Hinkley Point ‘A’:
Response to EU Stress Tests following the Events at Fukushima, Japan

Following the nuclear accident at Fukushima in Japan, the European Union agreed on assessments for all of its 143 nuclear power plants, based on a set of common criteria. These criteria have been developed by ENSREG (the European Nuclear Safety Regulators Group) and have become known as 'Stress Tests'.

In response to the Stress Tests, operators of UK nuclear power plants have reviewed the resilience of their plants to extreme situations, in particular the loss of safety functions however caused, including the loss of electrical power or loss of ultimate heat sink for heat removal from the reactor or spent fuel storage areas.

This report details the results of the Stress Test for Hinkley Point 'A' Site. It has been submitted to the Office for Nuclear Regulation (an agency of the Health and Safety Executive) who will review all UK submissions and prepare a summary national report. This will be reviewed by ENSREG who will report to the European Council in June 2012.

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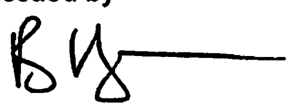

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Contents

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Executive Summary

This report is the response from Hinkley Point 'A' Site to the ENSREG Stress Tests following the events at Fukushima, Japan in March 2011.

Hinkley Point 'A' Site consists of the remaining structures of Hinkley Point 'A' Power Station following cessation of reactor operation in 2000. Decommissioning activities on the site are currently in progress to enable the site to be placed into a passive 'Care and Maintenance' storage phase prior to site clearance. The main remaining facilities are two Magnox reactors, their associated fuel cooling Ponds and the Radioactive Waste Storage Facilities.

Defuelling of the reactors was completed in November 2004 and defuelling of the site was completed in November 2010. Therefore there is no requirement for reactivity control, fuel cooling or ultimate heat sinks. The majority of the radioactive waste generated during operation remains within its original purpose built storage facilities.

It is concluded that hazards associated with the site are greatly reduced following the completion of defuelling. Therefore the consequences of earthquakes, flooding, extreme weather events, or any combinations of these, are below the threshold where protection or qualification against such external hazards is required. Nevertheless, the facilities are robust to the challenges of the design basis external hazards and the consequences for somewhat more severe events and combinations of events are not significant.

A series of workshops has been held to identify potential measures to enhance resilience in the event of external hazards or severe accidents, and those being considered for implementation are listed in Table 1. The site will also be supported by enhancements proposed for central emergency support.

1 General data about site/plant

1.1 Brief description of the site characteristics

- location (sea, river)[1]
- number of units;
- license holder

Hinkley Point 'A' Site is on the Somerset coast of the Bristol Channel, eight miles North West of the town of Bridgwater. The channel has a large tidal range.

1.2 Main characteristics of the unit

- reactor type;
- thermal power;
- date of first criticality;
- existing spent fuel storage (or shared storage).

<u>Reactor 1</u>

Reactor 1 is a Magnox reactor which first went critical in May 1964. During operation the reactor had a thermal power output of 947MW. The reactor has a welded steel reactor pressure vessel and contains a graphite core with 4500 fuel channels. The reactor pressure vessel sits within a concrete bioshield with a minimum thickness of 2.1m. Outside the main bioshield walls is a further secondary bioshield wall which is 2.0m thick.

The reactor operated up to April 1999, cessation of generation was declared in May 2000 and defuelling was completed in November 2004. Defuelling verification of the reactors was carried out as defuelling progressed to confirm to a high level of confidence that there was no fuel remaining. Consequently, there is no longer a requirement to provide core cooling or feed to the boilers. The reactor pressure vessel contains air at atmospheric pressure and, as a result of a modification performed following the completion of defuelling, it is vented to atmosphere by open pipework. The water has been drained from the boilers and the boilers isolated from the reactor pressure vessel by closing the main duct gas valves.

<u>Reactor 2</u>

Reactor 2 is the same design and is in the same current configuration as Reactor 1. Reactor 2 first went critical in October 1964. The reactor operated up to December 1999, cessation of generation was declared in May 2000 and defuelling was completed in October 2004.

<u>Irradiated Fuel Cooling Ponds</u>

Each reactor has a water-filled concrete pond divided into three bays. The ponds are separate above-ground structures. A concrete tunnel links the reactor pilecap to the ponds; this was previously used for the transfer of fuel. The ponds provided cooling and shielding of irradiated fuel discharged from the reactors before it was transferred to fuel flasks for transport to Sellafield. All fuel was removed from the ponds in November 2010 and thus defuelling of the site is complete. As at September 2011, both ponds remain filled with

[1] Text and headings which are in a smaller font are relevant extracts from the ENREG Stress Test documentation and not part of the Stress Test response.

water and contain a small amount of redundant equipment that was used in ponds operations, plus small amounts of sludge and other debris. Reactor 1 pond contains six cartridges of material previously used to capture radioactive Caesium from the pond water.

Radioactive Waste Facilities

There is no high level waste (HLW) stored on site. Intermediate level waste (ILW) and low level waste (LLW) is contained in purpose built storage facilities including:

- Dry Magnox Vaults: Each reactor has a dry Magnox vault located in the same structure as the ponds. They predominantly contain Magnesium alloy components removed from the fuel elements prior to shipping to Sellafield. Reactor 1 and Reactor 2 Dry Magnox Vaults contain 185m^3 and 175m^3 of solid radioactive waste respectively.

- Wet Magnox Vaults: Each reactor has a wet Magnox vault located in a separate structure adjacent to the ponds which extends to the same height above ground as the ponds. They predominantly contain Magnesium alloy components removed from the fuel elements prior to shipping to Sellafield. Reactor 1 and Reactor 2 Wet Magnox Vaults contain 218m^3 and 230m^3 of waste respectively.

- Pond Water Treatment Plant, Active Effluent Treatment Plant (AETP) and Sludge Canning Building: These contain plant used for the treatment of pond water and other active liquors arising within the reactor controlled area. The bulk of the waste is ILW resin and sludge stored in Settling Tanks resulting from this treatment. The 8 Settling Tanks contain a total of 180m^3 of wet ILW.

- Reactor storage voids and disposal tubes: These contain items of non-combustible metallic ILW arising from reactor operations. The voids are within the reactor bioshield and are accessed from the pile cap level.

- AETP Lower Vault: This consists of a below ground storage facility and is used to store LLW and 3.0m^3 of ILW awaiting disposal.

- Non-Combustible Active Waste Store: This consists of a below ground storage facility containing LLW and a small amount of ILW held in storage drums and other containers.

1.3 Systems for providing or supporting main safety functions

In this chapter, all relevant systems should be identified and described, whether they are classified and accordingly qualified as safety systems, or designed for normal operation and classified to non-nuclear safety category. The systems description should include also fixed hook-up points for transportable external power or water supply systems that are planned to be used as last resort during emergencies.

1.3.1 Reactivity control

Systems that are planned to ensure sub-criticality of the reactor core in all shut down conditions, and sub-criticality of spent fuel in all potential storage conditions. Report should give a thorough understanding of available means to ensure that there is adequate amount of boron or other respective neutron absorber in the coolant in all circumstances, also including the situations after a severe damage of the reactor or the spent fuel.

Following the completion of reactor defuelling, there is no longer a requirement for reactivity control of the reactors. Nevertheless, all control rods remain fully inserted into the core and all power supplies to them are permanently disconnected. There was no requirement to provide systems to ensure subcriticality of spent fuel in storage locations when it was present on site, and defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

Small quantities of fissile material are present in the ILW stored on site. However a criticality study has concluded that there is insufficient fissile material for criticality to be possible.

1.3.2 Heat transfer from reactor to the ultimate heat sink

1.3.2.1 All existing heat transfer means / chains from the reactor to the primary heat sink (e.g., sea water) and to the secondary heat sinks (e.g., atmosphere or district heating system) in different reactor shut down conditions: hot shut down, cooling from hot to cold shut down, cold shut down with closed primary circuit, and cold shut down with open primary circuit.

Following the completion of reactor defuelling, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

1.3.2.2 Lay out information on the heat transfer chains: routing of redundant and diverse heat transfer piping and location of the main equipment. Physical protection of equipment from the internal and external threats.

As discussed in Section 1.3.2.1, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no requirement to describe the design and operation of the heat transfer capability from the reactors. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.2.3 Possible time constraints for availability of different heat transfer chains, and possibilities to extend the respective times by external measures (e.g., running out of a water storage and possibilities to refill this storage).

As discussed in Section 1.3.2.1, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there are no time constraints for availability of the heat transfer capability from the reactors. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.2.4 AC power sources and batteries that could provide the necessary power to each chain (e.g., for driving of pumps and valves, for controlling the systems operation).

As discussed in Section 1.3.2.1, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no longer a requirement for back-up power sources to be provided to maintain the heat transfer capability from the reactors. Hence this section is not applicable for Hinkley Point ‘A’ Site (the available power supplies in event of loss of off-site power are described in Sections 1.3.5 and 1.3.6).

1.3.2.5 Need and method of cooling equipment that belong to a certain heat transfer chain; special emphasis should be given to verifying true diversity of alternative heat transfer chains (e.g., air cooling, cooling with water from separate sources, potential constraints for providing respective coolant).

As discussed in Section 1.3.2.1, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no longer a requirement for diversity of the heat transfer capability from the reactors or cooling of this equipment. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.3 Heat transfer from spent fuel pools to the ultimate heat sink

1.3.3.1 All existing heat transfer means / chains from the spent fuel pools to the primary heat sink (e.g., sea water) and to the secondary heat sinks (e.g., atmosphere or district heating system).

Following the completion of site defuelling, there is no longer a requirement for heat transfer from the ponds to a heat sink. Therefore this section is not applicable for Hinkley Point 'A' Site.

1.3.3.2 Respective information on lay out, physical protection, time constraints of use, power sources, and cooling of equipment as explained under 1.3.2.

As discussed in Section 1.3.3.1, there is no longer a requirement for heat transfer from the ponds to a heat sink. Therefore there is no requirement to describe the design and operation of the heat transfer capability from the ponds. Hence this section is not applicable for Hinkley Point 'A' Site.

1.3.4 Heat transfer from the reactor containment to the ultimate heat sink

1.3.4.1 All existing heat transfer means / chains from the containment to the primary heat sink (e.g., sea water) and to the secondary heat sinks (e.g., atmosphere or district heating system).

The reactor pressure vessel is the primary reactor containment. There is no secondary containment. In addition, following the completion of reactor defuelling, there is no longer a requirement for heat transfer from the reactor to a heat sink. Therefore this section is not applicable for Hinkley Point 'A' Site.

1.3.4.2 Respective information on lay out, physical protection, time constraints of use, power sources, and cooling of equipment as explained under 1.3.2.

As discussed in Section 1.3.4.1, there is no longer a requirement for heat transfer from the reactor to a heat sink. Therefore there is no requirement to describe the design and operation of the heat transfer capability from the reactor containment. Hence this section is not applicable for Hinkley Point 'A' Site.

1.3.5 AC power supply

Following the completion of reactor defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Nor was it deemed necessary for power supplies to be maintained for heat transfer from the ponds to a heat sink, or to guarantee a supply to the Radioactive Waste Facilities in the event of loss of normal supplies.

1.3.5.1 Off-site power supply

1.3.5.1.1 Information on reliability of off-site power supply: historical data at least from power cuts and their durations during the plant lifetime.

There have been four 'loss of off-site power' occurrences, the longest period being 30 minutes. The most recent loss of off-site power supply on site occurred on 12th September 2006 during the current Care and Maintenance Preparations phase of operation.

1.3.5.1.2 Connections of the plant with external power grids: transmission line and potential earth cable routings with their connection points, physical protection, and design against internal and external hazards.

The electrical supply to Hinkley Point ‘A’ Site is fed from the national grid via the 275kV sub-station located on the site on ground which is considerably higher (16.54m Above Ordnance Datum (AOD)) than the general site (11.00m nominal AOD) where the reactor plant is located. The sub-station feeds two 275kV to 11kV transformers within the footprint of the sub-station. The 11kV transformers feed two decommissioning supplies switchboards via buried cables which distribute power across the site. The 11kV switchboards are located in a purpose built Decommissioning Supplies Substation, located close to and at the same level as the reactor plant.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee a supply to the Radioactive Waste Facilities. Therefore, it is not necessary to describe the protection of the supply system against internal and external hazards. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.5.2 Power distribution inside the plant

1.3.5.2.1 Main cable routings and power distribution switchboards.

The decommissioning supplies switchboards feed five 11kV to 415V transformers in diverse locations across the site. These five transformers each feed switchboards that supply different areas of the site with general electrical services via armoured cables in cable trenches.

1.3.5.2.2 Lay-out, location, and physical protection against internal and external hazards.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee a supply to the Radioactive Waste Facilities. Therefore, it is not necessary to describe the protection of the supply system against internal and external hazards. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.5.3 Main ordinary on-site source for back-up power supply

1.3.5.3.1 On-site sources that serve as first back-up if offsite power is lost.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee a supply to the Radioactive Waste Facilities. Hence this section is not applicable for Hinkley Point ‘A’ Site.

However, for operational convenience it was judged prudent to retain the capability to support electrical supplies for switching, alarms, and emergency lighting in the event of loss of off-site power. This is met by Uninterruptible Power Supplies (UPS), which have batteries capable of sustaining electrical supplies for several hours, and the 415V Standby Essential Diesel Board (SEDB), which can be supplied by the Standby Essential Diesel Generator (SEDG). Note that this system provided an essential function during reactor operation and the word 'essential' is still used because of the existing plant labelling. However, as discussed in Section 1.3.5, no electrical supply systems are considered essential for the safe operation of the site.

The following dc batteries and UPS units currently remain supportable from the SEDB in the event of a prolonged loss of grid:

i) 50Vdc battery for alarms
ii) 110Vdc batteries for switching
iii) 240Vdc for emergency lighting
iv) 240Vac UPS units for alarms and instrumentation.

1.3.5.3.2 Redundancy, separation of redundant sources by structures or distance, and their physical protection against internal and external hazards.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore it is not necessary to provide redundant and diverse supplies or substantiate the design of the supply system against internal and external hazards. Hence this section is not applicable for Hinkley Point ‘A’ Site.

Note that work is currently being specified to replace a second out of service SEDG with a connection point for a 415V transportable generator to provide diversity of supply should the remaining SEDG become unavailable.

1.3.5.3.3 Time constraints for availability of these sources and external measures to extend the time of use (e.g., fuel tank capacity).

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there is no requirement to ensure their availability. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, a local diesel tank provides sufficient capacity to run the SEDG for 10 hours. Additional fuel could be transferred from the site bulk diesel storage tank using a diesel fuel bowser. Sufficient stocks of diesel fuel are maintained available on-site for the SEDG to function for 24 hours without the need for further off-site supply of fuel.

1.3.5.4 Diverse permanently installed on-site sources for back-up power supply

1.3.5.4.1 All diverse sources that can be used for the same tasks as the main back-up sources, or for more limited dedicated purposes (e.g., for decay heat removal from reactor when the primary system is intact, for operation of systems that protect containment integrity after core meltdown).

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no diverse permanently installed on-site sources for back-up power supply. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.5.4.2 Respective information on location, physical protection and time constraints as explained under 1.3.5.3.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no diverse permanently installed on-site sources for back-up power supply. Hence this section is not applicable for Hinkley Point 'A' Site.

1.3.5.5 Other power sources that are planned and kept in preparedness for use as last resort means to prevent a serious accident damaging reactor or spent fuel.

1.3.5.5.1 Potential dedicated connections to neighbouring units or to nearby other power plants.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no dedicated connections to neighbouring units or a nearby power plant. Hence this section is not applicable for Hinkley Point 'A' Site.

For information, if it became necessary, it would be possible to engineer a means of making a connection to the adjacent Hinkley Point 'B' Site, if their supplies remained available.

1.3.5.5.2 Possibilities to hook-up transportable power sources to supply certain safety systems.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no specific arrangements to ensure the availability of transportable power sources to supply the site. Hence this section is not applicable for Hinkley Point 'A' Site.

However, as discussed in section 1.3.5.3, work is currently under way to provide a connection point for a 415V transportable generator.

1.3.5.5.3 Information on each power source: power capacity, voltage level and other relevant constraints.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no specific arrangements to ensure the availability of transportable power sources to supply the site. Hence this section is not applicable for Hinkley Point 'A' Site.

1.3.5.5.4 Preparedness to take the source in use: need for special personnel, procedures and training, connection time, contract arrangements if not in ownership of the Licensee, vulnerability of source and its connection to external hazards and weather conditions.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore there are no specific arrangements to ensure the availability of transportable power sources to supply the site. Hence this section is not applicable for Hinkley Point 'A' Site.

1.3.6 Batteries for DC power supply

Following the completion of reactor defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Nor was it deemed necessary for power supplies to be maintained for heat transfer from the ponds to a heat sink, or to guarantee a supply to the Radioactive Waste Facilities in the event of loss of normal supplies.

1.3.6.1 Description of separate battery banks that could be used to supply safety relevant consumers: capacity and time to exhaust batteries in different operational situations.

As discussed in Section 1.3.6, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore it is not necessary to describe the battery banks and their capacity. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, in the event of loss of off-site power supply, the primary concern will be safety of staff in the vicinity of the plant. It is considered that the minimum 3 hour rating of the 240V batteries supplying emergency lighting is adequate in ensuring that staff can withdraw safely from these plant areas. Instructions would be issued via the site-wide public address system which has a battery back-up allowing continuity of use for approximately 10 hours. Various alarms and indicators have batteries or uninterruptable power supplies which are provided for operational convenience but are not a requirement of the site safety case.

1.3.6.2 Consumers served by each battery bank: driving of valve motors, control systems, measuring devices, etc.

As discussed in Section 1.3.6, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore it is not necessary to describe the systems supported by each battery bank. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.6.3 Physical location and separation of battery banks and their protection from internal and external hazards.

As discussed in Section 1.3.6, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore it is not necessary to describe the layout of battery banks and their protection from internal and external faults. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.3.6.4 Alternative possibilities for recharging each battery bank.

As discussed in Section 1.3.6, there is no longer a requirement for power supplies to be maintained in the event of loss of off-site power supply. Therefore it is not necessary to describe alternative arrangements for charging batteries. Hence this section is not applicable for Hinkley Point ‘A’ Site.

1.4 Significant differences between units

This chapter is relevant only for sites with multiple NPP units of similar type. In case some site has units of completely different design (e.g., PWR's and BWR's or plants of different generation), design information of each unit is presented separately.

There are no significant differences between the designs of the two units.

1.5 Scope and main results of Probabilistic Safety Assessments

Scope of the PSA is explained both for level 1 addressing core meltdown frequency and for level 2 addressing frequency of large radioactive release as consequence of containment failure. At each level, and depending on the scope of the existing PSA, the results and respective risk contributions are presented for different initiating events such as random internal equipment failures, fires, internal and external floods, extreme weather conditions, seismic hazards. Information is presented also on PSA's conducted for different initiating conditions: full power, small power, or shut down.

Following the completion of site defuelling the major hazards were removed. A probabilistic safety assessment performed following the completion of defuelling considered the most serious remaining hazards from the reactors, ponds and radioactive waste facilities and showed that the risk was broadly acceptable and As Low as Reasonably Practicable (ALARP) when assessed against Magnox Limited and Regulatory criteria.

2 Earthquakes

2.1 Design basis

2.1.1 Earthquake against which the plant is designed

2.1.1.1 Characteristics of the design basis earthquake (DBE)

Level of DBE expressed in terms of maximum horizontal peak ground acceleration (PGA). If no DBE was specified in the original design due to the very low seismicity of the site, PGA that was used to demonstrate the robustness of the as built design.

Seismic hazards were not included within the original design basis for Hinkley Point ‘A’ Site. The capability of the site to withstand seismic events was first evaluated as part of the Long Term Safety Review carried out during the 1980s.

When the reactors were operating the design basis earthquake for the Hinkley Point ‘A’ Site reactors and ponds was defined by the envelope of the Principia Mechanica Limited (PML) hard site United Kingdom (UK) design response spectrum anchored to a horizontal zero period acceleration of 0.1g, and a site specific Uniform Risk Spectrum (URS) with a probability of exceedance of 10^{-4} per annum. In the horizontal direction the URS bounds the 0.1g PML spectrum. The horizontal peak ground acceleration associated with the design basis event was approximately 0.23g.

Following the completion of site defuelling, the nuclear consequences of a seismic event for the reactors and ponds were greatly reduced, and the main focus was then placed on the Radioactive Waste Facilities. There was no formal seismic design basis for the Radioactive Waste Facilities during operation. However, the structures by their nature are considered to be robust against seismic loading at the 10^{-4} per annum exceedance frequency.

2.1.1.2 Methodology used to evaluate the design basis earthquake

Expected frequency of DBE, statistical analysis of historical data, geological information on site, safety margin.

The URS component of the design basis earthquake for the Hinkley Point ‘A’ Site is derived from a site-specific probabilistic seismic hazard assessment. That assessment is based on detailed seismological and geological reviews of the region surrounding the site. The seismic hazard is calculated using a logic-tree formulation based on a zonal hazard model and source parameter (b-value, activity rate, maximum magnitude, depth etc) distributions that reflect the pattern of historical seismicity in the region. In the absence of sufficient UK-specific strong motion records, ground motion spectral attenuation relationships were derived by regression analysis of earthquake records from regions elsewhere in the world considered to share tectonic similarity with the UK. The ground response spectra used in the definition of the design basis event are those assessed to have a uniform probability of exceedance of 10^{-4} per annum. Extensive sensitivity analyses have been undertaken to demonstrate that the predicted hazard is robust against input parameter variation.

The PML UK design response spectra are piece-wise linear (on a standard tripartite plot) response spectra derived by statistical analysis of strong motion earthquake records from elsewhere in the world conforming to the profile of expected UK events. This is necessitated by a lack of suitable UK-specific strong motion records. These design spectra may be anchored to any zero period acceleration. For the purpose of defining the design basis event for Hinkley Point ‘A’ Site the spectrum has been anchored to a zero period acceleration of 0.1g in recognition of the international regulatory significance of that value.

The design basis earthquake for the reactors and ponds is defined as the upper envelope of these two spectral components.

2.1.1.3 Conclusion on the adequacy of the design basis for the earthquake

Reassessment of the validity of earlier information taking into account the current state-of-the-art knowledge.

The UK as a whole is a region of relatively low seismic activity. No specific geological or tectonic features have been identified that would suggest that earthquakes larger than those considered in the studies underpinning the Hinkley Point ‘A’ Site design basis event are credible.

It is considered that the design basis earthquake is an adequate representation of the prevailing seismic hazard for the Hinkley Point ‘A’ Site at a 10^{-4} per annum exceedance frequency.

2.1.2 Provisions to protect the plant against the design basis earthquake

2.1.2.1 Systems Structures and Components (SSCs)

Identification of systems, structures and components (SSCs) that are required for achieving safe shut down state and are most endangered during an earthquake. Evaluation of their robustness in connection with DBE and assessment of potential safety margin.

Following the completion of site defuelling, there is no longer a requirement for core reactivity control, reactor shutdown, or heat transfer capabilities to be maintained. Therefore, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Nor was there a requirement to ensure the integrity of the ponds was maintained. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, the primary concern following the design basis event would be associated with containment of radioactive materials in the Radioactive Waste Facilities. However, the safety case for the Radioactive Waste Facilities does not identify the requirement to seismically qualify them due to the relatively low consequences of failure. Furthermore, the building structures provide secondary containment and by their nature are considered to be robust against seismic loading consistent with the design basis event. Hence it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities for the design basis seismic event.

2.1.2.2 Main operating contingencies in case of damage that could be caused by an earthquake and could threaten achieving safe shut down state.

As discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

2.1.2.3 Protection against indirect effects of the earthquake

2.1.2.3.1 Assessment of potential failures of heavy structures, pressure retaining devices, rotating equipment, or systems containing large amount of liquid that are not designed to withstand DBE and that might threaten heat transfer to ultimate heat sink by mechanical interaction or through internal flood.

As discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

2.1.2.3.2 Loss of external power supply that could impair the impact of seismically induced internal damage at the plant.

As discussed in Section 1.3.5, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee supplies to the Radioactive Waste Facilities. Therefore, it is not anticipated that loss of power supplies would exacerbate the consequences of an earthquake. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, the back-up power supplies that are available in the event of loss of off-site power supply are described in Section 1.3.5 and Section 1.3.6.

2.1.2.3.3 Situation outside the plant, including preventing or delaying access of personnel and equipment to the site.

As discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Nor was there a requirement to ensure the integrity of the ponds was maintained. Following the design basis event it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities. Hence, there would be no requirement for a large amount of personnel or equipment to immediately access the site.

2.1.2.3.4 Other indirect effects (e.g. fire, explosion).

It is judged that the consequences of other indirect effects of an earthquake are bounded by the direct consequences of the earthquake.

The effects of earthquake damage to the adjacent Hinkley Point ‘B’ Site (licensee EDF) could restrict access to the Hinkley Point ‘A’ Site. However, as discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Nor was there a requirement to ensure the integrity of the ponds was maintained. Following the design basis event it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities. Hence, there would be no requirement for a large amount of personnel or equipment to immediately access the site.

2.1.3 Compliance of the plant with its current licensing basis

2.1.3.1 Processes to ensure SSCs remain in faultless condition

Licensee's processes to ensure that plant systems, structures, and components that are needed for achieving safe shut down after earthquake, or that might cause indirect effects discussed under 2.1.2.3 remain in faultless condition.

As discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Nor was there a requirement to ensure the integrity of the ponds was maintained. Following the design basis event it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities. Therefore, there are no systems, structures or components which must be maintained in faultless condition.

However, the plant is subject to routine maintenance, inspection and testing as required by the Maintenance Schedules, which lists those activities that are necessary to support the site safety case and other legal requirements. This is implemented in accordance with Management Control Procedure (MCP) 19 “Management of Maintenance Work” and MCP 13 “Surveillance and Routine Testing of Plant Items and Systems”. Specific procedures include S-268 "Inspection and Assessment of Nuclear Safety Related Civil Structures to Comply with Site Licence Condition 28", whose scope specifically includes all significant civil structures.

As necessary, the plant and safety case is modified or updated in accord with MCP-99 "Unified Arrangements for Regulatory Compliance in Projects During Defuelling and/or Decommissioning".

At 10 yearly intervals, and in response to significant operating events, the safety of the plant is reviewed in a Periodic Safety Review. This reviews the safety of the plant against modern standards and operating experience. The most recent Periodic Safety Review was completed in 2005.

2.1.3.2 Processes for mobile equipment and supplies

Licensee's processes to ensure that mobile equipment and supplies that are planned to be available after an earthquake are in continuous preparedness to be used.

As discussed in Section 2.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Nor was there a requirement to ensure the integrity of the ponds was maintained. Following the design basis event it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities. Therefore, there are no processes to ensure mobile equipment or supplies would be available following an earthquake. Hence this section is not applicable for Hinkley Point ‘A’ Site.

2.1.3.3 Potential deviations from licensing basis

Potential deviations from licensing basis and actions to address those deviations.

There are no identified deviations from the licensing basis with respect to the seismic safety case.

2.2 Evaluation of safety margins

2.2.1 Range of earthquake leading to severe fuel damage

Weak points and cliff edge effects: estimation of PGA that would result in damage to the weakest part of heat transfer chain, and consequently cause a situation where the reactor integrity or spent fuel integrity would be seriously challenged.

Following the completion of site defuelling, there is no possibility of an earthquake leading to fuel damage. Therefore this section is not applicable for Hinkley Point 'A' Site.

2.2.2 Range of earthquake leading to loss of containment integrity

Estimation of PGA that would result in loss of integrity of the reactor containment.

As discussed in Section 1.3.4.1, there is no secondary containment and following the completion of reactor defuelling, the consequences of loss of the primary reactor containment integrity are insignificant. Hence this section is not applicable for Hinkley Point 'A' Site.

2.2.3 Earthquake exceeding the design basis earthquake for the plant and consequent flooding exceeding design basis flood

Possibility of external floods caused by an earthquake and potential impacts on the safety of the plant. Evaluation of the geographical factors and the physical possibility of an earthquake to cause an external flood on site, e.g. a dam failure upstream of the river that flows past the site.

The relatively low magnitudes together with the anticipated mechanisms of UK earthquakes indicate that the potential for a significant tsunami resulting from a local earthquake is very low. Furthermore, the potential for local land-slips into water or slippage of the river/sea bed leading to a local tsunami affecting the Hinkley Point 'A' Site is also considered to be negligible. A more significant tsunami could credibly result from a distant earthquake. In that case, however, the ground motion at the Hinkley Point 'A' Site resulting from the earthquake would not be damaging. Thus, the potential for significant earthquake damage combined with significant tsunami-induced damage can be discounted. The potential for flooding of the site is discussed further in Section 3.

There are no off-site water retaining structures whose failure during an earthquake could credibly lead to site flooding. The nearest reservoirs to the site at Durleigh (12 km) and Hawkridge (11 km) are small in flooding potential and drain eastward and southwards away from the site into the river system.

Localised flooding following a design basis earthquake could arise from failures of on-site tanks or pipework that are not qualified against the design basis seismic demand. Specifically, the Decommissioning Supplies Substation could be flooded following failure of adjacent water tanks resulting in loss of site power supplies. However the consequences of flooding this building are not significant for the reasons discussed in Section 1.3.5.

2.2.4 Potential need to increase robustness of the plant against earthquakes

Consideration of measures, which could be envisaged to increase plant robustness against seismic phenomena and would enhance plant safety.

Following the completion of site defuelling, no additional measures are considered reasonably practicable to increase the robustness of the site against the seismic hazard.

3 Flooding

3.1 Design basis

3.1.1 Flooding against which the plant is designed

3.1.1.1 Characteristics of the design basis flood (DBF)

Maximum height of flood postulated in design of the plant and maximum postulated rate of water level rising. If no DBF was postulated, evaluation of flood height that would seriously challenge the function of electrical power systems or the heat transfer to the ultimate heat sink.

The site is located on the Somerset coast of the Bristol Channel. The 10^{-4} combination of Maximum Astronomical Tide (MAT), surge height and wave height is 11.43m AOD. This is considered suitably pessimistic since it is highly unlikely that MAT, maximum surge and maximum wave heights would occur simultaneously.

It is also noteworthy in this respect that the Bristol Channel has a very high tidal range and, as a consequence, the still water level falls rapidly within the first hour following high water. The period over which water ingress onto site could occur is, therefore, very limited.

In defining the design basis water levels for Hinkley Point ‘A’ Site no explicit account has been taken of potential tsunami risk. The tsunami threat is considered to arise primarily from large distant earthquakes. Any residual tsunami wave affecting Hinkley Point ‘A’ Site is expected to be small. At the 10^{-4} per annum exceedance frequency the risk from both the flooding and kinetic effects of a tsunami is bounded by the existing design basis sea levels considering extreme tide and surge combinations.

The 10^{-3} per annum exceedance frequency extreme rainfall event is assessed to be a total of 63mm of rain in one hour. It is recognised that extreme precipitation events and the expected levels of water on site as a result of 10^{-4} per annum rainfall events have not been estimated.

There are no off-site water retaining structures whose failure could credibly lead to site flooding. The nearest reservoirs to the site at Durleigh (12 km) and Hawkridge (11 km) are small in flooding potential and drain eastward and southwards away from the site into the river system.

3.1.1.2 Methodology used to evaluate the design basis flood.

Reassessment of the maximum height of flood considered possible on site, in view of the historical data and the best available knowledge on the physical phenomena that have a potential to increase the height of flood. Expected frequency of the DBF and the information used as basis for reassessment.

<u>Design Basis Sea Levels</u>

Extreme tidal levels (highest astronomical tide) are based on long term observations at the nearest standard port, the Port of Bristol (Avonmouth), transformed to provide tide predictions at Hinkley Point ‘A’ Site. The extreme combined tide and surge level has been derived from statistical analysis of long term observations of surge levels coincident with high tide at Avonmouth.

Significant wave heights and periods have been calculated for the worst meteorological conditions supported by measured data from recorders installed in the estuary for the Severn Barrage study. When combining wave heights with still water levels it has been assumed that the wave shape is such that the wave crest is two-thirds of the wave height above still water level.

Water levels in the Bristol Channel around the location of Hinkley Point ‘A’ Site are the product of a complex interaction of tidal processes, surge, river flow and surface wind waves. The detailed analysis of tide and surge levels and significant wave heights appropriate to Hinkley Point ‘A’ Site was carried out in 1987. The effects of climate change were assessed and incorporated into the Design Basis Flood in 2004 as part of the last Periodic Safety Review.

The underlying tide height estimates used to define the design basis extreme water levels are expected to be accurate because tides are reliably predictable based on the available observation records.

Design Basis Rainfall

Short duration rainfall amounts for given return periods are from Meteorological Office records of long term extreme rainfall at nearby locations of Cannington and Brymore. No significant change in severe rainstorm events is predicted as a result of global warming.

3.1.1.3 Conclusion on the adequacy of protection against external flooding

Following the completion of site defuelling, the consequences of a flooding event have become less onerous. Therefore, the methodology and underlying data utilised to estimate the design basis extreme precipitation and consequent flood levels is considered to be adequate for Hinkley Point ‘A’ Site. Nevertheless, the risk of flooding of the site from external sources is being reviewed as part of the site’s response to the Fukushima incident.

The omission of tsunami contributions from the design basis sea levels is not judged to be significant. At the 10^{-4} per annum exceedance frequency the contribution of tsunami to the overall flood risk is considered to be substantially bounded by that of extreme tide, surge and wave combinations.

3.1.2 Provisions to protect the plant against the design basis flood

3.1.2.1 Systems Structures and Components (SSCs)

Identification of systems, structures and components (SSCs) that are required for achieving and maintaining safe shut down state and are most endangered when flood is increasing.

Following the completion of site defuelling, there is no longer a requirement for core reactivity control, reactor shutdown, or heat transfer capabilities to be maintained. Therefore, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Hence this section is not applicable for Hinkley Point ‘A’ Site.

Note that the primary concern following the design basis event would be associated with containment of radioactive materials in the Radioactive Waste Facilities. The safety case has not identified a requirement to qualify any of the Radioactive Waste Facilities against a flooding event due to the relatively low consequences of failure. Furthermore, the facilities by their nature prevent a significant loss of containment for the design basis event.

3.1.2.2 Main design and construction provisions

Main design and construction provisions to prevent flood impact to the plant.

The site ground level at Hinkley Point 'A' Site is a nominal 11.0m AOD. There is a concrete sea wall with a top level of approximately 8.5m AOD and a gabion wave spoiling wall between the sea wall and the site which extends to approximately 12.0m AOD, which is 0.57m above the maximum predicted flood height. All buildings containing ILW have thresholds at a minimum of 11.2m AOD, except for the AETP Lower Vault, which is at 11.1m AOD.

The AETP Lower Vault contains 3.0m^3 of ILW sludge in small sealed containers which are not anticipated to fail in the event of a flood. Therefore, the consequences of flooding this facility are considered to be minimal.

Note that within these facilities, the ponds and the bulk of ILW on site are located in containments with thresholds for flooding of the order of 5m above the maximum predicted flood height.

The Site has previously suffered external flooding by wave water near the Cooling Water (CW) pumphouse, which was at approximately 8.2m AOD. The CW pumphouse has now been demolished as part of the sites decommissioning programme, however it was this event which led to the construction of the gabion wave spoiling wall. Further floods in 1990 led to extension of the east end of the gabion wave spoiling wall and removal of an access gate to the sea frontage.

The entire site is drained by a comprehensive surface and storm water drains system. All roads fall to the sea and accordingly would tend to act as open gullies if flood water were upon the site.

3.1.2.3 Main operating provisions

Main operating provisions to prevent flood impact to the plant.

As discussed in Section 3.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore this section is not applicable for Hinkley Point 'A' Site.

Furthermore, many hours notice of extreme tides and surges would be expected. Advice on actions/response to severe weather conditions is given in the site Emergency Handbook.

3.1.2.4 Situation outside the plant, including preventing or delaying access of personnel and equipment to the site.

Situation outside the plant, including preventing or delaying access of personnel and equipment to the site.

As discussed in Section 3.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

Note that following the design basis event it is not anticipated that there would be a significant loss of containment from the Radioactive Waste Facilities. Therefore, there would be no requirement for a large amount of personnel or equipment to immediately access the site.

3.1.3 Plant compliance with its current licensing basis

3.1.3.1 Processes to ensure SSCs remain in faultless condition

Licensee's processes to ensure that plant systems, structures, and components that are needed for achieving and maintaining the safe shut down state, as well as systems and structures designed for flood protection remain in faultless condition.

As discussed in Section 3.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore, there are no systems, structures or components which must be maintained in faultless condition.

However, the plant is subject to routine maintenance, inspection and testing as required by the Maintenance Schedules, which lists those activities that are necessary to support the site safety case and other legal requirements. This is implemented in accordance with MCP 19 “Management of Maintenance Work” and MCP 13 “Surveillance and Routine Testing of Plant Items and Systems”. Specific procedures include S-268 "Inspection and Assessment of Nuclear Safety Related Civil Structures to Comply with Site Licence Condition 28", whose scope specifically includes "sea and river flood defences that protect the licensed site from flooding".

As necessary, the plant and safety case is modified or updated in accord with MCP-99 "Unified Arrangements for Regulatory Compliance in Projects During Defuelling and/or Decommissioning".

At 10 yearly intervals, and in response to significant operating events, the safety of the plant is reviewed in a Periodic Safety Review. This reviews the safety of the plant against modern standards and operating experience. The most recent Periodic Safety Review was completed in 2005.

3.1.3.2 Processes for mobile equipment and supplies

Licensee's processes to ensure that mobile equipment and supplies that are planned for use in connection with flooding are in continuous preparedness to be used.

As discussed in Section 3.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore, there are no processes to ensure mobile equipment or supplies would be available following a flooding event. Hence this section is not applicable for Hinkley Point ‘A’ Site.

3.1.3.3 Potential deviations from licensing basis

Potential deviations from licensing basis and actions to address those deviations.

There are no identified deviations from the licensing basis with respect to the flooding safety case.

3.2 Evaluation of safety margins

3.2.1 Estimation of safety margin against flooding

Estimation of difference between maximum height of flood considered possible on site and the height of flood that would seriously challenge the safety systems, which are essential for heat transfer from the reactor and the spent fuel to ultimate heat sink.

As discussed in Section 3.1.2.1, there are no systems, structures or components which are required to achieve a safe shutdown state following the design basis event. Therefore, no safety margin against flooding is required. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, although some of the facilities may experience flooding in the design basis event, the ponds and the bulk of ILW on site are located in containments with thresholds for flooding of the order of 5m above the maximum predicted flood height.

3.2.2 Potential need to increase robustness of the plant against flooding

Consideration of measures, which could be envisaged to increase plant robustness against flooding and would enhance plant safety.

Following the completion of site defuelling, no additional measures are considered necessary to increase the robustness of the site against the flooding hazard.

4 Extreme weather conditions

4.1 Design basis

4.1.1 Reassessment of weather conditions used as design basis

4.1.1.1 Characteristics of design basis extreme weather conditions

Verification of weather conditions that were used as design basis for various plant systems, structures and components: maximum temperature, minimum temperature, various type of storms, heavy rainfall, high winds, etc.

Snow and Ice

Meteorological records show that the Hinkley Point area is subject to a moderate climate, due to the close proximity of the Severn Estuary and the prevailing westerly winds. Instances of snow and ice are, therefore, likely to be of short duration and the risk of severe plant disruption is minimal. Potential effects from snow/ice include blockage of access roads with snow, increased structural loadings and falling ice.

Lightning

The potential for lightning striking the site is considered within the safety case. This could result in the loss of control and instrumentation equipment but it is not anticipated that there would be a significant release of activity as a consequence.

Extreme Temperatures and Relative Humidity

The moderate climate in the Hinkley Point area means that extreme temperatures are likely to be of short duration and the risk of severe plant disruption is minimal. Potential cold ambient temperature effects include freezing of pipes and embrittlement of civil structures. Potential hot weather effects include the overheating of electronics.

Wind Loading

During operation, the structures considered to have a nuclear safety significance were assessed against a 10^{-4} wind loading. Other site structures were assessed against a 1 in 50 year wind loading. All assessed structures performed satisfactorily, however localised failure of external cladding may occur beyond the 1 in 50 event.

4.1.1.2 Postulation of design basis characteristics

Postulation of proper specifications for extreme weather conditions if not included in the original design basis.

The design basis characteristics were assessed during the most recent Periodic Safety Review in 2005 and are as discussed in Section 4.1.1.1

4.1.1.3 Assessment of frequency

Assessment of the expected frequency of the originally postulated or the redefined design basis conditions.

Extreme weather conditions discussed in Section 4.1.1.1 are assessed against an annual probability of 10^{-4} unless otherwise stated.

4.1.1.4 Potential combinations of weather conditions

Consideration of potential combination of weather conditions.

The safety case has not identified a requirement to qualify any of the Radioactive Waste Facilities against extreme weather due to the relatively low consequences that this would have. Therefore potential combinations of weather conditions are not considered within the safety case.

4.2 Evaluation of safety margins

Following the completion of site defuelling, there is no longer a requirement for core reactivity control, reactor shutdown, or heat transfer capabilities to be maintained. Nor was there a requirement to ensure the integrity of the ponds was maintained. Therefore the primary concern relating to extreme weather conditions would be associated with containment of radioactive materials in the Radioactive Waste Facilities.

The safety case has not identified a requirement to qualify any of the Radioactive Waste Facilities against extreme weather due to the relatively low consequences that this would have.

4.2.1 Estimation of safety margin against extreme weather conditions

Analysis of potential impact of different extreme weather conditions to the reliable operation of the safety systems, which are essential for heat transfer from the reactor and the spent fuel to ultimate heat sink. Estimation of difference between the design basis conditions and the cliff edge type limits, i.e. limits that would seriously challenge the reliability of heat transfer.

As discussed in Section 4.2, there is no longer a requirement for heat transfer from the reactors or ponds to a heat sink. Therefore this section is not applicable for Hinkley Point 'A' Site.

4.2.2 Potential need to increase robustness of the plant against extreme weather conditions

Consideration of measures, which could be envisaged to increase plant robustness against extreme weather conditions and would enhance plant safety.

Following the completion of site defuelling, no additional measures are considered reasonably practicable to increase the robustness of the site against the extreme weather hazard.

5 Loss of electrical power and loss of ultimate heat sink

For writing chapter 5, it is suggested that detailed systems information given in chapter 1.3. is used as reference and the emphasis is in consecutive measures that could be attempted to provide necessary power supply and decay heat removal from the reactor and from the spent fuel.

Chapter 5 should focus on prevention of severe damage of the reactor and of the spent fuel, including all last resort means and evaluation of time available to prevent severe damage in various circumstances. As opposite, the chapter 6 should focus on mitigation, i.e. the actions to be taken after severe reactor or spent fuel damage as needed to prevent large radioactive releases. Main focus in chapter 6 should thus be in protection of containment integrity.

5.1 Nuclear power reactors

5.1.1 Loss of electrical power

As discussed in Section 1.3.5, following the completion of reactor defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink.

In a prolonged loss of off-site power, unavailability of the Wet and Dry Magnox Vault Ventilation System could lead to the build-up of Hydrogen, potentially giving rise to an explosion. However, the off-site consequences of such an event are not considered to be significant. In addition, long gracetimes exist, and in reality Hydrogen production rates are very low and the design of the Vaults is such that the Hydrogen would tend to disperse even without forced ventilation. Therefore loss of power supply to the installed Ventilation Systems and the absence of an installed back-up power supply is considered to be manageable.

5.1.1.1 Loss of off-site power

5.1.1.1.1 Design provisions taking into account this situation: back-up power sources provided, capacity and preparedness to take them in operation.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement to describe the design provisions for loss of off-site power. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.1.2 Autonomy of the on-site power sources and provisions taken to prolong the time of on-site AC power supply.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement for autonomy of on-site power sources following loss of off-site power. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.2 Loss of off-site power and loss of the ordinary back-up AC power source

5.1.1.2.1 Design provisions taking into account this situation: diverse permanently installed AC power sources and/or means to timely provide other diverse AC power sources, capacity and preparedness to take them in operation.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement to describe the design provisions for loss of off-site power. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.2.2 Battery capacity, duration and possibilities to recharge batteries.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement to describe the design provisions for loss of off-site power. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.3 Loss of off-site power and loss of the ordinary back-up AC power sources, and loss of permanently installed diverse back-up AC power sources

5.1.1.3.1 Battery capacity, duration and possibilities to recharge batteries in this situation

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement to describe the design provisions for loss of off-site power. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.3.2 Actions foreseen to arrange exceptional AC power supply from transportable or dedicated off-site source

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement to arrange for a power supply from an off-site source. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.3.3 Competence of shift staff to make necessary electrical connections and time needed for those actions. Time needed by experts to make the necessary connections.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to the reactors to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore there is no requirement for personnel to make electrical connection to a transportable AC power supply. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.1.3.4 Time available to provide AC power and to restore core cooling before fuel damage: consideration of various examples of time delay from reactor shut down and loss of normal reactor core cooling condition (e.g., start of water loss from the primary circuit).

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to be maintained in the event of loss of power supply to the reactors. Therefore there are no time constraints for provision of a back-up AC power supply to the reactors. Hence this section is not applicable for Hinkley Point 'A' Site.

5.1.2 Measures which can be envisaged to increase robustness of the plant in case of loss of electrical power

As discussed in Section 5.1.1, following the completion of reactor defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control or for heat transfer from the reactor and its containment to a heat sink. Therefore no additional measures are considered necessary to increase the robustness of the site against loss of power supplies. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3 Loss of the ultimate heat sink

As discussed in Section 1.3.2.1, following the completion of reactor defuelling, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.1 Design provisions to prevent the loss of the primary ultimate heat sink

Design provisions to prevent the loss of the primary ultimate heat sink, such as alternative inlets for sea water or systems to protect main water inlet from blocking.

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no requirement to describe the design and operation of the heat transfer capability from the reactors. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.2 Effects of loss of the primary ultimate heat sink

Loss of the primary ultimate heat sink (e.g., loss of access to cooling water from the river, lake or sea, or loss of the main cooling tower).

5.1.3.2.1 Availability of an alternate heat sink

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no requirement to describe the design and operation of the heat transfer capability from the reactors. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.2.2 Possible time constraints for availability of alternate heat sink and possibilities to increase the available time.

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there are no time constraints for availability of an alternate heat sink. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.3 Loss of the primary ultimate heat sink and the alternate heat sink

5.1.3.3.1 External actions foreseen to prevent fuel degradation.

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there are no external actions required for prevention of fuel degradation. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.3.2 Time available to recover one of the lost heat sinks or to initiate external actions and to restore core cooling before fuel damage: consideration of situations with various time delays from reactor shut down to loss of normal reactor core cooling state (e.g., start of water loss from the primary circuit).

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there are no time constraints for restoration of a heat sink and core cooling. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.4 Loss of the primary ultimate heat sink, combined with station black out (i.e. loss of off-site power and ordinary on-site back-up power source).

5.1.3.4.1 Time of autonomy of the site before start of water loss from the primary circuit starts.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to be maintained in the event of loss of power supply to the reactor, and as discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there is no time constraint for prevention of fuel degradation. Hence this section is not applicable for Hinkley Point ‘A’ Site.

5.1.3.4.2 External actions foreseen to prevent fuel degradation.

As discussed in Section 5.1.1, there is no longer a requirement for power supplies to be maintained in the event of loss of power supply to the reactor, and, as discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore there are no external actions required for prevention of fuel degradation. Hence this section is not applicable for Hinkley Point ‘A’ Site

5.1.4 Measures which can be envisaged to increase robustness of the plant in case of loss of ultimate heat sink

As discussed in Section 5.1.3, there is no longer a requirement for heat transfer from the reactors to a heat sink. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

5.2 Spent fuel storage pools

Where relevant, equivalent information is provided for the spent fuel storage pools as explained in chapter 5.1 for nuclear power reactors.

5.2.1 Loss of electrical power

As discussed in Section 1.3.5, following the completion of site defuelling, there is no longer a requirement for power supplies to be maintained in the event of loss of normal supplies to the ponds. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

For information, the back-up power supplies that are available in the event of loss of off-site power supply are described in Section 1.3.5 and Section 1.3.6.

5.2.2 Measures which can be envisaged to increase robustness of the plant in case of loss of electrical power

As discussed in Section 5.2.1, there is no longer a requirement for power supplies to be maintained in the event of a loss of off-site power supply to the ponds. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

5.2.3 Loss of the ultimate heat sink

Following the completion of site defuelling, there is no longer a requirement for a pond cooling or heat sink capability to be retained. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

5.2.4 Measures which can be envisaged to increase robustness of the plant in case of loss of ultimate heat sink

As discussed in Section 5.2.3, there is no longer a requirement for a pond cooling or heat sink capability to be retained. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6 Severe accident management

6.1 Organisation and arrangements of the licensee to manage accidents

Chapter 6.1 should cover organization and management measures for all type of accidents, starting from design basis accidents where the plant can be brought to safe shut down without any significant nuclear fuel damage and up to severe accidents involving core meltdown or damage of the spent nuclear fuel in the storage pool.

6.1.1 Organisation of the licensee to manage the accident

6.1.1.1 Staffing and shift management in normal operation

As Hinkley Point 'A' Site is currently undergoing decommissioning activities, the staffing levels are dependent on the projects being carried out at the time, but are always manned to minimum staffing levels as required by the site's arrangements for core competency and design authority.

6.1.1.2 Plans for strengthening the site organisation for accident management

In the event of an incident at Hinkley 'A' Site, the site will act in accordance with the Emergency Plan which is an approved document produced under License Condition 11 of the Site Licence. It contains the site emergency arrangements and the arrangements for collaboration with external organisations, including the Office for Nuclear Regulation (ONR), the emergency services, local and central government. The on-site arrangements allow for the establishment of an Emergency Control Centre (ECC) staffed by an Emergency Controller, an Assistant Emergency Controller (if available), an Emergency Administration Officer, an Emergency Health Physicist, an Emergency Technical Officer and an Emergency Communications Officer. In addition the Access Control Point (ACP) and an Initial Response Team are established. Members of these teams are on an emergency call-out rota.

6.1.1.3 Measures taken to enable optimum intervention by personnel

The arrangements described in 6.1.1.2 allow for the intervention of suitably qualified and experienced personnel to assess and mitigate emergency situations.

6.1.1.4 Use of off-site technical support for accident management

In the event of a site incident or off-site nuclear emergency being declared the Central Emergency Support Centre (CESC) is set up in Gloucestershire. This dedicated facility is manned by a Controller, a Health Physicist and a Technical Officer each with a support team on a one-hour call out rota.

The CESC Controller has the full backing of the Company to take whatever steps are necessary, including using any resources required, to control the situation. The CESC manages the links to the local and national responding organisations and takes over the management of the off-site survey and the formulation of Company advice. The CESC mobilises and coordinates the resources of the whole Company and cooperation from other nuclear companies.

Other Company sites can also be called upon for assistance. They will provide additional personnel and equipment, including off-site survey teams, 6.1.1.5 Procedures, training and exercises

Training is given to all site personnel with an involvement in the emergency scheme. Exercises are held to demonstrate the site’s arrangements, and the ability of its scheme members.

6.1.2 Possibility to use existing equipment

6.1.2.1 Provisions to use mobile devices (availability of such devices, time to bring them on site and put them in operation)

The Company shares a Beyond Design Basis Accident Container set in a central location in the UK that can be transported to any affected site. These containers are equipped with Command and Control, fire fighting, reactor cooling and contamination control materials.

6.1.2.2 Provisions for and management of supplies (fuel for diesel generators, water, etc.)

As discussed in Sections 1.3.2, 1.3.3 and 1.3.5, there is no longer a requirement to maintain a heat transfer capability or for power supplies to be maintained in the event of loss of off-site power. Therefore there is no requirement to ensure the availability of water, fuel for generators or other supplies. Hence this section is not applicable for Hinkley Point ‘A’ Site.

For information, a local diesel tank provides sufficient capacity to run the SEDG for 10 hours. Additional fuel could be transferred from the site bulk diesel storage tank using a diesel fuel bowser. Sufficient stocks of diesel fuel are maintained available on-site for the SEDG to function for 24 hours without the need for further off-site supply of fuel.

6.1.2.3 Management of radioactive releases, provisions to limit them

Following the completion of site defuelling, the consequences of a radiological release have become less onerous. As such, there are no special provisions necessary to limit them.

6.1.2.4 Communication and information systems (internal and external).

In the event of an accident or natural disaster at a site there is a need to be able to promulgate an alert and then to pass information into and out of the site. Particularly important communications paths are those between the site, the Strategic Coordinating Centre (SCC) (where representatives of off-site organisations involved in incident recovery assemble), the CESC and the responding emergency services.

The Magnox telephone system is designed to be resilient and function through any single point failure. Sites have two telephone exchanges physically separated and connect to the Public Switched Telephone network (PSTN) via diverse routes. Phones in the key response centres are divided between the two exchanges so that failure of an exchange will not leave the room without at least some working phones. The telephone exchanges are connected to robust electrical supplies and have battery back-up.

6.1.3 Evaluation of factors that may impede accident management and respective contingencies

6.1.3.1 Extensive destruction of infrastructure or flooding around the installation that hinders access to the site.

If the normal road-based vehicular access to the site were compromised, it may affect the ability of responding staff and emergency services to reach the site in a timely manner.

The site has sufficient people on site at all times to initiate a response to an emergency (a minimum shift complement of 3). Personnel on shift include a Duly Authorised Person appointed to act as Emergency Controller with authority to respond to an emergency as they see fit.

For Hinkley Point ‘A’ Site, there would be no requirement for a large amount of personnel or equipment to immediately access the site. The most significant issue resulting from the site being cut-off is the evacuation of casualties from the site. However, this would still be possible by air even if the site could not be accessed by the approach road.

6.1.3.2 Loss of communication facilities / systems

The Company has robust communications systems featuring diversity and redundancy. These include:

- A resilient Company Wide Area Network
- Telephones that are independent of the Company exchanges with direct (copper) links to the PSTN
- The Nuclear Industry Airwave Service, designed to allow communication with off-site survey vehicles, which can be used to make phone calls independent of the local PSTN

A total failure of these communications systems is highly unlikely and following the completion of site defuelling the consequence of any event would not be significant.

6.1.3.3 Impairment of work performance due to high local dose rates, radioactive contamination and destruction of some facilities on site

In all exposure conditions including accident response, doses to personnel should be below dose limits and must be ALARP. The role of the Health Physicist in the ECC is to ensure the safety of all people on site.

Staff that are not responding to an accident will be subject to controls based on doserate, airborne contamination levels and other hazards, and may be evacuated from the site.

On-site survey and emergency team staff controlled from the ACP are subject to the normal dose limits but in the event of a major accident higher emergency exposures can be applied to informed volunteers (whole body doses of 100 mSv for operations and 500 mSv for life saving). Health Physics monitoring provides information on the local dose rates allowing response teams to ensure their doses are minimised and Electronic Personal Dosimeters are used to monitor doses and enforce dose limits. If necessary an alternative facility would be nominated and used.

Training is given on the use of appropriate Personal Protective Equipment and undressing/ decontamination processes, and use of these would not prevent appropriate remedial work being undertaken.

In some extreme instances high radiation levels could make access to the damage scene unachievable. If this were the case then remote access or the installation of the appropriate level of shielding would be required. If radiation levels remain high then working time would be limited, which could impair the recovery operation particularly if the operations required are time consuming. Under conditions of high local dose rates, contamination and destruction of some facilities, the Company would be relying on the site Command and Control structures to manage the event making an accurate assessment of the situation and best use of available resource. The function of the ECC could be transferred to other locations on site should the primary facility be declared untenable.

6.1.3.4 Impact on the accessibility and habitability of the main and secondary control rooms, measures to be taken to avoid or manage this situation

Following the completion of site defuelling, there is no longer a requirement for a control capability from the control room to be maintained. In addition, the Duly Authorised Person carries a radio-based plant monitoring system which provides an indication of plant alarms.

6.1.3.5 Impact on the different premises used by the crisis teams or for which access would be necessary for management of the accident.

Key emergency response centres on site are the ECC and ACP. Hinkley Point ‘A’ Site has outline plans on how to cope if the primary facility is unavailable.

For decontamination of returning teams there are a number of options including other shower facilities on site or, in the longer term, use of the emergency services mobile facilities.

6.1.3.6 Feasibility and effectiveness of accident management measures under the conditions of external hazards (earthquakes, floods)

The accident management measures provided at Magnox sites are intended to be flexible. The Duly Authorised Personnel have high levels of authority to utilise any resources available and technical advice is available from off-site facilities.

6.1.3.7 Unavailability of power supply

As discussed in Section 1.3.5, following the completion of site defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee a supply to the Radioactive Waste Facilities.

For information, the back-up power supplies that are available in the event of loss of off-site power supply are described in Section 1.3.5 and Section 1.3.6.

6.1.3.8 Potential failure of instrumentation

Following the completion of site defuelling, there is no longer a requirement for power supplies to be maintained for core reactivity control, heat transfer, or to guarantee a supply to the Radioactive Waste Facilities to support the monitoring of plant conditions.

6.1.3.9 Potential effects from the other neighbouring installations at site.

Arrangements are in place with the adjacent Hinkley Point ‘B’ Site to ensure a coordinated response to incidents which could affect both sites.

6.1.4 Measures which can be envisaged to enhance accident management capabilities

Following the Fukushima event a series of workshops has been held to consider the robustness of the site against internal and external hazards, and to look at the site’s emergency preparedness arrangements. Some areas for consideration were identified and these are currently being assessed. The areas for consideration relevant to this section are given below and summarised in Table 1:-

Consideration HPA 1: Consideration will be given to enhancing the availability of beyond design basis equipment.

Consideration HPA 2: Consideration will be given to providing further equipment to facilitate operator access around the Site.

Consideration HPA 3: Consideration will be given to enhancing on site arrangements for command, control and communications.

Consideration HPA 4: Consideration will be given to updating and enhancing severe accident management guidance.

Consideration HPA 5: Consideration will be given to the fire safety case for ILW storage facilities to identify any appropriate enhancements to the level of resilience.

6.2 Maintaining the containment integrity after occurrence of significant fuel damage (up to core meltdown) in the reactor core

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.1 Elimination of fuel damage / meltdown in high pressure

6.2.1.1 Design provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.1.2 Operational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.2 Management of hydrogen risks inside the containment

6.2.2.1 Design provisions, including consideration of adequacy in view of hydrogen production rate and amount

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

For information, as discussed in Section 5.1.1, Hydrogen is produced in the Wet and Dry Magnox Vaults and could build-up, potentially giving rise to an explosion. However, long gracetimes exist, and in reality Hydrogen production rates are very low. It is not anticipated that Hydrogen production rates would increase significantly as the result of any event.

6.2.2.2 Operational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.3 Prevention of overpressure of the containment

6.2.3.1 Design provisions, including means to restrict radioactive releases if prevention of overpressure requires steam / gas relief from containment

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.3.2 Operational and organisational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.4 Prevention of re-criticality

6.2.4.1 Design provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.4.2 Operational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.5 Prevention of base-mat melt through

6.2.5.1 Potential design arrangements for retention of the corium in the pressure vessel

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.2.5.2 Potential arrangements to cool the corium inside the containment after reactor pressure vessel rupture

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.2.5.3 Cliff edge effects related to time delay between reactor shut down and core meltdown

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.2.6 Need for and supply of electrical AC and DC power and compressed air to equipment used for protecting containment integrity

6.2.6.1 Design provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.2.6.2 Operational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.2.7 Measuring and control instrumentation needed for protecting containment integrity

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.2.8 Measures which can be envisaged to enhance capability to maintain containment integrity after occurrence of severe fuel damage

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.3 Accident management measures to restrict the radioactive releases

6.3.1 Radioactive releases after loss of containment integrity

6.3.1.1 Design provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.3.1.2 Operational provisions

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site.

6.3.2 Accident management after uncovering of the top of fuel in the fuel pool

6.3.2.1 Hydrogen management

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point 'A' Site. Hydrogen production in the vaults is covered in Section 5.1.1.

6.3.2.2 Providing adequate shielding against radiation

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.3.2.3 Restricting releases after severe damage of spent fuel in the fuel storage pools

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.3.2.4 Instrumentation needed to monitor the spent fuel state and to manage the accident

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.3.2.5 Availability and habitability of the control room

As discussed in Section 1.3.1, defuelling of the site was completed in 2010. Therefore this section is not applicable for Hinkley Point ‘A’ Site.

6.3.3 Measures which can be envisaged to enhance capability to restrict radioactive releases

Following the completion of site defuelling, the consequences of a radiological release have become less onerous. Additional measures to enhance the capability of the site to restrict radioactive releases are detailed in Section 6.1.4 and Table 1.

7 Glossary

AC	Alternating Current
ACP	Access Control Point
AETP	Active Effluent Treatment Plant
ALARP	As Low as Reasonably Practicable
AOD	Above Ordnance Datum
CESC	Central Emergency Support Centre
CW	Cooling Water
DBE	Design Basis Earthquake
DBF	Design Basis Flood
DC	Direct Current
ECC	Emergency Control Centre
ENSREG	European Nuclear Safety Regulators Group
ILW	Intermediate Level Waste
LLW	Low Level Waste
MCP	Management Control Procedure
OD	Ordnance Datum (Mean Sea Level in Newlyn in Cornwall UK 1915 - 1921)
ONR	Office for Nuclear Regulation
PGA	Peak Ground Acceleration
PML	Principia Mechanica Limited
PSA	Probabilistic Safety Analysis
PSTN	Public Switched Telephone Network
SCC	Strategic Coordinating Centre
SEDB	Standby Essential Diesel Board
SEDG	Standby Essential Diesel Generator
SSC	Systems, Structures and Components
UPS	Uninterruptible Power Supplies
URS	Uniform Risk Spectrum

Table 1: Considerations Identified for Hinkley Point 'A' Site

No.	Section	Consideration
HPA 1	6.1.4	Consideration will be given to enhancing the availability of beyond design basis equipment.
HPA 2	6.1.4	Consideration will be given to providing further equipment to facilitate operator access around the site.
HPA 3	6.1.4	Consideration will be given to enhancing on site arrangements for command, control and communications.
HPA 4	6.1.4	Consideration will be given to updating and enhancing severe accident management guidance.
HPA 5	6.1.4	Consideration will be given to the fire safety case for ILW storage facilities to identify any appropriate enhancements to the level of resilience.