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SDFW Division - THORP Post Operational Clean Out Event Driven Review (POCO EDR)

Project Assessment of the THORP POCO EDR - February 2018

Project Assessment Report ONR-SDFW-PAR-17-060
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EXECUTIVE SUMMARY

ONR Review of THORP Post Operation Clean Out Event Driven Review – February 2018

ONR undertakes its regulatory interactions with Sellafield Ltd (SL) against the strategy and objectives of the Sellafield, Decommissioning, Fuel & Waste (SDFW) Division. Objective 12 is concerned with the proportionate assessment of Long Term Periodic Reviews (LTPR) and other safety submissions. SL's arrangements for Periodic Safety Review (LTPR) include provision for reviews to be event driven as well as time driven. Facility transition into POCO (or S&M) is one such event. Thermal Oxide Reprocessing Plant (THORP) & Finishing Line 6 (FL6) is the first event driven review of a safety case prompted by the POCO transition.

This report provides an ONR review of progress with the THORP & FL6 POCO EDR up to February 2018.

Permission Requested

No Licence Instrument or formal permission is required for these changes under SL Licence Condition 15 (LC 15, Periodic Review) arrangements.

ONR has previously engaged with SL to determine progress with the THORP & FL6 POCO EDR up to the end of 2016. This resulted in a Project Assessment Report (PAR) which raised a number of Regulatory Observations (ROs) on significant findings. SL provided an initial response to each RO and has continued to address them throughout 2017 and into 2018.

ONR has continued to interact with SL on the THORP & FL6 POCO EDR to:

- Ensure that the necessary steps are being taken to maintain and/or remediate the plant in a manner that ensures the plant risks over the whole lifecycle are maintained as low as reasonably practicable (ALARP).
- Determine progress towards closure of the ONR ROs raised in the initial PAR.

This PAR records the outcome of the SL/ONR interactions on the THORP & FL6 POCO EDR for the period from December 2016 to February 2018.

Background

The THORP facility reprocesses spent uranium oxide fuel, extracting plutonium and uranium and producing waste. It is currently moving towards the end of its operational life and parts of the facility are scheduled to transition from commercial operations into POCO shortly after the final fuel shearing operations in November 2018.

The overall risk from THORP & FL6 will not reduce significantly until reprocessing activities cease and operations to remove significant amounts of radioactive inventory from the facility have been undertaken. The POCO EDR addresses the extant safety case and considers the arrangements for managing safety and maintaining risks ALARP during the period of change from operations, through the POCO phase, into the subsequent period of surveillance and maintenance (S&M).

Post reprocessing, some areas of the THORP facility will continue to operate to support evaporation activities, store product and provide services such as ventilation and heating to the rest of the THORP facility. The key areas of THORP that will transition into POCO and S&M include the Head End Plant, Chemical Plant and FL6.

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If the THORP POCO EDR is successful it will form the basis for future activities to be applied to other SL facilities at the end of their operational lifetimes.

Work carried out by ONR

A team of ONR specialist inspectors engaged at an early stage with SL on the THORP & FL6 POCO EDR. The ONR engagement with the THORP & FL6 POCO EDR is currently at a strategic level, aiming to determine whether the SL process will deliver a satisfactory outcome.

The ONR regulatory approach that has been developed is targeted, efficient and proportionate. The project team includes a project inspector, site inspector and technical inspectors from the nuclear liabilities, human factors, control & instrumentation and fault studies disciplines. Additional support is provided by ONR mechanical engineering and security inspectors and other disciplines as required.

The ONR review of the THORP & FL6 POCO EDR has been supported by a number of interactions with SL, a SL/ONR workshop to discuss POCO EDR, a visit to the THORP facility and the findings from a number of relevant inspections.

Matters arising from ONR's work

The ONR team has interacted at an early stage with SL on the THORP & FL6 POCO EDR. ONR acknowledges the considerable progress that SL has made with the THORP & FL6 POCO EDR in the period from December 2016 to February 2018. At this time, ONR considers that the EDR has not developed far enough to provide adequate confidence in the proposed approach. However, SL has developed and presented a credible plan for transitioning parts of the THORP & FL6 facility into POCO and S&M and the necessary regulatory confidence will be generated as the plan is delivered.

Conclusions

Following continuing interactions with SL in the period from December 2016 to February 2018, ONR is of the opinion that:

- a) SL is developing and implementing a systematic and structured approach to the THORP & FL6 POCO EDR, but this process is not yet complete.
- b) Good progress has been made in addressing the ROs and that as a result, four of them can now be closed.
- c) A potential enhancement to the site-wide SL arrangements for LC15 has been identified and will be raised with the ONR SL Corporate Inspector for consideration.
- d) Further SL/ONR interactions will be required to confirm that SL is taking the necessary steps to maintain and/or remediate the plant in a manner that ensures the plant risks over the whole lifecycle are maintained ALARP.

Recommendations

This PAR recommends that:

- a) The ONR project inspector should send a letter to SL confirming the current position and outline expectations for further regulatory interaction and close-out of any outstanding ROs.

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- b) ONR should continue to interact with SL in its development of the THORP & FL6 POCO EDR and undertake a further assessment once the POCO safety case summary report and readiness reviews ahead of transitions into POCO are available (currently estimated to be in the first quarter of 2019). This will provide an opportunity for any emergent issues to be addressed.
- c) A potential enhancement to the site-wide SL arrangements for LC15 has been identified and will be raised with the ONR SL Corporate Inspector for consideration.
- d) ONR should develop and define its future permissioning strategy for the THORP & FL6 POCO EDR.

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LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
C&I	Control and Instrumentation
EDR	Event Driven Review
FL	Finishing Line
FS	Fault Studies
HF	Human Factors
HFIP	Human Factors Integration Plan
HOF	Human & Organisational Factors
LC	Licence Condition
LFE	Learning from Experience
LMfS	Leadership & Management for Safety
LTPR	Long Term Periodic Review
ME	Mechanical Engineering
NLR	Nuclear Liabilities Regulation
NSSP	Nuclear Site Security Plan
OA	Operating Assumption
OI	Operator Instruction
ONR	Office for Nuclear Regulation
ONR-S	Office for Nuclear Regulation – Security
OPM	Operational Preventative Measures
OR	Operating Rule
PDP	Preliminary Decommissioning Plan
PI	Project Inspector
POCO	Post Operation Clean Out
PSR	Periodic Safety Review
RO	Regulatory Observation
SDFW	Sellafield, Decommissioning, Fuel & Waste Division (ONR)
SI	Site Inspector
SL	Sellafield Limited
S&M	Surveillance and Maintenance
SQEP	Suitably Qualified & Experienced Person
THORP	Thermal Oxide Reprocessing Plant

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TABLE OF CONTENTS

1	PERMISSION REQUESTED	8
2	BACKGROUND	8
3	ONR ASSESSMENT	10
4	MATTERS ARISING FROM ONR'S WORK.....	17
5	CONCLUSIONS	17
6	RECOMMENDATIONS.....	18
7	REFERENCES	19

Tables

Table 1: Status of ONR Regulatory Observations – February 2018

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1 PERMISSION REQUESTED

1. ONR undertakes its regulatory interactions with Sellafield Ltd (SL) against the strategy and objectives of the Sellafield, Decommissioning, Fuel & Waste (SDFW) Division. Objective 12 is concerned with the proportionate assessment of Long Term Periodic Reviews (LTPRs) and other safety submissions. SL's arrangements for Periodic Safety Review include provision for reviews to be event driven as well as time driven. Facility transition into POCO (or S&M) is one such event. Thermal Oxide Reprocessing Plant (THORP) & Finishing Line 6 (FL6) is the first event driven review of a safety case prompted by the POCO transition.
2. No Licence Instrument or formal permission is required for these changes under SL Licence Condition (LC) 15, Periodic Review arrangements.
3. ONR has previously reviewed SL progress with this EDR up to the end of 2016. This resulted in a Project Assessment Report (PAR) (Reference 1), which raised a number of Regulatory Observations (ROs) on significant findings. SL provided a response to each of the ROs and has continued to address them throughout 2017 and into 2018. ONR has continued to interact with SL on the THORP & FL6 POCO EDR to:
 - Ensure that the necessary steps are being taken to maintain and/or remediate the plant in a manner that ensures the plant risks over the whole lifecycle are maintained as low as reasonably practicable (ALARP).
 - Determine SL progress with the ONR ROs that were raised earlier in the assessment process.
4. This PAR records the outcome of the SL/ONR interactions on the THORP & FL6 POCO EDR from December 2016 to February 2018.

2 BACKGROUND

2.1 THORP BACKGROUND & TRANSITION INTO POCO AND S&M

5. The THORP facility reprocesses spent uranium oxide fuel, extracting plutonium and uranium and producing waste. It is currently moving towards the end of its operational life and parts of the facility are scheduled to transition from commercial operations into POCO shortly after the final fuel shearing operations in November 2018.
6. The overall risk from THORP & FL6 will not reduce significantly until reprocessing activities cease and operations to remove significant amounts of radioactive inventory from the facility have been undertaken. The THORP & FL6 POCO EDR addresses the extant safety case and considers the arrangements for managing safety and maintaining risks ALARP during the period of change from operations, through the POCO phase, into the subsequent period of surveillance and maintenance (S&M).
7. SL POCO preparations are underway to identify the condition that plant will be left in at the end of operations and the end of POCO. These are important steps because if the end state of the plant at the end of operations is known and the target end state at the end of POCO is defined, the safety case to transition from one end state to the other can be developed. SL has outlined the steps to carry out the POCO EDR (Reference 2) of the safety case to ensure that the safety case in place for POCO and S&M is adequate.
8. Post reprocessing, some areas of THORP will continue to operate to support Highly Active Liquor Evaporation and Storage (HALES), store product and provide services such as ventilation and heating to the rest of the THORP facility. The key areas of

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THORP that will transition into POCO and S&M include the Head End Plant, Chemical Plant and FL6.

9. The scope of the THORP & FL6 POCO EDR requires changes not only to the safety case, but also to other key factors such as personnel, organisation, process and physical plant condition. If the THORP & FL6 POCO EDR is successful it will form the basis for activities to be applied to other SL facilities at the end of their operational lifetimes.

2.2 PREVIOUS ONR INTERVENTIONS

10. ONR reviewed SL progress with the THORP & FL6 POCO EDR at the end of 2016, resulting in a PAR (Reference 1), which concluded that SL was taking a systematic and structured approach to its management of POCO. However, on the basis of the engagements that were carried out at that time (up to December 2016), ONR considered that the THORP EDR process was still in the early stages of development. Furthermore, it was not sufficiently well developed, defined or documented to give ONR the necessary confidence in the adequacy of the proposed approach as a replacement for its LTPR process for plants transitioning from operations into POCO or S&M.
11. The PAR recommended that:
 - ONR should send a decision letter (Reference 3) stating the conclusions set out above, outlining the further regulatory oversight that will be applied to the THORP & FL6 POCO EDR and advising in regard to our expectations for the close-out of our ROs and associated actions.
 - ONR should continue to regulate SL in its development of the THORP & FL6 POCO EDR safety case strategy and undertake a further assessment once this development work is suitably complete.
12. This PAR records the outcome of the continued SL/ONR interactions on the THORP & FL6 POCO EDR from December 2016 to February 2018.

2.3 THORP & FL6 POCO EDR TIMELINE & FUTURE PERMISSIONING STRATEGY

13. The transition of THORP & FL6 from operations to POCO and then to S&M will take place over several years and some indicative key dates (correct as of February 2018) include:
 - Issue of POCO safety case strategy – November 2017.
 - Last shear of spent nuclear fuel – November 2018.
 - End of reprocessing operations – April 2019.
 - POCO safety case summary report – January 2019.
 - S&M safety case summary report – January 2022.
 - Readiness reviews ahead of transitions into POCO and S&M – early 2019 (POCO) and early 2022 (S&M).
 - Decommissioning unlikely to start before 2040.
14. The ONR approach to future permissioning of the THORP & FL6 POCO EDR is being considered for both the current year and for the period between the start of POCO, the start of S&M and beyond. At this time it is likely that ONR will seek additional reassurance from SL on:
 - The POCO Safety Case Summary and POCO readiness inspection (currently around January 2019).

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- The S&M Safety Case Summary and POCO readiness inspection (currently around January 2022).
 - The resolution of any hold points raised by SL or ONR on the Hold Point Control Plan.
 - How the requirements of future Article 37 and Safeguards will be addressed.
15. SDFW is reviewing its approach to the regulation of plants entering POCO and this will inform the decision on future regulation of the THORP & FL6 POCO EDR.

3 ONR ASSESSMENT

16. The aim of the ONR interaction is to ensure that SL is controlling the plant risks ALARP whilst enabling a safe transition into POCO and subsequent S&M phases and beyond. Therefore, the ONR engagement with the THORP & FL6 POCO EDR is currently at a strategic level, aiming to determine whether the SL process will:
- Deliver adequate safety cases for POCO and S&M.
 - Successfully define the end states for POCO and S&M.
 - Define safe operating envelopes and requirements for Safety Mechanisms and Safety Related Equipment with suitable engineering substantiation and on-going surveillance.
 - Define appropriate operating limits and conditions in the interests of safety.
 - Review the Engineering Schedule, Operator Requirements, Operator Instructions and other activities required in the interests of safety.
 - Provide a meaningful estimate of the risk posed by the facility, to quantify the known shortfalls against expected standards and to demonstrate that the risks associated with the facility remain ALARP.
 - Provide a summary document to present the overall safety claims of the safety cases and to explain how the evidence contained within the various assessments and substantiations support these claims.
 - Define the activities and logic required to produce and approve the new safety cases.
 - Define the activities and logic required to implement the new safety cases, including plant configuration and management.
 - Define the activities and logic for plant improvements that provide a positive safety benefit.

3.1 ONR ASSESSMENT PROCESS & INTERACTIONS WITH SL

17. ONR assessment of safety cases typically uses a sampling strategy to improve the overall efficiency of the process. As the THORP & FL6 POCO EDR is in the early stages of development, ONR specialist inspectors developed and followed lines of enquiry with SL to evaluate progress. In the past year, the majority of the SL/ONR interactions have been undertaken in the following technical areas:
- Project Inspection (PI).
 - Nuclear Liabilities Regulation (NLR).
 - Human Factors (HF).
 - Control and Instrumentation (C&I).
 - Fault Studies (FS).
 - Site Inspection (SI).
18. The following disciplines undertook more limited interactions within the period:
- Mechanical Engineering (ME).
 - ONR Security (ONR-S).

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19. The significant interactions between the ONR team and SL in the past year included:
- Review of SL progress towards the closure of the ROs raised in the December 2016 PAR, see Table 1.
 - Review of a significant SL deliverable - THORP & FL6 POCO safety case strategy (Reference 4).
 - Participation in an SL/ONR workshop to discuss the THORP & FL6 safety case strategy and overall progress with the POCO EDR (References 5, 6 & 7).
 - Discussion of the question set that was developed and submitted to SL before the workshop (Reference 8).
 - Participation in a planned intervention with a multi-disciplined ONR team to determine SL progress with the THORP & FL6 POCO EDR and inspection of relevant parts of the facility in January 2018 (Reference 9).
20. In addition, the ONR specialist inspectors carried out other targeted interventions and these are reported separately in the following sections.

3.2 PROJECT INSPECTION

21. In addition to the activities outlined in Section 3.1, the ONR PI has interacted with SL during the past year to:
- Discuss on a monthly basis, SL progress with the THORP & FL6 POCO EDR. This information is subsequently circulated to the ONR team for continued awareness. An example of a recent Contact Record can be found in (Reference 10).
 - Maintain a list of key issues arising from SL/ONR interactions which will be addressed by SL as the POCO EDR progresses.
 - Co-ordinate the ONR review of a key SL deliverable (THORP & FL6 POCO safety case strategy) which included facilitating the SL/ONR workshop, progressing the resolution of the significant question set which was submitted to SL before the SL/ONR workshop and arranging and reporting the ONR team intervention in January 2018.
 - Discuss the close out of LTPR shortfalls from the previous review, noting that:
 - SL reporting that all Urgent or Safety Significant shortfalls in THORP & FL6 are now closed out.
 - The THORP & FL6 POCO safety case strategy document (Reference 4) states that “all shortfalls raised during the LTPR on THORP have been closed”. Some of these shortfalls have existed for several years and the way in which SL raises and deals with shortfalls has changed; some of the closures may have been based on activities being moved to normal business or being justified as no longer required. The ONR PI will progress this separate to this PAR (ONR Regulatory Issue 5352 refers).
 - Some of the LTPR shortfalls have significantly changed the extant safety case. In some cases new hazard analyses have been produced to remodel faults and consequences and new controls have been identified and implemented. This will be of interest to the ONR FS inspector in relation to the extant safety case and the changes required for POCO and S&M phases.
 - Discuss future LTPR requirements noting that:

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- The LTPR decision date for THORP & FL6 has been realigned (with agreement from ONR) to 31 December 2019 (Reference 11). The POCO safety case summary report will be available in January 2019 and at the current time, SL does not propose to submit anything else ahead of the LTPR decision date.
- The S&M Safety Case Summary report will be available in January 2022). The current expectation is that facilities in S&M will still need to comply with LC15 so THORP & FL6 will continue to conduct LTPR on a ten yearly cycle. SL has proposed that the next LTPR would be 10 years from the implementation of the S&M safety case (i.e. 2032).

22. Following these interactions, the ONR PI is of the view that:

- SL has developed a credible plan for transitioning parts of the THORP & FL6 facility into POCO and S&M and is making good progress with its execution. A key deliverable to ONR (the THORP & FL6 POCO safety case strategy) was delivered ahead of plan.
- SL has continued to address the ROs raised by ONR to the point that 4 (of 11 ROs originally raised) can now be closed.
- SL is following its internal arrangements for the THORP & FL6 POCO EDR and is reviewing and modifying its guidance to reflect any learning from the process.
- The close out of LTPR shortfalls and future LTPR plans are being progressed.
- The ONR regulatory approach that has been developed is targeted, efficient and proportionate.

23. Overall, the ONR PI was satisfied with the progress that SL was making, but considers that further interactions with SL will be required as the THORP & FL6 POCO EDR develops.

3.3 NUCLEAR LIABILITIES REGULATION

24. In addition to the activities outlined in Section 3.1, the ONR NLR inspector has engaged with SL during the past year to:

- Discuss progress with POCO preparations, and how Learning from Experience (LFE) has been used to both develop the site-wide arrangements for POCO and inform preparations at other facilities on site (Reference 12).
- Discuss progress on management of legacy wastes accumulated in the Head End area in support of POCO (Reference 13).
- Inspect SL compliance arrangements and implementation at THORP for LC32 (Accumulation of Radioactive Waste) and LC35 (Decommissioning) (Reference 13).

25. Following these interactions, the NLR inspector is of the opinion that:

- With regard to RO-5.A1-1 on consideration of waste management and decommissioning in the EDR process, SL has made good progress in addressing the waste management aspect of this RO. The justification for this opinion is provided in (Reference 9). In addition:
 - SL has demonstrated significant progress in managing historic wastes currently stored at the facility and those wastes arising from operations, providing good evidence of compliance with LC32 arrangements.
 - Notwithstanding the progress that has been made with respect to waste management, SL acknowledges that the current EDR does not consider final decommissioning, which the NLR inspector considers to be the

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result of a shortfall in the site-wide arrangements for LC15. This emergent shortfall has been raised via the ONR SL Corporate Inspector and will be considered outside of the EDR as it applies site wide, not just to THORP & FL6.

- RO-5.A1-2, on the definition of end states, can be closed. The justification for this opinion is provided in (Reference 9). In addition:
 - SL has adequately demonstrated the link between the definition of end states and the EDR; however, SL has excluded consideration of decommissioning and therefore has not adequately demonstrated progress in assessing the adequacy of the end states with respect to minimising risks to ALARP. The ALARP justification for both the end state and methods will now be covered under RO-5.A1-4.
- RO-5.A1-3, concerning the outputs and deliverables from the THORP & FL6 POCO EDR, can be closed. The justification for this opinion is provided in (Reference 9). In addition:
 - The safety case strategy, together with the site-wide arrangements that have developed as a result of learning from the EDR now provides better definition of the outputs and deliverables expected to be produced.
 - The suitability of these documents in producing an adequate safety case is judged as part of the other ROs.
- With regard to RO-5.A1-4, SL has made some progress in addressing this RO. The justification for this opinion is provided in (Reference 9). In addition:
 - SL has produced a number of interim end state documents, but has not yet demonstrated to the satisfaction of the NLR inspector that the THORP & FL6 POCO EDR will minimise, so far as is reasonably practicable, risks to workers and members of the public during future decommissioning. This will require consideration of the development of the decommissioning plan linked with the POCO process and review of the interim end states, including the outstanding ALARP justification under RO-5.A1-2.
- With regard to RO-5.A1-5 on the link between the THORP & FL6 POCO EDR and the development of the decommissioning plan, SL has not yet provided adequate evidence to be able to close this RO. The justification for this opinion is provided in (Reference 9). In addition:
 - SL stated that development of a Preliminary Decommissioning Plan (PDP) from the current decommissioning mandate, in line with current site arrangements for LC35 (Decommissioning), is not planned during the POCO period, as decommissioning of the THORP facility is not due to commence until after 2040.
 - Notwithstanding this, SL confirmed that a 'bridging document' is being developed that will be in place prior to developing the PDP. However, this is currently out with the SL site arrangements for LC35 and the NLR inspector will raise this at the forthcoming planned LC35 compliance inspection at THORP in March 2018.

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26. Overall, on the basis of the evidence presented, the NLR inspector is content that SL is making progress towards addressing the NLR ROs, but considers that further interactions will be required as the THORP & FL6 POCO EDR develops. This will primarily be by further assessment/inspection of SL compliance arrangements and implementation for LC32 (Accumulation of Radioactive Waste) and LC35 (Decommissioning), which will enable evidence to be collected to address the three remaining ROs.

3.4 HUMAN FACTORS

27. In addition to the activities outlined in Section 3.1, the ONR HF inspectors have engaged with SL during the past year to:
- Review progress with the development of key HF related documents including the Human Factors Integration Plan (HFIP) for THORP & FL6 POCO and S&M (Reference 14).
 - Assess the scope and nature of the Human and Organisational Factors (HOF) for POCO and S&M work to be undertaken with particular emphasis on the substantiation of operator claims.
 - Determine the sufficiency of the Leadership & Management for Safety (LMfS) aspects of the HFIP:
 - In liaison with an ONR LMfS Principal Inspector.
 - Against the backdrop of the recent Behavioural and Cultural improvements implemented within THORP.
 - Clarify the SL HF SQEP resource allocated to the ongoing and future HF related aspects of the project.
 - Confirm upcoming and outstanding HF work scope yet to be completed against the themes of organisation, tasks and person; and seek clarification on the means by which completion will be satisfactorily achieved against recommended good practice.
28. ONR HF scrutiny and challenge to the information provided by SL in respect of the above during the course of the year was via through a series of interactions (including emails and telephone calls), with SL HF SQEP. Additional scrutiny and challenge was provided during the THORP POCO strategy EDR inspection in January 2018, (Reference 9) prior to which a structured ONR HF Question Set (Reference 15) was shared with SL. Following these interactions, the ONR HF inspectors are of the opinion that:
- With regard to RO-1.A1 on Human Factors Integration, SL has demonstrated increased clarity in the scope of HOF work to be undertaken in support of the THORP & FL6 POCO EDR and in so doing has made good progress in addressing this RO. The justification for this opinion is provided in (Reference 9). In addition:
 - Many aspects of the HOF scope of work have been progressed and implemented and as additional information and project details become available, the scope will be further developed and extended.
 - Notwithstanding the progress that has been made, there remain some areas where the scope and nature of activities to be undertaken are still to be determined (for example, command and control aspects, details of workload assessment and organisational resilience). SL recognises this and is in the process of securing additional specialist HOF resource to

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support the work (including these aspects). This will require linkage and integration with the wider project and work completed in support of the Management of Change Risk Assessment (MOCRA).

- The criteria for closure of this RO were discussed and agreed with SL as part of the ONR inspection in January 2018 (Reference 9), and in respect of this, SL has agreed to send an updated scoping document (replacing and updating the HFIP). This is expected to be delivered in the first quarter of 2018, and ONR will look to review this and update the status of the RO at that time.
- With regard to RO-2.A1 on substantiation of extant operational safety measures, SL has made very good progress in addressing this RO. The justification for this opinion is provided in (Reference 9). In addition:
- SL has used the outcome of the scoping reviews to systematically identify Operational Preventative Measures (OPMs) which will be relied upon either in POCO or S&M. The SL HF SQEP also outlined the process used to determine which OPMs require further work to provide confidence that they can be reliably delivered. This included a basket safety measure review and a multi-disciplinary review which included consideration of criteria such as novelty, complexity, LFE and operator perception.
 - SL has confirmed that all extant OPMs identified within the scoping reviews are being taken forward for consideration within the high level review and evidence will be recorded to support the decision where no further consideration is deemed necessary. SL also described an appropriate approach with regard to treatment of Operating Assumptions (OA) and minimisation of maintenance error.
 - The criteria for closure of this RO were discussed and agreed with SL as part of the ONR inspection in January 2018 (Reference 9) and in respect of this, SL has agreed to share evidence of decision making and samples of extant substantiations where they are relied upon. These are expected to be delivered in the first quarter of 2018, and ONR will look to review this and update the status of the RO at that time.
29. Overall, on the basis of the evidence presented, ONR welcomes the good progress that has been made by SL in addressing the HOF ROs and acknowledges the SL constructive responses to regulatory challenges made since the last ONR PAR in December 2016 (Reference 1). This gives confidence that the HF aspects of the safety case will be adequately addressed. As above, additional evidence is required to support closure of the ROs. SL has committed to provide this in a timely manner and this will be reviewed in due course and the status of the HOF ROs updated accordingly.

3.5 CONTROL AND INSTRUMENTATION

30. The ONR C&I inspector has interacted with SL as indicated in Section 3.1 to determine progress in addressing two ROs that were raised previously. The ONR C&I inspector considered that SL has made progress towards the closure of RO-3.A1 (on review of previously identified issues with equipment) and RO-3.A2 (on proportionate use of operational experience including test results). This provided increased confidence that C&I aspects will be adequately addressed (Reference 9).

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31. Overall, the ONR C&I inspector is satisfied with the progress that SL is making, but considers that further C&I interactions with SL will be required as the THORP & FL6 POCO EDR project develops.

3.6 FAULT STUDIES

32. In addition to the activities outlined in Section 3.1, the ONR FS inspector has interacted with SL during the past year (Reference 16) to:

- Discuss progress with the development of a revised fault schedule for POCO and S&M, to determine which parts of the extant safety case will be required and what new safety assessments may be required.
- Clarify the future use of FL6, which is now expected to transition to POCO as expected in the THORP & FL6 POCO EDR.
- Review future use of Medium Active Salt Free Evaporator (MASFE) and the likely significance of pipebridge faults during POCO and S&M.

33. Following these interactions, the ONR FS inspector is of the view that:

- The single FS RO can now be closed. The justification for this can be found in Reference 9. ONR now understands the significance and purpose of the end state definition sheets and how they will be used to inform subsequent steps to determine the safety case faults required to support operations/areas through POCO and into S&M. In addition, a review of several completed documents confirmed that they had completed the required due process within SL and were fully signed off. As a result, the ONR FS inspector was satisfied that SL had made sufficient progress in addressing the RO to the point that it can be closed.
- Significant existing faults in the current safety case have been reviewed and analysis of those that will remain in POCO and S&M has begun but the work is on-going (Reference 16).
- The THORP & FL6 POCO EDR safety case strategy (Reference 4) has identified 16 areas where further safety case work will be required. These new fault sequences may arise during the POCO and S&M phases and are being evaluated by SL.

34. Overall, the ONR FS inspector is satisfied with the progress that SL is making, but considers that further FS interactions with SL will be required as the THORP & FL6 POCO EDR project develops.

3.7 SITE INSPECTION

35. In addition to the activities outlined in Section 3.1, the ONR SI has interacted with SL during the past year (Reference 17) in a planned follow-up inspection to assess SL compliance with LC36 – Organisational Capability.

36. The inspection focussed specifically on the organisational changes required for THORP POCO. On the basis of the evidence gathered during this inspection, the SI judged that an inspection rating of GREEN (no formal action required) was appropriate for compliance against LC36. However, the SI considered that it would have been appropriate and beneficial for SL to have made use of the LC36 process earlier in the planning of this organisation change.

37. Overall, the ONR SI is satisfied with the progress that SL is making, but considers that further SI interactions with SL will be required as the THORP & FL6 POCO EDR project develops.

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3.8 MECHANICAL ENGINEERING

38. The ONR ME inspector participated in the activities outlined in section 3.1, but did not participate in the planned intervention and inspection in January 2018.
39. The ONR ME inspector reviewed the SL response to RO-4.A1 regarding gap analysis review and conformance to modern standards. SL provided an initial response to this RO that the ONR ME inspector was content with and as a result the RO can be closed. The ONR ME inspector will continue to sample in this area for further evidence as part of future assessments (Reference 18).
40. Overall, the ONR ME inspector is satisfied with the progress that SL is making, but considers that further ME interactions with SL will be required as the THORP & FL6 POCO EDR project develops.

3.9 ONR SECURITY

41. The ONR-S inspector participated in the activities outlined in section 3.1, but did not take part in the planned intervention and inspection in January 2018.
42. In addition to the activities outlined in Section 3.1, ONR-S has interacted with SL during the past year (Reference 19) in a planned inspection of THORP. As part of that inspection, ONR-S established that the overall building security arrangements and plans for THORP will not be impacted by POCO due to the continued operations in adjacent plant. Consequently, security arrangements as detailed in the Sellafield Nuclear Site Security Plan (NSSP) will remain extant. The NSSP is subject to an annual review of the security arrangements at the site.
43. ONR-S will continue to review security aspects of the THORP & FL6 POCO EDR as part of its normal duties.

4 MATTERS ARISING FROM ONR'S WORK

44. A team of ONR specialist inspectors has engaged at an early stage with SL on the THORP & FL6 POCO EDR. ONR acknowledges the considerable progress that SL has made with the THORP & FL6 POCO EDR in the period from December 2016 to February 2018. At this time, ONR considers that the EDR has not developed far enough to provide adequate confidence in the proposed approach. However, as SL has developed and presented a credible plan for transitioning parts of the THORP & FL6 facility into POCO and S&M, the necessary regulatory confidence will be generated as the plan is delivered.

5 CONCLUSIONS

45. A team of ONR specialist inspectors has engaged at an early stage with SL on the THORP & FL6 POCO EDR to:
 - Ensure that the necessary steps are being taken to maintain and/or remediate the plant in a manner that ensures the plant risks over the whole lifecycle are maintained as low as reasonably practicable (ALARP).
 - Determine progress towards closure of the ONR ROs raised in the initial PAR.
46. Following continuing interactions with SL in the period from December 2016 to February 2018, ONR is of the opinion that:

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- a) SL is developing and implementing a systematic and structured approach to the THORP & FL6 POCO EDR, but this process is not yet complete.
- b) Good progress has been made in addressing the ROs and that as a result, 4 of the 11 ROs can be closed.
- c) A potential enhancement to the site-wide SL arrangements for LC15 has been identified and will be raised with the ONR SL Corporate Inspector for consideration.
- d) Further SL/ONR interactions will be required to confirm that SL is taking the necessary steps to maintain and/or remediate the plant in a manner that ensures the plant risks over the whole lifecycle are maintained ALARP.

6 RECOMMENDATIONS

47. This PAR recommends that:

- a) The ONR PI should send a letter to SL confirming the current position and outline expectations for further regulatory interaction and close-out of any outstanding ROs.
- b) ONR should continue to interact with SL in its development of the THORP & FL6 POCO EDR and undertake a further assessment once the POCO safety case summary report and readiness reviews ahead of transitions into POCO are available (currently estimated to be in the first quarter of 2019). This will provide an opportunity for any emergent issues to be addressed.
- c) A potential enhancement to the site-wide SL arrangements for LC15 has been identified and will be raised with the ONR SL Corporate Inspector for consideration.
- d) ONR should develop and define its future permissioning strategy for the THORP & FL6 POCO EDR.

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REFERENCES

1. ONR-SEL-PAR-024. Periodic Safety Review Programme – THORP Event Driven Review Process. Project Assessment of the THORP EDR Process. December 2016. TRIM 2016/464931.
2. SL Document: THORP POCO Event Driven Review of the Safety Case. June 2016. TRIM 2016/337501.
3. ONR Letter SEL77604N. Periodic Safety Reviews for facilities entering POCO at the time of 3rd Cycle. January 2017. TRIM 2017/5449
4. SL Document: THORP & FL6 Post Operational Clean Out Safety Case Strategy. November 2017. TRIM 2017/440540.
5. SL Document: Agenda for SL/ONR Workshop to Discuss THORP & FL6 Post Operational Clean Out Safety Case Strategy. November 2017. TRIM 2017/458006.
6. SL Presentation Slides: THORP & FL6 Post Operational Clean Out Safety Case Strategy. November 2017. TRIM 2017/456185.
7. ONR-SDFW-CR-17-810. Objective 12-THORP Post Operational Clean Out Event Driven Review Progress Meeting #8-POCO Strategy Workshop. December 2017. TRIM 2017/469937.
8. THORP & FL6 Post Operational Clean Out Safety case Strategy. ONR Question Set for SL/ONR Workshop on 12 December 2017. V3 December 2017. TRIM 2017/464292.
9. ONR-SDFW-IR-17-204. Inspection of THORP and Finishing Line 6 Post Operational Clean Out Safety Case Strategy. January 2018. TRIM 2018/52132.
10. ONR-SDFW-CR-17-740. Objective 12-THORP POCO Event Driven Review Progress Meeting – Monthly Progress #7. November 2017. TRIM 2017/445332.
11. ONR Letter SEL77385R. Submission of PSR Programme Deliverables for [REDACTED] THORP and Finishing Line 6 as required by arrangements for the PSR Programme. March 2013. TRIM 2013/110286.
12. ONR-SDFW-CR-17-650. Level 4 Sellafeld Quarterly POCO (Post Operational Clean Out) Programme Meeting. October 2017. TRIM 2017/408321
13. ONR-SDFW-IR-16-196. Planned Joint (with EA) Licence Compliance Inspection covering LC35; Decommissioning – focusing on the preparations for Post Operational Clean Out (POCO) in the THORP facility. March 2017. TRIM 2017/108813.
14. SL Document: Human Factors Integration Plan (HFIP) for THORP & FL6 POCO and S&M. Document Reference: HF/17/04. Icepac Reference: RP/[REDACTED]TPR/PROJ/00077. March 2017. TRIM 2017/169027.
15. ONR EDR Question Set for THORP POCO Team Inspection - 24 January 2018 at THORP Sellafeld. In respect of: Regulatory Observations: RO-1.A1 and RO-2.A1.HF QA. January 2018. TRIM 2018/38857
16. ONR-SDFW-CR-17-398. Objective 12-THORP POCO Event Driven Review Progress Meeting #4. July 2017. TRIM 2017/304514.

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17. ONR-SDFW-IR-17-190. The Thermal Oxide Reprocessing Plant (Thorp) on Sellafield Ltd.'s nuclear licenced site at Sellafield, Cumbria. Planned licence compliance inspection covering LC36; Organisational Capability. January 2018. TRIM 2018/21788.
18. Response from ONR Mechanical Engineering Inspector closing THORP & FL6 POCO EDR Regulatory Observation RO-4.A1. March 2017. TRIM 2018/60400.
19. ONR-CNS-IR-17-59. Sellafield Site Routine Planned Inspection of the Thermal Oxide Reprocessing Plant (THORP) and the THORP Drum Store. July 2017. TRIM 2017/295799.

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**Table 1
Status of ONR Regulatory Observations – February 2018**

ONR Discipline	Regulatory Observation	Status at February 2018
Nuclear Liabilities Regulation	RO-5.A1-1 states that: “The evidence provided to date, particularly the Event Driven Review (EDR) sequencing, does not provide sufficient clarity on how radioactive waste management and decommissioning are addressed in the EDR, in the existing safety case or the future safety case for the surveillance and maintenance phase. The sequencing makes no specific mention of radioactive waste management and decommissioning so I cannot conclude that the approach will be adequate to meet ONR’s expectations and legal requirements in these areas, on the basis of the evidence to date”.	Open
	RO-5.A1-2 states that: “the sequencing of the EDR relies on end state definitions which are defined outside the sequencing process. The sequencing is meant to provide a path from a known state at the end of operations to an assumed target end state at the end of POCO. It is not clear how and where SL defines the start and end states, assesses their adequacy with respect to minimising risks to as low as reasonably practicable, and how these link to the extant safety case and the future safety case for surveillance and maintenance”.	Closed (Reference 9)
	RO-5.A1-3 states that “the sequencing steps do not define the outputs or deliverables of the steps so it is difficult to judge the adequacy of their application in producing an adequate safety case, for the POCO phase or for the facility in a state of surveillance and maintenance, at the current time”.	Closed (Reference 9)
	RO-5.A1-4 states that “the evidence provided to date does not provide sufficient clarity that application of the POCO process will minimise, so far as is reasonably practicable, risks to workers and members of the public during future decommissioning of THORP (beyond POCO)”.	Open
	RO-5.A1-5 states that “the link between the EDR process and the development of the Decommissioning Plan is not clear”.	Open
Human Factors	RO-1.A1: SL to develop and then implement a Human Factors Integration Plan (HFIP). This Regulatory Observation Action should be completed such that it does not delay or impact upon the timely execution of the THORP EDR process.	Open

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	RO-2.A1: SL to review and update any operational safety measures designated within the extant safety case, which will be relied upon during POCO and S & M, to ensure that they are sufficiently robust and consistent with modern standards. This Regulatory Observation Action should be completed such that it does not delay or impact upon the timely execution of the THORP EDR process.	Open
Control & Instrumentation	RO-3.A1: SL to review and update the relevant C&I safety measures reviewing issues already identified in relation to C&I safety measures designated within the extant safety case, which will be relied upon during POCO, to ensure that they are sufficiently robust and consistent with modern standards. This RO Action should be completed such that it does not delay or impact upon the timely execution of the THORP EDR process.	Open
	RO-3.A2: In the case of C&I equipment where there is no System Engineer issue reported, SL should consider how to make proportionate use of operational experience of C&I equipment (particularly safety mechanisms), including proof test results and documented incidents, and inform ONR of its proposed approach.	Open
Fault Studies	RO-6.A1 requires “SL to review and clarify the following relevant fault studies aspects which will be required during POCO, to ensure that they are sufficiently robust and consistent. This RO should be completed such that it does not delay or impact upon the timely execution of the THORP EDR process: <ul style="list-style-type: none"> • ONR should seek an explanation from SL as to how to interpret the end state definition sheets. • The quality of scoping review output documents is not adequate for use in a safety case or as a basis for developing nuclear safety arguments”. 	Closed (Reference 9)
Mechanical Engineering	RO-4.A1: SL should conduct an adequate gap analysis review, and where not reasonably practicable to demonstrate conformance to modern standards, SL should otherwise put forward an ALARP justification for making no additional improvements, with respect to nuclear safety. In conducting the review, ONR expects SL to conduct the review and address any relevant mechanical engineering shortfalls accordingly. This Regulatory Observation Action should be completed such that it does not delay or impact upon the timely execution of the THORP EDR process.	Closed (Reference 9)

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