HEALTH AND SAFETY EXECUTIVE - NUCLEAR DIRECTORATE

HM NUCLEAR INSTALLATIONS INSPECTORATE

HINKLEY POINT B AND HUNTERSTON B PERIODIC SAFETY REVIEW

PROJECT OVERVIEW REPORT OF NII FINDINGS AND DECISION ON CONTINUED OPERATION

Summary

1 The Health and Safety Executive's (HSE) Nuclear Installations Inspectorate (NII) has completed its independent assessment of the second Periodic Safety Reviews (PSR) for the nuclear power stations at Hinkley Point B and Hunterston B. The main conclusion is that the PSR, as submitted, has a number of significant shortfalls. Nevertheless, the issues arising are not immediate concerns for nuclear safety and it is appropriate that operation should be allowed to continue whilst a remedial programme of work is progressed for each station.

2 The conclusions from NII's assessment have been described and communicated to British Energy Generation Ltd. (BE), the licensee, via a Decision Letter to each of the relevant Station Directors.

3 This Project Overview Report gives some background to the regulatory decision. It explains the list of NII findings requiring substantive work from the licensee and puts it into context with other ongoing work at the two stations.

Background

4 Continuous day to day monitoring and inspection are important aspects for ensuring safe operation of nuclear installations. However international best practice recognises an additional review is also necessary that periodically considers the safety of the whole installation against modern safety standards and requirements. Within the UK, PSRs conducted by the nuclear site licensees meet this requirement and the periodicity is normally ten years.

5 The PSR aims to:

i) confirm that the plant is adequately safe for continued operation;

ii) identify and evaluate any factors which might limit the safe operation of the plant in the foreseeable future; and

iii) assess the plants' safety standards and practices and introduce any improvements which are reasonably practicable.

6 The first two aims are fulfilled by a re-examination of the safety case for the plant to confirm that it is still valid and will remain so up to the next review. As part of this examination, any life limiting features are identified and their safe remaining lives are conservatively predicted (particularly where they may ultimately dictate the safe working life of the station).

7 The third aim is achieved by a comparison with current standards and re-analysis using up to date methodologies where appropriate.

8 NII's task is to ensure that the licensee carries out a comprehensive PSR and that the appropriate corrective actions and/or safety improvements are implemented within a reasonably practicable timescale. Although NII may conclude that the PSR provides an adequate basis for managing nuclear safety for a further ten years, continued operation will depend upon satisfactory results from further in-service and periodic inspections over that period.

9 Thus PSRs provide confidence in, but are not the sole means of ensuring, continued safe operation. Should any safety-related factors emerge subsequently that may raise questions on the continuing validity of the safety case, NII would require the licensee to resolve the issue. If the NII is not satisfied with the licensee's response, it has extensive powers under the licence to require any necessary changes, and can direct that the plant be shut down until it is satisfied that it can be operated safely. This process gives confidence that relevant safety issues will be identified and resolved as plants age.

10 The requirement on the licensee to conduct periodic reviews is derived from Licence Condition 15 (LC 15), which is attached to all nuclear site licences. The licensee's arrangements for complying with LC 15 include processes for undertaking both major (10 year) and minor (periodic maintenance outage) periodic reviews, and the checking and approvals processes to be used prior to issue to NII. BE's arrangements include a forward programme of PSR submissions. Under these arrangements, both Hinkley Point B and Hunterston B were due to submit a PSR at the end of 2005 for NII assessment against a planned Decision Date of January 2007.

BE's submission of PSRs for Hinkley Point B and Hunterston B

11 BE submitted the PSRs at the end of March 2006, three months later than originally planned. They are extensive documents. In each case 40 review documents were provided (although one of these covering hazards, actually also included a further 18 lower tier documents). A list of reports is provided as Table 1.

12 The PSR documentation is hierarchical. There are four "top tier" summary documents. These are:

- Chapter 1 - Adequacy of Nuclear Safety Case Statement
- Chapter 2 - Operations and Safety Performance
- Chapter 3 - Systems, Structures and Components
- Chapter 4 - Safety Analysis

Chapter 1 has no specific supporting references because it is an overview document which provides a summary of the adequacy of the nuclear safety case. In effect, all the rest of the main review reports are supporting reports to Chapter 1. The remaining submissions support the top tier documents, so that there are four supporting reports to Chapter 2, covering different aspects of operations and safety performance, twenty-four supporting references to Chapter 3 giving information on Systems, Structures and Components, their engineering justification, operational performance and condition, and eight supporting reports to Chapter 4 describing different aspects of safety analysis, including fault studies, radiological consequences, hazards, worker risks and the probabilistic risk assessment.

13 Providing a report of the size and scope delivered was a considerable undertaking. BE reported to their nuclear safety committee that the project had taken in excess of four years (commencement to submission of main review reports), and that the resource in preparing the review had been in excess of 50 man years. This amount of effort is broadly in keeping with international expectations for periodic reviews.

14 The outcomes from the BE review included a number of shortfalls and improvement points. These were summarised in Chapter 1 of the PSRs for each station. The work elements to rectify the shortfalls or implement the improvement points are called PSR Identified Corrective Actions (PICAs) by the licensee. These were classified as follows:

- Type A: A nuclear safety shortfall which requires further work.
- Type B: A minor nuclear safety shortfall/potential safety enhancement which requires further work.
- Type C: A shortfall previously identified and progressing under an existing work programme.

15 At each station several hundred PICAs were identified, and the majority were sentenced as "low safety significance". Each station however identified a substantial programme of PICAs which were sentenced by BE as having safety significance (i.e. Type A/Type B PICAs)

a. At Hinkley Point B, the PSR implementation programme included 100 Type A/Type B PICAs of "medium/high safety significance".

b. At Hunterston B the PSR implementation programme included 144 Type A/Type B PICAs of "medium/high safety significance".

16 For both stations BE concluded that:

The outcome of this second PSR differs markedly from PSR1 in terms of the nature of the shortfalls identified. PSR1 identified a significant number of issues that resulted in major programmes of plant modifications. This has not been the case for PSR2 where the majority of shortfalls are not related to plant modifications. As well as this the safety significance of the shortfalls identified has been much lower…
… The conclusions that follow are conditional on the resolution of the shortfalls identified:

• Two Type 'A's have been identified relating to a requirement to amend the gas baffle safety case and associated Technical Specification and work is in hand to resolve these. Justifications for Continued Operation have shown that the safety positions are secure.

• Overall the findings of PSR have confirmed that the stations adequately meet current safety standards and only a small proportion of the shortfalls relate to standards issues.

• A review of Ageing has been conducted and a number of Type B shortfalls have been identified. The review has also revealed that whilst key elements of an ageing management process exist there is a need for a drawing together of this process across the company into an overall ageing management programme. Furthermore there is the ongoing need to update integrity assessments at the appropriate time to maintain the safety case to 2016. These assessments will be managed via the above ageing management processes.

• PSR2 recognises that operation of the graphite core is the major issue to be managed over the PSR2 period and that this will be achieved via interim reviews.

• The overall safety case has been reviewed against the Nuclear Safety Principles and the risks shown to be ALARP.

Overall, the findings of the PSR have confirmed that the stations adequately meet current safety standards. A review of the safety case and safety management systems has been conducted and it is concluded that, subject to resolution of the shortfalls and the continuing programme of test and inspection that underpins the normal regulatory control of the station, adequate systems and processes are in place to maintain the case for safe operation for for the next Periodic Safety Review period to December 2016. This review has identified a number of safety significant shortfalls which will be resolved to maintain the safety case.

17 BE's arrangements require that they make progress on implementing their findings whilst NII are assessing the periodic review. The expectation within their arrangements is that all safety significant PICAs should normally be programmed to be completed by the NII Decision Date. Exceptions to this are allowed for long-lead items, and of items requiring implementation at a reactor shutdown, etc., when a safety justification must be produced for any delays past the Decision Date. BE made insufficient resource and funding available to complete this implementation programme on schedule, but at both stations the majority of PICAs of high/medium safety significance were completed prior to the NII Decision Date.

18 BE have maintained a Project Team to manage and monitor the PICA implementation phase. There are team members both at station and at BE's corporate HQ, since PSR activities have taken place at both locations. This team has provided support at station during NII station visits on PSR-related issues. Station visits have shown that both Hinkley Point B and Hunterston B stations have taken "ownership" of their own periodic reviews and of the resulting work programme.

NII assessment of Hinkley Point B and Hunterston B PSRs

19 NII nuclear inspectors carried out a detailed assessment of the submissions. Up to sixteen inspectors were used, each covering their area of expertise. Assessment reports or notes were produced covering Graphite, Health Physics/Radiological protection, Internals Hazards, Fault Studies/Fuel Fault Studies, Chemistry, Radioactive Waste Management, Civil Engineering, Externals Hazards, Mechanical Engineering or key systems, structures and components, Oxidation, Structural Integrity of systems, structures and components, Control and Instrumentation, Electrical, Safety Management, Probabilistic Safety Analysis (PSA), and Emergency Planning. In the area of PSA NII's expertise was supplemented by an external consultant under contract.

20 Many of the inspectors visited the stations to inspect plant and better understand the PSR submissions and programme of work. In order to progress their findings, inspectors also requested identified references from the main review submissions. In response, BE provided many of these second tier reports, and the volume of material provided dwarfed even the PSR submission itself.

21 During the assessment NII decided to delay the decision on the Periodic Safety Reviews (HPB/HNB PSR2) by three months, from 31st January 2007 to 30th April 2007. NII's decision was made because of a number of factors. These include constrained resources within NII and the effect of high priority emergent issues. The delay was approximately equal to BE's delay in submitting the Main Review.

22 Although NII delayed the decision date, the licensee was informed that this delay should not be allowed to impact on their programmes for safety improvements. They were asked to retain the agreed milestone dates related to BE's completion of corrective actions.

23 In assessing the PSR, the nuclear inspectors followed NII guidance. This included NII's Technical Assessment Guide "Periodic Safety Reviews (PSRs)" (T/AST/050, available on NII's website). They also used other NII technical guidance, as appropriate and in particular NII's Safety Assessment Principles (SAPs) as the basic standard against which to judge the acceptability of the safety review (also available via NII's website).

24 NII's SAPs include some key messages on the Regulatory Background; the principles of So Far as Is Reasonably Practicable (SFAIRP), As Low As Reasonably Practicable (ALARP) and As Low As Reasonably Achievable (ALARA), Proportionality and the relevance to facilities built to earlier standards. In the case of the latter, NII recognises that:

…The extent to which the principles have been satisfied must also take into account the age of the facility or plant. For facilities that were designed and constructed to standards that are different from current standards the issue of whether sufficient measures are available to satisfy ALARP considerations will be judged case by case.

Summary of findings from NII specialist assessment

25 Although the PSR2 submissions provided good information on the operating experience of the plant and its reliability, there were some areas where the inspectors were not convinced that BE's review had been carried out to the required depth.

26 NII inspectors in most cases tried to resolve these differences with BE. Some initial findings were indeed agreed to be misunderstandings or miscommunications, and these were closed out after exchange of information. Other NII findings had already been identified by BE and were already on the programme of work (PICA programme). However there remained a significant number of areas which in NII's view required additional work by BE.

27 At the end of the assessment phase of the PSR, NII drew up an Action Plan. This constituted those findings for which resolution could only be achieved by BE undertaking a programme of work. Action Plans for the two stations are appended to this Project Overview Report, along with a commentary on why NII have raised the issue for resolution.

28 Key items on the Action Plan were identified to BE within the Decision Letter(s): these are listed below:

- Review Control and instrumentation (C&I) against modern standards, especially for the fuel route (HPB.AP.23/HNB.AP.25)

- BE has not provided adequate ALARP summaries for the current situation, as required by NII's guidance for periodic review (HPB.AP.1/ HNB.AP.2).).

- NII inspectors identified a modelling problem with a specific fire scenario (details withheld). In this case, although BE and NII believe it is of low frequency, BE have agreed to investigate the scenario with due urgency (HPB.AP.30/HNB.AP.32).

- BE's hazard identification has not adequately considered interactions between services within service trenches.(HPB.AP.10/HNB.AP.10)

- BE have not carried out a Fire PSA to modern standards for any of the older AGR power stations (HPB.AP.29). NII have agreed for BE to carry out such a Fire PSA for Hinkley Point as a pilot across the fleet. The position for Hunterston will be reviewed at a later stage of this pilot study.

29 The relative significance of the Action Plan to other parts of BE's PSR-related work programme is discussed later.

Summary of NII project-level considerations

30 As well as the specific findings by NII's nuclear inspectors, there were a number of project-level considerations that fed into the regulatory decision. Some of these were derived from taking an overview across the specialist comments. Other considerations came by examining BE's PICA programme, their own findings and the progress during the year, others from relating PSR to other current programmes of work.

31 It became apparent that many assessment comments arose from mismatches between NII expectations and the PSR as submitted. NII had made its Safety Assessment Principles and supporting Technical Guidance available, and in addition had commented on a scope document produced by BE at the commencement of the Hinkley Point B and Hunterston B PSR2 project. Notwithstanding all of this, certain themes run across the findings from more than one inspector. These include:

- NII expected the PSR to be a more effective strategic look-forward in areas of plant ageing and future integrity cases. This comment particularly applies to integrity cases for steel structures. This is not a direct safety issue, since extant integrity and safety cases extend to the current commercial end-date of 2011 for the reactors and the periodic review does provide confidence that integrity can be accurately predicted beyond this date. BE's intention is to provide integrity and safety cases before they expire, which is re-iterated within the work programme.

- Related to the above, the PSR reviews of plant obsolescence have not been integrated into the periodic review. There are two sides to this; there may be future threats to the safety case from plant obsolescence, but also there are the opportunities for ALARP improvements to be introduced when plant is re-engineered as part of planned replacement.

32 During the NII examination of the PICA programme and other current programmes of work other themes emerged:

- The integration between the periodic review and other programmes of work was less than NII expected. As an example the PSR did not fully account for some major work programmes currently ongoing. Some of these were identified within the PSR (Type C PICAs) as significant issues, to whose resolution BE were already committed, however not all these work programmes were completed to PSR programme dates. This means that the PSRs have not, in all instances, incorporated these improvements within their ALARP cases.

- NII also has concerns over the progress that British Energy (BE) has made so far in closing out their PICA work programme. For Hinkley Point B at the Decision Date 18 (out of 100) PICAs of high/medium safety significance remain to be completed. On the same basis Hunterston still have to complete 50 (out of 144) PICAs of high/medium safety significance. BE's own arrangements would normally expect almost all of these PICAs to be completed. NII's expectation within their Technical Guidance is also for a higher "success ratio" in closing out work programmes by this stage in a periodic review. NII would also expect a significant proportion of the PICAs of low safety significance to be closed out.

33 At a project level it was also possible to identify positive aspects of BE's periodic review projects for Hinkley Point B and Hunterston B, including:

- Many of the main review submissions give good information on the operating experience of the plant and its reliability.

- BE's review process using their in house Safety and Regulation Division had identified a number of issues with the PSR main reviews prior to submission to NII. These include many of the issues that otherwise would be NII findings. This shows evidence of effective in-house checks and balances.

- BE's central PSR project team had identified many issues for improvement with the PSR prior to submission to NII. This shows evidence of awareness of expected quality standards from the central team responsible for overall PSR quality.

34 At a project level, it was also possible to discern positive experiences from interactions with station staff:

- Both stations were visited by a number of inspectors during the project. NII staff were given good support from staff at both stations (including from the station PSR team) to allow them to carry out their assessment.

- Stations have shown good awareness of the PSR issues and ownership of their periodic review, both at inspection visits to station and also in participation in progress meetings and project meetings with NII.

Consolidated work programme

35 NII is aware that the majority of the findings from inspectors are "review issues" relating to the completeness of the periodic safety review against NII expectations. It is not clear until these review aspects have been completed whether safety improvements to plant or to operation practices are justified. This is not to downplay the importance of the findings, but to explain that these issues differ from "safety shortfalls", where the benefits of change are immediately clear. NII are very keen that these issues are worked through to completion, but the failure to complete them by the time of submission of the PSR is not viewed as an immediate concern for nuclear safety, and thus it can be acceptable for station operation to continue whilst these reviews are carried out.

36 NII is also aware that insisting on priority being given to some issues can affect delivery of other issues, and that this may be detrimental overall to safety. NII therefore has chosen to challenge BE to develop for work programmes for each station in which NII's Action Plans are addressed in a timely manner, but without adversely affecting the delivery of other safety improvements.

37 The resulting "consolidated work programmes" therefore reflects BE's views on practicable work programmes to address both their own shortfalls and improvements and also the findings within NII's Action Plans. NII have accepted BE's assurance that these programmes can be carried out without adverse effects on other safety-related work. In addition, BE have committed to provide funding and resource such that the work programmes can be delivered.

38 NII's Decision on the Hinkley Point B and Hunterston B PSRs is based upon acceptance of these consolidated work programmes but also on holding BE to the delivery of these commitments. BE was therefore asked to develop a process by which they would monitor the progress on the consolidated work programme and report this to NII. BE has proposed such a process. NII judges that this process is capable of generating the information that NII requires.

39 On the basis of all the issues summarised in this Project Overview Report, NII has decided that the shortfalls do not warrant formal enforcement action at present, but that BE's performance in discharging the work programme will be closely monitored, and any slippage will be reviewed against options for further enforcement actions.

Conclusions – the Decision as expressed to the licensee

40 The bases for NII's decision, as outlined in the Decision Letters, were as follows:

- NII clearly said that the current submissions were viewed as having a number of significant shortfalls both in the quality and the scope of information that is required by the UK regulatory system.
- Despite this, NII concluded that the issues arising from its PSR assessment are not immediate concerns for nuclear safety and that it is appropriate that normal station operation should continue whilst a remedial programme of work is progressed for each station.
- An Action Plan has been sent to each station covering the major NII findings.
- BE have responded with a comprehensive programme of work which covers the items on the Action Plan and also work to complete BE's own shortfalls and improvements as identified in the PSR.
- BE have developed a process by which NII can monitor progress on the PSR work programmes during the next few years.
- NII's view is that the current periodic review will not be complete and adequate until the end of this work programme.
- NII's decision is to accept the work programme as a baseline against which progress will be monitored. Any significant slippage on any aspect of the work will be reviewed against options for future enforcement action.

Table 1: Reports making up the PSR2 submissions for Hinkley Point B and Hunterston B Power Stations

The titles of the reports are given in the following tables.
Some were joint submissions, i.e. identical reports for Hinkley B and Hunterston B

ID	Title
Chapter 1	Chapter 1 - Adequacy of Nuclear Safety Case Statement
Chapter 2	Chapter 2 - Operations and Safety Performance
Chapter 3	Chapter 3 - Systems, Structures and Components
Chapter 4	Chapter 4 - Safety Analysis
R2.01	R2.01 - Review of Operations
R2.02	R2.02 - Safety Management Systems
R2.03	R2.03 - Radiological Protection and Monitoring
R2.04	R2.04 - Emergency Planning Arrangements
R3.01	R3.01 - Fuel Handling
R3.02	R3.02 - Core Systems
R3.03	R3.03 - Control Rod Assemblies
R3.04	R3.04 - Secondary Shutdown System
R3.05	R3.05 - Gas Baffle
R3.06	R3.06 - Core Support
R3.07	R3.07 - Core Restraint
R3.08	R3.08 - Guide Tubes
R3.09	R3.09 - Boilers
R3.10	R3.10 - Gas Circulators
R3.11	R3.11 - Prestressed Concrete Pressure Vessels
R3.12	R3.12 - PCPV Liner and Penetrations
R3.13	R3.13 - Pressure Vessel Thermal Shield
R3.14	R3.14 - Primary Coolant System
R3.15	R3.15 - Secondary Coolant System
R3.16	R3.16 - Main Cooling Water and Auxiliary Systems
R3.17	R3.17 - Reactor Safety Circuits
R3.18	R3.18 - Control and Instrumentation Equipment
R3.19	R3.19 - Radioactive Waste Handling
R3.20	R3.20 - Steam Pipework
R3.21	R3.21 - Electrical Supplies
R3.22	R3.22 - Heating and Ventilation Systems
R3.23	R3.23 - Reactor Shutdown Sequence Equipment (RSSE)
R3.24	R3.24 - Civil Works

Table 1: (continued)
Reports making up the PSR2 submissions

ID	Title
R4.01	R4.01 - Fault Based Assessment
R4.02	R4.02 - Transient Analysis
R4.03	R4.03 - Radiological Consequences
R4.04	R4.04 - Shutdown Safety Case
R4.05	R4.05 - Internal and External Hazards
R4.05 Appendix 1	R4.05 - Internal and External Hazards, Appendix 1 - Fire
R4.05 Appendix 2	R4.05 - Internal and External Hazards, Appendix 2 - Steam Release
R4.05 Appendix 3	R4.05 - Internal and External Hazards, Appendix 3 - Hot Gas Release
R4.05 Appendix 4	R4.05 - Internal and External Hazards, Appendix 4 - Cold Gas Release
R4.05 Appendix 5	R4.05 - Internal and External Hazards, Appendix 5 - Missile Impact
R4.05 Appendix 6	R4.05 - Internal and External Hazards, Appendix 6 - Dropped Loads and Lifting Equipment
R4.05 Appendix 7	R4.05 - Internal and External Hazards, Appendix 7 - Internal Flooding and Corrosive Fluid Release
R4.05 Appendix 8	R4.05 - Internal and External Hazards, Appendix 8 - Internal Toxic Gas Cloud
R4.05 Appendix 9	R4.05 - Internal and External Hazards, Appendix 9 - Vehicular Impact
R4.05 Appendix 10	R4.05 - Internal and External Hazards, Appendix 10 - Seismic
R4.05 Appendix 11	R4.05 - Internal and External Hazards, Appendix 11 - Wind Loading
R4.05 Appendix 12	R4.05 - Internal and External Hazards, Appendix 12 - External Flooding
R4.05 Appendix 13	R4.05 - Internal and External Hazards, Appendix 13 - Aircraft Impact Hazard
R4.05 Appendix 14	R4.05 - Internal and External Hazards, Appendix 14 - Industrial Hazards
R4.05 Appendix 15	R4.05 - Internal and External Hazards, Appendix 15 - Extreme Ambient Temperatures
R4.05 Appendix 16	R4.05 - Internal and External Hazards, Appendix 16 - Electro-Magnetic Interference (EMI)
R4.05 Appendix 17	R4.05 - Internal and External Hazards, Appendix 17 - Lightning Appendix
R4.05 Appendix 18	R4.05 - Internal and External Hazards, Appendix 18 - Drought and Biological Fouling
R4.06	R4.06 - Probabilistic Safety Analysis
R4.07	R4.07 – SBERGs [*Symptom Based Emergency Response Guidelines*]
R4.08	R4.08 - Worker Risk from Faults

Table 2: Hinkley Point B Action Plan

(Arising from NII Findings)

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HPB.AP.1	Provide revised ALARP statements.	HSE and NII have published recent guidance on reducing risks and demonstrating that risks have been reduced As Low As Reasonably Practicable. It was expected that the PSR would have included a statement that this is the case for the stations, and also a discussion of how ALARP has been applied in decisions on PSR corrective actions. There is limited discussion within Chapter 1 of the PSR Main Review, mainly restricted to a discussion of the quantitative risk results and the deterministic criteria of the Licensee's NSPs (Nuclear Safety Principles). This top-level statement falls short of the scope of ALARP as discussed in the published HSE and NSD guidance, as well as being poor in terms of the global assessment described in the IAEA standard.
HPB.AP.2	Conduct a review against NS-G-1.2	IAEA Safety Standards series No.NS-G-1.2 "Safety Assessment and Verification for Nuclear Power Plants Safety Guide" provides recommendations to the designers of nuclear power plants for a comprehensive safety assessment in the initial design process and for modifications to the design, as well as recommendations to operating organizations for independent verification of the safety assessment for new nuclear power plants. It is the view of the NII assessor that, although BE have carried out a review of their fault studies, they would benefit from also considering the requirements of this international standard.
HPB.AP.3	Review the fuel route safety case transient analysis and radiological assessment tools with a view to confirming their current applicability.	Specialist analysis tools are used for fuel route safety case fault studies. It is the view of the NII assessor that BE should have confirmed the current applicability of these tools within the PSR.
HPB.AP.4	Review the technical basis of the Severe Accident Guidelines (SAGs) and check the continuing availability of the relevant information and training at the stations.	In the 1990s, the licensee developed SAGs for the AGRs. These gave technical data and possible remedial actions for unforeseen circumstances, and addressed degraded core states and possible actions to mitigate off-site releases. NII's assessor was of the view that the PSR2 should have reviewed the basis of the SAGs.

Table 2 (continued): Hinkley Point B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HPB.AP.5	Radwaste Safety case to be revised.	BE have been reviewing and revising their radwaste safety case over a period of years. A revised version has been under discussion for some time. This Action Plan item is raised to ensure it gets prioritised.
HPB.AP.6	Undertake "Confirmatory calculations of the integrity of the tanks in the active effluent treatment plant".	The condition and future integrity for the AETP tanks should be checked.
HPB.AP.7	Revisit the effects on changes in civil standards once these have been evaluated as part of the next phase of PSR2 submissions	Civil Engineering standards have recently been changed. BE are including a review of these changes for PSRs currently being written (later AGR stations). The effects will then be reviewed against Hinkley Point B civil assessments
HPB.AP.8	BE to review the seismic capability of the CW pumphouse basement.	Self explanatory – the assessor thought the PSR required to be supplemented in this area.
HPB.AP.8	Provide a more robust demonstration that complete collapse of CW intake tunnels is not credible	Self explanatory – the assessor thought the PSR required to be supplemented in this area.
HPB.AP.10	Review potential interactions of services in trenches.	The assessor thought that the PSR should have extended the hazard identification process to consider interaction between services in trenches.
HPB.AP.11	Review/reinforce the management systems for the site drainage outfalls.	Site drainage outfall can block with tidal actions bringing debris into outfalls. This is not a major safety issue, but suitable for review.
HPB.AP.12	Review access control points and emergency control centres during or after external events, and operators' actions following the events, to provide confirmation that access routes / equipment are viable.	The assessor thought that the information on hazard withstand capability and emergency arrangements should be reviewed side-by-side to confirm compatibility.
HPB.AP.13	Review methodology for deriving the 10^{-4} hazard and provide evidence that it is to be conservative by Modern standards	Note: should read "the 10^{-4} seismic hazards" Technical detail: the definition of the 10^{-4} earthquake was taken over from PSR1, and should have been confirmed as conservative against modern standards seismic assessment methods.
HPB.AP.14	BE to extend their review of the seismic analysis and appraisal of the main building structures.	Technical detail: the assessor wishes additional analysis and review in this area.

Table 2 (continued): Hinkley Point B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HPB.AP.15	BE to review the coverage of ageing (both structures and plant) within PSR walkdowns.	Walk downs are carried out for both structural condition appraisal and to confirm hazard identification. The assessor wished some improvement to walkdown practices, and a view on the applicability of SQUG (Seismic Qualification Utility Group) walkdown methodology to ageing plant.
HPB.AP.16	Revise the analysis of the hazard posed to the sites from extreme flooding to account for changes due to revised models of climate change.	Technical detail: the assessor wishes additional analysis and review in this area with revised models of external flooding to modern standards.
HPB.AP.17	BE to update aircrash risk modelling.	Technical detail: aircraft risk modelling was taken over from PSR1, and should have been confirmed as conservative against modern standards.
HPB.AP.18	BE to confirm that adequate corrosion allowances are present in the component life assessments.	Self explanatory - the assessor thought the PSR required to be supplemented in this area.
HPB.AP.19	Demonstrate that the seismic structural integrity cases for the steel reactor internal components remain secure for operation to 2016.	BE already have plans for carrying out additional integrity/safety cases, but assessor wished these formally identified from PSR and progressed to early completion.
HPB.AP.20	Provide substantiation to their assertions on the effects of GCRO (Gas Circulator Run-On) and loss of PVCW (Pressure Vessel Cooling Water) faults on the core restraint system, and also clarify whether and how the other outstanding issues in Section 6 of R3.07: Core Restraint have been addressed.	Technical detail: the assessor wishes additional analysis and review in this area.
HPB.AP.21	Provide the timescales for issuing the irradiation dose recommendations for reactor internal structural components and for reviewing the implications.	The assessor wished to see this work programme formally identified from PSR and progressed to early completion.
HPB.AP.22	Complete the analysis of the effects of charge machine chilling during pressurisation & demonstrate that the charge machine IOF pressure boundary components are capable of withstanding the operational load conditions.	Technical detail: the assessor wishes additional analysis and review in this area.
HPB.AP.23	Complete an adequate review of C&I against modern standards.	The PSR did not carry out a comprehensive review of C&I. against modern standards.

Table 2 (continued): Hinkley Point B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HPB.AP.24	Develop an adequate EMI/RFI safety case.	The station currently controls EMI/RF (Electromagnetic Interference/Radio Frequency) by the exclusion of potentially interfering equipment from the site. The assessor was of the view that a more comprehensive safety case would be beneficial.
HPB.AP.25	Carry out an independent audit of documentary evidence of C&I plant walkdowns, against the requirements of the licensee's formal guidance (internal guidance memo). If no documentary evidence exists, plant walkdowns should be carried out in compliance with licensee's formal guidance.	The assessor wishes additional analysis and review in this area, since walk downs are one of the means by which BE confirm the state of plant and the adequacy of hazard identification.
HPB.AP.26	Develop a C&I ageing management strategy for addressing ageing and obsolescence (equipment/ expertise).	The assessor wishes a comprehensive management strategy. Being proactive rather than reactive brings many benefits. BE are proactive to an extent, but a review may show further improvements.
HPB.AP.27	Carry out a review of hazard and interlocks schedule, establish safety function of fuel handling equipment, and company, national and international standards applicable. It should then carry out a comparison against the modern standards, including RSCM, identify any shortfalls and put in place a programme to address the shortfalls.	The assessor expected a thorough review of fuel route C&I, and the PSR did not deliver this. NII requires a work programme to address this.
HPB.AP.28	Provide a work programme for developing the PSA of internal faults in line with NII expectations.	Technical details: the assessor had some detailed concerns and queries over the PSR as submitted, and BE is to provide a work programme to address this.
HPB.AP.29	Provide a programme to develop fire PSA consistent with modern standards for HPB as lead station.	BE have not carried out a Fire PSA to modern standards for any of the older AGR power stations. NII view it is likely that such a PSA may identify system weaknesses that could provide valuable insights, either in terms of required plant enhancements, improved maintenance or management of plant, or similar. BE has agreed to carry out such a Fire PSA for Hinkley Point as a pilot across the fleet to demonstrate the benefits and insights from a modern standards Fire PSA. The position for Hunterston will be reviewed when this pilot study delivers results.

Table 2 (continued): Hinkley Point B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HPB.AP.30	Provide a programme to address the shortcomings of the Seismic Safety Case, including analysis that the Seismic Risk is ALARP.	Technical details: the assessors thought that the PSR as submitted should be extended in its coverage of seismic faults. BE is to provide a work programme to address this.
HPB.AP.31	Develop a shutdown PSA (consistent with modern standards) for HPB as lead station.	Technical details: the assessor thought that the PSR as submitted should be extended in its coverage of faults in a shutdown reactor. BE is to provide a work programme to address this.
HPB.AP.32	Address the modelling shortcomings of a specific Fire Scenario (details withheld).	Technical details: NII identified fire modelling concerns for a particular, low frequency, fire scenario. BE is already investigating this further.
HPB.AP.33	BE should review and reissue the chemistry Company Specifications as required by its arrangements.	BE have a number of chemistry Company Standards. Their arrangements call for regular review, but some have not been recently updated.

Table 3: Hunterston B Action Plan

(Arising from NII Findings)

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HNB.AP.1	Further investigation of the potential frequency and consequences of missiles generated from hydrogen bottle storage at HNB.	The internal missile case was largely carried forward from PSR1. Some sources of missiles were assumed bounded by the missiles from turbine disintegration. NII's assessor was of the view that this could be developed further for some areas of plant.
HNB.AP.2	Provide revised ALARP statements.	HSE and NII have published recent guidance on reducing risks and demonstrating that risks have been reduced As Low As Reasonably Practicable. It was expected that the PSR would have included a statement that this is the case for the stations, and also a discussion of how ALARP has been applied in decisions on PSR corrective actions. There is limited discussion within Chapter 1 of the PSR Main Review, mainly restricted to a discussion of the quantitative risk results and the deterministic criteria of the Licensee's NSPs (Nuclear Safety Principles). This top-level statement falls short of the scope of ALARP as discussed in the published HSE and NSD guidance, as well as being poor in terms of the global assessment described in the IAEA standard.
HNB.AP.3	Conduct a review against NS-G-1.2	IAEA Safety Standards series No.NS-G-1.2 "Safety Assessment and Verification for Nuclear Power Plants Safety Guide" provides recommendations to the designers of nuclear power plants for a comprehensive safety assessment in the initial design process and for modifications to the design, as well as recommendations to operating organizations for independent verification of the safety assessment for new nuclear power plants. It is the view of the NII assessor that, although BE have carried out a review of their fault studies, they would benefit from also considering the requirements of this international standard.
HNB.AP.4	Review the fuel route safety case transient analysis and radiological assessment tools with a view to confirming their current applicability.	Specialist analysis tools are used for fuel route safety case fault studies. It is the view of the NII assessor that BE should have confirmed the current applicability of these tools within the PSR.

Table 3 (continued): Hunterston B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HNB.AP.5	Review the technical basis of the SAGs and check the continuing availability of the relevant information and training at the stations.	In the 1990s, the licensee developed severe accident guidelines (SAGs) for the AGRs. These gave technical data and possible remedial actions for unforeseen circumstances, and addressed degraded core states and possible actions to mitigate off-site releases. NII's assessor was of the view that the PSR2 should have reviewed the basis of the SAGs.
HNB.AP.6	Revised Radwaste Safety case to be issued.	BE have been reviewing and revising their radwaste safety case over a period of years. A revised version has been under discussion for some time. This Action Plan item is raised to ensure it gets prioritised.
HNB.AP.7	Uundertake "Confirmatory calculations of the integrity of the tanks in the active effluent treatment plant" .	The condition and future integrity for the AETP tanks should be checked.
HNB.AP.8	Revisit the effects on changes in civil standards once these have been evaluated as part of the next phase of PSR2 submissions	Civil Engineering standards have recently been changed. BE are including a review of these changes for PSRs currently being written (later AGR stations). The effects will then be reviewed against Hunterston B civil assessments
HNB.AP.9	Provide a more robust demonstration that complete collapse of CW intake tunnels is not credible	Self explanatory – the assessor thought the PSR required to be supplemented in this area.
HNB.AP.10	Review potential interactions of services in trenches.	NII assessor thought that the PSR should have extended the hazard identification process to consider interaction between services in trenches.
HNB.AP.11	Provide a clear demonstration of the safety case against dropped loads for the cooling ponds.	Self explanatory – NII assessor thought the PSR required to be supplemented in this area.
HNB.AP.12	Production of a consolidated Hazards safety case for HNB	The presentation of hazards within the Hinkley Point B PSR was improved by having a consolidated hazards safety case. This was not the case for Hunterston B and the NII assessor thought the PSR should be supplemented in this area.
HNB.AP.13	Review access control points and emergency control centres during or after external events, and operators' actions following the events, to provide confirmation that access routes / equipment are viable.	The assessor thought that the information on hazard withstand capability and emergency arrangements should be reviewed side-by-side to confirm compatibility.

Table 3 (continued): Hunterston B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HNB.AP.14	Review methodology for deriving the 10-4 hazard and provide evidence that it is to be conservative by Modern standards	Note: should read "the 10^{-4} seismic hazards" Technical detail: the definition of the 10^{-4} earthquake was taken over from PSR1, and should have been confirmed as conservative against modern standards seismic assessment methods.
HNB.AP.15	BE to extend their review of the seismic analysis and appraisal of the main building structures.	Technical detail: the assessor wishes additional analysis and review in this area.
HNB.AP.16	BE to review the coverage of ageing (both structures and plant) within PSR walkdowns.	Walk downs are carried out for both structural condition appraisal and to confirm hazard identification. The assessor wished some improvement to walkdown practices, and a view on the applicability of SQUG (Seismic Qualification Utility Group) walkdown methodology to ageing plant.
HNB.AP.17	Revise the analysis of the hazard posed to the sites from extreme flooding to account for changes due to revised models of climate change.	Technical detail: the specialist assessor wishes additional analysis and review in this area with revised models of external flooding to modern standards.
HNB.AP.18	BE to update aircrash risk modelling.	Technical detail: aircraft risk modelling was taken over from PSR1, and should have been confirmed as conservative against modern standards.
HNB.AP.19	BE to confirm that adequate corrosion allowances are present in the component life assessments.	Self explanatory - the Assessor thought the PSR required to be supplemented in this area.
HNB.AP.20	Complete work to extend CLA assessments for HNB to include the damage caused by the boiler temperature oscillations and show high damage levels for some components.	Self explanatory - the Assessor thought the Component Life Assessment within the PSR required to be supplemented in this area.
HNB.AP.21	Demonstrate that the seismic structural integrity cases for the steel reactor internal components remain secure for operation to 2016.	BE already have plans for carrying out additional integrity/safety cases, but assessor wished these formally identified from PSR and progressed to early completion.
HNB.AP.22	Provide substantiation to their assertions on the effects of GCRO (Gas Circulator Run-On) and loss of PVCW)Pressure Vessel Cooling Water) faults on the core restraint system, and also clarify whether / how the other outstanding issues in Section 6 of R3.07: Core Restraint have been addressed.	Technical detail: the assessor wishes additional analysis and review in this area.

Table 3 (continued): Hunterston B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HNB.AP.23	Provide the timescales for issuing the irradiation dose recommendations for reactor internal structural components and for reviewing the implications.	The assessor wished to see this work programme formally identified from PSR and progressed to early completion.
HNB.AP.24	Complete the analysis of the effects of charge machine chilling during pressurisation & demonstrate that the charge machine IOF pressure boundary components are capable of withstanding the operational load conditions.	Technical detail: the assessor wishes additional analysis and review in this area.
HNB.AP.25	Complete an adequate review of C&I against modern standards.	The PSR did not carry out a comprehensive review of C&I. against modern standards.
HNB.AP.26	Develop an adequate EMI/RFI safety case.	The station currently controls EMI/RF (Electromagnetic Interference/Radio Frequency) by the exclusion of potentially interfering equipment from the site. The assessor was of the view that a more comprehensive safety case would be beneficial.
HNB.AP.27	Carry out an independent audit of documentary evidence of C&I plant walkdowns, against the requirements of the licensee's formal guidance (internal guidance memo). If no documentary evidence exists, plant walkdowns should be carried out in compliance with licensee's formal guidance.	The assessor wishes additional analysis and review in this area, since walk downs are one of the means by which BE confirm the state of plant and the adequacy of hazard identification.
HNB.AP.28	Develop a C&I ageing management strategy for addressing ageing and obsolescence (equipment/ expertise).	The assessor wishes a comprehensive management strategy. Being proactive rather than reactive brings many benefits. BE are proactive to an extent, but a review may show further improvements.
HNB.AP.29	Carry out a review of hazard and interlocks schedule, establish safety function of fuel handling equipment, and company, national and international standards applicable. It should then carry out a comparison against the modern standards, including RSCM, identify any shortfalls and put in place a programme to address the shortfalls.	The assessor expected a thorough review of fuel route C&I, and the PSR did not deliver this. NII requires a work programme to address this.

Table 3 (continued): Hunterston B Action Plan

NII tracking no.	Commitment (summarised)	Background to Action Plan item
HNB.AP.30	Provide a work programme for developing the PSA of internal faults in line with NII expectations.	Technical details: the assessor had some detailed concerns and queries over the PSR as submitted, and BE is to provide a work programme to address this.
HNB.AP.31	Provide a programme to address the shortcomings of the Seismic Safety Case, including analysis that the Seismic Risk is ALARP.	Technical details: the assessors thought that the PSR as submitted should be extended in its coverage of seismic faults. BE is to provide a work programme to address this.
HNB.AP.32	Address the modelling shortcomings of a specific Fire Scenario (details withheld).	Technical details: NII identified fire modelling concerns for a particular, low frequency, fire scenario. BE is already investigating this further.
HNB.AP.33	Commit to the programme for provision of the Visible Safety Case for HNB.	BE are currently performing an improvement programme for the AGR safety cases (the Visible Safety Case programme). When it was started the intention was for this to be complete prior to the PSR. Unfortunately there has been slippage, so that the PSR has not benefited from these improvements.
HNB.AP.34	BE should review and reissue the chemistry Company Specifications as required by its arrangements.	BE have a number of chemistry Company Standards. Their arrangements call for regular review, but some have not been recently updated.