



Pile Fuel Storage Pond Decommissioning - Metal Fuel Stream

**Agreement to Commence Export Operations of the Pile Fuel Storage Pond Metal Fuel
Transfer Route**

Project Assessment Report ONR-SEL-PAR-15-014
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EXECUTIVE SUMMARY

Title

Agreement to Commence Export Operations of the Pile Fuel Storage Pond Metal Fuel Transfer Route

Permission Requested

Sellafield Ltd (SL) has requested the Office for Nuclear Regulation (ONR) agreement to commence export operations of the Pile Fuel Storage Pond (PFSP) metal fuel transfer route, in accordance with its arrangements made under Licence Condition (LC) 22.

Background

The PFSP was built in 1949/50 for the purpose of receipt and storage of fuel and isotopes from the Windscale Piles as well as the decanning of the fuel elements prior to reprocessing. Following the closure of the Windscale Piles and commissioning of the First Generation Magnox Storage Pond, plant operations were scaled down, although the facility was still used for storage of some materials.

As a result, PFSP still contains significant volumes of historical inventory including various fuels, radioactive sludge and other solid wastes, all of which present an on-going radiological risk due to the ageing pond structure and infrastructure obsolescence. SL has therefore developed a programme to systematically and progressively reduce this hazard. This report is focussed on the metal fuel export element of this programme.

Retrieval of the PFSP metal fuel aligns with ONR's 2015/16 Annual Plan, the top priority of which is hazard reduction and remediation at Sellafield, specifically accelerated, safe and secure retrievals from the legacy ponds. The Fuel Handling Plant (FHP) has been identified as a suitable location to provide safer interim storage for the PFSP legacy metal fuel, pending a long term disposal solution becoming available.

This project assessment report (PAR) provides the ONR judgement on SL commencing export operations of the PFSP metal fuel transfer route to the FHP.

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

Following initial consideration of SL's proposal, I judged it proportionate to obtain specialist inspector advice. I therefore sought advice from human factors, mechanical engineering, fault studies, radiological protection, criticality and process engineering specialist inspectors.

In addition, ONR has also undertaken a readiness inspection of PFSP to assess SL's implementation of its LC 22 arrangements for the proposed modification and an assessment of SL's implementation of its LC 11 arrangements to recover from a dropped PFSP metal fuel load scenario to inform the permissioning decision.

Matters arising from ONR's work

A number of the specialist assessments raised recommendations, specifically associated with undertaking a readiness inspection to ensure operational readiness. This has been undertaken and judged as adequate. As a result, all specialists have advised that they have no objection to SL's proposal and recommend that ONR issues the Licence Instrument to allow SL to commence export operations of the PFSP metal fuel transfer route.

In addition, the project has been subject to independent internal governance by SL's internal regulator and readiness review by SL's decommissioning assurance team, who have both concluded that they have no objection to the project commencing.

Conclusions

Based on the evidence sampled, I am satisfied that the people, process and plant for the proposed modification are adequate. Based on the evidence sampled, I judge that there are no outstanding issues to prevent ONR agreeing to SL commencing export operations of the PFSP metal fuel transfer route.

Recommendation

I recommend that ONR agrees to SL's request to commence export operations of the PFSP metal fuel transfer route export and issues Licence Instrument 894.

LIST OF ABBREVIATIONS

CFA	Conditions for Acceptance
EA	Environment Agency
FHP	Fuel Handling Plant
HOW2	(Office for Nuclear Regulation) Business Management System
IIS	Integrated Inspection Strategy
LC	Licence Condition
LI	Licence Instrument
MSC	Management Safety Committee
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PMP	Plant Modification Proposal
PFSP	Pile Fuel Storage Pond
SL	Sellafield Limited

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1 PERMISSION REQUESTED

1. Sellafield Ltd (SL) has requested ONR's agreement to commence export operations of the Pile Fuel Storage Pond (PFSP) metal fuel transfer route, in accordance with its arrangements made under Licence Condition (LC) 22 (Ref. 1).
2. This project assessment report (PAR) provides the ONR judgement on SL commencing export operations of the PFSP metal fuel transfer route. It has been produced in accordance with ONR guidance (Ref. 2) and programme specific permissioning guidance (Ref. 3). In accordance with this guidance, the permissioning strategy for this regulatory hold point has been previously agreed with the ONR Sellafield Programme sub-programme delivery lead (Ref. 4).

2 BACKGROUND

3. The PFSP was built in 1949/50 for the purpose of receipt and storage of fuel and isotopes from the Windscale Piles as well as the decanning of the fuel elements prior to reprocessing. Following the closure of the Windscale Piles and commissioning of the First Generation Magnox Storage Pond, plant operations were scaled down, although the facility was still used for storage of some materials.
4. As a result, PFSP still contains significant volumes of historical inventory including various fuels, radioactive sludge and other solid wastes, all of which present an on-going radiological risk due to the ageing pond structure and infrastructure obsolescence. SL has therefore developed a programme to systematically and progressively reduce this risk. This report is focussed on the metal fuel export element of this programme.
5. Retrieval of the PFSP metal fuel aligns with ONR's 2015/16 Annual Plan, the top priority of which is hazard reduction and remediation at Sellafield, specifically accelerated, safe and secure retrievals from the legacy ponds.
6. The Fuel Handling Plant (FHP) has been identified as a suitable location to provide safer interim storage for the PFSP legacy metal fuel, pending a long term disposal solution becoming available. Therefore, to meet FHP's conditions for acceptance (CFA), SL has subsequently sorted, segregated and consolidated the metal fuel into hole-less Magnox skips under PFSP's extant safety case.
7. The metal fuel within the scope of this project has been agreed by both facilities (Ref. 5). In summary, it includes approximately 3t of intact Magnox clad and bare metal fuels but excludes aluminium clad fuel, fuel pieces less than 100mm in length and fuel elements currently on the pond/bay floors, all of which are to be exported via future decommissioning projects.
8. This project is part of a decommissioning stream that also includes a regulatory engagement window hold point on FHP importing the metal fuel. This aspect is outside the scope of this PAR and has been assessed by ONR via a separate decision record (Ref. 6). This assessment identified no issues; subsequently, the regulatory hold point on FHP has been released (Ref. 6).
9. The process overview for exporting the metal fuel from PFSP and importing it into FHP is identified by Reference 5. The export will be undertaken utilising equipment and techniques, which in combination, are used by PFSP on a routine basis (e.g. skip movements, flask transfers and lifting) and is summarised as follows:
 - Import an empty flask via a trailer and tractor unit into the PFSP hoist-well.
 - Remove the flask lid bolts and using the 12t crane and dedicated attachment; remove the flask lid to the set down area adjacent to the top of the hoist-well.

- Using the 12t Crane and dedicated grapple, align the filled Magnox skip (whilst still underwater in the PFSP Withdrawal Bay) with the flask in the hoist-well.
 - Using the 12t crane, raise the filled Magnox skip out of Withdrawal Bay. This will instigate the siphoning of 150mm of water from the filled Magnox skip, which will drain back into the Withdrawal Bay.
 - Weigh the Magnox skip using the 12t crane load cell and allow to drip dry.
 - Remotely radiologically survey the skip external surface.
 - Transfer the filled Magnox skip to above the hoist-well using the long travel only.
 - Lower the filled Magnox skip into the flask and detach the 12t crane.
 - Using the 12t Crane, re-lid the flask and detach the 12t Crane.
 - Re-insert the flask lid bolts and pressure test the flask seal.
 - Attach the tractor unit to the trailer. Transfer the Flask to FHP via a pre-determined route.
10. SL's proposal (Ref. 7) includes the full scope of the project, which includes initial plant reconfiguration, installation and then export operations (as described above). In support of this Licence Instrument (LI) permissioning decision, I initially advised SL that I intended to undertake a readiness inspection. SL subsequently stated that to undertake the inactive trials to demonstrate readiness, it would need to undertake the following scope of its proposal in advance of the LI permission:
- Plant reconfiguration;
 - Import of the export flask and empty skip into the building, including partial implementation of the safety case as this could result in some fault sequence groups being realised.
11. As a result, I agreed that the above work would be subject to a separate regulatory hold point in advance of the LI permissioning decision. This hold point has now been permissioned (Ref. 8) and SL has successfully completed these aspects of the project.

3 ASSESSMENT AND INSPECTION WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

12. In support of SL's request to commence export of metal fuel from PFSP (Ref. 1), it has submitted an associated Plant Modification Proposal (PMP) (Ref. 7), which has been subjected to Management Safety Committee (MSC) consideration and been approved (Ref. 9).
13. To initiate the regulatory engagement on this project, a project kick-off meeting was held between SL and ONR (Ref. 10). This included a SL overview of the project from both the PFSP and FHP perspective (Ref. 11) and a walkround of the proposed PFSP export route.
14. The greatest potential hazard within the scope of SL's proposal is that posed during transfer of a filled Magnox skip from the Withdrawal Bay to the flask in the PFSP hoist-well, which if dropped/lowered uncontrollably/snagged/ledged, could result in fuel spillage, damage and loss of water cover. If this was to occur, the fuel would lose the containment and shielding provided by the pond water in the Magnox Skip. This fault sequence has the potential for significant operator doses and if not recovered, could present an ongoing radioactive release to the public.
15. Given the safety significance of exporting legacy fuel via the process described in Section 2 above, I judged it proportionate to obtain specialist inspector advice. I therefore sought advice from the following specialist areas:
- Human Factors

- Mechanical Engineering
 - Fault Studies
 - Radiological Protection
 - Criticality
 - Process Engineering
16. Following initial consideration of SL's proposal, I targeted the above specialist advice given the operations:
- Have significant reliance on operators during both normal and fault conditions;
 - Require the use of mechanical handling equipment for skip transfers;
 - Have the potential to result in fault scenarios that have potentially high doses associated with recovery;
 - Require the use of temporary shielding and shield walls;
 - Include fuels of varying enrichments;
 - Have the potential to generate hydrogen during flask transfers to FHP.
17. In addition to the above, ONR has also undertaken the following inspections to inform the permissioning decision:
- A readiness inspection of PFSP to assess SL's implementation of its LC 22 arrangements for the proposed modification (Ref. 12).
 - An assessment of SL's implementation of its LC 11 arrangements to recover from a dropped PFSP metal fuel load scenario (Ref. 13).

4 MATTERS ARISING FROM ONR'S WORK

18. Having sought specialist assessment advice on SL's submission, they have made the following conclusions.
19. The specialist mechanical engineering inspector undertook a walk-down of the proposed PFSP export route with SL. In conclusion, the inspector has advised that he is content for SL to commence metal fuel export without the need for further detailed ONR mechanical engineering assessment (Ref. 14). This was based on the routine and well understood nature of the crane operations, the enhanced crane maintenance regime (Ref. 15) and the mitigation in place to recover from the different crane failure scenarios.
20. Given that SL has undertaken enhanced examination, maintenance, inspection and testing of the crane, with no outstanding issues remaining (Ref. 15) and has substantiated all crane load path items to Safety Function Class 2 (i.e. a system structure, or component that makes a significant contribution to nuclear safety) (Ref. 16), I judge the specialist mechanical engineering inspector's approach to be proportionate.
21. The specialist criticality inspector concluded that SL has produced a well-argued criticality safety case, underpinned by demonstrably pessimistic criticality calculations and concluded that no formal ONR criticality assessment of the licensee's safety case was required (Ref.17).
22. The specialist human factors inspector has undertaken an assessment of SL's submission and is content with the conclusions drawn in relation to the adequacy of the operational controls and designations (Ref. 18). However, the inspector did make three recommendations. One was associated with corporate improvements, which does not impact this permissioning decision; one was associated with FHP's readiness to receive the fuel, which is outside the scope of this permissioning decision and is

covered by Reference 6; the final recommendation is associated with this permissioning decision and is as follows:

- An operational readiness review should be carried out at PFSP prior to permissioning to confirm the adequacy of the crane recovery and emergency management arrangements, operational aspects (including training) and resolution of the remaining outstanding issues identified by SL submission. This recommendation is addressed later in this section.
23. The specialist fault studies inspector has undertaken an assessment of SL's submission and has a number of concerns with the way in which SL has assessed the potential dropped load fault against deterministic criteria (Ref. 19). However, having engaged with SL has concluded that the hazard will be well controlled and the risks have been reduced as low as reasonably practicable.
24. The specialist chemical engineering inspector has assessed SL's submission, specifically the hydrogen and pyrophoric materials management. In conclusion, the inspector has advised that he is content that the case meets the relevant legal requirements and regulatory expectations (Ref. 20) and has no objection for SL to commence metal fuel export, subject to satisfactory completion of the following recommendation:
- The Project Inspector should undertake a readiness inspection to ensure the licensee's arrangements for ensuring the transfer route is clear, transfer equipment is available and in full working order and that FHP is ready and available, prior to a fuel export taking place. This recommendation is addressed later in this section.
25. Following SL's submission and completion of the specialist chemical engineering inspector's assessment, SL stated that the flask to be used to transport the fuel has changed resulting in additional assessment of the hydrogen management case. Subsequently, SL has confirmed that there is no impact to the extant safety case (Ref. 21). I judged it proportionate to seek additional advice from the specialist chemical engineering inspector, who has concluded that there is no impact to his assessment findings summarised above (Ref. 22). However, the inspector did recommend that a specialist review on the new flask substantiation is performed. Following review of SL's substantiation (Ref. 23), which raised no issues, and the substantial nature of the flask, which has been designed to offsite transport requirements, I do not consider it proportionate to undertake a specialist assessment of this substantiation.
26. In support of the permissioning decision, ONR has undertaken a readiness inspection to assess SL's implementation of its LC 22 arrangements for the proposed modification. In advance of the inspection, ONR undertook a desktop session with SL to review aspects of its proposal, which included specialist human factors, fault studies and radiological protection inspectors (Ref.'s 24 and 25). The review provided clarity of SL's proposal and did not identify any actions or shortfalls (Ref. 26).
27. ONR's readiness inspection included specialist human factors, fault studies and radiological protection inspectors and ONR judged SLs' implementation of its LC 22 arrangements an Integrated Inspection Strategy (IIS) rating of 3 'Adequate' (Ref. 12). However, the inspection did conclude that that SL needs to complete its specified programme of work to be in a state of readiness to commence export operations. As a result, we were unable to gather sufficient evidence on certain aspects that were judged relevant to the permissioning decision and related to completion of key documentation and operator trials. We requested that completion of the outstanding actions be confirmed to ONR by the SL internal regulator.

28. SL's internal decommissioning assurance team has since confirmed that the outstanding actions have been satisfactorily completed (Ref. 27). In addition, SL has provided all the outstanding documentation including a note for the record summarising completion of the operator trials (Ref. 28) and the operational method statement (Ref. 29), which confirms the safety case requirements are included and clearly identified.
29. Based on ONR's readiness inspection and the satisfactory close out of the outstanding actions referred to above, I judge that the people, process and plant for the proposed modification are adequate, thereby addressing the specialist recommendations identified above.
30. ONR also undertook an intervention to determine if the site is implementing adequately its site-wide arrangements for compliance with LC 11 (Emergency Arrangements) (Ref. 13). The exercise scenario assessed was the recovery from a dropped PFSP metal fuel load. ONR concluded that SL demonstrated an adequate emergency response performance including a particularly strong performance from SL's Incident Control Centre in the Separation Area and awarded the exercise a pass rating. However, a number of deficiencies associated with health physics were observed resulting in a subsequent ONR issue, No. 3815. ONR has subsequently engaged with SL and concluded that there is adequate HP capability to support emergencies (Ref. 30), which has resulted in closure of ONR Issue 3815.
31. ONR also reviewed SL's emergency management arrangements as part of its readiness inspection and judged them to be adequate (Ref. 12).
32. I have also sought assurance from SL's internal governance process. SL has confirmed that the project has been subject to an independent SL internal readiness review by the SL Decommissioning Directorate project assurance team assessing the plant, process and people readiness. This review has concluded that the project has satisfactorily closed out all identified findings is authorised to proceed (Ref. 27).
33. In addition, SL has confirmed that its internal regulator has maintained oversight of the project and undertaken detailed inspection in a number of areas including engineering substantiation, commissioning, CFA, safety case compliance and examination, inspection, maintenance and testing. To this end, the internal regulator has produced a project summary visit report (Ref. 31), which supports SL's application for a LI. Based on the above, I judge that SL's proposal has been subject to an adequate level of independent internal challenge and governance.
34. In addition, in 2011, SL undertook the metal fuel pilot project, which commissioned the route, by transferring one skip of metal fuel from PFSP to FHP, which provides additional assurance of SL's proposal. This project was permissioned by ONR (Ref. 32). SL has since confirmed that learning from experience from this pilot project has not raised any significant concerns with or recommended any significant changes to the proposed export process (Ref. 5).
35. PFSP's ability to meet FHP's CFA is outside the scope of this PAR and is addressed as part of the permissioning decision on FHP's proposal to receive PFSP's metal fuel. This has been assessed and no issues identified. Subsequently, the regulatory hold point has been released (Ref. 6).
36. I sought assurance that FHP can return the empty skips to PFSP within its technical requirements. To this end, PFSP has produced a CFA document for FHP to comply with (Ref. 33), which has been approved by the PFSP MSC (Ref. 34).
37. In accordance with the ONR/Environment Agency (EA) Memorandum of Understanding, I have consulted with the EA inspector whether he had any objections

on environmental grounds to ONR granting a LI agreement to export metal fuel from PFSP. The EA inspector has confirmed that the EA has no objection (Ref. 35). Similarly, the Civil Nuclear Security inspector has indicated that he has no objection to granting the LI (Ref. 36).

5 CONCLUSIONS

38. To conclude, I am satisfied with SL's proposal. Based on the evidence sampled, I judge that there are no outstanding issues to prevent ONR agreeing to SL commencing export operations of the PFSP metal fuel transfer route.

6 RECOMMENDATIONS

39. ONR agrees to SL's request to commence export operations of the PFSP metal fuel transfer route export (Ref. 1) and issues LI 894 (Ref. 37).

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