storage is controlled and limited. Equipment that is degraded (owing to leaks, corrosion spots, loose parts or damaged thermal insulation, for example) shall be identified and reported and deficiencies shall be corrected in a timely manner.

Plant Response/Action:

Root cause identification:

Following on from the OSART inspection we reviewed the facts identified and found the following trends from the facts:

- 4 facts related to Unidentified and improperly managed leak (*FT1*)
- 5 facts related to Known oil leak not managed properly (*FT2*)
- A fact on Cleanliness of electrical cables (*FT3*)
- A fact on Electrical termination covers not reinstated post maintenance (*FT4*)
- A fact on Drainage insufficient (*FT5*)
- A fact on Corroded cable trays (*FT6*)
- A fact on Concrete spalling (*FT7*)

- 5 instances observed of Electrical cables damaged (*FT8*)

Actions completed:

- Following the OSART review, a team of individuals reviewed the specific facts found by the OSART team, specific facts which required action have been addressed.
- A team was set up throughout 2024 to drive improvements in our leak management process and reduce the risk caused by leaks by 50%. This team focussed on improving the leaks in our key areas such as Gas Circ Lub Oil Pits and Diesel Generators.
  The team has focussed on two areas:-
  1) Completing major overhaul packages to reduce/eliminate oil leaks. During 2025 a major overhaul was completed on DX diesel to reduce oil leaks and other issues. During the S13R7 outage the maintenance teams had a concerted effort on resolving defects on the Gas Circ Lub Oil pits, a total of 62 defects were complete on the Gas Circ Lub Oil Pits on U7: (*FT1*, *FT2*)

7AX1 - 7	7BX1 - 11	7CX1 - 6	7DX1 - 4
7AX2 - 7	7BX2 - 9	7CX2 - 9	7DX2 - 9

  2) Improved cleaning regimes – the team reviewed the cleaning regimes for the key areas where known oil leaks occur – Diesels, SSBFP, MBFP and Gas Circ Lub Oil Pits. What Excellence Looks Like (WELL) sheets were created for these areas to clearly set the expectations with our facilities contractor to ensure the standards were maintained and loose oil minimised. (*FT1, FT2*)
- Pride in Our Plant days have been re-established, the Pride in our Plant days are planned days when all staff go out onto the plant and focussing on improving the standards on plant, so far through 2024 and 2025 we have held special focusses on ensuring defect tags are accurate, ensuring defects are reported, removing fire loading and ensuring laydown are registered effectively. These days also focus on the cleanliness of the plant with teams taking equipment and cleaning areas of the plant. (*FT1, FT2, FT5, FT8*).
- In May 2024 we conducted our first Maintenance Fundamentals workshop with all plant touchers from Maintenance and Contract Partners. This workshop covered a number of topics which had been identified by OSART as weaknesses. The topics covered were : Risk Assessments, Work Area Standards, Procedure Use & Adherence, FME standards, PUWER (Work Equipment), Pre Job Brief and Post Job Debriefs. (*FT3, FT4, FT8*)
- In December 24 / January 25 we conducted pre-outage training for all staff, this covered a variety of topics including a number of maintenance fundamental topics such as Procedural Use and Adherence, Backout Inspections, Housekeeping and Laydown as well as Working at Height and FME. (*FT3, FT4, FT8*)
- In September 2025 we conducted a second Maintenance Fundamentals workshop for all maintenance and contractor staff, this covered PUWER, Bolt Tightening, Risk Assessments, Process Safety, Electrical Safety and Building Fabric. (*FT3, FT4*)
- The drainage at the CO2 plant has been reviewed by the civil oversight team, the drainage is deemed sufficient. Dalkia our facilities management contract partner have reviewed to ensure that there are no blockages to the drain in this area. External pools of standing water do not pose a direct risk to the plant. The industrial safety risk is mitigated as when the weather is sufficiently bad we place restrictions on outdoor working. At low ambient temperatures we have a gritting contract on site who will manage this industrial safety risk. (*FT5*)
- The Co2 plant is subject to regular Maintenance Projects work packages, we have reset the standard and ensured that as part of these packages corroded or defective electrical cabling

is included in the work scope. The corroded cable tray identified during the OSART visit has been replaced. (FT6)

- A walkdown was carried out of the concrete spalling identified to confirm this was in our existing process for managing civil infrastructure. Any concrete defects that present a falling object risk are treated as a safety defect and barriers are erected until such time that loose material can be removed. Concrete defects are tracked using the Civil Database and are repaired on a priority basis. In 2024/25 repairs have been carried out on internal concrete defects. In 2026 it is proposed to repair the south elevation of R7 Reactor Building above the Decay Heat Fans. (*FT7*)

Further Actions to be taken:

- The major overhaul package completed in 2025 on BX diesel is planned to be rolled out to 2 further diesels in 2026 (DY and BY). The scope of these packages is similar to that of BX to reduce known oil leaks and reduce the likelihood of wet stacking (a known condition in Diesel engines where oil may accumulate in the exhausts during periods of load loads or low temperatures).
- During the 2026 Statutory outage we will be repeating the defect clearance on the Unit 8 Gas Circ Lub Oil pits to improve the oil leaks in this area.

Results and Effectiveness:

- Improvements have been made to minimise and manage leaks.
- Further work is planned to improve the Unit 8 Gas Circ Lub Oil Pits and Diesels, these cannot be rectified sooner due to plant release requirements.

IAEA comments:

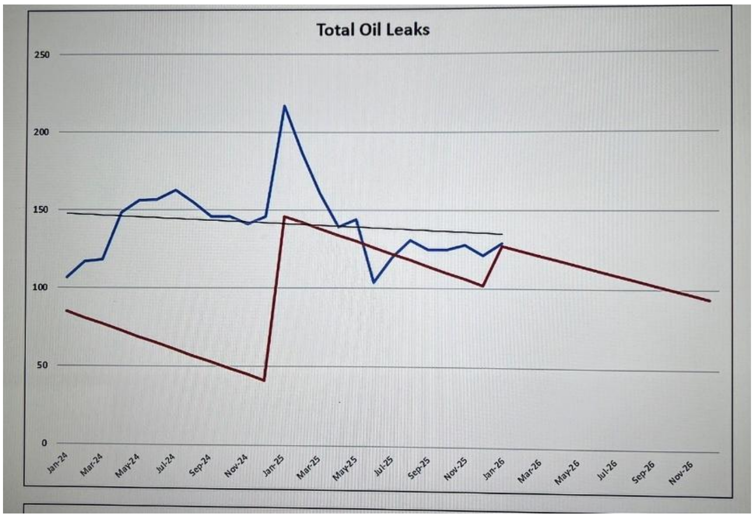
The plant has not systematically identified the root causes of the issue but sorted the facts by topics. Ageing and corrosion were identified as causes for a part of the leaks.

Actions have been implemented since 2023 to manage the risk linked to leaks. Priorities have been reviewed, cleaning actions have been performed, and monitoring has been strengthened.

From July 2024 to November 2025, chemical leaks have increased from 8 to 20, while significant chemical leaks increased from 0 to 4 between July 2024 and July 2025 (3 of them have been fixed since). Within the last 18 months, the number of “severe” oil leaks has significantly decreased from 9 to 0. In the same period, the total number of leaks has decreased from 170 to 134.

An internal monitoring of the oil leaks is performed by the maintenance department. Until January 2025, oils leaks increased significantly above the target. Since the 2025 statutory outage, a decreasing target has been set, and oil leaks have been reduced according to the plan.

(target in red, number of oil leaks in blue). (2024, 2025, 2026)



In the leaks backlog, amongst the 134 oils leaks, 67 are planned to be repaired in a normal work week and 24 during either Fuel Route, interim or statutory outages.

Conclusion: Satisfactory progress to date.

5. TECHNICAL SUPPORT

5.1. ORGANIZATION AND FUNCTIONS

The plant has introduced a weekly Medium Term Operational Risk (MTOR) meeting where the plant monitors progress and discusses mitigation actions of risks which may not necessarily need an investment, or immediate intervention but warrants close monitoring. The plant has also developed an easily accessible database tool where all risks are logged that can affect plant operation and which need attention by the plant in the next 12 months. The MTOR meetings have improved cross functional discussions at the plant. The team recognized this as a good performance.

The team identified that seismic controls are not always strictly implemented in seismically qualified areas of the plant. Even though the plant has implemented an improvement programme in the area of seismic control, which includes walkdowns and training, the team noted several items in seismically controlled areas not systematically secured. The team made a suggestion in this area.

5.2. SAFETY ASSESSMENT

During the mission the team noted that actions from the latest Periodic Safety Review (PSR) were not completed in a timely manner. For example, the safety case health checks introduced as part of the PSR process, raised several actions, and nine of these actions were not yet completed during the PSR closeout review in 2019 and, by the time of the mission, four of these actions were still not completed after having been rescheduled several times. The team also observed that the PSR identified 41 issues with low level significance for which 50% of the actions had not been completed. The team encouraged the plant to make further efforts to complete all actions from the latest PSR.

5.3. PROGRAMME FOR LONG-TERM OPERATION

The team observed that the plant's ageing management activities are not comprehensive and systematic. The team recognized that the plant had several programmes and activities that manage ageing, however, the team identified that ageing management activities were not coordinated and reviewed against the attributes of an effective ageing management programme. The team made a suggestion in this area.

5.6. SURVEILLANCE PROGRAMME

The team noted that the plant equipment reliability programme is not always effective at preventing abnormal conditions that challenge safe plant operation. During the mission the team identified that the plant has a comprehensive equipment reliability programme, however, the team noted that the system health of several important systems indicated red and amber status, in part due to a high number of equipment deficiencies. Further the team assessed that the total backlog of open deficiencies at the plant was high, and deferrals of surveillance testing were present due to equipment reliability issues. The team made a recommendation in this area.

5.7. PLANT MODIFICATION SYSTEM

The plant has adopted an Electronic Key Management System for personnel access to laptops, keys, and USB removable media across the plant. The system ensures that mitigations are in place for all plant programmable equipment, such as when hardware or software of plant computer systems is modified. The system is also used in the Central Control Room, whereby operators can access tablets and connect them to installed connections points from which key plant parameters can be monitored in case of an event. The team recognized this as a good practice.

The team identified that plant modifications are not always fully completed and reviewed in time to maintain plant effective configuration control. In recent years, an increasing trend of plant configuration events has occurred and the team noted that several condition reports have been raised because relevant plant procedures had not been updated to reflect modifications. The plant indicator for the target for closing modifications (including document amendments) within six months of implementation was red and this value had slightly increased during 2023. The team made a suggestion in this area.

DETAILED TECHNICAL SUPPORT FINDINGS

5.1. ORGANIZATION AND FUNCTIONS

5.1 (1) Issue: Seismic controls are not always strictly implemented in seismically qualified areas of the plant.

The plant has implemented an improvement programme to address seismic control which includes walkdowns and training. The housekeeping procedure for seismic standards states that "Stored mobile or wheeled equipment must be chained to floors and walls, have brakes applied or wheels chocked. The safe distance shall be more than 30 cm." During the mission the team noted several unsecured items in seismically controlled areas that were not effectively secured which could impact seismically qualified equipment, for example:

- In the room R8B01R01 which contains seismically qualified control panels, there was an air conditioning unit that was mounted on a temporary bench built from scaffolds which was not effectively secured to either the wall or the floor.
- Within the seismically qualified CO2 plant there is a designated, marked storage area for mobile trollies, however a trolley was identified outside the designated storage area, which was not chained nor had its brakes applied. Inside the storage area there were many items which did not appear to belong there.
- In the CO2 plant control room, a fire extinguisher next to the door inside the room was not restrained although it is explicitly stated on the entrance door that permanent mobile equipment shall be fixed as it is a seismically controlled building.
- In the reactor building of Unit 7, a Burst Can Detection trolley was less than 30 cm from sensitive cabinets.
- In reactor building of Unit 7, an old computer programming terminal VPU was stored in a seismic area on a trolley which was not chained to the floor and wall.
- In the reactor building, in a seismically controlled area, a trolley (ID 776153) carrying an engine was stored with the brakes applied as per the standard, but the brakes were not working effectively, and the trolley could move easily.
- In reactor building unit 8, at Level 32, Charge Hall Area, which is a seismically controlled area, a rack stand cart was left unsecured next to CO2 Control Panel LEH 8-1300. Multiple other items were found stored but not properly secured.
- On the reactor Unit 8 pile cap an inspection mirror was placed in a "keep clear" seismic area.

Without strictly implementing seismic controls in seismically controlled areas, unsecured items could pose hazard to safe operation of plant and equipment in a seismic event.

Suggestion: The plant should consider more strictly implementing seismic controls in seismically controlled areas.

IAEA Bases:

GSR Part 2

4.32. Each process or activity that could have implications for safety shall be carried out under controlled conditions, by means of following readily understood, approved and current procedures, instructions and drawings.
SSR-2/2 (Rev.1)

4.26 All activities important to safety shall be carried out in accordance with written procedures to ensure that the plant is operated within the established operational limits and conditions. Acceptable margins shall be ensured between normal operating values and the established safety system settings to avoid undesirably frequent actuation of safety systems.

4.35 Monitoring of safety performance shall include the monitoring of: personnel performance; attitudes to safety; response to infringements of safety; and violations of operational limits and conditions, operating procedures, regulations and licence conditions. The monitoring of plant conditions, activities and attitudes of personnel shall be supported by systematic walk downs of the plant by the plant managers.

SSG-77

3.1. The operating organization should establish a set of hazard management measures to ensure that the plant can be protected against hazards by suitable design and operational activities — including prevention and mitigation of the impact of, and coping with the consequences of, hazards or credible combinations of hazards, according to SSG-64 [4] — in an integrated management system.

3.18. The operating organization should establish separate (or integrated, where appropriate) procedures for different types of hazard. These procedures should provide clear instructions to the personnel on actions to be implemented if precursors or indications of hazards are observed or if hazard induced precursors to initiating events occur.

NS-G-2.13

5.33. Plant walkdowns are one of the most significant components of the seismic safety evaluation of existing installations... These walkdowns may serve many purposes, such as: evaluating in-plant vulnerabilities of SSCs, specifically issues of seismic system interaction (impact, falling, spray, flooding); identifying other in-plant hazards, such as those related to temporary equipment (scaffolding, ladders, equipment carts, etc.); and identifying the ‘easy fixes’ that are necessary to reduce some obvious vulnerabilities, including interaction effects. Walkdowns should also be used to consider outage configurations that are associated with shutdown modes.

Plant Response/Action:

In response to the OSART suggestion that the plant should consider more strictly implementing seismic controls in seismically controlled areas:

Root cause:

The site personnel seismic awareness and importance of implementing the correct seismic controls had drifted and led to some sub-standard conditions. The rationale for this conclusion is as follows:

- When interviewed Seismic considerations were always considered in regular routine plant walkdowns by staff
- There was insufficient evidence of a robust training arrangement in this area
- There was ongoing evidence of seismic shortfalls in laydown areas and controls within those with respect to adherence to standards MCP 27 and BEG/SPEC/OPS/030

Actions performed:

The plant has taken steps to improve awareness and seismic standards within laydown areas by:

- Produced and delivered a mandatory Seismic briefing to all staff
- Enacted a Seismic improvement plan in the areas of laydown and signage
- Updated local Seismic guidance with further detailed arrangements and clarity
- Focus by leaders when spending time in the field

Results and Effectiveness:

The signage standard across the site is deemed to be of a good standard. The actions arising from the Seismic improvement plan have been effective in closing the gaps identified. There is evidence of reporting of Seismic shortfalls and positive reinforcement of standards in our corrective action programme management system.

IAEA comments:

The plant has analysed the suggestion and combined with walkdowns, implemented an action plan in order to enhance the seismic control and awareness of the plant.

Seismic awareness has been improved through the delivery of a mandatory safety briefing pack which included the plant seismic definitions and expectations. It was delivered during 2025 and by October 81% of the staff at the plant had completed the briefing. The briefing included also some of the contractors such as scaffolders.

The plant seismic management control procedure, MCP 27, has been improved with clarifications and seismic areas have been re-evaluated and some boundaries have been redefined to fit its purpose.

During 2025, 12 condition reports have been reported by plant staff regarding seismic observations, which is an improvement compared to the previous years. During a field visit by the team at some seismically controlled areas, for example at the CO2 plant and diesel house, no deviations were observed.

The corrective actions were effective, have raised the awareness of seismic controlled areas and performance across the site has been improved.

Conclusion: Issue resolved.

5.3. PROGRAMME FOR LONG-TERM OPERATION

5.3 (1) Issue: The plant's ageing management activities are not comprehensive and systematic.

The plant has several programmes and activities that manage ageing within areas such as corrosion, maintenance, obsolescence, chemistry, life asset management plans and at the time of the mission were conducting an industry Member support mission in this area, however, the team noted:

- The plant presented a corporate guide on ageing management, which takes into account the IAEA Safety Standards, however this guide is not yet implemented at the plant.
- Though the plant recognized the potential gap in ageing management with respect to IAEA Safety Standard, the plant programmes and activities are not coordinated by an overarching ageing management programme.
- The plant has not reviewed that the ageing related programmes and activities meet the 9 attributes of an effective ageing management programme.
- The plant health committee follows up and evaluates the individual plant programmes that are relevant for ageing management, however, the overall ageing management approach is not a separate topic on its agenda.
- The latest periodic safety review (PSR) conducted in 2017 issued 5 category B actions (Safety significant issue). One action within Safety factor 4 Ageing, covering the implementation of preventive maintenance on critical spare parts was closed, however the action has not been completed.
- During recent years, the plant obsolescence management programme had significantly reduced the number of obsolete spares for Single Point Vulnerability (SPV) and critical 1 components. However, to date, spares for 60 SPV and 9020 critical 1 components are left to be reviewed. The plant has not developed a plan with targets in the short or medium term to complete assessment of the remaining unevaluated components.
- On 1 January 2021, the Reactor 7 tripped due to a transformer fault. During this event the CX Diesel failed to start. The failure to start was attributed to an air leak on the AC3A and stiction on AC3B because ageing effects had not proactively been addressed.

Without comprehensive and systematic ageing management activities, plant systems, structures, and components might not fulfil their safety functions throughout the life of the plant.

Suggestion: The plant should consider improving its ageing management activities to ensure ageing of systems, structures, and components is properly managed.

IAEA Bases:

SSR 2/2 (Rev.1)

Requirement 14: Ageing management
4.50 The ageing management programme shall determine the consequences of ageing and the activities necessary to maintain the operability and reliability of structures, systems and components. The ageing management programme shall be coordinated with, and be consistent with, other relevant programmes, including the programme for periodic safety review. A systematic approach shall be taken to provide for the development, implementation and continuous improvement of ageing management programmes.

SSG.48

2.6 Effective ageing management throughout the lifetime of SSCs requires the use of a systematic approach to managing the effects of ageing that provides a framework for coordinating all activities relating to the understanding, prevention, detection, monitoring and mitigation of ageing effects on the plant's structures and components.

2.13. Ageing management programmes should be developed using a structured methodology, to ensure a consistent approach in implementing ageing management.

2.15. Where existing plant programmes are not sufficient, they should be improved or new ageing management programmes should be developed and implemented.

2.18 Effective ageing management is in practice accomplished by coordinating existing plant programmes and processes (or elements thereof that are relevant to ageing), as well as external activities such as research and development, and by implementing, coordinating or taking credit for other specific actions.

2.24 The effectiveness of ageing management should be periodically reviewed to maintain plant safety and to ensure feedback and continuous improvement.

2.25 Nuclear power plant safety can be impaired if the obsolescence of SSCs is not identified in advance and corrective actions are not taken before the associated decrease in the reliability or availability of SSCs occurs.

Plant Response/Action:

In response to the OSART suggestion that the plant should consider improving its ageing management activities to ensure ageing of systems, structures, and components is properly managed

Root cause:

The plant had not implemented fully the requirements of BEG/GN/DAO/001 (EDF Guide for Ageing Management Arrangements) and was unclear how the activities performed under separate processes Maintain Design Integrity, Equipment Reliability Process and Technical Governance contributed to the adherence to the Ageing Management Arrangements. While plant staff were actively engaged in ageing management activities, they often did not recognise that their activities were involved in ageing management.

Actions performed:

The plant has taken steps to improve awareness and reinforce ageing management activities across the site by –

- Production of Management Control Procedure: - MCP 031 AGEING MANAGEMENT AT HEYSHAM 2 to define ageing management arrangements for site
- Deployed Ageing Management Awareness training to all engineering support personnel to embed arrangements and make connections with everyday processes used on site.
- Introduction of Ageing Management health monitoring in key station forum meetings such as the Plant Health Committee, and Equipment Reliability and Operational Focus Delivery Team (EROFDT)
- Regular cadence of Station comms to staff on Ageing Management activities

– Improvements to walkdown processes to capture ageing mechanisms

Results and Effectiveness:

The steps above were sufficient to close a WANO AFI around Ageing Management which was identified during the 2021 Peer Review. The AFI was followed up in 2023 and found to be B rating- on track, and in subsequent 2025 peer review, this was closed out. The WANO review team commented station process is now robust, however should maintain close monitoring of the material condition of plant.

IAEA comments:

During the OSART mission in 2023 the operating lifetime of the plant was set to 2028. In December 2024 the operating lifetime was extended to 2030. A safety assessment was conducted based on existing processes such as lifetime asset management plans of plant systems. At the time of the OSART follow-up mission the plant was considering the possibility to further extend its lifetime beyond 2030.

The suggestion was reviewed by the plant, and an action plan was developed to address the issue. As part of the action plan an initial fleet workshop was held where the corporate guide on ageing management was reviewed, which takes into account the IAEA Safety Standards. As an input to this workshop, the result from an external expert support mission regarding ageing management was included. The plant stated that the workshop concluded that the current processes were adequate to support a comprehensive ageing management programme, however gaps in performance were identified which formed the action plan.

There was no documented assessment made to directly evaluate that the plant's ageing management programme meets the IAEA safety standards, and to demonstrate that the ageing management related programmes meet the 9 attributes of an effective ageing management programme. The plant concluded that there was no need to reassess the plant ageing management activities as they were considered implemented through the existing comprehensive management system. The plant ageing management activities are primarily driven through Maintain Design Integrity, Equipment Reliability and Technical Governance processes in accordance with corporate guides.

The plant has improved awareness and reinforced ageing management activities across the site as follows:

- A plant procedure, MCP 031 AGEING MANAGEMENT AT HEYSHAM 2, was developed to define ageing management arrangements at the plant. To enhance the awareness an Ageing Management training for all engineering support personnel was deployed and improvements have been implemented in plant walkdown processes to capture degradation mechanisms.
- In the area of obsolescence management, the plant has focused on plant obsolescence top risks finding solutions for proactive implementation. A significant turnover including mitigation of the plant's five high risk items was made during 2024. Since the OSART mission in 2023 the plant has resolved several components including those related to SPVs. By the time of the follow up mission the amount of unsolved components had decreased to 47 SPV and 5349 critical 1 components. A plan has been developed with a focus to deliver solutions based on the plant's top obsolescence risk and this plan was included in the business plan.

Despite the actions taken in the area and the positive results that could be observed, the plant still has challenges due to ageing (e.g. material conditions, leakages) and has not demonstrated that its ageing management related programmes directly meet the 9 attributes of an effective ageing management programme defined in the IAEA standard.

Conclusion: Insufficient progress to date.

5.6. SURVEILLANCE PROGRAMME

5.6 (1) Issue: The equipment reliability programme is not always effective to prevent abnormal conditions.

The plant equipment reliability programme has comprehensive governance and oversight forums, such as plant health committee and system review boards, with the overall purpose to proactively enhance the reliability of plant equipment, however, the team noted:

- The system health of several important systems indicated red (unacceptable) and amber (needs improvement) status due in part, to a high number of equipment deficiencies in the plant physical condition metrics. For example, the refuelling machine, primary circuit sampling system, and emergency diesel generators.
- The cumulative effect on plant equipment reliability due to the total amount of deficiencies has not been assessed. The total amount of work requests at the plant was 6952 at the time of the mission and was categorized as follows:
  - 446 corrective and deficient (non-outage);
  - 336 corrective and deficient (awaiting an appropriate plant outage to address);
  - 2429 low significance deficient, 226 are on ‘criticality 1’ components;
  - 3741 other work requests, 611 on ‘criticality 1’ components.
- The system health indicator programme (SHIP) contains many indicators, one of which is system walkdowns. The system health walkdowns conducted for emergency diesel generators did not record any leaks in the feedback form, however, several important leaks around the different emergency diesel engines were observed by the review team and the diesel CY had to be taken out of service for deep cleaning before Maintenance Schedule (MS) surveillance test could be conducted.
- In October 2023, 144 Maintenance Schedule tasks (MS) had passed the maximum grace period. 83 MSs were in the second half of grace while the plant key performance indicator (KPI) targets less than 50. In September 2022 the total number of deferrals was 85 and it was concluded that 38% of the deferrals were due to equipment reliability issues causing the plant to remain out of service when the maintenance was due. When the MS related plant is unavailable, it may challenge the safety redundancy margins.
- Since 2021 there has been 4reheater leaks across both reactor units which challenge system performance and require chemistry programme mitigations.
- A technical review based on interviews was undertaken of effects on plant equipment reliability from the new outage cycle (‘new rhythm’). Although the plant remained within its safety case, the level of rigour applied to this review was inconsistent across the engineering functions which resulted in some unanticipated equipment reliability issues as a result of the increased number of outages.
- On 6 September 2022, an event occurred causing a bulk moisture filter unavailability leading to short duration technical specification limiting condition of operation. The direct cause was the increased carbon deposition on bulk moisture system filters and the root cause was related to the changed outage frequency and that the preventive maintenance frequency had not been changed to match the change in outage frequency.
- The plant has experienced problems with control rod relay failures due to ageing in service. With the new refuelling outage cycle, these failures have been occurring more often owing

to more regular demands on the control rods. The Operational Safety Review Committee commissioned a review of startup issues which showed that in the period considered, there were seventeen control rod freeze faults, 70% of which were related to relay failures. During start-up the reactor is operated in manual reactivity control, and rod freeze faults challenge the operations staff due to control rod relay reliability. On 27 January 2022, a minor reactivity transient event occurred during startup due to a rod relay fault. The plant has implemented changes to the relay maintenance programme as a result of this OPEX report.

Without an effective equipment reliability programme abnormal plant conditions can challenge safe plant operation.

Recommendation: The plant should improve the equipment reliability programme to prevent abnormal plant conditions.

IAEA Bases:

SSR 2/2 (Rev.1)

Requirement 31: Maintenance, testing, surveillance and inspection programmes
The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented.

8.2. The operating organization shall establish surveillance programmes for ensuring compliance with established operational limits and conditions and for detecting and correcting any abnormal condition before it can give rise to significant consequences for safety.

8.5. The frequency of maintenance, testing, surveillance and inspection of individual structures, systems and components shall be determined on the basis of:
a) The importance to safety of the structures, systems and components, with insights from probabilistic safety assessment taken into account;
b) Their reliability in, and availability for, operation;

8.6 A comprehensive and structured approach to identifying failure scenarios shall be taken to ensure the proper management of maintenance activities, using methods of probabilistic safety analysis as appropriate.

8.8 A comprehensive work planning and control system shall be implemented to ensure that work for purposes of maintenance, testing, surveillance and inspection is properly authorized, is carried out safely and is documented in accordance with established procedures.

8.12 A management system for managing and correcting deficiencies shall be established and shall be used to ensure that operating personnel are not overly burdened. This system shall also ensure that safety at the plant is not compromised by the cumulative effects of these deficiencies.

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2.27 MTSI activities should be planned and coordinated effectively.
5.13 This work planning and control system should also ensure that the concept of defence in

depth is applied (see para. 3.3) and that MTSI activities are properly scheduled and can be completed (by either plant personnel or contractors) in a timely manner. The work planning system should also ensure adequate availability and reliability of SSCs important to safety.

5.15 Waivers or deferrals of scheduled MTSI activities should be minimized. Such waivers or deferrals should only be authorized if justified by plant conditions and after an appropriate review of the effects on plant safety has been performed.

5.19 An appropriate system to manage and control backlogs of MTSI activities should be established to ensure that there are no adverse effects on the safety of the plant and that a backlog due to a lack of resources does not develop.

10.10 The frequency of inspections at a nuclear power plant should be chosen on the basis of conservative assumptions to ensure that any degradation of SSCs is detected before it can lead to failure.

Plant Response/Action:

In response to the OSART recommendation to improve the equipment reliability programme to prevent abnormal plant conditions, this recommendation addressed two key points around Material Condition of the plant (defect backlog) and monitoring/traction on long-standing plant health issues.

Root cause:

The cause identified for the defect backlog was that the delivery of the work management process was ineffective due to poor process adherence across the site, leading to unstable plans and inefficient work delivery. This was a conclusion from a Significant Adverse Condition Investigation (CR 1388934) which was performed into this area.

The cause identified for the Monitoring/traction on long-standing plant health issues was that there is a tolerance for degraded plant state and prioritisation of short-term fixes over root cause analysis. Engineering had aligned with Operational push for prompt resolution to maintain plant availability rather than taking a holistic view of risks associated with plant health and prioritised accordingly.

Actions Taken:

Material Condition Improvements:

- Significant Adverse Condition Investigation into the Management of Work process; with enhancements made with WANO Enhanced Performance Monitoring (ePM).
- Management of Work (MoW) GDAR action plan produced and driven to close the gap of lack of adherence to the MoW process.
- MoW Board established to provide governance and oversight of the MoW process and improvement actions.
- A focussed Leaks Task Team established.
- Walkdown process improved and embedded in 100-day Station level business plans.
- Targeted actions to reduce critical Preventative Maintenance (PM) backlog.

Monitoring & Long-Term Issue Resolution:

- Equipment Reliability and Operational Focus Team weekly meeting reviews and track trends.
- Engineering presence strengthened in Daily Station Focus meetings and Work week Planning Scope Control meetings
- Improvements across Management of Engineering Programmes:
  - Equipment Reliability Reviews, Pressure System Safety Regulation (PSSR) compliance, Risk Management, Technical Governance, Corrosion, Obsolescence and Walkdowns.
  - New tools and procedures introduced (OneRisk risk management, Ageing Management MCP).

Results and Effectiveness:

In terms of material condition improvements, the plant has reduced the number high risk defects, and weekly prioritisation reviews are in place for those. PM Catalogue improvements underway to balance proactive/reactive maintenance. Walkdowns have highlighted and reduced the cumulative risk from low level defects (e.g. Make Up Water Treatment Plant fuse board corrosion, switchgear heater failures).

The monitoring & long-term issue resolution:

- Programme metrics show strong improvement:
  - Technical governance compliance rose from 80% (2023) to 98% (2025).
  - Risk management improved from 100+ unreviewed risks to <10.
- Unplanned Technical specification Action Condition entries have declined year-on-year since 2023.

The actions above were sufficient to close an AFI from 2021 WANO Peer Review rated ‘B – On Track’ in 2023 and closed out in 2025 peer review.

IAEA comments:

In response to the OSART recommendation the plant addressed two main areas for improvements: ineffective work management process and monitoring of long-standing plant health issues.

A Significant Adverse Condition Investigation was performed to find causes within the work management process and several actions were proposed. Most of the actions from the improvement programme have been implemented before the OSART follow-up mission, while 3 were still in progress and planned to be completed in 2026. The programme also included actions such as improved cross functional walkdown process and targeted actions to reduce the critical preventative maintenance backlog.

Regarding the area of monitoring long-term issues, the plant concluded that there was a tolerance for degraded plant state and prioritization of short-term fixes rather than taking a holistic view of risks associated with plant health and prioritizing them accordingly. Actions included development of new tools and procedures to handle risk and at the time of the OSART follow-up mission there were no overdue actions of risk mitigation.

The team noted that the overall amount of defects had decreased since 2024 and there was a positive trend, however, the physical condition was still an outstanding challenge for the plant and was the main driver for systems health indicator status.

The total amount of work requests at the plant during the OSART follow-up mission was 6175 and was categorized as follows:

- 289 corrective and deficient (non-outage);
- 231 corrective and deficient (awaiting an appropriate plant outage to address);
- 2942 low significance deficient, 275 are on ‘criticality 1’ components;
- 2713 other work requests, 352 on ‘criticality 1’ components.

The total amount of oil leaks had increased to 127 and during a field visit at the emergency diesel generator AY, several leaks were observed and the system health report concluded a deep cleaning was necessary.

Performance indicators related to management of work for both preventive maintenance and maintenance schedule tasks in the second half of grace showed red status.

The team concluded that the plant had implemented a number of actions which had resulted in improvements in this area. However, more time and efforts are still needed to fully resolve the issue.

Conclusion: Satisfactory progress to date.

5.7. PLANT MODIFICATION SYSTEM

5.7 (a) Good practice: Electronic Laptop Lockers and Key Storage

The plant Electronic Key Management System has been deployed for plant access laptops, keys, and USB removable media across the site to ensure mitigations are in place for all plant programmable equipment. The system ensures that only authorized people have access to areas and equipment important to safety, for example, when hardware or software of plant computer systems is modified. The lockers are also used in the central control room where the Electronic Key Management System contains electronic tablets. During events that could result in loss of control room instrumentation, operators can access the tablet and connect them to installed connections points from which they can monitor key plant parameters.

The Electronic Key Management System lockers use fingerprint technology to authenticate users to retrieve their key, media or laptop. The system can be configured with built in charging and a Radio-Frequency Identification device tracking if required.

Figure 5.1: Laptop lockers using Electronic Key Management System

5.7 (1) Issue: Plant modifications are not always fully completed and reviewed in a timely manner to maintain effective plant configuration control.

The team noted the following:

- The plant target for closing plant modifications (including to complete all documentation changes associated with the modification) is less than 6 months after implementation, and the plant target is to have less than five open modifications to be green. The current number is eighteen, which is red (criteria for red is >10) and the number has been slightly increasing during 2023.
- In the period between April to September 2023 there were 55 (33% of total) plant modifications open after implementation, several of these are due to documentation backlog that have not been finalized, such as maintenance procedures and drawings.
- In recent years, an increasing trend of plant configuration events has occurred. For example, in September 2022 the major air ingress prevention was not available due to plant configuration error and the root cause was due to insufficient details in operation return to service procedure. On 1 March 2023 the plant discovered that a plant modification had not updated the maintenance procedure for the gas circulator variable frequency converter.
- On 25 June 2023 it was discovered that a plant modification on the unit 8 decay heat system had failed to add new steam traps onto the operations plant check sheet which led to possible risk of damage to the plant or the personnel.
- On 26 June 2023 it was discovered that a plant modification had missed updates to the operational reactor startup check sheet for return to service. Operating experience from plant modifications is used during refresher training. However, there are no formal trends and learning cycle related to engineering change shortfalls. Post-job debriefings (PJDs) are not routinely used within the engineering change process.

Without fully and timely completing and reviewing plant modifications, safety system, structures and components and their operation could be compromised.

Suggestion: The plant should consider fully and timely completing and reviewing plant modifications to ensure that the plant configuration is always up to date.

IAEA Bases:

GSR Part 2

Requirement 8:
The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use.

4.18. Revisions to documents shall be controlled, reviewed and recorded. Revised documents shall be subject to the same level of approval as the initial documents.

4.32. Each process or activity that could have implications for safety shall be carried out under controlled conditions, by means of following readily understood, approved and current procedures, instructions and drawings.

SSR 2/2 (Rev.1)

Requirement 10: Control of plant configuration
4.38. Controls on plant configuration shall ensure that changes to the plant and its safety related systems are properly identified, screened, designed, evaluated, implemented and recorded.

Requirement 11: Management of modifications
4.40 Modification control, in compliance with the requirements set out in SSR-2/1 [2], shall ensure the proper design, safety assessment and review, control, implementation and testing of all permanent and temporary modifications.

4.42 The plant management shall establish a system for modification control to ensure that plans, documents and computer programs are revised in accordance with modifications.

4.43 Before commissioning a modified plant or putting the plant back into operation after modifications, personnel shall be trained, as appropriate, and all relevant documents necessary for plant operation shall be updated.

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4.27 Consistency is required between modifications, design requirements and plant documentation (see Requirement 10 and para. 4.38 of SSR-2/2 (Rev. 1) [1]). When modifications are made to structures, systems and components or process software, the relevant plant documentation should be modified accordingly.

4.28 Configuration management should also be used to ensure that the implementation of the modification is in accordance with the design requirements as established in the design documentation.

7.16 The final approval of modifications before routine operation should be based on the successful completion of the commissioning tests and verification that the information and experience obtained confirms compliance with regard to the design.

Plant Response/Action:

The plant has closely monitored KPIs relating to Maintain Design Integrity since the OSART visit, and since February 2024, the plant has had 5 (currently 3 in August 2025) ECs at modified greater than 6 months meaning our MDI (Maintain design Integrity) KPI has been measured as green. Note, that as of August 2025, our total number of ECs at the status of modified is currently at 17.

When OSART reviewed the data in October 2023, Heysham 2 had 18 ECs greater than 6 months old and 55 total ECs at modified. Therefore Heysham 2 are in a much better position with regards configuration control, routines, spares, documentation, etc.

Root cause identification:

An organisational tolerance at the time of the OSART visit to delayed closure of modifications through the process.

Actions Performed:

The improvement has been achieved and maintained by:

- A weekly review of every Engineering change (EC) at modified by the Design Engineering (DE) team.
- Reinforcement that ECs cannot be approved until the documents, routine amendments, work order cards are at the appropriate status. Unless there is a valid reason noted in the Responsible Engineer (RE) milestone.
- Employing a Close Out Engineer whose role is to look at all ECs, including those at active /modified to assist the engineers in completing documentation in a timely manner.
- The engineering restructure and therefore increase of resource in Design Engineering has enabled us to train the team to become REs. This is allowing DE to be the RE for the majority of ECs ensuring that the correct standards are set from the start of a proposal, resulting in early closure once the modification is realised on plant.
- Additionally, we employ a Maintain Design Integrity (MDI) support engineer who tracks and assists with progression of ECs at all statuses on a weekly basis.

The 3 remaining ECs which have been modified for over 6 months have been difficult to close, due to their complexity but now have actions in play to close them. By the end of the year 2025 the aim is to have this down to 2 ECs at modified greater than 6 months.

Results and Effectiveness:

The plant Key Performance Indicators (KPIs) relating to Maintain Design Integrity have improved significantly since the OSART mission. The plant has 3 ECs at modified greater than 6 months resulting in the MDI (Maintain design Integrity) KPI has been measured as green. Note, that as of August 2025, our total number of ECs at the status of modified is currently at 17.

As the number of ECs at Modified has been significantly reduced and is maintained at a low level by the Design Engineering team it is judged by the plant that this suggestion is resolved.

IAEA comments:

The plant performed a review to determine why modifications were not always fully completed and reviewed in a timely manner and concluded that there was an organizational tolerance to delayed closure of modifications through the process.

Actions were taken directly after the mission which included reinforcement of plant expectations, appointing a responsible engineer to track and assist with progression of modifications of all statuses and implementation of a weekly review by the design engineering team.

In February 2024, the plant had reduced the number of delayed closure of modifications to meet plant expectations. For the last 24 months the plant had 5 modifications that were more than 6 months old and the current number during the OSART follow-up mission was 4. The trend has been stable since these actions were implemented. For the modifications that were delayed, a justification had been made, and actions were taken to close them.

Conclusion: Issue resolved.

6. OPERATING EXPERIENCE FEEDBACK

6.2. THE MANAGEMENT SYSTEM AND THE ROLE OF MANAGEMENT

The plant has decided to split its well-established Organizational Learning Challenge Board (OLCB) into two parts: one proactive focused on learning and organized monthly, and one reactive, focused on events and organized weekly. Clear distinction between reactive and proactive OLCB provides dedicated time to review the proactive learning activities such as cross-functional self-assessments, benchmarks, trend reports, health of the organisational learning programmes, fleet learning, etc. Proactive OLCB also provides a forum for examining the potential risk of events before they occur, enabling a proactive response where necessary. The team identified this as good performance.

6.4. SCREENING

The team observed that the screening and prioritization process of the plant does not always ensure that events are evaluated on their actual or potential consequences for safety. Event priorities are not always assigned in accordance with the process check sheet and Condition Reports are sometimes closed and fed into trending without clear evidence of actions taken or planned. The team made a suggestion in this area.

6.8. COMMUNICATION: USE, DISSEMINATION AND EXCHANGE OF INFORMATION

The team observed that the plant has established several formats of Operating Experience (OPEX) information. One of them is an outage OPEX package, bringing Just-In-Time information for outage milestones and different mode changes like re-pressurization and purging CO2, reactor blowdown, purge to air, etc. This outage OPEX package is produced to heighten awareness to unique configurations and events that have happened across the fleet during previous outages. The team identified this as good performance.

DETAILED OPERATING EXPERIENCE FINDINGS

6.4 SCREENING

6.4 (1) Issue: The screening and prioritization process does not always ensure that events are evaluated on their actual or potential consequences.

The team noted the following:

- The screening and prioritization flowchart described in Appendix D of the plant procedure “Organizational Learning Process, Site Screening” does not clearly reflect potential risk and safety significance. Appendix D, Table D1 of the procedure contains additional considerations for condition report prioritization guidance but is not aligned with the flowchart. For example, Table D1 describes priority 4 (P4) as applicable for low level events which, individually, are without significant actual or potential consequences. However, the flowchart in appendix D shows P4 as being an event which the plant accepts to reoccur.
- A condition report (CR 1186739) related to excessive standing oil in a pit underneath the diesel generator BY was prioritized as P4. The condition report was raised in June 2020. Work order to repair the leak was originally scheduled to be completed in July 2022, later changed to 2021 as a repair two years after the identification of the defects was identified as unacceptable. This condition report was an example of elevated fire risk on a plant system with high safety importance, but this was not reflected in the event prioritization or in repair planning.
- A condition report (CR 1281009) from July 2022 related to management of stator water chemistry alarms was assigned P4 instead of P3. The CR states that several alarms were set incorrectly, several alarms did not reflect the latest specification and there was potential to operate outside of permitted ranges without initiation of an alarm. Specific actions were proposed in the CR by the originator, such as how to set the alarms and their required values. When screened the CR was closed and fed into plant trending only. The CR was closed without clear supporting evidence. There is a cross-referenced CR which details actions relating to procedures but not physical plant changes.
- A sample of NPE30B events (discovery that non-safety related plant is in an inappropriate configuration or duty) was screened. The condition report prioritization guidance gives a typical priority of P3 for such events. Thirty-one out of forty-four between 2022 and 2023 were prioritized as P4 instead of P3 based on the guidance. Only thirteen of these condition reports were prioritized as P3.

Without proper event screening and prioritization, events may not be investigated and addressed commensurate with their significance to prevent recurrence.

Suggestion: The plant should consider improving its screening and prioritization of plant events to prevent recurrence.

IAEA Bases:

SSR-2/2 (Rev. 1)

5.28 Events with safety implications shall be investigated in accordance with their actual or potential significance. Events with significant implications for safety shall be investigated to identify their direct and root causes, including causes relating to equipment design, operation and maintenance, or to human and organizational factors. The results of such analyses shall be included, as appropriate, in relevant training programmes and shall be used in reviewing procedures and instructions. Plant event reports and non-radiation-related accident reports shall identify tasks for which inadequate training may be contributing to equipment damage, excessive unavailability of equipment, the need for unscheduled maintenance work, the need for repetition of work, unsafe practices or lack of adherence to approved procedures.

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2.31 In order to apply a graded approach to operating experience, identified issues should be screened in a timely manner to evaluate their significance on the basis of their actual or potential consequences for safety. Written guidance with established criteria for significance should be used for the screening process. The screening process should determine the type of investigation or level of analysis for all reported issues, and necessary compensating or mitigating actions should be initiated commensurate with the significance of the issues.

2.33 Screening criteria should include the actual or potential consequences of reported issues for nuclear safety, radiation protection, protection of the environment and non-radiation-related safety.

2.35 Screening should include identifying and prioritizing any immediate actions that might be necessary, in accordance with the safety significance and potential for recurrence of a particular issue or in accordance with the significance of a developing adverse trend.

Plant Response/Action:

In response to the OSART suggestion that the plant should consider enhancing its practice for event prioritisation, therefore ensuring that appropriate learning is taken from the event to prevent recurrence, considering both the actual event but also any potential consequences that could have occurred.

Root cause identification:

Performance Improvement (PI) together with Central Fleet Managers and the station's WANO ePM and Peer Review counterparts reviewed the finding examples as found by OSART as well as further facts identified during the plant's 4-yearly peer review to determine the main causes and contributors. These can be summarised as:

– The station's mindset had become overly focussed on identifying and resolving the cause of the event, rather than seeking to answer: "What is the learning from the event?" This mindset had contributed to some investigations being prioritised based on their actual consequence rather than also considering their potential consequence. This has led in some cases to under-scoping the investigation and/or superficial corrective actions.
– Poor or incomplete scope selection for investigations which can result in equipment investigations that are too narrowly focused and miss underlying, systemic or broader issues, such as what if circumstances had been different, would the outcome have been more serious? The guidance for investigations does not clearly specify what should be included for extent of condition. The Organisational Learning Challenge Board (OLCB) was not always making explicit reference back to the terms of reference to check they had been fully addressed.
– In examples where the direct cause of the event or issue has been external to station control, focus has been on the equipment failure, rather than the station's response to this external factor.

– Lack of a more holistic regular monitoring of the overall health of the Organisational Learning programme. A focus on the Response to Significant Event Index (RSEI) performance indicator, which emphasizes timeliness and closure, rather than the quality and effectiveness of investigations can create a false sense of progress while masking deeper issues in the learning process. An example finding could be that the application of the organisational learning programme rarely addresses process performance gaps as the requirement is not specified within the company specification.

Actions Performed:

To address the station's mindset around consideration of the wider consequences from events (cause 1):

- PI have made improvements to the investigation Pre-Job Brief process, providing Sponsoring Managers with standard templates/additional guidance when drafting Terms of Reference and providing Investigation leads with thorough support and guidance as they conduct their findings.
- An enabling action to restructure the Departmental Screening Meetings (DSMs) has been introduced. These meetings are now held on Tuesdays and Thursdays, providing stakeholders with additional time to review the meeting packs and ensure wider scope of events has been fully considered, as well as allowing the CAP team more time to process the Condition Reports (CRs) to better manage Organisational Learning (OL) health (cause 3).

To address scope selection and review of the extent of condition/terms of reference for investigations (cause 2):

- The OLCB agenda pack and presentation material has been enhanced to ensure Investigations are presented in a more structured format, including opportunities and guidance for challenge by attendees at the meeting and a formal review of Terms of Reference adherence.

To address the monitoring of the overall health of the Organisational Learning programme (cause 3):

- PI have assessed Organisational Learning health using the fleet KPI Dashboard, identifying prioritisation as a key improvement area. Completed actions include a cross-functional OL Investigation Tracker to enhance investigation performance, quality control and prioritisation clarity and departmental Action Trackers to improve assignment quality and management.
- A frequent health check is carried out by the CAP Coordinator to ensure consistency and presented to station management through OLCB. This takes the form of a monthly OL Dashboard review and annual Self-Assessment into OL Dashboard metrics.
- PI have amended the format and structure of the biannual Station Trend Report from previous iterations, making the report more concise and focussed on a much more holistic overview of station performance.

Additionally, to address other areas for improvement within Performance Improvement:

- A Self-Assessment addressing OSART, WANO, and the regulatory the Office of Nuclear Regulation (ONR) findings on CR prioritisation has been completed. Key actions, including role-specific training, are complete. Remaining actions will be addressed through the WANO AFI response via Performance Improvement's GDAR response.

- PI have shared the updated CR prioritisation guidance, reflecting changes to the corporate procedure 'Organizational Learning Process – Site Screening' (Appendix D), with all DSM and CR Screening stakeholders to reinforce consistent evaluation of priority levels. To support this, prompts have been incorporated into DSM packs, and reminders embedded within distribution email templates.

Several actions are planned or underway to address the identified causes, including:

- An additional weekly OL Health Meeting will be introduced to the station schedule with attendance from key stakeholders in OL and the Station Management Team, as well as Nuclear Safety Group (NSG) representation and the INA, as appropriate. This new forum will include a standing agenda item focused on prioritisation challenges, as well as a review of short-term trends and an evaluation of Terms of Reference for ongoing investigations (to address Cause 2)
- Apparent Cause Investigation (ACIN) Training is scheduled for re-introduction to the station to improve the quality of investigations and subsequent corrective actions.
- Further improvements are to be introduced to the Biannual Station Trend Report, implementing trend data from other sources outside of the CAP process.
- Improving the communication of investigation learnings is a priority, with a focus on leveraging the station communications function more effectively to ensure key messages reach a wider and more relevant audience.
- Broader awareness of the Organizational Learning (OL) Process will be enhanced through a multi-channel approach, including targeted educational communications, in-person briefings with station teams, and the launch of an online OL Hub. This hub will serve as a central resource, providing accessible information and support materials to assist stakeholders in effectively engaging with all aspects of the OL framework.
- The plant manager has initiated more discussions on CR prioritisation during Departmental Screening Meetings (DSMs). These efforts are starting to have an impact and to further strengthen and accelerate the impact the CAP Coordinator developed a set of prompts to guide prioritisation discussions. These prompts are now included in each DSM pack and embedded within the email templates used to distribute the packs.
- The fleet guidance on prioritisation has been updated. The changes aim to provide clearer guidance to support decision-making prior to screening, though they are intentionally not exhaustive for every event type.
- Further improvements are proposed in a GDAR plan that has been created by the PI dept.

Results and Effectiveness:

A check of configuration control events shows that that only 3 out of 33 CRs (9%) were classified as Priority 4 (P4). This represents an improvement compared to the initial assessment by OSART, which had 31 out of 44 CRs (70%) categorized as P4.

IAEA comments:

In the response to the OSART suggestion the plant's Performance Improvement group (PI) performed analysis of the issue related to its practice for CR screening and prioritization, including self-assessment and identified the main causes and contributors. Following the analysis, actions to address the issue were implemented including the following:

- The plant procedure "Organizational Learning Process, Site Screening" was reviewed to reflect potential risk and safety significance of the events. Additional guidance was provided in the Appendix D flowchart to highlight the actual and potential consequences with respect to event categorization;

- The sequence of actions – first investigate, then prioritise, was turned the other way round. The CRs are now prioritized before the investigation ensuring events with higher priority level receive more attention during the investigation;
- Plant's managers, who are involved in the screening and prioritization process, received additional training on the prioritization and are provided with standard templates, pre-job briefs and additional guidance prior to support and guide them as they conduct their findings;
- Emergency Controllers attending the Departmental Screening Meetings receive detailed guidance including visual aids to focus their attention on the proposed CR coding (categorisation, priority, trends, etc.);
- The plant established a new OEF stakeholder forum as of November 2025, the 'OL Oversight Meeting', attended by senior managers, aimed to challenge the prioritization of Condition Reports, records trends and re-prioritize Conditional Reports in the system. These meetings provide an additional barrier in the OEF process enhancing the overall robustness and effectiveness of the process.

All actions were completed before the end of 2025. The implemented actions impacted the overall distribution of CRs categorization compared to 2023 when the OSART team identified the issue. The overall distribution for 2023 to 2025 was as follows:

CRs by year	P1	P2	P3	P4
2023				4627
2024	5	51	237	3912
2025	7	37	356	3700

The number of CRs prioritized as P3 increased significantly since 2023 while maintaining the overall high level of reporting across the plant. The overall number of corrective actions increased from 737 (2023), 951 (2024) to 1022 (2025), while the average age of action completion remained essentially unchanged – 136 days (2023) and 128 days (2025). This demonstrates that more rigorous approach in CR screening and prioritization did not lead to extended implementation of actions.

In addition, the plant started to use Priority 1 and 2 investigations to recurring events which have not been fully resolved over extended period of time. Two examples were presented during the review:

- events related to working in heights (P1), and
- management of work process issues (P2).

By assigning higher priority to the events which did not have actual direct consequences, however with significant potential consequences, more efforts were dedicated for investigation and corrective actions.

Overall, the plant has demonstrated that the changes implemented to the OEF process resulted in more conservative CR screening and prioritization in which both the actual and potential consequences are taken into account.

Conclusion: Issue resolved.

7. RADIATION PROTECTION

7.3. RADIATION WORK CONTROL

The team identified that contamination controls at the plant are not applied effectively to ensure resilience against potential contamination events. As examples, during the OSART mission, a radiation worker was contaminated externally and internally at the plant when working on a pressure transmitter from the reactor gas coolant processing system. In addition, gaps were found related to controls applied to discrete radioactive particles without the use of adequate detectors, radiologically contaminated areas not isolated and marked correctly, inappropriate behaviour for removing personal protective equipment, inadequate practices for measuring, recording, and informing radiation workers of the existing levels of radiation and contamination. The team made a recommendation in this area.

7.4. CONTROL OF OCCUPATIONAL EXPOSURE

The team identified that the plant does not systematically optimize radiation protection processes and controls to reduce potential occupational exposure to levels as low as reasonably achievable. Some examples include the lack of a formal, integrated programme to reduce the number of hot spots in the plant, failure to use temporary shielding to mitigate hot spot dose rates, tolerance of electronic personal dosimeter (EPD) alarms since condition reports are not elevated to plant level, survey procedure not adhered to, lack of information on radiation levels and contamination on signposting, and lack of questioning attitude to promptly detect and correct abnormal conditions in radiological instrumentation. The team made a suggestion in this area.

7.5. RADIATION PROTECTION INSTRUMENTATION, PROTECTIVE CLOTHING AND FACILITIES

The plant uses an electronic system with a systematic process for managing radiological protection instruments. The process links the health physicist to the instrument to be used, the verification test performed and the results. This avoids the use of defective or uncalibrated instruments and allows traceability of use only by authorized people. The team identified this as a good performance.

It is observed that immediate traceability of all radioactive sources in use, discarded or under disposal is not always effective, and the team encouraged the plant to improve in this area.

DETAILED RADIATION PROTECTION FINDINGS

7.3. RADIATION WORK CONTROL

7.3 (1) Issue: The plant contamination controls are not effectively applied to protect against possible contamination events.

The team noted the following:

- On 12 October 2023, a radiation worker was contaminated externally and internally at the plant when working on a pressure transmitter from the reactor gas coolant processing system. The counts at the gamma detector of the whole-body contamination monitor, after the external contamination was removed, was about 460 Bq of contamination, calibrated to Co-60.
- A barricaded area contained some piping inside, and at the bottom a bag with a radiation tri-foil from the laundry. No postings or other information was visible. Later, a survey confirmed that the drain area below the bag was contaminated, and the area was set as C2.
- When exiting a contamination-controlled area an employee required help to remove his PPE for that area. Whilst doing so his shoe came off within an overshoe. This employee used his naked hand to recover the shoe from the overshoe potentially exposing it to contamination.
- During sampling the reactor coolant system:
  - Radiation protection technicians checked only for dose rates levels and did not perform a contamination check (baseline) inside the cabinet where the potentially contaminated particulate and charcoal filters are located.
  - One of the two technicians used gloves and gantlets, but the other did not. They handed over CO2 detectors between them, thus potentially cross-contaminating.
  - Contamination check was not done at the cabinet to ensure no residual external contamination remained on the equipment.
- During work inside room R4:
  - The radiation protection technician made a survey for radiation and contamination, before allowing the work to start. The radiation protection technician did not inform the workers of the detail of the measured dose rates and results of the contamination control; he only gave a thumbs up. The technician did not record the survey results and the plant said he would create a survey map later, by keeping the information in his memory.
  - The housekeeping standards at the area (dirt on the floor) are not suitable to prevent spread of contamination.
- The contamination control programme mandates routine survey for the hot laundry once a week. After daily hot laundry operation, experienced workers survey for contamination, sometime finding positive counts, and clean the facility. This is not captured in the current contamination control programme and the daily surveys are not recorded.
- There is no gamma detector or frisker at the whole body contamination monitor at the drinking water station facility inside the reactor building. The contamination control is made only by using a whole body contamination monitor for alpha/beta radiation in that place, therefore hot particles or discrete radioactive particles (DRPs), may remain unnoticed. DRPs are very difficult to detect and could be easily shielded, and large area detectors are not suitable to detect a DRP.

Without effective application of contamination controls the plant may not protect against personal contamination events that could lead to significant skin or committed doses.

Recommendation: The plant should improve its application of contamination controls.

IAEA Bases:

GSR Part 3

3.76. Employers, registrants and licensees shall ensure, for all workers engaged in activities in which they are or could be subject to occupational exposure, that:
(g) Appropriate monitoring equipment and personal protective equipment is provided and arrangements are made for its proper use, calibration, testing and maintenance;

3.90. Registrants and licensees:
(a) Shall delineate controlled areas by physical means or, where this is not reasonably practicable, by some other suitable means.
[…]
(c) Shall display the symbol recommended by the International Organization for Standardization [16] and shall display instructions at access points to and at appropriate locations within controlled areas.
(g) Shall provide, as appropriate, at exits from controlled areas:
(i) Equipment for monitoring for contamination of skin and clothing;
(ii) Equipment for monitoring for contamination of any objects or material being removed from the area;
[…]
(i) Shall provide appropriate information, instruction and training for persons working in controlled areas.

3.94. Employers, registrants and licensees, in consultation with workers, or through their representatives where appropriate:
(c) Shall make the local rules and procedures and the measures for protection and safety known to those workers to whom they apply and to other persons who may be affected by them; [...]

3.97. The type and frequency of workplace monitoring:
(a) Shall be sufficient to enable:
(i) Evaluation of the radiological conditions in all workplaces; […]

3.101. For any worker who regularly works in a supervised area or who enters a controlled area only occasionally, the occupational exposure shall be assessed on the basis of the results of workplace monitoring or individual monitoring, as appropriate.

3.102. Employers shall ensure that workers who could be subject to exposure due to contamination are identified, including workers who use respiratory protective equipment. Employers shall arrange for appropriate monitoring to the extent necessary to demonstrate the effectiveness of the measures for protection and safety and to assess intakes of radionuclides and the committed effective doses.

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3.96. For each task that needs special radiological precautions to be taken, a radiation work permit should normally be prepared. The radiation work permit is issued by the persons in charge of the planning of the operations, in collaboration with the radiation protection officer. A copy of the radiation work permit should be provided to the supervisor of the work and should remain with the working team during the performance of the work. In addition to a description of the work to be performed, the radiation work permit can include:
(a) A detailed dose rate map of the working area and possible hot spots […];
(b) An estimate of contamination levels and how they could change during the course of the work; […]

3.105. The equipment to be used in the monitoring programme should be suitable for the types of radiation and the forms of radioactive material encountered in the workplace. […]

3.60. The radiation protection programme should document the following, with an appropriate level of detail: […]
(h) The arrangements for monitoring workers and the workplace, including the acquisition and maintenance of suitable instruments (see paras 3.97–3.128 and Section 7); […]
(i) The system for recording and reporting all of the relevant information relating to the control of exposures, the decisions regarding measures for occupational radiation protection and safety, and the monitoring of individuals (see paras 3.132–3.140 and Section 7) […]

7.133. The assessment of doses received by workers from exposure due to intakes of radionuclides may be based on the results of individual monitoring involving one or more of the following types of measurement:
(a) Sequential measurements of radionuclides in the whole body or in specific organs, such as the thyroid or the lung;
(b) Measurements of radionuclides in biological samples, such as excretions or breath;
(c) Measurement of activity concentrations in air samples that are collected using personal air sampling devices worn by the worker and that are representative of the air breathed by that worker.

7.141. Routine monitoring of internal exposure should be conducted on a fixed schedule for selected workers. […]

7.146. In order to determine the appropriate frequency and type of individual monitoring, the workplace exposure conditions should be characterized. The radionuclides in use and, if possible, their chemical and physical forms should be known. Consideration should also be given to the potential for these forms to change under accident conditions (e.g. the release of uranium hexafluoride into the atmosphere, resulting in the production of hydrogen fluoride gas and uranyl fluoride). The chemical form and physical form (e.g. particle size) of the material determine its behaviour in the respiratory tract and its subsequent biokinetic behaviour in the body. These in turn determine the excretion routes and rates, and hence the types of excretion sample that might need to be collected and their frequency of collection.

7.247. Situations may arise in which exposure due to hot particles is possible. This can lead to spatially non-uniform exposure from discrete radiation sources with dimensions of up to 1 mm. [...] Detection of hot particles within an ambient radiation field in a workplace can be difficult because of the very localized nature of the radiation from the particles. [...]

Plant Response/Action:

In response to identified issues surrounding Radiological Protection (RP) standards and practices, relating to contamination control a comprehensive review and improvement initiative was undertaken. The focus was on enhancing communication, work practices, and environmental conditions to ensure alignment with RP expectations and regulatory standards.

Root cause identification:

The following key areas were identified as contributing factors to the observed deficiencies:

- Communication and adherence to RP standards
- Environmental Safety Technician work practices
- Housekeeping standards
- Radiological Protection specific work practices

Actions performed:

A series of targeted actions were implemented to address the root causes and drive improvement:

- Self-assessment conducted against Contamination control RP standards to benchmark current performance.
- Re-establishment of the As Low As Reasonable Practicable (ALARP) Committee to provide governance and oversight.
- Communication of RP standards and expectations through targeted Radiation Protection Supervisor (RPS) briefings (e.g. pre-statutory outage S13R7), including the development of WELL sheets for key operational areas such as the Charge Hall.
- Enhanced communications and interventions were initiated following a small increase in radiological safety rules events at the start of the S13R7 outage. This included a novel communications campaign (Dead Ed) and enhanced Radiation Controlled Area (RCA) meet and greet.
- Integration of Contamination control standards into the S13R7 outage training package to reinforce expectations.
- RP and contamination-themed engagement during station safety weeks to raise awareness and promote best practices.
- Enhancements to plant labelling and signage, including the implementation of ‘bagging and tagging’ protocols for contaminated items.
- RCA meet and greets and enhanced empty pockets searches are being performed routinely with radiological protection engineers and security personnel.
- Targeted contamination control training for higher risk work groups, including Fuel Route Operations technicians (September – November 2025) and active laundry personnel (December 2025).
- Identification of equipment improvements, with corresponding CAP actions raised to ensure timely resolution.
- Adjustment of the Station Leaders time in the field programme to include weekly participation by an Environmental Safety Engineer (ESE) as part of the Safety Team.
- Action plan tracking facilitated through the ALARP Committee and Safety Oversight Board to ensure accountability and progress.

Results and Effectiveness:

Improvements have been made, with evidence that they have been effective. The combined personal contamination event rate remains very low and has shown improvement despite significant outage work in both the S13R7 statutory outage and recent graphite inspection and offload defueling outages. The number of radiological safety rule breaches remains low too. Pre-statutory outage training was effective for Contamination control area working and the station's robust response to RP safety rules issues early in the outage was very effective. We are incorporating operating experience from events in to training material that is currently being delivered to fuel route operations technicians. Improved RP engagement with the leaders and time in the field processes continues to drive the improvements in standards for key risk areas.

IAEA comments:

In response to identified issues the plant conducted analysis including self-assessment and proposed actions which were included in the annual RP Action Plan and in the CAP. Work practices, adherence to RP standards and housekeeping were identified as the root causes of this issue. The actions which were completed or were in advanced stage of completion during the review included the following:

- The ALARP committee was re-established in December 2024, meeting at least two times a year (there were three meetings in 2025). The meetings help to highlight the main issues related to RP at the plant senior managers level and to track actions proposed by the RP team.
- Enhancements to plant labelling and signage practices for contaminated items.
- Ad-hoc checks of workers entering the RCA area and search for items which should not be brought into the area.
- Series of trainings to increase the RP awareness and improve the practices across plant staff as well as contractors.
- Improvements in the RCA to further minimise the spread of contamination (use of hands-free telephones, phase out of fabric cushioned chairs, labelling of SPES cages);
- Communication campaign (Dead Ed) to underline the importance of RP rules for human health.
- Provision of laydown mats are provided in all permanent sub-change rooms;
- Regular surveys in the hot laundry facility are now recorded in the contamination control programme and trends are assessed.

Some of these actions were verified during the walkdown to the RCA.

The actions implemented contributed to good results achieved in 2025 including during the statutory outage in 2025. The total number of personal contamination events was decreased from 24 (2024) to 12 (2025). All 2025 statutory outage RP targets were met, and the number of radiological safety rules breaches remains low.

RP objectives and targets for 2024 and 2025 were presented during the review. The plan for 2026 was still under development. Further actions are planned to be implemented during 2026, including those in the hot laundry facility. With further actions in place the issue is expected to be resolved within 2026.

Conclusion: Satisfactory progress to date.

7.4. CONTROL OF OCCUPATIONAL EXPOSURE

7.4 (1) Issue: The plant does not systematically optimize radiation protection processes and controls to further reduce potential occupational exposure to as low as reasonably achievable level.

The team noted the following:

– There are 15 hot spots registered at the plant, varying from 400 microSv/h to 7000 microSv/h. There is no formal, integrated plan involving radiation protection, chemistry, operations, maintenance, and engineering departments to reduce the number of hot spots at the plant.
– The plant does not routinely use temporary shielding to reduce potential radiation exposure from hot spots. There is one set of lead blankets installed as temporary modification at one place for more than a year. There is no proposal for a design modification with permanent shielding, refitting piping, or other source term reduction solutions to remove the temporary shielding.
– The plant's electronic personal dosimeter (EPD) can indicate both dose and dose rate alarms. In 2023, 77 EPD alarms were recorded (from approximately 90,000 RCA entries), out of which 36 were valid alarms and the remaining 41 were considered not valid, for several reasons. There were no valid total dose alarms in the period. Out of the real dose rate alarms 22 were above 1000 microSv/h and the highest value was 6150 microSv/h.
– EPD dose rate alarms (regardless of whether it is valid or not) do not require raising a condition report or another low-level event report. Radiation protection performs an investigation of all alarms, but the information remains with radiation protection and the individual only and is reviewed at the station As Low As Reasonably Practical (ALARP) committee.
– During the review, it was observed that a Health Physicist and a Chemist checked a radiation monitor, the CO2 monitor, and the ventilation system in the emergency control centre, however none of them identified that the status (white) light was not functioning.
– The team observed that during an exercise the radiation protection technicians were unable to correlate the activity concentration (Bq/m^3) with the committed dose rate (mSv/h) in the field outside the vehicle.
– At the pipe tunnel on Unit 7, local signage identified the contact dose rates and dose rates at a distance of 0.5 m, however it was dated to October 2022, while the survey frequency required by the procedure is every 6 months.
– At the exit of the Fuel Plugging Unit (FPU) C2 area, the radiation frisker was found defective.
– At the radioactive waste separation facility, a radiation protection worker coached the supervisor not to stay close to the wall, as the dose rates were higher at that location, however there was no sign indicating the area had increased radiation level.
– The plant does not display the detailed radiation and contamination levels inside the workplaces by signposting. Surveys are made, and sign posts are applied indicating dose rate ranges in general, like C0, C2, R2, R3, R4, which are area classification, not specific levels of dose rate and contamination.
– A sign for Elevated Dose Rate gave the dose rate information required on contact as +50 microSv/h and at 0.5 m as <50 microSv/h. The actual level of radiation above 50 microSv/h was not written.
– A posting at the Radiation Controlled Area entrance gave outdated information of radiography shot to happen on 6 September 2023 (observation was done on 9 October 2023).

– The team noted that there are cases when EPDs are not returned for days after the person leaves the RCA, and if it is detected by the radiation protection team they take the required action. However, a condition report is not raised. The EPD is the sole dosimeter used for official doses at the plant.

Without systematic optimization of radiation protection processes and comprehensive occupational exposure controls the plant may impact its capacity to further reduce potential occupational exposure to as low as reasonably achievable level at the plant.

Suggestion: The plant should consider optimizing radiation protection processes and occupational exposure controls.

IAEA Bases:

GSR Part 3

3.23. Registrants and licensees shall ensure that protection and safety is optimized.

3.24. […] registrants and licensees shall ensure that all relevant factors are taken into account in a coherent way in the optimization of protection and safety […]:
(a) To determine measures for protection and safety that are optimized for the prevailing circumstances, with account taken of the available options for protection and safety as well as the nature, likelihood and magnitude of exposures;
(b) To establish criteria, on the basis of the results of the optimization, for the restriction of the likelihood and magnitudes of exposures by means of measures for preventing accidents and for mitigating the consequences of those that do occur.

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3.10. Optimization of protection and safety should be considered at all stages in the lifetime of equipment and installations, As a consequence, all situations — from design through operation to decommissioning and waste management — should be considered in the optimization procedure.

3.11. From a practical viewpoint, the requirements for optimization call for an approach that:
(a) Considers all possible actions involving the source(s) and the way workers operate with or near the source(s).
(b) Implies a 'management by objective' process with the following sequence: planning, setting objectives, monitoring, measuring performance, evaluating and analysing performance to define corrective actions, and setting new objectives.
[…]
(d) Encourages accountability, such that all parties adopt a responsible attitude to the process of eliminating unnecessary exposures.

3.16. […] The use of engineered controls should be examined carefully at this stage in defining the protection options. […] for example, where there is a potential for workers to receive a significant dose to the lens of the eye, attention should be paid to the installation of fixed shielding […] At this stage, the content and the scale of the optimization process will depend on the situation. […] For nuclear facilities, situations are more complicated, and a structured approach should be followed as part of the radiation protection programme, […]

Plant Response/Action:

In response to the suggestion regarding optimising radiation protection processes and occupational exposure controls a comprehensive review and improvement initiative was undertaken.

Root cause identification:

- Arrangements for management of hot spots and Electronic Personal Dosimeter (EPD) alarms was not adequately documented.
- RP standards and expectations (signage) required improvement.
- Radioactive waste management arrangements can impact dose rates in surrounding areas.
- Provision of routine survey information could be improved in some areas.

Actions Performed:

- A review of hot spot arrangements, including identification, tracking, decision making and remedial actions has been completed, and local station documentation updates were identified to provide clarity.
- Hot spot labels have been reviewed and labels confirmed up to date, standards for updating information have been reinforced with Environmental Safety Technicians.
- A review of the other sites where non genuine EPD alarms are tracked it concluded there was no additional benefit in raising a CR for non-genuine events as any associated trending would be misleading.
- The indication on the ECC H&V recirculation panel has been repaired.
- Signage at monitoring locations has been amended to inform personnel where the nearest alternative monitoring location is in the event that the equipment is unavailable.
- Radioactive waste management facilities have been reviewed and changes made to how and where we store higher dose rate wastes. This has significantly reduced the potential for creating elevated dose rates in adjacent areas.
- Management of radiation exposure through the use of dose contour maps has been reviewed. Higher dose rate areas (R3, R4) require initial surveys prior to work taking place therefore workers are informed of areas to avoid prior to entry. A review of R2 areas has been completed and routine survey information is now being posted in key areas where enhancement to ALARP arrangements could be made (charge-hall; GCMW; FPU and PWTP).

Actions to be completed:

- local station documentation updates need to be completed and approved.
- Update routine survey programme MCP to require surveys to be posted in key areas (see above).

Results and Effectiveness:

A review of hot spot management has shown that our arrangements are generally effective. These standards and expectations of technicians performing routine surveys needs to be reinforced so as to prevent drift. There has been one dose rate alarm this year due to movement of a barrier, which inadvertently allowed closer access to a hot spot. Barrier arrangements have been reviewed and in areas where such an event could occur and fixed barriers are now in place which cannot be moved inadvertently.

Routine surveys demonstrate that dose rates outside of radioactive waste storage areas are no longer impacted by activities in the processing facility.

IAEA comments:

In response to the issue the plant conducted an analysis including a self-assessment and proposed actions which were included in the annual RP Action Plan and in the CAP. Arrangements for management of hot spots and EPD alarms, RP standards and expectations, radioactive waste storage arrangements and the provision of routine survey information were identified as the main causes of this issue. The actions which were completed or were in advanced stage of completion during the review included the following:

- The monthly monitoring of plant's hot spots was improved by providing more detail information in the survey record sheets. Few additional hot spots were identified and properly labelled. Efforts are ongoing to explore options for the reduction of the total number of hot spots.
- Non-genuine EPD alarms are recorded in a database.
- The indication on the ECC H&V recirculation panel has been repaired.
- Some of the solid radioactive waste in the radwaste separation facility has been relocated to areas where it does not cause radiation risk to the personnel passing on the other side of the wall.
- Routine survey information of R2 areas is being posted in key areas.
- Improvements in the design of temporary shielding (transportable on wheels).

During the walkdown to the RCA some of these improvements were demonstrated. In the charge hall of Reactor 7 one place with elevated dose rate sign was found with an outdated label (from November 2023). Routine radiation survey protocol for this place has been provided from January 2026.

The plant continues to work on the radiation protection optimization, and further actions are planned for 2026, including the reduction of plant hot spots and the management of EPD alarms. From the discussion with counterparts, from the evidence provided and from the observations made is clear that effective actions have been taken including root cause determination to resolve this issue.

Conclusion: Satisfactory progress to date.

8. CHEMISTRY

8.1. ORGANIZATION AND FUNCTIONS

The chemistry staff start their day with a morning meeting, where the actual plant status is described, and where the critical steps of the work planned for the day are identified. The staff report anomalies that present a risk and other low-level deviations that were experienced during the previous day. These reports are collected in a database and reviewed by the team twice a week in order to decide whether further action is required. This process drives the staff to look for deviations, safety issues, or process anomalies in the plant with a view to dealing with them before they become more significant. Preventing low level events from becoming significant enhances nuclear safety in the plant. The team identified this as a good performance in this area.

8.2 CHEMISTRY PROGRAMME

The objective of the chemistry programme is to preserve the integrity and availability of systems, structures and components. The plant has implemented chemistry regimes for each circuit according to the construction materials. Operating experience from other plants is included as relevant. However, the team found some control parameters to be in short or long term action levels, mainly due to leakages. The findings were included in the relevant issues in the areas of Maintenance and Technical Support.

To avoid detrimental effects of corrosion during longer shutdowns, systems, structures and components need to be preserved. The plant has developed preservation metrics that facilitates close monitoring of the status. The team identified this as a good practice.

The major discharges of radioactive liquid effluents from the radiation-controlled area are properly collected and controlled prior to discharge. In conformity with the license conditions, there are minor drains that are periodically sampled and analyzed, however, they are not collected and analyzed prior to release; these drains are pumped automatically to the sea. The team encouraged the plant to review this practice.

8.3. MANAGEMENT OF CHEMISTRY DATA

The plant uses several spreadsheets for calculating relevant quantities, e.g. the risk of stress corrosion cracking depending on chemical values. Such spreadsheets are either provided and approved by corporate or written and approved by the plant, but these were not write-protected to avoid unintended changes. The team encouraged the plant to improve the control of these spreadsheets.

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

The team observed Shortfalls in the standard for proper control and labelling of auxiliary chemicals and substances in the plant exist. For example, the plant policy for labelling of chemicals and substances does not indicate the area in which they are permitted to be used. The team found several unlabelled containers of chemicals in the plant, or containers that did not indicate the expiry date of the substance. The team provided a suggestion in this area.

DETAILED CHEMISTRY FINDINGS

8.2 CHEMISTRY PROGRAMME

8.2 (a) Good Practice: Chemistry Preservation Metric

To preserve the integrity of structures and components, it is necessary to maintain environmental conditions in systems removed from service during outages and long shutdowns. For the plant, these systems include the preheater, boiler, reheater, and auxiliary cooling systems. For proper preservation measures, several chemical parameters like humidity, hydrazine concentration, pH, and over pressure must be monitored and controlled. It is easy to lose organizational focus and understanding of system preservation status without a means to easily check status.

The plant has developed a metric that summarizes chemistry status as green, white, amber or red. The colour scheme allows the plant staff to quickly identify where further investigation is needed. The metric is included in the daily outage information and helps to focus on relevant action.

Communication of Indicator
09:00 Outage Meeting update item
Daily Outage Info - send update to coordinator by 11am

Plant Preservation Indicator	100%

Green	White	Amber	Red

F&C	Rotaire to D/A Storage Vessel	1
	Rotaire to BFP Strainer A	1
	Rotaire to Generator	1
	Rotaire to condenser A	1
	Rotaire to condenser B	1
	Rotaire to condenser C	1
	Rotaire to Extr P/P	1
	Rotaire to TMEC NRV 271	1
	Score	1

Boilers	A Main boiler	1
	B Main boiler	1
	C Main boiler	1
	D Main boiler	1
	A DHB boiler	1
	B DHB boiler	1
	C DHB boiler	1
	D DHB boiler	1
	Score	1

A Reheater	Dry	1
	Days >plan no air	0
B Reheater	Dry	1
	Days >plan no air	0
C Reheater	Dry	1
	Days >plan no air	0
D Reheater	Dry	1
	Days >plan no air	0
	Total Dry	4
	Total days >plan	1
	Score	1

FAC	DP	1
	DP trend regen	1
	Score	1

MAC	Oxygen	1
	pH	1
	Score	1

		pH
Reactor Waters	A CACS	1
	B CACS	1
	C CACS	1
	D CACS	1
	PVCS Y1	1
	PVCS Y2	1
	DSSCS X1	1
	DSSCS X2	1
	BPGP	1
	Score	1

Feed & Condensate Dryers
1 represents dryer in service with no issues
0 represents dryer either in service with wet/cold air or out of service

Main Boiler and Decay Heat Dryers
1 represents dryer in service with no issues
0 represents dryer either in service with wet/cold air or out of service

Reheaters
1 represents that the boiler is dry
0 represents anything >30% rh
Days >7 self explanatory i.e. if air has been off to a reheater for 9 days then 2 days should be entered into cell for days 8 and 9

FAC
1 represents a good dew point and dew point trend
0 represents poor dp i.e. bypass might need adjustment and would also represent a fault with the dryer regeneration

MAC
For both Oxygen and pH
1 represents in specification chemistry
0.5 represents out of specification chemistry that is trendings towards exiting AL i.e. high oxygen but oxygen reducing
0 represents out of specification chemistry that is out of control i.e.unexplained air ingress

Reactor Waters
Outage reactor waters in specfication as per specification when pH elevated when no means of oxygen control
1 represents the system being in spec
0 represents pH/O2 being out of spec

Figure 8.1: Chemistry preservation metric

8.6. QUALITY CONTROL OF OPERATIONAL CHEMICALS AND OTHER SUBSTANCES

8.6 (1) Issue: Shortfalls in the standard for proper control and labelling of auxiliary chemicals and substances in the plant exist.

The team noted the following:

– The plant policy for labelling of chemicals and substances, does not include indication of where their use is permitted.
– In the radiological controlled area of reactor 7, in room RA7B2C01 outside 7A QUAD at -9 m, four 5-litre canisters of "CORROCOAT Chlor*RID DTS ®" ("causes skin irritation") and a 5-litre plastic container with red lid "PAL TECH" with "Cleaning and Degreasing Wipes" were found without labelling showing the permitted area to be used. Additionally, these were not stored in a bund or in a control of substances hazardous to health (COSHH) cabinet as required by the plant standard. 'The "PAL TECH" substance was not found in the appropriate plant chemical database, which is not according to plant expectation.
– In the radiological controlled area near door 99, one unlabelled 2.5-litre canister with an unknown oily liquid was found. This is not according to plant expectation.
– In the conventional laboratory, two empty 25-litre containers containing 'Trasar TM TRAC101' were found without labelling showing the permitted area to be used. This chemical is a corrosion inhibitor that used in a closed cooling water system.
– In the reactor building, one unlabelled chemical was observed on the platform of the refuelling machine. The plant explained that this is a degreaser and should have been properly labelled.
– Opposite to the main workshop, four barrels of "SHELL DIALA S4" were temporarily stored on a bench. Two of them were empty, two of them were full, and none were labelled showing the permitted area to be used.
– In the Unit 8 reactor building at refuelling level, there were four bottles of leak test spray found without labels showing the permitted area to be used.
– In the Jacobs storage cabinet, two tubes of "Silicone Grease RS 494-124" (100 ml) and one can "OMEGA 99N Nuclear Grade" without an expiry date were found. In the electrical workshop of the plant, three white 2.5-litre canisters were found, one of which was not labelled at all, another was poorly labelled and not according to plant procedure and the last was labelled according to plant procedure, however that label did not indicate the expiry date of the substance.

Without implementing a labelling standard and control of auxiliary chemicals clearly identifying which chemicals can be used where, detrimental effects on the integrity and availability of systems, structures and components could arise.

Suggestion: The plant should consider addressing shortfalls in the control and labelling standard for auxiliary chemical substances.

IAEA Bases:

SSR 2/2 (Rev. 1)

7.17 The use of chemicals in the plant, including chemicals brought in by contractors, shall be kept under close control. The appropriate control measures shall be put in place to ensure that the use of chemical substances and reagents does not adversely affect equipment or lead to its degradation.

Plant Response/Action:

Root cause identification:

OSART identified 2 issues relating to chemical storage-

- Several chemical containers were found during plant walkdowns with inadequate or no labelling. HYB follows the fleet process for COSHH (BEG/SPEC/SHE/COP/007) and provides COSHH awareness training to all staff who work with hazardous substances. Any chemicals found outside of approved storage locations or without adequate labelling were due to non-compliance with company processes.
- The policy for labelling chemicals does not include the area in which they are permitted to be used, which could lead to substances entering systems with which they are incompatible. It is not EDF policy to label auxiliary chemicals with the area in which they are permitted to be used.

Actions Performed:

The company processes outline clear standards and expectations for the storage and labelling of chemicals shortfalls in adherence were identified Therefore corrective actions have focused on improving awareness of the standards and the review process available to identify and resolve issues.

These are supported by - Annual COSHH cabinet audit which is independently verified by the cabinet owner and chemistry staff.

All chemistry staff have an individual focus area in their 1-2-1s to discuss chemical observations. Specific Appraisal objectives for chemical staff have been implemented to support chemical adherence in the workplace.

Monthly mandatory safety pack – Chemical control - Mar 2024 covered amongst other chemical related topics container labelling standards.

Since 2023 there have been 2 additional Control of Substances Hazardous to Health (COSHH) selected Persons authorised in chemistry. This increases the pool of SQEP resource to give authoritative advice on chemical safety queries.

Pride in our plant PJB 18th June 2025 included WELL reminder of chemical storage and chemical cabinet expectations.

Safe storage of chemical information communication launched June 2025 and September 2025. Sent to all cabinet owners on chemical storage expectations.

Leadership time in the field strategy launched with an agreed rotation of plant based observations scheduled in throughout the year. These cover all aspects of safe work including the storage and use of chemicals on site.

IOSH working safely training launched in 2024 for all EDF staff this included safe use of chemicals.

Chemicals approval data base upgrades have progressed to improve contractor access and ease of requesting approval of chemicals they want to use. This remains an ongoing chemistry peer group focus.

3 yearly review of the chemical approval database for all chemicals approved for use on site by EDF contract partners started September 2025. Industrial Safety worker level 1 role training profile launched Q4 2023 for plant facing staff which includes a module on control of substances hazardous to health awareness including expectations when using chemicals.

Consideration had already been given to implementing a labelling system that includes the area of permitted use for a given chemical as part of a fleet wide routine evaluation following use of an incompatible valve lapping compound at Dungeness B NPP 2020.

Company controls include:

- A single company database of compatible materials is maintained by the company. This database is updated by nuclear services compatibility engineers and confirms compatibility and area of use.
- company specification compliance is then linked into compliance documents across all areas including engineering and maintenance governance.
- Examples include Contractor Enquiry technical specifications for work by third part contractors, spares interchange process, Item equivalence process and engineering change process and remote access operations in the reactor.
- Entry into an Advanced Gas Reactor vessel is not part of a statutory outage inspection program and is controlled using “Control of materials introduced into a nuclear reactor pressure vessel” when required.
- Graded approach to compatibility training – with Material Compatibility Awareness available and Material Compatibility Advanced available for users with a safety case link.
- Risks associated with reliance on labelling also considered in this response – including the potential for incorrect label applied when chemicals arrive on site by stores or end user. Vs independently verified database entry.
- Risks in the implementation of questioning attitude human performance tool and moving to a reliance on labels Vs database checks.

Supporting actions:

- Robustness of compliance with the company requirement has increased. With the addition of an annual audit checking chemical usage in the RCA against the compatibility database.
- Further work fleetwide is proposed to drive sustainable compliance with materials compatibility company specification

Results and Effectiveness:

- Since these actions there has been some good awareness and reporting with some limited evidence of chemical storage outside of approved cabinets. This will be continued to be addressed via further communications and reinforced during pride in our plant days and leaders time in the field.
- Since 2011 there have been no CRs raised or other evidence regarding the use of incompatible materials in any area of the plant.

IAEA comments:

The plant, in response to the issue, focused on improving awareness of the chemical safety standards and the review process applied to identify and resolve issues. The actions taken included the following:

- Additional staff were trained and authorized for the role Control of Substances Hazardous to Health.
- Communication campaigns aimed at safe storage of chemicals were implemented.
- In the field observations and walkdowns were conducted.
- Annual inspections of all chemical storages across the plant were introduced.

Sample inspection reports and presentations used for trainings and information campaigns were presented by the plant during the OSART follow-up mission demonstrating that efforts were made to increase the awareness of plant staff and contractors in the area of control and labelling of auxiliary chemicals and substances.

In addition, the plant has strengthened awareness of material compatibility, which it considers an essential contributor to nuclear safety within the chemistry area. Plant staff and contractors now approach the plant’s chemistry experts more frequently with requests for clarification, helping to prevent events related to the use of substances that are incompatible with the materials in use.

The plant conducts walkdowns to identify issues related to the storage and labelling of auxiliary chemicals and noticed some improvements in this respect. However, during the plant walkdown to the maintenance workshop the team observed a chemical storage location which was not aligned with expectations. The deviations included unlabelled chemicals, incomplete and blank labels, chemicals abandoned at the workplaces, content of the chemical storage location not corresponding to the inventory list posted on the cabinet.

The deviations identified during the walkdowns by the plant are usually resolved on the spot, however, a condition report is not always raised.

Overall, the plant has a plan to further improve in this area, but it requires more time for all the improvement actions to be completed and demonstrate these improvements as sustained.

Conclusion: Satisfactory progress to date.

9. EMERGENCY PREPAREDNESS AND RESPONSE

9.2. EMERGENCY RESPONSE

The team identified that workers without a role in the emergency response organization are usually not trained in radiological response in anticipation they may be called upon during an emergency. As an example, the workers of the grid operator are not trained in radiological response or the use of a breathing apparatus. If specialist workers were required in an emergency, they would need to be trained just-in-time, however the plant does not have a plan or procedure for just-in-time training. The team encouraged the plant to improve in this area.

The team identified that the effective dose limit for emergency workers to take emergency response actions applied by the plant (100 mSv) is not in compliance with IAEA Safety Standards, which specify the effective dose limit for an emergency worker taking life-saving actions and avoiding severe consequences as 50 mSv. The plant indicated that their effective dose limit is in compliance with the UK national regulations. The team made a recommendation in this area.

9.3. EMERGENCY PREPAREDNESS

A digital system was used in the plant that allows direct sharing of whiteboard content across all emergency response facilities. The system includes a conventional whiteboard and a stem mounted camera. The camera detects changes in the content of the whiteboard and saves a timestamped snapshot of the whiteboard in a timeline ribbon that can be accessed remotely from the various response facilities. The team recognized this as a good practice.

The plant adopted a method of briefing off-site emergency services during emergency situations using the ‘METHANE’ mnemonic. METHANE represents a standard way to share important information about an incident in a clear and consistent fashion. The team recognized this as a good practice.

The team identified that the training and exercise programme requirements do not ensure that the proficiencies of all staff in each emergency response position is maintained. A large proportion of the training to qualify for various roles in the emergency response organization (ERO) is valid for fifty-one years. The plant relies on attendance at an emergency exercise as a minimum every three years to ensure that competencies are retained for all members of the ERO, however the plant does not keep a record of which essential competencies for emergency roles are tested during each exercise. The team made a suggestion in this area.

The exercise programme does not systematically evaluate implementation of all functions of the emergency response organization. The plant does not keep track of the objectives corresponding to functional response areas of the emergency plan covered by each exercise and does not ensure that all such objectives are covered over a period of time, in order to systematically evaluate their implementation. The team made a suggestion in this area.

DETAILED EMERGENCY PREPAREDNESS AND RESPONSE FINDINGS

9.2 EMERGENCY RESPONSE

9.2 (1) Issue: The effective dose limit and controls applied by the plant for emergency workers to take emergency response actions is not aligned with the IAEA Safety Standards.

According to the Emergency Handbook of the plant, workers are authorized for emergency exposure to exceed the limits specified in national regulations for occupational exposure (20 mSv/y) in emergency situations. Priority must be given to reducing doses below an effective dose of 100 mSv, but in extremely severe accidents involving saving of life, or when preventing a major release of radioactivity, the Emergency Controller may authorize identified emergency workers to exceed 100 mSv, but not to exceed 500 mSv. The actions decided and the names of the volunteers must be recorded in the emergency logs and volunteers must be made aware of the significance of the risk associated with the doses for which they have volunteered.

However, the team noted:

- The effective dose limit applied by the plant (100 mSv) is not in compliance with IAEA Safety Standards which specify the effective dose limit for an emergency worker taking lifesaving actions and avoiding severe consequences as 50 mSv. The plant indicated that their effective dose limit is in compliance with the UK national regulations (REPPIR 20.(1) and REPPIR 18.(8)).
- Emergency workers receive their briefing on risk via an Access Control Point (ACP) briefing process. However, the process does not explicitly cover clear and comprehensive information of the health risks associated with the dose turnback limit and a formal acknowledgement that the worker accepts the risk.

Without applying a strict effective dose limit and controls for taking lifesaving actions and avoiding severe consequences, the protection of the emergency workers may not be optimal.

Recommendation: The plant should update the emergency effective dose controls and change the limit to 50 mSv.

IAEA Bases:

GSR Part 7

5.55. The operating organization and response organizations shall ensure that no emergency worker is subject to an exposure in an emergency that could give rise to an effective dose in excess of 50 mSv other than:
(1) For the purposes of saving human life or preventing serious injury;
(2) When taking actions to prevent severe deterministic effects
or actions to prevent the development of catastrophic conditions that could significantly affect people and the environment;
(3) When taking actions to avert a large collective dose.

5.57. The operating organization and response organizations shall ensure that emergency workers who undertake emergency response actions in which doses received might exceed an effective dose of 50 mSv do so voluntarily.
GSR Part 3

4.15. Response organizations and employers shall ensure that no emergency worker is subject to an exposure in an emergency in excess of 50 mSv other than:
(a) For the purposes of saving life or preventing serious injury;
(b) When undertaking actions to prevent severe deterministic effects and actions to prevent the development of catastrophic conditions that could significantly affect people and the environment; or
(c) When undertaking actions to avert a large collective dose

4.17. Response organizations and employers shall ensure that emergency workers who undertake actions in which the doses received might exceed 50 mSv do so voluntarily.

Plant Response/Action:

Root cause identification:

The effective dose limits applied are in compliance with the UK national regulations: - Radiation (Emergency Preparedness and Public Information) Regulations 2019.

EDF Nuclear Operations believes that its extant emergency arrangements do align to the IAEA guidance as set out in GSR part 7 as well as the latest guidance given by the International Commission on Radiological Protection(ICRP) in publication 146 (Radiological Protection of People and the Environment in the Event of a Large Nuclear Accident). However, the way in which this is achieved is not clear in the written emergency arrangements and this could be enhanced for the benefit of workers, emergency role holders and emergency planners.

The following points are important to consider when applied to all EDF emergency arrangements:

- All EDF Nuclear Operations emergency response is technical voluntary – EDF do not have the power to compel workers to undertake activities that they are not willing to do.
- Nuclear Operations seeks to restrict REPPIR Emergency Exposures (above the IRR17 dose limits) to only those individuals who are directly involved in going forward to a damage area during a response. Going forward in a response scenario is only done for the purposes of location and rescue/life saving of personnel and to control a release for the purpose of reducing the dose to the public (a large collective dose) and/or preventing the worsening of the situation that could lead to catastrophic conditions.
- While REPPIR allows for the specific disapplication of the IRR17 dose limits, they do not remove the requirement that all doses are restricted so far as is reasonably practicable. EDF Nuclear Operations emergency response arrangements are built on this principle and dose management arrangements during an emergency response would ensure that doses are kept As Low As Reasonably Practicable (ALARP).

Actions Performed:

The following actions are proposed to address the concerns identified by the OSART Team.

Introduce an additional REPPIR Reference Level, as documented in the Emergency Handbook Section 10, and set this at 50mSv with wording which sets clear expectations that doses for all individuals should be maintained below this level except;

- For the purposes of saving human life or preventing serious injury;

- When taking actions to prevent severe deterministic effects or actions to prevent the development of catastrophic conditions that could significantly affect people and the environment;
- When taking actions to avert a large collective dose.

Revise the wording of the criteria for the 100mSv Reference Level to closer align with IAEA guidance to demonstrate that this is only acceptable in the following circumstances:

- For the purposes of saving human life or preventing serious injury;
- When taking actions to prevent severe deterministic effects or actions to prevent the development of catastrophic conditions that could significantly affect people and the environment;
- When taking actions to avert a large collective dose.

Revise the wording of the criteria for the 500mSv Reference Level to closer align with IAEA guidance to demonstrate that this is only acceptable in the following circumstances:

- For the purposes of saving human life or preventing serious injury;
- When taking actions to prevent severe deterministic effects or actions to prevent the development of catastrophic conditions that could significantly affect people and the environment;

Revise the wording in section 10.5.4.8 to account for the additional 50mSv reference level, clarify the expectation that only identified Emergency Workers can be authorised to receive doses above the IRR limit of 20mSv and re-enforce the requirement that any entry into emergency exposures is to be done on a voluntary basis (current wording suggests volunteers are required above 100mSv) with the role holders required to be given a risk briefing before deployment.

Revise the emergency dose control form to include record of voluntary acceptance of exposure above IRR limits and risk brief having been provided

Revise section 9.2.7 “Incident Area Entry Preparations” of section 9 of the Emergency Handbook to include clear direction that incident teams must receive a briefing on health risks associated with the assigned reference level if exceeding the IRR 20mSv limit

Revise the relevant GEST training packages associated with radiological protection for emergency situations to account for the changes identified above.

Undertake an information awareness procedure to ensure current role holders are aware of the changes identified above.

Results and Effectiveness:

Once the above changes have been implemented the plant believes any ambiguity to compliance with be GSR part 7 will be removed resolving this recommendation.

IAEA comments:

The plant identified the root cause of the dose limit deviation as differences between UK regulatory requirements and the IAEA Safety Standards.

In response to the OSART recommendation, the plant agreed to strengthen its emergency arrangements related to dose reference levels. The Fleet Head of Emergency Planning and the

Fleet Head of Radiation Protection agreed to update the fleet-level Generic Emergency Handbook to implement the required changes in the second quarter of 2025. A draft of the revised handbook was completed in December 2025 and is currently under the approval process. Approval is expected by the end of February 2026.

Following approval, plant-level implementation is required within six months, while the corresponding level training is to be completed within twelve months. During the review, the plant committed to treating this activity as a priority and to completing the training within a maximum of six months, with initial individual briefings to be conducted even earlier. As part of the publication process, all relevant emergency personnel will be informed of the changes and will be required to formally acknowledge them by signature in the plant asset management system.

The plant presented to the team the relevant draft documents (dated December 2025) that are currently under approval:

– Draft Section 9 of the fleet level Generic Emergency Handbook requires that all persons entering the incident area may need to receive instruction on authorized radiation dose and dose rate limits. It also requires that incident teams (emergency workers) receive a briefing from a health physicist on health risks associated with the assigned reference level if exceeding 20 mSv.
– Draft Section 10 of the fleet level Generic Emergency Handbook specifies that emergency workers must volunteer to undertake activities that may entail doses in excess of 50 mSv and they must receive briefing on potential consequences. Priority must be given to reduce dose levels below 50 mSv. Also the table of Emergency Dose Reference Levels was extended with a line for 50 mSv, and the actions that can justify exceeding the given dose are explained in line with IAEA recommendations.
– The draft dose recording sheet includes the acknowledgement of risk briefing and signature of individual accepting the risk of emergency exposure.

Conclusion: Satisfactory progress to date.

9.3 EMERGENCY PREPAREDNESS

9.3 (a) Good practice: Live White Board Sharing Approach

A digital system was used in the plant that allows direct sharing of whiteboard content across all facilities. The system includes a conventional whiteboard and a stem mounted camera. The camera detects changes in the content of the whiteboard and saves a timestamped snapshot of the whiteboard in a timeline ribbon that can be accessed remotely from the various emergency response facilities.

Previous whiteboards allowed for local printing of hardcopies but had no sharing capability. Web cameras pointed at whiteboards have been used in the past to share the content of the whiteboards across facilities, but they did not allow for electronic 'time-stamp' records to be maintained. Screen captures of the video feed could be printed, but the hardcopies were of low quality due to the limitations of the technology. Smart boards can share information, but they require special pens and are more difficult to use.

The Live White Board Sharing Approach is simple to use, enhances the usefulness of the status boards, and provides a record of the information posted during an emergency.

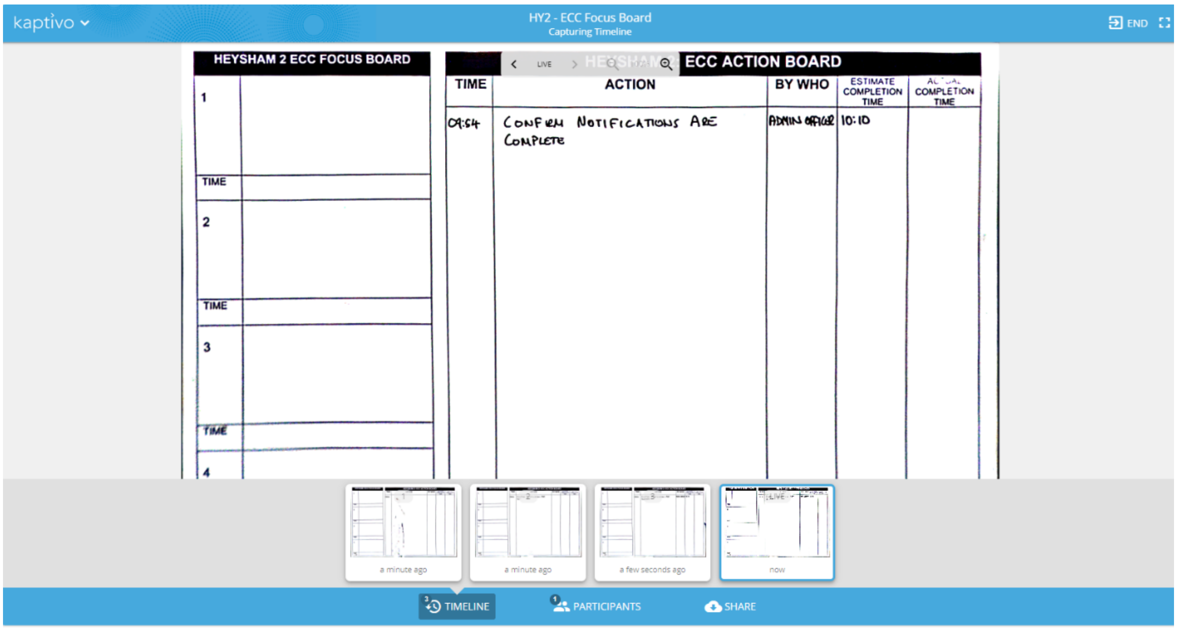

Figure 9.1: Live White Boarding Sharing

9.3 (b) Good practice: METHANE emergency briefing mnemonic

The plant adopted a method of briefing off-site personnel during emergencies using the 'METHANE' mnemonic. METHANE represents a standard way to share important information about an incident in a clear and consistent way.

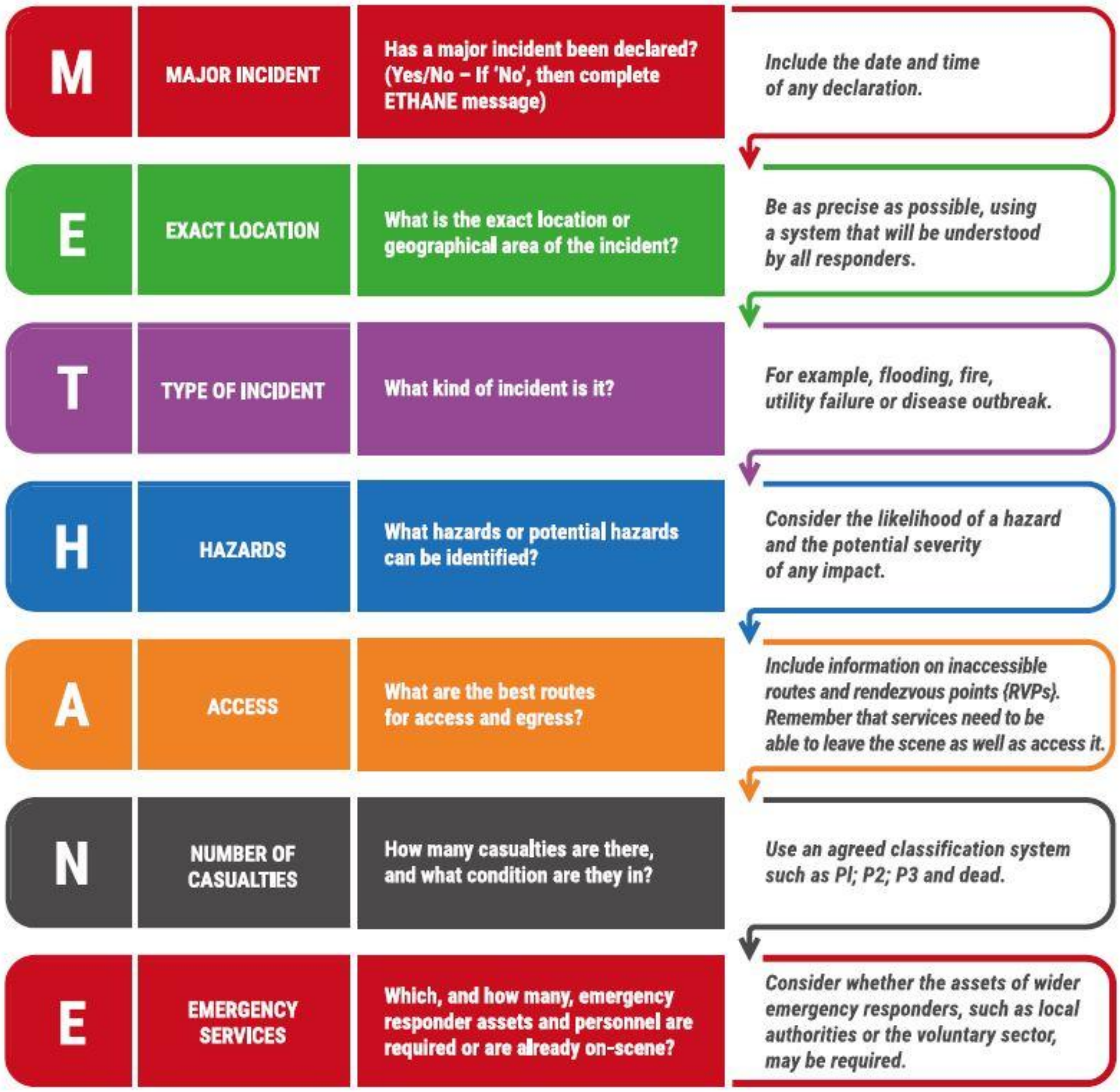

Figure 9.2: METHANE method details

The process aligns with the UK Emergency Services Joint Emergency Services Inter-Operability Principles (JESSIP) and ensures sharing situational awareness across the EDF and the local authority emergency response throughout an event.

The METHANE report should not be used just once. It is the standard format for passing information about an incident. This will make sure that all agencies get the information they need. It will also act as a trigger if an incident condition deteriorates over time.

9.3 (1) Issue: The training and exercise programme requirements do not ensure that the proficiencies of staff in each emergency response position are maintained.

The team noted the following:

- A large proportion of the training to qualify for various roles in the emergency response organization is valid for fifty-one years. Only a few training courses require refresher training repeated annually, eighteen monthly, or every three years.
- The plant relies on attendance at an emergency exercise as a minimum every three years to ensure that competencies are retained for all members of the emergency response organization, however the plant does not keep a record of which essential competencies for emergency roles are tested during each exercise for each individual. As a result, the plant cannot prove that all competencies have been tested and retained by all emergency response staff.
- There are seven persons qualified as Emergency Controllers. There are typically five shift crew exercises, plus two or three more demonstration exercises per year on a given theme. In recent years, some Emergency Controllers have participated in more than one exercise in the same calendar year. This means that some qualified persons have not performed in an Emergency Controller role during an annual exercise for more than 12 months.
- The plant has five essential roles in the emergency response organization. For these roles, the plant requirement is to have a minimum of four persons qualified and the plant target is to have six persons qualified. In 2021-2022, there were five qualified assistant Emergency Controllers and four Accredited Health Physicists. In order to qualify new persons for a given role, the plant required them to participate in exercises on an accelerated schedule. As a result, other qualified incumbents for these roles did not have as many opportunities to participate in a refresher exercise.

Without ensuring that each member of the emergency response organization is regularly trained and participates in exercises testing all the essential competencies, their proficiency to effectively respond in an emergency cannot be maintained.

Suggestion: The plant should consider improving regular training and exercises requirements for each member of the emergency response organization to ensure that proficiencies are maintained.

IAEA Bases:

GSR Part 7

6.28. The operating organization and response organizations shall identify the knowledge, skills and abilities necessary to perform the functions specified in Section 5. The operating organization and response organizations shall make arrangements for the selection of personnel and for training to ensure that the personnel selected have the requisite knowledge, skills and abilities to perform their assigned response functions. The arrangements shall include arrangements for continuing refresher training on an appropriate schedule and arrangements for ensuring that personnel assigned to positions with responsibilities in an emergency response undergo the specified training.

6.31. The personnel responsible for critical response functions shall participate in drills and exercises on a regular basis so as to ensure their ability to take their actions effectively.

SSR-2/2 (Rev. 1)

3.10. The operating organization shall be responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise are sustained at the plant, and that long term objectives for human resources policy are developed and are met.

3.11. The organization, qualifications and number of operating personnel shall be adequate for the safe and reliable operation of the plant in all operational states and in accident conditions. Succession planning shall be an established practice for the operating personnel. The recruitment and selection policy of the operating organization shall be directed at retaining competent personnel to cover all aspects of safe operation. A long term staffing plan aligned to the long term objectives of the operating organization shall be developed in anticipation of the future needs of the operating organization for personnel and skills.

5.5. A training programme for emergencies shall be established and implemented to ensure that plant staff and, as required, staff from other participating organizations possess the essential knowledge, skills and attitudes required for the accomplishment of non-routine tasks under stressful emergency conditions.

SSG-75

4.34. The purpose of exercises and drills should be as follows:

a) To demonstrate how effectively the emergency plan (see Requirement 18 of SSR-2/2 (Rev. 1) [1]), or part of the emergency plan, can be implemented;
b) To confirm the adequacy of the plan to deal with an emergency and to identify potential improvements;
c) To verify that the appropriate lines of communication are established and maintained;
d) To verify that all participating individuals are familiar with, and capable of performing, the emergency duties assigned to them;
e) To verify that emergency response duties and all related duties can be performed under stressful conditions in a timely manner and in accordance with the expected schedule;
f) To verify the provisions for the assessment of radiological hazards and the implementation of protective actions.

Plant Response/Action:

Root cause identification:

The current method to demonstrate that the core responsibilities of each emergency scheme role holder have been achieved is through the 3 yearly exercise programme outlined within company specifications. Exercises are developed on event themes not role holder responsibilities and expected outcomes.

As such, depending on the theme of a given exercise, it is possible core responsibilities for roles such as Chemist, Emergency Health Physicist and Reactor Performance Engineer, are not tested on any prescribed frequency, however, due to the requirements outlined in the exercise matrix, these roles will be tested over a period of time.

Actions Performed:

The company continues to strengthen its emergency preparedness arrangements through targeted improvements in both training and exercising at Heysham 2. A structured programme of work, led by the Training department, is currently underway to review the competencies associated with practically trained modules within the Emergency Scheme roles. This review focuses on roles within the Emergency Control Centre (ECC), Incident Response Team (IRT), and Site Emergency Response Team (SERT), particularly those with a once only compliance frequency. A workshop is scheduled with relevant role holders and the Emergency Preparedness Engineer to review and endorse the updated competency framework. This work will align training modules with the three-year rolling exercise programme to ensure knowledge retention and regulatory compliance.

In parallel, improvements to GEST0701 (Battlefield First Aid) have already been initiated and are being implemented through this year's training season. This structured programme ensures that all learning objectives are met over a three-year cycle and embeds essential first aid and rescue skills within operational teams. It includes a fleet-wide review of GEST0701 and introduces a rolling training package with one full day of casualty handling per year, incorporating a nationally recognised First Aid at Work qualification valid for three years. This initiative directly addresses the IAEA's observation regarding long validity periods for emergency response training by introducing regular requalification and practical refreshers.

Emergency exercises are conducted in accordance with BEG/SPEC/OPSV/EPG/016/01 to demonstrate compliance with nuclear site licence condition 11, REPPIR, and relevant nuclear security regulations. Each site maintains a three-year rolling exercise objectives matrix, provided by the Emergency Planning Group (EPG), which defines the frequency and complexity of objectives to be tested. This matrix supports realistic scenario development and records the success or need for improvement of each objective, reviewed annually to ensure continuous improvement.

Heysham 2 has planned its 2025–2026 exercise season to ensure that all qualified Emergency Controllers (ECs) are actively involved, including the authorisation of a new EC. ECs also participate as umpires, gaining valuable insight that supports their ongoing development. While role holders are expected to attend a shift exercise annually, we recognise the need to strengthen individual competency tracking. To address this, and in support of improved training code applications, we are reviewing the integration of training codes linked to specific emergency response themes within exercise attendance records. This will allow for clearer identification of demonstrated competencies and highlight any gaps in coverage. Additionally, tracking mechanisms will be strengthened to ensure equitable rotation and role-specific engagement across the EC group.

Actions Already Performed:

- Initiated a structured review of competencies for ECC, IRT, and SERT roles.
- Scheduled a workshop with role holders and the Emergency Preparedness Engineer to endorse updated competencies.
- Implemented improvements to GEST0701 (Battlefield First Aid) at Heysham 2.
- Rolled out a training package including annual casualty handling and First Aid at Work qualification.
- Maintained and reviewed a three-year rolling exercise objectives matrix.
- Planned the 2025–2026 exercise season to ensure all ECs are actively involved.
- Authorised a new Emergency Controller and other EC role holders and incorporated their participation into the exercise schedule.

Results and Effectiveness:

The implementation of the GEST0701 improvements at Heysham 2 has already demonstrated increased effectiveness, with noticeable gains in knowledge and consolidation of first aid skills observed during this year's shift exercise season. The structured approach, including annual casualty handling and a nationally recognised qualification, has enhanced team confidence and capability in battlefield first aid scenarios. Building on this success, the wider competency improvement programme; focused on roles within the ECC, IRT, and SERT teams, is to be developed with the same structured methodology and aims to achieve comparable improvements in knowledge retention, role readiness, and regulatory alignment across all emergency response functions.

Planned Improvements:

- Align training modules with the three-year rolling exercise programme.
- Introduce regular requalification and practical refreshers for emergency response roles.
- Review and integrate training codes into exercise attendance records to track individual competency demonstration.
- Strengthen tracking mechanisms to ensure equitable EC role rotation and participation.
- Improve integration of role-specific objectives into exercise planning and post-exercise review.

IAEA comments:

The root cause of the issue was identified as the exercise preparation being event-based rather than systematic. As a result, not all role-holder responsibilities were covered within the three-year cycle, and there was no refresher training associated with individual training modules. Corrective actions have been initiated to systematically align training and exercise activities and to ensure that each role holder receives regular training in every cycle. According to the plant's statement, tangible improvements have already been achieved in some areas, for example in first aid, where additional training was introduced based on a needs analysis. In other areas, however, the planned actions have not yet been fully implemented.

With regard to staffing the Emergency Control Centre (ECC) roles that incorporates the essential roles, the situation has improved since the OSART mission. For each of the eight ECC roles, a minimum of four trained persons is required, with a target of six per role. Currently, one role has four trained persons, one role has five, and the remaining six roles are fully staffed. In addition, one or more candidates (trainees) are assigned to each role.

The training requirements for each emergency role (including ECC, Incident Response Team, Site Emergency Response Team) consist of three elements:

1. An induction phase to become familiar with facilities, locations, and equipment;
2. General and role-specific training modules;
3. A set of competencies to be demonstrated during exercises.

Induction training is conducted once. The training modules are intended to be completed once during a person's career (with a validity of 51 years), while exercise-related competencies are covered through the three-year exercise cycle plan.

The plant reviewed the list of 117 station-level emergency training modules under item 2 and identified those that are inherently refreshed through exercises. The remaining 84 modules, covering 22 station emergency response roles (amounting to approximately 300 individual cases), were identified as requiring regular training. All of these modules have been incorporated into the exercise season planning period (from April to the following March) and will be tested for the first time in the 2026/27 season. Existing training sessions were expanded to include the missing topics, ensuring that the training programme for the next three-year cycle will cover all identified modules. Following the initial implementation in 2026, the plant plans to finalize this approach based on the lessons learned.

Regarding exercise competencies (item 3), the plant stated that all required competencies are systematically trained and evaluated within the three-year exercise cycle. All exercise locations are observed and assessed by designated exercise umpires. The plant's training compliance system monitors individual training records and alerts the training department if any emergency training or exercise requirement for a role holder is not fulfilled within the three-year period. Although there is no systematic verification that every exercise competency is demonstrated for every individual within each three-year cycle, the plant considers that the existing arrangements provide reasonable assurance that no competency remains untested.

Conclusion: Satisfactory progress to date.

9.3 (2) Issue: The exercise programme does not systematically evaluate implementation of all functions of the emergency response organization.

The team noted the following:

- The plant keeps track of exercise frequencies covering themes (conventional, BDBA, and off-site security) and variants (during working hours or outside working hours, rooms or facilities where intervention is required, etc.) to ensure that the exercises are varied. However, the plant does not keep track of the specific objectives corresponding to functional response areas of the emergency plan covered by each exercise and hence does not ensure that all such objectives are covered over a period of time.
- Some of the evaluation reports of the exercises include a qualitative evaluation of the exercise objectives. The plant lists what went well and what could be improved, but these observations are not summarized in a systematic evaluation of how the exercise objectives were met with clear criteria.
- In 2022, exercise Hercules identified 9 objectives and key performance indicators. The evaluation report included a qualitative evaluation of 5 of them, without providing the criteria that supported the evaluation.
- In 2021, exercise Ragnarok identified 16 objectives and key performance indicators. The evaluation report included a qualitative evaluation of 9 of them, without providing the criteria that supported the evaluation.

Without systematically evaluating all functions of the emergency response organization during exercises, the plant cannot ensure that they can be effectively implemented during an emergency.

Suggestion: The plant should consider systematically evaluating the implementation of all functions of the response organization during exercises.

IAEA Bases:

GSR Part 7

6.30. Exercise programmes shall be developed and implemented to ensure that all specified functions required to be performed for emergency response, all organizational interfaces for facilities in category I, II or III, and the national level programmes for category IV or V are tested at suitable intervals. These programmes shall include the participation in some exercises of, as appropriate and feasible, all the organizations concerned, people who are potentially affected, and representatives of news media. The exercises shall be systematically evaluated (see para. 4.10(h)) and some exercises shall be evaluated by the regulatory body.

EPR-Exercise

4.1. The most recent IAEA guidance for emergency response objectives is EPR-Method [2]. This document provides checklists of emergency preparedness elements and emergency response functions that cover nuclear as well as radiological emergencies (threat categories I to V). Each emergency response function is defined in terms of a main response objective and, where appropriate, by a performance objective.

7.3.5. A performance-based evaluation focuses on results, not process. It is based on response objectives and response time objectives (see Appendix X of [2] for details). It answers the question: was the response objective achieved and in what time it was achieved?

Plant Response/Action:

Root cause identification:

The Exercise objectives evaluation is not systematic or defined and inconsistencies exist with qualitative assessment only taking place.

Actions Performed:

The plant has developed a scoring methodology to provide the organisation a means of measuring success against completion of the specific exercise objectives. Each exercise objective will then be scored by utilising the methodology:

This approach is being trailed as part of the current 2025-2026 Exercise season, and the umpiring responsibilities and exercise debrief have been amended to encompass a review of the objectives.

Future Actions:

- Further develop the debriefing process to ensure a review of the exercise objectives is carried out.
- Ensure Exercise scenarios explicitly describe the theme/variant themes plus objectives being tested.
- Ensure analysis of performance against exercise objectives is included in the Exercise Season Report for 2025-2026.
- Consider revising the station Exercise Matrix to include all themes, variants with a structured forward plan in line with BEG/SPEC/OPSV/EPG/016.

Results and Effectiveness:

Recent developments have significantly strengthened the station’s ability to address OSART observations concerning the systematic evaluation of all functions within the emergency response organisation. These improvements have enabled a more comprehensive understanding of performance during exercises, helping to identify both areas of excellence and those requiring additional focus or targeted training.

A key enabler of this progress has been the introduction of a structured scoring and assessment framework. This system provides valuable insights that support continuous improvement, allowing the Emergency Preparedness organisation to tailor future training and exercise scenarios more effectively. By analysing performance trends, the station can ensure that resources are directed where they are most needed, thereby enhancing overall organisational resilience.

Importantly, the scoring mechanism is being implemented in a way that fosters a positive learning environment. Individual team will receive specific feedback, and constructive observations will be provided to support development. This approach ensures that the focus remains on learning and growth.

Looking ahead, the station is transitioning to a more training and learning-focused model for the shift exercise season. This will allow teams to engage with exercises in a way that maximises their development, encourages reflective practice, and reinforces a culture of continuous improvement

IAEA comments:

The plant has developed an exercise evaluation matrix that enables systematic and quantitative evaluation of each exercise objective.

At the fleet level, the plant applies a guide entitled “Exercise Objectives for Level 1, 2, and 3 Exercises – Process and Guidance.” The plant’s seasonal exercise plan, covering the period from April to the following March, derives the main exercise scenarios, variants, and general objectives from this document. Seasonal and longer-term exercise planning is supported by an exercise planning matrix, which ensures that all required types of exercises are conducted regularly. Exercise dates are planned two years in advance, while simulator training is planned four years ahead.

For the planning of individual exercises, a template containing 12 general exercise objectives is tailored to plant-specific needs by defining exercise-specific objectives. An example was presented to the team in which a peer-assessed demonstration exercise, comprising 11 specific objectives, was conducted in January 2026.

The exercise evaluation matrix is implemented as a set of Microsoft Excel spreadsheets tailored to each exercise. It includes all exercise objectives and is completed by each umpire assigned to the respective exercise location or team. The matrix uses a scoring system ranging from 1 to 10, supported by a colour code. Black or red scores require the umpire to identify areas for improvement, while green scores indicate areas suitable for positive recognition.

The evaluation matrices are used during hot debriefings held immediately after the exercise at each location, during the station-level debriefing on the day of the exercise, and for the systematic evaluation of the overall exercise season. The matrix also includes a dedicated worksheet for identifying deviations that require immediate corrective action.

The developed exercise evaluation matrix was tested and refined during 11 exercises in 2025, and the plant’s intention is to standardize and approve it as part of the plant’s emergency documentation during 2026.

Benefits of the exercise evaluation matrix include:

- Systematic evaluation of each exercise objective at each exercise location or team;
- Quantitative, score-based assessment of each objective;
- Support for efficient sharing of lessons learned among exercising teams immediately after the exercise;
- The potential for straightforward data processing using AI-based tools;
- Support for objective evaluation and trend analysis across exercise seasons.

Conclusion: Issue resolved.

10. ACCIDENT MANAGEMENT

10.1. ORGANIZATION AND FUNCTIONS

The Accident Management Training and Qualification Programme is not comprehensive to ensure that personnel are fully prepared to support Severe Accident Guideline (SAG) implementation. The team identified that the Emergency Controller who is the primary decision maker for SAGs is not required by the programme to receive formal SAG training and is not required to participate in a drill/exercise involving SAGs as part of their initial qualification. The team also identified that continuing training requirements are not established for key roles supporting SAG implementation and that evaluation criteria have not been established to assess the effective utilization of SAGs in training drills/scenarios. The team made a recommendation in this area.

The team performed a review of accident management programme training materials and noted that roles and responsibilities of Decision Makers and Evaluators in both the preventative and mitigative domains are not fully clarified. The team encouraged the plant to enhance training materials to further clarify roles and responsibilities.

10.4 DEVELOPMENT OF PROCEDURES AND GUIDELINES

Guidance for the preparation and review of SAGs and the control of staged equipment is not comprehensive to ensure that these activities are conducted in a manner that supports programme goals. The team identified that the SAG Guidance Document does not clarify the standards for validation activities and the periodic review of SAGs is only performed as part of the 10-year PSR process. Equipment is staged in the plant to support response to a Beyond Design Bases Event (BDBE), however, the team identified that Foreign Material Exclusion (FME) covers are not always installed on hose and electrical connections, signage is not provided to ensure that personnel do not remove staged equipment without authorization, inventory of staged equipment is not performed, and measures such as checks on operator rounds are not established to ensure that workers do not block access to connection points or routes used to deploy portable equipment. The team made a suggestion in this area.

10.5. PLANT EMERGENCY ARRANGEMENTS WITH RESPECT TO SAM

Additional hardware provisions have been provided to ensure that indications used to assess plant conditions remain functional after a Beyond Design Basis (BDB) event. Following a BDB event causing loss of normal indications, the Continuous Emergency Monitoring System (CEMS) provides a live display of key plant parameters in multiple locations both on and off-site to facilitate severe accident management decision making. CEMS records 8 hours of plant data leading up to and 24 hours after the event utilizing resilient power supplies. CEMS also provides an interface to the Deployable Communication and Information System (DCIS) so that plant status can continue to be monitored beyond the initial 24-hour period that CEMS supports. The team recognized this as a good practice.

Deployable Back Up Emergency Equipment (DBUE) to support a BDB event is located at an off-site location which requires transport to the plant. The equipment would be transported by an on-call team of drivers who have the capability to move all the required equipment to a designated staging area regardless of time and environmental conditions. Driver availability is monitored and tracked real time via GPS and reported on every two hours. This arrangement ensures that DBUE deployment to the plant can commence within two hours of notification. Comprised of some 220 drivers, the national driver cohort which supports the activation system undergoes annual refresher training in deployment to maintain proficiency and capability. The team recognized this as a good performance.

DETAILED ACCIDENT MANAGEMENT FINDINGS

10.1 ORGANIZATION AND FUNCTIONS

10.1 (1) Issue: The Accident Management Training and Qualification Programme established by corporate and used at the plant is not comprehensive to ensure that personnel are fully prepared to support Severe Accident Guideline (SAG) implementation.

The team noted the following:

- The Emergency Controller (EC) is the Primary Decision Maker during the implementation of SAGs. However, the corporate Generic Emergency Scheme Training (GEST) Training Role Matrix does not require the EC to receive SAG Training.
- While not required by corporate, some plant ECs have received SAG training, however the two most recently qualified ECs have not received SAG training.
- The training programme does not require participation of ECs in a drill/exercise involving SAGs as part of their initial qualification.
- The use of SAGs requires extensive input and technical support from the corporate Central Emergency Support Centre (CESC). However, the CESC is not required to be involved (directly or simulated manner) in training drills/exercises that would involve SAG utilization for the plant.
- Continuing training requirements are not established for key roles supporting SAG implementation such as the EC and the Duty Reactor Physicist.
- Evaluation criteria have not been established to assess the effective utilization of SAGs in training drills/scenarios.
- The plant prepared a plan to address issues related to the conduct of drills/exercises involving the use of SAG noted in an external review. Based on the plan, drills/exercises have started on the Symptom Based Emergency Response Guidelines (SBERGs) and future drills/exercises are planned on the SAGs. However, requirements for drills/exercises have not yet been integrated into the corporate and plant accident management programmes to ensure long-term sustainable performance.

Without comprehensive training and qualification, the ability and proficiency of the plant staff to respond to a severe accident could be challenged.

Recommendation: The plant should improve the Accident Management Training and Qualification Program to ensure that plant staff is prepared to support SAG implementation.

IAEA Bases:

SSR-2/2 (Rev.1)

5.8E. The accident management programme shall include training necessary for implementation of the programme.

5.9. Arrangements for accident management shall provide the operating staff with appropriate competence, systems and technical support. These arrangements and relevant guidance shall be available before the commencement of fuel loading, shall be validated and shall then be periodically tested as far as practicable in exercises and used in training and drills [1, 6]. In addition, arrangements shall be made, as part of the accident management programme and the emergency plan, to expand the emergency arrangements, where necessary, to include the responsibility for long term actions.

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2.98. Personnel responsible for performing accident management measures should be trained to acquire the required knowledge, skills and proficiency to execute their tasks. A comprehensive training programme for accident management should be prepared that includes the interfaces with emergency preparedness and response. Training should include a combination of techniques, such as classroom training, drills, tabletop exercises and the use of simulation tools.

2.103. Training, including periodic exercises and drills, should be sufficiently realistic and challenging to prepare personnel responsible for accident management duties to cope with and respond to situations that may occur during an event [21]. Drills should extend over a time period long enough to realistically represent the plant response and should allow for the transmission of information during shift changes to be tested. Special exercises and drills should be developed to practice shift changeovers between operations staff and technical support centre staff and information transfer between different teams. Training should cover accidents occurring simultaneously at more than one unit, accidents occurring in different reactor operating states and accidents in the spent fuel pool. Training should consider unconventional line-ups of the plant equipment, the use of non-permanent equipment (e.g. diesel power generators, pumps) and repair of the equipment.

2.105. Training for new staff, as well as refresher training for existing staff, should be developed for all groups of staff involved in accident management. The frequency of refresher training should be established on the basis of the difficulty and the importance of accident management tasks. A maximum interval for refresher training should be defined, but depending on the outcome of exercises and drills held at the plant, a shorter interval may be selected. Changes in the guidance or in the use of the guidance should be reflected in the training programme. Such changes should be communicated to interested parties.

3.114. Training, including periodic exercises and drills, should be sufficiently realistic and challenging to prepare personnel responsible for severe accident management duties to cope with and respond to situations that may occur during an event. Drills should extend over a time period long enough to realistically represent the plan response and should allow for the transmission of information during shift changes to be tested. Special exercises and drills should be developed to practice shift changeovers between operations staff and technical support centre staff and information transfer between different teams. Training should cover severe accidents occurring simultaneously at more than one unit and severe accidents occurring in different reactor operating states. Training should consider unconventional line-ups of the plant equipment, the use of non-permanent equipment (e.g. diesel power generators, pumps) and repair of the equipment.

3.115. Exercises and drills should be based on scenarios that require the application of a substantial portion of the overall severe accident management programme in concert with emergency response and should simulate realistic conditions characteristic of those that would be encountered in an emergency. Large scale exercises providing an opportunity to observe and evaluate all aspects of severe accident management should be undertaken.

3.117. Some of the scenarios used for exercises and drills should assume an extensively damaged state of the core that eventually results in failure of the reactor pressure vessel and the containment. Consideration should be given to conducting exercises that enhance the awareness of main control room staff, technical support centre staff and engineering staff of the need for and possible consequences of defeating or resetting control and logic systems.

Plant Response/Action:

Root cause identification:

As identified, there are opportunities to improve in the training and the exercising of the Severe Accident Guidelines (SAGs).

Severe Accident Guidelines training is delivered within the two different training courses:

GEST 1507 – Symptom Based Emergency Response & Severe Accident Guidelines

Identifies the conditions that would force consideration of SAGs, outlines to the trainees the five aims of the guidelines and outlines the key issues and focuses that would be faced.

This training is currently mandatory for the following station based roles:

- Shift Manager
- CCR Supervisor
- Reactor Desk Engineer
- Duty Reactor Performance Engineer

115 station personnel have completed this training with GEST1507 being refreshed with all Operations Engineers in 2023.

GEST 1508 - Severe Accident Guidelines Advanced

To develop participants' understanding of Severe Accident Guidelines (SAGs), including their fundamental purpose, structural framework, strategic objectives, and their role in influencing decision-making during Severe Beyond Design Basis Event Response Guidelines (SBERGs).

Objectives and learning outcomes:

- State the fundamental purpose of SAGs
- Outline the structure of SAGs guidance
- Explain how SAGs might influence actions whilst in SBERGs
- Describe the Strategic Objectives underlying the SAGs

This training is currently not mandatory for any station based roles as it is aimed at the specialists who would support from the CESC

Actions Performed:

To strengthen preparedness and response capabilities, a series of actions have been proposed and initiated to ensure appropriate integration of SAG (Severe Accident Guidelines) training across relevant operational roles.

GEST1508 Implementation: SAG training has been added to the SM, CCRS, and RDE roles. This update has been approved by the Operations Manager peer group and is now incorporated into the relevant documentation.

Proposed Actions:

- In collaboration with Fleet EPG, a review of Role Training Profiles is underway to identify where SAG training should be incorporated, including continuation training requirements.

SAG training is currently being added to the CCR and RPE roles. The EC role has not yet been identified by Fleet as requiring SAG training, however, Heysham 2 will progress with EC's being trained in SAG's.
- SAG training will be delivered to all roles identified through the review process.
- A pilot SAG training session will be conducted to assess the appropriateness and relevance of the content for the identified role holders. Feedback from this session will inform any necessary adjustments prior to wider rollout.
- SAG training and exercising will be embedded into the Exercise Matrix by Fleet EPG.

Results and Effectiveness:

To date, 115 station personnel have successfully completed GEST 1507 SAG training. In addition, GEST1507 was refreshed for all Operations Engineers in 2023, ensuring alignment with current expectations and operational needs. Although further training is taking place at a fleet level there are sufficient specialists who would provide SAG advice appropriately trained to their level of skill and knowledge in the subject that would allow EDF to appropriately respond to a severe accident This assurance is supported by the nature of the AGR reactor design and support from the Central Emergency Support Centre (CESC) will be initiated when required.

IAEA comments:

Following the OSART mission the plant fully supported the opportunities to improve the training and exercising of the Severe Accident Guidelines (SAGs). The roles and responsibilities and training needs were based on the common accident management roles of Decision Maker, Evaluator, and Implementor as described in IAEA Safety Standard Series No. SSG-54. For Heysham 2, this included the following positions:

- Shift Manager;
- CCR Supervisor;
- Reactor Desk Engineer;
- Duty Reactor Performance Engineer.

Training includes formal classroom training (GEST 1507 & GEST 1508), periodic refresher training, and participation in emergency drills involving simulated accident conditions. A review of the training established for each key position is provided in the following matrix:

	Initial Training	**Continuing Training**	**Exercise**
Shift Managers	GEST 1507 – SBERG & SAGS GEST 1508 – Specialist SAGS* Simulator SBERG training (TTM)	• SBERG sim training (3 years) in TTM- this covers SBERG 6 and SBERG 3 • SBERG as part of desktops (5 years) in emergency exercise planning matrix document (not in an Accident Management programme document)	SBERG exercising matrix to cover all SBERGS
CCR Supervisors	GEST 1507 – SBERG & SAGS GEST 1508 – Specialist SAGS* Simulator SBERG training (TTM)	SBERG simulator training 4 year refresher	
Reactor Desk Engineer (RDE)	GEST 1507 – SBERG & SAGS GEST 1508 – Specialist SAGS* Simulator SBERG training (TTM)	SBERG simulator 5 year refresher	
Emergency Controller	Optional initial. Training request in system to develop an SBERGS & SAGS awareness training (CR **01442184)**	None	
Duty Reactor Performance Engineer (DRPE)	GEST 1507 SBERGS & SAGS (GEST 1508 will be added in 2026)	CTM- SBERG/ SAG's every 5 years	

The team review noted the following activities which have not been fully addressed by the time of the OSART follow-up mission:

– GEST1508 Implementation: SAG training has been added to the Shift Manager, CCR Supervisor, and Reactor Desk Engineer roles. This update has been approved by the Operations Manager peer group and is now incorporated into the relevant program documentation. The training is in progress, and all personnel are scheduled to receive the training.
– Although Emergency Controllers are the designated decision makers for SAG implementation, fleet guidelines do not currently require the Emergency Coordinator to complete SAG training as part of their qualification. The plant has taken additional action beyond the fleet requirements to ensure that all current personnel qualified as Emergency Controllers have completed SAG training (GEST 1507 Training). Action Request (AR) 01442184 was generated by the plant to request that the fleet formally establish this requirement.
– Shift Managers are required to receive initial SAG training. However, this training has only been assessed as an Initial Training requirement and Refresher Training is currently not required. A review of training and qualification records confirmed that all personnel filling accident management roles in the emergency response organization have completed all currently required training.

Conclusion: Satisfactory progress to date.

10.4. DEVELOPMENT OF PROCEDURES AND GUIDELINES

10.4 (1) Issue: Guidance for the preparation and review of SAGs and the control of staged equipment which support Deployable Backup Equipment (DBUE) use is not comprehensive to ensure that these activities are conducted in a manner that effectively supports programme goals.

The team noted the following:

- The corporate SAG Guidance Document does not distinguish the differences between SAG verification and validation activities. Standards for validation have not been established in the document although some aspects of validation were stated as having been performed.
- Plant guidelines for the periodic review of procedures do not require periodic review of the SBERGs. Corporate guidelines for the periodic review of procedures do not require the periodic review of SAGs. The SAGs are reviewed as part of the 10-year PSR process.
- Foreign material exclusion (FME) covers are not installed on hoses and electrical plug connections for Deployable Backup Equipment staged in the plant.
- Signage is not provided to ensure that personnel do not remove staged equipment without authorization.
- Measures are not established such as periodic field operator reviews of connection points and staged material to ensure that workers do not block access to DBUE connection points or routes or compromise staged equipment. This concern would be magnified during outage periods that involve many field work activities and large numbers of contract workers.
- There is no guidance to perform a periodic inventory of some staged equipment to ensure that it is available.
- The completed Accident Management Self-Assessments were found primarily compliance-based and reactive versus a proactive critical review of programme effectiveness and did not utilize external peers to provide outside perspectives.

Without comprehensive guidance for the preparation and review of SAGs and the control of staged equipment, the readiness of the plant to manage a severe accident could be compromised.

Suggestion: The plant should consider improving the guidance for preparation and review of SAGs and controls for staged equipment to ensure availability.

IAEA Bases:

SSR-2/2 (Rev.1)

Requirement 19: The operating organization shall establish, and shall periodically review and as necessary revise, an accident management programme.

5.8. An accident management programme shall be established that covers the preparatory measures, procedures and guidelines, and equipment that are necessary for preventing the progression of accidents, including accidents more severe than design basis accidents, and for mitigating their consequences if they do occur. The accident management programme shall be documented and shall be periodically reviewed and as necessary revised.

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2.56. Verification and validation processes should assess the technical accuracy and adequacy of the accident management guidance to the extent possible, as well as the ability of personnel to follow and implement this guidance. The verification process should confirm the compatibility of the guidance with the referenced equipment, user aids and supplies (e.g. non-permanent equipment, posted job aids, computational aids) (see Ref. [17]). The validation process should demonstrate that the necessary instructions are provided to implement the guidance.

2.57. The staff involved in the validation of accident management guidance should be different from those who developed the guidance. Developers and writers of plant specific accident management guidance should prepare appropriate tests and scenarios for validation, and their participation as observers to the validation process may be beneficial (see Ref. [18]).

2.58. The findings and insights from the verification and validation processes, including consideration of positive and negative consequences of actions, should be documented. This information should be used to provide feedback to the developers of procedures and guidelines for any necessary updates before the documents are brought into force by the management of the operating organization. The documentation should be stored appropriately to enable any future revalidation.

3.62. Validation tests should address the organizational aspects of severe accident management, especially the roles of the evaluators and decision makers, including the staff in the main control room and in the technical support centre.

3.63. Changes made to procedures and guidelines should be re-evaluated and revalidated on a periodic basis to maintain the adequacy of the severe accident management programme.

3.64. Possible methods for the validation of the SAMGs and background documents include:
(a) an engineering simulator including a full scope simulator (if available) or other plant analysis tool, and
(b) a tabletop method. The most appropriate method or combination of methods should be selected, taking into account the role of each functional group of personnel in an emergency.

3.65. If a full scope simulator is used, validation should encompass the uncertainties in the magnitude and timing of phenomena (both phenomena that result from the accident progression and phenomena that result from recovery actions). Consideration should be given to simulating a degraded or unavailable instrumentation response, or a delay in obtaining the information.

3.66. Validation should be performed under conditions that realistically simulate the conditions present during an emergency and should include simulation of other response actions, hazardous work conditions, time constraints and stress. Special attention should be paid to the use of portable and mobile equipment, when such use is considered, and for multiple unit sites, to the practicality of using backup equipment that could be provided by other units.

3.90. When the severe accident management strategies rely on non-permanent equipment, the operability of such equipment for anticipated conditions and for the actual configuration and layout should be assessed to confirm that it is likely to meet accident management objectives. Steps should be taken (including obtaining any necessary permits or licenses) to ensure that personnel can install and operate the non-permanent equipment within the time frames necessary even under adverse conditions.

Plant Response/Action:

Root cause identification:

The frequency for update of the SBERGS & SAGs is not defined. Checks on the Deployable Back Up Equipment (DBUE) could be enhanced.

Actions Performed:

Proposed Actions:

- Working with fleet Emergency Planning Group (EPG), review the approach for SBERGS and SAGs update frequencies.
- Enhance the DBUE checks on site (Fire PA checks).
- Implement the Fleet annual check of station-based DBUE.

Results and Effectiveness:

Overall, the preparation and review of Severe Accident Guidelines (SAGs), as well as the control of staged equipment supporting Deployable Backup Equipment (DBUE), is comprehensive for the following reasons:

- Roles and responsibilities of responders to a severe accident are clearly defined and documented, Additionally, responsibilities for preparing, reviewing, approving, and maintaining SAGs and DBUE-related procedures are assigned via Discipline Health requirements.
- Escalation paths and decision-making authority during emergencies are detailed in SAM documentation.
- Procedural detail is well established in both the SBERGs and SAGs. These documents are appropriately reviewed and updated (see more detailed response below).
- There is adequate evidence of validation and verification (see detailed response below). Additionally, SBERGs, SAGs, and DBUE readiness have been validated through drills, desktop exercises, and fault studies.
- There are specific training requirements for personnel involved in SBERG, SAG, and DBUE activities.
- User performance is monitored through desktop exercises and simulator training.
- The SAM SQEP mentor guide incorporates lessons learned from international operational experience and industry standards (e.g., OECD/NEA, ASAMPSA)

1. Governance and Review Process

All Technical Severe Accident Management (SAM) Guidance is subject to the Company's verification and technical review process. This guidance undergoes a structured review cycle, which has evolved over time in response to changes within the SAM programme.

Currently, technical guidance reviews are triggered by three mechanisms:

- Changes in plant configuration with potential implications for SAM.
- Identification of Safety Case anomalies affecting SAM.
- Updates in international guidance and operational experience (OpEx).

The first two mechanisms are embedded within the established Modification Process. The Engineering Change (EC) process includes a technical review of Nuclear Safety Requirements Specifications to identify potential impacts. A checklist guides this review, explicitly including SAM considerations. If SAM implications are identified, the Safety Case must address them in accordance with Company procedures.

2. Station-Specific Guidance and Communication

The Station-Based Emergency Response Guidelines (SBERGs) for all Advanced Gas-cooled Reactors (AGRs) are regularly reviewed and updated to reflect changes in plant operations. Updates include:

– Training session outcomes.

– Guidance on using poor-quality water.

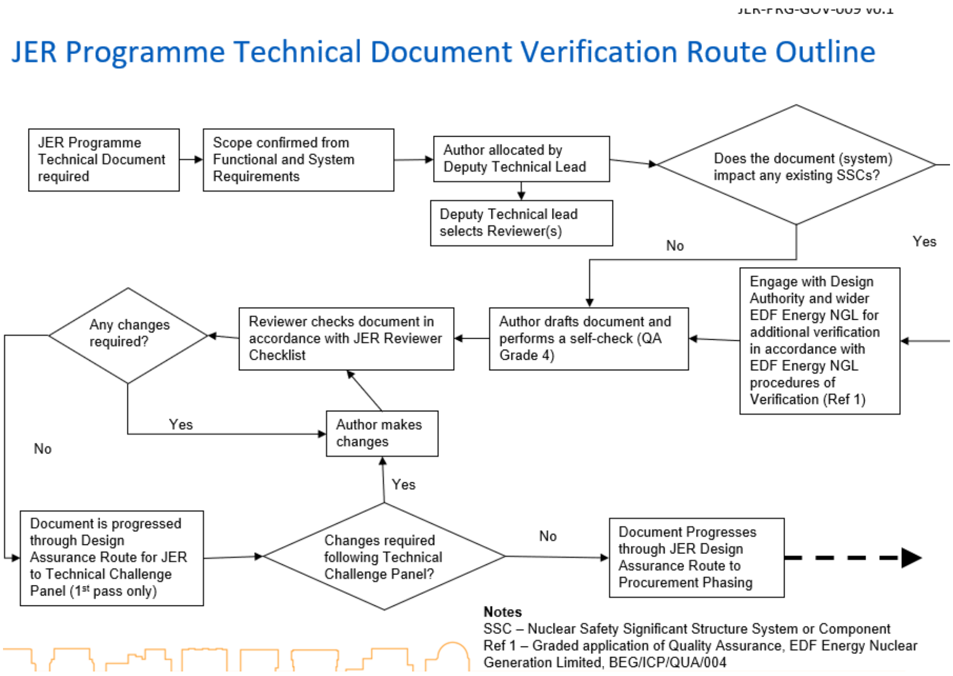
– Transition to full reactor defueling.

Changes to SBERGs, which are station-specific operating instructions, are communicated to relevant personnel via directed reading and training modules within the EC process.

3. Applicability of International Guidance

Due to the unique design of AGRs, much international guidance and OpEx is not directly applicable. However, relevant lessons from significant nuclear events — including Three Mile Island, Chernobyl, and Fukushima — have been incorporated where appropriate.

Following the Fukushima Daiichi accident, EDF Energy launched the Japan Earthquake Response (JER) programme to reassess preparedness. This initiative led to the development of specifications across key capability areas: training, equipment, personnel, information, deployment, organisation, infrastructure, and logistics. All JER-driven station-specific modifications, including updates to SBERGs and SAGs, underwent rigorous verification and, where feasible, validation.



4. Validation Challenges for SAM Guidance

Full validation of SAM Guidance (SAMGs) presents several challenges:

a. Physical Phenomena Complexity

Severe accidents involve extreme and complex physical and chemical processes that are difficult to model or replicate experimentally.

b. Limited Real-World Data

Severe accidents are rare, and data collection during such events is limited. This restricts opportunities for direct validation of guidance and analytical tools.

c. Simulation Tool Limitations

- Computer Codes: These rely on models with inherent assumptions and limitations, often producing divergent results for the same scenario. Uncertainty quantification remains an active research area.
- Full-Scope Simulators: Typically designed for design-basis accidents, these simulators lack the capability to model severe accident conditions such as core melt or equipment performance beyond design limits.

d. Uncertain Plant Conditions

During severe accidents, instrumentation may fail or become unreliable, and communication systems may degrade, complicating diagnosis and adherence to predefined guidance.

5. Validation Approach

Given these challenges, validation of SAMGs involves:

- Desktop drills and scenario-based exercises.
- Evaluation of fault study analysis codes.
- Comparison of model outputs with experimental data and validated legacy codes.

Fault study codes are primarily used for design-basis fault analysis but have also been applied to beyond design-basis scenarios. These analyses, conducted on a best-estimate basis, help explore potential outcomes of low-frequency, high-impact events and estimate recovery timeframes before significant radiological consequences occur.

EDF also leverages OECD/NEA SOAR reports, which provide valuable insights. The ASAMPSA Level 2 PSA report, although focused on Light Water Reactors (LWRs), offers best practices that may be applicable to AGRs in certain areas.

6. SAG Updates and Human Factors Integration

The Severe Accident Guidelines (SAGs) were last comprehensively updated in 2021, with a commitment to review every five years. The update incorporated feedback from training sessions and input from Subject Matter Experts.

Training sessions emphasize decision-making under uncertainty, recognizing that no single correct path exists for complex, multi-causal scenarios. The focus is on understanding the consequences of each action or inaction.

A key enhancement was the integration of human factors, resulting in the addition of a third chapter: Actions to Avoid. This chapter helps responders prioritise effective actions and avoid those with minimal or no benefit. Feedback from trainees has been positive, noting improved clarity and decision-making focus.

GEST1508 – SAG training has been added to SM, CCRS, RDE, and NSG. This inclusion was approved by the Operations Manager peer group and incorporated into the training documentation.

Deployable Backup Equipment (DBUE) Enhanced Checks.

The implementation of the Governance and Oversight Assessment, as reinforced following a fleet mandatory evaluation, will significantly improve the station's ability to maintain and monitor Beyond Design Basis Accident (BDBA) equipment. These improvements directly support two key objectives:

– Enhanced DBUE Checks on Site: The structured assessment process ensures that all station-based DBUE is routinely inspected for availability, condition, and readiness. By validating maintenance schedules, confirming the accessibility of tie-in points, and verifying the operational status of critical equipment such as generators, pumps, and communications devices, the station can proactively identify and resolve deficiencies. This enhances confidence in the station's ability to deploy DBUE effectively during emergency scenarios.
– Implementing the Fleet Annual Check of Station-Based DBUE: The adoption of a standardised inspection tool across the fleet ensures consistency in how station-based DBUE is assessed. The form's ten-point checklist provides a comprehensive framework for evaluating compliance and identifying areas for improvement. Outputs from these assessments are reviewed by the Fleet Emergency Planning Group, enabling central oversight and ensuring that all stations maintain deployable capability in line with fleet-wide expectations.

Together, these measures reinforce the governance framework for BDBA equipment, reduce the risk of degradation, and ensure that emergency response infrastructure remains fit for purpose.

IAEA comments:

The plant has assessed the OSART mission findings and taken actions to address each of those.

The first aspect was the need to ensure that actions necessary to perform verification and validation of Severe Accident Guidelines (SAGs) is performed consistently with the expectations in SSG-54. The plant has provided sufficient information to confirm that verification and validation is being performed. To ensure that the methods for completing this are clarified, Action Request 01442294 was generated to update the governing accident management programme document. Based on the actions taken this aspect was sufficiently addressed.

The second aspect was the need to clarify the periodic review frequency of the SAGs which was previously based on the 10 year PSR timeline. The SAGs were last updated in 2021, with a commitment to review every five years such that the next review will be completed in 2026. On an ongoing basis, feedback is captured from training and emergency response drills and input from Subject Matter Experts and incorporated into planned updates. Based on the actions taken this aspect was sufficiently addressed.

The final aspect dealt with the need to have stronger controls to ensure that the Deployable Backup Equipment (DBUE) is available and maintained in a state of readiness. The plant has taken appropriate actions to ensure that plant-based DBUE is routinely inspected for availability, condition, and readiness. In addition to the plant actions, the corporate organization performed an independent assessment of DBUE availability based on a ten-point checklist. A field observation was performed by the IAEA team which noted that controls have been established. During walkdowns by the team it was identified that FME covers were missing on the staged hoses of the Backup Emergency Feed System Pumps. Operators took immediate action to install the necessary FME covers and revise procedure PIOI 3.24.5/4 which provides guidance on performing routine test runs of the pumps was revised to ensure that FME covers are installed after the test runs. Based on the actions taken this aspect was sufficiently addressed.

Conclusion: Issue resolved.

10.5 PLANT EMERGENCY ARRANGEMENTS WITH RESPECT TO SAM

10.5 (a) Good Practice: Monitoring of Key Plant Parameters Following a BDB Accident

Following a Beyond Design Basis (BDB) event causing loss of normal indications, the Continuous Emergency Monitoring System (CEMS) provides live display of key plant parameters in multiple locations both on and off-site to facilitate severe accident management decision making. CEMS records 8 hours of plant data leading up to and 24 hours after the event utilizing resilient station-based power. It consists of permanently installed response equipment and, when deployed, the CEMS Repair Kit can replace the functionality of key station-based system components. CEMS also provides an interface to the Deployable Communication and Information System (DCIS) so that plant status can continue to be monitored beyond the initial 24-hour period that CEMS supports.

The CEMS cubicle acts as the central hub of the CEMS system capturing data and making it available for users (CCR, Reactor Building, ECC) to view or download locally or from remote locations. A single CEMS cubicle is capable of monitoring two reactors. If the site is required to be evacuated, a mobile command centre is established at an appropriate staging post and the system can transmit data to this command centre, the CESC, and other organizations as required.
Parameters provided to monitor Critical Safety Functions (CSFs):

- Reactor bottom temp, T1 (2 Quadrants) - Circulator Outlet Gas Temp;
- Reactor top temp, T2 (2 Quadrants) - T2 Temperature;
- Reactor Pressure - Reactor Gas Pressure;
- Boiler Conditions - Boiler Outlet Pressure (4 Quadrants).

Key Benefits Provided by CEMS:

- Permits transfer of parameters key to monitor critical safety functions in a BDB event;
- Permanently installed in the plant;
- Continuously monitoring to record an additional 8 hours of data preceding the event;
- Provides parameters for 24 hours independently, which can be extended by DCIS from DBUE;
- Provides indications to multiple locations for flexibility:
  - Fixed PC in the Emergency Control Centre (ECC);
  - Satellite PC stored on site to allow mobile access;
  - Interfaces with the DCIS supplied as part of the DBUE;
  - Can transmit data to mobile and fixed offsite Command and Control locations;

Accessible by the Corporate Central Emergency Support Centre (CESC) for support.

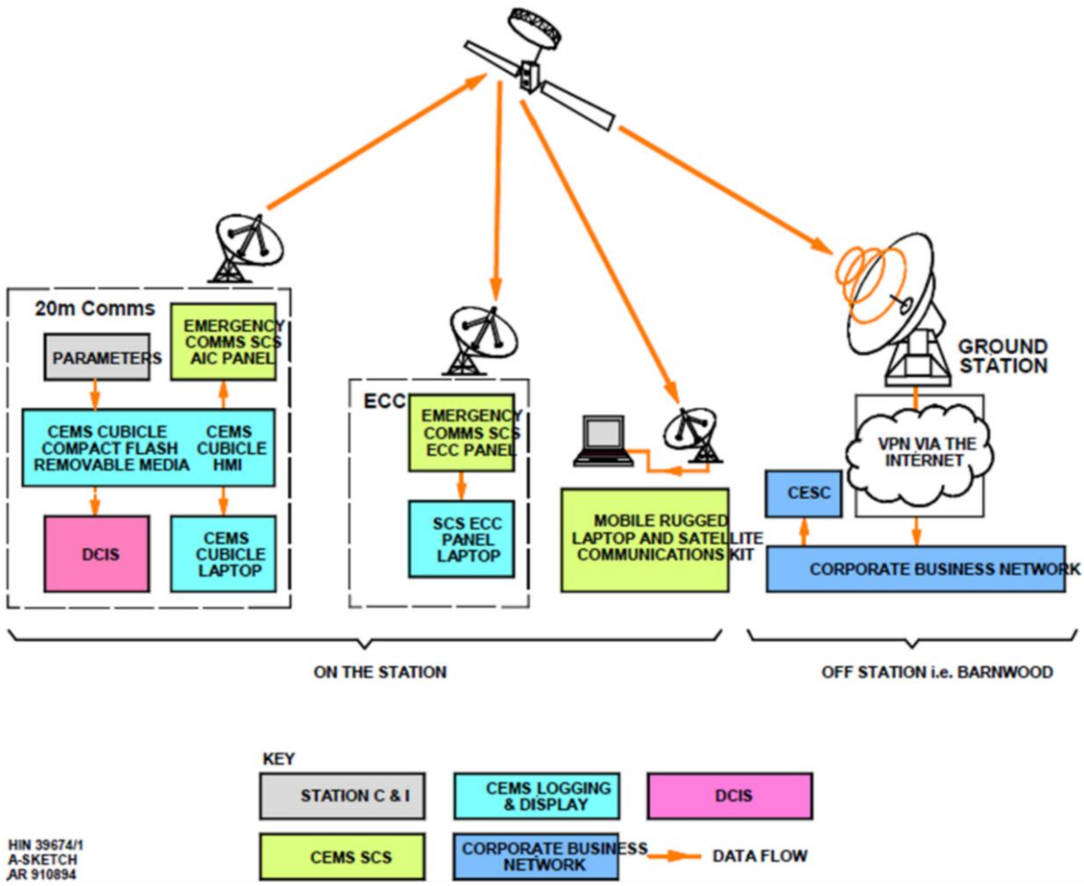


Figure 10.1. Representation of the Continuous Emergency Monitoring System

SUMMARY OF RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES

AREAS	RECOMMENDATIONS, SUGGESTIONS and GOOD PRACTICE
LMS	**Recommendation:** 1.1(1) The plant should improve its approach in setting and reinforcing expectations and challenge the site personnel to identify and correct substandard conditions and equipment deficiencies in a timely manner. **Good practice:** 1.5(a) The plant has implemented a system called “wall hound” to detect electromagnetic interference and radio frequency interference (EMI/RFI) emitted by mobile phones, laptops and smart watches raising an audible and visual cue/prompt. **Recommendation:** 1.6 (1) The plant should effectively identify and address industrial safety hazards and correct substandard behaviours to help prevent personnel injuries.
TQ	**Good practice:** 2.1(a) The plant has used military training expertise to develop high quality Crew Resource Management training.
OPS	**Good Practice:** 3.4(a) Use of hot connection indicators to monitor cable connections temperature. **Good practice:** 3.4(b) Contingency plans during routine maintenance or emergent issues **Suggestion:** 3.4(1) The plant should consider improving the field operator rounds to effectively identify and report deficiencies in a timely manner. **Recommendation:** 3.6(1) The plant should improve the closure of fire doors and control/ assessment of fire loads in the plant to minimize the consequences of fire to equipment and personnel safety.
MA	**Suggestion**: 4.5(1) The plant should consider improving its preparation, implementation and control of maintenance activities to reduce the risk of equipment failure. **Recommendation:** 4.6(1) The plant should improve the material conditions of plant systems, structures, and components to minimise the risk to plant safety and reliability.
TS	**Suggestion:** 5.1(1) The plant should consider more strictly implementing seismic controls in seismically controlled areas. **Suggestion:** 5.3(1) The plant should consider improving its ageing management activities to ensure ageing of systems, structures, and components is properly managed. **Recommendation:**

	5.6(1) The plant should improve the equipment reliability programme to prevent abnormal plant conditions. **Good practice:** 5.7(a) Electronic Laptop Lockers and Key Storage **Suggestion:** 5.7(1) The plant should consider fully and timely completing and reviewing plant modifications to ensure that the plant configuration is always up to date.
OEF	**Suggestion:** 6.4(1) The plant should consider improving its screening and prioritization of plant events to prevent recurrence.
RP	**Recommendation**: 7.3(1) The plant should improve its application of contamination controls. **Suggestion**: 7.4(1) The plant should consider optimizing radiation protection processes and occupational exposure controls.
CH	**Good Practice:** 8.2(a) Chemistry Preservation Metric **Suggestion:** 8.6(1) The plant should consider addressing shortfalls in the control and labelling standard for auxiliary chemical substances.
EPR	**Recommendation**: 9.2(1) The plant should update the emergency effective dose controls and change the limit to 50 mSv. **Good practice:** 9.3(a) Live White Board Sharing Approach **Good practice:** 9.3 (b) METHANE emergency briefing mnemonic **Suggestion**: 9.3(1) The plant should consider improving regular training and exercises requirements for each member of the emergency response organization to ensure that proficiencies are maintained. **Suggestion**: 9.3(2) The plant should consider systematically evaluating the implementation of all functions of the response organization during exercises.
AM	**Recommendation**: 10.1(1) The plant should improve the Accident Management Training and Qualification Program to ensure that plant staff is prepared to support SAG implementation. **Suggestion:** 10.4(1) The plant should consider improving the guidance for preparation and review of SAGs and controls for staged equipment to ensure availability. **Good Practice**: 10.5(a) Monitoring of Key Plant Parameters Following a BDB Accident

PSA	**Good Practice:** 14.5(a) The plant has developed a unique risk-informed application that categorizes the proposed areas of improvement, identified in the Periodic Safety Review (PSR), according to deterministic and probabilistic risk benefits in order to concentrate efforts in areas most beneficial to safety.

SUMMARY OF STATUS OF RECOMMENDATIONS AND SUGGESTIONS OF THE OSART FOLLOW-UP MISSION

	RESOLVED	SATISFACTORY PROGRESS	INSUFFICIENT PROGRESS	TOTAL
Leadership and Management for Safety				
1.1(1)R		X		1
1.6 (1)R		X		1
Operations				
3.4(1)S		X		1
3.6(1)R	X			1
Maintenance				
4.5(1)S		X		1
4.6(1)R		X		1
Technical Support				
5.1(1)S	X			
5.3(1)S			X	1
5.6(1)R		X		1
5.7(1)S	X			1
Operating Experience Feedback				
6.4(1)S	X			
Radiation Protection				
7.3(1)R		X		1
7.4(1)S		X		1
Chemistry				
8.6(1)S		X		1
Emergency Preparedness and Response				
9.2(1)R		X		1
9.2(1)S		X		1
9.3(2)S	X			1
Accident Management				
10.1(1)R		X		1
10.4(1)S	X			1
TOTAL R	1	7		8
TOTAL S	5	5	1	11
TOTAL	6	12	1	19
	32%	63%	5%	

DEFINITIONS

Recommendation

A recommendation is advice on what improvements in operational safety should be made in the activity or programme that has been evaluated. It is based on inadequate conformance with the IAEA safety standards and addresses the general concern rather than the symptoms of the identified concern. Recommendations are specific, realistic and designed to result in tangible improvements.

Suggestion

A suggestion is advice on an opportunity for a safety improvement not directly related to inadequate conformance with the IAEA Safety Standards. It is primarily intended to make performance more effective, to indicate useful expansions to existing programmes and to point out possible superior alternatives to ongoing work.

Good practice

A good practice is an outstanding and proven programme, activity or equipment in use that contributes directly or indirectly to operational safety and sustained good performance. A good practice is markedly superior to that observed elsewhere, not just the fulfilment of current requirements or expectations. It should be superior enough and have broad enough application to be brought to the attention of other nuclear operating organizations and be worthy of their consideration in the general drive for excellence. A good practice is novel; has a proven benefit; is replicable (it can be used in other organizations); and does not contradict an issue. Normally, good practices are brought to the attention of the team on the initiative of the host organization. An item may not meet all the criteria of a “good practice”, but still be worthy to take note of, in this case it may be referred to as a ‘good performance’ and documented in the text of the report.

Good performance

A good performance is a superior objective that has been achieved or a good technique or programme that contributes directly or indirectly to operational safety and sustained good performance, that works well at the nuclear installation. However, it might not be necessary to recommend its adoption by other nuclear installations, because of financial considerations, differences in design or other reasons.

Self-identified issue

A self-identified issue is documented by the OSART team in recognition of actions taken to address inadequate conformance with the IAEA safety standards identified in the self-assessment made by the host organization prior to the mission and reported to the OSART team by means of the Advance Information Package. Credit is given for the fact that actions have been taken, including root cause determination, which leads to a high level of confidence that the issue will be resolved within a reasonable time frame. These actions should include all the necessary provisions such as, for example, budget commitments, staffing, document preparation, increased or modified training, or equipment purchases, as necessary.

Encouragement

If an item does not have sufficient safety significance to meet the criteria of a ‘recommendation’ or ‘suggestion’, but the expert or the team feels that mentioning it is still desirable, the given topic may be described in the text of the report using the phrase ‘encouragement’ (e.g. the team encouraged the host organization to […])

DEFINITIONS – OSART FOLLOW UP MISSION

Recommendation or Suggestion – Issue resolved

All necessary actions have been taken to deal with the root cause of a recommendation or suggestion rather than to just eliminate the facts identified by the team. A management review has been performed to ensure that actions taken have eliminated the root cause. Actions have also been taken to check that it does not recur. Alternatively, an issue is no longer valid due to, for example, changes in the operating organization.

Recommendation or Suggestion – Satisfactory progress to date

Actions have been taken, including root cause determination, which lead to a high level of confidence that a recommendation or suggestion will be resolved within a reasonable time frame, after the follow up mission. These actions might include, for example, budget commitments, staffing, document preparation, increased or modified training, equipment purchases. This category implies that a recommendation or suggestion could not reasonably have been resolved prior to the follow-up mission, either due to its complexity or the need for long term actions. This category also includes recommendations and/or suggestions which have been resolved using temporary or informal methods, or when resolution has only recently taken place and its effectiveness has not been fully assessed.

Recommendation or Suggestion – Insufficient progress to date

Actions taken or planned do not lead to the conclusion that a recommendation or suggestion will be resolved within a reasonable time frame. This category includes recommendations and/or suggestions in response to which no action has been taken, barring recommendations and/or suggestions that have been withdrawn.

Self-identified issue – Issue resolved

All necessary actions have been taken, as defined in the self-assessment and the corresponding action plan, to address the root cause of an issue. A management review has been performed to ensure that actions taken have eliminated the issue. Actions have also been taken to check that it does not recur.

Self-identified issue – Satisfactory progress to date

Actions have been taken, as defined in the self-assessment made and the corresponding action plan to deal with the root cause and contributing causes, which lead to a high level of confidence that the issue will be resolved within a reasonable time frame.

Self-identified issue – Insufficient progress to date

The action plan developed to resolve the issue was not implemented as expected or did not achieve the expected results.

Recommendation or Suggestion – Withdrawn

The recommendation or suggestion is not appropriate due to, for example, a change in operating organization and/or structure, and/or the emergence of new, previously non-existent, circumstances associated with the identified issue.

REFERENCES

Safety Fundamentals (SF)

- **SF-1**; Fundamental Safety Principles (Safety Fundamentals)

General Safety Requirements (GSR)

- **GSR Part 1**; Governmental, Legal and Regulatory Framework for Safety
- **GSR Part 2**; Leadership and Management for Safety
- **GSR Part 3**; Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
- **GSR Part 4 Rev.1**; Safety Assessment for Facilities and Activities
- **GSR Part 5**; Predisposal Management of Radioactive Waste
- **GSR Part 6**; Decommissioning of Facilities
- **GSR Part 7**; Preparedness and Response for a Nuclear or Radiological Emergency

Specific Safety Requirements (SSR)

- **SSR-2/1 Rev. 1**; Safety of Nuclear Power Plants: Design
- **SSR-2/2 Rev. 1**; Safety of Nuclear Power Plants: Commissioning and Operation

General Safety Guides (GSG)

- **GSG-2**; Criteria for Use in Preparedness and Response for a Nuclear and Radiological Emergency
- **GSG-7**; Occupational Radiation Protection
- **GSG-11**; Arrangements for the Termination of a Nuclear Radiological Emergency

Safety Guides (SG)

- **GS-G-2.1**; Arrangement for Preparedness for a Nuclear or Radiological Emergency
- **GS-G-3.1**; Application of the Management System for Facilities and Activities
- **GS-G-3.5**; The Management System for Nuclear Installations
- **RS-G-1.8**; Environmental and Source Monitoring for Purposes of Radiation Protection

Specific Safety Guides (SSG)

- **SSG-2 Rev.1**; Deterministic Safety Analysis for Nuclear Power Plants

- **SSG-3 Rev.1**; Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants
- **SSG-4**; Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants
- **SSG-13 Rev.1**; Chemistry Programme for Water Cooled Nuclear Power Plants
- **SSG-25**; Periodic Safety Review for Nuclear Power Plants
- **SSG-28**; Commissioning for Nuclear Power Plants
- **SSG-38**; Construction for Nuclear Installations
- **SSG-39**; Design of Instrumentation and Control Systems for Nuclear Power Plants
- **SSG-40**; Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors
- **SSG-47**; Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities
- **SSG-48**; Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants
- **SSG-50**; Operating Experience Feedback for Nuclear Installations
- **SSG-54**; Accident Management Programmes for Nuclear Power Plants
- **SSG-61**; Format and Content of the Safety Analysis report for Nuclear Power Plants
- **SSG-70**; Operational Limits and Conditions and Operating Procedures for Nuclear Plants
- **SSG-71**; Modifications to Nuclear Power Plants
- **SSG-72**; The Operating Organization for Nuclear Power Plants
- **SSG-73**; Core Management and Fuel Handling for Nuclear Power Plants
- **SSG-74**; Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants
- **SSG-75**; Recruitment, Qualification and Training of Personnel for Nuclear Power Plants
- **SSG-76**; Conduct of Operations at Nuclear Power Plants
- **SSG-77**; Protection against Internal and External Hazards in the Operation of Nuclear Power Plants
- **SSG-89**; Evaluation of Seismic Safety for Existing Nuclear Installations

International Labour Office publications on industrial safety

- Guidelines on occupational safety and health management systems, International Labour office (ILO), Geneva, ILO-OSH 2001

- Safety and health in construction, International Labour office (ILO), Geneva, ISBN 92-2-107104-9
- Safety in the use of chemicals at work, International Labour office (ILO), Geneva, ISBN 92-2-108006-4

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TEAM COMPOSITION OF THE OSART FOLLOW-UP MISSION

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