Proposed Decision Consultation Document

Hinkley Point C water discharge activity permit variation: EPR/HP3228XT/V005

Consultation document in response to a permit variation application by NNB Generation Company (HPC) Limited to remove conditions that relate to an Acoustic Fish Deterrent and add a waste stream for a discharge from a Fish Recovery and Return (FRR) system.

April 2023

Version 1

We are the Environment Agency. We protect and improve the environment.

We help people and wildlife adapt to climate change and reduce its impacts, including flooding, drought, sea level rise and coastal erosion.

We improve the quality of our water, land and air by tackling pollution. We work with businesses to help them comply with environmental regulations. A healthy and diverse environment enhances people's lives and contributes to economic growth.

We can't do this alone. We work as part of the Defra group (Department for Environment, Food & Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

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This consultation – at a glance

Topic

This consultation is about the Environment Agency's proposed decision on the application from NNB Generation Company (HPC) Limited to vary an environmental permit.

The application has been made under the Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016) to make changes to water discharge activities associated with the operation of the new nuclear power station being constructed at Hinkley Point, near Bridgwater, in Somerset.

Geographical scope

England and Wales.

Audience

This consultation is aimed at:

- members of the public
- communities who reside in an area near the site
- statutory consultees
- academics with an interest in nuclear power, energy production or the environment
- non-governmental organisations (NGOs)

Comments from any other interested parties are also welcome.

Duration

4 weeks (20 working days).

Contact details

Please complete the online response form on our consultation hub. Alternatively, you can email your response to: psc-waterquality@environment-agency.gov.uk or write to us at:

Hinkley Point Consultation Environment Agency
Permit Support Centre
Quadrant 2
99 Parkway Avenue
Parkway Business Park
Sheffield
S9 4WF

If you have any queries, or would like a hard copy of this document, please email us at: psc-waterquality@environment-agency.gov.uk

Next steps

Our determination of NNB Generation Company (HPC) Limited's variation application continues and we have not yet reached any final decision. We will complete our determination, including carefully considering all relevant comments made during consultation and will produce a final decision document that:

- sets out our decision on whether or not to grant a variation to the permit to NNB Generation Company (HPC) Limited
- summarises the consultation responses and issues raised
- set out our views on those issues

We expect to:

- publish our final decision document at the end of our determination, which we are targeting to complete in mid-2023

Executive summary

This document is prepared for public consultation on our proposed decision on the application NNB Generation Company (HPC) Limited (NNB GenCo (HPC)) made for a variation to its environmental permit granted in 2013. The application has been made under the Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016) to make changes to water discharge activities associated with the operation of the new nuclear power station being constructed at Hinkley Point, near Bridgwater, in Somerset.

The construction and operation of Hinkley Point C (HPC) requires various permissions from the Environment Agency (EA), Department for Energy Security and Net Zero (formally Department for Business, Energy and Industrial Strategy), and the Marine Management Organisation (MMO) amongst others.

Permissions for the building and operation of the power station were granted in 2013. These included a Development Consent Order (DCO), a Water Discharge Activity (WDA) permit, and a Marine Licence (ML).

NNB GenCo (HPC) have applied to vary its WDA permit to include the fish recovery and return (FRR) system discharge as a specified WDA, and to remove conditions relating to the Acoustic Fish Deterrent (AFD) system. The requirement to install an AFD is also a condition on the DCO and on the ML.

We advertised the application and consulted the public and other stakeholders between 24 January and 2 March 2023. We have assessed the application, considered the consultation responses we received, and have made a proposed decision to grant the application subject to the conditions in the draft permit that accompanies this document. Our processes require further public consultation on our proposed decision and draft permit variation. The purpose of this consultation is to seek your views on our proposed decision and draft permit variation to help us come to a final decision.

We will not make a final decision about this application until we have carefully considered the responses to this public consultation.

The current permit allows the discharge of several trade effluent waste streams and treated sewage effluent from the HPC site via 2 cooling water outlets. The waste streams permitted to be discharged are as follows:

- Waste stream A – Trade effluent consisting of returned abstracted cooling water
- Waste stream B – Trade effluent from operations within the Nuclear Island waste monitoring and discharge system
- Waste stream C - Trade effluent from the Steam Generator Blowdown System that cannot be recycled
- Waste stream D - Trade effluent from the Turbine Hall and uncontrolled area floor drains, excluding effluent from the Steam Generator Blowdown System

- Waste stream E - Trade effluent from the site drainage system, including drainage from road and roof surfaces, uncontaminated water from oily water network and atmospheric condensate from chillers
- Waste stream F - Trade effluent from the production of demineralised water
- Waste stream G - Domestic sewage (sanitary effluent) from administration and mess facilities

Conditions within the permit require the applicant to submit reports to the EA describing how their proposed AFD will operate and demonstrate that it will be optimised to minimise impacts on fish.

In 2019, NNB GenCo (HPC) applied to vary this permit (variation application number: EPR/JP3122GM/V004) to remove the conditions requiring them to submit these reports and operate an AFD system 24 hours a day. This was on the grounds that since the permit was issued, NNB GenCo (HPC) have continued to progress studies and assessments. Following the review of new and updated information derived from environmental and ecological studies to confirm the reliability of the conservative assumptions made in the initial WDA permit application granted in 2013 and the revision of compliance assessments for the purposes of the Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) and the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. NNB GenCo (HPC) concluded that abstraction of seawater in the absence of an AFD system at HPC would not give rise to significant effects associated with the impingement and entrainment of fish.

In 2020, the EA produced a draft Habitats Regulations assessment (HRA) which assessed the implications of operating HPC without an AFD system via an appropriate assessment. This assessment proposed that we could not conclude no adverse effect on site integrity of relevant designated sites.

In 2020, NNB GenCo (HPC) served a deemed refusal notice as the EA had not yet determined the permit variation application (EPR/HP3228XT/V004). NNB GenCo (HPC) subsequently appealed against this deemed refusal to the Planning Inspectorate (PINs). The EA finalised its HRA appropriate assessment (Environment Agency, 2020a) in support of the appeal heard by PINs in 2021. The conclusions of this appropriate assessment were the central part of the matter in dispute within the appeal, and the conclusions of the appropriate assessment were upheld by PINs and the SoS's decision issued in 2022 to dismiss NNB Genco's appeal.

The current permit variation application (EPR/HP3228XT/V005) proposes to remove the conditions (or part of conditions) relating to an AFD system. This is on the grounds that the EA's appropriate assessment of 2020 (Environment Agency, 2020a) concluded that the operation of the FRR system in the absence of an AFD system would not adversely affect the site integrity of relevant designated sites, and therefore maintaining controls on the intake within the WDA permit is now an unnecessary duplication of regulation given that DCO and MMO marine licence retain requirement to install an AFD.

To assess the potential pollution risk (to the water quality of the Bristol Channel) from operating the FRR system without an AFD system, we reviewed and audited the data and

calculations provided to support the application (from impingement monitoring at HPB), and identified several errors that needed correcting. We then used this data to predict the volume of biomass expected to be subject to impingement at HPC. This entailed applying various factors to account for the difference in the volume of seawater to be abstracted, cooling water intake design, as well as consideration for the level of uncertainty from estimating from sampled data. We then used this to predict the amount of dead and/or moribund biota that would be expected to be discharged via the proposed FRR system outlet (in the absence of an AFD system).

From this, we then assessed the expected effects of the dead and/or moribund biota (biomass) on the receiving environment. This includes assessment of risks including potential smothering effects from this biomass on species and habitats, changes to water quality from the release of chemical and nutrients from the decay of this biomass, and the subsequent effect this change in water quality may have on species and habitats.

The worst-case zone of influence (ZoI), which is the area predicted to experience effects from the FRR system discharge predicted during our 2020 assessments was 0.56 km². The total impinged biomass calculations this ZoI was derived from have since been updated. The factor applied to take account of the difference in the intake structures between HPB and HPC were amended in agreement (between the EA and NNB GenCo (HPC)) during the HPC AFD appeal proceedings, and further impingement data from HPB has since been provided. Both these reduce the predicted total biomass expected to be impingement at HPC. However, as the 2020 assessment provides the most precautionary estimates, it is these figures that we have taken forward within our assessment for this permit variation application (known as our reasonable worst-case scenario).

Our Habitats Regulations assessment (HRA) demonstrated that we could conclude no adverse effect on the integrity of relevant designated European sites based on these precautionary assessments of discharges of biomass.

Our Sites of Species Scientific Interest (SSSI) assessment demonstrated that we could concluded no likely damage to any of the flora, fauna or geological or physiological features of relevant SSSIs based on these precautionary assessments.

Our Water Framework Directive (WFD) assessment demonstrated that we could conclude there is minimal risk of deterioration in water body status, based on these precautionary assessments, that might jeopardise compliance with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

On this basis we propose to grant the permit variation by varying the permit to remove any reference to an AFD system and include an additional WDA for the discharge of returned abstracted seawater from the FRR system via a third outlet. This WDA will be specified as activity A7, discharged via Outlet 3 and known as Waste stream H. To ensure that our reasonable worst-case scenario that was assessed as expectable is not exceeded, total biomass maximum limits will be set on waste stream H for the FRR system discharge.

At this stage, we consider that there is no reason why we should not grant the variation to the environmental permit for the proposed WDAs from the operational HPC power station.

We consider that the limits and conditions in the draft permit are suitable to protect people and the environment within the remit of a WDA permit.

The aim of our consultation regarding our proposed decision and draft permit is to seek views to help us reach a final decision, in particular whether there are any errors, omissions or new relevant information that has not already been considered.

1. About this consultation document

This is a document setting out our proposed decision and is accompanied by a draft environmental permit variation notice. It explains how we have considered NNB Generation Company (HPC) Limited's (afterwards referred to as NNB GenCo (HPC)) variation application and why we have included the specific conditions in the draft varied permit we are proposing to issue. It is our record of our decision-making process so far, to show how we have considered relevant matters in reaching our proposed decision.

The document sets out our proposed decision because we have yet to make a final decision. Before we make this decision, we want to explain our thinking to the public and other interested parties, to give them an opportunity to understand that thinking and, if they wish, to make comments to us. We will make our final decision only after carefully considering any relevant matters raised in the responses we receive. At that time, we will make our final decision about whether a variation to the permit should be granted and, if so, the conditions that it should place on the operator.

Unless we receive information that leads us to change the conditions in the draft permit, or to reject the variation application altogether, we propose to grant the variation and the varied permit in its current form.

This document includes:

- a description of how we process and determine applications (Section 2)
- a summary of the application and brief details of our consultation on the application (Section 3)
- a description of our assessment (Section 4)
- a statement of our proposed decision (Section 5)
- a summary of consultation responses (Appendix 1)

1.1 The Environment Agency

Our corporate strategy 'creating a better place 2025' sets out our aims and describes the role we play in being part of the solution to the environmental challenges society faces.

Our strategy aims to champion sustainable development, support our work to create better places and challenge us to tackle the climate emergency and provide a green economic recovery for everyone, in 3 long-term goals:

- a nation resilient to climate change
- healthy air, land and water
- green growth and a sustainable future

1.2 Our role in environmental regulation

We regulate the environmental impacts of nuclear sites, such as nuclear power stations, nuclear fuel production plants and plants for reprocessing spent nuclear fuel, through a number of environmental permits. These permits may be needed during the site preparation, construction, operation and decommissioning phases of the plant's lifecycle.

The permits we issue include conditions and limits. In setting these, we take into account all relevant national and international standards and legal requirements, to ensure that people and the environment will be properly protected. These standards and requirements are described in GOV.UK at:

- Environmental permitting guidance: Core guidance (UK Parliament, 2020d)
- Check if you need an environmental permit (Environment Agency, 2016a)

We inspect sites to check that operators are complying with the conditions and limits, and that they have arrangements in place to help ensure compliance. We may take enforcement action (for example, issuing an enforcement notice or taking a prosecution) if they are not compliant.

We regularly review permits, and vary (change) them if necessary, to ensure that the conditions and limits are still effective and appropriate. Where significant changes are required, we may consult on these changes.

We work closely with the Office for Nuclear Regulation (ONR), which regulates the safety, security and nuclear material safeguards and transport aspects of nuclear sites.

1.3 Our regulatory role in the development of new nuclear power stations

As with existing nuclear sites, any new nuclear power station will require environmental permits from us to cover specific aspects of site preparation, construction, operation and eventually decommissioning. In the light of government and industry expectation that plants of almost the same design might be built on a number of sites and potentially be run by different operating companies, we have split our process for assessing and permitting the operational stage of new nuclear power stations into 2 phases.

In the first phase, generic design assessment (GDA), we carry out a detailed assessment of the features of a generic reactor design that can affect those aspects of its environmental performance that we regulate. If we are fully content with the environmental aspects of the generic design, we provide a Statement of Design Acceptability (SoDA). If we are largely content, but there are GDA Issues (that is, significant but resolvable outstanding matters), we issue an interim Statement of Design Acceptability (iSoDA). In both cases, we also identify Assessment Findings. These are matters, which a future operator will need to address, at the appropriate stage of a new build project, that is, during detailed design, procurement, construction, commissioning or early operation. Where an iSoDA has been

issued, we expect the designer to provide further information as it implements its resolution plan. We close GDA Issues only once we are satisfied that they have been resolved. Once all GDA Issues are closed, we will consider issuing a full SoDA.

We carried out GDA of the UK EPR™ design from Électricité de France SA and AREVA NP SAS ('EDF and AREVA') and issued a final SoDA for the UK EPR™ in December 2012.

In the second phase, operators wishing to construct and operate nuclear power stations at specific sites are required to make applications for environmental permits. In determining these applications, we take account of the work we have already done during GDA. In this way, our efforts are focused on operator-specific and site-specific matters, including how the operator has addressed any relevant matters arising from GDA and any changes to the GDA design arising from the site-specific considerations or operator required modifications.

Operators can apply to the Environment Agency for a new permit or a variation (change) to an existing permit at any time. We expect GDA to be concluded prior to site-specific permit application, but recognise that this will not always be the case. Where an applicant wishes to take credit for the GDA process, we require a SoDA or iSoDA to be issued prior to consulting on a proposed decision on the permit application. Where only an iSoDA has been issued, we would expect the GDA Issues to be resolved before we would issue a permit.

2. How we process and determine applications

The Environment Agency is responsible under The Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016) (UK Parliament, 2016) for regulating certain activities on nuclear sites in England and Wales. This draft decision document details our assessment of an application to vary aspects of the water discharge activities (WDAs), namely the discharge of returned abstracted seawater via a fish recovery and return (FRR) system.

We regulate these sites to protect members of the public from harm from the discharge and disposal of the release of pollutants into surface waters, and to protect the wider environment. We regulate within a framework of extensive government policy, strategy and guidance. This framework is summarised in the Environmental permitting Core guidance issued by Defra in March 2020. This guidance sets out the government's position on how environmental permitting should be applied and implemented, including application of conditions in permits (see in particular paragraph 7.10 of which we have taken account), and how both we and operators in England and Wales should interpret particular terms. In summary, the aim of the environmental permitting system is to:

- protect the environment so that statutory and government policy environmental targets and outcomes are achieved
- carry out permitting and achieve compliance with permits and certain environmental targets in a more open way, minimising the administrative burden on both the regulator and the operators

- encourage regulators to promote best practice in operating facilities

2.1 Our process

We follow a 2-stage process for assessing and permitting new nuclear power stations:

1. Requesting Parties may apply to the Department for Energy Security and Net Zero for ministers to request that regulators (i.e. the Environment Agency and Office for Nuclear Regulation (ONR)) carry out a generic design assessment (GDA) of their design. If the GDA is carried out, the regulators will assess the design for its acceptability for use
2. A prospective operator of a nuclear reactor that wishes to carry out a water discharge activity, combustion activity and radioactive substances activity, must apply for any site-specific environmental permits

2.1.1 Generic design assessment

Our decision is documented in our 2011 UK EPR™ decision document (Environment Agency, 2011) and 2012 Supplement to the Decision Document (Environment Agency, 2012).

2.1.2 Site specific permitting

As part of the second stage, we receive applications for environmental permits for specific sites. In determining these applications, we take full account of the work we have done during GDA so that our efforts are focused on operator and site-specific matters, including how the operator has addressed GDA Assessment Findings and any changes to the GDA design arising from the site-specific considerations or operator required modifications.

2.1.3 Our permitting process

The process we follow in assessing an application is described in the government's EPR core guidance (Defra, March 2020).

Operators can apply to the Environment Agency for a new permit or a variation to an existing permit at any time. The process we follow in assessing applications is outlined here.

1. Pre-application - We encourage applicants to discuss applications with us before submission
2. Receive and consult on the application - The applicant makes an application, providing the information as set out in the application form and supporting guidance. We advertise and consult on all applications for new permits, and for permit variations when deemed applicable
3. Assess the application and propose a decision for consultation - We carefully assess the application and any responses to our consultation and come to a preliminary

conclusion i.e. a “draft decision” on whether to grant the permit and, if so, the appropriate permit conditions

4. Consultation on proposed decision - We may choose to carry out further consultation on our proposed decision and draft permit, depending on the nature of the proposals and the likely degree of public interest. We do this using a document that explains our proposed decision and a draft permit
5. Review consultation responses and issue of decision - Where we consult on our proposed decision, we carefully consider all relevant information we have received during and after that second consultation, together with existing information. We make a decision whether a permit should be issued and, if so, what its conditions should be. We publish a document that explains our decision

2.2 Legal, policy and regulatory considerations

2.2.1 Principal considerations

The following section lists the guidance we have taken into account in coming to our draft determination.

Management and operator competence

- Develop a management system: environmental permits (Environment Agency, 2016b)
- Control and monitor emissions for your environmental permit (Environment Agency, 2016c)
- Legal operator and competence requirements: environmental permits (Environment Agency, 2016d)

Technical assessment

- Surface water pollution risk assessment for your environmental permit (Environment Agency, 2016e)
- Modelling: surface water pollution risk assessment (Environment Agency, 2014a)
- Oil storage regulations for businesses (Environment Agency, 2015a)

Monitoring

- Monitoring discharges to water: guidance on selecting a monitoring approach (Environment Agency, 2020a)
- Monitoring discharges to water: environmental permits (Environment Agency, 2020b)
- Monitoring discharges to water: analytical quality control charts (Environment Agency, 2020c)
- MCERTS: performance standard for organisations undertaking sampling and chemical testing of water (Environment Agency, 2014b)

We have considered this application in the context of the government's policy to achieve net zero by 2050 as described in the Energy White Paper: Powering our Net Zero Future. The white paper's 10-point plan states: "Nuclear power provides a reliable source of low-carbon electricity. We are pursuing large-scale nuclear, whilst also looking to the future of nuclear power in the UK through further investment in Small Modular Reactors and Advanced Modular Reactors." As nuclear power generates electricity without the CO2 emissions associated with fossil fuels, HPC is expected to significantly contribute to the government's policy to achieve net zero.

Statutory requirements

We take into account various statutory requirements, see sections 4.11 and 4.12 for details of these.

Our assessment of the application is set out in sections 4.1 to 4.19 in a structure that reflects the layout and questions in the application form. Section 4.6 identifies the main issues we need to consider when making decisions on the proposed water discharge activities. In sections 4.9 to 4.18 and section 5, we explain how we have reached our proposed decision against these and any other relevant considerations.

2.2.2 Role of the Secretary of State

Although we will normally determine an application, the Secretary of State can require any application to be referred to them for determination (regulation 63 of EPR 2016). As noted in the EPR core guidance (UK Parliament, 2020), this would be an exceptional step and likely to be taken only if the application involves issues of more than local importance, for example, if the application:

- is of substantial regional or national significance
- is of substantial regional or national controversy
- may involve issues of national security or of foreign governments

The core guidance also says that any decision on the need for determination by the Secretary of State would be made solely on those grounds, with no consideration of the substantive merits of the application itself. The Secretary of State has not requested that this application be referred to them for determination.

In specific circumstances and within statutory timescales, appeals regarding the determination of an application must be made to the Secretary of State. They may appoint another person, generally within the Planning Inspectorate (PINS) to determine an appeal on their behalf. Further details regarding appeals can be found in The Environmental Permitting: Core Guidance for the Environmental Permitting (England and Wales) Regulations 2016 (SI2016 No 1154).

2.3 Public and stakeholder engagement

It will always remain the responsibility of the regulator to make decisions about the permits. However, we want our decisions to be better informed through good engagement. We want to be aware of and understand peoples' comments and views. Where relevant, we can use these to help inform our assessments of the permit applications.

We advertised and consulted on this application in accordance with our Public participation statement (Environment Agency, 2019b) and the government's published consultation principles. In view of the nature of the application and the degree of public interest, we have decided to carry out further consultation on our proposed decision and draft permit. We have not made any final decision about this application until we have considered the responses to our public consultations.

Aarhus Convention

The UK is a signatory to the United Nations Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, known as the Aarhus Convention. The Convention sets out an individual's rights to public participation in decision-making and the requirements on a public body to make sure that public participation in decision-making is carried out properly. The relevant requirements of the Convention are given effect by the public participation duties placed on us by the EPR 2016, including informing people about applications that we consider they are likely to be interested in or affected by, and inviting them to make representations. How we decide who to involve is described in our Public participation statement (Environment Agency, 2019b), which we are required to publish by Regulation 60 of the EPR 2016.

Espoo Convention

The UK is a signatory to the United Nations Convention on Environmental Impact Assessment in a Transboundary Context, usually known as the Espoo Convention. The Convention requires the parties signed up to it at state level to:

- notify each other as early as possible of any transboundary impacts
- prevent, reduce and control the impact of any proposed measures
- allow the public, in areas likely to be affected, to participate in relevant environmental impact assessment procedures

In the UK, the Department for Energy Security and Net Zero is the government department responsible for making any notification.

3. The application and our consultation on the application

3.1 Receipt of application

The permit variation application was duly made on 30 December 2022. This means we considered it was in the correct form and contained sufficient information for us to begin our determination, but not that it necessarily contained all the information we would need to complete that determination.

NNB GenCo (HPC) has applied to vary the permit that allows them to operate water discharge activities (WDAs) at the Hinkley Point C (HPC) site in Somerset, to remove conditions that relate to an Acoustic Fish Deterrent (AFD) and add a waste stream (A7) discharge from the Fish Recovery and Return (FRR) system.

The permit application was deemed to be considered high public interest following the initial advertising period based on the level of public interest shown.

NNB GenCo (HPC) (Company number 06937084) was incorporated in 2009. It is a wholly owned subsidiary of NNB Holding Company (HPC) Limited, which, in turn, is owned by EDF Energy Holdings Limited (66.5% share) and China General Nuclear (33.5% share).

NNB GenCo (HPC)'s application consists of the relevant water discharge activity (WDA) environmental permit variation forms and a submission of information to provide the required detailed technical information. NNB GenCo (HPC) provided the following permit application documents as supporting information:

- Hinkley Point C Operational Water Discharge Activity Environmental Permit Variation Application: Non-technical summary (Ref: 101067444)

- Hinkley Point C Cooling Water Infrastructure Fish Protection Measures: Report to discharge DCO requirement CW1 and Marine Licence condition 5.2.31 (ref: 100186617)

- TR479 – Particle Tracking Study of impinged sprat from the proposed Hinkley Point C Fish Recovery and Return (ref: 100805628)

- TR515 - Hinkley Point C water quality effects of the Fish Recovery and Return system (ref: 100805626)

- Updated report to inform the Habitats Regulations Assessment (ref: 100161830)

- SPP105 – Predicted performance of the HPC LVSE intake heads compared with the HPB intake (ref: 100889387)

- SPP112 - Hinkley Point C impingement predictions corrected for Hinkley Point B raising factors and cooling water flow rates (and supporting raw data files) (ref: 100874130)

- TR456 – Revised predictions of impingement effects at Hinkley Point C – 2018 (ref: 100805583)

3.2 Site location

The new nuclear power station is currently being constructed on the west coast of the United Kingdom approximately 12km north-west of the town of Bridgwater in the county of Somerset. The site is immediately west of the 2 existing Hinkley Point A and Hinkley Point B power stations, as shown in Figure 1.

The site is situated close to several international and national environmentally designated sites. These are:

- Severn Estuary Special Area of Conservation (SAC)
- Severn Estuary Special Protection Area (SPA)
- Severn Estuary Ramsar site
- River Wye SAC
- River Usk SAC
- Exmoor and Quantock Oakwoods SAC
- Bridgwater Bay Site of Special Scientific Interest (SSSI)
- Severn Estuary SSSI
- River Wye SSSI
- River Usk SSSI
- Blue Anchor to Lilstock Coast SSSI
- Bridgwater Bay National Nature Reserve

The nearest Area of Outstanding Natural Beauty (ANOB) is Exmoor.

3.3 Other environmental permits

NNB GenCo (HPC) also hold 2 other environmental permits required to operate the facility. These permits are for the discharge and disposal of radioactive wastes from the site (permit number: EPR/ZP3690SY) and the operation of the standby diesel generators (permit number: EPR/ZP3238FH). The permit variation application does not propose any changes to these permits.

3.4 Consultation on the application

We advertised and consulted on the NNB GenCo (HPC) application from 24 January to 2 March 2023, in accordance with our public participation statement (Environment Agency, 2019b) and the government's published consultation principles (Cabinet Office, 2012).

Our consultation was open to everyone. We invited the public, stakeholders, non-governmental organisations and other organisations and public bodies, to take part.

We have placed the responses to our consultation on the application, on the public register, except where the person making the response asked us not to do so. We can provide copies of documents available on public registers. We had three response that were not opposed to the permit variation application, some that were opposed in principle to the nuclear development, and some that raised specific issues about the proposed WDA permit application. Some of the responses were outside our remit, and are instead linked to any proposed DCO Material Change application that NNB GenCo (HPC) could make.

We are currently transforming our public register capability to be available online, but if this service is not available at the time of any request, you can still contact us and request documents by telephone or email. We also published responses made using our e-consultation tool online.

We received responses from our consultation on the application from organisations we have 'working together' agreements with, other organisations and members of the public. These responses and how we have addressed them are contained within Appendix 1.

3.5 Further information

The application was duly made on 30 December 2022 (that is, we considered it was in the correct form and contained sufficient information for us to begin our determination of the permit application).

When we are considering an application and find we need further information, we can serve a notice on the applicant in accordance with Schedule 5 (under paragraph 4 of part 1) of the EPR 2016. We refer to these notices as 'Schedule 5 notices' (notice of request for more information).

During the determination of NNB GenCo (HPC)'s variation application, we found that we did not need any further information.

4. Our assessment

4.1 Introduction

This section sets out our proposed decision following our assessment of the application and consideration of the responses to the consultations on the application. There are a number of matters we needed to consider before deciding whether to grant a variation to the permit and, if so, subject to what conditions.

In reaching our proposed decision, we have taken into account the relevant legislation, government policy and guidance, our own guidance and the responses to the consultations on the application.

There are also a number of issues that are outside our area of responsibility and which we have not considered in reaching our proposed decision. We have set out these issues at the end of this section.

4.2 Overview

This application to vary an environmental permit, requests the removal of conditions that relate to an Acoustic Fish Deterrent (AFD) and the addition of a waste stream (A7) for the discharge from the Fish Recovery and Return (FRR) system from the commissioning and operational phases of the new nuclear power station being constructed at Hinkley Point.

The legal framework that supports our assessment of the application for these water discharge activities (WDAs) is explained in sections 2.2 and 4.3.

The operation of HPC will require a continuous supply of water to serve the steam turbine condensers, removing waste heat from the system. The proposed direct cooling system would abstract seawater from the Bristol Channel via 2 intake tunnels, one for each UK EPR™ reactor unit. Each intake tunnel includes 2 low velocity side entry (LVSE) intake heads.

After being used within the plant, the seawater would then be discharged back to the Bristol Channel at a higher temperature via a single outfall cooling water tunnel (serving both UK EPR™ units), approximately 1.8 km long.

A small proportion of the seawater will be discharged back to the Bristol Channel via a FRR system via a separate outfall tunnel, approximately 0.5 km long.

Figure 1 shows where the above cooling water intake and discharge infrastructure will be located at HPC.

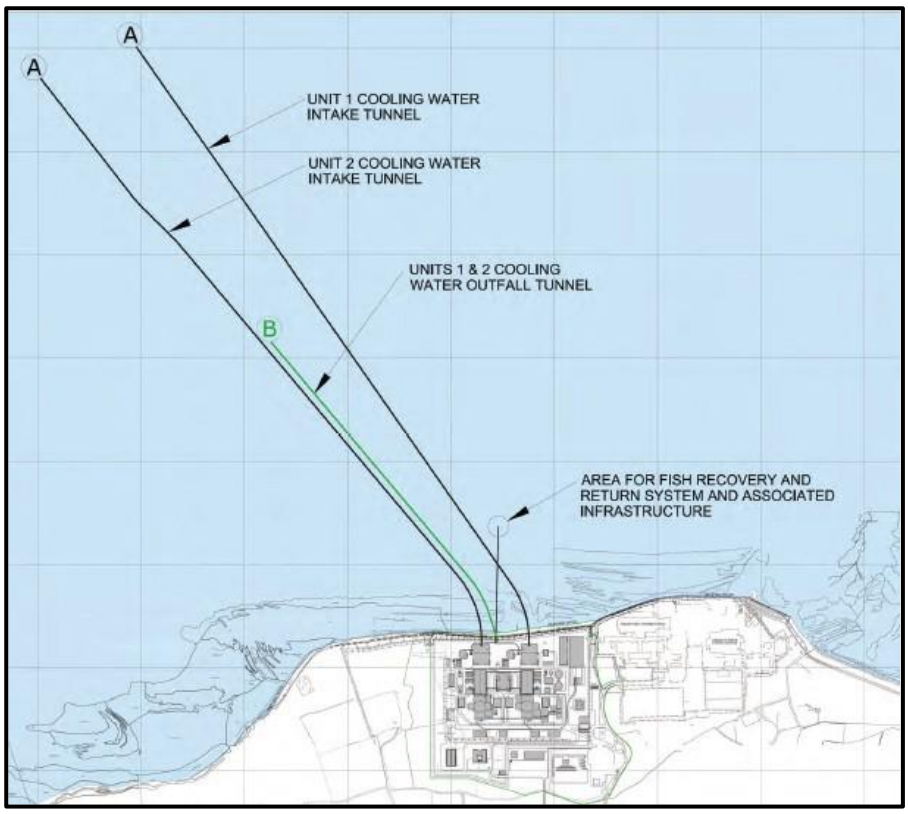

Figure 1. Schematic of cooling water system infrastructure showing intakes (A) and discharge outfall (B) and area of discharge point from FRR system (as supplied by NNB GenCo (HPC)).

When operating normally, the UK EPR™ reactor needs a maximum of around 67 m³/s (5.8 million m³/d) of cooling water. This would result in a maximum cooling water discharge from HPC of 134 m³/s (or 11.6 million m³/d). Returned abstracted cooling water would account for approximately 99% of the overall discharges from HPC, with the remainder made up of process effluents from various supporting systems, rainfall dependent site drainage, treated sewage effluent from staff welfare facilities and the FRR system.

The FRR system will discharge a maximum of 1.26 m³/s (108,863 m³/d) of seawater. This seawater will be a proportion of the water abstracted for cooling, but it will be diverted and will not have passed through the cooling water system and will remain at ambient temperature. This is to provide a continuous flow thought the FRR system to transport fish, that have been abstracted along with the seawater and impinged on the drum and band screens, along the FRR system and back to the Bristol Channel. Figure 2 shows a diagram of the cooling water system and FRR system proposed at HPC.

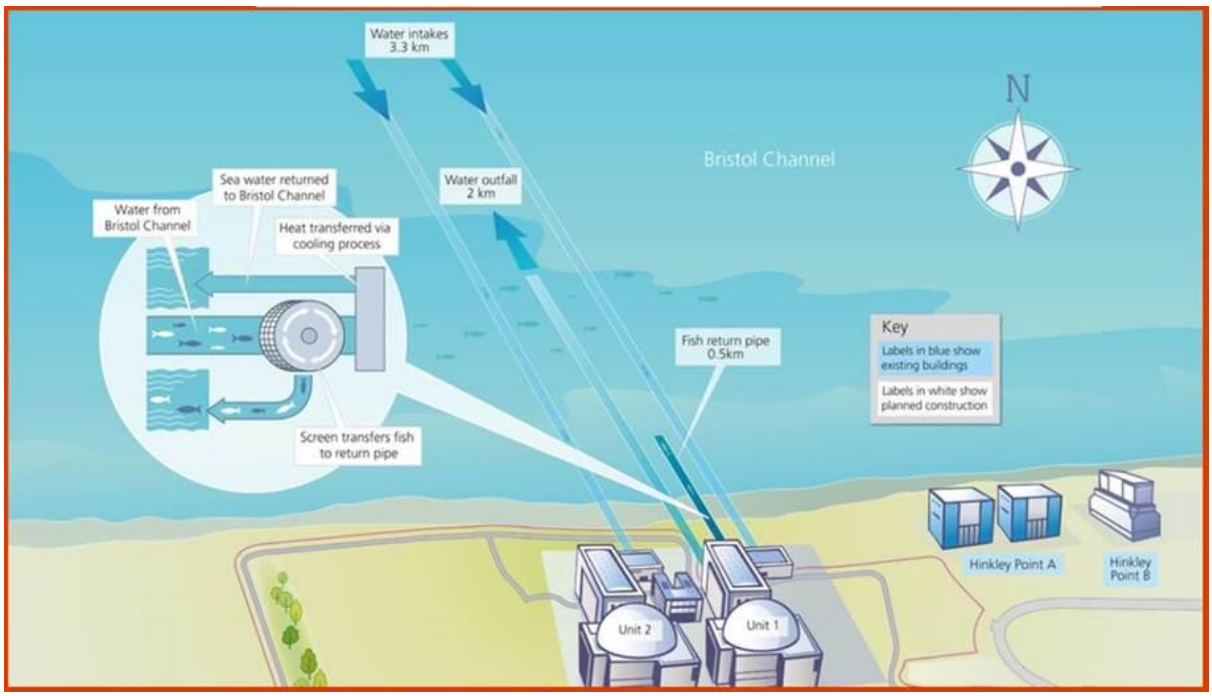

Figure 2. Summary of HPC cooling water abstraction and FRR system (as supplied by NNB GenCo (HPC)).

4.3 Legal framework

NNB GenCo (HPC) has applied to vary its environmental permit under the Environmental Permitting (England and Wales) Regulations 2016 (EPR 2016), for water discharge activities associated with the operation of Hinkley Point C power station. The permit was granted in March 2013 along with the DCO and marine licence although the environmental permit was granted before the other two permissions. The following definitions from EPR 2016 set out the legal context for the variation application and our determination of it.

Water discharge activity is defined under Schedule 21, paragraph (3)(1)(a) as:

“the discharge or entry to inland freshwaters, coastal waters or relevant territorial waters of any (i) poisonous, noxious or polluting matter, (ii) waste matter, or (iii) trade effluent or sewage effluent.”

The requirement for an environmental permit is set out in Part 2, Chapter 1, Regulation 12(1) as:

“A person must not, except under and to the extent authorised by an environmental permit, (a) operate a regulated facility or; (b) cause or knowingly permit a water discharge activity or groundwater activity.”

Part 2, Chapter 2, Regulation 13 (1) (a) states that:

“On the application of an operator, the regulator may grant the operator a permit (an ‘environmental permit’) authorising the operation of a regulated facility.”

Part 2, Chapter 3, Regulation 20 (1) additionally states that:

“The regulator may vary an environmental permit on the application of the operator or on its own initiative.”

These emphasise the discretionary nature of the granting of an environmental permit or variation to an existing environmental permit.

Regulated facility is a collective term used to describe all the different kinds of operations that require a permit under EPR 2016. A water discharge activity is a particular kind of regulated facility as defined under Part 1, Regulation 8 (1) (f):

“In these Regulations, ‘regulated facility’ means: (f) a water discharge activity”

The regulated facility includes all the equipment essential to carry out that activity and the site (of the regulated facility) is the footprint of that equipment, including the discharge pipe and outlet. The site includes control equipment, control rooms and utility areas serving them. In many cases, as with this permit, the discharges to surface water will be made outside the boundary of the development site via the 2 cooling water outlets, and the FRR system outlet.

The activity being regulated under the environmental permit for a water discharge activity is the discharge of polluting matter and/or trade effluent to the receiving water environment from the outlets rather than all activities being undertaken at Hinkley Point C.

4.4 The site

We considered the extent and nature of the facility at the site in accordance with regulatory guidance note 2 (RGN2) ‘Understanding the meaning of regulated facility’. The extent of the facility is defined in the site plan and in the permit. The activities are defined in Table S1.1 of the permit.

For the currently permitted waste streams A to G, the discharges will be made to the Bristol Channel via 2 diffuser heads on the cooling water outfall tunnel. Table S3.2 within the permit provides the National Grid References (NGRs) for Outlet 1 and Outlet 2, as ST 19176 47521 and ST 19128 47578 respectively.

For the additional waste stream from the FRR system, to be known as waste stream H, the discharge will also be made to the Bristol Channel via a separate outfall tunnel. NNB GenCo (HPC) has provided the NGR for this outlet, to be known as Outlet 3, as, ST 20230 46685.

These NGRs include a 50 metre (m) limit of deviation to allow for any tunnel drilling contingencies. We have included a pre-operational measure (PO13) in the draft permit that states that confirmation of the final NGRs must be submitted to us before any discharges can begin.

4.5 The Fish Recovering and Return (FRR) system

To protect the power station's cooling water system (by reducing risks of blockage/bio-fouling), the abstracted seawater will pass through a series of screens (drum and band). Any debris and biota (largely fish and crustaceans) larger than the screen mesh size will be trapped and removed (impinged).

Some of this biota will still be alive, and therefore the FRR system will return this biota back to the receiving water body via the dedicated outlet (at suitable location where they are not likely to be returned to the cooling water intakes) (as summarised in Figures 1 and 2).

However, a proportion of this biota will not survive transit onto the screens and through the FRR system, and so dead or moribund (close to, or at the point of death) biota will also be returned to the Bristol Channel via the FRR system outlet. It is the discharge of this moribund biota that constitutes a potential source of polluting matter. The potential impacts on water quality and designated features have therefore been assessed as part of this permit application.

4.6 Main issues of the proposed decision

4.6.1 Emissions to surface waters (water quality assessment)

The draft permit relates to the water discharge activities. The main focus of our assessment relates to the quality of the effluents to be discharged and the proper operation of the equipment produced/maintains this quality. The main issue was to carefully consider the emissions to surface waters from the discharge of polluting matter in waste stream H rather than wider issues with the operation of the power station.

4.6.2 Habitats Regulations assessment

We are required under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) (Habitats Regulations), to carry out an appropriate assessment of any applications for permissions that could have a likely significant effect on the designated conservation sites (European sites).

The purpose of this assessment is to establish whether we can conclude that the proposed variation of the permit, on its own or together with other relevant permissions, plans or projects, will not adversely affect the integrity of the designated sites in question.

We have carried out an appropriate assessment (Habitats Regulations assessment (HRA)), which covers all relevant Environment Agency permissions, plans or projects in-combination, as well as those of other bodies. A summary of our appropriate assessment for the water discharge activities is discussed in section 4.12.

4.6.3 Cooling water abstraction

During the original permit determination, we decided that an abstraction licence for direct cooling was not required for HPC, as we consider that the abstraction is from the open sea. An abstraction licence is only required if the location or method of abstraction leads to the water being abstracted from inland waters as defined in section 221 Water Resources Act 1991.

The proposed cooling water system for HPC includes a fish recovery and return (FRR) system. The FRR system forms an integral part of the design to sensitively recover (capture) and return impinged species back to the Bristol Channel via a dedicated FRR system outfall tunnel.

4.6.4 Control of biological fouling

Biological fouling (or biofouling) refers to the growth or colonisation by bacteria, fungi, biofilms or other species (such as mussels) within the cooling water system. Without appropriate control measures the abstraction of seawater for cooling would present considerable operational risks due to biofouling, particularly in the condensers, where significant colonisation of organisms entrained with the cooling water would reduce the

overall efficiency of the power station. The potential for biofouling increases as the sea temperature rises.

A seawater temperature of 10°C is typically regarded as the point at which operators would begin dosing the incoming cooling water with biocide to control the growth of undesirable organisms. The operational requirement to achieve and then maintain a level of control over biological growth in the cooling water system tends to focus on techniques involving (a) the intrinsic design of the system where specialised materials, paints and coatings can be used, and (b) chemical dosing of the incoming cooling water with an appropriate biocide, for example, sodium hypochlorite. The most appropriate strategy for any given location depends on site-specific factors, with careful consideration needed to determine the best system of control.

The proposals for controlling biofouling at HPC involves intrinsic design measures together with risk-based intermittent chemical dosing. Based on experience at HPB, NNB GenCo (HPC) concludes that chemical dosing is unlikely to be required. Nevertheless, for operational efficiency (and safety) reasons, it must retain the ability to dose (chlorinate) if conditions require it.

Within the application for the original permit NNB GenCo (HPC) has provided outline details of its proposed strategy for chlorination of the incoming cooling water and an associated risk assessment, looking at the potential impact of residual oxidant and chlorination by-products in the receiving water. During the original permit determination, NNB GenCo (HPC) also confirmed that the injection of biocide, into the system, will be downstream of the drum screens. This will eliminate the possibility of biota within the FRR system being impacted by total residual oxidant (TRO) or chlorination by-products (CBPs). An operating techniques condition was included in the permit (at Table S1.2) to enforce this approach.

NNB GenCo (HPC) also stated that the information contained within the original permit application presents a worst-case scenario in terms of the contaminants associated with chlorination. NNB GenCo (HPC) proposes to finalise their biofouling control strategy for HPC, based on the lessons learnt through commissioning and early operation of the EPR™ unit being built at Flamanville in France. We considered this to be acceptable and included a pre-operational measure (PO7 at Table S1.4) in the permit which requires NNB GenCo (HPC) to confirm and justify their final control strategy for HPC.

4.7 The water discharge activities

Given that a water discharge activity is “the discharge or entry to inland freshwaters, coastal waters or relevant territorial waters of any (i) poisonous, noxious or polluting matter, (ii) waste matter, or (iii) trade effluent or sewage effluent”, in making an environmental permit application NNB GenCo (HPC) has a duty to describe such matter or effluents in its application.

NNB GenCo (HPC) described the various waste streams (A to G) that would make up the water discharge activities (WDAs) at HPC, within the original permit application, and these

are summarised in the executive summary. However, in recent years it has become apparent that the proposed discharge from the FRR system is also classified as a water discharge activity and has therefore been applied to be added under this current permit variation for the permit as a waste stream (waste stream H).

Various treatment systems will be applied to waste streams B to G to reduce the contaminant concentrations, and to enable the recycling of boron and water in the primary circuit. The proposed treatment techniques include filtration, membrane filtration, ion exchange, degassing, evaporation and oil/water separation. The type of treatment is specific to both the origin and nature of the waste stream and the required treatment objectives.

NNB GenCo (HPC) described within the original permit application procedures for each waste stream where the effluent will be received in monitoring tanks and then sampled before being discharged. If the sample exceeds environmental permit limits, then the effluent can be re-circulated through the treatment system again and either discharged when within environmental permit specification, or tankered off site for disposal.

Following treatment, all of the individual waste streams (B – G) will be combined with the returned cooling water in an outfall pond before being discharged to the Bristol Channel. The outfall pond (sometimes also referred to as a ‘seal pit’ or ‘surge chamber’) is a large concrete basin structure set into the ground, which allows the operator to regulate the water level and control the pressure head on the discharge side of the system. It is part of the cooling water system infrastructure and will be located within the nuclear licensed site boundary. The HPC design incorporates 2 outfall ponds, one for each UK EPR™ unit.

Figure 3 is a conceptual view of the waste streams and the treatment facilities that make up the water discharge activity during standard operation.

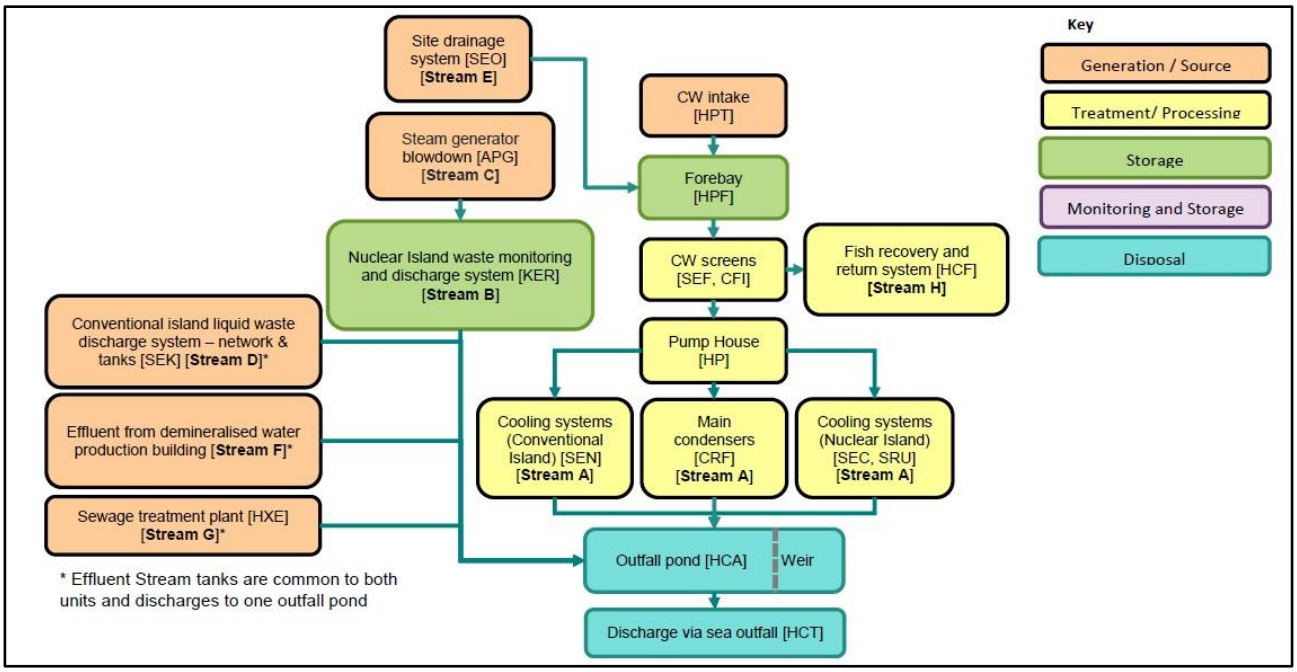

Figure 3. Simplified overview diagram of effluents contributing to the surface water discharges (as supplied by NNB GenCo (HPC)).

Each waste stream (A-G) was characterised during the original permit determination, showing that the flow of returned cooling water via waste stream A (which forms over 99% of the volume of HPC's operational water discharge activities combined) will provide a large dilution, prior to being discharged to the environment, to the other waste streams (B-G). NNB GenCo (HCP) has provided estimated emissions data, comprising maximum daily and annual loadings and maximum concentrations for each substance. The loading data refers to the maximum amount of the substance (in kilograms) resulting from the waste stream, while the substance concentration refers to the value in the waste stream before it is combined (diluted) with the flow of returned cooling water via waste stream A (which forms over 99% of the volume of HPC's operational water discharge activities combined).

4.7.1 Waste stream H

Waste stream H is trade effluent composed of returned abstracted seawater via the fish recovery and return (FRR) system. This is the only waste stream to be altered by this permit variation application.

HPC will have a single fish recovery and return (FRR) system which serves both UK EPR™ reactor units. The FRR system will discharge a maximum volume of 108,864 m³/day, and will operate on a continuous basis (at a discharge rate of 1.26 m³/second or 1,260 litres/second).

The FRR system is designed to protect and return fish from the abstracted seawater and return them to the Bristol Channel. The drum and band screens as designed to protect HPC's cooling water system, as the abstracted water will be passed through a series of screens (drum and band screens) to reduce the risks of blockage and biofouling of HPC's

cooling water system. Any debris and biota larger than the screen mesh size will be trapped and removed (impinged).

Some of this biota will still be alive, and therefore the FRR system is designed to return this biota back to the receiving water body via a dedicated tunnel and outlet (at a suitable location where they are not likely to be returned to the cooling water intakes).

However, a proportion of this biota will not survive transit onto the screens and through the FRR system, and so dead or moribund (close to, or at the point of death) biota will also be returned to the Bristol Channel via the FRR system outlet. It is the discharge of this dead or moribund biota that constitutes a potential source of polluting matter. The potential impacts on water quality and designated features have therefore been assessed as part of this permit variation application.

Our assessment considered the contribution of nutrients, unionised ammonia, organic enrichment, biochemical oxygen demand (BOD) and deoxygenation caused by the decay of the dead and moribund biota from the FRR system discharge.

4.7.2 Waste stream E

Waste stream E comprises oily water from the oily water drainage network, which serves those areas on site where oils and hydrocarbons are used and which, therefore, present a risk of contamination. These areas include the back-up diesel generators, transformer compounds, electrical substations, oil and grease store, oil and hydrocarbon offloading areas and various workshops.

Waste stream E results from the incidental collection of hydrocarbons in the site oily water system, rather than a planned introduction of a substance to the waste stream. NNB GenCo (HPC) proposes to install a Class 1 oil interceptor specified to achieve a maximum hydrocarbon concentration of 5 milligrams per litre (mg/l). With a maximum daily discharge volume of 240 m^3/day, the resultant maximum daily and annual loading of hydrocarbons would be 1 kg and 438 kg respectively. The maximum rate of discharge is 2.8 litres per second (l/s).

Waste stream E will be discharged on an intermittent basis via the forebay. This is before the drum and band screens and therefore has the potential to also influence Waste stream H (that discharges via the FRR system).

Within the forebay waste stream E will mix with the continuous flow of abstracted seawater. This seawater will provide a very large amount of dilution within the forebay.

Due to the use of oil interceptors and the large amount of dilution within the forebay, the potential for Waste stream E to impact the biota or water quality of waste stream H is insignificant. It will therefore not be considered any further within our assessment of Waste stream H.

4.8 General issues

4.8.1 Administrative issues

NNB GenCo (HPC) is the sole operator of the regulated facility.

We are satisfied that the applicant and proposed operator (NNB GenCo (HPC)) is the company that will have control over the operation of the facility if the permit is granted, and would be able to operate the regulated facility so as to comply with the conditions included in the permit. The proposed decision was taken in accordance with our guidance on legal operator for environmental permits.

4.8.2 Management

NNB GenCo (HPC) has stated in its permit applications (the original permit application and the current permit variation application) that it will implement an environmental management system (EMS) that will be certified under ISO14001. We included a pre-operational measure in the original permit (PO1 at table S1.4) that requires the operator to provide a summary of the EMS before the plant is commissioned, and to make all EMS documentation available for inspection. We recognise that the EMS cannot be certified until the regulated facility is operational. Therefore, we also included an improvement condition in the original permit requiring the operator to report progress towards gaining accreditation of its EMS after commissioning of the HPC power station has begun. These conditions will remain within this permit variation.

We have no evidence to suggest that the operator will not have the management systems to allow it to comply with the permit conditions. We took this decision in accordance with our guidance for legal operator and competence requirements for environmental permits.

4.8.3 Accident and incident management

NNB GenCo (HPC) submitted an initial environmental risk assessment of potential accidents and incidents at HPC relevant to the water discharge activities during the original permit application. The assessment identified a range of accidents that could occur, their potential environmental consequences, and comments on the control measures that would be applied.

Having considered NNB GenCo (HPC)'s outline approach to developing an accident and incident management plan and the information submitted in the original application regarding preventing and controlling pollution, we were (and still are) satisfied that appropriate measures will be in place to make sure that accidents that may pollute the water environment are prevented and that, if they should occur, their consequences are minimised. The plan will address how environmental risks will be prevented and mitigated during operation, and, in particular, will address the storage and handling of hazardous materials during operation of the site. The plan will also include a quantified hazard risk assessment that incorporates the engineering and procedural mitigation measures that will

be in place before operation commences, and how environmental risks will be prevented and mitigated during operation.

The plan will form part of the EMS and, as such, this requirement is covered in the pre-operational measure (PO1 at table S1.4) within the permit.

4.8.4 Consideration of foul sewer

Providing several kilometres of pipeline and the associated pumping infrastructure to enable process effluent and/or treated sewage effluent to be discharged to the public foul sewer is environmentally unsustainable. Furthermore, it does not offer significant environmental benefits over a discharge out into the Bristol Channel, where there is much greater capacity to dilute and disperse effluent, rather than for example, to the Parrot Estuary, where most of the local public sewage treatment works ultimately discharge. Therefore, we agree with NNB GenCo (HPC)'s justification for not connecting to the foul sewer in our determination of the original operational WDA permit application.

4.8.5 Operating techniques

The original permit specified that NNB GenCo (HPC) must operate the regulated facility in accordance with the documents contained in its original permit application:

- Sections 2.3.2 to 2.3.7 of the main HPC WDA permit application document (Environmental permit application for Hinkley Point C, application reference EPR/HP3228XT/A001 - Main document) for the descriptions of the treatment systems used to remove contaminants before discharge.
- Section 2.6.2 of the HPC WDA permit main application document for the description of the prevention of unplanned emissions of oils from heat exchangers. This is required to ensure that environment oil coolers are not used.
- Section 2.7.2 of the main HPC WDA permit application document for the description of hot functional testing (HFT). This is required to ensure that HFT does not involve dosing anything other than the chemicals that will be used during normal operation of the HPC power station, and which was included under the HPC WDA permit application.
- Section 3.1.3 of the main application document for minimisation of impingement of marine life to reduce potential for generation of polluting matter (arising through the death of impinged marine organisms) to ensure the multi-staged approach is adopted as stated, with respect to LVSE intake design, and exclusion systems, including the FRR system design.
- Section 3.5 of the main application document for the oily water treatment description, to ensure that the installation and operation of oily water interceptors follows GOV.uk guidance which includes:
    - https://www.gov.uk/guidance/storing-oil-at-a-home-or-business
    - https://www.gov.uk/guidance/pollution-prevention-for-businesses
    - https://www.gov.uk/oil-storage-regulations-and-safety/business

- Section 3.7.3 of the main application document for the strategy for minimising chlorination description. This is required to ensure that the in-principle strategy is developed based on risk-based intermittent dosing.
- Section 3.8 of the main application document for the sanitary effluent (treated sewage effluent) discharge description. This is to ensure that an appropriately sized and designed sewage treatment plant (STP) is provided to accommodate peak flows during outage, and the waste hierarchy is applied (to include the separation of uncontaminated surface water run-off from the site's foul flows).
- The response to question 25 in the Schedule 5 Notice, clarifying the injection of any biocide will be downstream of the drum screens but before the condensers.
- The response to question 9 in the Schedule 5 Notice, clarifying the maximum expected pre-dilution substance concentrations in waste stream B and C (combined), and waste stream D.
- The response to question 13 in the Schedule 5 Notice, clarifying the expected pre-dilution substance concentrations in waste stream F.

The original permit also specified that NNB GenCo (HPC) must operate the regulated facility in accordance with:

- The response to question 46 in the Schedule 5 Notice, clarifying that the Acoustic Fish Deterrent (AFD) system will be operated 24 hours per day.

This permit variation would remove this condition from the permit.

The original permit specified that NNB GenCo (HPC) must operate the regulated facility in accordance with the following plans in Table S1.4:

- Emissions management plan, as approved in accordance with pre-operational measure PO5
- Commissioning discharges management plan, as approved in accordance with pre-operational measure PO6
- Operational strategy for the control of biofouling, as approved in accordance with pre-operational measure PO7
- Forebay de-silting plan, as approved in accordance with pre-operational measure PO9
- Hydrazine management plan, as approved in accordance with pre-operational measure PO10
- Environmental monitoring plan, as approved in accordance with pre-operational measure PO11
- Priority hazardous substances management plan, as approved in accordance with pre-operational measure PO12
- Effluent monitoring plan, as approved in accordance with pre-operational measure PO15
- Hydrodynamic modelling review plan, as approved in accordance with preoperational measure PO16

All these conditions would remain within the varied permit.

The original permit also specified that NNB GenCo (HPC) must operate the regulated facility in accordance with a:

- Commissioning plan for the AFD and FRR systems, in accordance with pre-operational measure PO8 in Table S1.4

This permit variation would remove the reference to the AFD. So, the varied permit would specify that NNB GenCo (HPC) must operate the regulated facility in accordance with a:

- Commissioning plan for the FRR system discharge, in accordance with pre-operational measure PO8 in Table S1.4

This permit variation would also include an additional condition specifying that NNB GenCo (HPC) must operate the regulated facility in accordance with a:

- Monitoring data review plan, as approved in accordance with pre-operational measure PO18 in Table S1.4

This plan shall include a description of the sampling and monitoring regimes that will be put in place to ensure NNB GenCo (HPC) can detect any shift in fish species being impinged (as might occur due to climate change). In turn, review of this monitoring data will enable NNB GenCo (HPC) and the EA to assess how any shift in fish species and abundance being impinged could influence the effluent load from the FRR system discharge.

NNB GenCo (HPC) must submit these plans to us for approval as part of a package of pre-operational measures included in the permit. Our approvals must be provided before the hot functional testing (HTF) phase of the commissioning process begins.

Due to the lengthy design process and construction period associated with HPC, certain aspects of the detailed design are ongoing and evolving. We are, therefore, using these pre-operational measures in many instances to require the operator to confirm that the details and procedures proposed in the application have been adopted or implemented before commissioning begins. If designs change after the application is made, then the conditions require the operator to validate the original application data and, if necessary, demonstrate how any changes will prevent or minimise impacts on the environment and ensure compliance with the permit.

The details set out in this section would form part of the permit through permit condition 2.3.1 (operating techniques) and Table S1.2 in Schedule 1.

4.9 The environmental impact of the water discharge activities

We can set limits on environmental permits for the substances listed within 2008/105/EC, (as amended by 2013/39/EU), the Environmental Quality Standards Directive (EQSD) and for specific pollutants covered by Annex 8 of 2000/60/EC the Water Framework Directive (WFD).

The standards for these substances were transposed into UK legislation through The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

Environment Agency (2019a), and our GOV.UK guidance lists environmental quality standard (EQS) thresholds for 'hazardous chemicals and elements'. An EQS is the concentration below which a substance is not believed to be detrimental to aquatic life, based on the results of toxicity tests on organisms covering a range of levels within food chains. Each substance has its own EQS, which can differ depending on whether the receiving environment is fresh, transitional, or coastal water.

Hazardous chemicals and elements in Environment Agency (2019a) comprise:

- pollutants classed as either priority hazardous substances, priority substances or 'other pollutants' by the EQSD
- specific pollutants listed in The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015
- substances which have an operational (non-statutory) environmental quality standard (EQS)

Environment Agency (2019a) can also be applied to assess the environmental risk of substances with ecotoxic properties which are not within these categories, but that are present in discharges at sufficient concentrations to be of potential environmental concern. Rather than an EQS, these substances may have an equivalent environmental/ecotoxic threshold such as a predicted no effect concentration (PNEC) value.

Our ecotoxicology advisory service (ETAS) typically reviews any PNECs or other alternative threshold values that are proposed by an applicant for substances without an EQS, to confirm that the PNEC has been appropriately derived.

Substances with EQSs will have either a maximum allowable concentration (MAC) or an annual average (AA) concentration standard or both, and so the risk assessment will take into consideration mixing zones (Section 4.9.1), short-term (Section 4.9.2) and long-term effects (Section 4.9.3).

4.9.1 Mixing zones

The mixing zone is defined as the predicted area of the receiving water body that is expected to contain concentrations of these substances above the relevant EQS or PNEC value as a result of the discharge activity.

Computer modelling was used to determine the extent of the substance's mixing zone created by the FRR system discharge to determine the environmental impact and pollution risk of these relevant substances. The extent of the predicted mixing zone, with reference to the underlying toxicity data, was then be used to determine whether there would be an adverse effect on designated features or sites.

Based on the modelling and outcomes from our HRA and WFD assessments for the FRR system discharge, numeric compliance conditions and limits will be applied for a substance

to ensure the modelled mixing zone is not exceeded (as any exceedance of a modelled mixing zone may result in an adverse effect on site integrity). This may be achieved by setting a concentration limit (for example, mg/l or µg/l) and/or a loading limit (for example, kg/day or kg/year) for the substance assessed via the modelling.

If a modelled mixing zone is not acceptable, then we may have to set permit limits which will deliver an acceptable mixing zone. However, we may potentially have to refuse the permit application if the impact of the proposed discharge on the receiving environment is determined to be unacceptable.

4.9.2 Short-term effects

The maximum allowable (MAC) EQS of the proposed substance will be considered in order to evaluate the short-term environmental impact that the proposed discharge of the substance may cause. For substances with PNEC values, the short-term environmental impact is assessed via an appropriately derived acute PNEC value (calculated as a maximum allowable concentration, or maximum as a 95th percentile).

4.9.3 Long-term effects

The annual average EQS concentration of the proposed substance will be considered in order to evaluate the long-term environmental impact that the proposed discharge may cause. For substances with PNEC values, the long-term environmental impact is assessment via an appropriately derived chronic (calculated as a mean/average) PNEC value.

4.9.4 Assessment methodology for the fish recovery and return (FRR) system discharge (Waste Stream H)

Introduction

As described in section 4.7.1, waste stream H, discharged via the FRR system, will contain dead or moribund biota which constitutes a potential source of polluting matter.

This section describes the methodology used to estimate the amount of polluting matter predicted to be discharged, and what potential impacts this may have on relevant water quality elements. These quantitative results have then been considered qualitatively within our WFD compliance assessment report (Environment Agency, 2023a), Habitats Regulations Assessment (HRA) (Environment Agency, 2023b) and SSSI Assessment Report (Environment Agency, 2023c).

NNB GenCo (HPC) provided its analysis of potential water quality effects of the FRR system discharge within TR515 ‘HPC Water quality effects of the fish recovery and return system’ (NNB GenCo, 2020a).

Our review of this analysis is provided in our assessment report AR001 ‘Fish Recovery and Return System Discharge Assessment Report’ (Environment Agency, 2023d) ‘. In summary,

the assessment process we conducted, as part of the permit variation application determination, was identical to NNB GenCo (HPC)'s.

However, in AR001 the calculations were updated using several different evaluations of the potential biomass discharged. The difference between NNB GenCo (HPC)'s and our figures were largely due to differing estimates of the impingement predicted at HPC. Our impingement methodology was informed by 9 technical briefs (TBs) we completed to help our permit variation application determination:

- TB001: Vertical Audit and Raw Data Quality Assurance Summary Report (Environment Agency, 2023e)
- TB003: Fish impingement and abstraction volume relationship (Environment Agency, 2023f)
- TB005: Ebb tide sampling bias at HPB (Environment Agency, 2023g)
- TB006: Low Velocity Side Entry; effect of intake intercept area (Environment Agency, 2023h)
- TB007: Low Velocity Side Entry; effect of intake velocity cap (Environment Agency, 2023i)
- TB008: Fish Recovery and Return system mortality rates (Environment Agency, 2023j)
- TB009: Biomass weight and mortality report (Environment Agency, 2023k)
- TB014: Safe fish density in drum and band screen fish buckets (Environment Agency, 2023l)
- TB019: Relationship between impingement and abstraction in Bristol Channel (Environment Agency, 2023m)

Assessment process

The general steps involved in the assessment process are as follows:

1. Estimate the number of individuals that will be impinged within the HPC cooling water system (CWS).

This used impingement sampling data collected from HPB and apply scaling factors to take account of the differing volumes and intake designs.

2. Calculate the biomass of these impinged individuals.
3. Calculate the biomass of the individuals that will not survive the journey through the abstraction and FRR system by applying appropriate 'FRR system mortality rates'.

These differ between the types of species impinged.

4. Conduct a literature review to understand the decay products of moribund organisms.
5. The daily loading of those breakdown products (nitrogen, phosphorus, unionised ammonia, biochemical oxygen demand (BOD), and organic carbon) is then calculated using the biomass from Step 3 and the literature values in Step 4.
6. These loadings can then be compared against a relevant standard (for example, EQS or equivalent) to estimate a 'mixing zone' for each element and plume footprint for organic enrichment.

Estimating Hinkley Point C impingement (Step 1)

To support this permit variation application, NNB GenCo (HPC) submitted various reports to present their data analysis process to predict the number, weight, and size distribution of individuals by species that will be impinged at HPC, using impingement sample data from the Comprehensive Impingement Monitoring Programme (CIMP) at HPB:

- TR465: Revised Predictions of Impingement Effects at Hinkley Point – 2018 (reference: 100905583). NNB Generation Company (HPC) Limited (NNB GenCo, 2019a)
- SPP112: Hinkley Point C Impingement Predictions Corrected for Hinkley Point B Raising Factors and Cooling Water Flow Rates (reference: 100874130). NNB Generation Company (HPC) Limited (NNB GenCo, 2021a)
- SPP105: Predicted Performance of the HPCL VSE intake heads compared with the HPB intake (reference number: 100889387) NNB Generation Company (HPC) Limited (NNB GenCo, 2020b)
- TR573: Hinkley Point Comprehensive Impingement Monitoring Programme 2021 – 2022 (reference number: 101042348) NNB Generation Company (HPC) Limited (NNB GenCo, 2022)

Vertical audit

We carried out a vertical audit on NNB GenCo (HPC)'s data processing as detailed within these reports. This involved replicating the data processes on the raw data, as described by NNB GenCo (HPC)'s reports and ensuring that all were carried out correctly. This audit is detailed in our Technical Brief TB001 (Environment Agency, 2023e) and involved correcting errors identified in the NNB GenCo (HPC) data processing.

We have compared our results to those NNB GenCo (HPC) presented in TR456 (NNB GenCo, 2019a) and TR573 (NNB GenCO, 2022). TR456 presents revised annual impingement predictions for HPC without an Acoustic Fish Deterrent (AFD). Impingement predictions in TR456 are primarily based on data collected at Hinkley Point B (HPB) in 2009/10 as part of the Comprehensive Impingement Monitoring Programme (CIMP) while TR573 provides the results of the CIMP2 programme in 2021-22. Based on the results of our original vertical audit, NNB GenCo (HPC) updated their impingement estimates from TR456 in SPP112 (NNB GenCo, 2021a). This paper also includes an updated full capacity cooling water flow at HPB of 34.37 cumecs resulting in a volume scaling factor from HPB to HPC of 3.836 (originally 3.913).

Additional impingement predictions for HPC are also provided based on the multiyear Routine Impingement Monitoring Programme (RIMP). The RIMP data are also used to assess inter-annual variability. Two additional years of RIMP data, for 2018 and 2019, are also now available and were reported by NNB GenCo (HPC) in TR573.

Table 1 summarises how issues identified with NNB GenCo (HPC)'s data processing has been addressed between within our technical briefs. No errors were found in the vertical audit of the CIMP2 or additional RIMP data.

Table 1. Summary of corrections made for identified data processing errors

Data reviewed	Data issue	Error impact	Resolution
CIMP raw data	Not all samples were raised to full capacity	Results in the 'full capacity' values calculated for these sampling occasions being underestimated by 25%	These calculations have been redone using the correct number of pumps
CIMP raw data	On 6 occasions only the six 1 hour samples were used to raise impingement numbers to full capacity and these were not corrected for the ebb tide bias	Extrapolation of the hourly samples collected on the ebb produces and overestimation by a factor of 1.6	EA analysis shows ebb tide bias to be insignificant (TB005)[1] and has therefore not been applied to any samples within the EA's calculations
RIMP raw data	No error found	No impact	None required
Results reported in TR456 Ed2	Not possible to replicate the results of the uncertainty analysis for 3 species, as unknown what information was used to devise confidence intervals	Produces further uncertainty around the analysis of these 3 species	None required. The precautionary approach taken in EA analysis of FRR system discharge results in this uncertainty being insignificant
Results reported in TR456 Ed2	Impingement calculations used data incorrectly raised to full capacity as identified above from CIMP data	Impingement analysis with the corrected CIMP input data resulted in an overall increase in the mean impingement predictions of 4%. Changes in mean impingement predictions are species specific ranging from no change up to a 33% increase	These calculations were redone within the EA analysis

[1]TB005 – Estimation of evidence of an ebb tide sampling bias at HPB (Environment Agency, 2023g)

Uncertainty analysis

Estimates of variability in the monitoring data were calculated using bootstrapping by both NNB GenCo (HPC) and the EA as described in Appendix D of TR456. Bootstrapping is a statistical metric that uses random sampling with replacement (e.g. mimicking the sampling process). It is used to assign measures of accuracy (bias, variance, confidence intervals, prediction error, etc.) to sample estimates.

The CIMP measurements of fish impingement at HPB were resampled with replacement within each quarter of the year to match the data collection procedure (10 visits per quarter). Then, for each of 10,000 bootstrap iterations, the sum of the 40 sampled values was calculated and 95% confidence intervals were derived.

The sum from the 40 bootstrapped samples and confidence intervals were multiplied by 365.25/40 to give an annual estimate of HPB intake numbers along with the 95% confidence interval around that estimate.

Bootstrapping was carried out in the software R v3.4.3 (R Core Team, 2017) using package 'boot'. Finally, scaling the bootstrap confidence intervals to HPC values is valid as the method used in "transformation respecting" (TR456 and references therein).

LVSE factors

As sample data from HPB is used to predict the impingement at HPC, a factor needs to be applied to account for the low velocity side entry (LVSE) cooling water intake designs at HPC (termed the LVSE intake area factor). We have reviewed the work contained in TR456 and developed our own factors in TB007 and TB008. These factors, along with NNB GenCo (HPC)'s and the most recently agreed factors are provided in Table 2.

The LVSE intake area intercept factor, was agreed to be 1.0 as part of the HPC AFD appeal proceedings. We consider it unlikely that the true LVSE factor would be less than 1.0, but there is also evidence that the LVSE intake heads could act as an artificial reef and, therefore, be greater than 1.0. However, without any evidence or basis for a calculation otherwise, we have assumed an LVSE factor of 1.0 in our estimates of HPC impingement.

Our guidance (Environment Agency, 2010b) is in favour of LVSE designs in combination with a behavioural cue; the cue prompts fish to swim away from the intake, and the intake velocities with a LVSE design are low enough for fish to swim against. However, in the absence of a behavioural cue, there is no reason to assume that fish will avoid the intake.

The second factor, the pelagic cap factor, is applied to account for the capped nature of the LVSE intake head for HPC versus the up-capped intake at HPB (TB007).

Calculate the biomass of impinged individuals (Step 2)

The Comprehensive Impingement Monitoring Programme (CIMP) provided fish and invertebrate numbers caught over 41 separate days during the period of 24/02/2009 to 11/02/2010 and an additional 35 separate days during the period of 15/06/2021 to 16/06/2022, at HPB (TR573).

This data was collected through a hybrid sampling method, with a bulk sample collected in the trash basket for 18-hours (overnight), followed by six one-hour samples collected from the drum screen channels in baskets. All fish were sorted by species with the total number and weight recorded for each species. Invertebrates were also sorted by species and the total of each species weighed. On occasion, when there was a particularly heavy ingress of weed, fish or crustaceans, a sub-sampling approach was taken to provide an accurate representation of the entire sample.

The original CIMP biomass data from HPB was then scaled up to estimate biomass impingement at HPC, following the methodology described in TR456. The HPC 'volume scale' estimate directly raises the HPB impingement weights by the ratio of cooling water flows. An additional scaling factor is also applied to account for the design of the HPC intake heads.

We have three estimates of these factors: one from TR456, and a revised estimate calculated by the EA (as described in *Technical Brief: TB006 – effect of intake intercept area* and *Technical Brief: TB007 - effect of intake velocity cap*). The HPC volume scale was further updated by NNB GenCo (HPC) in SPP112 while the LVSE intake area factor was agreed to be 1.00 as part of the HPC AFD Appeal proceedings. A factor of 0.23 was agreed to be used as the LVSE pelagic cap factor.

These scaling factors are summarised in Table 2.

Table 2. Environment Agency revised method of predicting HPC impingement estimates from HPB CIMP data, as defined in TB009 (Environment Agency, 2023k)

Factor	HPC volume scale	HPC with LVSE
Environment Agency Factors (2020)	3.913 (131.86 / 33.7)	1.394 (for all species expect pelagic) 0.32062 (pelagic species (1.394 x 0.23))
TR456 factors (2019)	3.913 (131.86 / 33.7)	0.646 (for all species except pelagic) 0.2455 (for pelagic species (0.646 x 0.38))
SPP112 and agreed LVSE factors (2021)	3.836 (131.86 / 34.37)	1.00 (for all species except pelagic) 0.23 (pelagic species)

Although the LVSE factors were agreed as in SPP112 via the HPC AFD appeal proceedings, the our factors devised in 2020 provide a more precautionary approach. It was therefore decided to take these figures forward in the assessment to consider a reasonable worst-case scenario.

As described above, to derive annual biomass estimates, the daily impingement estimates were bootstrapped for each species and scaled up to an annual amount.

Weight of fish impinged was derived, by species, from a number of individuals across a range of length classes. Weight of invertebrates was derived by species from weight of all individuals.

Results from our annual biomass estimates indicate that 12 species of fish and 6 invertebrates contribute >100 kg to annual impinged biomass at HPC (99% of total

impingement by weight (*Table 3*)). Whiting (*Merlangius merlangus*) and Grey Shrimp (*Crangon crangon*) have the highest weight impinged. EA annual biomass impingement for HPB, HPC volume scale and HPC with LVSE is estimated as 36,156 kg, 141,469 kg, and 178,365 respectively (using factors from the first row of Table 2).

Table 3. Species with the highest annual mass (kg) of impingement in the CIMP1 original EA annual biomass estimates.

Fish – Latin name	Fish - common name	HPB	HPC volume scale	HPC with LVSE
Merlangius merlangus (L.)	Whiting	7,119	27,854	38,829
Sprattus sprattus (L.)	Sprat	4,375	17,118	5,488
Conger conger L.	Conger	3,567	13,958	19,457
Platichthys flesus (L.)	Flounder	2,036	7,966	11,105
Solea solea L.	Sole, Dover	1,866	7,300	10,177
Gadus morhua L.	Cod	1,574	6,160	8,587
Liza ramada (Risso)	Mullet, Thin-lipped grey	1,263	4,943	6,890
Raja clavata L.	Thornback ray	690	2,699	3,763
Scyliorhinus canicula (L.)	Dogfish, Lesser spotted	682	2,670	3,722
Ciliata mustela (L.)	Rockling, 5-Bearded	591	2,312	3,222
Dicentrarchus labrax (L.)	Bass	483	1,889	2,633
Clupea harengus L.	Herring	102	401	128
Crangon crangon	Shrimp, Grey	6,543	25,600	35,686
Pasiphaea sivado	Shrimp, Ghost	1,928	7,544	10,516
Pandalus montagui	Shrimp, Pink	1,368	5,351	7,460
Palaemon serratus	Prawn, Atlantic	1,187	4,644	6,473
-	Jellyfish	179	701	977
Cancer pagurus	Crab, Edible	123	480	669
	Overall total for all fish species:	**24,707**	**96,677**	**115,925**
	Overall total for all invertebrate species:	**11,449**	**44,800**	**62,451**
	Overall total for all species:	**36,156**	**141,477**	**178,376**

Calculation of the biomass of moribund organisms from the FRR system (Step 3)

To calculate the biomass of individuals that will not survive the journey through the cooling water abstraction and FRR system, we apply FRR system mortality rates to the biomass impingent estimates from Step 2.

TB008 provides the FRR system mortality rates we used following an extensive review. It details our review of the FRR system mortality rates in TR456 and those from previous reports.

It then recommends a final set of FRR system mortality rates for each species in the impingement record at HPB and a range around the FRR system mortality rate for each species. The range set accounts for the uncertainty in the underlying evidence used to set the FRR system mortality rate, and in the efficiency of the bespoke FRR system proposed for HPC.

Fish mortality rates were species-specific, where a common mortality rate of 20% was applied to all invertebrate species mortality rate. The FRR system mortality rates for the most common fish species captured in the HPB impingement data are provided in Table 4.

Table 4. Selected mortality rates to use in the EA's estimate of impact from the FRR system. EA values are from TB008 (Environment Agency, 2023j)

Species	FRR system mortality factor used by NNB GenCo (HPC) in TR456	FRR system mortality factor used by the Environment Agency	FRR system mortality uncertainty range used by the Environment Agency
European sprat	1.00	1.00	0.95 – 1
Whiting	0.55	0.55	0.41 – 1
Dover sole	0.20	0.20	0.05 – 0.2
Atlantic cod	0.55	0.56	0.18 – 0.56
Atlantic herring	1.00	1.00	0.9 – 1
European seabass	0.70	0.61	0.3 – 0.95
European plaice	0.43	0.20	0.02 – 0.2
Thornback ray	0.41	0.55	0.41 – 0.55
Blue whiting	0.55	0.66	0.56 – 0.66

European eel	0.20	0.20	0.11 – 0.2
Twaite shad	1.00	1.00	0.96 – 1
Allis shad	1.00	1.00	N/A
Sea lamprey	0.20	0.20	0.11-0.2
River lamprey	0.20	0.20	0.11 – 0.2
Atlantic salmon	0.55	1.00	0.97 – 1
Sea trout	0.55	1.00	N/A
Brown Shrimp	0.20	N/A	N/A
Horse mackerel	1.000	NA	1.000
Mackerel	1.000	NA	1.000
Tope	0.206	NA	1.000
Sea trout	1.000	1.000	1.000
Sea lamprey	0.206	0.200	0.206
Allis shad	1.000	1.000	1.000

Four biomass scenarios were run to determine the worst case mean daily loadings of moribund biota. This method follows the same approach as described in NNB GenCo (HPC)'s supporting document, TR515 - Hinkley Point C water quality effects of the Fish Recovery and Return system (NNB GenCo, 2020a). However, we used our impingement and mortality factors as described above. The scenarios we assessed were:

- The daily average from the month with the highest moribund biomass discharge of the fish species considered in TR515 (this scenario is the most consistent with the TR515 analysis).
- The discharge on the day with the highest biomass discharge of these same fish species. This daily maximum event occurred in June.
- The daily average from the month with the highest moribund biomass discharge of *all* species of fish (December).
- The daily average from the month with the highest total moribund biomass of all fish plus invertebrate species (also December).

Table 5 summaries the biomass loading estimates from these four scenarios. With the original EA LVSE factors applied, these scenarios provide the most conservative set of

impingement estimates to be used in our assessment of the potential impacts of moribund biomass discharged from the FRR system on water quality.

Table 5. NNB GenCo (HPC) biomass calculation compared to EA biomass scenarios.

	TR515	Environment Agency's calculations			
	Daily average	**Daily average - fish species used in TR515 only**	**Daily maximum - fish species used in TR515 only**	**Daily average - all fish**	**Daily average - all fish and inverts**
	December	**December**	**June**	**December**	**December**
Daily loading of dead and moribund biota (kg)	135.6	241.9	441.3	461.4	489.4

Conduct a literature review (Step 4)

In support of the HPC WDA permit variation application, NNB GenCo (HPC) provided a Technical Report TR515 (NNB GenCo, 2020a), on the influence of the Fish Recovery and Return (FRR) system on water quality and ecological receptors'. This documents NNB GenCo (HPC)'s review of the current relevant literature. We have reviewed the literature cited and have found no more relevant sources, so the values provided in TR515 are accepted and used within our own analysis.

Calculate the daily loading of breakdown products and estimate mixing zones for each element (Steps 5 and 6)

We reviewed further the evidence provided in TR515 to determine whether the FRR system discharge would cause a deterioration of water quality.

To determine any deterioration or impacts, the assessment considered the potential effects on:

- nutrient concentrations
- unionised ammonia
- biochemical oxygen demand (BOD)
- phytoplankton production
- organic enrichment

Following our review, we replicated the same analysis as in TR515. However, our calculations were updated using several different evaluations of the potential biomass discharged from the FRR system outlet (as shown in Table 5). This analysis is detailed in AR001 'Fish Recovery and Return System Discharge Assessment Report (Environment Agency, 2023d); but a summary for each element is provided here.

Calculation of nutrient inputs

The nutrient loads were predicted using published estimates in fish tissue (Gende and others, 2004; Walker and others, 2011). The average daily biomass was multiplied by the maximum estimates of phosphorus and nitrogen (for example, daily load x (0.5/100)) = kg P). It is estimated that the discharge of dead fish and invertebrates from the FRR system will result in an average of 8.47 kg of dissolved inorganic nitrogen (DIN) and 1.21 kg of phosphate per day.

Table 6 compares the nutrient input estimates using the average daily biomass and the maximum daily biomass discharged from the FRR system. The third column in this table shows the range of nutrient concentrations in fish tissue (as %) in the literature. In each case, we have followed the same procedure as used TR515 and applied the maximum concentration, shown in bold.

Table 6. Phosphorus and nitrogen inputs based on estimates of nutrient tissue concentrations (Gende and others, 2004; Walker and others, 2011).

Scenario (Biomass)	Nutrient	Concentration (% Wet Weight)	Nutrient Input (kg per day)
Average (241.9 kg per day)	Phosphorus	0.45 - 0.5	1.21
	Nitrogen	3.2 - 3.5	8.47
Maximum (441.3 kg per day)	Phosphorus	0.45 - 0.5	2.21
	Nitrogen	3.2 - 3.5	15.45

Calculation of unionised ammonia

As applied in TR515, Timm and Jorgenson's (2002) study of cod tissue was used to derive an equation of ammonium ions (125 mg/kg of NH_4 from cod tissue).

The calculated value of total ammonia was then used in the unionised ammonia calculator (NH3SEA) with background conditions as described in TR515 (pH 8.06, salinity 31.7, temperature 12.55°C) to derive a corresponding unionised ammonia discharge (NH_3 as N per day).

The volume of seawater required to dilute this mass of unionised ammonia to the environmental quality standard (EQS) was then calculated using the unionised ammonia EQS of 21µg/l and assumed background level of 2.57 µg/l. Assuming this is equally mixed through the full depth of the water column (7.0m), this volume can then be converted to an area that would be needed to dilute the unionised ammonia concentrations down to the EQS.

For example, using the daily average of fish used in TR515 from December biomass value of 241.9 kg:

- 241.9 kg/day x 125 g/kg of NH_4 from cod tissue = 30,236.9 mg NH_4-N per day
- this converts to a corresponding unionised ammonia discharge of 623.8 mg NH_3-N per day
- 623.8 mg NH_3-N x 1,000µg/mg = 623,763 µg NH_3-N
- 623,763 µg NH_3-N/(21 µg/l – 2.57 µg/l) = 33,845 litres
- 33,845 l / 1,000 l/m^3 = 33.84 m^3
- 33.84 m^3 / 7m = 4.83 m^2

Table 7 presents the full range of results from each of the scenarios assessed, including with a temperature uplift to allow for the power station thermal discharge.

Calculation of biochemical oxygen demand (BOD)

To assess the BOD, the influence on the dissolved oxygen is calculated in terms of the amount of water required to meet the corresponding oxygen demand from that biological demand.

Stigebrandt (2001) concluded that there are 3.5kg of oxygen per kg of carbon. The dry/wet weight conversion is assumed to be 0.36 (Wang and others, 2013). Therefore, the estimate of BOD input (each day) was calculated by:

- kg of biota/day x 3.5kg/kg C x 0.36 = kg BOD per day

OSPAR (1997) reports that a BOD of 1.5mg/l effectively produces 0.5mg/l O_2 reduction. Using this information, oxygen reduction in the receiving water can be calculated:

- (kg BOD/1.5mg/l) x 0.5mg/l = O_2 reduction kg/day

As defined in TR515, the background dissolved oxygen concentration level is 5 mg/l O_2, therefore the amount of water containing this equivalent amount of O_2 can be calculated. Assuming this is equally mixed through the full depth of the water column (7.0m), this volume can be converted to the corresponding area.

This volume is also compared to the daily tidal exchange for the Bridgwater Bay water body to calculate the percentage of the total daily tidal exchange required to meet that oxygen demand. As defined by Dyer (1979), a daily volume exchange of 10% would be equivalent to 97,700,000 m^3.

In addition to daily exchange, daily re-aeration at the sea surface contributes 3.2g/m^2/d (Hull and others, 2016). Therefore, the area required to replenish that oxygen demand can also be calculated.

For example, using the daily average of fish used in TR515 from December biomass value of 241.9 kg:

- 241.9 kg/day x 3.5 kg/kg C x 0.36 = 304.8 kg BOD
- (304.8 kg BOD / 1.5 mg/l) x 0.5 mg/l = 101.6 kg/day O_2 reduction

- 101.6 kg/day O_2 reduction x 1,000 g/kg x 1,000 mg/g = 101,596,109 mg/day O_2 reduction
- 101,596,109 mg/day O_2 reduction / 5 mg/l background O_2 = 20,319,221.76 l
- 20,319,221.76 l / 1,000 l/m^3 = 20,319.2 m^3
- 20,319.2 m^3 / 7 m = 2,902.7 m^2

Corresponding to:

- 20,319 m^3 / 97,700,000 m^3 = 0.02% of daily exchange

Or

- 101.6 kg/day O2 reduction / 0.0032 kg/m^2/day = 31,748.8 m^2

Table 7 **Error! Reference source not found.**presents the full range of results from each of t he scenarios assessed.

Calculation of organic enrichment

Organic enrichment refers to carbon released by the decomposition of dead species. As proxy for an EQS, 100g organic carbon/m^2/year is an acceptable benchmark to assess the negative impacts of organic enrichment (Tyler-Waters and others, 2018). From Alves and others, (2019) it is assumed that the carbon content of fish process waste is 64.7% of the dry weight and the carbon dry/wet weight conversion factor applied within this study is 0.48.

The daily carbon load is divided by the daily benchmark of carbon and converted to a daily value. If the daily carbon input were evenly spread, so that the release of carbon/m^2 occurred at the proxy EQS rate, the corresponding area can be considered the ‘mixing zone’ where a potential effect from this organic enrichment might be experienced.

Given that the Bridgwater Bay water body has an area of 97,700 km², this ‘mixing zone’ can be compared with the area of the water body to consider the percentage of the water body that could see effects of organic enrichment.

For example, using the daily average of fish used in TR515 from December biomass value of 489.4 kg:

- 241.9 kg wet weight x 0.48 dry weight/wet weight x 0.65 carbon kg/kg = 75.5 kg carbon/day
- 75.5 kg carbon/day / (100g organic carbon/m²/year x (1 kg /1,000 g) / (365 days / 1 year)) = 275,470.6 m^2 affected
- 275,470.6 m² / 97,700,000 x 100 = 0.28 % of water body affected

Table 7 presents the full range of results from each of the scenarios assessed.

Results

Table 7 presents a summary of the predicted water quality effects of HPC’s FRR system discharge. This table compares the results provided in TR515 to those we produced. The process in which these figures were calculated is identical to the analysis in TR515.

However, the loadings of dead biota discharged from the FRR system have been revised and several scenarios have been considered (Table) including:

- The daily average from the month with the highest moribund biomass discharge of the fish species considered in TR515 (this scenario is the most consistent with the TR515 analysis).
- The discharge on the day with the highest biomass discharge of these same fish species. This daily maximum event occurred in June.
- The daily average from the month with the highest moribund biomass discharge of *all* species of fish (December).
- The daily average from the month with the highest total moribund biomass of all fish plus invertebrate species (also December).

There are a number of uncertainties in all of these calculations. The factors used to calculate the breakdown products are specific to one or a limited number of species or studies; they do not strictly apply to all fish/invertebrate species. In the absence of more or better data, it was considered acceptable to apply the factors universally.

The approach taken here can be considered precautionary, as it assumes 100% of the biomass discharged will sink immediately and not be re-suspended or advected over a larger area. This is contrary to the particle tracking study in TR479 (NNB GenCo, 2021b), which predicted 12% of dead sprat would be transported away from the FRR system discharge point by tidal currents.

The approach also does not take account of accumulation, or consumption by detritivores. Our figures are thought to provide a worst-case acute impact. Given the location of the proposed HPC FRR system outlet, dispersal could be significant.

Our calculations for organic enrichment, using the ‘daily average of all fish and invertebrate from December’ scenario, resulted in the largest potential area that could be affected by the FRR system discharge. This area is also called the ‘maximum potential area of organic exceedance’ to reflect the precautionary assumptions used in this analysis.

Table 7. Summary of the predicted water quality effects of HPC's FRR system discharge.

		TR515	Environment Agency calculations			
		Daily average **December**	**Daily average - fish species used in TR515 only** **December**	**Daily maximum - fish species used in TR515 only** **June**	**Daily average - all fish** **December**	**Daily average - <u>all fish and inverts</u>** **December**
Daily loading of impinged fish		135.6	241.9	441.3	461.4	489.4
Nutrient input	Max Daily P content (kg)	0.68	1.21	2.21	2.31	2.4
	Max Daily N content (kg)	4.75	8.47	15.45	16.15	17.13
Unionised ammonia	Total NH_4 (mg)	16,950	30,237	55,167	57,681	61,175
	Unionised ammonia from calculator (mg)	350	624	1,138	1,190	1,262
	Volume required to dilute to the EQS (l)	18,973	33,845	61,750	64,564	68,475
	Area required (m^2)	**1.65**	**4.83**	**8.82**	**9.22**	**9.78**
	Unionised ammonia from calculator with temperature uplift (mg)	407.48	727	1,326	1,387	1,471
	Volume required to dilute to the EQS with temperature uplift (l)	22,110	39,441	71,961	75,240	79,797
	Area required with temperature uplift (m^2)	**2.05**	**5.63**	**10.28**	**10.75**	**11.40**
Influence on dissolved oxygen	BOD (kg)	170.9	304.8	556.1	581.4	616.6
	O_2 reduction (kg/day)	57	101.6	185.4	193.8	205.5
	Area needed to meet oxygen demand through reaeration (m^2)	17,798	31,749	57,926	60,565	64,234
	Area needed to meet oxygen demand through reaeration (km^2)	**0.018**	**0.032**	**0.058**	**0.061**	**0.064**
Organic enrichment	Carbon load (kg /day)	42.3	75.5	137.7	144.0	152.7
	Area affected (m^2)	154,421	275,471	502,595	525,494	557,328
	Area affected (km^2)	**0.15**	**0.28**	**0.50**	**0.53**	**0.56**

Conclusion of FRR system discharge

The quantitative results from Table 7 ‘daily average of all fish and invertebrate from December’ scenario (termed ‘Environment Agency reasonable worst-case scenario’) were taken forward for consideration within our review of the WFD compliance assessment (Environment Agency, 2023a), our HRA (Environment Agency, 2023b) and SSSI Assessment Report (Environment Agency, 2023c) to consider the potential effects on water quality and protected species. The conclusion outcomes are summarised here.

Our HRA concluded that the release and/or decay of biota discharged by the FRR system will not lead to a deterioration in water quality that will affect designated features, resulting in a conclusion that there will be no adverse effect on integrity of sites alone or in combination. A summary is provided in section 4.10.

Our WFD compliance assessment report review concluded that the biota discharged out of the FRR system does not give rise to any impacts that could compromise Water Environment (Water Framework Directive) Regulations 2017 environmental objectives for water quality, habitats or fish. A summary is provided in section 4.12.

Our SSSI Assessment Report concluded that the FRR system WDAs are not operations that are likely to damage the SSSIs as the biota discharged from the FRR system will not result in the condition of the sites deteriorating, nor will it prevent them from improving or recovering where necessary. A summary is provided in section 4.11.

In coming to these conclusions, we consider that we have taken into account all relevant considerations and legal requirements, to ensure that the draft permit will provide the appropriate level of environmental protection, and that appropriate emission limits and monitoring requirements will be set in accordance with the assessment methodology.

Our assessment is precautionary, being based on the daily average from the month with the highest recorded impingement in terms of biomass of fish and invertebrates.

4.9.5 Assessment of physical damage

At 108,863 m³/day, equivalent to 1.28 m³/s, discharge from the FRR system outlet is of a much lower volume and rate than the discharge from the two cooling water outlets, but will discharge further inshore than the cooling water abstraction point (Figure 1).

As it will not have passed through the cooling water system, the FRR system discharge will not form a buoyant plume. There will be no additional suspended solids added to the FRR system discharge.

As with the two cooling water outlets, scouring may take place in the short-term, but an equilibrium will be reached such that over the lifetime of the project, the effects of jet scour or scour resulting from the structures themselves will not significantly alter the turbidity of the surrounding water body.

The discharge from the FRR system outlet will not result in an increase in erosion or siltation of sufficient magnitude to result in a conceivable effect on the conservation objectives, so the discharge is considered to be low impact in terms of risk of physical damage.

4.10 Habitats Regulations assessment

In this section, we summarise how we have considered the potential impacts of the WDA in relation to our duties under The Conservation of Habitats and Species Regulations 2017 (as amended), which are known as the Habitats Regulations.

Under Regulation 63 of the Habitats Regulations, before deciding to undertake a plan or project or give a permit for a plan or project which:

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects)

(b) is not directly connected with or necessary to the management of that site

we must make an appropriate assessment of the implications for that site in view of that site's conservation objectives, and we must consult Natural England (NE) and Natural Resource Wales (NRW) (where applicable) on the findings of this assessment.

We have therefore considered the potential effects of the discharge to water from the Fish Return and Recovery (FRR) system on plant and animal life at the relevant designated European sites. This is the only discharge being considered as it is the only discharge that would be affected by this permit variation.

The relevant designated sites include: Special Areas of Conservation (SAC), which are designated for important high quality habitat sites and rare species, Special Protection Areas (SPA) for the protection of rare and vulnerable birds, and Ramsar sites. Ramsar sites are wetlands of international importance designated under the Ramsar Convention, but it is government policy that they are given the same protection as SACs and SPAs. The habitats and species protected by these European sites are known as 'designated' habitats and species, or collectively as 'designated features'.

We have assessed NNB GenCo (HPC)'s WDA permit application in accordance with our guidance and concluded that for the purposes of the Habitats Regulations there was the potential for likely significant effects on several European sites, and so we undertook an appropriate assessment (Habitats Regulations assessment Stage 2) of those effects. We have made this available as part of our consultation on our proposed decision (Environment Agency, 2023b).

We have consulted Natural England (NE) and Natural Resources Wales (NRW) on the draft HRA. They raised some minor points that we have addressed in our final HRA (Environment Agency, 2023b).

Due to the level of detail in our HRA, it is not appropriate to reproduce entire sections in this decision document. The full HRA document is available to review as part of our proposed

decision consultation available at Consultation material for proposed permit variation decision - Environment Agency - Citizen Space

4.10.1 Screening for likely significant effects

Regulation 63(1) of the Habitats Regulations 2017 requires us, the competent authority, to carry out a screening exercise to identify those permissions, plans or projects (PPP) that are likely to have a significant effect on the features of a European site. These effects are then subject to appropriate assessment.

For our assessment, a very high level and precautionary likely significant effect (LSE) stage was carried out considering a simple source receptor pathway linkage (that is, is there a potential link between the discharge and designated species and/or habitat that are sensitive to the pollutant).

We took this approach due to the bespoke, complex and detailed modelling NNB GenCo (HPC) submitted with its application, and we determined that this should be used for an appropriate assessment and not an LSE screen. We also completed additional detailed assessment work to support our HRA.

If the absence of risk in the plan can only be demonstrated after a detailed investigation, or expert opinion, that is an indicator that a risk exists and the competent authority must move from preliminary examination to appropriate assessment.

For the WDAs LSE screening, the simple source receptor pathway approach can be summarised as follows:

1. Is there a pathway such that the potential hazard could affect the interest features alone? If it is considered there is no connectivity, or any connectivity or effect would be of low impact and too small to result in a conceivable effect on the feature or site, then no in-combination assessment is required.

2. What is the exposure of the feature to this hazard?

3. For each hazard, is the potential scale or magnitude of any effect likely to be significant? The aim of the screening process is to identify those hazardous chemicals and elements within the FRR system discharge that may contribute to the deterioration of the receiving water body. This may be through preventing the achievement of the conservation objectives for a European site.

The following are the reasonably foreseeable risks for this type of project, as generated via our internal habitats regulations assessment system (HRAS) database for WDAs:

1. changes in thermal regime
2. toxic contamination
3. nutrient enrichment
4. pH

5. change in salinity regime
6. physical damage
7. siltation
8. turbidity

However, we concluded that some of these risks are not relevant to the proposed FRR WDA at HPC, and so did not require further assessment within our HRA. Following consideration of the above risks with the proposed WDA, we took the decision to focus on, and complete a detailed assessment of, the following risks within our HRA assessment:

- toxic contamination (due to the breakdown and decay of dead and moribund biota)
- nutrient enrichment (due to the breakdown and decay of dead and moribund biota)
- smothering (due to the accumulation of dead and moribund biota)
- habitat loss (as a result of the above risks)

These hazards have been assessed in respect of the permit variation application itself; and in respect of the combined impact of the project with other permissions, plans or projects in the area.

Within our WDA HRA, the following European sites were considered for the potential for LSE from the remaining identified risks.

This is because these sites are in direct connectivity with the proposed WDA (via the fish recovery and return system outlet):

- Severn Estuary SAC: the FRR system outlet discharges directly into the Severn Estuary SAC and all its features are sensitive to the risks identified above
- Severn Estuary SPA and Ramsar: the FRR system outlet discharges near to the boundary of this site so there is therefore potential for marine water discharges to reach it

We have also considered and assessed the potential for LSE on the migratory and highly mobile features of more distant designated European sites (to establish whether they are ecologically functionally linked to the Bristol Channel). The features of these more distance sites include seabirds, marine mammals and Annex II fish species:

- River Usk SAC, designated for Annex ll fish species
- River Wye SAC and Ramsar, designated for Annex ll fish species
- Somerset Levels and Moors SPA and Somerset Levels and Moors Ramsar, designated for local bird populations
- Bristol Channel Approaches SAC, designated for Harbour porpoise

Within our HRA, we have concluded it is not possible to conclude no likely significant effect from the proposed permit variation on all the sites and their designated features as identified above. All the sites and features were therefore taken forward into appropriate assessment and assessed, by detailed modelling, whether the FRR system discharge could affect the integrity of the sites in relation to their designated features.

4.10.2 Appropriate Assessment

In our appropriate assessment, we have fully considered each site in terms of their site-specific targets and pressures provided in the supplementary advice on conservation objectives (SACOs) relating to water quality (where these are available for each designated site, as they can also be of relevance to their coastal and freshwater supporting habitats):

- https://www.gov.uk/guidance/conservation-advice-for-marine-protected-areas-how-to-use-site-advice-packages
- https://www.gov.uk/guidance/conservation-objectives-for-land-based-protected-sites-in-england-how-to-use-the-site-advice

The methodology for our assessment of the impact of the proposed permit variation has considered a quantitative approach based on the applicant's technical report TR515 "HPC Water quality effects of the fish recovery and return system" (NNB GenCo, 2020a).

The generic approach taken in TR515 is summarised in section 4.9.4, together with additional scenarios undertaken with our estimate of the discharge of moribund biomass from the FRR system (AR001. Environment Agency, 2023d) which were considered when completing the appropriate assessment.

Our appropriate assessment assessed the potential for an adverse effect on the integrity of the European sites identified in the likely significant effect assessment (refer to section 8.1 of our HRA).

The first step of the appropriate assessment was to determine whether it is possible to conclude no adverse effect on site integrity alone from the FRR system discharge. As it was possible to conclude no adverse effect on site integrity alone. The next step was to determine whether it is possible to conclude no adverse effect on site integrity from the FRR system discharge in-combination with other relevant plans, projects and permission.

Alone assessment summary

The following risks from the FRR system discharge were identified within the likely significant effect assessment (refer to section 8.1 of our HRA) as having the potential for to adversely affect the integrity of European sites:

- toxic contamination (due to the breakdown and decay of dead and moribund biota)
- nutrient enrichment (due to the breakdown and decay of dead and moribund biota)
- smothering (due to the accumulation of dead and moribund biota)
- habitat loss (as a result of the above risks)

The following European sites were identified as having the potential to be adversely affected by the risks set out above:

- Severn Estuaries SAC
- Severn Estuary SPA
- Severn Estuary Ramsar
- River Usk SAC

- River Wye SAC
- Somerset Levels and Moors SPA and Somerset Levels and Moors Ramsar
- Bristol Channel Approaches SAC

Toxic contamination

The largest mixing zone to assess toxic contamination against was 9.78m² for unionised ammonia, and 0.064km² being needed to meet the oxygen demand through reaeration, as described in our HRA (section 9.1). These predicted mixing zones do not consider tidal dispersion of the discharged matter, consumption of the matter by detritivores or scavengers, or the seasonality of the discharge and are therefore conservative.

It is considered that this mixing zone is inconsequential when compared against the area of the designated sites for consideration.

It is therefore possible to conclude **no adverse effect** on site integrity alone for all European sites considered, when considering the effects of toxic contamination.

Nutrient enrichment

The largest mixing zone to assess nutrient enrichment against is 0.56 km² for organic enrichment, as described in our HRA (section **Error! Reference source not found.**). These predicted mixing zones do not consider tidal dispersion of the discharged matter, consumption of the matter by detritivores or scavengers, or the seasonality of the discharge and are therefore conservative.

It is considered that this mixing zone is inconsequential when compared against the area of the designated sites for consideration.

It is therefore possible to conclude **no adverse effect** on site integrity alone for all the European sites considered, when considering the effects of nutrient enrichment.

Smothering and habitat loss

The proportion of matter sinking on discharge is high but will in reality be dispersed over a large area due to the dynamic nature of the Severn and be scavenged by detritivores. The FRR system outlet is also located offshore where the dynamic tidal influence will ensure that there is no potential for any discharge of biomass from the FRR system to settle on the most sensitive inshore habitats. Therefore, there is little potential to smother any habitats associated with any of the European sites.

This allows for a conclusion of **no adverse effect** on site integrity alone, when considering the effects of smothering and indirect habitat loss.

4.10.3 Appropriate Assessment – In-combination assessment

Regulation 63 of The Conservation of Habitats and Species Regulations 2017 requires the competent authority to consider within the HRA, any permission, plans or projects (including

Environment Agency permissions, plans or projects) that are likely to have a significant effect on a European site, either alone or in combination with other permissions, plans or projects (PPP).

Where permissions indicate a likely significant effect, these will be assessed in combination with each other and with other relevant plans and projects. The alone and in combination test is also carried out at the appropriate assessment stage.

Within-project in-combination assessment summary

Our in-combination assessment has considered the potential for in-combination effects between other Environment Agency permits associated with the construction, commissioning and operation of the HPC nuclear new build site. This includes in-combination considerations for the risks of toxic contamination, nutrient enrichment, smothering and habitat loss, identified from the FRR system discharge.

The FRR system will be in use during the hot functional testing (HFT), commissioning and operation of HPC. Permits required for the construction of HPC have been assessed to determine if there will be a residual effect that could act in-combination with the FRR system outlet.

This included considering the effect between the 3 HPC operational EPR permits issued (Water Discharge Activity, Radioactive Substance Regulations and Combustion Activity) and between the different waste streams of the operational WDAs (waste streams A to H).

From the information currently available, we concluded that there are no in-combination effects between the operational and construction WDAs.

During the commissioning and operation of HPC it is proposed to discharge the various process effluents into the main cooling water flow, prior to discharge to the Bristol Channel. The outlets are located approximately 1.8 km offshore. This provides a significant initial dilution of chemicals before they reach the environment. The plant has been specifically designed to ensure that live fish leaving the FRR system outlet close to shore do not enter toxic plumes from the cooling water discharge.

The only waste streams and contaminants which are considered to have a likely significant effect are the excess temperature and TRO in waste stream A, and hydrazine and morpholine in waste streams B, C, and D. No other contaminants in any of the other waste streams are considered to have a likely significant effect on the integrity of the Severn Estuary SAC.

The HPC operation WDA permit currently requires hydrazine to be removed from the waste streams B, C & D before disposal. The applicant has started initial discussions with us on an additional variation to the HPC operational WDA permit for the proposed discharge of residual concentrations of hydrazine. These discussions are not yet far enough advanced to include in this in-combination assessment. However, the HRA for the proposed future WDA permit variation to include hydrazine will consider the potential for in-combination effects with the FRR system outlet discharge.

There will be no discharge of heated cooling water from the FRR system outlet (as it will remain at the ambient temperature of the abstracted seawater as it does not pass through the power station's cooling water systems). Therefore, there is no potential for a direct in-combination effect.

However, there is the potential that there could be a synergistic in-combination effect between the discharge of heated water from the cooling water system and the FRR system outlet discharge. An assessment has therefore been made to assess whether there will be any overlap of the discharge of warmed water from the cooling water system and the FRR system outlet discharge.

As the levels of TRO exceeded its respective target in the discharge of cooling water, there was a need to define the extent of the contaminant plume, and the areas at the sea surface and seabed where the relevant target is exceeded; that is the size of the mixing zones. Given the predicted scale of the mixing zones in relation to the size of the SAC, it is possible to conclude no adverse effect in-combination. The same conclusion can be made for the Severn Estuary Ramsar "estuaries" feature, and the features of the Severn Estuary SPA and Ramsar that are supported by the SAC habitat.

The applicant assessed the impact of thermal uplift from cooling water discharges associated with HPB and HPC (there was an assumption that there would be an overlap in the operation of HPB and HPC, this is no longer the case) on the area that would be required for ammonia to meet its EQS. Due to the very limited area of exceedance (11.4 m^2), it is possible to conclude no adverse effect when compared to the scale of the Severn Estuary SAC, SPA and Ramsar and their designated features.

It is possible to conclude no adverse effect in-combination with operational combustion activity. Those features that are sensitive to aerial emissions are inter-tidal, any contributions to nutrient enrichment and toxic contamination from the operation of the diesel generators will be inconsequential when considering the scale of the SAC and turbidity of the Severn Estuary.

There is no potential for an in-combination effect between the radioactive waste discharges from HPC power station and the FRR system outlet. There is no common risk, there will be no radiological discharges from the FRR system.

Interproject in-combination assessment summary

Our in-combination assessment considered other plans, projects and permissions (PPP) that might contribute to in-combination effects. These were as follows:

- Hinkley Point B (HPB)
- Hinkley Point A (HPA) decommissioning
- Oldbury Nuclear Power Station (Oldbury A)
- Environment Agency Steart Coastal Management Project
- Bristol Deep Sea Container Terminal (BDSCT) (Dredging)
- Compensation habitat creation at Steart for the Bristol deep sea container terminal
- Development of a new nuclear power station at Oldbury, Gloucestershire

- Temporary jetty
- Flood wall construction
- MMO south west marine plan
- Licensed activities at disposal sites within the Severn Estuary
- Avonmouth Severnside Enterprise Area ecology mitigation and flood defence project
- Bridgwater tidal barrier
- Cardiff coastal defences
- Planned Celtic Sea Floating offshore wind projects
- Blue Eden Tidal Lagoon in Swansea Bay
- META Wales: Phase 1 and 2, Milford Haven
- Severn Thames Transfer
- Black Rock lave net fishery
- EA salmon net limitation order licences
- Severn Estuary elver fishery

It was concluded after consideration of the specifics of each of these plans, project or permissions that none posed a potential for an in-combination effect between themselves and the proposed FRR system discharge.

4.10.4 Appropriate assessment conclusion

Our appropriate assessment determined whether the risks associated with the HPC FRR discharge via toxic contamination, nutrient enrichment, smothering or habitat loss could lead to an adverse effect on the features of the sites where a likely significant effect (LSE) was identified.

We were able to conclude no adverse effect on the features of the European sites where a likely significant effect had been identified alone or in combination, in view of the sites' conservation objectives.

Integrity test

Regulation 63(5) of the Habitats Regulations requires that a competent authority "shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned."

The European Union's Managing Natura 2000 guidance (Commission Notice C(2018)) explains the concept of the 'integrity of the site' at section 4.6.4 as the "coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated."

We do not consider that, for those European sites requiring appropriate assessment, the FRR system WDA from HPC will impact on their ecological structure, function and ecological processes across their whole area, as identified in the Managing Natura 2000 guidance.

We were able to reach this conclusion due to the bespoke modelling results which confirmed that the effects identified **Error! Reference source not found.**would be low impact and too small to undermine the achievement of the conservation objectives or would have no connectivity with the more distant sites. Site integrity cannot be considered to be adversely affected if the conclusions of an appropriate assessment demonstrate that the conservation objectives will not be undermined alone or in combination with other PPP.

Conclusion details for each site included in our appropriate assessment

We have completed an appropriate assessment and concluded that the FRR system WDA at HPC can be ascertained to have no adverse effect on the integrity of the following sites, either alone or in combination with other plans and projects:

- Severn Estuaries SAC
- Severn Estuary SPA
- Severn Estuary Ramsar
- River Usk SAC
- River Wye SAC
- Somerset Levels and Moors SPA
- Somerset Levels and Moors Ramsar
- Bristol Channel Approaches SAC

These conclusions are not dependent on any specific mitigation measures or conditions within the WDA permit.

4.10.5 Differences in approach between the Information provided within NNB GenCo (HPC)'s Updated Report to Inform the Habitats Regulations Assessment and our WDA HRA

NNB GenCo (HPC) provided a supporting document with its variation application titled "Updated Report to Inform the Habitats Regulations Assessment" (NNB GenCo, 2019b). The purpose of the report was to present information to support applications to allow a revision of the design of the Cooling Water System to omit installation of an AFD system as mitigation to reduce fish impingement losses. It was prepared to support the following proposed applications:

- DCO Change Application to be submitted to the SoS (Energy Security and Net Zero) for determination
- Marine Licence Variation Application to be submitted to the MMO for determination
- WDA Permit Variation application to be submitted to the Environment Agency for determination

It was submitted to support the WDA permit variation (EPR/HP3228XT/V004) in 2019 and formed evidence in the public enquiry process in 2021. However, it has not been updated further since being submitted in 2019.

The report provides information useful for competent authorities to carry out appropriate assessment of whether the operation of HPC within out the operation of an AFD would have an adverse effect on the integrity of relevant designated sites. However, it does not include information or consideration of the potential polluting effect of the FRR system discharge. Therefore, it is not referenced within our own HRA, and was not consulted on during the consultation of the permit variation application.

Our HRA, fully considers the potential polluting effect of the FRR system discharge making reference to the following supporting documentation submitted by NNB GenCo (HPC) to support its permit variation application:

- TR515 - Hinkley Point C water quality effects of the Fish Recovery and Return system (ref: 100805626)
- TR479 – Particle Tracking Study of impinged sprat from the proposed Hinkley Point C Fish Recovery and Return (ref: 100805628)
- TR456 – Revised predictions of impingement effects at Hinkley Point C – 2018 (ref: 100805583)

4.10.6 Consultation with Natural England and Natural Resources Wales

On 26 January 2023, we sent our initial draft HRA alone assessment for the proposed FRR discharge at HPC to Natural England (NE) and Natural Resources Wales (NRW) for consultation. Some minor comments were raised, such as addressing in detail why the impact of cooling water abstraction has not been assessed in the HRA and some clarification points, which we had regard to in accordance with Regulation 63 of the Habitats Regulations 2017 (as amended), before re-consulting on our final draft HRA (alone and in-combination assessment) on the 1 March 2023. No further comments were raised on the draft HRA and both NE and NRW were able to concur with our draft conclusion.

Our final HRA document (Environment Agency, 2023b) is available to review as part of our proposed decision consultation, available at Consultation material for proposed permit variation decision - Environment Agency - Citizen Space.

4.11 Conservation duties (other than Habitats Regulations)

In this section, we have considered the impact of the proposed discharge on the environment in relation to our duties under other statutory conservation provisions. We refer to these as ‘conservation duties’.

Section 6(1) of the Environment Act 1995 (conservation duties with regard to water)

We have considered whether we should impose any additional requirements in relation to our duty to promote the conservation and enhancement of the natural beauty and amenity of coastal waters, and the conservation of flora and fauna that depend on the water

environment under section 6(1) of the Environment Act 1995. We believe that the conditions of the environmental permit will be sufficient, and, therefore, have not identified any other requirements.

Section 6(6) of the Environment Act 1995 (fisheries duty)

Section 6(6) of the Environment Act 1995 imposes a duty to maintain, improve and develop fisheries. We have taken account of this duty, particularly with respect to the passage of migratory species, in terms of potential water quality and habitat impacts associated with the discharge from the FRR system. We are satisfied that the permit conditions are sufficient to make sure we have carried out this duty appropriately. For that reason, we do not consider that different or additional measures are needed.

Section 7 of the Environment Act 1995 (pursuit of conservation interests)

Section 7(1)(c) of the Environment Act 1995 places a duty on us when considering any proposal to consider the effect this would have on the economic and social wellbeing of local communities in rural areas, and to take into account any effect the proposal would have on the beauty or amenity of any rural area. We consider that the conditions of the environmental permit are sufficient in this case.

Section 8 Environment Act and Section 28I Wildlife and Countryside Act 1981

Under Section 28I of the Wildlife and Countryside Act 1981, we have a duty to consult the relevant conservation bodies, NE and NRW in relation to any permit that is likely to damage a Site of Special Scientific Interest (SSSI).

We have produced a SSSI Assessment Report (Environment Agency, 2023c) in accordance with the Wildlife and Countryside Act 1981, as amended by the Countryside Right of way Act 2000 (CRoW) for the following 6 Sites of Special Scientific Interest (SSSI) as they have all been identified as being potentially at risk from the FRR system discharge from HPC.

- Bridgwater Bay SSSI
- Blue Anchor to Lilstock Coast SSSI
- Steep Holm SSSI
- Brean Down SSSI
- Severn Estuary SSSI
- Flat Holm SSSI

The FRR system discharge from HPC could result in the release of toxic contaminants, nutrient enrichment, and smothering, with the potential to cause habitat loss.

In line with our statutory duties, we have therefore completed an assessment in which we have fully assessed the risks that the FRR system discharge poses, to conclude whether or not there will be an impact to the 6 SSSIs and if so, how significant the impact(s) will be.

Our SSSI assessment considered whether:

1. there is a potential risk from the WDA permit variation application, which could affect the features of the identified SSSIs, either directly or indirectly, and if the features are sensitive to the relevant risks
2. there is a pathway such that the potential risk could affect the interest features of the identified SSSIs, and the exposure of the feature to this risk
3. for each risk, the potential scale or magnitude of any effect could result in an operation likely to damage the features of the SSSIs

NNB GenCo (HPC) has provided information and modelling to inform our assessment, and we have reviewed this information. Using advice from Natural England on 'Operations likely to damage the special interest' for the 6 SSSIs, we consider the relevant operation for all 6 sites to be 'the dumping, spreading or discharge of any materials'.

We consider this the relevant operation under Natural England's guidance, as the operation of HPC will result in discharges of effluent that could potentially impact on the sites and their notified features. The discharge from the FRR system will result in a discharge of organic matter, dead and moribund fish, and may cause an increase in nutrient enrichment and potentially alter the water quality.

Our SSSI assessment was made to determine whether there will be any damage to the SSSIs because of the FRR discharge, based on the potential risks of toxic contamination, nutrient enrichment and habitat smothering.

It is our conclusion that the pathway of potential impact for the 6 SSSI sites is limited. The detail for this is provided within our SSSI Assessment Report (Environment Agency, 2023c), but is summarised here.

The FRR system discharge has the potential to cause very localised elevations in toxic contaminants in the vicinity of the discharge point due to the breakdown of dead or moribund biota. It also has the potential to introduce additional nutrients over a small area due to the breakdown of this biota. Habitat smothering from the accumulation of this biota has also been considered, although possess minimal risk due to the dynamic environment it is to be release in to.

We have therefore concluded that the discharge from the FRR system is not an operation likely to damage the Bridgwater Bay SSSI, the Blue Anchor to Lilstock Coast SSSI, Steep Holm SSSI, Brean Down SSSI, the Severn Estuary SSSI, Flat Holm SSSI, River Wye SSSI or River Usk SSSI.

The detailed evidence and reasoning for making the above conclusions is provided within the technical sections of our SSSI Assessment Report (Environment Agency, 2023c).

Some of the features designated under the SSSIs are replicated across of associated European sites. The potential for impact on the European sites has been fully considered separately in our HRA (Environment Agency, 2023b).

Our SSSI Assessment Report is available for review as part of our 'minded to' consultation process for our draft HPC WDA permit variation decision, available at Consultation material for proposed permit variation decision - Environment Agency - Citizen Space

The methodology and approaches used to assess the potential impact in our SSSI assessment are the same as those used in our HRA for the equivalent European sites, and where appropriate, information and main arguments presented in the HRA are replicated within our SSSI assessment.

We have considered the application in the context of the 6 SSSIs and concluded that the proposed WDAs will not cause damage to any of these SSSIs. We have shared our SSSI Assessment Report with NE and NRW as part of our determination.

Section 28G of the Wildlife and Countryside Act 1981

Under Section 28G of the Wildlife and Countryside Act 1981, we have a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest (SSSI). As mentioned, we have formally given notice to NE of our conclusion that the proposed WDAs will not cause damage to the Bridgwater Bay SSSI, the Blue Anchor to Lilstock Coast SSSI, Steep Holm SSSI, Brean Down SSSI, the Severn Estuary SSSI or Flat Holm SSSI. We have also shared our SSSI assessment report (Environment Agency, 2023c) with NRW. Both advised that, although it would not change the conclusion of the SSSI assessment report, the River Usk SSSI and River Wye SSSI should also be included. Therefore, these have been included and considered within our final SSSI Assessment Report.

Section 85 of the Countryside and Rights of Way Act 2000

Section 85 of the Countryside and Rights of Way Act 2000 places a duty on us to consider conserving and enhancing the natural beauty of the Area of Outstanding Natural Beauty (AONB) when carrying out any of our work in relation to, or so as to affect, land in such an area. We have considered the application in the context of the Quantock Hills AONB. We have considered whether we should impose any further requirements but believe that existing proposed conditions in the draft permit variation are sufficient.

4.12 Duties arising under legislation

In the following sections, we describe how we have assessed the impact of the water discharge activity (WDA) from the FRR system, in relation to our duties under the legislation (or statutory provisions) relevant to this WDA environmental permit application.

Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Statutory Instrument 2017 No.407) (WER)

Introduction

The Water Framework Directive (WFD) was a European directive (2000/60/EC) which was transposed into UK law in 2003. Its requirements are now encompassed within the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WER); Regulation 3 of the WER imposes a general duty on us to exercise our functions so as to secure compliance with the requirements of the WFD.

The WER imposes legal requirements to protect and improve the water environment. It seeks to protect groundwater and surface water on an integrated river basin basis, and the Environmental Quality Standards Directive (Directive 2008/105/EC).

Schedule 22 to EPR 2016 implements the Groundwater Directive (Directive 2006/118/EC) to require the taking of all necessary measures to prevent the input of any hazardous substances entering groundwater, and to limit non-hazardous pollutants entering groundwater, so they do not cause pollution. No releases to groundwater from the operational WDAs are applied for or are permitted by the proposed draft permit.

Under the WER, all designated water bodies are classified based on quality elements which encompass a range of physical, biological, and chemical parameters. Water body elements may be classed as being at (in descending order) high, good, moderate, poor, or bad status, with the lowest scoring element defining the overall status of the water body (under the 'one out, all out' principle). The target is for all water bodies to achieve a minimum of good status (or good potential for heavily modified water bodies).

Following the European Court of Justice 'Weser ruling' deterioration is considered when a WFD quality element falls by one class, even if that fall does not result in a drop in the overall classification of a water body.

An applicant must show that activities will not lead to a deterioration in water body status or prevent water body objectives being achieved. We provide guidance via GOV.UK in 'Clearing the Waters for all' (CtW) on how to undertake a WFD compliant assessment in estuarine (transitional) and coastal waters. It consists of 3 stages – screening, scoping and appropriate assessment. We then review the relevant parts of the applicant's assessment as part of our WDA determination.

WFD assessment

NNB GenCo (HPC) has submitted a number of documents in support of their variation application to assess the compliance of the HPC project with WFD.

The discharge proposed from the FRR system was identified as having the potential to affect ecological, physical and/or chemical aspects of the above water bodies. Associated potential impacts on protected sites were also investigated.

Overall, NNB GenCo (HPC) proposes that the FRR system discharge will not cause deterioration, nor result in any water bodies being unable to meet their objectives under the Water Framework Directive (WFD).

We have made an assessment as to whether sufficient evidence has been provided to conclude that HPC, and specifically the FRR system discharge, will comply with the requirements of WFD.

Potential impacts of HPC were considered for the Bridgwater Bay water body (GB670807410000) which covers an area of 92 km², and the Parrett transitional water body (GB54085210900) which covers an area of 71 km² (Figure 4).

The full WFD assessment document is available to review as part of our draft decision consultation available at Consultation material for proposed permit variation decision - Environment Agency - Citizen Space

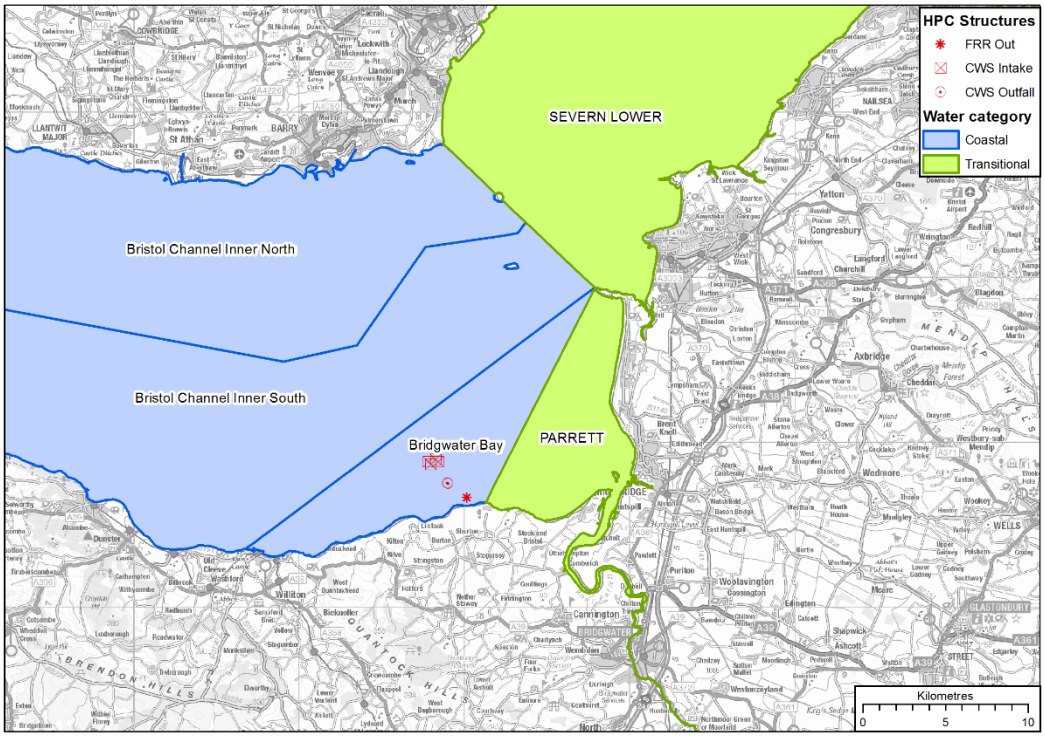

Figure 4. Transitional and Coastal water bodies in the vicinity of the HPC development site.

Environment Agency compliance review

We have reviewed previous work conducted to assess whether activities associated with HPC jeopardise compliance with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD). The 2011 Environmental Statement (NNB GenCo, 2011) screened in many activities which could affect compliance with WFD. That assessment concluded that HPC would not jeopardise compliance with WFD.

Since the submission of the 2011 Environmental Statement, an application was made (EPR/HP3228XT/V004) to vary the operational water discharge activity (OpWDA) permit, removing the requirement to incorporate an acoustic fish deterrent (AFD) system into the design of HPC's cooling water intake system (CWS). A number of documents were

submitted by the applicant with the aim of predicting the impacts of HPC and to update existing assessments in the absence of the AFD. We have reviewed these documents as the regulatory body and, where appropriate, new predictions of impacts were made.

As part of our assessment of the permit variation application (EPR/HP3228XT/V005) a new screening assessment was made following the Environment Agency's '*Clearing the Waters for All'* guidance, to assess compliance with WFD. It was considered that there were potential pathways for local ecological receptors and water quality parameters to be impacted as a result of the discharge of material from the FRR system. It was also considered that there was potential for impacts on the designated and qualifying features of protected areas.

Further Assessment of these impacts concluded that there was minimal risk of these activities on compliance with WFD.

Impacts of the FRR system discharge were considered for several water quality parameters. In terms of nutrient loading, our revised estimate of impact from the FRR system discharge was less than 1% of the normal daily exchange of nutrients with the wider environment.

Given this, and the fact that the assessment approach excludes any removal of fish (and therefore nutrients) through consumption by predators, it is considered that the nutrients discharged from the FRR system will not result in a failure to meet WFD environmental objectives in either the Bridgwater Bay or Parrett water bodies.

Our revised assessment of dissolved oxygen and unionised ammonia resulting from the discharge from the FRR system showed that it would not result in a water body deterioration or a failure to meet WFD environmental objectives in either the Bridgwater Bay or Parrett water bodies.

In addition, impacts of the organic enrichment of benthic sediments due to smothering and subsequent habitat loss were considered. While we consider the benthic community shows some sensitivity to organic enrichment and the effects of smothering, we have considered that there will be no overall WFD deterioration in benthic invertebrate community class of either the Bridgwater Bay or Parrett water bodies due to organic enrichment of the seabed.

In relation to the potential impacts on the fish element of the estuaries, we found that no deterioration of the fish element of estuaries is predicted as a result of change to dissolved oxygen, biochemical oxygen demand or unionised ammonia from the HPC FRR system discharge.

Therefore, our assessment of these impacts concluded that there was minimal risk of these activities on compromising requirements of WFD and the proposed grant of the environmental permit with conditions is compliant with our duties under WER.

Bathing Water Regulations 2013 (Statutory Instrument 2013 No.1675)

We have considered the potential impact of the proposed WDAs on the designated bathing waters, including Berrow North of Unity Farm (UK35500), Brean (UK35600), Weston-super-

Mare Uphill Slipway (UK35700), Weston Main (UK35800), Weston-super-Mare Sand Bay (UK35900), Blue Anchor West (UK35200), Dunster North West (UK35100), Minehead Terminus (UK35000). We have concluded that due to the minimal mixing zone of the polluting matter the discharge from the FRR system will make an insignificant contribution to the bacterial levels in the receiving waters of the Bridgwater Bay, and so there is no risk of impact to the above designated bathing waters.

Shellfish protected areas via the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Statutory Instrument 2017 No.407)

Shellfish protected areas are referred to in Regulation 9 of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The list of shellfish protected areas is provided here.

The nearest designated shellfish water protected areas is the Taw-Torridge Estuary, some 90 km away and the mixing zone of the polluting matter is predicted to be minimal.

The discharge from the FRR system will not impact on any shellfish waters, as these are all located outside of the Zone of Influence of the proposed WDA.

Urban Waste Water Treatment (England and Wales) Regulations 1994 (UWWTR) (Statutory Instrument 1994 No.2841)

Regulation 5(7) of UWWTR requires that urban waste water entering collecting systems from agglomerations with a population equivalent of less than 10,000, and thereafter discharging to coastal waters, must be appropriately treated.

We are satisfied that the WDA from the FRR system will not require treatment in this case and is not a discharge of urban waste water. In any event there is no risk to the receiving waters meeting the relevant water quality objectives, and the relevant provisions of retained EU law from the FRR system discharges.

The Eels (England and Wales) Regulations 2009 (Statutory Instrument 2009 No.3344)

The Eels (England and Wales) Regulations 2009 (Statutory Instrument No. 3344) came into force on 15 January 2010. These Regulations implement Council Regulation (EC) No 1100/2007 (OJ No L 248, 22.9.2007), establishing measures for the recovery of the stock of European eel (Anguilla anguilla, and includes elvers and glass eels) in England and Wales. As part of the Regulations we have to consider screening of outfalls and passage for eels.

Migratory species such as eels can be sensitive to power station operational discharges if avoidance of the discharge plume impacts on their migratory pathways, as thermal and/or chemical plumes may alter water quality properties and cause fish species to avoid an area due to the potential for a reduction in water quality.

We have assessed the potential impacts of the discharge from the FRR system on the passage of the European eel. Given the mixing zone for any toxic contamination is predicted

to be restricted to a small area in the vicinity of the outlet as a worst-case scenario, and that wider nutrient enrichment is not predicted to have any significant impacts on the water quality within Bridgwater Bay, we are satisfied the passage of eels will not be affected by this discharge.

The FRR system is actually designed to recovering the impinged eels from the cooling water system via the drum and band screens and return them to the estuary via the FRR system outlet. The applicant has proposed that the FRR system will return 80% of the eels impinged to the estuary alive (TR456).

Section 40 Natural Environment and Rural Communities Act 2006

Section 40 of the Natural Environment and Rural Communities Act 2006 has been amended with effect from 1 January 2023 to require consideration of the general biodiversity objective, which is to further the conservation and enhancement of biodiversity through the exercise of our functions. We have considered the general biodiversity objective when carrying out our permit application determination and concluded that no different or additional measures were required in the draft permit.

4.13 Setting permit limits

This section of the draft decision document describes and explains the permit limits (compliance limits) in the draft permit for the proposed water discharge activity. These will form the legal requirements against which we would regulate the permitted water discharge activity and through which we would monitor operational performance. In deciding to apply these limits and conditions we have considered:

- NNB GenCo (HPC)'s impingement and biomass calculations (TR456. NNB GenCo, 2019a)
- NNB GenCo (HPC)'s fish recovery and return system report on water quality and ecological receptors (TR515. NNB GenCo, 2020a)
- NNB GenCo (HPC)'s partial tracking study predicting the dispersal of the discharged biota (NNB GenCo, 2021b)
- our own assessment of the waste stream from the FRR system outlet, including our own impingement and biomass calculations (AR001. Environment Agency, 2023d)
- our Habitats Regulations assessment (HRA) (Environment Agency, 2023b)
- our Water Framework Directive (WFD) assessment (Environment Agency, 2023a)
- the requirements of other applicable legislation

We are satisfied that the limits and conditions as set out in the draft permit variation will ensure a high level of environmental protection.

4.13.1 Our approach to permitting

The activities currently permitted by EPR/HP3228XT/V004 are described in Table S1.1, as a single activity made up a several waste streams all discharging via 2 cooling water outlets.

However, each waste stream is then conditioned separately within the permit, as can be seen within Table S3.1. The water discharge activity being considered in this variation application will result in an additional waste stream (waste stream H, WDA reference A7), discharging via an additional, separate outlet (Outlet 3).

To bring the permit up to modern format the proposed permit variation will present each waste stream as a separate water discharge activity (WDA). This means that the draft permit variation has:

- 2 permitted cooling water outlets to the marine environment (Bristol Channel) for waste streams A to G, via the cooling water outfall diffusers at the end of the cooling water outfall tunnel
- 1 permitted outlet to the marine environment (Bristol Channel) for waste stream H, via a specific outlet for the FRR system discharge, which is served by a dedicated outfall tunnel

Permit limits (compliance limits) will remain on the individual waste streams B to G before they are combined with the returned cooling water (waste stream A) in the outfall pond, as well as on the cooling water itself. We have also proposed permit limits for waste stream H for the FRR system. Our reasons for this are as follows:

- there is the considerable practical problem of obtaining a representative sample of the discharge. We cannot sample at the end of the outfall tunnel, submerged and approximately 1.8 km offshore in the Bristol Channel. We also consider that the highly turbulent mixing environment within the discharge pond may prevent us from obtaining a truly reliable, representative sample of the combined discharge at that point, although this is still under consideration and will be confirmed under a preoperational measure (PO15, as described in section 4.15).
- NNB GenCo (HPC) has confirmed that it is not possible to obtain a sample of the combined cooling water flow before it is discharged through the common outfall tunnel. This means that for waste stream A, each UK EPR™ unit will need to be sampled separately in its respective turbine hall
- despite these practical issues, we consider that a single compliance point does not allow enough control of the discharges from the individual processes, or sufficient flexibility in assessing new or varied discharges that may be produced during the operation of the power plant, for example, due to process development
- future changes in environmental legislation may drive changes in the chemicals used in individual processes, or the processes themselves. In this case, we would want to be able to regulate the individual waste streams

Other important reasons for this proposed approach are that it allows the impact of each discharge to be assessed alone and in combination for Habitats Regulations Assessment (HRA) purposes, as well as allowing the definition of any treatment measures which are needed to mitigate the potential impact of a particular waste stream to be clearly made.

Permit limits are normally set as concentrations in the final effluent and, if relevant, as loads (based on measured flows and concentrations in the final effluent) over a time period (for

example, daily and annual). Other types of permit limit can be used, for example, differential concentrations between cooling water intake and discharge, but these are not considered to provide a simple means of regulating the various process effluent discharges, apart from the cooling water for temperature. We have applied a combination of limits to the WDA draft permit, that is effluent concentrations, loads (daily and annual), and differentials, depending on the most suitable measures for each waste stream.

In setting permit limits and conditions, we have thought about what is necessary in terms of our main objective to protect the environment, and also what is acceptable from a regulatory viewpoint. At the same time, and where our permitting guidance allows, we have respected the need for the operator to be able to manage the power station to maximise output and feed the National Grid, without being overly constrained by the permit. We have set out here our reasons for the limits being proposed for the additional waste stream within the draft varied permit.

4.13.2 Waste stream H

Waste stream H will be specified as A7 (Waste stream H) within Schedule 1 of the permit.

To ensure that our reasonable worst-case scenario is not exceeded, a total wet weight biomass (kg/day) maximum limit will be set on waste stream H for the FRR system discharge. Total wet weight biomass (before FRR system mortality is calculated) is easier to monitor and quicker to assess, minimising the potential damage to fish species.

This is on the basis that, limiting the total wet weight biomass offers the same protection to the environment as limiting the total dead and moribund biomass (as the former differ from the latter only in the application of theoretical mortality rates).

This assumes that over time there is no significant shift in impinged fish species from robust species (with low mortality rates) to a higher percentage of fragile species (with high mortality rates). To protect against such a shift in species, long-term monitoring of fish species impinged is required. The required monitoring for this is set out in improvement condition 4 (IC4). The monitoring requirements and IC4 are discussed in sections 4.14. 4.15 & 4.16.

Our assessment of the polluting potential of the FRR system discharge, detailed in section 4.9.4, considered predictions based on the daily average from the worst month sampled (December 2019). But it is evident that impingement and therefore biomass discharged will vary throughout the year. To take account of this variation and devise appropriate limits to place on the permit. Two time periods were considered, one to cover the annual variation seen within the impingement data, and one to cover the peak impingement period seen over 3 months. Therefore, annual and quarterly statistics were derived.

Table 8 presents the dead and moribund biomass as a daily average from each month of data, along with the corresponding wet weight of biomass. December being the worst case that was assessed, as described in section 4.9.4, as well as the annual and quarterly (worse case) statistics for each.

Table 8. Total FRR system discharge calculations as dead and moribund biomass and corresponding total wet weight biomass of all marine fauna

Month	Total dead and moribund biomass (kg/day) from FRR system	Total wet weight biomass (kg/day) from FRR system
January	143	262
February	161	336
March	105	224
April	193	432
May	191	482
June	123	335
July	131	472
August	182	696
September	173	538
October	156	515
November	412	803
December	489	924
Daily mean over a 12-month period (annual average)	**205**	**502**
Daily mean over a 90-day period (quarterly average)	**352**	**747**

The point source emissions limits below are therefore proposed to be set on the permit for waste stream H discharged via the FRR system:

- maximum combined total wet weight biomass for 502 kg, measured as daily mean over a 12-month rolling period (annual average)
- maximum combined total wet weight biomass for 747 kg, measured as a daily mean over a 90-day rolling period

The compliance measurement of these emission limits is not straightforward, as continuous measurement of the moribund or total biomass is not possible. However, as can been seen from our assessment methodology, this can be calculated using appropriate data and evidence.

We consider that specifying the taxonomic groups to include would not account for new species migrating to the area of the HPC cooling water intakes and becoming impinged (as might occur due to climate change). Therefore, all taxonomic groups impinged should be accounted for in monitoring against the FRR system discharges permit limits (expressed as total wet weight biomass). We have therefore included the following wording within the interpretation section of Schedule 3 to the draft permit variation, and within Table S3.1 (limit of effective range):

- 'Total combined wet weight biomass' is defined as all taxonomic groups

NNB GenCo (HPC) will need to report and supply to us monitoring data as part of the operation of the FRR system discharge and for compliance with the permit conditions for WDAs A7 (waste stream H). This monitoring data is required to ensure that:

- the assumed effectiveness of the FRR system is maintained
- any increase in the abundance of dead and moribund biomass is detected
- the total combined wet weight biomass limits for the FRR system discharges are still valid if species composition was to shift over the lifetime of the station

The monitoring data to achieve the above requirements shall be provided by NNB GenCo (HPC) and shall include, but not be restricted to:

- monitoring data regarding the total impinged biomass of all groups of marine fauna, as wet weight biomass
- long-term, periodic monitoring data regarding the impingement of individual species
- water quality monitoring at the discharge outlet for the FRR system (Outlet 3)

The above monitoring aspects are required, as monitoring for compliance against the total wet weight FRR system permit limits alone will only identify changes in overall abundance.

The monitoring data for the FRR system discharge (WDA A7) shall be detailed within the permit's operating techniques (OTs), as specified within Table S1.2 of the permit:

- OT9: Environmental monitoring plan
- OT11: Effluent monitoring plan

A fourth improvement condition (IC4) has also been specified within Table S1.3 of the permit. This is required to protect against a shift in fish species impinged, whereby the proportion of fragile species (with high mortality rates) relative to robust species (with low mortality rates) increases over time.

This is to be achieved by long-term, periodic monitoring of fish species and abundance impinged. The condition is directly linked to the water quality assessment for the discharge from the FRR system, and the adoption of total wet weight permit limits for the FRR system discharge.

An additional pre-operational measure (PO19) requires NNB GenCo (HPC) to set out for approval by us, in a monitoring data review plan (as operating technique 13 (OT13) for WDA A7), the sampling and monitoring regimes that it will put in place to meet the requirements of improvement condition 4 (IC4). IC4 is specified within section 4.16 of this decision document.

The environmental monitoring data (OT9), effluent monitoring data (OT11), review of monitoring data (OT13) and improvement condition 4 (IC4) required for the FRR system discharges (WDA A7) may be supplemented (in full or in part, as long as it is of sufficient quality) by the use of impingement monitoring data that will be required for compliance with the HPC development consent order (DCO).

However, NNB GenCo (HPC) is yet to develop operating techniques OT9, OT11 and OT13 and so they are not currently available for us to assess and review.

Therefore, prior to commencement of the hot functional testing phase of commissioning, NNB GenCo (HPC) will require our written approval of these 3 OTs in accordance with the following 3 pre-operational measures (POs):

- For OT9, this is PO11 (as referenced within in Table S1.4): Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval an environmental monitoring plan for the purpose of post-scheme validation (the additional requirements for PO11 are provided for reference in section 4.15).
- For OT11, this is PO15 (as referenced within Table S1.4): Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval an effluent monitoring plan which specifies the monitoring techniques and assessments to be used for monitoring effluents under this permit (the additional requirements for PO15 are provided for reference in section 4.15).
- For OT13, this is PO18 (as referenced within Table S1.4): Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a monitoring data review plan. The plan shall include a description of the sampling and monitoring regimes that will be put in place to meet the requirement of improvement condition IC4 in Table S1.3 of this permit (the additional requirements for PO18 are provided for reference in section 4.15).

NNB GenCo (HPC) will need to submit PO11, PO15 and PO18 for our review and written approval at least 3 calendar months before it intends to begin hot functional testing.

Our review and written approval will need to consider the FRR system discharge monitoring parameters and frequencies proposed by NNB GenCo (HPC).

We will only provide written approval once we find the proposals of the environmental (OT9) and effluent (OT11) monitoring plans acceptable. Our review and written approval will also be required for the monitoring data review plan (OT13).

We will also specify a maximum daily discharge volume of 108,864 m^3/day, and a maximum discharge rate of 1,260 litres/second.

These emission limit requirements are specific to HPC, however the approach taken is consistent with our approach to regulating the proposed discharges from the two FRR systems at Sizewell C (SZC), WDA environmental permit reference EPR/CB3997AD granted on 23/03/2023.

4.14 Monitoring

4.14.1 Scope of consideration

The monitoring systems associated with the FRR system WDA at HPC are still being designed. It has, therefore, not been possible in NNB GenCo (HPC)'s variation application to specify the exact location of the monitoring points associated with this waste stream.

We have therefore included a pre-operational measure in our permit (PO14), which requires NNB GenCo (HPC) to confirm the locations of the monitoring points for each waste stream (to include waste stream H), including exact National Grid references (NGRs) and site plans before the Hot Functional Testing phase of commissioning begins.

We have decided that NNB GenCo (HPC) should carry out effluent monitoring of waste stream H for the following parameters as listed below.

- maximum volume
- flow rate (15-minute instantaneous or integrated flow)
- total combined moribund biomass with daily mean (90 day rolling average)
- daily mean daily mean (12 month rolling period (annual average))

We have set these monitoring requirements in the draft permit variation in order to make sure that the level of emissions does not harm the receiving environment. We will also monitor certain aspects of the discharge as part of our routine compliance work.

The permit included a pre-operational measure (PO11), which requires NNB GenCo (HPC) to submit for approval an environmental monitoring plan for the purpose of post-scheme validation. This will also need to cover aspects of waste stream H if the permit variation is granted. NNB GenCo (HPC) will need to agree the scope of this plan with us.

In accordance with our guidance, monitoring equipment, techniques, staff and organisations employed for the emissions monitoring programme and environmental monitoring shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by us. MCERTS is our monitoring certification scheme. It provides the framework for businesses to meet our quality requirements. If an operator complies with MCERTS we have confidence in its monitoring of emissions to the environment. NNB GenCo (HPC) is required via pre-operational measures (PO11 and PO15) in the permit to confirm the proposed monitoring procedures/ techniques to be used, and its MCERTS status, before the Hot Functional Testing phase of commissioning begins. These conditions will remain in the varied permit.

4.15 Pre-operational conditions

Based on the current permit and additional information in the variation application, we consider that we need to impose pre-operational conditions ('measures'). These measures are set out here. We have also referred to them throughout this draft decision document, where appropriate. The pre-operational measures must be completed before the hot functional testing phase of plant commissioning begins. Many of the measures require the operator to submit a specific plan for our approval before any water discharge activities begin.

Due to the lengthy design process and construction period associated with HPC, certain aspects of the detailed design are ongoing and evolving. Our pre-operational measures in many instances require the operator to confirm that it has adopted or implemented the details and measures proposed in its application before commissioning begins. We note that the UK EPR™ is an evolutionary design based on operational PWR power stations in France and Germany. The most recent French design was the N4, a predecessor of the UK EPR™, brought into commercial operations in 1996 (Chooz B1, located in France). The most recent German design was KONVOI, brought into commercial operation in 1989 (GKN-2, located in Germany). We expect NNB GenCo (HPC) to learn lessons from the detailed design and construction of the other EPR™ units under construction, in particular at Flamanville in France, and that this experience will inform its responses to our pre-operational measures.

Where design amendments have taken place since the original and variation application were made, then the measures require the operator to validate the original and variation application data and, where appropriate, demonstrate how any amendments will prevent or minimise impacts on the environment and ensure compliance with this permit.

Pre-operational measure PO1

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit a summary of the site environment management system (EMS) to the Environment Agency and make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with our guidance on development of management systems for environmental permits, and shall include an

accident management plan for the water discharge activities. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.

Pre-operational measure PO2

Prior to the hot functional testing (HFT) phase of commissioning, the operator shall submit to the Environment Agency for approval a report which includes a completed, as-built description of the plant and infrastructure relevant to the water discharge activities. The report shall take into account the whole cooling water system, including the design of the FRR system.

In addition, the report shall contain an updated site plan clearly showing all relevant buildings and structures and the route of the associated pipework, including all land-based infrastructure associated with the cooling water system, and the national grid reference of the cooling water intakes.

Should the final design vary from that described in the permit application, the report shall include, as appropriate, a risk assessment to demonstrate how the changes will prevent or minimise impacts on the receiving water environment and ensure compliance with this permit.

Pre-operational measure PO3

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a report which reviews the proposed substance loadings and emissions to surface water from HPC. The report shall include, but not be restricted to the following:

- a summary of the lessons learnt through design evolution and/or commissioning and operating the EPR™ at Flamanville 3 in France, or any other EPR™ site worldwide
- information from designers and suppliers which has influenced the final design with respect to the flow and composition of effluents
- reference to outputs from the demineralisation plant (expected to be based on no desalination technology in variance to the data provided in GDA and the permit application)

The report shall validate the proposed substance loadings and emissions from HPC, fully describing and justifying:

- any expected variances from the substance loadings and emissions proposed in the permit application
- any additional mitigation measures required to ensure compliance with this permit

Pre-operational measure PO4

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a scoping document for development of an emissions management plan, to show how emissions not covered by emission limits in Table S3.1, will be prevented, or where that is not practicable, minimised.

Pre-operational measure PO5

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval an emissions management plan in accordance with the scope agreed under PO4.

Pre-operational measure PO6

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a commissioning discharges management plan. The plan shall describe how the operator intends to undertake hot functional testing (HFT). The plan shall include, but not be restricted to, the following:

- the timetable for HFT of both UK EPR™ units
- a description of the HFT process
- a description of associated effluent treatment measures
- confirmation of the expected substance loadings and emissions to surface water
- confirmation of the expected thermal loading, including the expected temperature of the discharge
- proposals for effluent monitoring during the HFT process.

The plan should also demonstrate how the operator's management and engineering controls will ensure that substance loadings and emissions to surface water do not exceed the levels stated in the permit application, with particular reference to how:

- environment impacts will be prevented or minimised
- compliance with this permit will be achieved.

Pre-operational measure PO7

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a report which confirms and justifies their operational strategy for the control of biofouling of the cooling water system. The report shall include, but not be restricted to, the following:

- an appraisal of the operational conditions and chlorination strategy employed at Hinkley Point B power station, and a description of how this has been taken into account in defining the proposed strategy for HPC
- the lessons learnt through design evolution and/or commissioning and operating the EPR™ at Flamanville 3 in France, or any other EPR™ site worldwide

- details of how the operational strategy has been optimised to reduce the need for chemical dosing and the subsequent discharge of TRO and the formation of chlorinated by-products (CBPs)
- validation of the impacts of the proposed dosing regime, to include reference to numerical modelling and ecotoxicological studies as appropriate

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 FRR (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 FRR system 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 commissioning of the FRR system
- proposals for demonstrating the effectiveness of the optimisation process to the Environment Agency prior to the start of active commissioning of the first HPC UK EPR™ unit

Pre-operational measure PO9

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a forebay desilting plan for the removal of accumulated silt from within the cooling water forebays. The plan shall include:

- verification of the initial impact assessment findings detailed in the permit application
- a method statement for undertaking the desilting activity

Pre-operational measure PO10

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a hydrazine removal plan which details how hydrazine shall be removed from the effluent prior to discharge. The plan shall include, but not be restricted to, the following:

- the methodology to be followed in removing hydrazine prior to discharge to ensure the modelled scenarios are achieved
- proposals for monitoring during the Hot Functional Testing phase of commissioning to demonstrate that the required treatment of hydrazine in (i) waste streams B and C (combined) and (ii) waste stream D, is below the Limit of Detection of the analytical method, the use of which shall be approved by the Environment Agency

- proposals for ongoing process monitoring to ensure that the hydrazine removal process maintains its effectiveness
- details of contingency plans to deal with equipment failure and/or breakdown, or other reasonably foreseeable incidents which may compromise the effectiveness of the hydrazine removal process

Pre-operational measure PO11

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval an environmental monitoring plan for the Severn Estuary SAC, SPA and Ramsar, purpose of post-scheme appraisal.

The plan shall propose monitoring methods to determine the physical, chemical and biological characteristics of the area of the projected plumes along with monitoring locations and frequencies. It shall also include the procedures for assessing any effects and reporting the results of the monitoring and assessment to the Environment Agency. The plan shall include, but not be restricted to, the following aspects:

- thermal plume monitoring
- chemical plume monitoring
- subtidal and intertidal benthic ecology
- water quality monitoring
- sediment quality monitoring
- the quality assurance procedures in place
- discharges of dead and moribund biomass, and wet weight biomass as a potential sources of polluting matter
- FRR system discharge monitoring
- review of the limit of detection for effluent monitoring techniques
- the progress towards MCERTS certification or MCERTS accreditation, unless otherwise agreed in writing by the Environment Agency, and, if necessary, a timetable for achieving the MCERTS standard

Pre-operational measure PO12

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a priority hazardous substances management plan. The plan shall describe how the operator intends to manage the use of chemicals so as to gradually cease or phase out discharging priority hazardous substances, in accordance with the environmental objectives set out under the Water Framework Directive.

The plan will make reference to, amongst other things, the cadmium and mercury which is present as trace contaminants in bulk raw materials and will propose a timetable for the gradual phasing out of the use of such chemicals.

Pre-operational measure PO13

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency confirmation of the final National Grid references (NGRs) for the individual diffuser heads on the cooling water outfall tunnel and the FRR outlet on the FRR tunnel, to refine the NGRs in the permit applications which were submitted with a 50m limit of deviation to allow for tunnel drilling contingency.

Following written approval by the Environment Agency, the NGRs shall be deemed to be incorporated under Table S3.2 of this permit.

Pre-operational measure PO14

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency:

- confirmation of the NGRs for the compliance monitoring points associated with each waste stream, as listed in Table S3.3
- confirmation of the monitoring point references, to be prefixed by 'M', for the waste stream compliance monitoring points
- detailed site plan(s) showing the exact location of the waste stream compliance monitoring points.

Following written approval by the Environment Agency, the NGRs and monitoring point references shall be deemed to be incorporated under Table S3.3 of this permit. The site plan(s) shall be deemed to be incorporated under Schedule 7 of this permit.

Pre-operational measure PO15

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval an effluent monitoring plan which specifies the monitoring techniques and assessments to be used for monitoring of effluents under this permit. The plan shall also include, but not be restricted to, the following:

- the quality assurance procedures in place
- review of the limit of detection for effluent monitoring techniques
- the incorporation of outcomes from the monitoring data review specified in IC4
- the progress towards MCERTS certification or MCERTS accreditation, unless otherwise agreed in writing by the Environment Agency, and if necessary, a timetable for achieving the MCERTS standard

Pre-operational measure PO16

Prior to the commencement of the hot functional testing phase of commissioning the operator shall submit to the Environment Agency for approval a hydrodynamic modelling review plan. The plan shall include a description of the sampling and monitoring regimes

that will be put in place to meet the requirement of improvement condition IC2 and IC3 in Table S1.3 of this permit.

Pre-operational measure PO17

Prior to the commencement of the hot functional testing (HFT) phase of commissioning, the operator shall submit to the Environment Agency for approval a site plan detailing the location of where the operating techniques specified in table S1.2 will be applied.

Following written approval by the Environment Agency, the site plan shall be deemed to be incorporated under Schedule 7 of this permit.

Pre-operational measure PO18

Prior to the commencement of the hot functional testing (HFT) phase of commissioning, the operator shall submit to the Environment Agency for approval a monitoring data review plan. The plan shall include a description of the sampling and monitoring regimes that will be put in place to meet the requirements of improvement condition IC4 in Table S1.3 of this permit.

4.16 Improvement conditions

Based on the current permit and additional information in the variation application, we consider that we need to impose what are called ‘improvement conditions’. In the case of a new regulated facility such as HPC, these are, in fact, conditions that require measures to be taken which cannot be carried out before the permit is granted (frequently to obtain operational information or environmental monitoring data for post-scheme appraisal); they are not measures to improve matters at a later stage. We are using these conditions to require NNB GenCo (HPC) as the operator to provide us with details that need to be validated or confirmed during operation. These conditions are set out here, and they have been referred to in the relevant section of this draft decision document.

Improvement condition IC1

The operator shall submit a written report to the Environment Agency on the implementation of its environmental management system and the progress made in the accreditation of the system by an external body, or, if appropriate, submit a schedule by which the EMS will be subject to accreditation. The report shall be submitted within 12 months of the date on which the hot functional testing phase of commissioning commences.

Improvement condition IC2

The operator shall review their hydrodynamic modelling for the purpose of post-scheme appraisal within 5 years of the commencement of commercial operation of second UK EPR™ unit on site, to validate their modelling predictions. The review shall include re-

calibration and validation of the hydrodynamic model(s) if necessary, as well as a reassessment of the assumptions concerning the near-field behaviour of the discharges.

The operator shall submit a written report to the Environment Agency on the review of their hydrodynamic modelling within one month of completion of the review.

Improvement condition IC3

The operator shall review their hydrodynamic modelling and associated impact assessment in light of the following:

- best available climate change projections
- operational performance of the power station
- the output from post scheme appraisal studies; within 5 years of the commencement of commercial operation of UK EPR™ unit 2, and every 10 years thereafter unless otherwise agreed in writing by the Environment Agency

The review will assess how the climate change projections could influence the operation of the power station in the future. The results of the review must be reported to the Environment Agency in writing within one month of completing of each review.

Improvement condition IC4

The operator shall review its monitoring data, including but not restricted to, that data available via the effluent monitoring plan (OT11) for the FRR system discharge, to identify any shift in fish species being impinged (as might occur due to climate change). The shift being away from the species distribution observed in the Pisces (2009 to 2010) and Cefas (2021 to 2022) monitoring that was the basis of the FRR system discharge water quality impact assessments in TR515 (NNB GenCo, 2020) and AR001 (Environment Agency, 2023). This shall be achieved by long-term, periodic monitoring of fish species and abundance impinged.

The monitoring data review shall be completed within 5 years of commencement of the hot functional testing phase of commissioning of UK EPR™ unit 1, and every 10 years thereafter unless otherwise agreed in writing by the Environment Agency.

The monitoring data review will assess how any shift in fish species and abundance being impinged could influence the effluent load from the FRR system discharge. The results of the review must be reported to the Environment Agency in writing within one month of completing each review.

4.17 Consideration of best available techniques

The use of Best Available Techniques (BAT) is a well-established approach for identifying, assessing and selecting appropriate controls on pollution. Most conventional power stations

are covered by the Industrial Emissions Directive (IED), and therefore require the application of BAT by law.

Nuclear power stations are not covered by the IED, although they do fall under EPR 2016 for water discharge activities (WDAs). In carrying out our permitting functions for water discharge activities, there is no duty on us (the Environment Agency) to consider Best Available Techniques (BAT). However, the obligations of the OSPAR Convention apply to these discharges.

The OSPAR Convention requires Contracting Parties (as the UK is) to apply BAT and Best Environmental Practice (BEP) including, where appropriate, clean technology, in their efforts to prevent and eliminate marine pollution.

As defined in Appendix 1 of the OSPAR Convention, BAT means "the latest stage of development (state of the art) of processes, of facilities or of methods of operation which indicate the practical suitability of a particular measure for limiting discharges, emissions and waste". BEP is defined as "the application of the most appropriate combination of environmental control measures and strategies".

In addition to our obligations under the OSPAR convention, we are also guided by the Government Nuclear National Policy Statement (EN-6) which states that:

"**3.7.7:** Discharges into water sources will be controlled in accordance with permits issued by the EA. Applicants will be expected to demonstrate Best Available Techniques to minimise the impacts of cooling water discharges."

In considering BAT we recognise that a point can be reached where the additional costs of securing further reductions in discharge quantity and / or quality, and of the risks associated with those discharges, would far outweigh the increased protection arising from such improvements to the environment and / or the general public. However, where a statutory obligation, for example, an EQS, requires stricter conditions and quality limits than those achievable by the use of BAT then we would seek to ensure that:

a) the operator investigates whether alternative means exist, for example, a change in process or equipment, or a change in operational regime
b) additional regulatory measures or controls are applied as necessary
c) compliance with said discharge quality limits can be achieved

We assessed the justifications given by NNB GenCo (HPC) in relation to pollution control and Best Available Techniques provided in their original application and additional information if their variation application.

Consideration of foul sewer connection

As discussed in sections 4.9.6 and 4.11.11, we are satisfied with NNB GenCo (HPC)'s proposal to discharge to the Bristol Channel via the FRR outlet as connection to the main foul sewer for the treatment of this effluent is unreasonable.

Consideration that priority hazardous substance concentrations are trace only

There are no priority hazardous substances (PHSs) dosed directly into any of the HPC FRR system, and we are satisfied that the sources of PHSs are trace only in nature, which is reasonable in terms of BAT.

With respect to the discharge of moribund biota from the FRR system:

We required NNB GenCo (HPC) to demonstrate that BAT principles are applied to limit the polluting effect of dead fish and biota discharged from HPC's FRR system. NNB GenCo (HPC) has proposed the following considerations and mitigation to reduce the quantity of fish and biota abstracted into the cooling water system, the design of the plant and the FRR system.

Fish Recovery and Return (FRR) system

The design and operation of the FRR system is based on our guidance (Environment Agency, 2005) to reduce the risk of damage and mortality of fish and biota passing through the systems prior to discharge. The passage of biota through the plant with water can be damaging as organisms undergo a range of stresses that often lead to injury or death. The main causes of harm can be classified into (1) mechanical (abrasion, pressure changes and shear stress), (2) thermal (elevated water temperature and rapid changes in temperature) and (3) chemical (addition of biocides and low oxygen).

NNB GenCo (HPC) has stated that the FRR system will employ the following features in line with our guidance

- very low-pressure wash sprays (1 bar) shall be used for biota removal from the pumping station's rotating, 10 mm fine-mesh band screens in order to minimise the potential for harm and abrasion of the biota
- the geometry of the collection hoppers is designed to minimise the escape of fish and return into the screen well
- the screen buckets are designed to retain water, with the contents of the bucket channelled via a wash water gully to the sea under gravity flow via a dedicated pipeline, separate to the cooling water outflow channel
- fish gullies will be smooth
- swept bends of radius >3m will be used wherever possible, were this is not achievable gutter diameter will be 4 m or more and the bend radius at least 1.5 times the diameter*
- dedicated fish return tunnels will be used
- a wash water supply will be provided to ensure the fish are immersed as they move along the return line
- minimal use of chemicals for intake water pre-treatment
- the HPC FFR system outlet location has been chosen to avoid live fish being immediately entrapped in the HPB intake or re-entrapped in the HPC intakes, and therefore, being returned to sea dead and moribund

The application of these measures will help to ensure that as many fish as possible are returned to the Bristol Channel alive via the FRR system outlet, therefore reducing the

*This is in accordance with Environment Agency FRR Guidance: Bends letter of 27 November 2015 (Environment Agency, 2015)

amount of dead and moribund fish being discharged, which could constitute polluting matter (for which our assessment is detailed within section 4.9.4). It will also reduce the amount of waste being directed to landfill. As the recovered biota will be returned to the environment it was taken from via the FRR system. If the FRR system was not provided all fish, invertebrates and debris impinged would have to be removed from site and disposed of accordingly. The detrimental environmental effect of transporting this waste for offsite disposal is considered to greatly outweigh the potential environmental risks from discharging it to the Bristol channel.

The provision and current design of the FRR system is therefore considered BAT.

4.18 Other statutory considerations

Environment Act 1995, Section 4: Principal aim of the Environment Agency ('sustainable development')

Under Section 4 of the Environment Act 1995 (EA 1995), we are required to contribute towards achieving sustainable development, as considered appropriate by the Secretary of State and set out in guidance issued to us. 'The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance' (issued by Defra in December 2002) provides guidance to us on matters such as formulating approaches that we should take to our work, decisions about our priorities and our allocation of resources. It is not directly applicable to our individual regulatory decisions.

The statutory guidance states that our main contribution to sustainable development will be to deliver our various objectives in a way that takes account (subject to and in accordance with EA 1995 and any other enactment) of economic and social considerations. In respect of EPR 2016, the guidance refers to the objective of regulating water discharge activities in accordance with statutory duties, statutory guidance and UK government policy.

We consider that the overall approach described in this draft decision document, which takes into consideration social and economic factors, and the assessment of the impact of the discharges on the environment, contribute appropriately to the aim of achieving sustainable development, having regard to the statutory guidance.

Environment Act 1995, Section 5: Pollution control powers

Section 5 of EA 1995 sets out the purpose for which our pollution control powers, including our powers under EPR 2016, must be used. This is for "preventing or minimising, or remedying or mitigating the effects of, pollution of the environment." We consider that we have exercised our pollution control powers for that purpose, in that:

- we have proposed draft limits and conditions, as specified in the statutory guidance, and having regard to government policy
- the environment would be protected

Environment Act 1995, Section 7(1)(c)(ii): Amenity issues

Under Section 7(1)(c)(ii) of EA 1995, we must take into account any effect which our proposals would have on the amenity of any rural or urban area. Following our assessment of the proposed WDAs, we do not consider that any additional or different limits or conditions are required in the draft permit, in relation to this duty.

We are satisfied that our proposed decision to permit the WDAs, in accordance with legal and policy requirements, will not lead to any harmful effects on local amenities.

Environment Act 1995, Section 7(1)(c)(iii): Wellbeing of local communities

Under Section 7(1)(c)(iii) of EA 1995, we must have regard to the effect our proposals would have on the economic and social wellbeing of local communities in rural areas.

We have had regard, as appropriate, the potential effect on the economic and social wellbeing of the local community as part of:

- our assessment of NNB GenCo (HPC)'s proposals in relation to the use of BAT
- our considerations in relation to the principal aim of the Environment Agency (sustainable development)
- our assessment of the impact of the proposed WDA

Following our assessments of the impacts of the proposed WDA, we do not consider that any additional or different limits or conditions are required in the draft permit, in relation to this duty.

Environment Act 1995, Section 39: Likely costs and benefits

Under Section 39, we have a duty to take into account the likely costs and benefits of whether and how we exercise our powers ('costs' being defined as including costs to the environment as well as to any person). However, this duty, does not affect our obligation to discharge any duties imposed upon us in other legislative provisions.

We have taken into account the likely costs and benefits in our assessment of BAT and generally. We are satisfied that the conditions in the draft permit are proportionate.

Water Resources Act 1991, Section 15 (particular regard to duties of the sewerage undertaker)

We have a duty under Section 15 of the Water Resources Act 1991 to consider whether granting an environmental permit is likely to affect the duties of any water or sewerage undertaker. We have considered whether we should impose any further requirements in terms of this duty, but we believe that the existing conditions are sufficient.

Marine and Coastal Access Act 2009

We have considered the new duties placed upon us under the Marine and Coastal Access Act 2009, one of the most important of which is set out in Part 3, Chapter 4, Section 58. This requires that any authorisation decision taken by a public authority must be in accordance with the appropriate marine policy documents that is the relevant marine plan or the Marine Policy Statement (MPS), unless relevant considerations indicate otherwise.

The MPS outlines the government's policies for achieving sustainable development in the marine environment around the UK, while at a local level, marine plans have been developed to provide the statutory basis for decision-making on activities within that area. The South West Marine Plan includes the North Devon Coast, which incorporates the waters of Bridgwater Bay and part of the Bristol Channel within the South West Inshore Area.

The proposed decision we have reached affects the marine waters of the North Devon Coast (including the Severn Estuary SAC and those assessed within our HRA), and so it has been made with reference to the Marine Policy Statement and the South West Marine Plan. We believe that our proposed decision is in accordance with the Marine Policy Statement and the South West Marine Plan.

Marine Strategy Regulations 2010

In relation to Regulation 9 of the Marine Strategy Regulations 2010 we have had regard to the marine strategy (in so far as it has been developed and published to date) and consider that there is nothing in it which would lead us to any different conclusions from those we have already reached through our other marine assessments.

Human Rights Act 1998

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our proposed decision. We consider that our decision is compatible with our duties under the Human Rights Act 1998 (UK Parliament, 1998). In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6) (which here includes the right to a reasoned decision – as provided in draft in this document), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

Public participation and duty to involve

Regulation 60 of EPR 2016 requires us to prepare and publish a statement of our policies for complying with our public participation duties. We have published our public participation statement (Environment Agency, 2019b) and this application is being consulted upon in line with it. This satisfies the requirements of the Public Participation Directive.

Section 23 of the Local Democracy, Economic Development and Construction Act 2009 (UK Parliament, 2009d) requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way.

We have described our consultation in relation to this application within this draft decision document. We have described the way in which we have taken account of representations we have received in Appendix 1.

Deregulation Act 2015 – Growth duty

We considered our duty to have regard to the desirability of promoting economic growth set out in Section 108(1) of the Deregulation Act 2015 (UK Parliament, 2015b) and the guidance issued under Section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be met in sections 4.12 to 4.20, of this consultation document. Paragraph 1.5 of the guidance is clear that encouraging economic growth should not be pursued at the expense of protecting the environment.

We consider the requirements and standards we have set in the proposed permit are reasonable and necessary to protect the environment and people. This also promotes growth among legitimate applicants and operators because the standards applied to the applicant are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Equality Act 2010

We have had regard to the Public Sector Equality Duty and are satisfied that our proposed decision and decision-making process are in accordance with the duty. We undertook an equality analysis to help inform our engagement activities relating to the Hinkley Point C project.

4.19 Matters which are outside the Environment Agency's permitting remit

Matters such as nuclear safety, the location of the facility, traffic movements and flood risk are generally dealt with under other regimes and/or by other bodies and not as part of our WDA permitting remit.

For example, vehicle access to the facility and traffic movements are relevant considerations when granting planning permission, but do not form part of the WDA environmental permit application decision-making process. Such planning permission aspects would have been considered during the DCO application process for the proposal of the new power station at HPC.

The original water discharge activity permit granted in March 2013 did include conditions relating to an AFD. At that time NNB Generation Company Limited had applied for three permissions relating to HPC (environmental permit, marine licence and Development Consent Order) and had included provision of an AFD as part of its applications. We, the Environment Agency, considered that we could impose controls within the cooling water system to minimise discharge of polluting matter or trade effluent from the outlets. We assessed the package of mitigation measures applied for by NNB Generation Company Limited and concluded that the impacts from the cooling water system were acceptable with those mitigation measures included. Our judgement at the time the AFD condition was imposed, therefore, was that it was necessary as part of the measures proposed by NNB Generation Company Limited to mitigate effects of its cooling water system. The AFD was offered as a package of mitigation by NNB Generation Company Limited, and the water discharge activity was conditioned on that basis. The HRA for the permit application in 2013 had concluded "no adverse effect" on designated sites as a result of the mitigation being included.

The issue, when determining the water discharge activity permit variation application to remove AFD requirements, is whether it would be necessary to control the potential polluting effects of the discharge by requiring an AFD given that Environment Agency's regulatory remit under EPR 2016 extends to consideration of polluting effects of discharge, rather than operation of the power plant as a whole, including abstraction of seawater in the absence of a requirement for an abstraction licence, where there is no risk of significant pollution.

We hav concluded that the polluting effects of the discharge, without an AFD being installed, do not cause adverse effects on the integrity of European site nor compromise achievement of the water body environmental objectives nor cause significant pollution of receiving waters. Given those conclusions we are of the view that it is not necessary or reasonable to impose permit conditions requiring an AFD as part of the pollution control measures in the water discharge activity permit.

Under better regulation principles the same requirement should not be duplicated across different permissions and as the requirement for AFD forms part of the DCO and marine licence it should not be repeated in the water discharge activity permit given the protections

sought by imposition of AFD can be secured via one of the other permissions. There is scope within DCO to consider and impose requirements in relation to the effects of abstraction of water where no abstraction licence is required.

Where consultees have raised issues relating to such matters, we provide more information in Appendix 1.

5. Our proposed decision

Our proposed decision, subject to careful consideration of any issues that are identified through this consultation, is that we should grant the variation and issue a varied permit.

A draft WDA permit, containing our proposed conditions is available on our HPC proposed decision online consultation hub.

5.1 Conditions of draft permit

The draft permit contains many conditions taken from our standard environmental permit template, including the relevant annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations 2016 and other relevant legislation.

We regularly review these conditions to make sure that they are up-to-date and effective, that permits for specific sites properly protect people and the environment, and that they are consistent with the relevant government legislation and policies.

This document does not therefore include an explanation for these standard conditions. Where they are included in the permit, we have considered the permit application and accepted the details are sufficient and satisfactory to make the standard condition appropriate.

The draft permit is based on our standard template permit for WDAs. We have developed the standard template over a number of years and we regularly review it to make sure that it is up-to-date and effective.

As well as the standard template conditions, the draft permit contains 2 bespoke conditions, regarding monitoring and reporting associated with the operation of HPC in RF3 maintenance configuration. We believe these are necessary to make sure that the permit achieves the required level of environmental protection.

The permit template and its conditions are described more fully in How to comply with your environmental permit for trade effluent discharges that are classed as water discharge or groundwater activities.

The standard permit variation template consists, principally, of:

- an introductory note (this is not part of the permit)
- a certificate page, authorising the permit
- Parts 1 to 4, being standard conditions about management, operations, discharges and monitoring, and provision of information
- Schedule 1, defining the permitted water discharge activities
- Schedule 3, specifying the volume, rate, composition, monitoring and routes of the permitted water discharge activities to the Bristol Channel
- Schedule 4, specifying reporting requirements
- Schedule 5, notification form
- Schedule 6, interpretation
- Schedule 7, being a site plan showing the geographical extent of the regulated facility

The conditions in Parts 1 to 4 of the draft WDA permit variation have not been modified from the standard conditions of our template, apart from those relating to monitoring and reporting during operation in RF3 maintenance configuration.

In Schedule 1, we have included 4 improvement conditions, and 18 pre-operational measure conditions for the reasons explained in sections 4.17 and 4.18.

Schedule 3 specifies the proposed point source releases and, as relevant, the proposed limits that apply to specific substances for each of the approved release points.

We are of the view that our proposed decision and draft permit conditions are consistent with the relevant legislation, and that we have reached the proposed decision having regard to the statutory guidance concerning the regulation of WDAs int the environment and relevant government policy.

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Glossary

Term	Meaning
Admixture	The act of mixing or mingling.
Activity	A generic title for the practices or operations which need to be permitted (unless exempted from the need for a permit).
AONB	Area of Outstanding Natural Beauty.
APG	Steam generator blowdown system.
BAT	Best available techniques – see 'Schedule 6 – Interpretation' in the draft permit for a full definition.
Batched discharge	A controlled discharge into the main cooling flow of trade effluent generated from an intermittent process in which a known volume of process/waste effluent is produced, collected, monitored, stored and treated as required to ensure environmental standards as determined via the H1 risk screening process or modelling are achieved.
Biota	In the context of our assessment, biota refers to animals (intact or otherwise) that have passed through the fish recovery and return system (ctenophores and jellyfish are excluded from our impingement mortality calculations).
Blackwater	Waste water contaminated with human faecal material.
Bootstrapping	Statistical method for resampling a single dataset to create many simulated samples
CBP	Chlorinated by-product.
Cefas	Centre for Environment, Fisheries and Aquaculture.
CFI	Drum screen and band screen pumps.
CFT	Cold flush testing.
Chemical plume	An area of water within which concentrations of chemicals are above background levels, as a result of a discharge activity.

CRF	Circulating water system pumps.
CROW	Countryside and Rights of Way Act.
CVCS	Chemical and volume control system.
CW	Cooling water.
CWS	Cooling water system.
DCO	Development Consent Order.
Defra	Department for Environment, Food and Rural Affairs.
DIN	Dissolved inorganic nitrogen.
DO	Dissolved oxygen.
ECHA	European Chemicals Agency
EDF	Électricité de France.
Enterococci	Bacteria; indicators of the presence of faecal material in water.
EPR™	European Pressurised Reactor.
EPR 2016	Environmental Permitting (England and Wales) Regulations 2016.
EQS	Environmental quality standard: The concentration and a corresponding statistic (for example, mean or 95th percentile), below which a substance is not believed to be detrimental to aquatic life, based on the results of toxicity tests on organisms covering a range of levels within food chains. Each substance has its own EQS which can differ depending on whether the receiving environment is fresh, transitional or coastal water.
Eutrophication	The increase in primary productivity and subsequent impacts on an ecosystem that arise as a result of inputs of nutrients (which can be human) raising ambient nutrient concentrations.
Ecotoxicology	The nature, effects and interactions of substances that are harmful to the environment.

FSA	Food Standards Agency.
FRR	Fish recovery and return system (SZC has 2 FRR systems).
FWP	Forward work plan.
GDA	Generic design assessment.
Greywater	Waste water without human faecal contamination.
GSB	Greater Sizewell Bay.
Haul-out site	A location on land that is used by seals – for rest, to moult and to breed. The nature of these sites varies widely and can include rocky islets or shorelines, sandy beaches or sandbanks.
HPA	Health Protection Agency (superseded by Public Health England and then by the UK Health Security Agency).
HPC	Hinkley Point C.
HRA	Habitats Regulations assessment.
HSE	Health and Safety Executive. Regulator with responsibilities under IRR17 (UK Parliament 2017b).
Impingement	This describes organisms (fish and invertebrates) trapped on the various screens which filter seawater to prevent damage occurring within the cooling water system. Impinged organisms are returned to sea via the fish recovery and return system.
IRR17	Ionising Radiations Regulations 2017.
iSoDA	Interim Statement of Design Acceptability.
KER	Liquid radwaste monitoring and discharge system.
LSE	Likely significant effect.
MCERTs	The Environment Agency's Monitoring Certification Scheme.

MCZ	Marine Conservation Zone.
Mg	Milligram (mg): A unit of mass equal to one thousandth of a gram (1.0mg = 0.001g).
Mg/l	Milligrams per litre. A measure of the concentration by weight of a substance per unit volume in water or wastewater.
Moribund	Where an organism is at the point of death. In our mortality calculation, we have used the term 'moribund biota' to mean biota passing through the FRR system that is dead and acts as a polluting matter.
Mixing zone	The mixing zone is the area around a discharge within which a quality standard is exceeded. The role of the regulator is to ensure that the size of the mixing zone is small enough so as to not impact on the function of the wider water body or habitat.
Mwe	Megawatt electrical, a measure of electrical power.
Ng	Nanogram (ng): A unit of mass equal to one thousandth of a microgram, and one billionth of a gram (1.0ng = 0.001µg).
NIA 65	The Nuclear Installations Act 1965.
NE	Natural England.
Nuclear island	The facilities within the reactor and associated buildings.
Nutrient enrichment	The introduction of additional and/or new nutrients into a water body or other environment. This can cause disruption to the existing water quality regime and therefore impact on species and habitats.
l/s	Litres Per second. A measure of a liquids volumetric role rate.
ONR	Office for Nuclear Regulation: a statutory public corporation, responsible for regulation of nuclear safety and security across the UK.
OSPAR	Oslo and Paris Convention for the protection of the marine environment in the north-east Atlantic.

	The UK is a signatory to this Convention, whose strategies aim to prevent pollution of the maritime area by continuously reducing discharges, emissions and losses of chemically hazardous substances and radioactive substances.
PHE	Public Health England (which superseded the Health Protection Agency (HPA) in 2013) and which became part of the UK Health Security Agency in 2021.
PHS	Priority hazardous substance.
PINs	Planning Inspectorate
PNEC	Predicted no effect concentration: The concentration of a chemical which marks the limit below which no adverse effects of exposure in an ecosystem are measured. The PNEC is used for substances for which an EQS has not been set.
PPP(s)	Permissions, plans or projects.
PWR	Pressurised water reactor.
Ramsar	Ramsar sites are wetlands of international importance that have been designated under the criteria of the Ramsar Convention on Wetlands for containing representative, rare or unique wetland types or for their importance in conserving biological diversity.
Regulated facility	A collective term for the range of activities permitted under EPR 2016.
RSR	Radioactive Substances Regulations.
SAC	Special Area of Conservation: A protected area designated under the Conservation of Habitats and Species Regulations 2017 in England and Wales, or the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) for UK offshore areas. A Special Area of Conservation is part of a network of import high-quality conservation sites that will make a contribution to conserving the habitats and species identified in Annexes I and II, respectively of European Council Directive 92/43/EEC, the Habitats Directive.
SACO	Supplementary advice on conservation objectives.

SEK	Conventional island liquid waste discharge system.
Sedimentation	The process by which suspended particles may settle out over time onto the bed of the water body.
SPA	Special Protection Area: Special Protection Areas are protected areas for birds classified under the Wildlife & Countryside Act 1981 (as amended), the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended).
SoDA	Statement of Design Acceptability.
Source pathway receptor (SPR)	Source pathway receptor: A framework for assessing risk of a proposal on the environment. The source refers to the hazard – something that has the potential to cause harm. The receptor is something that could suffer harm from a hazard. The pathway is the way in which a hazard can come into contact with a receptor.
SRU	Ultimate cooling water system pumps.
SSSI	Site of Special Scientific Interest.
STP	Sewage treatment plant.
Synergistic effect	The impact of the interaction of a number of effects is greater than the sum of the individual effects.
SZC	Sizewell C power station.
Thermal plume	The area of heated water caused by the discharges from a cooling water system.
Thermal uplift or thermal excess	The increase in temperature of a body of water as the result of a thermal input.
TraC	Transitional and coastal (water body).
µg	Microgram (µg): A unit of mass equal to one thousandth of a milligram, and one millionth of a gram (1µg = 0.001mg).
UIA	Unionised ammonia.

UWWTD	Urban Wastewater Treatment Directive.
WDA	Water discharge activity.
WFD	Water Framework Directive.

Appendix 1 - Consultation on the application

The application was advertised and consulted on in accordance with our public participation statement and government consultation principles. The way in which this has been carried out and how we have carefully considered consultation responses in preparing our proposed decision are summarised in this appendix and section 3.4 of this document. Copies of all consultation responses have been placed on our public register except where the person making the response asked us not to do so. Responses made using our e-consultation tool can also be accessed online via our consultation hub.

How we publicised the consultation on the application

The consultation on the application was advertised by a notice on GOV.UK from 24 January to 2 March 2023 and a press release. The notice provided brief details of the application and told people where they could see a copy of the application and how to make comments. Copies of the application were made available for public inspection using our e-consultation tool via our consultation hub.

We publicised the consultation by issuing press releases, advertising in local newspapers and writing directly to a number of organisations and individuals inviting them to participate.

Who we consulted

We wrote to the following bodies informing them of the application and directing them to copies of the application online:

- Natural England (NE)
- Natural Resources Wales (NRW)
- Marine Management Organisation (MMO)
- Devon and Severn Inshore Fisheries and Conservation Authority (IFCA)
- Welsh Government Marine and Fisheries Division
- Office for Nuclear Regulation (ONR)
- Health and Safety Executive (HSE)
- Food Standards Agency (FSA)
- Sedgemoor District Council

- Somerset West and Taunton Council
- Somerset County Council
- North Somerset Council
- Mendip District Council
- Vale of Glamorgan Council
- Bristol City Council
- North Devon Council
- Cornwall Council
- West Devon District Council
- Devon County Council
- Plymouth Council
- South Hams District Council
- Cardiff Council
- Newport Council
- Bridgend Council
- Neath Port Talbot Council
- Swansea Council
- Carmarthenshire Council
- Pembrokeshire Council
- Monmouthshire Council
- Bristol Port Company
- Associated British Ports
- Cardiff Harbour Authority

We also emailed over 2000 other interested groups, non-governmental organisations, councils, members of parliament, businesses and individuals informing them of the consultation and inviting them to participate.

Responses to the consultation on the application

We received 50 responses from organisations and individuals. These are summarised here, together with our consideration of them.

Response received from Natural England (NE)

Their comments state that they understand that the EA's assessment will be based on the impact of removing the AFD on aspects relating to the discharge of polluting matter via the FRR system outlet. And that any consideration of the potential impacts from the abstraction of the seawater, sits within the Development Consent Order (DCO) and MMO Marine Licence.

They advised that as the competent authority the EA must undertake an Appropriate Assessment. NE provided advice on the screening of plans/projects for the in-combination assessment to be included in this Appropriate Assessment. Noting that for those projects

that are currently operating ('operational consents') with residual impacts upon fish species, they advise that they are considered for inclusion in the assessment.

These comments were taken into account when producing our Habitat Regulations Assessment Report (HRA). As reported in section 4.10.6, in accordance with Regulation 63 of the Habitats Regulations 2017 we consulted NRW on our draft HRA on the 1 March 2023. No comments were raised on the draft HRA and NE were able to concur with our draft conclusion.

Response received from Natural Resources Wales (NRW)

NRW initially provided advice on the screening of plans/projects for the in-combination assessment to be included in an Appropriate Assessment. Noting that certain projects that are currently operating could now be considered part of the baseline.

NRW then provided further comments, stating that they understand that the EA's assessment will be based on the impact of removing the AFD on aspects relating to the discharge of polluting matter via the Fish Recovery and Return (FRR) system outlet. Advising that the EA's Habitats Regulations Assessment (HRA) for the permit variation should describe in detail why the impact of cooling water abstraction has not been assessed. And that this description should include confirmation that the impact of cooling water abstraction is going to be assessed by another competent authority under a different permission (i.e. DCO and MMO Marine Licence).

These further comments also advised that an additional project is relevant to be included within the in-combination assessment, and that the Welsh Government should be consulted on the permit variation.

These comments were taken into account when producing our HRA. As reported in section 4.10.6, in accordance with Regulation 63 of the Habitats Regulations 2017 we consulted NRW on our draft HRA on the 1 March 2023. No comments were raised on the draft HRA and NRW were able to concur with our draft conclusion.

and we have had regard to the comments raised. The Welsh Government was consulted on the permit variation application via their Marine and Fisheries Division.

Response received from Marine Management Organisation (MMO)

Their comments state that they understand that the EA's assessment will be based on the impact of removing the AFD on aspects relating to the discharge of polluting matter via the FRR system outlet. And that any consideration of the potential impacts from the abstraction of the seawater, sits within the DCO and MMO Marine Licence.

It advices that, for the purposes of this variation, the MMO defer to any advice provided by NE and NRW on matters of nature conservation.

As NE and NRW were consulted on the application and our HRA and their comments taken into consideration, there was no further action required from us as part of the WDA permit determination.

Response received from Somerset County, Somerset West & Taunton District Council and Sedgemoor District Council (Joint Councils)

Their response recognises that similar requirements in the HPC DCO and MMO Marine Licence regarding the AFD has led to a potential overlap of regulation. They agree the most appropriate mechanism for regulating the cooling water intakes is within the HPC DCO. Therefore, applications to vary the DCO and MMO Marine Licence will be required to remove the AFD from the design of HPC, and these applications will include a full assessment of impacts related to the abstraction of the seawater.

They advise that the Severn Estuary is a European designated site and is functionally linked with other designations, and these other sites will be relevant for assessment. They also advise that an in-combination assessment will be required within our HRA.

They also confirm that the Joint Councils have no reasonable grounds for doubting the conclusions made by the applicant, and that the EA's assessment of potential water quality impacts associated with the discharge of impinged biomass assessed during the 2019 variation application (EPR/HP3228XT/V004) determination process, should still be considered valid. They advise that the Joint Councils have no evidence available to dispute these conclusions and from the evidence submitted they appear to be reasonable.

The response does highlight the Joint Councils concerns of potential impacts to the coastal beaches in the area important for tourism and also the potential eutrophication effects from the release of nutrients.

However, it concludes that the EA is best placed to assess and judge these conclusions, advising that the EA carryout their own HRA and consult NE on the permit variation application.

The EA has fully assessed all the evidence currently available and carried out its own HRA. NE and NRW were consulted on the permit variation application, and their comments considered when producing our HRA. NE and NRW were then consulted on that HRA and their comments taking into regard. The EA has also conducted assessments on the potential eutrophication and impacts from potentially beached dead biota. There is therefore no further action required from us as part of the WDA permit determination.

Responses received from Nuclear Free Local Authorities, Historic England, Stop Hinkley, Fish Guidance Systems Ltd, Burnham Boat Owners, Wildfowl & Wetlands Trust, Somerset Wildlife Trust and Blue Marine Foundation (Severn Estuary Interests), Together Against Sizewell C and 33 individuals.

The responses and representations received from the above group raised similar issues and concerns with the proposed HPC operational WDA permit variation application. We have therefore decided to combine and summarise the same issues that have been raised within this group of responses, and the way in which we have considered these in the permit determination process. Three of the responses stated they were not opposed to the variation applied for, stating that, it was unlikely to affect heritage assets of archaeological

interest, predicted environmental impacts were minimal or that they trusted the EA to make the relevant assessments and suitable judgement.

Summary of issues raised - **Concerns raised regarding the impact on marine fauna and flora (including fish populations, birds and mammals), designated European sites and their designated habitat and species, impact on Sites of Special Scientific Interest and Marine Conservation Areas, and consideration of alternatives and compensation.**

Our consideration of the issue

In response to our duties under the Conservation of Habitats and Species Regulations 2017 (as amended), we have carried out a comprehensive assessment and produced a Habitats Regulations assessment (HRA), including completion of an appropriate assessment and in-combination assessment (for other plans, permissions and projects) of the potential impacts of the proposed operation of the Water Discharge Activities (WDAs) from HPC in the absence of an AFD. This considered impacts on the Severn Estuary SAC, Severn Estuary SPA and Ramsar, as well as several other functionally linked designated European conservation sites due to the migratory and highly mobile features.

The main areas of concern that have been raised is the impact on the fish populations from the losses predicted due to fish being drawn into the intakes along with the abstracted seawater. As well as concerns that birds and mammals will also be drawn into the intakes and drown.

Given its regulatory remit in relation to permitting of water discharge activities and the consideration of polluting effects from the discharges from the plant, the Environment Agency concluded that the most appropriate mechanism for regulating the cooling water intake sits within the HPC DCO and the MMO Marine Licence which both include the requirement for an AFD. We have discussed this issue with NE, NRW and MMO, who agreed with our conclusion. Maintaining controls on the intakes within the WDA permit would be a duplication of regulation, unless the assessment of the WDAs, required to operate HPC, showed further mitigation (for example, an AFD) was required to protect the environment from the polluting potential of the WDAs. Our conclusion was that this was not the case given the nature and effect of the discharges proposed to be authorised by the varied permit.

In this light, we took the decision to focus on, and complete a detailed assessment of, the following risks within our HRA assessment:

- toxic contamination (due to the breakdown and decay of dead and moribund biota)
- nutrient enrichment (due to the breakdown and decay of dead and moribund biota)
- smothering (due to the accumulation of dead and moribund biota)
- habitat loss (as a result of the above risks)

This assessment is described in detail in section 4.10.

We have consulted NE and NRW on our draft HRA, and we have had regard to their comments raised in accordance with Regulation 63 of the Habitats Regulations 2017 (as confirmed in section 4.10.6 of this consultation document).

We have concluded that the operational WDAs at HPC can be ascertained to have no adverse effect on the integrity of the sites assessed (including their designated features, as well as functionally linked land and their features), either alone or in combination with other plans and projects. This is detailed within sections 4.9 and 4.10 of this proposed decision consultation document. It should be noted that removal of the AFD system would only effect waste stream H (the discharge from the FRR system). However, this activity has been assessed in combination with the other HPC operational WDAs. To this end consideration of alternative measures and/or compensation measures are not required in accordance with Regulation 64 and 68 of the Habitats Regulations 2017.

Summary of issues raised - Concern raised regarding the potential impacts of the proposed HPC operational WDAs on local SSSIs and Marine Conservation Areas.

Our consideration of the issues

We have completed assessments under the Wildlife and Countryside Act 1981, as amended by the Countryside Rights of Way Act 2000 for the Bridgwater Bay SSSI, Severn Estuary SSSI, Blue Anchor to Lilstock Coast SSSI, Brean Down SSSI, Steep Holm SSSI and Flat Holm SSSI, as these SSSIs have all been identified as being potentially at risk from the FRR system WDA from HPC. The details of our assessment are reported in section 4.13 of this consultation document.

Some of the features designated under the SSSIs are replicated across associated European sites. The potential for impact on the European sites has been fully considered separately in our HRA as described within section 4.10 of this consultation document.

The methodology and approaches we have used to assess the potential impact in our SSSI Assessment Report are the same as those used in our HRA for the equivalent European sites, and where appropriate, information and main arguments presented in the HRA are replicated within our SSSI Assessment Report.

We have considered the operation of the FRR system in the absence of an AFD system at HPC in the context of the 6 SSSIs and concluded that the proposed FRR system discharge WDA will not cause damage to any of these SSSIs. We have consulted NE and NRW on our SSSI Assessment Report and had regard to their comments.

It should be noted that no Marine Conservation Zones (MCZs) were identified as having a potential impact from the proposed FRR system discharge. The nearest MCZ is approximately 50 km from the proposed FRR system discharge point location. Given the minimal mixing zones predicted, there is no likely effect at this distance.

Summary of issue raised – Concerns were raised about the uncertainties that remain within the assessments submitted (including the calculation of impingement

and there for pollution matter, the effect of the LVSEs, the effectiveness of the FRR system and the baseline data used).

Responses suggested that using the HPB impingement data was not accurate enough, due to the different location and design on intake. Some responses suggested that baseline sampling should be taken from the proposed intake location and/or local angling records should be consulted.

Our consideration of the issues

Our assessments have used the best available data to predict the potential impacts from the proposed WDAs from HPC including the FRR system discharge. HPB impingement data provides a reasonably comprehensive data set of real live impingement in the vicinity of Hinkley Point. Beam trawls (a fish samples technique) were also conducted around the area of the proposed intake locations and statistically compared with the CIMP and RIMP data to ensure it was a reasonable representation of the biomass expected to be in the vicinity of the proposed intake location. The EA recognises some uncertainty will remain, so a statistical boot strapping process was conducted to take account of some of this uncertainty (section 4.9.4).

The effect of the LVSE intakes, either at reducing impingement or as an attractant to fish is yet to be substantially evidenced. Therefore, through the HPC AFD appeal proceedings, it was agreed a factor of one would be applied in light of balancing these uncertainties. A reduction factor has only been applied to the pelagic species as the capped nature of the intake design has been suitably evidence to provide a benefit to these species (section 4.9.4).

Uncertainty of the effectiveness of the FRR system to return impingement individuals to the sea alive has been considered (section 4.9.4). To take account of the remaining uncertainty our assessment applied a range of mortality rates from a review of relevant available evidence.

Summary of issues raised – Concerns were raised that the polluting effect of entrained biota that did not survive the journey through the cooling water processes and therefore discharged via the cooling water outlet (waste stream A) had not been considered.

Our consideration of the issue

The original permit determination in 2013, concluded the discharge of returned abstracted cooling water (waste stream A) via the 2 cooling water outlets was deemed environmentally acceptable due to conditions set with in the WDA permit. We are satisfied these conclusions reached in 2013 are still sound.

The biota that will be discharged via waste stream A will consist largely of small eggs and larvae that fit through the 5 mm gaps in the screens. This constitutes a relatively small volume of biomass (and therefore subsequent nutrient and chemical loads), especially in

consideration with the dilution factor provided by the large volume of cooling water this biomass is discharge in.

Furthermore, the removal of the AFD system from the design does not affect the volume of biomass entrained and therefore discharged via waste stream A. It only affects the amount impinged and discharge via the FRR system (waste stream H, activity A7). The polluting potential of waste stream A (activity A1) has therefore not been reconsidered as part of this permit variation determination.

Summary of issue raised – Concerns were raised about the ambiguity within the consultation material in relation to what the consultation was for.

Our consideration of the issue

The relevant text within various consultation material has been considered. Explanation within this consultation document have been expanded further to clarify, that, our assessment in relation to this permit variation application will consider the potential polluting effects from the FRR system discharge as a WDA. Any potential impacts from operating the abstraction of seawater for the purpose of cooling will need to be assessed via a material change process to the HPC DCO and variation to the HPC MMO marine licence.

So, any comments made on these aspects of the proposals to not install and maintain an AFD need to be directed to PINs if a DCO variation public consultation commences.

Summary of issues raised – Concerns were raised that this permit variation application is an aim to 'sidestep' the original permit determination requirements, the HRA findings from 2020 and the Secretary of State's decision from 2022.

Our consideration of the issue

The permit variation application (EPR/HP3228XT/V004) made in 2019 proposed to remove the requirement to install and operate an AFD system from the WDA permit based on the grounds that the operation of HPC without an AFD system would have negligible impacts on the environment.

Our draft HRA of 2020 assessed the implications of operating HPC without an AFD system and proposed that we could not conclude no adverse effect on site integrity of relevant designated sites. These proposed conclusions were the centre of the appeal heard by PINs in 2021, and the conclusions of the final HRA produced to support the appeal by the EA was upheld by PINs and the SoS in 2022. Documentation of all these assessments and the SoS's decision is all available within the public domain. The issue subject to the appeal was about the efficacy and conclusions of our HRA rather than the extent and scope of conditions in WDA permits.

The current permit variation application proposes to remove reference to the AFD system on the grounds that the HRA of 2020 concluded that the operation of the FRR system in the absence of an AFD system would not adversely affect the site integrity of relevant

designated sites, and therefore maintaining controls on the intake within the WDA permit was an unnecessary duplication of regulation with the DCO and MMO marine licence.

Our proposed decision as set out in this proposed decision consultation document is to remove references to an AFD system within HPC's operational WDA permit, as our assessments have concluded that it is environmentally acceptable to operate the FRR system without and AFD system, in terms of the potential polluting effects of the FRR system discharge effluent (consisting of returned abstracted seawater containing dead or moribund biota). This does not remove the requirement to install and maintain an AFD system as a whole, as the requirement still remains in the DCO and MMO marine licence.

Within NNB GenCo (HPC)'s application from 2019 (EPR/HP3228XT/V004), it was confirmed that the intake heads have been designed and constructed with means to fit the AFD mounting structures if needed in the future. However, the feasibility of this once the intake heads have been placed on the bed of the estuary has yet to be investigated further.

Summary of issues raised – Requests were made within responses that comments relating to the impact of the abstraction, if not considered within this permit determination, be passed on to the relevant DCO consultation process.

Our consideration of the issue

Interested parties are reminded that this permit variation application and determination process can only consider aspects relating to the potential pollution of the proposed WDA(s). We have tried to explain what has and has not been considered within this permit variation draft decision consultation document.

All issues raised in relation to the potential impact of the abstraction of the seawater will need to be submitted separately to PINs if a material change to the DCO process is considered.

Summary of issue raised – Concerns raised regarding flood risk and natural disasters

Concerns were raised about the flood risk of the site, particularly in relation to a tsunami type event.

Our consideration of the issue

We provided advice and guidance on flood risk in our consultation responses relating to the NNB GenCo (HPC)'s application to the planning authority for a Development Consent Order (DCO). Our advice on these matters was accepted by both the applicant and the planning authority. The planning authority published the DCO for HPC on 19 March 2013.

The Office for Nuclear Regulation (ONR) considers flood risk as part of its regulation of nuclear site licensed sites. Flood risk and other external hazards would be addressed as part of the safety case for the site developed by NNB GenCo (HPC). NNB GenCo (HPC) has formally applied to ONR for a nuclear site license.

Summary of issues raised – Concerns were raised around whether operating the Power station without and AFD could be considered using the Best Available Techniques

Responses suggested that direct cooling should not be considered BAT for nuclear power stations and others suggested that the use of all three mitigation measures (LVSE, FRR and AFD) in combination should be considered BAT.

Our consideration of the issue

The DCO, MMO Marine Licence and original water discharge activity permit determination in 2013 concluded that the use of a direct cooling system was appropriate at HPC. The only WDA at HPC potentially affected by the removal of the AFD from the design is that of the discharge from the FRR system. Our WDA permitting assessment therefore considers the potential polluting potential from the discharge from the FRR system and is not a reconsideration of the whole cooling water system.

NNB GenCo (HPC) would have to apply to PINs and the MMO to remove the requirements of the AFD from their DCO and marine licence respectively for there to be no requirement to install an AFD. Impacts and the use of BAT in terms of the whole cooling water system would then have to be assessed via the material change process to the DCO.

The AFD system was expected to reduce the amount of biomass impinged and therefore reduce the amount of potentially polluting biomass discharged from the FRR system.

However, our precautionary assessment of the FRR discharge, taking a reasonable worst-case scenario (for example, selecting data from the month with the highest impingement (December 2009), which through the HPC AFD appeal proceedings and subsequent CIMP 2 data submission has been concluded as a conservative estimate) has predicted there is unlikely to be any environmental impact from the operation of the FRR system in the absence of an AFD system. Therefore, maintaining conditions within the WDA permit for the operation of HPC requiring the installation and operation of an AFD system would be unreasonable and unnecessary.

Each WDA permit application is determined on its own site specific merits. Therefore, not including conditions requiring an AFD system on the WDA for the operation of HPC is not setting a precedent. However, the approach of only setting requirements on the cooling water intakes within the WDA permit, if the assessment of the potential polluting aspects of the WDAs deems it necessary, is consistent with that taken for operational WDAs at Sizewell C (and is considered a reasonable approach to take with subsequent WDA permit determinations).

It should be noted that the reasons for not fitting the AFD system are included within NNB GenCo (HPC)’s permit variation application documentation (EPR/HP3228XT/V005) This justification has not been scrutinised by the EA as the potential polluting impact from the proposed WDAs forms the central part of the permit variation determination. If that assessment had shown further mitigation was required to protect the environment from the polluting potential of the WDAs, then a cost-benefit analysis might have been carried out

to ascertain the suitability of certain mitigation options, such as fitting and maintaining an AFD system. This would consider factors such as cost, technical feasibility, plus other justification issues. However, this was not required as part of this permit variation determination.

Summary of issues raised – Concerns were raised that HPC will impact on the local angling businesses and the local holiday industry.

Our consideration of the issue

Our precautionary assessments predict the FRR system discharge will not have a significant impact on water quality, designated sites or protected species and habitats. It is therefore not predicted to have any impact on fish species related to angling activities in the area.

NNB GenCo (HPC)'s particle tracking study (TR479) did predict that dead or moribund biota may be dispersed on to beaches within the vicinity of the FRR system discharge point. However, it is predicted that these would rapidly be consumed by scavenging birds, known to occupy the shoreline around Hinkley Point. This assessment, also, did not take in to account the predation of the dead or moribund biota within the water column, such as from fish, mammals, crustaceans and diving birds. There is therefore not expected to be a nuisance issued caused by the FRR system discharge that could affect the local holiday industry.

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