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Sellafield, Decommissioning, Fuel & Waste

**ONR Assessment of the Sellafield Ltd Analytical Services Second Cycle Long Term
Periodic Review**

Project Assessment Report ONR-SDFW-PAR-2017-007
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EXECUTIVE SUMMARY

ONR Review of the Analytical Services Second Cycle Long Term Periodic Review

This report summarises ONR's assessment of the Sellafield Ltd second cycle Long Term Periodic Review (LTPR) of its Analytical Services facility.

Permission Requested

The Analytical Services LTPR was received by ONR in May 2016. No Licence Instrument or formal permission is required under the Sellafield Ltd Licence Condition 15 (Periodic Review) arrangements. Instead, the ONR arrangements require a Periodic Safety Report decision letter from ONR advising Sellafield Ltd of the outcome of ONR's assessment and identifying any assessment findings that we consider Sellafield Ltd should address.

This Project Assessment Report records the basis of the ONR decision to issue a decision letter confirming its opinion that Sellafield Ltd has carried out an adequate review of safety for Analytical Services.

Background

The Analytical Services facility was established in 1952 to provide an on-site capability for the chemical analysis of highly radioactive and toxic materials. It is one of the oldest buildings on site and houses over 90 separate laboratories. It analyses around 100,000 samples annually on a variety of radioactive sample types in different chemical forms including effluents, Plutonium products and complex wastes. The analysis is undertaken using a variety of specialised instruments on benches, in fume hoods and gloveboxes, or in highly active cells, dependent on the activity and type of material being analysed.

The Analytical Services facility is considered essential to support reprocessing operations, waste processing and hazard/risk reduction activities across the site. It is anticipated that the facility will remain operational until at least 2028. Analytical support for the site will be required beyond 2070 and Sellafield Ltd has initiated a separate programme of work to determine how and when this support will be supplied.

Assessment and inspection work carried out by ONR in consideration of this request

ONR carried out an initial fault studies scoping study to assist in determining the key hazards in the Analytical Services facility. The review of the adequacy of the LTPR was determined by a multidisciplinary assessment team of ONR specialist inspectors who looked at compliance with Licence Condition 15. The ONR team included representation from fault studies, mechanical engineering, civil engineering, chemistry, radiological protection, leadership and management for safety, human factors and LTPR project inspection disciplines.

Matters arising from ONR's work

The Analytical Services facility represents a relatively high hazard and was also the first facility to be subject to LTPR using revised Sellafield Ltd guidance. It was selected for assessment to give ONR confidence in the adequacy of the LTPR and the new review process.

This report has concentrated on the assessments carried out by eight ONR specialist inspectors. During assessment the ONR specialist inspectors made recommendations for potential future improvements to safety and process. These are reviewed and sentenced in this report.

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The Sellafield Ltd's Confirmation of Safety Letter was received in February 2017 and provides evidence to support the ALARP argument and safety case. The Confirmation of Safety Letter:

- Clarifies how Sellafield Ltd will manage the outstanding improvements.
- Provides the ALARP arguments for the continued operation of Analytical Services.
- Provides a clear resumé of the additional work and reviews that Sellafield Ltd has carried out to demonstrate that it has undertaken a suitable periodic review of safety.

ONR considers that the Confirmation of Safety Letter addresses a number of recommendations made by the ONR specialist inspectors. Those that are not adequately addressed will be captured in a single ONR Regulatory Issue and progressed as part of normal regulatory business.

Conclusions

This report summarises ONR's assessment of the Sellafield Ltd second cycle LTPR of its Analytical Services facility up to June 2017. It has concentrated on the assessments carried out by eight ONR specialist inspectors; each was satisfied that SL had carried out an adequate LTPR using revised Sellafield Ltd guidance.

The Confirmation of Safety Letter was received in February 2017. It provides evidence to support Sellafield Ltd's ALARP argument and safety case and recognises that safety benefits will continue to be realised through the completion of the identified improvements. The Confirmation of Safety Letter also claims that the continued operation of the Analytical Services facility is justified and that the risks to the workforce and public are ALARP until the third cycle decision date of 31st March 2027. ONR is of the opinion that Sellafield Ltd has:

- a) Undertaken an adequate LTPR which meets the requirements of licence condition 15 and is taking steps to ensure the facility will continue to operate so that risks remain ALARP.
- b) Developed revised guidance for the management of LTPR that has produced a bespoke review designed specifically for the Analytical Services facility.

Recommendation

This PAR recommends that ONR issues a decision letter to confirm its conclusion that Sellafield Ltd has performed an adequate review of safety for the second cycle LTPR of its Analytical Services facility, with the following expectations going forwards:

- Sellafield Ltd should continue to make satisfactory progress on the improvement programmes which it has committed to in its Confirmation of Safety Letter for the Analytical Services facility.
- Sellafield Ltd should provide three-monthly progress reports to ONR on the substantive improvements identified by the LTPR.
- Sellafield Ltd should progress work to close out the four ONR recommendations contained in this PAR.

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LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
AS	Analytical Services
COSL	Confirmation of Safety Letter
CS&A	Civil, Structural and Architectural
HF	Human Factors
HOW2	(Office for Nuclear Regulation) Business Management System
LC	Licence Condition
LTPR	Long Term Periodic Review
NNL	National Nuclear Laboratory
ONR	Office for Nuclear Regulation
OPM	Operational Protective Measure
PAR	Project Assessment Report
PSR	Preliminary Safety Report
SCIE	Sellafield Compliance Intelligence and Enforcement
SFAIRP	So Far As Is Reasonably Practicable
SL	Sellafield Limited
SQEP	Suitable Qualified & Experienced Person
TAG	Technical Assessment Guide (ONR)

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Table 1: Review and Sentencing of ONR Recommendations

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1 PERMISSION REQUESTED

1. The Sellafield Ltd (SL) Analytical Services (AS) second cycle Long Term Periodic Review (LTPR) was received by ONR in May 2016 (Ref 1). No Licence Instrument or formal permission is required under SL's Licence Condition (LC) 15 (Periodic Review) arrangements.
2. This Project Assessment Report (PAR) records the basis for the ONR decision to issue a close out letter advising SL of the outcome of the assessment and identifying any further findings that ONR considers SL should address.

2 BACKGROUND

2.1 ANALYTICAL SERVICES HISTORY AND FUNCTION

3. The AS facility was established in 1952 to provide a facility capable of handling highly radioactive and toxic materials to determine their chemical constitution. The facility includes a number of buildings in addition to the laboratory, one of which is a substantial ventilation stack. The facility is considered essential to support reprocessing operations, waste processing and hazard/risk reduction activities at Sellafield. It is currently anticipated that the facility will remain operational until at least 2028.
4. The AS facility is one of the oldest buildings on the Sellafield site and houses over 90 separate laboratories. It analyses around 100,000 samples annually on a variety of radioactive sample types in different chemical forms including effluents, Plutonium products and complex wastes. Samples enter AS through a number of dispensing areas and are moved throughout the facility either by trolley or by hand. The analyses are undertaken using a variety of specialised instruments on benches, in fume hoods and gloveboxes, or in highly active cells, dependent on the activity and type of material being analysed.
5. A considerable radiological inventory has been accumulated within the facility, resulting in potentially high off site consequences in the event of a major incident. Considerable effort has been devoted to reducing the inventory, but this effort will have to continue for a number of years before the accumulated material will have been removed. This work is excluded from the scope of the second cycle AS LTPR, but ONR has regulatory oversight of the matter through its other interventions.
6. It is intended that the AS facility will provide the site's analytical service until at least 2025, before the transfer of the capability to a new location - the National Nuclear Laboratory's (NNL) Central Laboratory, which is part of the Sellafield site. A substantial asset care improvement programme is underway to ensure the AS facility maintains its capability to support the plants until ~2030, but analytical support for the site will be required for a much longer period.
7. The second cycle LTPR seeks to justify the continued operation of the AS facility for the next 10 years, by reviewing key operational and engineering controls and engineering assets to identify any shortfalls and/or improvements which would significantly improve nuclear safety in the facility.

2.2 ONR APPROACH TO ASSESSMENT OF SL LTPR

8. There are over 80 facilities on the SL site that are subject to LTPR. The ONR strategy is to undertake proportionate, targeted regulation of selected LTPRs, applying one of three levels of intervention:

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- Monitoring Level – applies primarily to LTPRs of plants with the lowest risks or hazards and where ONR has suitable confidence in SL’s delivery of its LTPR work. SL will submit LTPR documentation in line with its arrangements but ONR will generally not issue a close out letter and limit its work to monitoring SL’s progress.
 - Inspection Level – this applies to LTPRs where ONR requires greater confidence in SL’s review work. It is the minimum level that will usually be applied for LTPRs whose safety cases include systems that have been identified for System Based Inspections (SBI). At this level, the intervention will include a scoping assessment, an inspection to assess the adequacy of SL’s implementation of its LTPR process and the quality of its review work. When the LTPR has reached a satisfactory conclusion ONR will issue a close out letter.
 - Full Assessment Level – this applies to LTPRs where ONR requires the highest confidence in SL’s review work (e.g. because the plant has a relatively high risk or hazard, has known issues with periodic review, or a large number of outstanding Regulatory Issues etc). At this Level, the intervention will include a scoping assessment to identify topics for further specialist assessment, which will then be summarised in a Project Assessment Report that will recommend the ongoing regulatory approach to be taken; this could include the issuing of a close out letter or how to regulate or simply monitor ongoing improvements etc.
9. The AS facility represents a relatively high hazard and was also the first to be subject to LTPR using a revised SL procedure (Ref 2). For those reasons the AS LTPR was selected for full assessment. This Project Assessment Report (PAR) records the basis for the ONR decision to issue a close out letter.
10. The assessment has been carried out in line with ONR guidance on PSR (Ref 3) to determine the sufficiency of SL’s assessment of:
- The extent to which the facility and the safety case meet modern standards and good practices in safety.
 - The extent to which the safety documentation remains valid.
 - The adequacy of the arrangements in place to maintain safety until the next PSR.
 - The safety improvements to be implemented to resolve safety issues.
11. It is seldom possible, or necessary, to assess an LTPR and associated safety case in its entirety, therefore sampling is used to limit the areas for scrutiny and to improve the efficiency of the assessment process. For the second cycle AS LTPR, a scoping study was conducted by a fault studies inspector to identify the high impact fault sequences that ONR’s review of the LTPR should concentrate on.
12. Specialist ONR inspectors communicated with SL using technical queries to seek clarification of specific aspects of the LTPR via emails. The intention was that substantive findings would be raised via Regulatory Observations (none were raised) with any remaining concerns that ONR had with the LTPR, the implementation plan or the associated safety case for AS at the end of the assessment period being proposed as a Regulatory Issue.
13. ONR selected a multidisciplinary assessment team to review particular aspects of the safety case. Each specialist inspector was asked to determine which lines of enquiry were most appropriate for them to pursue with SL. The outcome is contained in the following assessment reports:

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- Fault studies (Ref 4).
 - Mechanical engineering (Ref 5).
 - Civil engineering (Ref 6).
 - Chemistry (Ref 7).
 - Radiological protection (Ref 8).
 - Leadership and management for safety (Ref 9).
 - Human factors (Ref 10).
14. The assessment included a two day inspection of the AS facility (Ref 11) which provided ONR with an appreciation of the scope and challenges of the tasks that are being undertaken. The visit provided a very useful overview of the LTPR process and helped to identify lines of enquiry for ONR to pursue to determine the adequacy of the revised process to produce an appropriate LTPR.

3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR

3.1 LTPR PROJECT INSPECTION

15. Based on the areas sampled for inspection, the ONR LTPR Project Inspector does not have any substantive concerns with the AS LTPR and makes the following observations:

- The AS second cycle LTPR was essentially the first to be carried out using a revised SL procedure, SLP 2.17.04 (Ref 2). In reality, the guidance was being developed at the time of the LTPR and SL used the opportunity to pilot the new process and learn from other recent LTPRs which were deemed to be successful.
- The AS second cycle LTPR was undertaken with the following core principles in mind:
 - The review was bespoke and designed specifically for AS, with the level of effort applied proportionate to the significance of the plant hazard, the plant risk and the degree of change.
 - The review was undertaken in collaboration with all necessary stakeholders, utilising plant teams for their knowledge and experience wherever possible, supported by relevant discipline specific experts where appropriate.
 - Improvements identified during the review process were considered in a holistic manner and have been prioritised appropriately.

It is evident that the revised SL guidance addressing how to review and maintain a safety case has been followed.

- The assessment included consideration of a number of SL reports that had been received as part of the overall LTPR process, including:
 - The safety case strategy overview report (Ref 12).
 - The long term periodic review status update report (Ref 13).
 - The AS second cycle LTPR (Ref 1).
- SL considers that the new process produced a focussed review of the facility that incorporated input from plant and safety case personnel with a good understanding of the facility. SL judges that the revised LTPR process has identified and addressed shortfalls within the old process and offers a good and

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cost effective solution which allowed immediate actions to be taken where necessary (eg glove box shortfalls noted below).

- The first cycle LTPR resulted in 1092 Recommendations being accepted for action. Of these, 424 were deemed to be safety significant. These were reviewed by SL as part of the second cycle LTPR (Ref 14) and four of the safety significant shortfalls remained open. The current situation is:
 - Gamma interlock in [REDACTED] (ID 57). Design work is complete and work is due for completion this year. A suspension on operations is in place.
 - Fortress interlocking system (ID 1032). Design work is complete and modifications have begun.
 - Glove box gauge replacement (ID 1093). Good progress has been made with the replacement of high priority gauges and work on lower priority replacements is in progress.
 - Installation of low pressure alarm in [REDACTED] (ID 39). Project complete.

- The review process adopted during the second cycle LTPR is presented in Ref 15. This has been developed by SL to ensure that proportionate and reasonably practicable improvements are identified which provide tangible benefits to plant safety. It incorporates the following steps:
 - Issue raised during LTPR process.
 - Issue sanctioned for action at shortfall surgery as either a shortfall (against risk), business improvement (operability issues or minor safety concerns), technical gaps/queries or misinformed issues that could be dismissed. These categories are defined in Ref 15.
 - ALARP review of potential shortfalls that may require significant cost, effort or time.
 - Holistic review of all issues to allow root cause and underlying issues to be identified and grouped.
 - Management and close out of improvements.

- Any LTPR shortfalls sanctioned as a shortfall in risk to the public or workforce were then considered further and placed into one of three categories:
 - Immediate threat to safety – urgent action to correct.
 - Quick and easy fix - the so called “do it” list (Ref 16).
 - Longer term improvements – the risk prioritised LTPR improvement plan (Ref 17).

- As part of the LTPR shortfall process, SL reviewed 140 glove boxes within the AS facility and identified four where the risk was at the higher end of the tolerable region, where continued operations may not be ALARP (Ref 18). The four were identified as a serious shortfall requiring urgent action as soon as practicable:
 - [REDACTED]: front window seal failing. Operations stopped, warning signage in place and condition checks initiated.
 - [REDACTED] Window has failed. Temporary window now in place. Operations stopped, warning signage in place and condition checks initiated.
 - [REDACTED] Roof window seal failing. Operations stopped, warning signage in place and condition checks initiated.

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- [REDACTED] PVC bag out of date/poor condition. Glovebox in care and maintenance and access to Lab is controlled by key access. Action taken to make bag safe.
 - The AS risk prioritised LTPR improvement plan is one of the key outputs from the overall process. It has been produced by SL to allow long term ALARP improvements to be tracked and was issued to ONR as part of the Confirmation of Safety Letter (COSL, Ref 17). It contains a total of 38 Recommendations which have been allocated to 20 separate groups:
 - LTPR/1: Glovebox improvement plan.
 - LTPR/2: B*** safety case rationalisation project.
 - LTPR/3: Prevention of over temperature of glovebox containment.
 - LTPR/4: SQEP packs for high risk nuclear safety operations/activities.
 - LTPR/5: Formalisation of glovebox register, risk criteria and matrix.
 - LTPR/6: Adequacy of AS operator instructions (post LTPR/2).
 - LTPR/7: Resource for high workload/demand laboratories.
 - LTPR/8: Team leader training/awareness of safety case.
 - LTPR/9: Emergency exercise schedule.
 - LTPR/10: Workload assessment for L108.
 - LTPR/11: Fire incident update drawings.
 - LTPR/12: Fire detection and alarm system review.
 - LTPR/13: Engineering schedule rationalisation.
 - LTPR/14: Implement glove box inlet filter change regime.
 - LTPR/15: Implement glove box extract filter change regime.
 - LTPR/16: ALARP review of gauge replacement on C&M gloveboxes.
 - LTPR/17: Review of glovebox interconnecting tunnels.
 - LTPR/18: Standards and expectations for operators.
 - LTPR/19: Adequate training of liaison teams.
 - LTPR/20: Independent verification step added.
 - The risk prioritised LTPR improvement plan also provides details of ownership and progress with each of the recommendations. SL reports progress with the majority of improvements and has incorporated the plan into the overall improvement plan for the AS facility (Ref 19). Oversight and monitoring of the plan is undertaken by SL on a monthly basis. These documents along with the “do it” shortfall list provide ONR with suitable vehicles to monitor SL progress in closing out the shortfalls.
16. The ONR assessments are described in the relevant technical area assessment reports (Refs 4 – 10); the conclusions are summarised below.
- ### 3.2 FAULT STUDIES ASSESSMENT
17. Overall, the specialist inspector is content that fault studies aspects of the AS LTPR are being adequately addressed (Ref 4).
18. The inspector provided an initial review to identify hazards to target and which specialists should be involved in the ONR review. Areas to focus on included radiation exposure or activity release from receipt of out of specification material, airborne activity release from containment failure, and building integrity.

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19. The specialist inspector sampled the LTPR and the supporting safety case baseline review from a fault studies perspective, focussing on the hazards identified above. He considers that the LTPR identified a number of shortfalls in the safety case, including:
- The preparation of a hazard management strategy for the plant.
 - The need to review and rationalise a number of areas of the safety case due to a perception that it is 'overly conservative'.
20. Based on the sampling he carried out he saw no evidence to suggest that the safety case as it stands currently is not fit for purpose. However, in lieu of the above findings, the depth of his review has been limited at this stage to allow SL time to develop its strategy for simplification of the safety case. Overall, he considers that the SL review has been adequate from a fault studies perspective, but he raised a number of recommendations to capture those areas where he considers further engagement with SL is required to gain further evidence to support the conclusion as part of the LTPR closure:
- Recommendation FS1: That the Project Inspector confirms that SL delivers an adequate hazard management strategy.
 - Recommendation FS2: That the Project Inspector confirms that SL delivers an adequate safety assessment rationalisation strategy.
 - Recommendation FS3: That the Project Inspector confirms that SL delivers an adequate operating rule review.
 - Recommendation FS4: That the LTPR process records the expectations, responsibilities and accountabilities of the SL staff involved and the requirements to be quorum during the reviews.
21. These recommendations are reviewed and sentenced in this report.

3.3 MECHANICAL ENGINEERING ASSESSMENT

22. Overall, the specialist inspector is content that mechanical engineering aspects of the AS LTPR are being adequately addressed (Ref 5). She assessed the safety case and its supporting references, targeting the following key mechanical engineering areas of interest:
- Gap analysis against modern standards.
 - Modifications to the plant.
 - Identification and sentencing of improvements.
 - Consideration of cumulative effects of shortfalls.
 - Ageing and degradation.
 - Decommissioning.
23. She concluded that the SL proposal to continue operations within AS for a further 10 years is adequate. She was also satisfied with the claims, arguments and evidence laid down within the SL safety case and supporting documentation. Her assessment highlighted a number of shortfalls in regulatory compliance which she did not believe were sufficient to threaten the immediate safe continued operation of AS. However, she is of the view that they are areas which SL needs to address in a timely fashion and made four recommendations:
- Recommendation ME1: the ONR Project Inspector should satisfy himself that the site has adequate arrangements in place for the close-out of shortfalls.

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- Recommendation ME2: SL should put written arrangements in place to manage window failure in Claytonrite glove boxes.
 - Recommendation ME3: the ONR Project Inspector should ensure that SL has a decommissioning strategy in place for managing redundant glove boxes.
 - Recommendation ME4: SL should produce a high level guidance document of the LTPR process followed, documentation produced and its chronology.
24. These recommendations are reviewed and sentenced in this report.

3.4 CIVIL ENGINEERING ASSESSMENT

25. Overall, the specialist inspector is content that civil engineering aspects of the AS LTPR are being adequately addressed (Ref 6). Her assessment found that SL had identified a number of potentially significant shortfalls to civil, structural and architectural (CS&A) assets during consideration of the safety case. These are partly due to the age of the facility, but also due to inadequate inspection and maintenance activities having been undertaken for an extended period. The specialist inspector was of the opinion that, while the facility has started from a degraded position, the shortfalls identified to CS&A assets are being addressed, with priority being given to the potentially most significant shortfalls. Lower priority maintenance actions will be completed during the next few years, and the outstanding shortfalls are not of sufficient concern to prevent continued operations.
26. Overall, the specialist inspector is satisfied that SL's LTPR is suitable and sufficient from a civil engineering perspective. She has identified a number of additional potential shortfalls not highlighted within the LTPR and these are listed below as recommendations to improve the safety case. She considers these to be low priority and not a current threat to continued operation. She also considers that future regular regulatory interventions should be sufficient to follow up on her recommendations:
- Recommendation CE1: The facility should review the potential for increased flat roof imposed loading due to snow drifting against changes in roof level or obstructions on the roof when undertaking the review of loading (seismic and wind) already identified in the LTPR CS&A documentation.
 - Recommendation CE2: The sinks within active areas of the facility should be suitably isolated until the potential leak identified to the trace active drainage system can be suitably repaired.
 - Recommendation CE3: Maintenance proposals should be developed for the asbestos clad stores to the east of the laboratory building, including measures to ensure that asbestos fibres are not released from ageing or deteriorated building components.
27. These recommendations are reviewed and sentenced in this report.

3.5 CHEMISTRY ASSESSMENT

28. Overall, the specialist inspector is content that chemistry aspects of the AS LTPR are being adequately addressed (Ref 7). From a chemistry perspective, he is content with:

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- The approach taken by the licensee and is satisfied that the review encompasses those areas of highest consequence.
 - The scope of the review which has been performed under the expectation of continued operation in the present facility for 10 years, although it is expected that the amount of analysis performed will decrease.
 - The identified areas for improvement that have been collated to form an action plan in an appropriate manner.
29. However, he notes that no review has been undertaken to assess the extent to which the analytical instruments and techniques conform to national or international safety standards and operating practices. He therefore makes a recommendation for SL to undertake this task, but due to the evidence that he has sampled he does not consider that this omission is significant enough to affect his overall judgement of the adequacy of the case.
30. To conclude, the specialist inspector is broadly satisfied with the claims, arguments and evidence laid down within the SL safety case. He is also satisfied that SL has adequately reviewed the chemistry aspects of the AS safety case, with prime focus on those areas that could lead to significant worker doses. He makes one recommendation:
- Recommendation CH1: SL should perform an assessment to determine the extent to which the analytical instruments and techniques conform to national or international safety standards and operating practices.
31. This recommendation is reviewed and sentenced in this report.

3.6 RADIOLOGICAL PROTECTION ASSESSMENT

32. Overall, the specialist inspector is content that radiological protection aspects of the AS LTPR are being adequately addressed (Ref 8). The scope of his assessment is to examine the evidence in support of the claim that an adequate LTPR of the AS safety case has been performed with regard to radiological protection (RP). He has undertaken this on a sampling basis by examination of:
- The evidence supporting the claim that the identified LTPR objectives relating to RP operational and engineering controls and to shortfalls and improvements have been met.
 - The adequacy of the review of shielding carried out during the LTPR.
 - The evidence supporting the claim that implementation of the LTPR Improvement Plan within the specified timescales will ensure that the risks associated with the operation of the AS facility will be reduced so far as is reasonably practicable.
33. On the basis of his assessment, following sampling of LTPR documentation submitted by SL, he considers that, despite minor deficiencies, an adequate periodic safety review of the AS safety case has been performed with regard to radiological protection. He is also of the view that adequate arrangements are in place to enable the licensee to maintain radiological safety until the next LTPR review. He concludes that:
- The review of shielding, its conclusion and its recommendation were broadly adequate.

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- The LTPR has failed to fully comply with site requirements for the review of safety cases (see Recommendation 1).
 - He has not found any evidence to suggest that the identified LTPR objectives relating to operational and engineering controls and to shortfalls and improvements have not been met.
34. He recommends that, based on his conclusions above, that there is no reason on the grounds of radiological protection for ONR not to issue a decision letter confirming its opinion that SL has carried out an adequate review of safety for the AS facility, subject to the licensee providing an adequate response to the recommendation below:
- Recommendation RP1: The licensee should ensure that the AS LTPR conforms to its own arrangements for the review of safety cases by the application of Risk-based Improvement Categories to the improvements identified within the LTPR Improvement Plan.
35. This recommendation is reviewed and sentenced in this report.

3.7 LEADERSHIP AND MANAGEMENT FOR SAFETY ASSESSMENT

36. Overall, the specialist inspector is content that leadership and management for safety aspects (LMFS) are being adequately addressed (Ref 9). His assessment comprised of a review of the LTPR report and key supporting references, as well as inspections of the facility in August 2016 and March 2017. He notes that:
- The approach followed by SL in reviewing LMFS in AS, which was open-minded and challenging, closely aligns with ONR's expectations and represents good practice. He recognises the recent improvements that SL has made, but judges that leadership and management for safety in AS (at March 2017) still falls below modern standards and good practices. The reasons for this relate to some slippage by SL in delivering the required improvements and the time it takes to embed these improvements and achieve the necessary cultural change.
 - The output of SL's LTPR was a set of short term (two year) actions and a longer term, risk-based improvement plan, which complement a range of improvements already underway in AS. The specialist inspector reviewed SL's improvement plans and was satisfied that, in combination, they address the main findings of the LTPR relating to LMFS in AS.
 - He examined SL's progress in implementing the improvement actions identified in the LTPR (as at March 2017) and noted one item relating to outstanding maintenance for which a completion date is still to be set. He judges this to be a significant shortfall and has recommended that ONR follows up formally to request and track the implementation of SL's action plan. He also examined relevant actions on the AS overall improvement plan and is satisfied that SL is making adequate progress (although with some slippage evident). He notes however, that it will take a sustained effort over several years for SL to achieve its aim of refocussing the culture in AS and recommends that ONR follows up to check whether the improvements set out by AS are being sustained.
37. His overall conclusion is that SL has conducted an adequate review of LMFS in the AS second cycle LTPR. The methodology followed by SL for its LTPR represents good practice, but revealed weaknesses in leadership and management for safety when

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compared with modern standards and good practice. He is satisfied that SL has adequately set out the improvements required to resolve these issues. He is also satisfied that SL has adequate arrangements in place to maintain safety until the next periodic review, but considers that it will take a sustained effort over several years for these changes to become fully embedded and deliver the desired cultural change. He therefore makes two recommendations:

- Recommendation LMFS1: To formally request SL's plan, with dates, to resolve short term item L&MfS/SF/6 (on outstanding maintenance) and track SL's progress in implementing it.
- Recommendation LMFS2: To monitor SL's progress in implementing its short term actions and overall improvement plan for AS to judge whether it is delivering proportionate, appropriate and effective LMFS.

38. These recommendations are reviewed and sentenced in this report.

3.8 HUMAN FACTORS ASSESSMENT

39. Overall, the specialist inspector is content that the human factors (HF) aspects of the AS LTPR are being adequately addressed (Ref 10). His assessment notes:

- There are no design-basis faults with potential significant public consequence but a number of fault sequences with potential significant consequences for the workforce are identified. Operational Preventive Measures (OPMs) and engineered systems are claimed as prevention/protection/mitigation, including the following actions, which are claimed across a broad range of fault groups:
 - Measurement of sample dose rates.
 - Checking of sample documentation and packaging.
 - Checking of equipment configuration prior to operations.
 - Prompt evacuation in response to alarms.
- In undertaking the AS LTPR, SL followed a pilot methodology for application on LTPRs which is intended to ensure that assessment effort is focused on the areas of highest risk. From a HF perspective this included high-level reviews of key fault sequences covering a broad range of AS operations, supplemented by targeted, detailed HF assessments, including plant walk-downs. The work was completed by multi-disciplinary teams including HF SQEPs (Suitably Qualified and Experienced Persons), safety-case, and operational representatives. The specialist inspector considers this has provided a proportionate and targeted assessment, but considers that improvements in articulating the rationale used during the screening phases and in reporting detail would have provided greater clarity and confidence in the process and its outcomes.
- The SL AS LTPR finds that the extant safety case provides a bounding safe operational envelope for the activities currently carried out. It acknowledges the requirement to implement improvements to make the case simpler by revising safety assessments to better reflect current/future radiological inventory. SL argues that these changes will remove unnecessary pessimisms from the case, rationalise safety measure designation, and so reduce the complexity of the safety case and facilitate improvements in compliance. The proposed improvements will be delivered via safety case improvements activities, some of which will continue to November 2018. The specialist

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inspector considers that this programme of work will provide a significant contribution to delivering improvements to the majority of the HF related findings from SL's review, particularly issues with inconsistent and overlapping limits and conditions, and content and quality of procedural support.

- SL claims that its assessment activities provide assurance of the robustness of its safety management arrangements and in the interim period the AS facility will continue to operate under its extant safety case. Nevertheless, a number of shortfalls were raised relating both to compliance with required operating instructions and wider HF related weaknesses including training, instructions, workload, supervision and emergency preparedness. These were taken forward for consideration and categorised according to the SL process. They include shortfalls against modern standards, "do-it-now" status for reasonably practicable improvements (regardless of risk reduction), and a number of 'business improvements' (not significant safety concerns) that were considered to improve operations. All of these have been reviewed and rationalised and this has simplified the initial improvement plan. The specialist inspector considers that this has resulted in some difficulties in provision of a clear audit trail, but notes that all actions can be tracked back to the original source. Additionally, his own review has not identified any omissions.
 - SL concludes the AS LTPR has demonstrated the safety case to be adequate, subject to the identified Improvement Plan actions. On completion of these improvements the risk associated with the operation of the AS facility will be ALARP and will remain so until the date of the next periodic review. The specialist inspector is satisfied that the review has identified suitable HF related improvements, the majority of which will be dealt with by the safety case improvement programme. He has also taken into account the findings of ONR's fault studies specialist inspector that the extant safety case for AS meets relevant risk targets and that the planned programme of work should reduce this further. He is therefore content and is of the view that it is not proportionate to seek further improvements in the interim, but SL should be encouraged to continue to consider reasonably practicable improvements.
40. In undertaking his assessment he accumulated sufficient evidence to broadly underpin these claims and is generally satisfied that the HF aspects of the AS second cycle LTPR are adequate to support operation of the AS facility until the next LTPR (assumed 10 years). The following observations are made:
- He is broadly content that the SL pilot methodology implemented in the AS LTPR has delivered a systematic and proportionate human factors review, informed by HF SQEPs. This has focused upon safety significant claims and has resulted in identification of suitable reasonably practicable improvements for ALARP consideration. However, he has identified a number of areas for improvement relating to the clarity of supporting documentation. This is of particular note for justification of the sampling strategy and reporting of substantiation of HF related aspects. He will provide this feedback to SL as part of ongoing Level 4 engagements and to the ONR safety case working group.
 - His review of the improvement plan has indicated that the improvements identified via the HF reviews did receive due consideration and have been sentenced appropriately. There are some issues surrounding traceability of discrete action items which is a result a multi-layered sentencing process and rationalisation of issues into groups. However, he is satisfied that the

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improvement plan is suitable and when delivered should provide real improvements to safety, particularly in reducing the complexity of the safety case, clarifying safety designations, and operational practice. Nevertheless, SL is reporting delays to completion of some improvements. On this basis, he recommends that ONR undertakes appropriate monitoring of the improvement plan. He is content that this can be undertaken as part of routine regulatory interaction with the site inspector.

- He has identified one specific human factors shortfall relating to the change out of Master Slave Manipulators which is not supported by an extant HF substantiation. He considers this to be a significant shortfall given the reliance on two OPMs to protect against high consequences. He recommends that SL provide assurance that the risk associated with this activity is ALARP prior to its next occurrence.
 - His assessment identifies areas where the work completed in support of the AS LTPR is not in compliance with SL's human factors guidance. The analyses do not provide consistently clear conclusions as to the validity of the operator claim, and it is difficult to confirm that the requirement for mandatory HF assessment has been met and that discretionary assessment has been considered and undertaken completed where appropriate. He believes these shortfalls to be largely presentational and he is satisfied that they are not an indication of an unknown or unacceptable risk gap associated with continued operations.
41. Overall, he concludes that SL has completed an appropriate human factors review in support of the AS LTPR. However, based on the evidence presented, he found shortfalls in SL's demonstration that continued operations of the AS facility remains ALARP in the interim period before required safety improvements are implemented. He found no evidence in SL's submission or his subsequent assessment that there is currently a safety significant risk from human factors aspects of continued operation. He therefore does not consider it proportionate to require SL to cease or restrict operations or to pursue any further justification or specific improvements in the interim period before the safety case related improvements are completed.
42. He made the following recommendations to provide assurance that the improvements are implemented in a timely manner:
- Recommendation HF1: SL to provide ONR with further assurance that the required improvements associated with individual human factors shortfalls will be completed in a timely manner where they have been integrated into larger work packages. The specialist inspector is content that this should be achieved through regular interaction with the Project Inspector.
 - Recommendation HF2: SL to provide assurance that the scope of the planned development and implementation of a hazard management strategy, safety case rationalisation and operating rule review, appropriately considers HF related aspects and delivers.
 - Recommendation HF3: Prior to its next use, SL to provide assurance to ONR that the risks associated with/arising from master slave manipulator change-out activities are ALARP.
43. These recommendations are reviewed and sentenced in this report.

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44. Based on the results of his assessment and the associated recommendations, the specialist inspector had no objection from a human factors perspective to ONR issuing a positive decision letter in response to the AS LTPR.

4 MATTERS ARISING FROM ONR'S WORK

45. This review has concentrated on the assessments carried out on the SL AS second cycle LTPR by eight specialist ONR inspectors. Each was satisfied that SL had carried out an adequate LTPR using the revised guidance.

46. During the assessment the ONR inspectors made recommendations for potential future improvements to safety and process. These are reviewed and sentenced in Table 1 of this report.

47. The COSL was received in February 2017 (Ref 17) and provides evidence to support SL's ALARP argument and safety case. I am satisfied that SL has undertaken an adequate periodic review of safety meeting the requirements of LC15. The COSL:

- Clarifies how SL will manage the outstanding improvements.
- Provides the ALARP arguments for the continued operation of AS.
- Provides a clear resumé of the additional work and reviews SL has carried out to demonstrate that it has undertaken a suitable periodic review of safety.

48. ONR considers that the COSL addresses a number of recommendations made by the ONR specialist inspectors. Those that are not adequately addressed by the SL plans will be captured in a single ONR Regulatory Issue which will be pursued as part of normal regulatory business. There are four sentenced ONR recommendations arising from this PAR:

- PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
- PAR Recommendation 2: SL to review the potential for increased AS flat roof imposed loading due to snow drifting against changes in roof level or obstructions on the roof when undertaking the review of loading (seismic and wind) already identified in the LTPR CS&A documentation.
- PAR Recommendation 3: SL to develop maintenance proposals for the asbestos clad stores to the east of the laboratory building, including measures to ensure that asbestos fibres are not released from ageing or deteriorated building components.
- PAR Recommendation 4: SL to provide assurance to ONR that the risks associated with/arising from master slave manipulator change-out activities are ALARP.

49. My rationale behind these decisions is provided in Table 1. ONR will continue to regulate SL and monitor closure of shortfalls identified in the second cycle AS LTPR.

5 CONCLUSIONS

50. This review has concentrated on the assessments carried out on the SL AS second cycle LTPR by eight ONR specialist inspectors. Each was satisfied that SL had carried out an adequate LTPR using the revised guidance.

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51. The COSL was received in February 2017 and provides evidence to support SL's ALARP argument and safety case. In the COSL, SL recognises that safety benefits will continue to be realised through the completion of the identified improvements, and claims that the continued operation of AS is justified and risks to the workforce and public are ALARP (until the third cycle decision date of 31st March 2027). ONR is of the opinion that SL has:
- a) Undertaken an adequate LTPR which meets the requirements of LC15 and is taking steps to ensure the facility will continue to operate so that risks remain ALARP.
 - b) Developed revised guidance for the management of safety cases that has produced a bespoke review designed specifically for AS.

6 RECOMMENDATIONS

52. This PAR recommends that ONR issues a decision letter to confirm its conclusion that SL has performed an adequate review of safety for the second cycle AS LTPR, with the following expectations going forwards:
- SL should continue to make satisfactory progress on the improvement programmes which it has committed to in its Confirmation of Safety Letter for the AS facility.
 - SL should provide three-monthly progress reports to ONR on the substantive improvements identified by the LTPR.
 - SL should progress work to close out the four ONR recommendations contained in this PAR.

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REFERENCES

1. Second Cycle Long Term Periodic Review of the Analytical Services Safety Case. TRIM 2016/223422.
2. How do I Review and Maintain a Safety Case? SLP 2.17.04. TRIM 2017/134800.
3. ONR Technical Assessment Guide: Periodic Safety Reviews, NS-TAST-GD-050 Revision 4.
http://www.onr.org.uk/operational/tech_asst_guides/index.htm
4. ONR-SDFW-AR-17-003. Fault Studies Assessment of the Analytical Services LTPR. TRIM: 2017/173146.
5. ONR-SDFW-AR-16-81. Mechanical Engineering Assessment of the Second Cycle Long Term Periodic Review of Analytical Services. TRIM: 2016/383814.
6. ONR-SDFW-AR-16-057. Civil Engineering Assessment of Long Term Periodic Review of Safety Case. TRIM: 2016/488732.
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10. ONR-SDFW-AR-17-004. Human Factors Assessment of Analytical Services Long Term Periodic Review of Safety. TRIM 2017/151463.
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12. Safety Case Strategy Overview Report: Analytical Services, Sellafield. B*** MSC/14/1356. TRIM 2016/261891.
13. Sellafield Letter ONR/14/11427/02: Analytical Services Second Cycle Long Term Periodic Review, Safety Case Review Update. TRIM 2016/259877.
14. B*** First Cycle LTPR Recommendations – Closure Statement. ICEPAC RP/B***/SAFE/00090. TRIM 2017/181048.
15. B*** Second Cycle LTPR Improvement Review Process. ICEPAC Ref: STR/B***/SAFE/00005. TRIM 2016/351014.
16. B*** Second Cycle LTPR Shortfall Tracking - "do it" list June 2017. TRIM 2017/245497.
17. Sellafield Letter ONR/14/11427/04: Analytical Services Second Cycle Long Term Periodic Review, Confirmation of Safety Letter. TRIM 2017/83769.
18. Email SL to ONR. AS LTPR glove box review and urgent action taken. TRIM 2017/248994.
19. Analytical Services Improvement Plan (incorporating LTPR improvement plan). February 2017 update. TRIM 2017/135086.
20. Email SL to ONR. LTPR Recommendations. SL response to ONR recommendation FS4, sentenced in PAR. TRIM 2017/244303.

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21. Email SL to ONR. LTPR Recommendations - SL response to ONR recommendation ME4 (sentenced in PAR). TRIM 2017/244267.
22. Email SL to ONR. LTPR Recommendations - SL response to ONR recommendation CE2 and sentence table in PAR. TRIM 2017/244447.

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Table 1

Review and Sentencing of ONR Recommendations

ID	Assessor Recommendation	Project Inspector Comments	Outcome
FS1	I recommend that the Project Inspector confirms that SL delivers an adequate hazard management strategy.	Accepted. This is part of the SL LTPR risk prioritised plan (LTPR/2/1). ONR monitoring of close out of LTPR findings by SL is required so this will be covered.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
FS2	The Project Inspector confirms that SL delivers an adequate safety assessment rationalisation strategy.	Accepted. This is part of the SL LTPR risk prioritised plan (LTPR/2/3).	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
FS3	The Project Inspector confirms that SL delivers an adequate operating rule review.	Accepted. This is actually a Business Improvement item (2016/33) so its close out will be tracked. However, in addition SL intends to include the review in LTPR/2.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
FS4	The LTPR process records the expectations, responsibilities and accountabilities of the SL staff involved and the requirements to be quorum during the reviews.	SL maintains that it has carried out appropriate reviews using SQEP resources and that its reviews were appropriate. I note that the B*** second cycle LTPR improvement review process (Ref 15) specifies the requirements for the review panel. I have raised this matter with SL and I am satisfied with the response (Ref 20).	Not taken forward.
ME1	The ONR Project Inspector should satisfy himself that the site has adequate arrangements in place for the close-out of shortfalls.	Accepted. The close out of shortfalls is addressed in PAR Recommendation 1.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
ME2	SL should put written arrangements in place to manage window failure in Claytonrite glove boxes.	Accepted. This is part of the SL LTPR risk prioritised plan (LTPR/1/1).	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement

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			plan.
E3	The ONR Project Inspector should ensure that SL has a decommissioning strategy in place for managing redundant glove boxes.	Accepted. This is part of the SL LTPR risk prioritised plan (LTPR/1/1).	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
ME4	SL should produce a high level guidance document of the LTPR process followed, documentation produced and its chronology.	The AS LTPR was essentially the first to be carried out using a revised SL procedure, SLP 2.17.04 (Ref 2). In reality, the guidance was being finalised at the time so SL used the opportunity to pilot the new process and learn from other recent LTPRs which were deemed to be successful. That guidance has now been formally issued. I have raised this matter with SL and I am satisfied with the response (Ref 21).	Not taken forward.
CE1	The facility should review the potential for increased flat roof imposed loading due to snow drifting against changes in roof level or obstructions on the roof when undertaking the review of loading (seismic and wind) already identified in the LTPR CS&A documentation.	Accepted.	PAR Recommendation 2: SL to review the potential for increased AS flat roof imposed loading due to snow drifting against changes in roof level or obstructions on the roof when undertaking the review of loading (seismic and wind) already identified in the LTPR CS&A documentation.
CE2	The sinks within active areas of the facility should be suitably isolated until the potential leak identified to the trace active drainage system can be suitably repaired.	I discussed this with SL and note that the affected sinks have been signed to restrict use and staff are aware that they are not to be used for routine activities (eg washing). However, SL is reluctant to isolate the sinks in case they are required for emergency purposes (eg eye washing etc) following any spillage. I have raised this matter with SL and I	Not taken forward.

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		am satisfied with the response (Ref 22).	
CE3	Maintenance proposals should be developed for the asbestos clad stores to the east of the laboratory building, including measures to ensure that asbestos fibres are not released from ageing or deteriorated building components.	Accepted.	PAR Recommendation 3: SL to develop maintenance proposals for the asbestos clad stores to the east of the laboratory building, including measures to ensure that asbestos fibres are not released from ageing or deteriorated building components.
CH1	SL should perform an assessment to determine the extent to which the analytical instruments and techniques conform to national or international safety standards and operating practices.	I discussed this with SL and note that the facility has delivered an established analytical service for many years. Operations are carried out in accordance with the required safety regulations and that the facility is accredited to ISO 17025. However, such a review may be of use to the new analytical facility being assembled on site and I will discuss the observation with the appropriate ONR Project Officer	Not taken forward for AS, but such a review may be of use to the new analytical laboratory that is being developed on site and I will raise this with the ONR Project Officer.
RP1	The licensee should ensure that the AS LTPR conforms to its own arrangements for the review of safety cases by the application of Risk-based Improvement Categories to the improvements identified within the LTPR Improvement Plan.	Accepted. SL close out of LTPR findings will be reviewed as part of PAR recommendation 1.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
LMFS1	To formally request SL's plan, with dates, to resolve short term item L&MfS/SF/6 (on outstanding maintenance) and track SL's progress in implementing it.	I discussed this with SL and note that a new work delivery system is now in place within AS. This should allow progress on this matter to be monitored. ONR will also have oversight via Recommendation 1 and	Not taken forward as an LTPR matter, but ONR visibility on this matter will be provided via Recommendation 1 and through the work of other inspectors in the facility.

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		the on-going interactions with other ONR inspectors (eg SCIE Objective 5) so I do not intend to take it forward as an LTPR matter.	
LMFS2	To monitor SL's progress in implementing its short term actions and overall improvement plan for AS to judge whether it is delivering proportionate, appropriate and effective LMFS.	Accepted. SL close out of LTPR findings will be reviewed as part of PAR recommendation 1. LMFS contributions can be considered as part of that.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
HF1	SL to provide ONR with further assurance that the required improvements associated with individual human factors shortfalls will be completed in a timely manner where they have been integrated into larger work packages. This should be achieved through regular interaction with the Project Inspector.	Accepted. SL close out of LTPR findings will be reviewed as part of PAR recommendation 1. HF contributions can be considered as part of that.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
HF2	SL to provide assurance that the scope of the planned development and implementation of a hazard management strategy, safety case rationalisation and operating rule review, appropriately considers HF related aspects.	Accepted. LTPR/2/2 specifically relates to a HF review. This recommendation is essentially covered by FS1, 2 & 3 and HF matters can be addressed as part of that.	PAR Recommendation 1: SL to progress LTPR shortfalls contained in the risk prioritised LTPR improvement plan, "do it" list and overall AS improvement plan.
HF3	Prior to its next use, SL to provide assurance to ONR that the risks associated with/arising from master slave manipulator change-out activities are ALARP.	Accepted. It is unlikely that this can be done by the time of next usage, but SL will determine how to address this substantiation.	PAR Recommendation 4: SL to provide assurance to ONR that the risks associated with/arising from master slave manipulator change-out activities are ALARP.

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Note:

FS = Fault Studies; ME = Mechanical Engineering; CE = Civil Engineering;
CH = Chemistry; RP = Radiological Protection;
LMFS = Leadership and Management for Safety; HF = Human Factors.