ENVIRONMENTAL PERMITTING (ENGLAND AND WALES) REGULATIONS 2016

Appeal by NNB Generation Company (HPC) Limited

Water discharge activity at Hinkley Point C, Somerset

Permit variation application relating to acoustic fish deterrent

Reference: EPR/HP3228XT/V004

STATEMENT OF CASE

23 September 2020

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TABLE OF CONTENTS

1. INTRODUCTION

1.1 This Statement of Case is submitted on behalf of NNB Generation Company (HPC) Limited (the "**Appellant**").

1.2 On 15 February 2019 the Appellant submitted to the Environment Agency (the "**EA**") an application to vary the Hinkley Point C Water Discharge Activity Environmental Permit (EPR/HP3228XT ("**WDA Permit**")) (the "**Application**").

1.3 Schedule 5, Part 1, paragraph 15(1) of the Environmental Permitting (England and Wales) Regulations 2016 ("**EPR**") provides that if the EA has not determined an application within the "relevant period", the applicant may serve notice on the EA, and the application is deemed to have been refused on the day on which the notice is served.

1.4 The Appellant served such notice on the EA on 4 August 2020 (**CD Ref L.1**).

1.5 This appeal is therefore submitted in response to the deemed refusal by the EA of the Application.

1.6 This Statement of Case has been prepared in support of the appeal made by the Appellant under Schedule 6 of the EPR.

1.7 There is no technical or legal basis for refusal of the Application, for the reasons summarised in this Statement of Case and to be set out in the Appellant's evidence.

2. THE APPLICATION

2.1 Development consent for the Hinkley Point C project, including two pressurised water reactors of EPR design, was granted by a Development Consent Order (**"DCO"**) under the Planning Act 2008 on 19 March 2013. The project is under construction. The cooling water system for Hinkley Point C is designed to abstract seawater from the Severn Estuary through two intake tunnels extending approximately 3.3km offshore, to use this water to cool the condensers from the cooling circuits of the two nuclear reactors, and to then discharge the water back into the Severn Estuary through a single outfall tunnel.

2.2 The Appellant secured the WDA Permit (**CD Ref I.3**) on 13 March 2013 authorising the discharge of water into the Severn Estuary in connection with this cooling water system.

2.3 One of the features proposed to minimise fish mortality through the operation of the cooling water system was an acoustic fish deterrent system ("**AFD**").

2.4 The Application seeks the removal of those conditions in the WDA Permit (**CD Ref I.3**) requiring the installation and operation of an AFD. The Appellant's Case for Removal of the Requirement to Install an Acoustic Fish Deterrent (**CD Ref B.10**), submitted to the EA with its Application, sets out at Table 1.1 the conditions required to be varied, as follows:

Table 1.1 WDA Permit conditions to be varied

Condition reference	**Condition requirements**	**Proposed variation of WDA Permit condition**
Schedule 1, Table S1.2 - Operating techniques	Requires the operation of the AFD system to be undertaken in accordance with the arrangements provided in response to Question 46 of the Schedule 5 request for further information received by the EA on 29th March 2012	Delete this Operating technique.
Schedule 1, Table S1.2 - Operating techniques:	This requirement will be discharged when the EA has confirmed that the requirements of Pre-operational measure PO8 (in Table S1.4) have been addressed.	Delete reference to AFD in this Operating technique
Commissioning Plan for AFD and FRR Systems		
Schedule 1, Table S1.4 - Pre-operational Measure PO2	Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency a report which includes a completed, as-built description of the plant and infrastructure relevant to the Water Discharge Activity. Note that the report shall take into account the cooling water system in its entirety, including the design of the AFD system and the FRR system.	Remove requirement to provide design information and an as-built description of the AFD system

Schedule 1, Table S1.4 - Pre-operational Measure PO8	Prior to the commencement of the Hot Functional Testing phase of commissioning the operator shall submit to the Environment Agency for approval a Commissioning Plan for the AFD system and the fish recovery and return system. The Plan shall include, but not be restricted to the following: • a description of how the operator intends to optimise the AFD and the FRR systems to minimise impacts upon fish; • details of the monitoring proposed to facilitate optimisation and meet the above objective; • confirmation of the timetable associated with the AFD and FRR system commissioning; • proposals for demonstrating the effectiveness of the optimisation process to the Environment Agency prior to the start of Active Commissioning of Unit 1.	Remove references to the AFD system from PO8

2.5 The Application is supported by:

(A) Application Document setting out the Case for Removal of the Requirement to Install an Acoustic Fish Deterrent (**CD Ref B.10**);

(B) Justification and Supporting Evidence Report (Appendix A to the Case for Removal) (**CD Ref B.8**);

(C) Updated Report to Inform the Habitats Regulations Assessment (**CD Ref B.5**);

(D) Updated Water Framework Compliance Assessment (**CD Ref B.9**);

(E) Report on the Implications for Compliance with the Eels Regulations (**CD Ref B.7**);

(F) Cefas Revised Predictions of Impingement Effects at Hinkley Point C 2019 (the Cefas **"TR456 Report"**) (**CD Ref B.6**);

(G) Summary of Engineering Optioneering Process (**"AFD Optioneering Report"**) (**CD Ref B.4**);

(H) Hinkley Point C Cooling Water Infrastructure Fish Protection Measures: Report to Discharge DCO requirement CW1 (**"CW1 Report"**) (**CD Ref B.3**);

(I) Bureau Veritas Acoustic Fish Deterrent Health and Safety Review (**"Bureau Veritas Report"**, appended to AFD Optioneering Report) (**CD Ref B.4**);

2.6 In response to requests for further information from the EA under Schedule 5 of the EPR dated 16 April 2019 (**CD Ref H.1, H.2**) and 7 October 2019 (**CD Ref H.4, H.5**) the Appellant provided a response to the first request on 28 June 2019 (**CD Ref H.3**) and to the second request on 16 January 2020 and 21 April 2020 (**CD Ref H.7**). All Schedule 5 requests were closed out at the time of serving the notice of deemed refusal (**CD Ref L.1**).

3. THE NECESSITY FOR THE APPLICATION

3.1 Three measures to protect fish were incorporated into the design of the cooling water system for Hinkley Point C as consented by the DCO:

(A) Low velocity side entry intake heads ("**LVSE intake heads**"), at the entrance to the intake tunnels;

(B) A fish recovery and return system ("**FRR system**"); and

(C) An AFD.

3.2 These three measures and their role as part of the cooling water system for Hinkley Point C are described in Chapters 2 and 3 of the Consultation Overview Document (**CD Ref K.1**) which was published in April 2019 to support the proposed variation to the DCO to address the removal of the commitment to install an AFD. The CW1 Report (**CD Ref B.3**) also sets out in more detail the LVSE intake heads and FRR system design. The risks to fish of the cooling water system and the role of the three measures in reducing those risks is summarised below. For ease of reference, a schematic depiction of the cooling water system is provided in Appendix 3.

Overview of the cooling water system

3.3 The cooling water system for Hinkley Point C is designed to abstract seawater from the Severn Estuary through two intake tunnels extending approximately 3.3km offshore, to use this water to cool the closed circuit of water heated by the two nuclear reactors, and to then discharge the water back into the Severn Estuary through a single outfall tunnel of 1.9km in length. The large volume of water required for cooling (approximately 132m^3 per second) means that the intake and outfall tunnels have large internal diameters of approximately 6m and 7m respectively.

The LVSE intake heads

3.4 The LVSE intake heads are located at the entrance to the intake tunnels. Two intake heads will be installed for each intake tunnel. The detailed design of the intake heads has been developed since the issue of the WDA Permit and DCO, and the Appellant is confident that these will be highly effective in reducing entry of fish into the system. The intake heads are large rectangular structures (35.5m long, 10m wide and 2.8m deep) through which the abstracted water must pass before reaching the intake tunnels. The design and location of the LVSE intake heads have been carefully selected to minimise impacts to fish (see Table 3.1 of Consultation Overview Document (**CD Ref K.1**)). These include a design which only abstracts water in a horizontal plane through the sides of the intake heads, low intake velocities and a low cross sectional area facing into the tidal flow.

3.5 The vertical bars of the LVSE intake heads are spaced approximately 30cm apart. Some fish and other organisms will be drawn into the cooling water system through the intake heads, and will be unable to swim out due to the high speed of the water flow (a process referred to as "**entrapment**").

The FRR system

3.6 The cooling water system also encompasses a forebay and pumping station for each intake tunnel, located onshore. The forebay is a large, 29m deep structure that allows the hydraulic energy from the seawater to dissipate before it enters the pumping station. In the pumping station, debris and organisms which pass through the widely spaced bars on the LVSE intake heads will be removed before the water enters the power station cooling water system. This occurs using a further coarse bar screen (the space between these bars is 50mm), fine mesh (5mm) drum screens which protect the main cooling water supply to the steam condensers, and band screens (also 5mm) which protect the rest of the cooling water system. The coarse screens are equipped with time and pressure actuated rakes that will remove larger debris and fish from the bars to a dedicated gutter in the pumping station. Each drum and band screen is fitted with buckets to recover fish and discharge them into a common gutter system for return to the sea. The retention of fish or other

marine organisms on the surface of the filtration screens by the water current (typically including juvenile-adult fish, shrimps and crabs) is referred to as '**impingement**'.

3.7 The FRR system is designed to reduce damage to fish and to optimise survival rates but some fish will not survive their journey through the cooling water system. FRR systems have been reported to achieve 80 to 100% survival rates for robust epibenthic species[1] like sole, and moderate survival rates (50 to 60%) for demersal species[2] like cod and whiting. However, for delicate pelagic species[3] such as herring and sprat survival rates are relatively low (<10%).

3.8 Smaller organisms, which penetrate the 5mm mesh (including fish eggs, larvae and other plankton), will pass through the whole cooling water system (a process referred to as '**entrainment**') and will be discharged back into the Severn Estuary. These small organisms suffer an extremely high rate of natural mortality and the Appellant and the EA agree that the additional mortality caused by entrainment at Hinkley Point C is not significant at population level. The intakes will not be located near to any important fish spawning areas.

Acoustic fish deterrent

3.9 An AFD was intended to assist in reducing fish mortality by deterring those fish which are sensitive to sound from approaching the LVSE intake heads, therefore reducing the number of fish entering the system in the first place. The effectiveness of an AFD system is dependent (among other things) upon the hearing ability of the fish species concerned, which varies significantly. Eels, for example, have no hearing and therefore their entrapment into, and survival through, the cooling water system will be unaffected by whether an AFD is fitted.

3.10 The Appellant is still committed to installing the LSVE intake heads and FRR system at Hinkley Point C, providing two layers of protection to fish.

3.11 However, further work since the granting of the Hinkley Point C DCO has shown that an efficient AFD is extremely difficult to design, and would be very challenging to construct and maintain in the specific environmental conditions of the Severn Estuary.

3.12 Although there are limited examples of AFDs being used at power stations in the UK and around the world, there are no examples of such systems being installed in an offshore environment, or in conditions as harsh as those encountered in the Severn Estuary. Table 5.3 of the Justification and Evidence Report (**CD Ref B.8**) lists examples of AFDs in use, together with a commentary on the environmental conditions prevailing where they are located. This review concluded that AFDs are typically installed near the shoreline within sheltered estuaries or in inland waters (rivers and lakes). AFDs are easier to construct and maintain in such locations, as fewer sound projectors are required and the proximity of the intake to the shore means that the system can be constructed and maintained with limited disruption being caused by weather, water quality and tidal conditions. The EA's own 2019 APEM Evidence Report (**CD Ref C.3**) drew the same conclusion: *"The review found that there are technologies available that can be operated at intakes comparable with the size of nuclear power plants, including acoustic and light based systems in isolation and combined. However, the majority of the studies were carried out at sites in onshore environments with few in offshore environments, in particular with the harsh coastal or estuarine conditions that could be experienced by new UK nuclear plants […]The installation, operation and maintenance of behavioural deterrents in harsh offshore*

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1 **Epibenthic** refers to organisms that live on or just above the bottom sediments in a body of water. These organisms, many of which support commercial and recreational fisheries, tend to forage on the creatures that live in or on the sediments.

2 **Demersal fish** are those which live on, or near to the bottom of lakes or seas. This area of the water is called the Demersal Zone and is the area in which demersal fish both live and feed.

3 **Pelagic fish** are species which live and feed away from the bottom of the sea or lakes and also away from the shore.

environments will therefore be reliant on manufacturer and third party designs and theoretical information" (para 3.1.6).

3.13 At the time that the Appellant made its DCO application for Hinkley Point C a design for an AFD had not been worked up by the Appellant or any other operator around the world in a location similar to that at Hinkley Point C. Experience with AFD systems at other UK nuclear power stations (e.g. Hinkley Point B and Hartlepool) had suggested serious problems in maintaining them intact. It was agreed that detailed design would be carried out by the Appellant following the granting of the DCO. The Appellant therefore undertook an extensive two-year programme to develop a design for an AFD that would work at Hinkley Point C taking into account the following key considerations:

(A) The hearing sensitivity of fish and marine organisms present in the area;

(B) The isolated offshore location. The intake heads will be located in an exposed location which is subject to high wave heights and frequent winter storms. These reduce the windows of time available to construct and maintain an AFD;

(C) The tidal conditions: The Severn Estuary is characterised by a very large tidal range and a short period of 'slack water', when there is no significant movement either way in the tidal stream water.

(D) The tidal range (more than 10m between high and low tide) and fast current velocities (up to 1.8m per second at the intake head locations) mean that the only time available to undertake maintenance safely is approximately 30 to 60 minutes per tide at slack water;

(E) The turbidity of the water within the area of the Hinkley Point C intake heads is extremely high. There are high levels of suspended sediment and underwater visibility is near zero. This presents significant risks and constraints for offshore construction and maintenance activities, particularly for divers; and

(F) The nuclear safety classification of the intake heads. The sound modelling undertaken by HPC confirmed that the sound projectors for an AFD would need to be mounted on or close to the intake heads in order to provide effective fish deterrence. However, as the intake heads provide a function that is safety critical for the operation of the reactors, maintenance of an AFD must not in any way impact on the intake heads' capacity to abstract seawater.

3.14 Reflecting the complexity of these considerations, the optimum design identified by the Appellant (as set out in the AFD Optioneering Report (**CD Ref B.4**)) would require a total of 288 underwater sound projectors (72 projectors per intake head), located along the sides of each intake head. The installation of permanent structures with rails and/or lifting frames to raise the sound projectors out of the water for maintenance was considered but concluded not to be practical. The sound projectors would therefore need to be fixed to sea-bed mounted piled structures and installed/recovered (for maintenance) in clusters by divers.

3.15 The design process therefore identified significant health and safety concerns relating to the construction and maintenance of an AFD at Hinkley Point C (as set out in the Bureau Veritas Report (**CD Ref B.4**)). The harsh marine environment at Hinkley Point and the challenging tidal conditions encountered give rise to risks to human life. Health and safety legislation requires the Appellant to reduce risks to workers to a level that is as low as is reasonably practicable (ALARP). The risks to employees and contractors undertaking installation and maintenance activities, particularly divers, would not be compatible with these requirements.

3.16 These concerns led the Appellant to decide to assess the environmental impacts of operating the cooling water system without an AFD, relying only on the LVSE intake heads and FRR system.

3.17 Work carried out by the Centre for Environment, Fisheries and Aquaculture Science ("**Cefas**"), the Government's fisheries expert body, acting as a consultant to the Appellant,

has demonstrated that without an AFD in place, an increased number of fish will enter the cooling water system and there will be greater fish mortality than if an AFD was deployed. However, the Appellant's case is that this increase does not lead to a significant effect on the populations of any species of fish in the Severn Estuary.

3.18 It is the magnitude of this impact, and its implication for the conclusions of the appropriate assessment **("AA")** required under the Conservation of Habitats and Species Regulations 2017 No. 1012 ("**the HR"**), which forms the substance of the disagreement between the Appellant and the EA and is expected to be the main issue on appeal. If, as the EA appears to argue, adverse impacts on the integrity of the relevant sites under the HR could be caused by the operation of Hinkley Point C without an AFD then as a matter of jurisdiction the variation sought could not be granted by the EA as competent authority under the HR. If on the other hand, as the Appellant contends, it can be shown with the necessary high degree of certainty that such effects will not arise, there is no reason, as suggested by the EA, for the Application to be refused. The grounds of appeal and the case for the Appellant therefore centre on the outcome of the AA and any effects on the integrity of the relevant sites.

4. HISTORY OF ENGAGEMENT WITH THE EA

4.1 The WDA Permit and related DCO and marine licence were granted in 2013 on the basis of assessment work by Cefas, which predicted that with three fish protection measures in place (LVSE intake heads, an FRR system and an AFD) the losses of fish due to operation of the Hinkley Point C cooling water system would be less than 1% of any of the relevant populations. The methodologies of assessment which led to this conclusion were agreed with the EA as part of that process as was the use of 1% as the threshold of significance for concluding an adverse effect on the integrity of the relevant European sites – see excerpt of the EA's original Appropriate Assessment (**CD Ref I.8**).

4.2 The Appellant committed in good faith to install an AFD as part of Hinkley Point C, but as explained in section 3 above, following detailed design work it became apparent it would be neither feasible nor safe to install, operate and maintain, due to the harsh conditions offshore in the Severn Estuary at the location of the intake heads.

4.3 Since the summer of 2017, the Appellant has been engaging with the EA and other members of the Defra family on the proposal to rely on the LVSE intake heads and FRR system and not to install an AFD. Cefas has shared its developing assessments with these bodies through a series of independently chaired technical meetings (Marine Technical Forums).

4.4 Cefas carried out its initial assessment in support of the WDA Permit variation based on the methodologies which had been agreed with the EA for the original WDA Permit application. This assessment suggested that even without the AFD the 1% threshold for loss of fish would not be breached.

4.5 However, as part of the pre-application process the EA challenged the assessment uncertainties and assumptions and asked Cefas to revise the calculations. These further refinements requested by the EA, and the advancement of science and knowledge about the Severn Estuary fish populations in fact led to predictions of impacts which were even lower than set out in the original WDA Permit assessments in 2011 (see comparison in Table 18 of the TR456 Report (**CD Ref B.6**)).

4.6 However, during the process of the EA reviewing Application in draft in 2018 it became clear that the EA were considering alternative ways to challenge the assessment methodology used by Cefas. Unfortunately, despite requests by Cefas, the EA was unwilling to share details of the exact nature of these methodologies or to provide worked examples. This hampered any meaningful technical engagement between the parties. This was disappointing, given the long history of engagement through the Marine Technical Forum during which the use of a radically different methodology from that used for the original WDA Permit application had not been raised.

4.7 Since meaningful progress with the EA was proving difficult, the Appellant decided to submit its Application in February 2019, being confident in Cefas' approach. The EA's policy of limiting engagement with applicants after an application has been submitted has meant that there has been little further information or engagement in relation to the disagreements over methodology since the Application was made.

4.8 In November 2019 the EA provided initial feedback on their Stage 2 appropriate assessment under the HR. They informed the Appellant that they had reached an interim conclusion that they would not be able to conclude that there would be no adverse effect on the integrity of the relevant protected European sites. It was still unclear to the Appellant what new methods the EA was using to draw this conclusion, except that they related to the scaling of impacts on the SAC.

4.9 On 1 April 2020, the EA discussed its interim Habitats Regulations Assessment ("**HRA**") Stage 2 conclusions with the Appellant (that an adverse effect on integrity could not be ruled out) and some of the Technical Briefs on which these conclusions were based. The Appellant agreed at this meeting to provide some worked examples to address the areas of disagreement with the EA. Cefas's SPP106 Alternative Analysis (**CD Ref G.3**) was undertaken for this purpose, and provided to the EA on 20 July 2020. However, feedback

from the EA suggested that nothing in this assessment led them to reconsider the validity of their preferred methodologies and the findings drawn from them.

4.10 The EA has encouraged the Appellant to await the formal conclusion of its Stage 2 appropriate assessment and to then seek a derogation from the Secretary of State pursuant to Regulation 64 of the HR by going through Stages 3 and 4 of the HRA assessment process.

4.11 The process of seeking a derogation under the HR is, rightly, extremely onerous. It is reserved for circumstances where there is a real risk that a project might damage the integrity of some of Europe's most highly prized and protected habitats. Assessment work carried out by Cefas provides robust evidence that there is no reasonable scientific doubt that such damage will occur due to the operation of Hinkley Point C without an AFD. For this reason, the Appellant does not consider seeking a derogation to be necessary or appropriate, and considers that to do so would present real and unacceptable risks to obtaining the necessary authorisations for this nationally significant infrastructure project, which is currently under construction.

4.12 The Appellant has not initiated this appeal lightly. However, after years of engagement with the EA, and the adoption by the EA of a very different methodology at a relatively late stage, which Cefas does not consider scientifically valid, an appeal is considered necessary to resolve the fundamental disagreements between the Appellant and the EA.

5. THE REGULATORY POSITION

Appropriate Assessment under the Habitat Regulations

5.1 The HR require that before making a decision in respect of an environmental permit, or a variation thereto, which *"is likely to have a significant effect on a European site or European offshore marine site (either alone or in combination with other plans or projects)"* the competent authority must make an *"appropriate assessment of the implications of the […] project for that site in view of that site's conservation objectives"* (regulations 101 and 63 HR).

5.2 The HR provide that *"In light of the conclusions of the assessment, and subject to regulation 64, the competent authority may agree to the […] project only after having ascertained that it will not adversely affect the integrity of the European site or European offshore marine site (as the case may be)."* (regulation 63(5)).

5.3 Furthermore: *"In considering whether a plan or project will adversely affect the integrity of the site, the competent authority must have regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which it proposes that the consent, permission or other authorisation should be given."* (regulation 63(6)).

5.4 The threshold for finding no adverse effect on integrity is high: *"… taking account of the appropriate assessment of the implications of the plan or project for the site concerned in the light of the site's conservation objectives, [the competent national authorities] are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects."* (Case C-127/02 Waddenzee, paragraph 59 (**CD Ref M.1**)). Similarly, *"Where doubt remains as to the absence of adverse effects on the integrity of the site linked to the plan or project being considered, the competent authority will have to refuse authorisation"* (Waddenzee, paragraph 57 (**CD Ref M.1**)).

5.5 The ultimate test is the effect on the integrity of the site. Case C-258/11, Peter Sweetman and Others v An Bord Pleanála, paragraph 48 stated: *"Article 6(3) of the Habitats Directive must be interpreted as meaning that a project … will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of SCIs, in accordance with the Directive. The precautionary principle should be applied for the purposes of that appraisal."* (**CD Ref M.2**)

5.6 The logic of such an interpretation is also relevant to non-priority habitat types and to habitats of species.

Relevant Sites and Species

5.7 The Hinkley Point C project is in proximity to a number of European sites protected under the Habitats Directive and the Wild Birds Directive, which brings into play the provisions of those Directives. The most relevant sites are the Severn Estuary Special Area of Conservation ("**SAC**") (designated under the Habitats Directive) and the Severn Estuary Special Protection Area (designated under the Wild Birds Directive). Also relevant is the Severn Estuary Ramsar Site, under the Ramsar Convention on Wetlands of International Importance. Ramsar Sites are accorded, as a matter of government policy, the same level of protection as European Sites. The reasons for designating these sites include the presence of a number of fish species and in the case of the Ramsar Site a fish assemblage.

5.8 In terms of the SAC, the citation refers to "… large populations of migratory fish, including Sea lamprey *Petromyzon marinus*, River lamprey *Lampetra fluviatilis* (both of which spawn in freshwater but complete part of their life cycle in the sea), Twaite shad *Alosa fallax* and the nationally rare and endangered Allis Shad *Alosa alosa*." It is also stated that the site is designated under Article 4(4) of the Habitats Directive as it hosts three species listed in

Annex II: Sea Lamprey *Petromyzon marinus*; River Lamprey *Lampetra fluviatilis*; and Twaite Shad *Alosa fallax*.

5.9 These three qualifying species of fish are referred to in the Conservation Objectives for the SAC, which states that *"… subject to natural change; [to] ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring; … the populations of qualifying species, and the distribution of qualifying species within the site."*

5.10 In terms of the Ramsar Site, criterion 4 refers to the site as being important for the run of migratory fish between sea and river via estuary. Species include Salmon *Salmo salar*, sea trout *S. trutta*, sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis*, allis shad *Alosa alosa*, twaite shad *A. fallax*, and eel *Anguilla anguilla*. Ramsar Criterion 8 states that *"… the fish of the whole estuarine and river system is one of the most diverse in Britain, with over 110 species recorded. Salmon Salmo salar, sea trout S. trutta, sea lamprey Petromyzon marinus, river lamprey Lampetra fluviatilis, allis shad Alosa alosa, twaite shad A. fallax, and eel Anguilla anguilla use the Severn Estuary as a key migration route to their spawning grounds in the many tributaries that flow into the estuary. The site is important as a feeding and nursery ground for many fish species particularly allis shad Alosa alosa and twaite shad A. fallax which feed on mysid shrimps in the salt wedge"*.

6. THE ENVIRONMENT AGENCY'S POSITION

The EA's provisional conclusion

6.1 When determining the original WDA Permit application in 2013, the EA undertook an AA of the implications of the project for the relevant European sites in view of those sites' conservation objectives. The EA, having regard to the package of fish protection measures proposed at that time, including an AFD, which would be required by conditions, was able to conclude that the project would not adversely affect the integrity of the European sites in question.

6.2 AA is also applicable to variations of a permit. Therefore the question for the EA on the variation sought is whether, without an AFD, a conclusion of no adverse effect on integrity can still be made.

6.3 In considering that question, the EA is not confined to considering the information which it had at the time of the initial AA, but can address any relevant changes in information, data, or scientific methodology. This is because an AA is expected to make use of the best information available at the time it is undertaken.

6.4 The EA has not yet shared with the Appellant its Stage 2 HRA. However, the EA had made clear to the Appellant that their Stage 2 HRA is likely to conclude that the risk of an adverse effect to the integrity of the relevant European sites cannot be ruled out, applying the precautionary principle.

6.5 In this section, we explain the EA's position as far as we understand it, pending submission of their statement of case to this appeal. The right to amend or supplement the Appellant's statement to respond to issues raised by the EA is reserved.

Basis of the EA's HRA provisional conclusion

6.6 The EA shared a summary of their HRA provisional conclusions with the Appellant on 28 July 2020 in the form of a document entitled "Table 1 – assessment of Results (Interim) – results of our Quantitative Assessment/summary of provisional HRA conclusions per species" (**CD Ref F.30**). This Table is replicated in Appendix 1 to this statement of case for ease of reference. The fish species which are of concern to the EA in light of their AA are shown in red in that table.

6.7 For those species indicated as of concern to the EA in the Table, the Appellant has extracted data showing (1) the number of 'equivalent adult' fish predicted by the EA to be lost due to the operation of Hinkley Point C annually without an AFD; (2) this figure as a

percentage of the population as measured by the EA (best estimate[4] and worst case estimate figures presented); and (3) the provisional HRA conclusion drawn by the EA based on this analysis.

6.8 The fish losses shown in the EA's Table and summarised below are the total fish losses predicted by the EA to be lost when Hinkley Point C is operating, with the LVSE intake heads and the FRR system in place but without an AFD.

Excerpt from Table 1 - assessment of Results (Interim) – results of our Quantitative Assessment/summary of provisional HRA conclusions per species" (CD Ref F.30)

	Column (1)	Column (2)(a)	Column (2)(b)	Column (3)
Species	**Total no. of equivalent adults lost due to HPC impingement**	**Best estimate – Annual proportional loss from the population due to entrapment**	**Worst case estimate (99th percentile) – Annual proportional loss from the population due to entrapment**	**HRA provisional conclusion**
Marine assemblage species for Severn Estuary SAC and Ramsar				
Whiting	1,708,720 (fish)	9%	23%	We have concerns over the level of impact predicted due to the high losses predicted and the value this species provides in the local ecosystem.
Atlantic cod	302,034 (fish)	22%	36%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population. ICES current advice is zero catch to allow the species to recover.
Atlantic herring	37,549 (fish) 221,128 (larvae)	5%	6%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population. The status of the stock in the Bristol Channel is uncertain and not assessed, but adjacent ICES stocks are considered to be at increased risk of fishing pressures and have a reduced reproductive capacity.
European sea bass	23,626 (fish) 13,129,264 (larvae)	3%	5%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population and the important role it plays in the food web. ICES determine that stock development is decreasing over time and is presently functioning at a reduced reproductive capacity.
European eel	341 (fish)	3%	7%	The European Eel global stock is listed as Critically Endangered. HPC will reduce annual recruitment (via entrainment) and escapement (via

[4] By 'best estimate' the EA mean the ('predicted value result') i.e. the most likely result in their view, rather than the most optimistic result. See TB020 tables, column H.

				impingement) over the 60+ year life of the project, on a measure which is failing its sustainability targets by a long way and is forecast to do so for some time. It is not possible to conclude no adverse effect upon site integrity.
Twaite shad	763 (fish)	0.1%	1%	The twaite shad has experienced a population decline over the last 40 years. Against this background of declining populations, with the feature currently in unfavourable condition, it is considered that these predicted losses could prevent the species from being maintained at, or restored to favourable conservation status or a sustainable level.
Allis shad	23 (fish)	0.9%	8%	The modelled losses at HPC are likely to put further pressure on this small and declining population, while also preventing population recovery. The predicted impact, coupled with the small population size, could prevent the feature from being maintained at, or restored to, favourable conservation status or a sustainable level
Sea lamprey	103 (fish)	0.7%	2%	New information has indicated population may be lower than predicted. Data deficiency limits ability to estimate losses, but the predicted impact, together with paucity of knowledge of local population biology, means we cannot be certain impacts will be below a level that would allow the species to be maintained or restored to favourable conservation status or a sustainable level.
Atlantic salmon	76 (fish)	0.1%	2%	Recent cases (Byelaws/NLOs for England and Wales) have concluded there is currently no exploitable stock of salmon within the Severn Estuary. This is a relatively low predicted impact but when stocks are at such low levels even relatively small numbers of fish are crucial to recovering stocks. The predicted impact could prevent the species from being maintained, or restored to favourable conservation status or a sustainable level.
Individual River assessments – Annex II species				
Twaite shad – River Wye	763 (fish)	0.3%	2%	The twaite shad has experienced a population decline over the last 40 years. Against this background of declining populations, with the feature currently in unfavourable condition, it is considered that these predicted losses could prevent the species from being maintained at, or restored to favourable conservation status or a sustainable level within both these rivers.
Twaite shad – River Usk	763 (fish)	0.5%	4%	
Allis shad – River Wye	23 (fish)	2%	20%	The modelled losses at HPC are likely to put further pressure on this small and declining population, while also preventing population recovery. The predicted impact, coupled with the small

				population size, could prevent the population from being maintained at, or restored to, favourable conservation status or a sustainable level
Atlantic salmon – River Wye	76 (fish)	0.3%	4%	Recent cases (Byelaws/NLOs for England and Wales) have concluded there is currently no exploitable stock of salmon within the Severn Estuary. This is a relatively low predicted impact but when stocks are at such low levels even
Atlantic salmon – River Usk	76 (fish)	0.3%	5%	

6.9 For the reasons set out in the next section, the Appellant disagrees with the EA's analysis of the impacts on fish populations, and disagrees with the EA's HRA provisional conclusions.

7. THE APPELLANT'S CASE

Focus of the Appeal

7.1 From what the Appellant understands of the EA's concerns, these relate to the direct effects of the cooling water system on fish species by increasing mortality through entrainment or impingement. As stated at 6.5 above, the Appellant has accordingly focused this Statement of Case on that issue. However, the Appellant reserves the right to respond and to rely on further documents in the event that this understanding is not borne out by the EA's own statement of case.

7.2 The EA appears to have drawn an 'HRA provisional conclusion' in relation to a number of species that fall outside the SAC citation. This section 7 of the Appellant's Statement of Case summarises the Appellant's disagreement with the EA's assessment methodologies and findings as they relate to a wide range of fish species. However, the test under Reg 63(5) of the HR requires only a conclusion as to whether there would be a significant adverse effect on the integrity of protected sites. The focus of the appeal should therefore be the predicted effects on the relevant Annex II species (being Sea Lamprey, River Lamprey and Twaite Shad), which form the cited reason for the designation of the SAC. Any effects on other fish species should not be relevant to the conclusion of the HRA. Nevertheless, the Appellant reserves its right to respond to any argument the EA may make that predicted losses of uncited fish species could have an effect on integrity under the HR.

Effects predicted by Cefas

7.3 Cefas has undertaken a comprehensive assessment of the effectiveness of the LVSE intake heads and the FRR system (with no AFD) in reducing the number of fish and other organisms entrapped in the abstracted seawater and impinged in the cooling water system.

7.4 This assessment updates the original impingement assessment submitted with the WDA Permit application for Hinkley Point C in 2011, when development of the cooling water system was at an early stage. The 2011 assessment was based on the best available information at that time, but to counter gaps and limitations in the information available, worst case assumptions were used in 2011 to ensure that the findings of the report were not unduly optimistic and did not underestimate effects.

7.5 Since the original WDA Permit application was made, there have been considerable advances in scientific understanding and knowledge of the Severn Estuary fish community. Cefas's TR456 Report (**CD Ref B.6**) gives a comprehensive appraisal of these matters and a detailed assessment of fish impingement at Hinkley Point C.

7.6 The Application sets out the results of the assessment work undertaken by Cefas on the Appellant's behalf. Specifically, the Justification and Evidence Report (**CD Ref B.8**), Cefas TR456 Report (**CD Ref B.6**) and the Updated HRA Report (**CD Ref B.5**) set out the findings of Cefas, and explain why this work has led Cefas to conclude that the operation of the cooling water system, without an AFD, will not adversely affect the integrity of the designated European sites in question.

7.7 The percentage of fish populations affected as assessed by Cefas differs greatly to that assessed by the EA. Cefas assess fish mortality caused by Hinkley Point C in all relevant fish populations as less than 1% (the threshold for adverse effect for HRA purposes used in the original WDA Permit and DCO decisions). Appendix 2 of this Statement of Case replicates 'Table 4.2 Predicted HPC Impingement effects with LVSE intake heads and FRR system fitted as mitigation' at page 29 of the Justification and Evidence Report **(CD Ref B.8).** Importantly, the fish population (SSB[5]) used for the HRA species in carrying out these calculations are the local Severn Estuary populations (favoured as the appropriate baseline population by the EA), rather than the larger ICES populations which Cefas consider more appropriate as a baseline.

[5] Stock spawning biomass

7.8 **'ICES'** refers to the 'International Council for the Exploration of the Sea', which is the international scientific body that advises the EU commission and individual governments on the status of fish stocks and their sustainable exploitation. ICES has been established for more than 100 years and is the scientific authority for assessment of fish stocks in Europe. Fish stock identities are decided after a critical review of all scientific evidence and are subject to peer review when new evidence becomes available. By a considerable margin, fishing is by far the largest contributor to anthropogenic fish mortality for most marine fish species and the assessment methods developed by ICES scientists are both evidence based and at the forefront of fisheries science. The stock identities for each fish species assessed in the TR456 Report are those defined by the ICES.

7.9 However, even on the conservative basis of assessment against local Severn Estuary populations, favoured by the EA, the population impacts on HRA species are shown as ranging only between 0.0043% and 0.166% in Cefas's assessment as set out in Appendix 2. Accordingly, the evidence is clear that there will be no adverse impact on the relevant protected sites by impacting these listed species.

7.10 In contrast, as set out in the Table in section 6 above (and in full at Appendix 1 of this Statement of Case), the EA assess the mortality of some unlisted species caused by Hinkley Point C as up to 36% (see worst case, Atlantic cod).

Differences in assessment methodology

7.11 The three key differences in assessment methodology which Cefas believes have led to this discrepancy between the findings and conclusions drawn by the EA and Cefas are:

(A) Differences in the quantitative assessment of fish mortality;

(B) Differences in the method of adjustment made for juvenile fish to arrive at an Equivalent Adult Value figure **("EAV")**; and

(C) Differences in the assumption made about the area and scale of the population of which the affected fish are members.

7.12 The Appellant's position in relation to each is set out below[6].

(A) Number of fish mortalities: quantitative assessment

7.13 This analysis involves estimating the number of fish which, in the absence of an AFD, would enter the cooling system and would not survive.

7.14 In support of its Application, the Appellant submitted Cefas's TR456 Report (**CD Ref B.6**), to quantify the effects of operation without an AFD.

7.15 As part of the process of considering the Application, the EA produced a number of Technical Briefs. The issue of quantitative assessment is summarised in its Technical Brief TB020 (**CD Ref F.29**). This states that the EA took the model used in the TR456 Report but made various adjustments. The key addition was the inclusion of "entrainment" (meaning fish, larvae and eggs which are drawn into the cooling water system) as well as impingement (fish caught against the 5mm mesh which are then removed by the FRR system). Mortality rates are different for each route, and will also vary between species.

7.16 The process adopted by the EA is shown as Stages 1-5 of Fig. 1 in TB020 (**CD Ref F.29**), which involves scaling and adjusting data from the adjacent (operational) Hinkley Point B power station to take account of differences at Hinkley Point C, and applying an estimated mortality of fish transiting the FRR system. The EA acknowledges uncertainty and

[6] The EA's provisional HRA conclusions (as set out in the Table above (**CD Ref F.30**)) incorporate what Cefas have also identified to be an error in the EA's calculations of the level of reduction of impingement due to the LVSE intake heads design. Cefas has notified the EA of its error but the EA has not responded on this point. The Appellant reserves its position on the right to respond and to rely on further documents should the EA contend that Cefas's calculation of the level of reduction of impingement due to the LVSE intake heads design is incorrect.

unknown factors in this process, applying uncertainty analysis (explained further in its TB013 (**CD Ref F.22**)).

7.17 The Appellant has addressed TB020 in a further document, 'Assessment of Local Effects of HPC on the Hinkley Point Fish Assemblage' (SPP 106, Rev. 03 **'SPP106 Alternative Analysis**') (**CD Ref G.3**)).This document was provided by Cefas as a sense-check to the figures put forward by the EA and is summarised below at paragraphs 7.30 to 7.41. Its focus is on the EA's approach to EAVs and identification of populations, and it does not seek to contest the EA's fish mortality figures directly. However, it does suggest on a common sense basis that the tonnages arrived at by the EA seem incompatible with the recorded effects of Hinkley Point B and the Appellant's case will examine that issue further. It also notes that there may be issues with the EA's approach to FRR mortalities in TB008 (**CD Ref F.14, F.15**). The Appellant reserves its position on the accuracy and reliability of the EA's figures pending sight of the EA's full case and the assumptions underlying it.

(B) Adjustment to account for juvenile fish

7.18 Most fish affected by the cooling water system will be juveniles. Loss of a number of juvenile fish does not have the same impact as loss of the same number of adult fish, because of the high natural mortality of juveniles through disease and predation. It is common ground therefore that numbers of juvenile fish lost must be adjusted to arrive at an EAV of fish lost from the population.

7.19 Cefas has provided a method for calculating EAVs that can be applied to most fish species in most environments, extending the earlier work on EAVs that needed such specific data that EAVs could only be calculated for a handful of species (see Cefas TR383 EAV Metrics paper (**CD Ref G.5**)[7]**.** The EA does not disagree with this approach, indeed this approach is cited in their 2018 report as having advantages over the original approach (**CD Ref C.2**). Furthermore, the EA use the same method for their own calculations – however, they then use what they call an "extension" to account for repeat spawning of fish over several years (Spawner Production Foregone; SPF).

7.20 While the SPF calculation was not originally intended for making risk assessments of this type, the Appellant does not object to the use of the SPF extension per se. However, the Appellant maintains that because SPF is not applied to the baseline stock or fishing assessments it cannot, therefore, be used solely for the impact (impingement) calculations. Either the SPF extension is not used at all or it needs to be applied to both the impact and the baseline (which gives similar, though not the same, results to not using the SPF extension at all).

7.21 The Cefas SPP102 Use of SPF-EAVs For Impingement Assessment (**CD Ref G.1**) suggests three possible flaws in the EA's approach to calculation of EAVs on which the Appellant will elaborate in evidence.

(C) Comparison of mortality as a proportion of population

7.22 It is common ground that the adjusted number of fish losses expressed as EAV should be compared with the population estimate for the relevant species. This may be expressed either in terms of weight in tonnes, which involves applying a mean weight factor for the species, or in the numbers of individuals. Either way, this gives a proportion of the population affected on an annual basis.

7.23 The controversial issue is the population which should be used for the comparison: obviously the wider the area used to assess population, the smaller the proportion will be.

7.24 It is self-evident that the assessment of the impact on species falling within the 'fish assemblage' must relate to the impact on assemblage fish within the SAC/Ramsar sites, not the wider ICES areas. It is the integrity of that component of the SAC which is relevant. Therefore:

[7] This is a Sizewell paper but the underlying method for calculating EAVs as set out in TR383 applies to Hinkley Point C as well.

(A) If it is true (or a matter of reasonable scientific possibility) that fish populations tend to remain within the Severn Estuary, then it would be correct to assess the effect of Hinkley Point C on that local population in order to determine impact.

(B) However, if it is true (beyond reasonable scientific doubt) that the local population in the Severn Estuary in fact moves freely out into the Atlantic and English Channel, and is replenished by fish from those areas, then the correct approach is to assess impact against populations in those wider areas as it is that population which will replenish fish numbers in the Severn Estuary. It would only be if Hinkley Point C was killing fish in sufficient numbers to prevent that wider population replenishing the fish present from time to time in the Severn Estuary that there could be an effect on integrity. That is not contended by the EA.

7.25 A key issue therefore is whether there is reasonable scientific doubt that some species might have localised populations within the Severn Estuary which are independent of, and not replenished by, fish from a wider area. It is the Appellant's position (advised by Cefas) that this is not the case. The EA disagrees.

7.26 In the case of fish in the assemblage category (such as for example cod), Cefas's approach in its TR456 Report was to take figures from internationally recognized fisheries areas. So for cod Cefas took the areas 7e-k, which are a number of blocks from the Severn Estuary south and west, past Ireland and out into the Atlantic, and south and east into the western half of the English Channel.

7.27 The EA in its Technical Brief TB011 considers that this area is too large and takes a revised and much more local stock definition, based on an interpretation of tagging experiments on cod carried out in 2014 (Neat et al) to suggest that populations are more localised.

7.28 Cefas's SPP106 Alternative Analysis (**CD Ref G.3**), para. 1.2.2, points out flaws in the EA's approach, on which the Appellant will elaborate in evidence.

7.29 The alternative approach to assessment set out in SPP106 Alternative Analysis (see paragraphs 7.30 to 7.41 below) suggests that the EA's approach to populations is simply not credible when the effects predicted by the EA for Hinkley Point C are compared with the known effects of Hinkley Point B.

Cefas's SPP106 Alternative Analysis

7.30 In an attempt to resolve the disagreement between the parties, Cefas recently advanced an alternative approach to impact assessment. This analysis does not require information on fish populations (stock areas or SSBs) or EAVs, but is instead based on empirical evidence gathered from monitoring of impingement at Hinkley Point B over a 37 year period.

Reasonableness Tests – Worked Example for Cod

7.31 Cod was chosen by Cefas for the purpose of carrying out a worked example because it has the highest predicted impingement as a percentage of the estimated SSB in the EA's Technical Brief TB020.

7.32 The EA's predicted impacts on cod were scrutinised by Cefas from the perspective of two different 'reasonableness tests.'

7.33 First, the SPP106 Alternative Analysis (**CD Ref G.3**) explains that if it were correct (as the EA suggests) that 22% of adult cod will be killed annually by the Hinkley Point C, then fish mortality caused by Hinkley Point B over the years of its operation would have been 10.7% of the SSB annually. This would have caused cod stocks to crash in the Severn Estuary – something which has not been borne out by the Hinkley Point B impingement data. In fact, the opposite has occurred: the Hinkley Point B impingement numbers have shown a significant positive trend over the period when Hinkley Point B has been operational.

7.34 Secondly, the SPP106 Alternative Analysis (**CD Ref G.3**) compares the EA's predictions with commercial fleet catch data. The annual level of cod killed by Hinkley Point C

according to EA figures would be equivalent to over 9 trawlers operating 24hrs a day, 365 days a year. Given the relative size of the intercept area of Hinkley Point C's LVSE intake heads (approx.31m^2), as compared with intercept areas for a single trawler (which would be 3 to 8 times greater), it is not credible that Hinkley Point C could kill cod in the numbers suggested by the EA's figures.

The effect of Hinkley Point B ceasing to operate

7.35 The effect of Hinkley Point B[8] ceasing to operate was not a factor taken into account in the TR456 Report.

7.36 The SPP106 Alternative Analysis (**CD Ref G.3**), however, considers the net effect on fish species of Hinkley Point B ceasing to operate when Hinkley Point C[9] commences operations.

7.37 It compares estimated losses for 21 fish species from Hinkley Point C, with those actually recorded at Hinkley Point B (over a 37 year period of monitoring), adjusted to address the additional mitigation measures at Hinkley Point C which are not fitted at Hinkley Point B (LVSE intake heads, capped intakes, and FRR system).

7.38 This analysis suggests that given the closure of Hinkley Point B before Hinkley Point C becomes operational, the only species for which losses increase compared with the current position are largely demersal species (whiting, cod, mullet, bass, thornback ray, blue whiting, salmon, and sea trout using the EA's estimated FRR mortality rates, plus flounder and plaice if Cefas's FRR mortality rates are applied). Using the EA's mortality rates as set out in TB008 (**CD Ref F.14, F.15**), the analysis shows that there will be no net increase in effects on the HRA or Ramsar designated species (twaite shad, allis shad, eel, marine lamprey and river lamprey).

The effect of the closure of Hinkley Point A

7.39 The SPP106 Alternative Analysis (**CD Ref G.3**) also looks at impingement data before and after closure of Hinkley Point A[10] in 2000. This suggests that fish stocks are not sensitive to a change of 44 cumecs abstraction (the Hinkley Point A abstraction rate).

7.40 If fish populations were adversely affected by such abstraction, then a bounce back of populations would have been expected once Hinkley Point A ceased operation. However, impingement data from Hinkley Point B before and after closure of Hinkley Point A did not show such an effect.

7.41 Comparing the effect of Hinkley Point C with that of Hinkley Point A and Hinkley Point B when both were operational suggests that only salmon and sea trout would show an increase in impingement pressure. Putting this in perspective, the data show that sea trout impingement at Hinkley Point has been extremely rare (only one fish caught during the 37 year impingement record at Hinkley Point B). For salmon only three adult fish were caught over the 37 years of monitoring, which were adults returning to sea after spawning. This supports a conclusion that any impact on these species would be negligible in terms of sustainability.

8 Hinkley Point B abstracts 33.7 cubic metres of water per second, and is not fitted with any fish protection measures as part of its cooling water infrastructure

9 Hinkley Point C will abstract 131.86 cubic metres of water per second, but with a highly effective FRR system and LVSE intake heads described at paras. 3.4-3.8 of this Statement of Case.

10 Hinkley Point A abstracted 44 cubic meters of water per second, and was not fitted with any fish protection measures as part of its cooling water infrastructure

8. CONCLUSION

8.1 The Appellant's evidence will demonstrate that there is no reasonable scientific basis on which to conclude that operation of Hinkley Point C without an AFD would have an adverse impact on the integrity of the relevant European sites.

8.2 On this basis, the Appellant submits that the requested variation to the WDA Permit should be granted.

HERBERT SMITH FREEHILLS

9. LIST OF DOCUMENTS

Document	CD Ref
CW1 Report to Discharge DCO Requirement CW1 and Marine Licence Condition 5.2.31 (NNB-209-REP-001030) dated March 2016	B.3
Report Summarising the Engineering Optionneering Process (NNB-308-REP-000710) dated 11 February 2019 (including Bureau Veritas Report as appendix)	B.4
Updated Report to Inform Habitats Regulations Assessment (NNB-308-REP-000722) dated 6 February 2019	B.5
TR456 Revised Predictions Cefas (HPC-DEV024-XX-000-RET-100031) dated 8 February 2019	B.6
Report on the Implications for Compliance with the Eels Regulations (NNB-308-REP-000746) dated 12 February 2019	B.7
Justification and Supporting Evidence Report (NNB-308-REP-000724) dated 12 February 2019	B.8
Updated Water Framework Directive Compliance Assessment (NNB-308-REP-000725) dated 13 February 2019	B.9
Application Document setting out the Case for Removal of the Requirement to Install an Acoustic Fish Deterrent (NNB-308-REP-000721) dated 13 February 2019	B.10
EA Evidence Report – Protection of Biota from Cooling Water Intakes at Nuclear Power Stations: Scoping Study dated August 2018	C.2
Environment Agency/APEM Evidence Report "Nuclear power station cooling waters: evidence on 3 aspects" dated April 2019	C.3
TB008 - FRR Mortality Rates - Draft-04	F.14
TB008 - Supporting Calculations - Draft-04	F.15
TB013 - Uncertainty Analysis Report - Draft-04	F.22
TB020 – Summary Technical Brief: Summary of Quantiative Impact Assessment Results - Draft 3	F.29
Updated summary of HPC cooling water system impacts on fish species TB020	F.30
SPP102 Use of Spawning Production Foregone EAVs for Impingement Assessment DATED 29 April 2020	G.1
SPP106 Assessment of Local Effects of HPC on Hinkley Point Fish Assemblages dated 20 July 2020	G.3
TR383 – Sizewell EAV metrics dated 31 July 2020	G.5
Schedule 5 Request No.1 – Notice dated 16 April 2019	H.1

Schedule 5 Request No.1 – letter dated 16 April 2019	H.2
TR493 Effect of not fitting AFD system on HPC FRR (Response) dated 28 June 2019	H.3
Schedule 5 Request No.2 – Notice dated 7 October 2019	H.4
Schedule 5 Request No.2 – letter dated 7 October 2019	H.5
Updated TR515 HPC Water quality effects of FRR discharges (Response) dated 21 April 2020	H.7
HPC Water Discharge Permit (EPR/HP3228XT) dated 13 March 2013	I.3
EA's original Appropriate Assessment for HPC dated March 2013 (excerpt)	I.8
Consultation Overview Document dated April 2019	K.1
Letter from HPC to EA – notice of deemed refusal dated 4 August 2020	L.1
Case C-127/02 Waddenzee dated 7 September 2004	M.1
Case C-258/11 Sweetman dated 11 April 2013	M.2

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APPENDIX 1

ENVIRONMENT AGENCY'S HRA PROVISIONAL CONCLUSIONS (CD Ref F.30)

HERBERT SMITH FREEHILLS

Table 1 - Assessment Results (Interim) - results of our Quantitative Impact Assessment/summary of provisional HRA conclusions per species

	A	B	C	D	E	F	G	H		
Species	**No. of fish lost due to HPC Impingement**	**No. of fish lost due to HPC Entrainment**	**No. of equivalent adults lost due to HPC Impingement**	**No. of equivalent adults lost due to HPC Entrainment**	**Total No. of equivalent adults lost due to HPC Entrapment**	**Total Tonnes of equivalent adults lost due to HPC Entrapment**	**Population Unit** SSB(tonnes) / *Fishery (tonnes)*/ **number of fish**	**Annual proportional loss from the population due to HPC entrapment** (key result considered in HRA)		**HRA provisional Conclusion** (brief summary of provisional conclusion, based on quantitative assessment and qualitative narrative. The full assessment to be provided within HRA once finalised)
								Predicted value (best estimate)	95th %ile / **99th %ile** value (worst case estimate)	
Marine assemblage species for Severn Estuary SAC and Ramsar										Species listed below are considered both quantitatively and qualitatively and the wider marine assemblage is considered by narrative
European sprat	1,322,637 (fish) 3,557,152 (larvae)	3,557,152 (larvae)	3,482,256	124,500	3,606,756	55.90	7,704	0.7%	1%	Predicted impact considered not of concern within the marine assemblage due to the healthy abundance of this species.
Whiting	1,708,720 (fish)		662,984		662,984	197.57	2,179	9%	23%	We have concerns over the level of impact predicted due to the high losses predicted and the value this species provides in the local ecosystem.
Dover sole	157,565 (fish) 324,176 (larvae)	1,106,693 (larvae) 991,212 (eggs)	170,362	0.02	170,362	60.14	809	7%	11%	Predicted impact considered not of concern within the marine assemblage due to healthy local population trends.
Atlantic cod	302,034 (fish)		51,648		51,648	245.12	1,118	22%	36%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population. ICES current advice is zero catch to allow the species to recover.
Atlantic herring	37,549 (fish) 221,128 (larvae)	193,487 (larvae)	114,464	267	114,731	7.46	*157*	5%	6%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population. The status of the stock in the Bristol Channel is uncertain and not assessed, but adjacent ICES stocks are considered to be at increased risk of fishing pressures and have a reduced reproductive capacity.
European seabass	23,626 (fish) 13,129,264(larvae)	6,108,346 (larvae) 9,456,586 (eggs)	14,401	0.0001	14,401	16.17	565	3%	5%	We have concerns over the level of impact predicted due to the concerns of the sustainability of the local and wider population and the important role it plays in the food web. ICES determine that stock development is decreasing over time and is presently functioning at a reduced reproductive capacity.
European plaice	1,446 (fish) 550,129 (larvae)	1,300,201 (larvae)	16,630	15	16,646	5.33	1,332	0.4%	0.3%	Predicted impact considered not of concern due to the very low impact levels predicted and abundance of this species.
Thornback ray	2,358 (fish)		1,457		1,457	4.78	*122*	4%	5%	Predicted impact considered not of concern within the marine assemblage due to healthy local population trends.
Blue whiting	7,375 (fish)		2,862		2,862	0.39	514,008	0.0001%	0.0001%	Predicted impact considered not of concern due to the very low impact levels predicted and abundance of this species.

Migratory assemblage and/or Annex II species for Severn Estuary SAC and Ramsar										
European Eel	341 (fish)	538,346 (glass eel)	341	32,398	33,739	Ent: 10,657 Imp:0.112	331.248 (entrainment assessment) 213.709 (impingement assessment)	3%	**7%**	The European Eel global stock is listed as Critically Endangered. HPC will reduce annual recruitment (via entrainment) and escapement (via impingement) over the 60+ year life of the project, on a measure which is failing its sustainability targets by a long way and is forecast to do so for some time. It is not possible to conclude no adverse effect upon site integrity.
Twaite shad	763 (fish)		117		117		**86,696**	0.1%	**1%**	The twaite shad has experienced a population decline over the last 40 years. Against this background of declining populations, with the feature currently in unfavourable condition, it is considered that these predicted losses could prevent the species from being maintained at, or restored to favourable conservation status or a sustainable level.
Allis shad	23 (fish)		9		9		**1,083**	0.9%	**8%**	The modelled losses at HPC are likely to put further pressure on this small and declining population, while also preventing population recovery. The predicted impact, coupled with the small population size, could prevent the feature from being maintained at, or restored to, favourable conservation status or a sustainable level
Sea lamprey	103 (fish)		103		103		**15,269**	0.7%	**2%**	New information has indicated population may be lower than predicted. Data deficiency limits ability to estimate losses, but the predicted impact, together with paucity of knowledge of local population biology, means we cannot be certain impacts will be below a level that would allow the species to be maintained or restored to favourable conservation status or a sustainable level.
River lamprey	20 (fish)		20		20		**116,109**	0.02%	**0.04%**	The predicted impact levels are not considered to prevent the species from being maintained, or restored to a sustainable level. This is due to a low level of impact predicted and the healthy status of the population.
Atlantic salmon	76 (fish)		17		17		**17,616**	0.1%	**2%**	Recent cases (Byelaws/NLOs for England and Wales) have concluded there is currently no exploitable stock of salmon within the Severn Estuary. This is a relatively low predicted impact but when stocks are at such low levels even relatively small numbers of fish are crucial to recovering stocks. The predicted impact could prevent the species from being maintained, or restored to favourable conservation status or a sustainable level.

Sea trout	8 (fish)		8		8		**8,750**	0.1%	**0.4%**	Predicted impact currently not considered to be at a level that would prevent the population being maintained or restored at a population level
Individual River Assessments - Annex II species										
Twaite shad - River Wye	763 (fish)		117		117		**43,348**	0.3%	**2%**	The twaite shad has experienced a population decline over the last 40 years. Against this background of declining populations, with the feature currently in unfavourable condition, it is considered that these predicted losses could prevent the species from being maintained at, or restored to favourable conservation status or a sustainable level within both these rivers.
Twaite shad - River Usk	763 (fish)		117		117		**21,674**	0.5%	**4%**	
Allis shad - River Wye	23 (fish)		9		9		**433**	2%	**20%**	The modelled losses at HPC are likely to put further pressure on this small and declining population, while also preventing population recovery. The predicted impact, coupled with the small population size, could prevent the population from being maintained at, or restored to, favourable conservation status or a sustainable level
Atlantic salmon - River Wye	76 (fish)		17		17		**5,890**	0.3%	**4%**	Recent cases (Byelaws/NLOs for England and Wales) have concluded there is currently no exploitable stock of salmon within the Severn Estuary. This is a relatively low predicted impact but when stocks are at such low levels even relatively small numbers of fish are crucial to recovering stocks. The predicted impact could prevent the population from being maintained, or restored to favourable conservation status or a sustainable level within both these rivers.
Atlantic salmon - River Usk	76 (fish)		17		17		**6,269**	0.3%	**5%**	
NB lamprey species population considered at estuary level therefore no separate quantitative results for individual rivers, however they will be consider as Annex II species for River Wye and Usk within the HRA										

HERBERT SMITH FREEHILLS

APPENDIX 2

CEFAS's PREDICTED EFFECTS OF IMPINGEMENT AT HINKLEY POINT C

Page 29 – Justification and Evidence Report (CD Ref B.8)

Table 4.2 Predicted HPC Impingement Effects with LVSE intake heads and FRR system fitted as mitigation

Common Name	*Species*	Mean effect	Upper 95%ile effect	Impingement indicator
Sprat	*Sprattus sprattus*	0.016% (from RIMP data)	0.043%	PELTIC SSB for 2013- 2016
Whiting[4]	*Merlangius merlangus*	0.038%	0.072%	SSB for 2009
Sole, Dover[4]	*Solea solea*	0.069%	0.140%	SSB for 2009
Cod[4]	*Gadus morhua*	0.054%	0.119%	SSB for 2009
Mullet, thin lipped grey	*Liza ramada*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Flounder	*Platichthys flesus*	Population trend increasing. Negligible effect predicted		RIMP trend analysis
Five-bearded rockling	*Ciliata mustela*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Herring[4]	*Clupea harengus*	0.050%	0.081%	International catch for 2009
Sand Goby	*Pomatoschistus minutus*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis
Bass	*Dicentrarchus labrax*	0.011%	0.013%	SSB for 2009
Plaice	*Pleuronectes platessa*	0.002%	0.005%	SSB for 2009
Ray, Thornback	*Raja clavata*	0.118%	0.194%	International catch for 2009 + Cefas discard estimate.
Whiting, Blue	*Micromesistius poutassou*	0.000%	0.000%	SSB for 2009
Eel	*Anguilla*	0.043%	0.084%	Independent stock estimate[1]
Shad, Twaite	*Alosa fallax*	0.0026% (from RIMP data)[3]	0.0043%	Independent stock estimate[1]
Shad, Allis	*Alosa alosa*	0.017%	0.053%	Independent stock estimate[2]
Lamprey, Marine	*Petromyzon marinus*	0.078%	0.166%	Independent stock estimate[1]
Lamprey, River	*Lampetra fluviatalis*	0.008%	0.021%	Independent stock estimate[1]
Salmon	*Salmo salar*	Less than 0.0086%. From RIMP data.	Less than 0.020%	EA/NRW estimates
Sea trout	*Salmo trutta*	Less than 0.0054%. From RIMP data.	Less than 0.04%	Extrapolated from rod catch for 2012-2016
Brown shrimp	*Crangon crangon*	Population trend increasing. Negligible effect predicted.		RIMP trend analysis

Notes:

1. Appendix G (TR456 Cefas, 2019a).
2. BEEMS SPP071 edition 3 (Cefas, 2019b).
3. 50th percentile impingement effect from SPP071 edition 3 (Cefas, 2019b).
4. Corrected by results of interannual variability analyses

APPENDIX 3

SCHEMATIC DRAWING OF THE COOLING WATER SYSTEM AND FISH PROTECTION MEASURES CONSENTED FOR HINKLEY POINT C

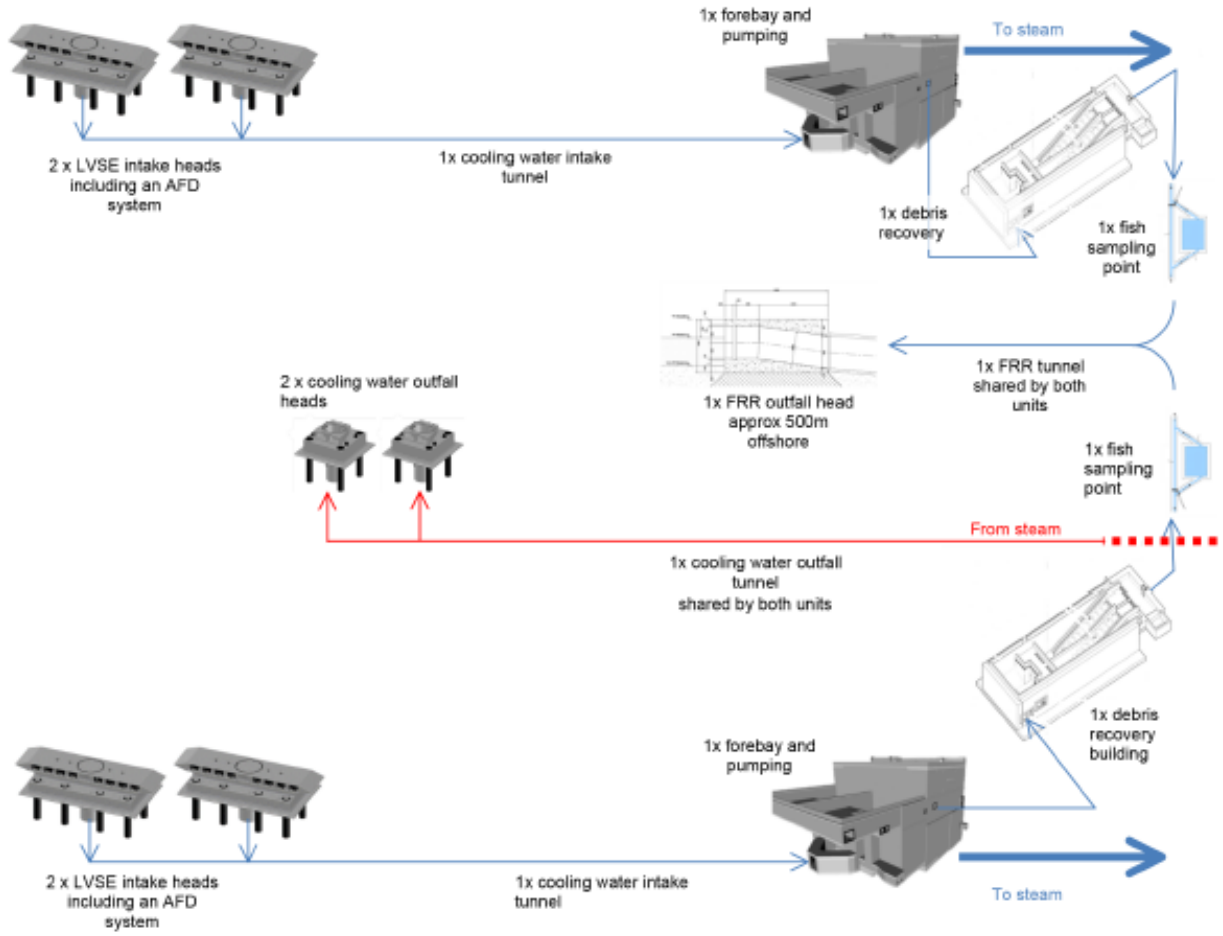

Figure 3.1: Schematic of cooling water system and fish protection measures consented by the HPC DCO