NNB GENERATION COMPANY (HPC) LIMITED

HINKLEY POINT C PROJECT

CASE FOR REMOVAL OF THE REQUIREMENT TO INSTALL AN ACOUSTIC FISH DETERRENT

Implications for Compliance with the Eels Regulations

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ACRONYMS

The following acronyms will be used in the report.

Acronym	Meaning
AFD	Acoustic fish deterrent
Cefas	The Centre for Environment, Fisheries and Aquaculture Science
CWS	Cooling water system
Defra	Department for Environment, Food and Rural Affairs
DCO	Development consent order
EC	European Community
FRR	Fish Recovery and Return
HPC	Hinkley Point C Power Station
HRA	Habitats Regulations assessment
ICES	International Council for the Exploration of the Sea
IUCN	International Union for Conservation of Nature
LVSE	Low velocity side entry
MHWS	Mean high water of spring tides
MMO	Marine Management Organisation
NNB GenCo	NNB Generation Company
PINS	The Planning Inspectorate
RBD	River basin district
SoS	Secretary of State
WDA	Water discharge activity
WFD	Water Framework Directive

1 INTRODUCTION TO THE EELS REPORT

1.1 Background

1.1.1 On 31 October 2011, NNB Generation Company Limited (Company number 06937084), part of EDF Energy and referred to within this document as “NNB GenCo”, made an application to the Secretary of State (“SoS”) under section 37 of the Planning Act 2008 (the 'Planning Act') for a development consent order (DCO) for a new nuclear power station at Hinkley Point, Somerset known as Hinkley Point C ('HPC').

1.1.1 The DCO application was granted by the SoS pursuant to the *Hinkley Point C (Nuclear Generating Station) Order 2013* made on 18 March 2013 (S.I. 2013 No. 648) (as amended) which came into force on 9 April 2013. Throughout this document, the development consent order is referred to as “the DCO” and the new nuclear build project at HPC is referred to as “the Project”.

1.1.2 Marine licences have been granted for the Project by the Marine Management Organisation (MMO) on behalf of the Secretary of State for carrying on activities associated with the Project for which a licence is required under Part 4 of the Marine and Coastal Access Act 2009. The marine licences granted cover the following works lying below mean high water of spring tides (MHWS):

- marine licence L/2012/00244 covering construction activities below MHWS for the which is proposed to facilitate the delivery by sea of bulk materials to be used in the construction of the Project (granted 23 July 2012);
- marine licence L/2012/00245 covering dredging of the berth pocket for the HPC jetty development (granted 23 July 2012); and
- marine licence L/2013/00178/4 covering construction of components of the CWS below MHWS, works to sea walls and Combwich Wharf refurbishment and extension (last variation granted 17 August 2017).

1.1.3 A water discharge activity (WDA) permit (EPR/HP3228XT) was granted by the Environment Agency on 13th March 2013 to carry on a water discharge activity during the operational phase of HPC pursuant to *The Environmental Permitting (England and Wales) Regulations 2010* (S.I. 2010 No. 675) (since replaced by S.I. 2016 No. 1154).

1.1.4 Since the DCO was made, detailed design of the impingement mitigation systems has been undertaken by NNB GenCo and its engineering contractors. The planned low velocity side entry (LVSE) intake heads and fish recovery and return (FRR) systems, for the drum screens (main cooling water system (CWS)) and the band screens (associated with the essential and auxiliary CWS), have been successfully incorporated into the final design. However, the proposed AFD system has caused significant technical, operational and health and safety concerns.

1.1.5 NNB GenCo carried out an extensive optioneering and design programme over a two-year period with the aim to develop an AFD system that was optimised to provide sufficiently robust technology to operate in the challenging environmental conditions found at Hinkley Point. This detailed design phase found that the AFD system would be

extremely complex to construct and to maintain with offshore maintenance operations restricted to narrow tidal windows and subject to lengthy periods of weather downtime. An assessment of the risks involved with such an operational system has concluded that the risks to maintenance staff would be unacceptable.

1.1.6 Given the safety and technical challenges associated with installation and maintenance of an AFD system in this location, NNB GenCo have concluded that there is a need to consider what the effects of not fitting the AFD system would be on the acceptability of the intake system in relation to effects on fish.

1.1.7 Of the permissions described above, the DCO, marine licence L/2013/00178/4 and the WDA Permit all include reference to provision of AFD systems at the cooling water intakes. These permissions will therefore require amendment to accommodate the revised design of the intake systems that does not incorporate AFD systems.

1.1.8 To obtain the necessary permissions for the revised design of the cooling water intakes without AFD systems, applications will be submitted in parallel for:

- an amendment to the development consent order (DCO) made by the Secretary of State (The Hinkley Point C (Nuclear Generating Station) Order 2013: S.I. 2013:248 (as amended)), authorising construction of HPC;
- a variation of the marine licence covering construction of components of the CWS lying below mean high water of spring tides (MHWS) (licence number L/2013/00178/4); and
- a variation of the WDA Permit (reference EPR/HP3228XT).

1.1.9 This report examines the effects on compliance with the regulatory regime established specifically to protect European eel (*Anguilla anguilla*) and is relevant to all three applications listed in paragraph 1.1.8.

1.2 The Eels Regulations

1.2.1 European *Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel* requires preparation of eel management plans, which have been prepared in the UK based on river basin districts (RBD) established under the Water Framework Directive (EC/2000/60).

1.2.2 In support of the measures required by Regulation EC/1100/2007, among other measures, *The Eels (England & Wales) Regulations 2009* (S.I. 2009 No. 3344) (as amended) (the 'Eels Regulations') impose requirements for protection of eels at water abstractions. These are relevant to the CWS intake systems proposed at HPC.

1.3 The Purpose of this Report

1.3.1 **Scope of the report**

1.3.2 This report provides supporting information on compliance with *The Eels (England and Wales) Regulations 2009* and the relevant eel management plans for submission as supporting information with each of the applications for amendment of the DCO, variation of marine licence L/2013/00178/4 and variation of the operational WDA Permit EPR/HP3228XT.

1.3.3 The report is specific to addressing the effects of implementation of a cooling water abstraction system not incorporating AFD on compliance with the Eels Regulations and Eel Management Plans. Other aspects regarding potential effects on eels are covered by other supporting reports.

1.3.4 **Other supporting reports**

1.3.5 Potential effects of the removal of the AFD systems from the HPC design on eels as an interest feature contributing to the integrity of the Severn Estuary/Môr Hafren Ramsar site and as a contributor to the estuaries interest feature of the Severn Estuary/Môr Hafren Special Area of Conservation are considered in the Habitats Regulations Assessment (HRA) report prepared to accompany all three applications.

1.3.6 Potential effects of a cooling water abstraction system without AFD on eel populations generally are addressed in TR456 (Cefas, 2018). These effects are discussed in the revised marine ecology chapter of the environmental statement, which will accompany the application for an amendment to the DCO and the application for variation of the marine licence, and in Appendix A of the WDA Permit variation application supporting report.

2 PROJECT DESIGN

2.1 Hinkley Point C Power Station

2.1.1 HPC is a new nuclear power station, comprising two pressurised water reactors and associated infrastructure for the generation of electricity at Hinkley Point, Somerset. The Project refers to the power station itself, along with associated developments, which are necessary for its construction and operation.

2.1.2 The new nuclear power station will comprise two UKEPR™ Units that will operate for 60 years, each with the capacity to produce 1650MW(e). The new station (the 'C' station) will be the third nuclear power station to be built at Hinkley Point and will be built immediately to the west of the existing 'A' station (which is now being decommissioned), which itself lies to the west of the 'B' station (still in operation).

2.1.3 Chapters 2, 3 and 4 of volume two of the original environmental statement, submitted to the Planning Inspectorate (PINS) with the initial DCO application, contain a full description of the construction and operation of HPC. The sections below outline the material changes proposed to the design of the CWS; from those presented during the examination of the DCO application and considered in relation to the original applications for marine licence L/2013/00178/4 and WDA Permit EPR/HP3228XT.

2.2 Cooling water system (CWS)

2.2.1 A brief outline of the design and location of the cooling water intakes can be found below. Full details are found within the CW1 report (NNB GenCo, 2017).

2.2.2 HPC will be 'direct-cooled', that is, it will abstract water from the sea in Bridgwater Bay to cool its steam condensers (and other heat exchangers), before returning that same water back into Bridgwater Bay at an elevated temperature of 11.8°C higher than at the intake. In order to abstract the combined (mean[1]) water flow of 132 m^3/s required to provide cooling water to both Units, a system of cooling water tunnels will extend out under the seabed into Bridgwater Bay, before linking to the sea via vertical shafts and associated headworks. The intake head design is a LVSE intake situated approximately 1 m above the sediment level of the seabed.

2.2.3 As part of the design of the CWS abstraction system, an FRR system will be provided, which will include a tunnel extending approximately 600 m under the foreshore, to return impinged fish back to the sea.

2.2.1 **Figure 2.1** and **Figure 2.2** below provide a schematic design of the CWS proposed at HPC and details of various components. **Figure 2.3** shows the location of the intake headworks and tunnels

[1] Abstraction rate varies according to tidal state, with abstraction rates fluctuating between 126 – 140 m^3/s.

Figure 2.1 Overall schematic of the CWS and FRR system

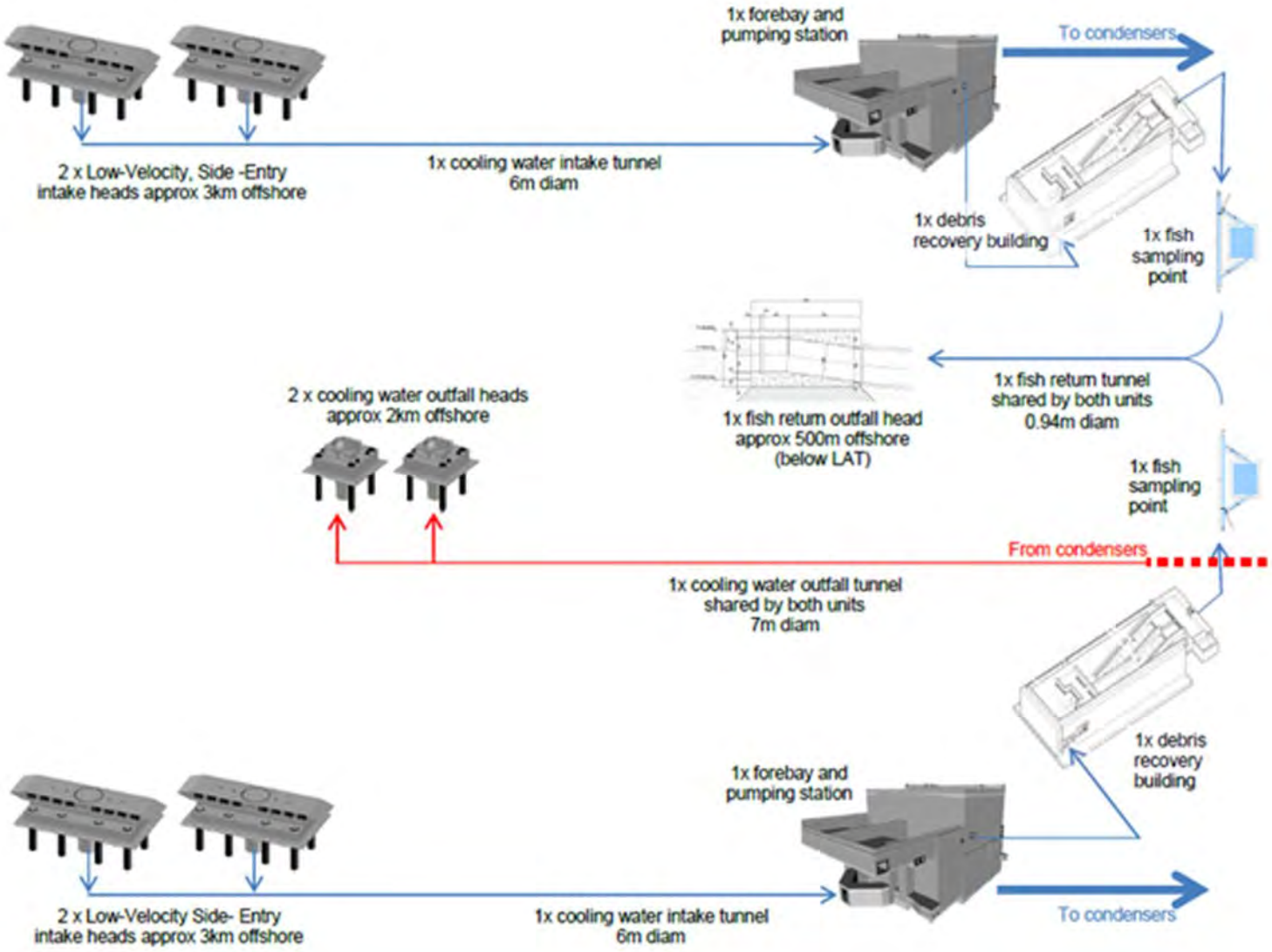
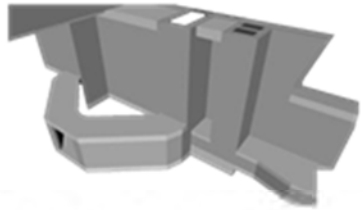
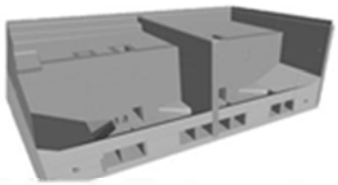


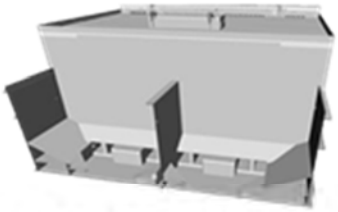
Figure 2.2 Overall schematic of forebay and cooling water pump house



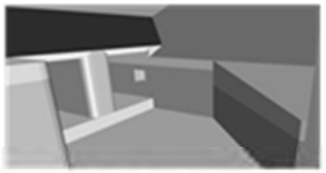
1) Intake tunnel terminates splitting flow into two halves.



2) Two halves of forebay (looking back to tunnel exit).

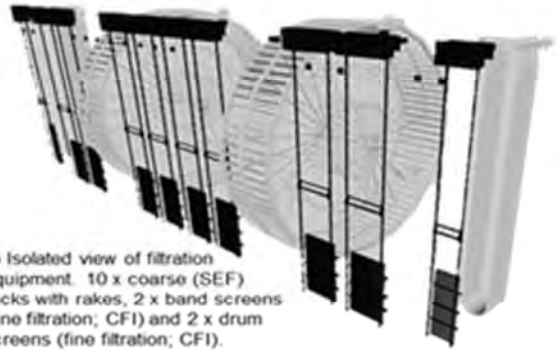


3) Two halves of forebay (looking back to tunnel exit).



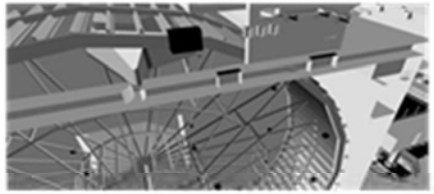
4) Detail of exit from forebay to pumping station.

9) Detail of exit to debris recovery building. 4 channels: 1 x coarse and 1 fine filtration feed from both drum screens and one band screen; and 1 x coarse and 1 x fine filtration feed from the remaining band screen.

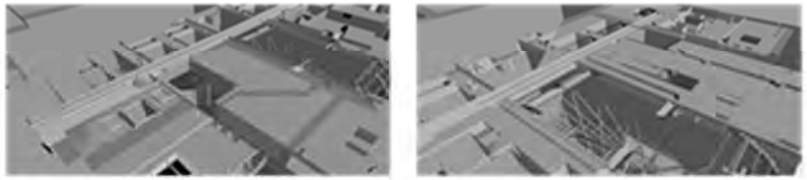


6) Isolated view of filtration equipment. 10 x coarse (SEF) racks with rakes, 2 x band screens (fine filtration; CFI) and 2 x drum screens (fine filtration; CFI).

5) Detail of coarse filtration (SEF) racks leading to drum screen well.

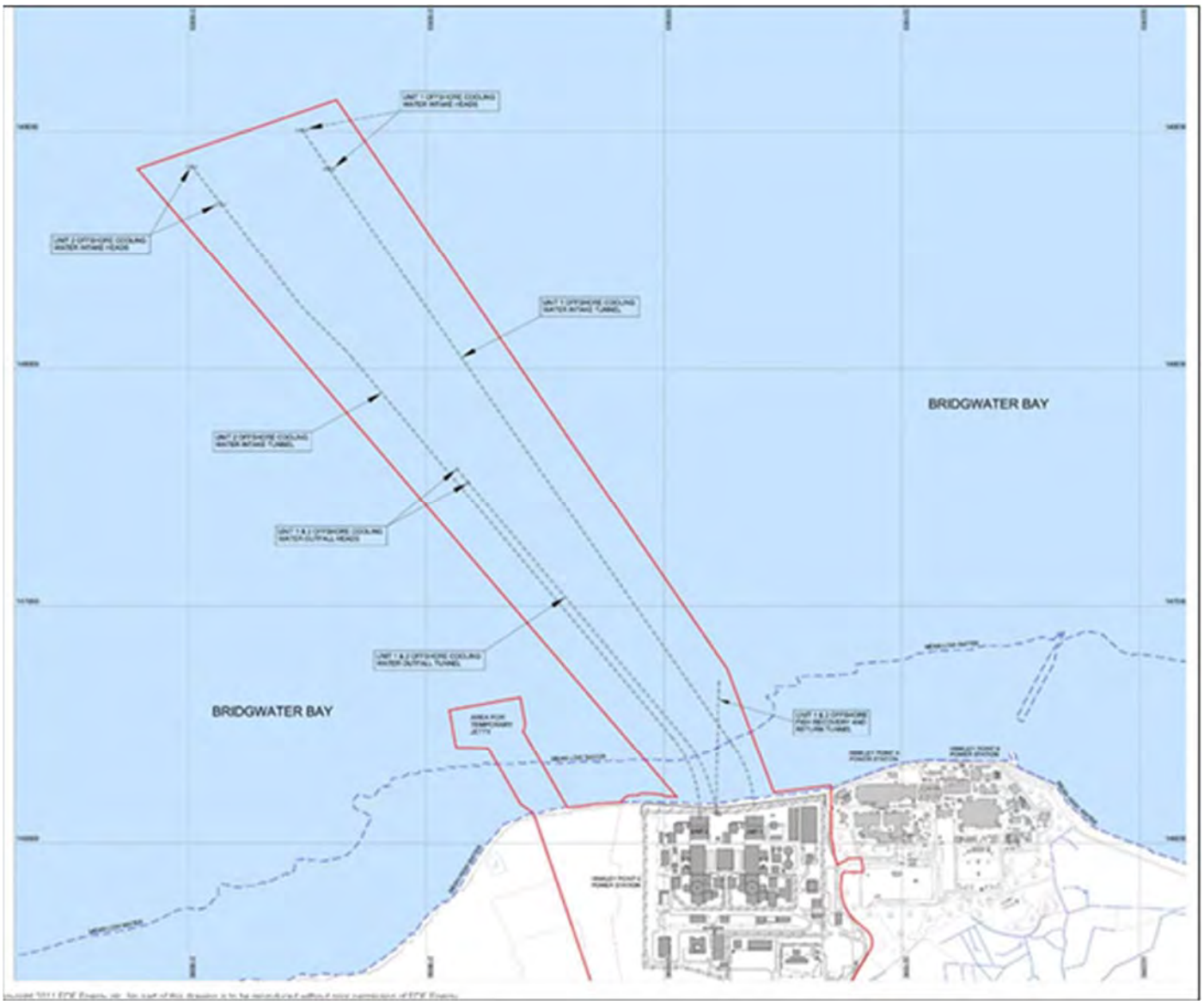


7) Detail of drum screen hopper and gutter interface. Note – two hoppers per drum screen (one each side).



8) Detail of pumping station gutters. Right hand image is eastern end (Trains 1-5) and left hand image is western end (Trains 6-10) exiting to debris recovery (HCB) building.

Figure 2.3 Locations of the intake headworks and intake tunnels (also showing outfall headworks and tunnels and FRR system outfall and tunnel)



2.2.2 The design of the Project assessed when previous applications were made in 2011 included the installation of an AFD system that was intended to deter pelagic and some demersal fish species from being abstracted into the cooling water intakes, thereby reducing the risk to fish populations resulting from impingement. The material change to

the original design that is the topic of this report is the proposed removal of the AFD system as mitigation to the CWS.

2.2.3 AFD systems have been installed at several coastal power stations, for the same purpose of providing mitigation against potential effects on local fish populations from impingement. For HPC, although the principles of an AFD system are well understood, the challenge was to design a system which could be safely installed and maintained over the predicted 60+ year lifecycle of the Project, in what are very difficult environmental conditions.

2.2.4 The AFD proposed for HPC originally comprised up to 288 projectors to generate and project the acoustic deterrent, located on or around the four seabed-mounted LVSE intake heads, approximately 3.3 km offshore. There are no above-sea structures associated with the intake heads, meaning that all infrastructure would need to be deployed, accessed and maintained via diving and subsea works.

2.2.5 In overview, the marine environment at Hinkley Point is particularly challenging, including:

- a very high tidal range, with a mean spring tidal range of 10.7 m;
- slack water periods of only approximately 30 mins each tide;
- tidal currents of approximately 1.5 m/s;
- high levels of suspended sediment, and approaching zero underwater visibility;
- being in a generally exposed location, therefore subject to high wave heights and frequent winter storms; and
- potentially large volumes of floating and submerged debris, particularly marine weed after storm events.

2.2.6 In addition to the above, the offshore location of the cooling water intakes means that any surface structures would create an added collision risk to local shipping.

2.2.7 After extensive engineering studies (summarised in NNB GenCo, 2018), it was concluded during the design phase that the installation of permanent structures with rails and/or lifting frames to raise the AFD projectors out of the water would be impractical. The projectors would need to be fixed to seabed-mounted piled structures and installed/recovered (for maintenance) in clusters, by divers. Such operations would need to be timed to fit narrow tidal windows for safety reasons and would be likely only to be possible during summer months. As servicing would require near-continuous operations for up to three months of each year, works could not be timed to coincide with reactor outages (due to resourcing conflicts), thereby adding an additional risk, with divers operating when CWS intakes were operational.

2.2.8 The conclusion of the AFD Optioneering report (NNB GenCo, 2018) was that an AFD system for HPC would be extremely complex to construct and maintain, and that the associated risks to maintenance staff would be unacceptable.

3 REQUIREMENTS UNDER THE EELS REGULATIONS

3.1 EC Regulation

3.1.1 The Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel was introduced in response to concerns about the decline in populations of European eel.

3.1.2 The principal requirement in EC/1100/2007 is that member states prepare eel management plans. The objective of each Eel Management Plan shall be to "*reduce anthropogenic mortalities, so as to permit with high probability the escapement to the sea of at least 40 % of the silver eel biomass relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock*". The eel management plan must be prepared with the purpose of achieving this objective in the long term.

3.1.3 Eel management plans may contain, but are not limited to, the following measures:

- reducing commercial fishing activity;
- restricting recreational fishing;
- restocking measures;
- structural measures to make rivers passable and improve river habitats, together with other environmental measures;
- transportation of silver eel from inland waters to waters from which they can escape freely to the Sargasso Sea;
- combating predators;
- temporary switching-off of hydro-electric power turbines; and
- measures related to aquaculture.

3.2 Eel management plans

3.2.1 In support of the requirements of Regulation EC/1100/2007 the UK produced a national overview report on eel management plans and a series of regional plans based on RBDs.

3.2.2 The overview report (Defra, 2010a) provides advice on assessment against the target for silver eel escapement and on generic measures that may assist in achieving compliance. Many of the measures relate to management of eel fisheries but the report does include recognition of the need to minimise effects of entrainment and impingement at water intakes and hydropower plants and reference is made to existing guidance on screening since updated (Turnpenny & O'Keefe, 2005) and to further guidance in preparation as part of the Eels Manual. This is now available (Environment Agency, 2011).

3.2.3 More detailed specific measures are included in the South West RBD Eel Management Plan (Defra, 2010b) and the Severn RBD Eel Management Plan (Defra, 2010c).

3.3 UK regulation

3.3.1 In support of the measures required by Regulation EC/1100/2007, *The Eels (England & Wales) Regulations 2009* (S.I. 2009 No. 3344) (as amended) provide for regulation of eel fisheries and provision of eel passes. They also impose requirements for eel screens and by-wash arrangements that are relevant to the CWS intake systems proposed at HPC, as detailed in the following paragraphs. These regulations are referred to hereafter in this report as the "Eels Regulations".

3.3.2 **Eel screens**

3.3.3 Regulation 17 imposes requirements for screening of intakes, as follows. These requirements apply at HPC, as the proposed abstraction of cooling water exceeds 20 m^3/d.

17.- (1) This regulation applies to -

(a) any diversion structure capable of abstracting at least 20 cubic metres of water through any one point in any 24-hour period; and

(b) any diversion structure returning water to a channel, bed or sea.

(2) Before 1st January 2015, the appropriate agency may, by service of a notice, require a responsible person to place an eel screen in a diversion structure.

(3) The notice may specify the dimensions and type of screen and where it is to be placed in the diversion structure.

(4) On or after 1st January 2015, a responsible person must ensure an eel screen is placed in a diversion structure.

(5) The appropriate agency may, by service of a notice -

(a) exempt the responsible person from the requirement in paragraph (4); or

(b) require the responsible person, at their own cost, to alter the dimensions (including mesh size) and the placement of any screen placed under paragraph (4) to those specified in the notice.

(6) It is an offence to fail to comply with—

(a) a notice served under paragraph (2) or (5)(b); or

(b) paragraph (4).

3.3.4 In the case of HPC, the 'appropriate agency' refers to the Environment Agency.

3.3.5 **By-wash**

3.3.6 Regulation 18 imposes requirements regarding by-washes for screens placed within the water abstraction system rather than at the point of abstraction, as follows. This relates to the FRR system proposed at HPC.

18.- (1) This regulation applies where an eel screen placed in accordance with regulation 17 is located at a point in the diversion structure other than at the entrance to the conduit or channel by which the water is abstracted.

(2) A responsible person must provide a continuous by-wash immediately upstream from the eel screen which allows eels to return by as direct route as practicable to the waters from which they entered the diversion structure.

(3) Failure to comply with paragraph (2) is an offence.

3.3.7 **Eel screens and by-wash**

3.3.8 Further provisions are made in Regulation 19 regarding screens and by-washes, as follows. Regulation 19(1)(b) and 19(1)(c) are relevant to the FRR system at HPC. It can be assumed that, as the screens and accessible parts of the FRR system will be within a nuclear site boundary, potential for damage or interference by third parties, in contravention of Regulation 19(2) will be eliminated.

19.- (1) A responsible person must ensure that an eel screen or by-wash -

(a) does not interfere with any statutory right of navigation;

(b) is constructed and located, so far as reasonably practicable, so that eels are not injured or damaged by it;

(c) is maintained in an efficient state.

(2) A person must not damage or interfere with an eel screen or do anything that impedes the free passage of eels through a by-wash.

(3) Failure to comply with paragraph (1) or (2) is an offence.

3.4 Guidance

3.4.1 Guidance on eel screens and associated by-washes is provided by the Environment Agency in a best practice guide on *Screening for intake and outfalls* (Turnpenny & Keeffe, 2005) and in later guidance forming part of the Eels Manual entitled *Screening at intakes and outfalls: measures to protect eel* (Environment Agency, 2011).

3.4.2 In each case the guidance focusses on riverine intakes but both guidance volumes do include best practice guidance for marine intakes fitted with drum or band screens and for associated fish return systems.

3.4.3 Both manuals consider AFD systems but the Eel Manual states that "*as yet there are no forms suitable for eel*", although it recommends that further research be undertaken on the potential for use of infrasound for deterring eels (<20 Hz).

3.4.4 Updated guidance is given in Turnpenny *et al* (2010), particularly on design of FRR systems, but this evidence report provides no new guidance on AFD systems.

4 CURRENT STATUS OF EUROPEAN EEL

4.1.1 The European eel (*Anguilla anguilla*) is widely distributed throughout European estuarine and inland waters. Estimates at the glass eel stage indicate that recruitment across Europe has fallen to below five percent of historic levels recorded between the 1950s and the 1970s (Defra, 2010a). The International Council for Exploration of the Sea (ICES) advised that the stock is outside safe biological limits and that current fisheries are not sustainable (ICES, 2006 and ICES, 2015).

4.1.2 Concern over low eel stock levels led the European Commission to adopt Council Regulation EC/1100/2007 requiring member states to prepare eel management plans targetted principally at improving escapement of silver eels (adults migrating to sea to spawn).

4.1.3 Further evidence of concern about the status of European eel is evidenced by the entry of the species onto the red list of endangered species by the International Union for Conservation of Nature (IUCN) and its listing as a species of principal importance for the purpose of conserving biodiversity under s.41 of the Natural Environment and Rural Communities Act 2006 in the UK.

4.1.4 HPC lies within the South West RBD but the Severn RBD extends seaward as far immediately north of Burnham-on-Sea, 10 km from HPC. As the European eel is a migratory species, any effects of the abstraction on eel populations would have the potential to affect both RBDs. These two RBDs are the principal focus of commercial of eel fishing in the UK.

4.1.5 The South West Eel Management Plan (Defra, 2010b) concluded that the RBD probably did comply with the 40% escapement target for silver eel, although the conclusion had low confidence due to the paucity of reliable historic data available for defining the reference condition. The plan also identifies concerns about a lack of data on the current availability of suitable eel habitat, regarding barriers to migration, entrainment (particularly in hydropower installations) and predation by cormorants. In the light of the uncertainties, the plan proposes increased monitoring and includes measures to reduce pressures and impacts on eel stocks through limitation of fishing effort and improvement of migratory access and habitat.

4.1.6 The Severn Eel Management Plan (Defra, 2010c) stated that comparison of data from an electrofishing survey in 1983/4 with that estimated by the reference condition model suggested that the potential production of silver eels from the Severn in 1983/4 represented 41% of the reference (“pristine”) conditions. The eel population downstream from Worcester had shown little change since the early 1980s, over the time period when average recruitment to Europe had declined substantially. However, there had been a general decline in densities of larger eels in recent years. Overall, the plan concluded that the data available suggested that the RBD probably did comply with the 40%

escapement target for silver eel. Again, the plan proposes increased monitoring and includes measures to reduce pressures and impacts on eel stocks through limitation of fishing effort and improvement of migratory access and habitat.

4.1.7 The UK's 2015 report to the European Commission on implementation of eel management plans presents revised figures showing silver eel escapement well below the target for both RBDs. In the light of this, any significant adverse effect of HPC on eel populations would therefore be of concern.

5 ASSESSMENT

5.1 Response of European eel to AFD systems

5.1.1 Work by Jerkø *et al* (1989) on the European eel, determined them to be sensitive to only low frequency sound with a hearing range between 80 and 138 dB re 1µPa and in the frequency range of 10 – 300Hz, with peak sensitivity at very low frequencies (90 Hz).

5.1.2 More recent work has been undertaken in this field, which reports statistically significant deflection avoidance reactions at infrasound frequencies, for example Sand *et al* (2004) demonstrated significant avoidance at 11.8 Hz in a river environment. However, no research has been found which demonstrates suitability of such systems in exposed marine coastal environments and no such installations have been identified. This is supported by the Environment Agency's guidance (Environment Agency, 2011), which states that, as yet, there are no forms of acoustic fish deterrent suitable for eel. The guidance recognises that the effects of infrasound or low frequency sound as a deterrent may merit further investigation, such methods are not at present ready for use.

5.2 Effect of removal of AFD on compliance with eel management plans

5.2.1 Any change in entrainment and impingement of European eel as a result of removal of the AFD system from the design of the abstraction arrangements would have the potential in principle to affect compliance of the relevant eel management plans with their targets.

5.2.2 During the design process, AFD had not been not considered an effective method for deterring European eel, taking account of the unsuitability of acoustic systems for deterring eel identified in the guidance (Environment Agency, 2011).

5.2.3 The optioneering was based on an AFD system using existing available technology with sound projectors operating in the 10 Hz to 3 kHz range and typically covering 20Hz to 600 Hz. This was targetted at fish other than eels; therefore, during the optioneering process (NNB GenCo, 2018), the performance target for efficiency of AFD (% deterred) was set at zero for European eel.

5.2.4 Subject to design of the FRR system complying with best practice as defined in the guidance (Environment Agency, 2011) and the further guidance on FRR systems included in Turnpenny *et al* (2010), silver eel survival in excess of 80% is expected (Turnpenny & Keeffe, 2005). This is dependent on fish buckets of the drum and band screens being fitted with inward curved lips that retain 80% of eels at first capture attempt, without eels escaping to the screen well to be recaptured, possibly multiple times and the design of the FRR having sufficient capacity to return all fish captured, allowing for variations in abstraction rate with tidal level.

5.2.5 The proposed design, set out in the *Report to Discharge DCO Requirement CW1 (Paragraph 1) and Marine Licence Condition 5.2.31* (NNB Genco, 2017) takes account of this latest guidance and has been approved by the MMO in consultation with the Environment Agency. Although detailed further design work is ongoing, use of buckets with a lip of the type depicted in the CW1 Report to minimise escape of sinuous fish such as eels is firmly agreed.

5.2.6 Juveniles are not susceptible to AFD systems and will be entrained. 5 mm x 5 mm screens will pass glass eels, elvers and smaller yellow eels, which will be entrained through the CWS and returned to the estuary with the spent cooling water, but the screens will capture larger yellow eels and silver eels (Environment Agency, 2011) and direct them through the rest of the FRR system. This is borne out by the fact that there are no records of glass eel impingement at Hinkley Point B Power Station (Cefas, 2018). Although the mesh size will be oversized in terms of specific best practice for young eel stages, the Environment Agency has confirmed that, given nuclear safety considerations and the combination of mitigations to minimise the velocities in the intake system, the specified mesh size is acceptable in relation to the Eels Regulations.

5.2.7 Estimates of eel losses made in the TR456 Report (Cefas, 2018) were predicted as negligible with or without the presence of an AFD system. Due to the lack of data for species such as eel with such complex life cycles, an equivalent adult value (EAV) of 1 was used, which will produce overestimates of impingement, as most of the fish impinged were not mature. This represents a precautionary approach.

5.2.8 Taking account of the fact that the AFD system previously proposed was designed with the expectation that there would be no deterrent effect at all on European eel, as well as the very high rate of survival predicted for individuals impinged on the screens and their successful return to sea via the FRR system across the range of abstraction rates, the TR456 Report (Cefas, 2018) concluded that removal of the AFD system would not change the previous conclusion that effects of the proposed abstraction on European eel would be negligible. Thus, removal of the AFD system would make no significant difference to the level of compliance with eel management plans.

5.3 Effect of removal of AFD on compliance with UK Eels Regulations

5.3.1 The requirements of the Eels Regulations on the provision of screens are met by the provision in the forebay of drum screens and band screens with a mesh size of 5 mm x 5 mm. The detailed design is given in the *Report to Discharge DCO Requirement CW1 (Paragraph 1) and Marine Licence Condition 5.2.31* (NNB Genco, 2017). The conditions referred to cover the design of the intakes, tunnels and the FRR system and the report has been approved by the MMO in consultation with the Environment Agency.

5.3.2 There is no proposal to change the provision or design of the screens as a result of removal of the AFD system from the cooling water abstraction arrangements, therefore compliance with the Eels Regulations 2009 regarding placing of an eel screen in the

diversion structure and the powers of the Environment Agency to specify the dimensions (including mesh size) and placement will continue to be fulfilled.

5.3.3 The requirements of the Eels Regulations on the provision of a continuous by-wash immediately upstream from the screens which allows eels to return by as direct route as practicable to the waters from which they entered the diversion structure are met by the design of the proposed FRR system. The detailed design is given in the *Report to Discharge DCO Requirement CW1 (Paragraph 1) and Marine Licence Condition 5.2.31* (NNB Genco, 2017). The conditions referred to cover the design of the intakes, tunnels and the FRR system and the report has been approved by the MMO in consultation with the Environment Agency.

5.3.4 There is no proposal to change the provision or design of the FRR system as a result of removal of the AFD system from the cooling water abstraction arrangements, therefore compliance with the Eels Regulations 2009 regarding provision of a continuous by-wash immediately upstream from the eel screen which allows eels to return by as direct route as practicable to the waters from which they entered the diversion structure will continue to be fulfilled.

5.3.5 Similarly, the requirements of Regulation 19(1) that screens and the FRR system are constructed and located, so far as reasonably practicable, so that eels are not injured or damaged by them are addressed in the CW1 Report (NNB Genco, 2017) and the relevant design aspects have been approved by the MMO in consultation with the Environment Agency. Maintenance in an efficient state will be essential to allow sufficient throughput of cooling water to allow the power station to operate at its design capacity. Again, removal of the AFD system will not change this situation.

5.3.6 Regulation 19 paras (2) and (3) make it an offence for a person to damage or interfere with an eel screen or do anything that impedes the free passage of eels through a by-wash. Exclusion of any persons who might be minded to cause such damage or interference will be achieved readily by maintenance of the usual security arrangements required at a nuclear licenced site.

5.3.7 In summary, compliance of the proposed design and operation of the cooling water abstraction arrangements with *The Eels Regulations 2009* will be entirely unaffected by the removal of the AFD system from the proposed arrangements.

6 CONCLUSIONS AND SUMMARY

6.1.1 The AFD system originally proposed as part of the cooling water abstraction arrangements at HPC was targetted at fish species other than European eel. Eels are not sensitive to the range of frequencies that were proposed to be transmitted by the sound projectors.

6.1.2 Removal of the AFD system is therefore not predicted to have any significant effect on predicted impingement of eels on the drum and band screens in the forebay.

6.1.3 Design of the screens and by-wash (FRR system) comply with the requirements of the Eels Regulations and a high rate of survival of impinged eels Is predicted. The design has already been agreed with the relevant authorities and the design requirements for these aspects in the DCO and conditions in the marine licence have been discharged.

6.1.4 Overall the impact on eel populations is predicted to remain at a negligible level for abstraction arrangements without provision of an AFD system. Therefore, removal of the AFD system from the design would have no significant impact on compliance with eel management plans.

6.1.5 The design of the screens and by-wash (FRR system) would not be changed at all by removal of the AFD system from the proposed intake arrangements, therefore their designs would remain compliant with the Eels Regulations.

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