H2 Teesside Project

Environmental Permit Application Reference:
EPR/AP3328SQ/A001
Response to Duly Making Request for Further Information

H2 Teesside Limited

Project number: 60689030
AP3328SQ-DMR-R02

October 2024

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
R01	27/09/2024	Initial Draft	27/09/2024	A Graham	Associate
R02	09/10/2024	Final Draft	10/10/2024	A Graham	Associate

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1. Report Context

1.1 Introduction

This document has been prepared by AECOM Ltd ('AECOM') on behalf of H2 Teesside Limited ('the Applicant), a company with bp and ADNOC as shareholders, in support of an Environmental Permit application for the proposed H2 Teesside 1.2-Gigawatt Thermal (GWth) Lower Heating Value (LHV) Carbon Capture and Storage (CCS) enabled Hydrogen Production Facility ('proposed Installation') on land in the Teesside industrial cluster area in Redcar, Stockton-on-Tees ('the Site').

1.2 The Proposed Facility

The proposed Installation will have a design capacity of 1.2 GWth LHV, across two phases of development (600 Megawatt thermal (MWth) per phase). This equates to the capacity to produce 37.3 t/hr of hydrogen at peak production. The proposed Installation will be supported by electricity and water connections along with pipelines to export the hydrogen (H2) gas and carbon dioxide (CO_2). The proposed Installation is designed to deliver a carbon capture rate of 95% in accordance with current BAT guidance and has the potential capacity to further increase the capture rate to meet potential future regulatory changes. The proposed Installation will have the capacity to continuously export 2.54 megatonnes (Mt) of CO_2 per year once both phases are operational (100% utilisation).

The captured CO_2 will be transported via the Northern Endurance Partnership (NEP) pipeline infrastructure for secure storage within the Endurance saline aquifer, located approximately 145 km offshore from Teesside, under the North Sea. This project can therefore make a significant contribution toward the UK reaching its net zero greenhouse gas (GHG) emission target by 2050.

1.3 Scope of this Response

The application for an environmental permit was submitted on 14th June 2024 to the Environment Agency.

As a result of the Duly Making process the Agency has issued a request for additional information (ref Letter dated 07/08/2024) under the Environmental Permitting Regulations 2016, as amended.

This report provides the response to the questions raised by the Environment Agency. Information contained in this report will form part of the application information. The report is supported by updated application documents which are provided in the appendices of the report. Where relevant the updated application documents will supersede the original submitted documents.

2. Responses to Duly Making Questions

2.1 Question 1 - Director Contact Details

Application Form Part A1 6a (contact details of Relevant Person). Provide the contact details, including phone number and email address as a minimum, of at least one (or more) Company Director(s) or Company secretary (ies).

Response

Application form A has been updated and is presented in Appendix A.

2.2 Question 2 – Regulated Activities – Water Discharges

a. *Whilst we understand the reasons for considering options appraisals at early stages of the design, you should narrow them down to clearly define the scope of the application for the environmental permit. In particular, you should decide and clarify:*

   i. *Whether the application entails discharging of treated effluents to Tees Bay through the Net Zero Teesside outfall, as opposed to the Minimum Liquid Discharge (MLD) option entailing offsite disposal, or vice versa.*

   ii. *Whether surface water will be discharged to the river Tees or to the Net Zero Teesside outfall.*

b. *Confirm the technologies, process units and design specifications of each water treatment plant, namely (as referred to in application documents:*

   i. *Water Treatment Plant,*
   ii. *Effluent Treatment Plant (ETP),*
   iii. *Biological treatment plant,*
   iv. *Surface water (stormwater) treatment if applicable*
   v. *Any other effluent treatment activities.*

c. *Provide a more detailed BAT assessment for the proposed wastewater treatment technologies, in particular against the BAT options listed in BAT conclusion 12 of the BAT Conclusions for Common Wastewater and Waste Gas Treatment/Management Systems in the Chemical Sector 2016 (CWW BAT conclusions). The assessment currently provided in 'Appendix C5 Assessment of Best Available Techniques For Emissions Management' is just a compliance statement, which we don't consider adequate to begin the determination of your application.*

d. *Amend any application forms and other application documents so it is clear the number of separate effluent treatment activities required.*

e. *Amend any application forms and other application documents affected by the changes.*

Response

a. It is confirmed that the scope of the application will be progressed on the basis of discharging treated effluent to Tees Bay through the Net Zero Teesside outfall. In terms of surface water, potentially contaminated surface water (PCSW) will be collected in the PCSW drainage system and will be directed to oil interceptors where oily water will be sent offsite for third party disposal and recovered water will be directed to the wastewater treatment plant where treated water will be either recovered for reuse in the process or directed via the retention pond to the NZT outfall for discharge to Tees Bay. Clean surface water will also discharge via the retention pond to the NZT outfall for discharge to Tees Bay. Further details of the drainage system are provided in the Drainage Philosophy provided in Appendix I.

b. A summary of the treatment stages is provided in the Table 1 below and it should be noted that there is an element of recirculation across the stages to facilitate as much reuse as possible. Further details on the treatment processes and flow charts have been added to the Supporting Statement (Appendix B) at Section 4.5 & 5.2.

Table 1. Summary of Water Treatment Stages

Treatment type	Process Stages
Feed Water Treatment	1. Coagulation & Flocculation 2. Clarification 3. Sludge Dewatering 4. Further Coagulation & Flocculation 5. DAF (Dissolved Air Flotation) 6. Ultra Filtration 7. GAC (Granular activated Carbon) 8. Disinfection

Treatment type	Process Stages
Demineralisation Water Treatment	1. Reverse Osmosis First Pass 2. Reverse Osmosis Second Pass 3. Electro-deionisation
Membrane Bioreactor	1. Anoxic denitrification 2. Aerobic nitrification 3. Sludge Dewatering
Wastewater treatment	1. Wastewater tank 2. Media Filter 3. Sludge Dewatering

c. The Emissions BAT statement (Document Reference AP3328SQ-APP-BAT5) has been reviewed and more detail added with respect to BATc No 12. The revised BAT statement is presented in Appendix C.

d. Section 2, Table 2.1 of the Supporting Statement which is referenced from application form B3 has been updated with a revised list of proposed activities and directly associated activities (DAA). The revised Supporting Statement is presented in Appendix B.

e. All application documents have been checked for cross references to water treatment activities and updated where necessary. Updated documents are as follows:

- AP3328SQ-APP-SS Supporting Statement), Section 2.1, Section 2.3 Table 2.1, Section 4.4. Section 4.5, and Section 5.2. Updated document is in Appendix B
- AP3328SQ-APP-SCR Site Condition and Baseline Report (SCBR), Section 3. The updated SCRB is provided in Appendix D.
- AP3328SQ-APP-BAT1 Process BAT Assessment which is provided in Appendix H.
- AP3328SQ-APP-BAT5 Emissions BAT Assessment which is provided in Appendix C.
- AP3328SQ-APP-BAT3 Cooling BAT Assessment which is provided in Appendix Q.
- AP3328SQ-APP-BAT4 Energy Efficiency BAT Assessment which is provided in Appendix R.
- AP3328SQ-APP-CCRA Climate Change Risk Assessment which is provided in Appendix S.

2.3 Question 3 – Sewage Wastewater as Raw Water Feed

Reference: Application Form Part B3 3a (Regulated activities); and Part B2-3b & appendix 2. Confirm whether feed of treated sewage wastewater is included in the scope of the permit application. This is mentioned several times in the application documents, including but not limited to in the water balance diagrams provided in the Application Supporting Statement document. This will have a bearing on the regulatory framework and activities applicable to the Water Treatment Plant. If wastewater is imported you will need to:

a. *Provide the specification / characterisation of the treated sewer feed water along with the waste codes you intend to accept.*

b. *Assess the operating techniques in the Water Treatment Plant against the relevant BAT conclusions for Waste Treatment and Non-hazardous and inert waste: appropriate measures for permitted facilities - Guidance - GOV.UK (www.gov.uk). In particular, but not limited to, address operating techniques for pre-acceptance, acceptance, monitoring and off-spec management (e.g. in the case of off-spec treated sewage being received).*

c. *If the treatment of the sewage effluent carried out at your installation consists of a Section 5.4 scheduled activity, provide evidence of technical competence certification/membership as require by Part B2-3b & appendix 2. Note, this requirement would not apply if the proposed treatment consists of a waste operation directly associated with the hydrogen production.*

   If feed of treated sewage wastewater is not included in the scope of the application at this stage, confirm this clearly and if possible remove references from the application documents.

Response

We can confirm that the use of sewage wastewater as a water feedstock will no longer be progressed. The Supporting Statement, BAT assessments and forms have been updated as appropriate and are attached in the Appendices.

2.4 Question 4 – Site Grid References

a. *Reference: Application Form B2 2a (Location of the site). Location plan and permit boundary are adequate, however the location of site stated in application Form Part B2-2a (i.e. NZ 57691 24154) doesn't match permit boundary on the site plan drawing submitted with the application.*

b. *Advise the correct coordinates corresponding to the approximate centre of the installation boundary.*

c. *Amend application form B2, the application Site Condition Report and any other affected application documents to show the correct site location.*

Response

a. There was an error on the application forms which incorrectly quoted a central point linked to the DCO application.

b. The grid references for the site are summarized in table below.

Table 2. Grid References for the Site

Point Details	Easting	Northing	NGR
Site Layout and Boundary			
Site Central Point	457048	525427	NZ 57048 25427
Point Source Releases to Air			
A1 Fired Heater (Phase 1)	456360	525375	NZ 56360 25375
A2 Auxiliary Boiler (Phase 1)	456421	525325	NZ 56421 25325
A3 Fired Heater (Phase 2)	456558	525792	NZ 56558 25792
A4 Auxiliary Boiler (Phase 2)	456634	525765	NZ 56634 25765
A5 Flare (Phase 1)	456477	525580	NZ 56477 25580
A6 Flare (Phase 2)	456558	525536	NZ 56588 25536
A7 Emergency Generator (Phase 1)	456542	525209	NZ 56542 25209
A8 Emergency Generator (Phase 2)	456441	525830	NZ 56441 25830
Point Source Releases to Water			
W1 Discharge to Tees Bay	458983	526734	NZ 58983 26734

c. The following documents have been updated with the above grid references:

- Application B2, Question 2a (provided in Appendix A).
- AP3328SQ-APP-SS Supporting Statement, Table 5.1 (provided in Appendix B).
- AP3328SQ-APP-SCR SCBR, Section 1 (provided in Appendix D).

2.5 Question 5 – Drawings and Plans

Reference: Application Form B2 -5a. Provide adequate drawings taking into account the following comments:

a. *Provide a site layout /location plan showing all the emission points to air and water (including surface water runoff), included in the confirmed scope of the application. Ensure process vents (e.g. CO2 venting points) and flares are also shown as emissions points to air.*

b. *The indicative site layout provided is not adequate as it doesn't provide the level of detail necessary to begin the determination of the permit, e.g. it does not identify water and waste water treatment activities, location of storage tanks and associated bunds, cooling towers, etc. Furthermore large part of the installation boundary seems to be unutilised according to the drawing provided, hence it is unclear what permitted activities will be carried out in those areas.*

c. *The site drainage plan is not adequate as it doesn't provide the level of detail necessary for the determination of the permit, e.g. segregated drainage systems, connections to bunds, etc.*

Response

a. An emissions plan (Figure 5) is provided in Appendix E

b. A revised site layout plan (Updated Figure 2) is provided in Appendix E

c. The Drainage Philosophy is provided in Appendix I. This explains the drainage design and provides a conceptual schematic at the end of the document.

2.6 Question 6 – Accident Prevention and Control Measures

Reference: Application Part B2, 4d2 (Accident prevention and control measures). The Application Supporting Statement states the installation is going to be regulated under COMAH, but application form Part B2, 4d2 states the site is not covered by COMAH. Please clarify and, if applicable, amend application form Part B2 to confirm the applicability of COMAH Regulations to the proposed installation.

Response

We can confirm that the proposed installation will require regulation under COMAH Regulations and Form B2 has been updated accordingly and is presented in Appendix A.

2.7 Question 7 – Process Flow Diagrams

Reference: Application Form B3-3a (Process Flow Diagrams). Provide more detailed Process Flow Diagrams or Block Flow Diagrams for the hydrogen production process plants and utility systems (water/waste water treatment, blowdown and flares, storage tanks, etc.) showing the main equipment in the scope of the application.

Response

The following Process Flow Diagrams (PFD) and Utility Flow Diagrams (UFD) have been provided are attached as Appendix F.

Table 3. Process Flow Diagram List

Drawing Number	Drawing Title
00-PFD-PR-00001	PFD – Natural Gas Pre-treatment
00-PFD-PR-00002	PFD – CO2 Compression
00-PFD-PR-00003	PFD – CO2 Dehydration & Metering
00-PFD-PR-00004	PFD – H2 Compression, Distribution, Metering & Export
00-PFD-PR-00005	PFD – Hydrogen Aboveground Storage
00-PFD-PR-00006	PFD – Natural Gas Metering
00-PFD-PR-00007	PFD – Preheat, Saturation, Pre-Reforming and ATR Reforming
00-PFD-PR-00011	PFD – CO2 Removal and Amine Storage Make-up System
00-PFD-PR-00012	PFD – CO Conversion & Heat Recovery
00-PFD-PR-00013	PFD – Hydrogen Purification
00-PR-UFD-00001	UFD – Water Preparation
00-PR-UFD-00002	UFD – Wastewater Treatment 1
00-PR-UFD-00004	UFD – Wastewater Treatment 2 (NZT Discharge Option)
00-PR-UFD-00005	UFD – Cooling Water
00-PR-UFD-00006	UFD - Flare
00-PR-UFD-00007	UFD – Instrument Air / Plant Air
00-PR-UFD-00008	UFD – Fire Water
00-PR-UFD-00009	UFD - Air
00-PR-UFD-00010	UFD - Steam System
00-PR-UFD-00011	UFD – Auxiliary Boiler
00-PR-UFD-00012	UFD – BFW & Supply Treatment
00-PR-UFD-00013	UFD - Emergency Diesel Generator

2.8 Question 8 – Site Condition Report

a. *Update the inventory of all the potential hazardous substances stored, used or generated on-site, including documentation of their physical properties and hazards, documented by Material Safety Data Sheets (MSDS) for all the substances identified. Please take into account the following:*

   i. *Include, among the others, the MSDS for the amine-based solvent which is likely to represent a Relevant Hazardous Substance (RHS) for the purposes of potential soil and groundwater contamination.*
   ii. *Ensure the inventory is as complete as possible (for example include foam used for firefighting, which is referred to in Appendix D – Qualitative Environmental Risk Assessment, but not included in the current SCR; cross-check against the list of raw materials presented in Table 4.1 of the Application Statement document).*

b. *An assessment of which hazardous substances, out of those identified above, have a potential to cause soil or groundwater contamination, due to their physical status and properties, hazardousness, mobility, persistence and biodegradability. These are known as 'Relevant Hazardous Substances' or RHS.*

c. *A site-specific environmental risk assessment addressing the actual possibility for soil or groundwater contamination at the site of the installation, including the probability of releases and their consequences, during normal operations and accidental scenarios entailing loss of primary containment. This risk assessment should take into account the potential contaminations pathways and details of the proposed operational and design measures (e.g. secondary containment, etc.)*

Response

a. The inventory of potential hazardous substances including all catalysts and the amine solvent has been completed and the relevant Table 4.1 in AP3328SQ-APP-SS Supporting Statement and Annex 2 of the AP3328SQ-APP-SCR SCRB have been updated. MSDS sheets for each substance are provided in Appendix G.

b. Section 5.2 of the AP3328SQ-APP-SCR SCBR provides a summary of the review of each MSDS to include a summary of RHS including their physical status, hazardous properties, persistence and biodegradability.

c. The site specific environmental risk assessment provided in Section 5 of the original SCR document has been updated to reflect an assessment of the latest inventory of RHS including the potential for soil or groundwater contamination during normal and accidental releases. The environmental risk assessment summarises the pathways and receptors that could affected, identifies the containment, inspection and maintenance measures that will be implemented.

2.9 Question 9 – BAT Assessment and Operational Techniques

Reference: Application Form B3-3a (BAT assessment and description of abatement/operating techniques).

a. *Identify specific information that you consider will require validation through pre-operational conditions.*

b. *Advise the commercial name and describe the key properties of the amine-based proprietary solvent proposed to be used in the CO2 capture process (along with providing the MSDS as requested above) and provide a justification for its selection, taking into account aspects such as the overall energy efficiency of the carbon capture and solvent regeneration strategy.*

c. *Provide additional details and a BAT assessment of the proposed abatement techniques on storage tanks for the amine-based solvent to demonstrate whether these consist of an effective break to the potential emission pathways of outbreathing emissions from this storage.*

d. *Describe the operating techniques and the drainage philosophy for drainage of process equipment, and process effluents contaminated or potentially contaminated with amines, taking the following into account:*

   i. *Advise whether a closed drain system is provided for maintenance drainage of equipment and pipework containing the solvent; and advise whether any amine contaminated maintenance drain will be either recycled to the solvent system, disposed offsite as a waste, or drained to the effluent treatment plants in the scope of the installation.*

   ii. *Identify any process effluents generated during the normal operations of the activities that might be contaminated with amines and advise whether any amine contaminated process effluents will be either recycled into the solvent system, disposed offsite as a waste, or drained to the effluent treatment plants in the scope of the installation.*

   iii. *If amine contaminated effluents are intended to be drained to the effluent treatment plants in the scope of the installation, and the final treated effluent is discharged to the environment, as per the Net Zero Teesside discharge option to the Tees Bay:*

      - *Provide the characterisation of these effluents, including the speciation of the amines;*
      - *Discuss and confirm the suitability of the proposed technologies (as further detailed in response to item 2) to treat amine-contaminated waste water streams;*
      - *Assess whether any residual concentrations of amines might be present in the effluent discharge and, in the positive, update the environmental risk assessment for discharges to water (and associated modelling) to assess the impacts associated with their discharge on the recipient water body.*
      - *Provide methods to be implemented (sampling and analysis) for detection of amines in the discharge effluent.*

Response

a. The information we consider will need validation through a pre-operational condition is summarised in the table below.

Table 4. Information Requiring Validation Through Pre-Operational Conditions

Ref No	Information Requiring Validation	Reason
1	Site Condition Report	Application SCR is based on the current pre-remediation state. However, construction takes place on post-remediated site and baseline will need to be updated.
2	Site Layout, Emission Point and Drainage Plans	Provide EA with final plans
3	Application Assessments	Based on other recent permits understand that EA will likely require updated assessments based on the final design for: • CO2 venting • Air Quality • Water Quality • Noise

Ref No	Information Requiring Validation	Reason
4	OTNOC	To set out any potential 'other than normal operating conditions (OTNOC) to include emergencies and NEP being offline.

b. The amine based solvent is OASE White and the MSDS for the solvent is provided in Appendix G. In terms of solvent selection this takes into consideration a number of factors, including (but not limited to) the energy requirement for solvent regeneration, the volatility of the solvent. the performance in long term, thermal and oxidative degradation tests. The approach is outlined below and additional detail included in the AP3328SQ-APP-SS Supporting Statement, Section 4.8 which is provided in Appendix B.

Initial Solvent Selection

Initial solvent selection was undertaken with the engineering contractor during the early feasibility stage of the project as part of the technology screening process to evaluate carbon capture technology available on the market including pre-combustion chemical solvent, post-combustion chemical solvent, physical solvent, cryogenic process and pressure swing adsorption.

This initial screening process included ranking the technology according to their:

- technology readiness,
- scalability,
- efficiency,
- performance,
- effluent,
- waste,
- safety,
- cost,
- operability and
- flexibility.

The conclusion of this initial assessment was:

- Pre-combustion chemical solvent (i.e. amine) scored the highest. Pre-combustion carbon capture with amine maximises energy efficiency for H2Teesside blue hydrogen plant as it utilises the waste heat from the syngas for the amine stripper reboiler and flashes the solvent to lower pressure to minimise energy consumption. The pre-combustion amine itself is highly energy efficient as there is no huge compressor power demand. Pre-combustion amine processes can be designed to capture almost all the carbon dioxide in the process stream; the only waste stream from the process is the flash gas which can be used to raise steam in the syngas process and no liquid effluent treatment is required during normal operation. The risk of amine degradation is low due to the absence of oxygen and low carbon monoxide in the feed gas

- Post combustion chemical solvent is not applicable to this project as all the carbon dioxide is in the process stream during normal operation.

- In the case of cryogenic process, physical solvent and pressure swing adsorption process these had a huge compressor power demand which made them less energy efficient.

Given that H2Teesside is a standalone blue hydrogen plant (i.e. no benefit to export steam) and carbon dioxide export is in gaseous phase, and that pre-combustion amine technology is field proven as it is widely used to remove carbon dioxide from natural gas and ammonia plants worldwide; this technology was deemed to be the BAT for the project at this stage.

Second Stage Solvent Selection

At the next stage of the project development further assessment of potential pre-combustion amine based solvents was undertaken which considered aspects such as the maturity of the systems and associated real world operation, the related energy demand, the lifecycle of the solvent and the environmental impact of the operation.

The review recognised that options could include:

- Single solvent options using amines classed as primary, secondary, or tertiary depending on whether one, two, or three of the hydrogen atoms of ammonia are replaced by organic functional groups. Some of the single amines most commonly used in CO2 capture are monoethanolamine (MEA), methyldiethanolamine (MDEA), 2-Amino-2- methylpropanol (AMP), Piperazine (PIPA), diglycolamine (DGA), diethanolamine (DEA), and di-isopropanolamine (DIPA). MDEA is typically selected over primary (such as MEA, DGA) and secondary amines (such as DEA) due to its lower corrosivity potential (lower reactivity). This is counter-acted by adding an activator to promote the reaction with CO2.

- Cutting-edge proprietary solvent blends that are being used new technologies. These solvents used for CO2 capture are often a mixture of several different amines. As per the OASE White MSDS, which is the BASF supplied amine comprising a mixture of amine solvents.

Bids were received from a number of pre-combustion solvent suppliers, with their proposal and solvent selection made based on bp's defined plant requirements. The technical evaluation was undertaken, and BASF was selected and was deemed to be BAT based on the following advantages:

- It had the largest number of installed reference plants (in the order of hundreds) in syngas and natural gas applications.

- It was proven on operating plants at 1.5 times the capacity required for H2Teesside.

- It is a proven solvent for large CO2 removal from syngas stream (similar to H2Teesside).

- There was multiple references for split flow schemes

- It had the lowest amine circulation rate

- There was experience working with knowledgeable contractors to provide the Process Design Package (PDP)

- BASF are a provider of amine services on multiple previous bp projects; and

- As BASF own in-house solvent will be used there is potential ongoing improvement with BASF continuous R&D programme.

c. A BAT assessment against the Emissions from Storage BREF has been completed and is provided as an amendment to the AP3328SQ-APP-BAT1 Process BAT in Appendix H.

d. The Drainage Philosophy with full details of the drainage collection system is provided in Appendix I. In terms of the specific points raised above:

   i. The site will operate with both open and closed drainage systems which segregate clean and potentially contaminated water streams and allow them to be managed in an appropriate manner.

      - The open drainage system will have three separate collection systems. The first is for clean surface water that has no potential for contamination with oils or chemicals and which will be discharged to the Tees Bay without treatment. The second system collects potentially contaminated surface waters (PCSW) which will be routed via gravity by an underground network for appropriate treatment in the oily water treatment or effluent treatment packages. The third is a chemical drain for run-off from specified areas that may be contaminated with non-amine chemicals and diesel which will be sent offsite for treatment.

      - The closed drainage system comprises:

        - Foul drain for domestic sewage that is not chemically contaminated and will be sent offsite to the Teesworks sewerage network.
        - Process condensates drainage that will directed for treatment to allow reuse in the raw water system.
        - Carbon-Capture (Amine) drainage system will be collected separately and tested to facilitate reuse in the process where possible or for offsite disposal for degraded solvent.

Equipment liquid inventories in the closed drain system will be reduced to a low low level and system depressurised to allow maintenance and inspection (see section 9.1 of Drainage Philosophy).

ii. Effluents collected in the carbon capture area of the plant will be collected in a separate carbon capture closed drainage system and fully segregated from other effluents. The closed drainage system facilitates sampling of this effluent stream so that undegraded solvent can be reused on the process and degrade solvent can be disposed via vacuum tanker for offsite disposal.

iii. No amine contaminated effluents will be treated onsite, and none will be discharged to the Tees Bay.

2.10 Question 10 – Combustion Activities

Reference: Application Form Part B3-Appendix 1 (combustion activities). Clarify the classification of combustion activities, and amend the relevant application documents as required, taking into account the following comments:

a. *It is unclear whether the stated figures are net rated thermal inputs as opposed to power outputs. Please clarify and, if applicable, amend to show the net rated thermal (i.e. based on LHV of fuels).*

b. *It is unclear whether each Auxiliary boiler consists of 80 MW thermal input or 40 MW thermal input. Table 4.2: 'Breakdown of energy consumption per phase' of Application Supporting Statement document shows for the auxiliary boiler in each phase a thermal input of 103.64 MW. This makes the difference between auxiliary boilers being either Large Combustion Plant (LCP) or Medium Combustion Plant (MCP), given that they have individual stacks; this is essential to determine the applicable ELVs and BAT requirements.*

c. *The Fired Heaters are likely to be new MCP in any case, however 'Table 4-2: Breakdown of energy consumption per phase' of c) Application Supporting Statement document shows for the Fired Start-up Heater in each phase a thermal input of 6.9 MW which is not in line with the information presented in Table 2-1.*

d. *Since the Fired Heaters are MCP, confirm whether you still intend to propose the emission levels and monitoring routine for these pieces of equipment by referring to LCP BREF, as stated in comments to table 6.1 of the Application Supporting Statement. In principle, this might acceptable to us, however it is likely to result in stricter emission limits and monitoring requirements in the permit, compared to setting them according to MCPD.*

e. *Provide the specific information required for each MCP according to Application Form Part B3, Appendix 1 – 13. This should be provided using the Environment Agency's MCP spreadsheet: https://assets.publishing.service.gov.uk/media/64ff30891886eb000d9770d9/MCP-generator-list-v3.ods*

f. *Include the Emergency back-up generators for black start, diesel driven fire water pump and emergency diesel driven compressor if these pieces of equipment have net rated thermal inputs above 1 MW; or confirm if they are below 1 MW (you don't need to advise the net rated thermal input for equipment below 1 MW).*

g. *Provide a signed declaration for each MCP intended to be operated for less than 500 hours per year as a rolling average over a period of three years, as required by Application Form Part B-3 Appendix 1 – 13 'Where the option of exemption under Article 6(8) is used the operator (as identified on Form A) should sign a declaration here that the MCP will not be operated more than the number of hours referred to in this paragraph'. This is essential to determine which pieces of combustion equipment are exempted from MCPD emissions limits.*

h. *Application document 'Appendix C2 Assessment of Best Available Techniques for Large Combustion Plant' states that BAT 55 - 59 for combustion of process fuels from chemical industry are not applicable. This seems to be incorrect in that the tail gas from the PSA units proposed to be combusted in the Auxiliary Boilers meets the definition of 'process fuels from the chemical industry' provided in the LCP BAT conclusions (i.e.: 'Gaseous and/or liquid by-products generated by the (petro-)chemical industry and used as non-commercial fuels in combustion plants'). This is in line with the advice we gave you as part of pre-application discussions. If the Auxiliary Boilers are confirmed to be LCP:*

    i. *Assess compliance against these BAT conclusions and associated BAT-AELs and amend the application document Appendix C2 Assessment of Best Available Techniques for Large Combustion Plant'*

    ii. *Review and if applicable amend the emission limit values identified for the Auxiliary Boilers in table 6.1 of the Application Supporting Statement and the inputs to the air dispersion model presented in Appendix 8B: Air Quality – Operational Phase.*

Response

a. The data provided originally were the known net rated thermal inputs at the time of submission. We have however reviewed the information in light of the current stage of design and provide summary table of thermal inputs below in response to clarification (b). The AP3328SQ-APP-SS Supporting Statement, Section 4.11 (provided in Appendix B) has been updated.

b. The net thermal rated inputs based on current design information are presented in Table 5 below. The AP3328SQ-APP-SS Supporting Statement, Section 2.3 and 4.10 (provided in Appendix B) has been updated.

Table 5. Summary of Combustion Plant

Combustion Plant	Net Rated Thermal Input (MWth)	Comments
Auxiliary Boiler Phase 1	71.87	LCP continuous operation
Auxiliary Boiler Phase 2	71.87	
Fired Heater Phase 1	18.3	MCP start-up only – confirmed as operating <500 Hrs/year
Fired Heater Phase 2	18.3	
Emergency Generator Phase 1	8.86	MCP– confirmed as operating <500 hrs/year
Emergency Generator Phase 1	8.86	
Firewater Pumps – Phase 1	1.30	MCP– confirmed as operating <500 hrs/year
Firewater Pumps – Phase 2	1.30	

c. The AP3328SQ-APP-SS Supporting Statement, Section 2.3, Table 2.1 and 4.10 (provided in Appendix B) has been updated.

d. We have confirmed that the fired heaters will be MCP based on the net rated thermal input and as they will only operate during start-up periods, the operational hours will not exceed 500 hours per year. As such we have modified AP3328SQ-APP-SS Supporting Statement, Section 6.2, Table 6.1 (provided in Appendix B) to reflect that no ELVs are proposed, and the proposed monitoring has been changed to periodic monitoring to the appropriate.

e. The complete MCP spreadsheet is provided in Appendix K.

f. We have confirmed there will be no diesel driven compressors on site. The details of the emergency diesel generators and the firewater pumps are summarised in Table 5 above.

g. Signed declarations as required by Application Form Part B3, Appendix 1 -13 are provided in Appendix A.

h. The AP3328SQ-APP-BAT2 LCP BAT Assessment has been reviewed and provided in Appendix J – this will supersede the previous version. We have also updated AP3328SQ-APP-SS Supporting Statement, Section 6.2, Table 6.1 (provided in Appendix B) which will also supersede the previous version, and an updated Air Quality Dispersion Assessment have been prepared in response to Question 11 below and is presented in Appendix M.

2.11 Question 11 – Air Emissions Risk Assessment

Reference Application Form B2-6 (Air Emissions Risk Assessment) and Environmental Statement Volume III – Appendix 8B: Air Quality – Operational Phase. Provide an updated Air Quality – Operational Phase air emissions risk assessment addressing the following comments:

a. *'Table 8B-2: Emissions Inventory per Unit', include the fuel combusted in each emission source and scenario and operational hours;*

b. *'Table 8B-3: Emissions Concentrations and the Assessed Emission Rate per Units', include the reference conditions applicable to each emission limit value (ELV) identified (i.e reference oxygen concentration, dry basis, reference pressure and temperature).*

c. *'Table 8B-3: Emissions Concentrations and the Assessed Emission Rate per Units', for a number of pollutants note 1 states 'No emission rate supplied'. Amend to clarify whether the emissions of these pollutants are expected to be nil or trivial;*

d. *Reconcile the emission levels used as inputs to the air dispersion modelling exercise with the proposed emission limits for each piece of combustion equipment, noting the following:*

    i. *The emission levels for the Fired Heaters stated in Table 8B-3 don't match proposed emission limits in Table 6.1 of Environmental Permit Application Supporting Statement (which however, might need amending, see item 10.d. above). Furthermore, it is unclear whether the fired heaters are constrained to operate for less than 500 hours per year, so that MCPD emission limits don't apply. If MCPD emission limits apply to fired heaters, the emission levels used as inputs to the air emissions risk assessment are unlikely to be compliant. Similarly, the emission levels for the Auxiliary Boilers don't match the proposed NOx yearly average level of 60 mg/m3 stated in Table 6.1 of Environmental Permit Application Supporting Statement, although these seem to be close to the proposed emission level of 80 mg/Nm3 when using tail gas. Refer also to question 10.h. requesting to review compliance with the LCP BAT-AELs for combustion of process gas in the chemical industry. Please clarify/amend as appropriate.*

    ii. *The NOx emission levels for the emergency diesel generators presented in Table 8B-3: Emissions Concentrations and the Assessed Emission Rate per Units' don't seem to reflect the information provided in 'Appendix C2 Assessment of Best Available Techniques for Large Combustion Plant'. This states compliance with TA Luft 2g or US EPA Tier II, which would normally entail NOx emission levels around 2,000 mg/m3 at 5% reference oxygen. Attaining the NOx emission levels used in the air emission risk assessment (i.e. 195 mg/m3) is likely to require using Selective Catalytic Reduction (SCR), although this is unclear due to lack of actual/reference oxygen and moisture information.*

        1) *Provide the actual oxygen and reference oxygen and water missing for diesel generators; note that reference conditions are requested above for all emission sources.*

        2) *Confirm emission levels for the emergency diesel generators consistent with the proposed specification / abatement techniques for this equipment.*

        3) *If applicable, amend the inputs to the air emissions risk assessment for the diesel generators.*

        4) *If SCR is used for the diesel generators, ammonia emissions due to ammonia slip should be considered as we ll or a justification should be provided for not including this pollutant.*

e. *Emission parameters for the flare(s).*

    i. *Clarify the number of flares and amend the application documents as appropriate: only one flare is included in the air emissions risk assessment, whilst the application document 'Appendix C5 Assessment of Best Available Techniques For Emissions Management' states that a 'flare system will be provided for each phase' and talks about flares (plural).*

    ii. *Provide the physical (actual) stack height of the flare.*

    iii. *Provide a methodology statement and calculations to work out the effective stack height and effective diameter of the flare (or explain whether these are calculated by the modelling software).*

iv. Provide calculations, methodology statements and supporting information at the basis of the estimates of the emissions from the flare (e.g. composition of flared gas in the modelled scenarios, combustion calculations, methodology to work out emission levels, such as emission factors or equipment manufacturer data, etc.).

f. If any of the amendments affect the air dispersion modelling exercise, provide updated modelling files.

Response

We have prepared an updated Air Quality Dispersion Assessment which should address the points identified above in points (a) to (e) above, including confirming a separate flare will be used for each phase. Updates have been made to the following documents to ensure consistency with quoted emission levels in the revised assessment:

- AP3328SQ-APP-SS Supporting Statement), Section 5 and 7. Updated document is in Appendix B
- AP3328SQ-APP-BAT1 Process BAT Assessment which is provided in Appendix H.
- AP3328SQ-APP-BAT2 LCP BAT Assessment which is provided in Appendix J.
- AP3328SQ-APP-BAT5 Emissions BAT Assessment which is provided in Appendix C.

The Updated Dispersion Assessment is presented at Appendix M and is supported by associated modelling files and the underlying data calculations sheet. Please supersede the earlier submitted assessment and modelling files.

Please note we have identified in our response to Question 9a, that we would expect a pre-operational condition in relation to updating the air quality assessment in accordance with the final installation design.

2.12 Question 12 – CO2 Venting

Reference: Application Form B2-6 (Air Emissions Risk Assessment – CO2 venting assessment). Provide a risk assessment for emissions associated with venting of concentrated / pressurised carbon dioxide inventories, according to scope, methodology and advice provided during the pre-application.

Response

We have prepared a CO_2 venting assessment in line with the methodology discussed during pre-application discussions. This is presented at Appendix N. Modelling files associated with this assessment are also provided with this response.

Please note we have identified in our response to Question 9a, that we would expect a pre-operational condition in relation to updating this assessment in accordance with the final installation design.

2.13 Question 13 – Point Source Releases to Water

Reference: Application Form B6 (Point source emission to water from an installation) and supporting documentation

a. *The Application document 'Appendix L - Appendix L Water Quality Assessment - H2Teesside ES Chapter 9 Surface Water, Flood Risk and Water Resources' is a chapter of the environmental statement, i.e. a planning application document. Whilst this document is useful as a reference, it does not fulfil the requirements of the EPR permit application. Please consider extracting the parts that are relevant to the permit application and resubmitting them, either as a standalone document, or as part an expanded/amended version of either the Application Supporting Statement or Water Quality Modelling Report.*

b. *Application document 'Appendix L - Environmental Statement Volume III – Appendices Appendix 9B: Water Quality Modelling Report Document Reference: 6.4.10' states that it is anticipated that a further stage of water quality modelling will be carried out following finalisation of the proposals, including water treatment methods and that this will be required as part of the Environmental Permit application for operation of the Main Site (i.e. the installation in the scope of this environmental permit application). Please clarify whether another environmental permit water quality modelling report is going to be submitted as part of this application and the anticipated timeline for submitting it.*

c. *Application document 'Appendix L - Environmental Statement Volume III – Appendices Appendix 9B: Water Quality Modelling Report Document Reference: 6.4.10' provides in Table 9B-4 Flows and Pollutant Loads for Modelled Main Site Discharge. If the discharge to the Tees Bay through the Net Zero Teesside outfall is confirmed to be in the scope of the application, as requested to confirm in response to question 2.a., please:*

    i. *Explain how the above values have been derived (e.g. based on operational plant data or other method of performance assurances including material balances and engineering calculations), in consideration that much of the technology to be employed is still not decided upon.*

    ii. *Provide any raw data, process units' effluent summaries, effluent treatment units design specifications, list of assumptions and supporting narrative, necessary to understand how you have estimated the quality and composition of the effluent proposed to be discharged through the Net Zero Teesside outfall.*

    iii. *Confirm that, on review of the processes, raw materials, additives and chemicals used at the installation, you have not identified any additional potentially hazardous chemicals, with established EQS in our published guidance*

        - *https://assets.publishing.service.gov.uk/media/60e85aa08fa8f50c75b6ad32/Estuaries_and_coastal_waters_specific_pollutants_and_operational_environmental_quality_standards.ods*
        - *https://assets.publishing.service.gov.uk/media/6217c303e90e0710be035467/Estuaries_and_coastal_waters_priority_hazardous_substances__priority_substances_and_other_pollutants_environmental_quality_standards__2_.ods*
        - *or any additional potentially hazardous chemicals for which Predicted No Effects Concentrations (PNECs) might need to be used.*

    iv. *Refer to question 9.d. above for process effluents contaminated or potentially contaminated with amines associated with the carbon capture solvent.*

    v. *Provide the water quality modelling input files (section 9B.5).*

Response

a. We can confirm that a further water quality modelling assessment will be undertaken which reflects the final discharge point design and the latest water/wastewater treatment design. This should be available by 31/01/2025.

   Please note we have identified in our response to Question 9a, that we would expect a pre-operational condition in relation to updating this assessment in accordance with the final installation design.

b. We have prepared a short Technical Note responding to points (a) and (c) with supporting information on the data used to address the queries on the current modelling assessment and this is presented at Appendix O.

The modelling files associated with the current assessment are also provided as part of this submission and there are no changes to our current conclusions, namely:

- All discharges to the Tees Bay from the proposed Installation will be continuously monitored to verify compliance with the Environmental Permit. It is therefore considered that the impact of the discharges to surface water will be insignificant.

- There are no proposals to discharge any contaminated wastewater from the proposed Installation into the foul sewer (only domestic sewerage).

- On this basis it is considered that the risk of impact to controlled water from treated and uncontaminated wastewaters from the proposed Installation will be very low.

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3. Fees

a. Missing Application Payment

Unfortunately, the application payment you sent is incorrect, based on the information available. the application charges cannot be confirmed until the scope of the application is clarified more clearly and more detailed technical description is provided for the effluent treatment activities

Response

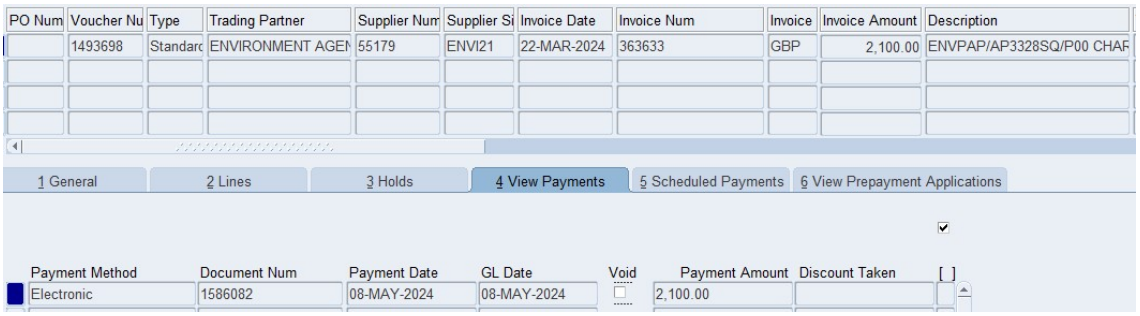
The schedule of revised installation activities and DAA is presented in Appendix P. This identifies that there is an additional £8314.40 to be paid in respect of the application fee. This will be paid by BACs transfer and we will forward confirmation of transfer when received so that this can be tracked in the Environment Agency payment system.

b. Outstanding Pre-paid Balance

Pre-application fees for EPR/AP3328SQ/P001 of £1750 + VAT are showing outstanding in our system. You must pay this outstanding balance before we can duly make your application. If you have already paid this charges, please provide suitable evidence so that we can track the payment.

Response

We can confirm that this invoice was paid on the 8th May as shown below.



PO Num	Voucher Nu	Type	Trading Partner	Supplier Num	Supplier Si	Invoice Date	Invoice Num	Invoice	Invoice Amount	Description
	1493698	Standarc	ENVIRONMENT AGEN	55179	ENVI21	22-MAR-2024	363633	GBP	2,100.00	ENVPAP/AP3328SQ/P00 CHAF

1 General | 2 Lines | 3 Holds | 4 View Payments | 5 Scheduled Payments | 6 View Prepayment Applications

Payment Method	Document Num	Payment Date	GL Date	Void	Payment Amount	Discount Taken	[ ]
Electronic	1586082	08-MAY-2024	08-MAY-2024		2,100.00		

Appendix A Updated Application Forms

Appendix B Updated Supporting Statement

Appendix C Updated Emissions BAT

Appendix D Updated Site Condition Report

Appendix E Drawings and Plans

Appendix F Process Flow Diagrams

Appendix G Material Safety Data Sheets

Appendix H Updated Process BAT Assessment

Appendix I Drainage Philosophy

Appendix J Updated LCP BAT Assessment

Appendix K MCP Spreadsheet

Appendix L Updated H1 Assessment

Appendix M Updated Air Quality Assessment

Appendix N CO2 Venting Assessment

Appendix O Technical Note on Water Quality Assessment

Appendix P Updated List of Activities

Appendix Q Updated Cooling BAT

Appendix R Updated Energy Efficiency BAT

Appendix S Updated Climate Change Risk Assessment