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Modification to the Hinkley Point C UK EPR Design
ONR Agreement to Category 1 Modification: PS Architecture Modification

Project Assessment Report ONR-NR-PAR-18-005
Revision 1
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EXECUTIVE SUMMARY

Title

ONR Agreement to Category 1 Modification: PS Architecture Modification.

Permission Requested

NNB Generation Company (HPC) Ltd (NNB GenCo), for the purposes of arrangements made under Condition 20(1) of Schedule 2 attached to Nuclear Site Licence No. 97A to control any modification to the design of the Hinkley Point C (HPC) nuclear installation, currently under construction in Somerset, has requested ONR's agreement to or acknowledgment of implementation of the modification as described in the licensee's two documents:

- Licence Summary Statement – “*PS Architecture Modification*”, HPC- HPC-NNBOSL-AU-RPR-LSS-100001 Revision 3.0; and
- Licence Summary Statement – “*PS Architecture Modification LSS Addendum*”, HPC-NNBOSL-AU-RPR-LSS-100009 Revision 1.0.

Background

At the end of Generic Design Assessment (GDA), the Protection System (PS) architecture was predominately based on the one used for Flamanville 3. A key ONR finding in GDA was the requirement to categorise support functions (e.g. heating, ventilation, and air conditioning) at the same level as the function it is supporting. As a result, a set of functions formerly categorised as Category B are now Category A and require to be implemented in the Class 1 PS. To implement the new Class 1 safety features, NNB GenCo proposed an extension to the GDA PS Architecture by including additional Acquisition Process Units and Actuation Logic Units in each division. This resulted in NNB GenCo adopting the 'GDA Extended architecture' for the PS.

NNB GenCo's Licence Summary Statement (LSS) notes that accommodating any future requirements may exceed the physical limits of the PS architecture, and that the inclusion of additional Class 1 safety features would push “*the GDA Extended architecture to the limit in terms of sizing and network loading*”.

Consequently, the LSS proposes a modification to the PS architecture to principally:

- accommodate the new Category A functions identified from GDA;
- simplify the architecture by removal of the constraints associated with the non-UK design;
- use less hardware and be more flexible to accommodate future requirements minimising the impact on control & instrumentation (C&I) sizing.

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

ONR's C&I inspector has carried out an assessment of the safety justification for the proposed modifications described in the LSS and the LSS addendum. This assessment focused on the technical and safety justification for the modification, a comparison with Relevant Good Practice and consideration of as low as reasonably practicable (ALARP), and also considered NNB GenCo's commitments in relation to implementation of the modification.

ONR's C&I inspector concluded that NNB GenCo has proposed realistic and achievable design optimisations for the PS, and that this provides confidence that all functions could achieve the reliability requirement. The inspector was content that the proposal provides adequate quantitative and qualitative arguments to justify the proposed modification to the PS architecture, and demonstrate that it has met the principles of ALARP.

The ONR C&I inspector recommended that ONR provide agreement to NNB GenCo's request to implement the proposed modification described in the LSS and LSS Addendum.

NNB GenCo internal assurance and governance

In accordance with arrangements under LC20, the proposed modification, as described in the LSS and the LSS addendum, has been considered by NNB GenCo's Safety Design Change Committee and by NNB GenCo's Nuclear Safety Committee. The LSS and addendum have also been subject to review by NNB GenCo's Independent Technical Assessment function.

Conclusions

Based on the evidence sampled I am satisfied with NNB GenCo's case for the acceptance of this design modification.

Recommendation

I recommend that ONR issue Licence Instrument (LI) 516 giving its Agreement under LC20(1) to NNB GenCo's proposed modification to the design of Hinkley Point C that is currently under construction.

LIST OF ABBREVIATIONS

ALARP	as low as reasonably practicable
ALU	Actuation Logic Unit
APU	Acquisition Process Unit
AR	Assessment Report
CBSIS	Computer Based Systems Important to Safety
CCF	Common Cause Failure
C&I	Control & Instrumentation
DBC	Design Basis Categories
DDM	Decision du Modification
EPR	EPR Pressurised Water Reactor
ESFAS	Engineered Safeguard Features Actuation System
FA3	Flamanville 3 EPR, France
FDM	Fiche de Modification
GDA	Generic Design Assessment
HOW2	(ONR) Business Management System
HPC	Hinkley Point C
ITA	Independent Technical Assessment
LC	Licence Condition
LI	Licence Instrument
LSS	Licence Summary Statement
NNB GenCo	NNB Generation Company (HPC) Ltd
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
PAR	Project Assessment Report
PCSR	Pre-Construction Safety Report
pdf	Probability of Failure on Demand
PS	Protection System
RC	Reference Configuration
RD	Responsible Designer
RGP	Relevant Good Practice
RT	Reactor Trip
SAP	Safety Assessment Principle(s)
SDSC	Safety Design Change Committee
TAG	Technical Assessment Guide(s)
TXS	Teleperm XS Platform

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1 PERMISSION REQUESTED

1. NNB Generation Company (HPC) Ltd (NNB GenCo), for the purposes of arrangements made under Condition 20(1) of Schedule 2 attached to Nuclear Site Licence No. 97A to control any modification to the design of the Hinkley Point C (HPC) nuclear installation, currently under construction in Somerset, has requested (Ref. 1) ONR's agreement to or acknowledgment of implementation of the modification as described in the licensee's documents:
 - Licence Summary Statement – "*PS Architecture Modification*", numbered HPC-NNBOSL-AU-RPR-LSS-100001 Revision 3.0, dated 10 August 2016 (Ref. 2); and
 - Licence Summary Statement – "*PS Architecture Modification LSS Addendum*", numbered HPC-NNBOSL-AU-RPR-LSS-100009 Revision 1.0, dated 01 November 2018 (Ref. 3)
2. This project assessment report (PAR): summarises ONR's assessment of NNB GenCo's proposal to modify the design of the HPC EPR; records ONR's judgement of the impact of the modification upon nuclear safety; and responds to NNB GenCo's request. It has been produced in accordance with ONR HOW2 guidance (Ref. 4).

2 BACKGROUND

2.1 Role of the Protection System

3. The role of the Protection System (PS) is primarily to implement the automatic and manual protection functions, including support functions, which are categorised³ Category A. These functions are required to reach the controlled state in case of a postulated initiating event DBC2 to DBC4 (Design Basis Categories). These Design Basis Categories (DBC) are: DBC2 incident conditions; DBC3 accident conditions of low frequency; and DBC4 accident conditions of very low frequency. DBC1 covers normal operating conditions.
4. The PS also implements Category B functions needed beyond achievement of the controlled state to reach the safe shutdown and to maintain it after any internal events DBC2 to DBC4. In addition, some post-accident functions are implemented in the PS. The PS is implemented on the Teleperm XS Platform (TXS) supplied by Framatome.

2.2 GDA PS Architecture

5. At the end of Generic Design Assessment (GDA), the PS architecture was predominately based on the one used for Flamanville 3 (FA3). A key ONR finding in GDA was the requirement to categorise support functions (e.g. heating, ventilation, and air conditioning) at the same level as the function it is supporting. As a result, a set of functions formerly categorised as Category B are now Category A and require to be implemented in the Class 1 PS.
6. Each division of the GDA PS architecture is composed of two sub-systems, sub-system A and sub-system B. These sub-systems implement functional diversity within a division of the PS enabling a higher reliability to be claimed in non-UK context designs. Each sub-system is comprised of Acquisition Process Units (APU) and Actuation Logic Units (ALU). APUs are dedicated to the acquisition of the Class 1 sensors and to the processing related to acquisition, such as signal conversion, signal validation or threshold detection. ALUs are dedicated to voting and actuation management of core functions i.e. Engineered Safeguard Features Actuation System (ESFAS), Reactor Trip (RT) and also support functions.
7. As the number of inputs and outputs available in the APUs and ALUs respectively was insufficient to implement the new Class 1 safety features, NNB GenCo proposed an extension to the GDA PS Architecture by including additional APUs and ALUs in each

³ Category A, B and C safety functions are defined in ONR's SAPs: www.onr.org.uk/saps/

- division. This resulted in NNB GenCo adopting the '*GDA Extended architecture*' for the PS.
8. As discussed in the Licence Summary Statement (LSS) (Ref. 2), accommodating any future requirements may require additional APUs (and ALUs) therefore increasing the number of APU/ALU divisional networks. The LSS identifies that the inclusion of the additional Class 1 safety features "*pushed the GDA Extended architecture to the limit in terms of sizing and network loading*". i.e. to accommodate future requirements, any further modification to the GDA architecture could result in network loading issues.
 9. Furthermore, the LSS describes the constraints associated with the functional diversity implemented across the two sub-systems A & B in each division in order to achieve a higher reliability (1E-05 probability of failure on demand (pfd)) to be claimed in non-UK context designs, and explains that these constraints are no longer required. This is justified based on UK guidance (Technical Assessment Guide (TAG) 046) (Ref. 5) defining the accepted limit due to Common Cause Failure (CCF) for a Computer Based System Important to Safety (CBSIS) is no more than 1E-04 pfd.
 10. Consequently, the LSS proposes a modification to the PS architecture to principally:
 - accommodate the new Category A functions identified from GDA;
 - simplify the architecture by removal of the constraints associated with the non-UK design as outlined above;
 - use less hardware and be more flexible to accommodate future requirements minimising the impact on Control & Instrumentation (C&I) sizing.
 11. The LSS notes that the modification to the PS architecture does not change the functional scope and requirements of the PS, and identifies 'Architecture 1b' as the preferred modification to the PS architecture. The proposal involves the removal of sub-systems A & B from each PS division and replacing with three redundant APUs/ALUs in each division.

2.3 LSS Addendum

12. The LSS (Ref. 2) was the primary supporting document when NNB GenCo requested ONR acknowledgment/agreement under Licence Condition (LC) 20 "Modification to design of plant under construction" for the proposed design change in December 2016 (Ref. 6).
13. ONR's assessment of the LSS raised a number of questions which were pursued with NNB GenCo at a series of workshop during 2017/18. As a result of these interactions, NNB GenCo agreed (Ref. 7) that an update to this LSS would be issued to:
 - correct some identified errors in the original LSS and incorporate the additional clarifications and explanations from the exchanges with ONR;
 - update and improve upon the ALARP Section in the original LSS;
 - include the results of additional reliability analyses to cover the comparison between the 4 possible designs (GDA Extended Architecture, Architecture 1a, Architecture 1b and Architecture 2) detailed in the LSS rather than just the chosen design against the previous FA3 design.
14. The resulting LSS addendum (Ref. 3) was submitted in December 2018 to support the renewed LC20 request for ONR's acknowledgment of or agreement to the proposed design change (Ref. 1).

3 ASSESSMENT CARRIED OUT BY ONR IN CONSIDERATION OF THE REQUEST

3.1 Scope

15. ONR has already undertaken a comprehensive assessment of the licensee's Pre-Construction Safety Report, PCSR3 (Ref. 8) as well as 'supplementary' safety submissions that have supported the release of certain construction hold-points (e.g. Ref. 9). Thus ONR's assessment of this design modification is set against its current understanding of the state of evolution of the safety case, and the extant Reference Configuration (RC1.2) design.
16. The proposed modification will only affect certain aspects of the safety case and therefore ONR's assessment has been limited to those technical areas concerned. In this case, the assessment is limited to the control & instrumentation topic area. This is reported in an ONR Assessment Report (AR), as discussed below.

3.2 Control & instrumentation assessment

17. ONR's C&I inspector has carried out an assessment (Ref. 10) of the safety justification for the proposed modifications described in the LSS and the LSS addendum. This assessment focused on the technical and safety justification for the modification, a comparison with Relevant Good Practice (RGP) and consideration of As Low As Reasonably Practicable (ALARP), and also considered NNB GenCo's commitments in relation to implementation of the modification. The assessment is limited to a review of the changes to the PS architecture and the impact upon ONR's current understanding of the safety case for the HPC UK EPR as presented in the Pre-Construction Safety Report (PCSR).
18. The inspector's assessment is based on sampling the LSS and LSS Addendum (as well as NNB GenCo responses to ONR queries, including supporting submissions) against ONR's Safety Assessment Principles (SAPs) and whether the proposed PS modification is demonstrated to be ALARP.
19. Following assessment, the C&I inspector concluded that:
 - the arguments adequately identify the limitations of the extant PS architecture design;
 - the PS Architecture 1b provides improved reliability, in comparison to the PS GDA architecture;
 - the submissions identify realistic and achievable 'design optimisations'. This provides confidence that if required, support functions implemented in a single division for success could achieve the target reliability;
 - although there is a minor decrease in the reliability of a reactor trip and the Engineered Safeguard Features Actuation System function with Architecture 1b as compared to the GDA architecture, the functions still achieve the target reliability;
 - subsequent analysis will need to adequately demonstrate PS Architecture 1b core functions achieve the reliability requirements and that there is a minimal effect on the overall core damage frequency;
 - in meeting function reliability requirements and based on the proposed design optimisations, the inspector was confident there would be a minimal impact on ONR's current understanding of the C&I sizing requirements for the PS;
 - the Independent Technical Assessment (ITA) report on the LSS Addendum revealed no additional points that have not been raised by the C&I inspector;

- the inspector was content that the modification does not affect the divisional arrangements of the PS, and that the provision for testing, maintaining and inspecting a PS channel whilst the reactor is on-load is unaffected. The separation and segregation requirements between PS divisions and systems of lower classification are unaffected;
 - the C&I inspector was content that the LSS Addendum and NNB GenCo responses to previous ONR comments and questions provide adequate quantitative and qualitative arguments that the selection of Architecture 1b is ALARP.
20. Overall, the ONR C&I inspector was satisfied with the direction of progress of the claims, arguments and evidence described within the LSS and LSS Addendum. The inspector noted that the adequacy of future evidence substantiating the PS function reliability, standards compliance for the TXS and PS application, will need to be assessed. The inspector was satisfied that this could be pursued by ONR as part of normal regulatory business.

3.3 NNB GenCo internal assurance and governance

21. NNB GenCo's control of modifications to the design of the HPC EPR uses the arrangements for compliance with LC20 described in the suite of procedures and associated guidance listed in the licensee's Nuclear Site Licence Compliance Matrix (Ref. 11). The arrangements involve activities within both the Responsible Designer (RD) and NNB GenCo.
22. A proposed modification, initiated by a 'fiche de modification' (FDM), is assessed by the RD and NNB GenCo as it is developed. A 'decision du modification' (DDM) is subsequently produced to capture details of the modification. The modification is categorised in accordance with NNB GenCo and RD procedures (Refs. 12 & 13). NNB GenCo's LC20 arrangements require it to review modification proposals raised by the RD and to confirm the nuclear safety categorisation. Modifications of nuclear safety Category 1 or 2 are issued to NNB GenCo for acceptance. NNB GenCo's ITA team assesses all Category 1 modifications. NNB GenCo's modification control process requires that an LSS is produced for all proposed Category 1 and 2 design modifications.
23. The licensee's Safety Design Change Committee (SDCC) assesses the adequacy of the technical information in the LSS and agrees to the categorisation. Once approved by the SDCC (Ref. 14), a Category 1 LSS will be presented to the HPC Nuclear Safety Committee (NSC) for 'Consideration and Advice' before being submitted to ONR for regulatory review. In accordance with its LC20 arrangements NNB GenCo cannot implement a Category 1 modification to the installation's design during the period of construction without ONR's acknowledgement or agreement.

3.3.1 Safety Design Change Committee

24. The LSS for the proposed modification was presented to two meetings of the SDCC: Revision 1 to the 21st January 2016 meeting (Ref. 15) and Revision 3 to the 31st August 2016 meeting (Ref. 16). Following discussion, the January 2016 meeting accepted the LSS, subject to editorial changes as ready for submission to the NSC. The April 2016 NSC expressed concerns about the LSS and recommended changes. A revised version was submitted to the August 2016 SDCC meeting where it was accepted by the committee as ready for presentation at a further NSC meeting.
25. Although there are no changes to the modification described in the LSS and in the LSS addendum, NNB GenCo nevertheless sought the views of the 16th October 2018 SDCC on the acceptability of the LSS addendum (Ref. 17). The committee noted that the LSS addendum had been marked as 'Category 2' on the advice of the Design Authority, even though the design change it described remains at Category 1. The

SDCC expressed concern that marking the LSS and its addendum with different categories could be a source of confusion, but following discussion the committee concluded that the Category 2 marking on the LSS was appropriate. Having discussed this with ONR's design and safety case lead, we are both of the view that the LSS and/or the addendum merely sets out the assessed Category of the proposed design change, and that the documents themselves carry no categorisation. It therefore makes no sense for the addendum to be marked with a different Category to the main LSS. NNB GenCo has been asked to consider this and, if necessary amend its procedures or guidance as appropriate. In reality, the categorisation marked on the LSS addendum has no consequence for the discussion contained therein, so in the context of this PAR the matter is trivial.

26. Leaving this minor detail aside, having reviewed the minutes of the January and August 2016 SDCC meetings, I am satisfied that, as required by the licensee's LC20 arrangements, the LSS describing the proposed modification was subject to suitable consideration at the meetings and that the SDCC's final acceptance statement at the August 2016 meeting was justified by those considerations.

3.3.2 Nuclear Safety Committee

27. Following acceptance by the January 2016 SDCC, Revision 1 of the LSS was submitted to the April 2016 NSC (Ref. 18). At that meeting, the NSC was asked to consider and advise on:
- the acceptability of the decision to pursue the 'Architecture 1b' option for the design of the PS architecture;
 - the adequacy of the Safety Justification supporting the choice of the option;
 - the adequacy of the Future Work Programme and NNB GenCo surveillance during the detailed design phase.
28. The minutes of the meeting indicate a detailed and informed discussion took place, with the committee supporting the proposed design change and forward work programme. Nevertheless, the Committee requested a further submission to address the potential for an increase in the spurious trip rate, and to demonstrate the ALARP position, reflecting on the reliability claims against, and the overall benefits of, the modification in terms of additional inputs/outputs required for support functions, the required reliability and the overall capability to physically locate the equipment within the buildings.
29. Consequently, following its acceptance at the August 2016 SDCC, a revised version of the LSS (Revision 3) was submitted to the November 2016 NSC (Ref. 19) for consideration and advice, with the committee being asked to give advice in relation to the same three points as at the April 2016 meeting. NNB GenCo's presentation to the NSC indicated that the points raised by the committee in the previous meeting had been addressed in the revised version of the LSS. Following a comprehensive discussion, the NSC:
- supported the decision to pursue this modification to the Protection System architecture;
 - recognised the future work programme and NNB GenCo surveillance during the detailed design phase as set out in the LSS was adequate;
 - noted that the revised LSS provided additional clarity on the modification as requested at the April 2016 meeting;
 - nevertheless, noted that some of the system target reliabilities were not currently being fulfilled by the design and therefore there was a risk that the design would not be able to meet the safety claims, and that the holistic ALARP justification was considered to require further development;

- supported the continued development of the modification.

30. Having reviewed the minutes of both NSC meetings, I am satisfied that in line with the licensee's LC20 arrangements, the committee undertook an appropriate examination of the proposed design change, as set out in the LSS.

3.3.3 Independent Technical Assessment

31. NNB GenCo's ITA function undertook reviews of both the original LSS (Ref. 20) and the LSS Addendum (Ref. 21). With regard to the original LSS, ITA judged that on the basis of the arguments in the LSS and responses to ITA comments, the proposal to adopt option 1b for the HPC PS architecture was the ALARP option, and was agreed by ITA without conditions.

32. ITA's review of the addendum (Ref. 21) was very limited as the main safety claims or arguments had not changed from those set out in the original LSS, and the addendum simply provides more detailed and accurate evidence to underpin these. ITA noted that the addendum had helpfully clarified the change from GDA architecture to Architecture 1b.

33. ITA also noted that issuing an addendum LSS meant that there were two LSSs describing the same modification, which was a unique situation for the project and was contrary to ITA advice to update the first LSS *"to ensure a self-contained justification for the modification and to keep configuration control simple"*. This concurs with the ONR observation in Section 3.3.1 above.

3.3.4 Conclusions on NNB GenCo internal assurance & governance

34. I am satisfied that the proposed modification has been satisfactorily subjected to NNB GenCo's rigorous due process, including a number of reviews by the SDCC and the NSC, and engagement and sign-off by NNB GenCo's ITA function.

4 MATTERS ARISING FROM ONR'S WORK

35. As discussed above, the C&I inspector has identified a number of safety case items for follow-up as the details of the modification are developed. These will be monitored by ONR as part of normal regulatory interactions with NNB GenCo as the project progresses.

5 CONCLUSIONS

36. This PAR presents the findings from ONR's considerations of the request by NNB GenCo to implement a modification to the design of the HPC EPR. Section 3.2 above sets out the findings of ONR's assessment of the proposed modification. Section 3.3 above examines the adequacy of NNB GenCo's application of its governance and assurance processes in its consideration and approval of the proposed modification.

37. Having considered the matters discussed above, I am satisfied that:

- NNB GenCo has satisfactorily completed its due process for the proposal;
- the technical assessment undertaken by ONR's Control & Instrumentation specialist supports ONR giving agreement to the proposal.

38. I have prepared the Hinkley Point C Licence Instrument LI516 in accordance with published ONR guidance, which gives ONR's agreement to NNB GenCo implementing the proposed modification described in NNB GenCo's documents:

- Licence Summary Statement – *"PS Architecture Modification"*, HPC- HPC- NNBSL-AU-RPR-LSS-100001 Version 3.0; and

- Licence Summary Statement – “*PS Architecture Modification LSS Addendum*”, HPC-NNBOSL-AU-RPR-LSS-100009 Version 1.0.

6 RECOMMENDATIONS

39. I recommend that the Head of ONR’s EPR sub-Division:

- accepts this PAR to confirm support for the ONR technical and regulatory arguments that justify Hinkley Point C Licence Instrument LI516;
- approves this PAR for publication, after redaction where appropriate; and
- signs Hinkley Point C Licence Instrument LI516.

7 REFERENCES

1. NNB-209-RIO-002144 - Request for Acknowledgement or Agreement under Licence Condition 20(1) of Schedule 2 of Nuclear Site Licence No. 97A – 05 December 2018. CM 2018/395377
2. Licence Summary Statement – “*PS Architecture Modification*” HPC-NNBOSL-AU-RPR-LSS-100001 Revision 3.0, 10 August 2016. CM 2016/387566
3. Licence Summary Statement – “*PS Architecture Modification LSS Addendum*” HPC-NNBOSL-AU-RPR-LSS-100009 Revision 01, 01 November 2018. CM 2019/3786
4. ONR HOW2 Guide - Purpose and Scope of Permissioning - NS-PER-GD-014 Rev 4. July 2014. www.onr.org.uk/operational/assessment/index.htm
5. ONR Technical Assessment Guide “*Computer based safety systems*” NS-TAST-GD-046 Revision 4 February 2017 http://www.onr.org.uk/operational/tech_asst_guides/ns-tast-gd-046.pdf
6. NNB-209-RIO-001439 – Licence Condition 20(1): Request for Acknowledgement or Agreement under LC20(1) - Category 1 Design Change – 13 December 2016. CM 2016/496816
7. Level 4 Technical Convergence Workshop – PS Architecture LSS Update - 18th July 2018, London, NNB-202-PRE-000511 V2.0, CM 2018/237510
8. ONR-NR-AR-17-038 Hinkley Point C (HPC) Pre-Construction Safety Report 3 (PCSR3), PCSR3 – Summary Assessment Report, Revision 0, February 2018, CM 2017/356172
9. ONR, Design and Safety Case Cornerstone Report to Inform Consent to Commence Hinkley Point C Unit 1 Nuclear Island Concrete, ONR-NR-AR-18-029, Revision 0, November 2018, CM 2018/252545
10. ONR-NR-AR-18-036 Revision 0 Control and Instrumentation Assessment of Protection System Architecture Modification CM 2018/396080
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12. NNB GenCo Company Procedure NNB-202-PRO-000033 Version 4.0. Manage Design Modification. CM 2018/27420
13. Responsible Designer Instruction: INS-UKEPR-313 UK EPR Management of Design Changes UKX-ECUKXX-XX-000-INS-000808 CM 2018/27305
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15. HPC-HPC-NNBGEN-XX-000-MOM-100014 Minutes of the 21st January 2016 Safety Design Change Committee CM 2016/496819
16. HPC-HPC-NNBGEN-XX-000-MOM-100039 Minutes of the 31st August 2016 Safety Design Change Committee CM 2016/496820
17. HPC-HPC-NNBOSL-XX-000-MOM-100155 Minutes of the 16th October 2018 Safety Design Change Committee CM 2019/3784
18. NNB-102-MOM-000506 Nuclear Safety Committee Minutes 7th April 2016. CM 2016/167572
19. NNB-102-MOM-000550 Nuclear Safety Committee Minutes 2nd November 2016. CM 2017/58388
20. NNB-103-REP-000118 Independent Technical Assessment of PS Architecture Category 1 LSS January 2016 CM 2016/499728

21. NNB-103-FRM-000043 Independent Technical Assessment of PS Architecture
Category 1 LSS Addendum October 2018 CM 2018/395973