PROJECT ASSESSMENT REPORT			
Unique Document ID and Revision No:	ONR-OPF-PAR-16-016	**TRIM Ref:**	2016/399380
Project:	Sizewell B Dry Fuel Store		
Site:	Sizewell B		
Title:	Consent for Commencement of Active Commissioning of Sizewell B Dry Fuel Store Process.		
Licence Instrument No: (if applicable)	551		
Nuclear Site Licence No:	63		
Licence Condition:	LC21(4)		

Document Acceptance and Approval for Issue / Publication

Role	Name	Position	Signature	Date
Author	[redacted]	Principal Inspector		30/11/2016
Reviewer	[redacted]	Principal Inspector		2/12/2016
Accepted by[1]	[redacted]	Superintending Inspector		20 Dec 2016
Approval for publication[2]	[redacted]	Superintending Inspector		20 Dec 2016

Revision History

Revision	Date	Author(s)	Reviewed By	Accepted By	Description of Change
A	28/11/2016	[redacted]	[redacted]	n/a	Review of 1st draft
B	30/11/2016	[redacted]	[redacted]	n/a	Incorporating reviewers comments
0	20/12/2016	[redacted]			First accepted issue

[1] Acceptance of the PAR to allow release of LI
[2] Approval is for publication on ONR web-site, after redaction where relevant

Circulation (latest issue)

Organisation	Name	Date
Office for Nuclear Regulation	[redacted] **TRIM Folders** Project Assessment Report Folder 4.4.1.2979. Case File Folder Volume 3 4.4.2.16517. Volume 2 4.4.2.11112. Volume 1 4.4.2.5689.	
Environment Agency	[redacted]	
Licensee	[redacted]	

Sizewell B Dry Fuel Store

Consent for Commencement of
Active Commissioning of Sizewell B Dry Fuel Store Process
Stage Submission 5, NP/SC 7575, EC 353382

Project Assessment Report ONR-OPF-PAR-16-016
Revision 0
December 2016

Published 01/2017

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EXECUTIVE SUMMARY

Title

Consent for Commencement of Active Commissioning of Sizewell B Dry Fuel Store Process.

Permission Requested

EdF Energy Nuclear Generation Limited (NGL) has requested Office for Nuclear Regulation (ONR) consent under Nuclear Site Licence Condition (LC) 21 (4): Commissioning, to commence active commissioning of the Sizewell B Dry Fuel Store process.

Background

The requirement for NGL to seek ONR consent was established through a previous ONR Licence Instrument (LI) 531 issued in December 2012, which specified that NGL shall not commence active commissioning of the Sizewell B Dry Fuel Store process without the consent of ONR. This regulatory action was taken on the grounds that this was the first time this type of dry fuel storage process was to be undertaken in the UK, so ONR has sought to confirm that NGL has reduced risks to safety So Far As Is Reasonably Practicable (SFAIRP) before active commissioning took place.

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

ONR inspection and assessment activities carried out in consideration of granting consent to NGL involved:

- Monitoring NGL's development of the Dry Fuel Store Safety Case and the approach to commissioning equipment and operations to confirm design and safety functional requirements were met and the process was reliable.
- Confirming Dry Fuel Store project governance was robust by ensuring the effectiveness of processes delivered through its Design Decision Panel (DDP), Testing and Commissioning Panel (T&CP) and Project Safety Review Group (PSRG). This considered: whether individuals were suitably qualified and experienced persons to carry out their duties; that appropriate rigour was applied in the monitoring and sentencing of testing and commissioning results; that suitable project oversight was in place to confirm the project's preparedness to commence active commissioning.
- Confirming that documentation for inactive testing and commissioning had been completed and that technical queries raised from non-conformities had been addressed.
- Ensuring appropriate training was delivered to operators, operating instructions were produced to the appropriate standard and safety case limits and conditions were clearly identified.
- Confirming appropriate organisational control and supervision was in place for active commissioning of the dry fuel store process to take place.

Matters arising from ONR's work

Based on ONR's inspection findings, it was considered that NGL had developed an appropriate commissioning strategy to demonstrate qualification of Dry Fuel Store equipment and its operations. Robust governance was in place confirming equipment design and safety functional requirements had been met as well as satisfactory close-out of non-conformities. The monitoring and oversight of activities has ensured appropriate controls and supervision of operations were in place, safety case commitments had been met as well as confirming the project's readiness to move into active commissioning.

Conclusions

The ONR Sizewell B Dry Fuel Store Project Inspector considered the project had met its inactive testing and commissioning commitments, addressing identified technical and organisational issues. A suitable safety justification had been provided to demonstrate that risks from operations were adequately controlled and supervised.

Recommendation

The ONR Sizewell B Dry Fuel Store Project Inspector recommended that ONR issue LI 551 granting consent for commencement of active commissioning of Sizewell B Dry Fuel Store process.

LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
DDP	Design Decision Panel
HI-STORM	Multi-Purpose Canisters Shielded Storage Package
HI-TRAC	Multi-Purpose Canisters Shielded Transport Package
MPC	Multi-Purpose Canisters
NGL	EdF Energy Nuclear Generation Limited
ONR	Office for Nuclear Regulation
PSRG	Project Safety Review Group
RGP	Relevant Good Practice
SAP	Safety Assessment Principle(s)
SFAIRP	So Far As Is Reasonably Practicable
SSC	System, Structure and Component
T&CP	Testing and Commissioning Panel

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1 PERMISSION REQUESTED

1. This Office for Nuclear Regulation (ONR) Project Assessment Report (PAR) has been produced to record regulatory opinion and judgments in consideration of EdF Energy Nuclear Generation Limited's (NGL) request for ONR's consent to commence active commissioning of the Sizewell B Dry Fuel Store process. This requirement was established through ONR issuing Licence Instrument (LI) 531 against Licence Condition 21 (4) Commissioning, under Sizewell B's Nuclear Site Licence, Licence Number 63 in December 2012.

2. LI 531 specified that NGL shall not commence active commissioning of the Sizewell B Dry Fuel Store process without the consent of ONR. "Active commissioning" was defined as commencement of placing spent nuclear fuel into any part of the Dry Fuel Store process.

2 BACKGROUND

3. This PAR considers whether NGL has undertaken adequate preparations for commencement of active commissioning of the Dry Fuel Store process. NGL's request for ONR's consent, through letter SZB 50835R (Reference 1), was supported by the following safety documentation:

   - Sizewell B Dry Fuel Store Pre-Operational Safety Case, Stage Submission 1 Revision 1, NP/SC 7575, EC 338898-1 (Reference 2); and
   - Sizewell B Dry Fuel Storage In-active Testing and Commissioning Safety Report Stage Submission 5, NP/SC 7575, EC 353382 (Reference 3).

4. A brief summary of the Sizewell B Dry Fuel Store process is provided in Appendix 1.

5. Reference 2 sets out NGL's assessment of hazards and risks from Dry Fuel Storage operations together with safety measures to reduce risks So Far As Reasonably Practicable (SFAIRP). ONR's assessment (Reference 4) concluded that NGL had undertaken a suitable and sufficient assessment of hazards from Dry Fuel Storage operations and implemented adequate safety controls. Outstanding issues identified in Reference 4 have been satisfactorily addressed with close-out statements provided in Appendix 2 of this report.

6. Reference 3 summarises NGL's inactive testing and commissioning findings of the Sizewell B Dry Fuel Storage process, and makes 3 claims:

   1 Inactive commissioning has been carried out in-line with best practice and takes into account operating experience and learning.
   2 Documentation and training will ensure safe and reliable operations.
   3 The risks posed by active commissioning are ALARP.

7. NGL considers the Sizewell B's Dry Fuel Storage process is:

   - Low energy when compared to pressures and temperatures observed during reactor operations.
   - The proprietary system provided by Holtec International (Holtec) has a proven safety track record being in operation for a number of years in several countries around the world.
   - The Dry fuel Process accounts for less than 10% of the total risk posed by station's operation.

8. NGL carried out its own independent review of Reference 3 through the Sizewell B's Nuclear Safety Operational Review Committee (Reference 5) and by NGL's Nuclear Safety Committee (Reference 6 and 7). These reviews concluded that NGL's testing and commissioning activities adequately demonstrate that equipment design, performance and safety functional requirements have been met.

9. NGL's Independent Nuclear Assurance (INA) department reviewed Reference 3 and concluded that a suitable and sufficient evaluation of dry fuel storage equipment and process had been undertaken. This was confirmed in the issuing of an Independent Nuclear Safety Assessment certificate (Reference 8).

10. INA also monitored the delivery of the Dry Fuel Storage project through a surveillance plan (Reference 9). The plan established a number of internal hold-points for the project to confirm satisfactory progress. Hold-Point 8 requiring the demonstration that inactive commissioning requirements had been completed before this hold point could be released. Based on demonstration of identified requirements during a site-based readiness inspection, INA has issued its concurrence Part B (Reference 10) that confirms commitments have been met and the Dry Fuel Store project is able to move into active commissioning.

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

11. In evaluating NGL's request to move the Sizewell B dry fuel storage project into active commissioning, ONR has reviewed claims made in Reference 2 and 3, carrying out a series of site-based compliance inspections (Reference 12 to 19) and holding regular project progress meetings (Reference 20 to 36).

12. ONR's assessment of the Sizewell B Dry Fuel Store Pre-Operational safety case Reference 2 involved assessment of 6 areas considered important to safety: fuel element integrity, storage container integrity; fault studies; human factors; radiation protection; and radioactive waste management. This assessment Reference 4 concluded that NGL had complied with the requirements of LC 23(1) in producing an adequate safety case for dry fuel store processing and storage operations. The assessment concluded that NGL had taken reasonable steps to address potential risks from placing spent nuclear fuel into dry storage on the Sizewell B Nuclear Licenced Site.

13. NGL's safety justification presented in Reference 3 In-active Testing and Commissioning Safety Report for the Dry Fuel Storage process argues it is low risk. However ONR considered there is a high reliance placed upon human intervention within the activities to be carried out. The ONR Project Inspector approach to evaluating NGL's demonstration of safety and commissioning of the dry fuel process has focused upon confirming robust administrative process has been followed. ONR evaluating the following key aspects:

- Project Governance - to ensure each step of the process had been scrutinised;
- Equipment Qualification - suitable and sufficient testing to confirm design and safety requirements had been met;
- Process Implementation – Inactive testing and commissioning would confirm effective operation of safety features;
- Training and Organisational Control – confirming the robustness of process delivery through operator activities and suitable control, supervision and human reliability.

14. As this was the first time this type of Dry Fuel Storage process had been undertaken in the UK, it was considered appropriate to address all these aspects to confirm NGL's ability to deliver a safe and reliable process.

4 MATTERS ARISING FROM ONR'S WORK

4.1 Project Governance

15. The Sizewell B Dry Fuel Store Project has been managed through NGL's corporate arrangements for major investment projects. These arrangements draw on best practice in that they require a governance structure to be established. This ensures project delivery receives the appropriate level of rigor and challenge in support of the safety case claims when confirming that safety requirements have been met and during its implementation and qualification. The dry fuel store governance functions evaluated were Design Decision Panel (DDP), Testing and Commissioning Panel (T&CP) and Project Safety Review Group (PSRG).

16. The DDP is responsible for resolving design issues and ensuring safety case justification remains valid. A total of 118 design issues have been submitted to the DDP for consideration at the time this report was being prepared. I have not observed the DDP meetings; however I have reviewed justifications produced by the DDP to close out issues.

In the case of safe lifting limits for the fuel building crane I challenged arguments presented (TRIM Ref 2015/115300) although after further discussions with NGL's Design Authority considered the proposed solution was reasonable. This view is based upon conservative decision-making and use of engineering judgment by DDP, based upon relevant design and safety standards.

17. The T&CP is responsible for ensuring testing and commissioning of Structures, Systems and Components (SSCs) along with operations are undertaken in a methodical way. NGL has mature terms of reference in place for T&CPs, which set out roles, responsibilities, authorities and accountabilities. I reviewed the Sizewell B Dry Fuel Store Project T&CP commissioning strategy (TRIM Ref 2016/388165) and consider that this set out a structured and logical approach. The strategy was implemented through a paper of principle (TRIM Ref 2016/388167) which identified the required level of testing to be undertaken, test team structure and traceability to safety case claims through a testing and commissioning matrix.

18. I have observed T&CP meetings and reviewed meeting minutes and justifications produced in resolving issues. It is my opinion that the Sizewell B Dry Fuel Store Project T&CP has conducted itself professionally; ensuring members of the testing and commissioning team are suitably qualified and experienced to carry out required work. Work was delivered in accordance with an agreed plan; test results were reviewed by the T&CP and approved by the Chair. Where issues were identified from testing and commissioning work, associated Technical Queries (TQs) were raised. The justification for closing out TQs was reviewed by T&CP and endorsed by the T&CP Chair. From inspection of a sample of closed out TQs I was able to confirm the process was structured, with the issue of non-conformity being clearly defined, options to resolve problems evaluated and challenged by T&CP members. The chosen solution tested to confirm satisfactory outcome before being implemented and approved by T&CP Chair.

19. The role of the PSRG is to ensure safety standards are maintained throughout the life of a project. NGL has mature terms of reference for PSRG with representation from Chairs of the DDP and T&CP together with Station, Safety Case and Design Authority required for quorate meetings. I have observed PSRG meetings, reviewed meeting minutes and decision-making. It is my opinion that the PSRG has met its responsibilities to challenge the project in the way it delivered its commitments, ensuring safety standards are adhered to and monitored the project's readiness to move into active commissioning. This has involved ensuring training needs analysis has been conducted; management of change justification for new organisational structures are in place and ensuring validity of safety case claims given changes in design and process resulting from inactive commissioning.

20. To move to active commissioning, the Dry Fuel Store Commissioning Manager will issue a readiness report to confirm the pre-requisites for active commissioning have been met. This report requires approval by the T&CP Chair and endorsement by the PSRG before being submitted to the Station's Operational Safety Review Committee (OSRC) for final approval for commencement of active commissioning.

21. In conclusion, I consider the governance arrangements for the dry fuel store project are suitable and sufficient and have delivered the required scrutiny and attention to inactive testing and commissioning activities. The DDP and T&CP addressing technical and operational commissioning issues, with the PSRG providing project oversight to confirm safety case, training and quality requirements have been met. The final stage of this process, resting with the Station's OSRC, provides the level of independence with limited involvement in the project, but providing a holistic view given the knowledge and experience of its members.

4.2 Equipment Qualification

22. Evaluation of equipment qualification is considered important in confirming that claimed design and safety case requirements have been met. The Dry Fuel Store project has complied with NGL'S corporate testing and commissioning arrangements through

implementation of its testing and commissioning paper of principle (TRIM Ref 2016/388167). The process involves:

- testing equipment at the manufacturer's works to confirm specified design and safety case requirements can be met (Factory Acceptance Testing).
- addressing identified equipment performance shortfalls before it is dispatched to site.
- performance tests being repeated when equipment arrived at site to confirm no damage has occurred during transit and to reconfirm design and safety requirements (Site Acceptance Testing).

23. The individual pieces of equipment were then operated in their functional groups - MPC Cooling System (MPCCS), Forced Helium Drying (FHD), welding and inspection to simulate dry fuel store operations. This phase of work allowed operating instructions to be trialled to confirm their correctness. This was then followed by a complete loading and unloading demonstration, which the project classified as inactive commissioning.

24. Ongoing modifications to the Pond Fuel Handling Machine during this phase of testing prevented the MPC 24 position loading trial (using a dummy fuel element) to be carried out. NGL has since confirmed that this test has been successfully completed and has provided a test report detailing that operational and safety functional requirements were met (TRIM Ref 2016/486458).

25. As part of my assessment of dry fuel store equipment qualification, I have reviewed factory acceptance test reports for the Hauling Transporter, site and system acceptance test reports for MPCCS and the FHD and observed site testing of the Lifting Transporter. I have also reviewed inactive commissioning reports from the loading and unloading demonstration. From this evidence I consider that NGL has adequately demonstrated equipment qualification requirements.

26. NGL has also undertaken a review of equipment performance after inactive commissioning to confirm that the required equipment reliability could be justified as well as seeking wider learning from Holtec's operational experience. It is my opinion that this work shows NGL's commitment to minimise safety risks from Dry Fuel Store operations.

27. In conclusion, inspection of close-out of TQs from equipment testing and commissioning activities is considered suitable and sufficient. Some issues were identified with the recommissioning of equipment, including MPCCS performance, Fuel Pond Preparation drain down time. Station has addressed these issues, stating required safety function and reliability have been met (TRIM Ref 2016/487311, 2016/487307).

4.3 Process Implementation

28. In considering the adequacy of implementation of the Dry Fuel Store process, I have focused on confirming that safety case requirements have been delivered and are supported by adequate arrangements. Based on an inspection of a sample of safety case requirements covering fuel selection, fuel storage components and human factors I am satisfied that Operational Commitments (OCs) made in the dry fuel store safety case have been met. I consider that good practice has been applied with the OCs being identified alongside steps within operational documentation highlighting that a safety case claim or requirement is being met through the activity being undertaken.

29. My inspection of Station Operating Instructions (SOIs) used to control activities and my sampling of Plant Operating Instructions (POIs) setting out the steps required to carry out a specific task has provided evidence to support my judgement that operational documentation is appropriately structured and follows a logical process. In summary, I consider that the instructions to control and conduct operations of the Sizewell B Dry Fuel Store processes are suitable and sufficient and are in line with safety case requirements.

4.4 Training and Organisational Control

30. The associated Dry Fuel Storage process training provided for both NGL and its partner organisation, Holtec, was inspected. NGL's arrangements for developing training material are considered to be in line with the systematic approach to training (SAT) applied in the nuclear industry. Inspection of dry fuel store training material covering both classroom learning (including safety case requirements and abnormal operations) along with plant-based familiarisation were found to be suitable and sufficient. With assessment of operator's understanding and knowledge from training evaluated through written examination and task observation. Demonstration of delivery of training requirements recorded on a competency training matrix TRIM Ref 2016/469439.

31. NGL and Holtec operational personnel were interviewed as part of ONR compliance inspection activities to confirm their knowledge and understanding of processes and safety case requirements. Based on the responses from Holtec personnel I judged these operators to be competent, being able to accurately describe processes and operations they were required to conduct and confirm understanding of safety case requirements. Discussions with NGL Fuel Route Duly Authorised Persons (DAPs), who will be responsible for controlling and supervising operations, confirmed they had a good understanding of the Dry Fuel Storage process, safety case requirements and arrangements to safely control activities.

32. The project would also benefit from desk top style review being conducted at the final phase of readiness to confirm sequencing of documentation control requirements. The project has confirmed that this requirement will be delivered during an operational stand-down prior to commencement of active commissioning. This will involve all relevant parties in the Dry Fuel Store process (i.e. Holtec, NGL health physics, fuel route operational staff and commissioning group).

33. I have reviewed the organisational structure for dry fuel store active commissioning set out in NGL's Management of Change justification TRIM Ref 2016/469425 and 2016/469430. This identifies organisational risks and measures which have been taken to mitigate them as well as setting out operational controls to be implemented. The NGL Fuel Route DAP is responsible for overall control of the process with the NGL Fuel Route Engineers (FRE) undertaking MPC loading with spent fuel elements. Holtec personnel are responsible for preparing the MPC for loading, taking back control of the loaded MPC to carry out MPC lid to shell welding, fuel drying and helium pressurisation. During these operations NGL FREs carry out a series of surveillance activities to confirm integrity of fuel elements. This involves assessment of MPC lid weld integrity by NGL Fuel Route System Engineer based on dye penetrant and ultrasonic examination. The NGL Station Chemist monitoring Caesium 137 isotope level from pond water within loaded MPC for increased activity as well as the presence of Krypton-85 isotope in helium gas during fuel drying. This testing providing confidence in the integrity of fuel element cladding during handling and drying operations.

34. In addition, the Dry Fuel Store Commissioning Manager, or their deputy, will be monitoring operations from the outage control centre. The Fuel Route DAP will also maintain communication with the station's main control room to ensure that they are aware of the stage of the process being undertaken.

35. In conclusion, I judge that NGL and its supporting partner organisation has adequate arrangements to ensure personnel carrying out dry fuel store active commissioning operations are suitably qualified and experienced. This commemorate with the safety standards for operations to be undertaken given the high reliance on human intervention. This judgement is based upon the quality of training material for both classroom and on the job instruction as well as the responses provided by personnel interviewed. In my opinion, there are suitable and sufficient controls and supervisory arrangements in place through Fuel Route DAP and station's oversight to ensure safe operations. These arrangements are similar to those used during station reactor refuelling outages and provide confidence in approach to be applied.

4.5 Consultation within ONR and with Other Regulatory Bodies

36. Internal consultation within ONR has taken place with Civil Nuclear Security and Safeguards Inspectors involved in the Sizewell B dry fuel store project. The ONR Security Inspector has confirmed that he has no objection to ONR issuing its consent for Sizewell B dry fuel store process commencing active commissioning. This based upon Sizewell B Nuclear Site Security Plan being updated with dry fuel store requirements (References 37).

37. ONR Safeguards has also confirmed that they have no objections which would prevent ONR issuing its consent for Sizewell B to commence active commissioning (Reference 38). This is based on EURATOM safeguard confirming that installed equipment at Sizewell B is operational and the process for installing EURATOM seals considered acceptable ONR Safeguards Contact Record 2016/469323.

38. External consultation took place with Environment Agency (EA) who confirmed they have no objection to ONR issuing its consent to allow Sizewell B dry fuel store project to move into active commissioning (Reference 39).

5 CONCLUSIONS

39. Based on ONR's assessment of the Sizewell B Pre-Operational Dry Fuel Store Safety Case; review of Sizewell B Dry Fuel Store Inactive Testing and Commissioning Safety Report and documented ONR inspection findings I judge:

- A suitable safety justification has been produced by NGL to show risks from Dry Fuel Store operations are SFAIRP in support of commencing active commissioning.
- Effective project governance has been demonstrated by NGL within its Sizewell B dry fuel store project through the DDP, T&CP and PSRG. This provides confidence that risks from equipment design, process and safety controls have been adequately managed and are of the required robustness to move into active commissioning.
- Equipment qualification has confirmed safety case design and equipment safety functional requirements have been demonstrated and met.
- Safety case requirements identified through Operational Commitments (OCs) have been adequately implemented, demonstrated through operational documentation.
- Operational personnel have received appropriate training and are suitably qualified and experienced.
- Appropriate control and supervision is in place as set out in the dry fuel store arrangements.

6 RECOMMENDATIONS

40. I recommend that ONR issues LI 551 giving consent for commencement of active commissioning of Sizewell B dry fuel store process. This LI issued is against LC 21 (4): Commissioning under Sizewell B Nuclear Site Licence 63.

7 REFERENCES

1. NGL letter Sizewell B Power Station Unique Letter Number NSL SZB 50835R dates 30 September 2016, requesting ONR consent to commence active commissioning of the Sizewell D Dry Fuel Store, ONR TRIM Ref 2016/382840
2. NGL Document NP/SC 7575 Stage Submission 1 Revision 1, Sizewell B Dry Fuel Store Pre-Operational Safety Case, Stage Submission 1 Revision 1
3. NGL Document NP/SC 7575 Stage Submission 5, Dry Fuel Store In-Active Commissioning Safety Report EC 353982, ONR TRIM Ref 2016/416107
4. ONR Project Assessment Report ONR-OPF-PAR-16-010 Assessment of NP/SC 7575, EC 338898-1, Titled Sizewell B Dry Fuel Store Post Operational Safety Case, Stage Submission 1 Revision 1, ONR TRIM Ref 2016/294694
5. Sizewell B's Nuclear Safety Operational Review Committee minutes from meeting 587 held 15 December 2015, ONR TRIM Ref 2016/382858
6. NGL's Nuclear Safety Committee minutes from meeting 07/16 held 13 July 2016, ONR TRIM Ref 2016/382850
7. NGL's Nuclear Safety Committee, special meeting held 9 August 2016, ONR TRIM Ref 2016/382876
8. NGL Independent Nuclear Safety Assessment interim certificate for EC 353982 Rev 000, Approved 30 September 2016, ONR TRIM Ref 2016/382844
9. NGL Independent Nuclear Assurance department Sizewell B Dry fuel store surveillance plant, ONR TRIM Ref 2016/115046
10. NGL Independent Nuclear Assurance Concurrence Report Part B Release of Hold Point 8 Sizewell B Dry Fuel Store Active Commissioning, ONR TRIM Ref 2016/495616
11. ONR Sizewell B Dry Fuel Store Permissioning Strategy TRIM Ref 2015/59515
12. ONR Intervention Records ONR-SZB-IR-14-140, 15 to 18 September 2014, LC19 Construction of New Plant and LC21 Commissioning, TRIM Ref 2014/351500
13. ONR Intervention Records ONR-SZB-IR-14-214, 24 to 26 February 2015, LC19 Construction of New Plant and LC21 Commissioning, TRIM Ref 2015/84522
14. ONR Intervention Records ONR-SZB-IR-15-081, 9 and 10 September 2015, LC21 Commissioning, TRIM Ref 2015/341867
15. ONR Intervention Records ONR-SZB-IR-15-156, 2 to 4 February 2016, LC21 Commissioning, TRIM Ref 2016/57698
16. ONR Intervention Records ONR-SZB-IR-16-135, 18 to 20 October 2016, LC21 Commissioning, TRIM Ref 2016/411326
17. ONR Intervention Record ONR-SZB-IR-15-047 Structural Integrity and Radiological Protection, 6 and 7 July 2015
18. ONR Intervention Record ONR-SZB-IR-15-054 Fuel Selection and Human Factors, 28 and 29 July 2015
19. ONR Intervention Record ONR-SZB-IR-15-112 Radioactive Waste Management, 3 and 4 November 2015
20. ONR Contact Record ONR-CNRP-CR-13-392 20, March 2014, TRIM Ref 2014/119644
21. ONR Contact Record ONR-CNRP-CR-14- 016, 1 May 2014, TRIM Ref 2014/174942
22. ONR Contact Record ONR-CNRP-CR-14- 047, 12 June 2014, TRIM Ref 2014/232249

23. ONR Contact Record ONR-CNRP-CR-14- 124, 24 July 2014, TRIM Ref 2014/285338
24. ONR Contact Record ONR-CNRP-CR-14-174, 4 September 2014, TRIM Ref 2014/338731
25. ONR Contact Record ONR-CNRP–CR-14-221, 16 October 2014, TRIM Ref 2014/385202
26. ONR Contact Record ONR-CNRP-CR-14-325, 27 January 2015, TRIM Ref 2015/36042
27. ONR Contact Record ONR-CNRP-CR-15-001, 21 April 2015, TRIM Ref 2015/147654
28. ONR Contact Record ONR-CNRP-CR-15-081, 11 June 2015, 2015/219083
29. ONR Contact Record ONR-CNRP-CR-15-118, 23 July 2915, TRIM Ref 2015/277125
30. ONR Contact Record ONR-CNRP-CR-15-256, 24 November 2015, TRIM Ref 2015/453509
31. ONR Contact Record ONR-CNRP-CR-15-297, 21 January 2016, TRIM 2015/33594
32. ONR Contact Record ONR-CNRP-CR-15-358, 17 March 2016, TRIM Ref 2016/131140
33. ONR Contact Record ONR-OFP-CR-16-104, 20 May 2016, TRIM Ref 2016/209600
34. ONR Contact Record ONR-OFP-CR-16-180, 30 June 2016, TRIM Ref 2016/27149
35. ONR Contact Record ONR-OPF-CR-16-279, 1 September 2016, TRIM Ref 2016/348377
36. ONR Contact Record ONR-OPF-CR-16-389, 27 October 2016, TRIM Ref 2016/420330
37. ONR email from ONR Security Inspector TRIM Ref 2016/483608
38. ONR email from ONR Safeguard Inspector TRIM Ref 2016/473202
39. Email for Environment Agency Sizewell B Site Inspector TRIM Ref 2016/414212

APPENDIX 1 BRIEF DISCRIPTION OF DRY FUEL STORE PROCESS

NGL's reason for constructing and operating the Sizewell B Dry Fuel Store process is due to a number of converging issues:

- Limited storage capacity in Sizewell B Station's fuel cooling pond;
- Limited nuclear fuel reprocessing capacity both worldwide and within the UK given the Government's decision to stop nuclear fuel reprocessing at Sellafield and move to underground radiological waste disposal;
- The UK underground radiological waste disposal facility has yet to be constructed.

The consequence of not proceeding with Sizewell B dry fuel storage would be the premature closure of the Power Station due to it not complying with its safety case by exceeding spent fuel inventory in its cooling pond. The dry fuel storage process allows spent nuclear fuel to be removed from the Station's cooling pond and placed in storage containers for interim safe storage.

The dry fuel storage process involves the movement of an empty Multi-Purpose Canisters (MPC) into the Station's drained cooling pond preparation bay. The MPC contained within its shielded transport package (HI-TRAC) does not have its lid fitted. The preparation bay is then flooded with cooling water to submerge the MPC and HI-TRAC. This is then moved under water through the pond fill bay transfer gate into the pond fill bay where 24 undamaged spent fuel assemblies are loaded into the MPC. The lid of the MPC is then fitted and secured with toggle bolts and moved back to the pond preparation bay. The preparation bay is drained and the MPC and HI-TRAC decontaminated and external cooling fitted. A small volume of pond water is removed from inside the MPC and checked for caesium levels to confirm fuel clad is undamaged. If caesium levels are acceptable the lid of the MPC is then welded to the shell of the vessel. After inspection of the lid weld any pond water inside the MPC is ejected using pressurised helium followed by drying of the fuels using heated helium gas. During the drying phase the presence of krypton gas is monitored, again to confirm fuel clad remains intact. The MPC is then pressurised with dry helium gas and sealed to allow passive cooling within the MPC. This process is based on natural thermal convection, with contained fuel elements heating the helium gas which rises pushing cooler gas back down in the MPC. Dissipating helium gas absorbs heat energy by convection through the wall of the MPC which is then radiated from its external surface.

The loaded and sealed MPC is then moved within its shielded over-package from the pond building to a purpose built storage facility where it is transferred into a shielded storage over-package (HI-STORM). The MPC's external temperatures are remotely monitored within the HI-STORM using thermocouples fitted to its base and lid. The difference between temperature measurements indicates the health of the MPC containment, whereby a small temperature difference indicates containment is intact. This is based on the MPC being pressurised with helium gas, and natural thermal convection is in operation. A large temperature difference suggests loss of helium gas due to no natural thermal convection taking place with the top of the MPC at a significant higher temperature than its base. The threat to MPC containment arises from stress corrosion cracking given the presence of chlorine.

APPENDIX 2 CLOSE OUT OF ONR'S ASSESSMENT ISSUES

ONR's assessment of the Sizewell B Dry Fuel Store Post Operational Safety Case, Stage Submission 1 Revision 1, NP/SC 7575, EC 338898-1 is reported in ONR Project Assessment Report ONR-OPF-PAR-16-010 TRIM Ref 2016/2016/294694. Following this, a number of issues remained open which were addressed during ONR's Dry Fuel Store Readiness Inspection on 18-20 October 2016, ONR Intervention Records ONR-SZB-IR-16-135, TRIM Ref 2016/411326. This justification for closure of these issues is detailed in the table below:

No	Issue / *Resolution*
1	That the ONR Sizewell B Dry Fuel Store (SZB DFS) Project Inspector obtains assurance from NGL that any issues relating to the use of imperial components are identified and managed. This to include, from Structural Integrity, control of welding consumables, control of fittings and attention to through-life monitoring. *The NGL Dry Fuel Store Manager reported that no significant issues had arisen from the use of imperial manufactured components, in that all drawings had been converted to their decimal equivalents. NGL did not require HOLTEC to alter the design of dry fuel storage components which are used in a number of countries around the world. Equipment used in dry fuel processing (chiller unit and lifting attachments) supplied from United States of America (USA) were manufactured to required standards using metric components. It is considered this ONR Assessment issue has been closed out.*
2	That the ONR SZB DFS Project Inspector obtains confirmation from NGL that all INA comments covering Section 5 Spent Fuel Storage Casks of EC 338898-1 have been satisfactorily closed out before active commissioning commences. *NGL INA has provided a full Independent Nuclear Safety Assessment (INSA) (TRIM Ref 2016/382502) for EC 338898-1. In reviewing this document all INSA issues have been addressed. This ONR Assessment issue has been closed out.*
3	That the ONR SZB DFS Project Inspector ensures that a complete and suitable non-conformance and concession report is obtained for all nuclear safety significant equipment before active commissioning commences. *This intervention covers NGL's quality assurance arrangements for supply of fuel storage components. This process requires Holtec to identify all non-conformities to NGL before components are dispatched from the USA to the UK in a quality and conformance report. Inspection of reports for the supply of fuel storage components was carried out during the ONR Structural Integrity Site Inspection (TRIM Ref 2015/248210). This concluded that sufficient information was provided to allow NGL to reach a view on the impact on nuclear safety from recorded non-conformance and to accept or reject component.* *NGL carries out its own inspection of components on arrival at site to confirm no damage has occurred during transit and identified non-conformance are as detailed in Holtec report (this includes any remedial work on components). This ONR Assessment issue has been closed out.*

4	That the ONR SZB DFS Project Inspector ensures that Operational Commitment (OC) 1643.10-04 (adequate technical justification is provided for the MPC LTS Weld UT Inspection System) is complete before active commissioning commences. *EC 338898-1 INSA Issue 02: INA requires evidence of revised weld procedures (including arrangements for identifying and sentencing welding rework and repairs) prior to granting Full Approval (TRIM Ref 2016/382502). The INSA stated that to release Hold Point 8 INA requires evidence of technical justification for weld inspection procedure* *During this Inspection the INA officer stated that OC 1643.10-06 had been addressed by submission of procedure for MPC LTS inspection TRIM Ref 2016.417543. On this basis this ONR Assessment issue has been closed out.*
5	That the ONR SZB DFS Project Inspector monitors commissioning of Thermal Differential Monitoring System (TDMS) to confirm values recorded to those predicted by NGL's MPC CFD model. *NGL have tested TDMS in support of active commissioning TRIM Ref 2016/487298. Actual monitoring of temperatures from Multi-Purpose Canister (MPC) could not be undertaken but end to end testing has been carried out using heated water to confirm thermal couple current flow and calibration of probes. Some minor issued remain but it is considered intent of system has been demonstrated. This ONR Assessment issue has been closed out.*
6	That the ONR SZB DFS Project Inspector monitor NGL's Human Factors Implementation Plan to ensure adequate closure of Human Factors Operational Commitments for SS1 Rev 1 and SS5. OC 1643.13-1 Ensure the assumptions underpinning the DFS Human Reliability Assessments are validated during commissioning activities to substantiate the Human Error Probabilities that have been derived. OC 1643.13-3 To enable the DFS Human Factors assessments to remain valid, ensure the items outlined in Table 13.4 of EC338898 are incorporated within the operational regime of the Dry Fuel Store prior to commencement of Active System Commissioning. *Based on sampling of close out requirements for the above two OCs during the joint ONR / INA readiness inspection I consider sufficient evidence was provided to confirm commitments had been met. I consider Sizewell B's approach in referencing OC commitments through their unique number was a demonstration of good practice. The reference to an OC commitment highlights the need for increased attention given its importance to safety being linked to a safety case requirement. This ONR Assessment issue has been closed out.*
7	ONR to carry out radiological protection compliance inspection during active commissioning of dry fuel store processing and storage to monitor effectiveness of engineered radiological protection measures and procedures. *This issue is still outstanding and will be addressed February 2017 through a planned ONR compliance inspection*.