Immingham Green Energy Terminal Green Hydrogen Production Facility

EPR/VP3425SV/A001

Environmental Permit Application

Non-Technical Summary

Environmental Permitting (England and Wales) Regulations 2016

Applicant: Air Products (BR) Ltd

May 2024

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Regulation Reference	EPR Regulations, Part 2, Chapter 1 R12
Environmental Permit Reference	EPR/VP3425SV/A001
Application Document Reference	VP3425SV/APP/NTS
Author	Air Products (BR) Limited

Version	**Date**	**Status of Version**
Revision 1	28 March 2024	For Client Review
Revision 2	03 May 2024	Final revision
Issue 1	17 May 2024	Issue to Regulator

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1. Introduction

1.1. Context

1.1.1 This report has been prepared by AECOM Limited ('AECOM') on behalf of Air Products (BR) Limited ("the Operator" or AP) and presents the Non-Technical Summary (NTS) for an Environmental Permit (EP) application for the proposed Green Hydrogen (H_2) Production Facility ('proposed installation') which forms part of the wider Immingham Green Energy Terminal ('IGET') Nationally Significant Infrastructure Project (NSIP) being developed by Associated British Ports ('ABP') on the eastern side of the Port of Immingham, situated in northeast Lincolnshire on the south bank of the Humber Estuary.

1.1.2 The proposed installation will be the UK's first commercial scale project which will utilise green ammonia (NH_3) to generate green H_2 and will initially produce up 105 metric tonnes per day (MTPD) of H_2 increasing to 210 MTPD of H_2 by the end of phase 3.

1.1.3 This application is made in connection with the application (reference: TR030008) for a Development Consent Order (DCO) that has been submitted for the construction, operation and maintenance of a multi-user liquid bulk terminal and its associated green hydrogen facility for the production of green hydrogen. The DCO application (TR030008) is currently the examination stage.

1.1.4 The EP Application adopts an approach 'and consistent with the 'Rochdale Envelope' approach used in the DCO application. The permit application is being made prior to the detailed design of the proposed H_2 installation being completed. Therefore, where possible, conservative or worst-case assumptions are used within the application with the information available at the time of writing. It is anticipated that a number of pre-operational or improvement conditions will be set to reflect design changes that may have occurred and/or to verify that environmental assessment conclusions remain valid. Such conditions are likely to require submission of information before, during and following installation commissioning.

1.2. Proposed Installation

1.1.5 The proposed installation will be operated by Air Products (BR) Limited (APBR) ("the Operator" or AP).

1.1.6 The proposed installation comprises the development of a green H_2 production facility which includes infrastructure for the offloading and

transfer of green ammonia (NH_3) from ships to ammonia storage facilities, the main H_2 production facility and vehicle and trailer H_2 refuelling facilities.

1.1.7 The proposed installation will be located in North East Lincolnshire on the south bank of the Humber Estuary on the eastern side of the Port of Immingham. The installation will comprise:

- Ship offloading facilities on a new jetty;
- Two production related areas known as 'East Site' and 'West Site'
- A pipeline areas which connect the jetty to East Site as well as pipeline area to connect both East and West sites.

1.1.8 The proposed installation comprises ship offloading infrastructure to receive NH_3 with a pipeline transferring the shipped NH_3 to the storage tanks on East Site. The offloading infrastructure which is part of the installation boundary will be located on a new jetty being constructed by ABP. The jetty itself remains outside the proposed installation boundary.

1.1.9 The NH_3 storage tanks will be located on the East site which will also comprise plant relating to the storage tanks including an NH_3 flare stack. Additionally, the East site will comprise a hydrogen production facility, with up to three hydrogen production units (HPU's) and associated flue gas and flare stacks, power distribution and instrumentation buildings, analyser shelters, ammonia and hydrogen associated equipment and a welfare facility.

1.1.10 Connecting the East site to the West site will be a pipeline corridor containing underground pipelines, cables, and other conduction media for the transfer of ammonia, hydrogen, nitrogen and utilities.

1.1.11 The West Site will comprise another H_2 production facility with up to three HPU's including associated flue gas a flare stacks, up to four liquefier units, H_2 storage tanks and trailer filling stations, H_2 vent stack and associated process equipment and H_2 compressors and associated process equipment. Other non-process areas of the West Site will include a control room and workshop, security and visitor building, contractor building, warehouse, driver administration building, safe haven building, electrical substation and metering station, power distribution buildings, process instrumentation buildings and analyser buildings. The West Site will also contain process and utility plant including cooling towers and pumps, fire water tank, instrument air equipment small nitrogen production plant for utility nitrogen, pipe racks, pipelines, pipes, cable racks, utilities and other infrastructure.

1.1.12 Outside of the proposed installation boundary and therefore not included in the permit application is the single berth jetty that will extend 1.2km seawards into the Humber Estuary and will operate 24 hours a day, seven days a week and 365 days a year and will accommodate up to 292 ship calls per year. Only 12 ship calls will be associated with the receipt of NH_3

and only the specific NH_3 offloading infrastructure will form part of the proposed installation boundary.

1.1.13 Full details of the proposed installation's technology and processes is provided in Section 3 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

2. Application Summary

2.1. The Operator

2.1.1 APBRL is part of Air Products and Chemicals Incorporated a world-leading industrial gases company that has been in operation for nearly 80 years, with more than 60 years in the UK and Ireland. Air Products in the UK employ more than 1,000 employees across a significant number of operating facilities including 35 production facilities across the UK and Ireland. Additionally, APBRL operate a number of hydrogen refuelling stations and hydrogen, nitrogen and oxygen plants.

2.1.2 Air Products are focused on serving energy, environment and emerging markets, providing essential industrial gases, related equipment and technical applications expertise to customers in dozens of industries, including refining, chemical, metals, electronics, manufacturing, and food and beverage.

2.1.3 The company develops, engineers, builds, owns and operates some of the world's largest industrial gas and carbon-capture projects, supplying world-scale clean hydrogen for global transportation and industrial markets, as well as the broader energy transition.

2.2. The Process

2.2.1. Hydrogen production will take place in an NH_3 Hydrogen Production Unit furnace consisting of catalyst filled tubes inside a gas fired furnace whereby the liquid NH_3 would be split into hydrogen (H_2) and nitrogen (N_2) through an endothermic reaction. The catalyst facilitates the NH_3 cracking reaction. The primary fuel source for the furnace will be natural gas, supplemented with H_2 rich off gas. The convection section within the furnace includes an SCR (Selective Catalytic Reduction) unit to reduce NOx before discharge to the atmosphere.

2.2.2. The H_2 leaving the Hydrogen Production Unit contains N_2, unreacted NH_3 and a small amount of water and will be purified using a pressure swing adsorption (PSA) unit located downstream to produce > 99.97% pure H_2.

2.2.3. NH_3 storage and H_2 production processes are supported by flares to manage any releases of gas during emergency, start-up and shutdown activities.

2.2.4. Cooling for the installation will be achieved through a site-wide recirculating cooling system, with the evaporative cooling towers located on the West Site. The feed water into the cooling system will be non-potable (service water) used to remove process waste heat. The cooling tower is based on the wet bulb temperature and can use a closer approach temperature in the design due to the nature of the latent heat. This cooling system requires less power consumption than an air-cooled system. The peak make-up water demand for cooling water system per estimates is 177 m^3/h. The Operator will install

a wastewater treatment package in Phase 1 to help meet the clean water supply requirements. The Operator also aims further reducing the make-up water demand for the cooling water system and thus is in discussion to employ best available techniques with the cooling water system specialists for this purpose. The cooling water system will take frequent blowdowns to maintain conductivity of the systems which will divert into the blowdown sump where the water will be pumped into a wastewater treatment package to remove dosed chemicals and become non-potable water. The residual wastewater from this blowdown will be sent to Anglian Water for further treatment.

2.2.5. There will be a small on site nitrogen generation unit to provide nitrogen of the correct purity and reliability for purging and inerting the equipment for safety reasons.

2.2.6. The whole site will be covered by a hardstanding drainage system and surface water will be routed through a gravity network into retention ponds underneath the Site. Water from possible contaminated areas will be put in a sump and undergo oil-water separation and ammonia detection. All non-contaminated water will be pumped into the adjacent area outfall ditches that will carry water to the Humber Estuary. The water will be sampled before being discharged. Contaminated water will be sent to Anglian Water for further treatment.

2.2.7. Full details of the proposed installation's technology and processes is provided in Section 3 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

2.2.8. The design and operation of the proposed installation is intended to meet the indicative requirements of Best Available Technique (BAT) as defined for common waste water and waste gas treatment/management systems in the chemical sector, energy efficiency, large volume inorganic chemicals, emerging techniques for hydrogen production with carbon capture and industrial cooling systems. As a 'First of a Kind' technology, Best Available Techniques (BAT) documents have been selected based on the documents most suited to the site as agreed with the Environment Agency (EA) during pre-application engagement. The proposed installation will not produce H2 from methane or fuel gas and currently carbon capture is not proposed as further studies are required to develop a system which is technically and commercially viable, but the application uses the EA's 'Hydrogen production with carbon capture: emerging techniques' guidance document where applicable to address similar important environmental issues and will be used until further guidance is available. The BAT standards used for the assessment are described in full in Appendix D of the Supporting Document which is made up of:

- Appendix D1 - BAT 01: Assessment of Plant Emissions;
- Appendix D2 - BAT 02: Assessment of Energy Efficiency;

- Appendix D3 – BAT 03: Assessment of Process and Technology; and
- Appendix D4 – BAT 04: Assessment of Cooling System.

2.3. Site Location and Current Condition

2.3.1. The current site setting differs between the East Site, West Site and Pipeline Corridor. The area surrounding the site is mainly industrial in nature. The proposed Pipeline Corridor crosses an area that has mostly already been impacted by industrial development alongside Queens Road and Laporte Road, and also crosses the Grimsby Docks Branch Line. At the eastern end, the Pipeline Corridor area includes a section of woodland known as 'Long Strip' between Laporte Road and the Humber Estuary that is subject to a Tree Preservation Order (TPO).

2.3.2. The East Site is a split in to two parcels of land bisected by Laporte Road; the first consisting of a hardstanding area used as a storage area by ABP. The second is a triangular shaped area of brownfield land currently covered by gravel and various stockpiles, located south of Laporte Road.

2.3.3. The West Site comprises three agricultural fields.

2.3.4. An electrical sub-station and a gas-fired power generator proposed installation are situated to the north-west. Directly surrounding the West Site are various roads including Kings Road and the A1173 to the north west and western boundaries of the West Site and Queens Road on the north eastern boundary. Queens Road comprises a number of residential and commercial properties that are within the proposed installation boundary. The residential properties within the boundary on Queens Road will not be compatible with the proposed installation and will need to cease as residential use. The business/commercial receptors are considered compatible with the installation. The east and south-eastern boundary is adjacent to another gas fired power generator proposed installation, the community recycling centre and a large waste gypsum landfill.

2.3.5. Other residential properties are located on the eastern edge of Immingham and include those on Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, Kendal Road, Chestnut Avenue, Waterworks Street and Spring Street, which at the closest point are located between approximately 460m and 480m west of the West Site. Mauxhall Farm is located off Stallingborough Road, located approximately 1km south-west of the West Site. Other settlements nearby include Grimsby (approximately 5km) to the southeast; Healing (approximately 3.5km) and Great Coates (approximately 5.5km) to the south-east; Stallingborough (approximately 2.5km) to the south; Keelby (approximately 5km) to the south-west; and Habrough (approximately 4.5km) to the west.

2.3.6. In addition to the Humber Estuary forming the north-eastern boundary of the Site, there are also a number of surface water features within the vicinity of the Site including the North Beck Drain located immediately east from the

Site, the Habrough Marsh Drain to the west of the site and the Middle Drain also located in the vicinity of the Site.

2.3.7. The Humber Estuary Environmental Management Area (EMA) lies within the proposed installation boundary within the Humber, which is a statutory designated site that encompasses the Humber Estuary SPA, SAC, RAMSAR and Site of Special Scientific Interest ("SSSI") designations. Two local nature reserves and an additional SSSI are also located within 15km of the proposed installation boundary.

2.3.8. The current site will be raised, levelled and remediated prior to construction. The Site Condition and Baseline report (Document ref: VP3425SV/APP/SCR) is provided in Appendix B of the Supporting Document and covers the current site setting and proposed remedial works.

2.4. Management Arrangements

2.4.1. The site will be operated under an ISO14001 certified Environmental Management System (EMS) including operating procedures to manage the various aspects of the operation of the plant, including but not limited to emissions monitoring, accident management, waste minimisation and management, and infrastructure maintenance. Internal procedures will be developed in line with the Operators global procedures to ensure adequate running of the installation to best practices and to maintain consistency with relevant National and International Standards.

2.4.2. The site will be regulated under the Control of Major Accident Hazards (COMAH) regulations and as such a Site Safety Report and Emergency Plan will be developed following completion of HAZID and HAZOP studies being undertaken during detailed design. These documents will be controlled through the EMS.

2.4.3. Full details of the proposed management system is provided in Section 4 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

2.5. Monitoring Arrangements

2.5.1. The site will implement a defined monitoring schedule which will include:

- Infrastructure inspection and monitoring via planned preventative maintenance;
- Process monitoring and control via a Basic Process Control System; and
- Environmental monitoring for emissions to air and water.

2.5.2. Full details of the proposed monitoring arrangements is provided in Section 6 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

2.6. Environmental Impacts

2.6.1. Full details of the emissions from the proposed installation and associated mitigation and management techniques is provided in Section 5 of the Supporting Statement (Document ref: VP3425SV/APP/SS). The assessment of environmental emissions from these emissions are summarised in Section 7 and supported by the following assessments:

- Appendix C: Shadow Habitats Regulations Assessment;
- Appendix E: H1 Screening Assessment
- Appendix F: Air Quality Assessment
- Appendix G: Noise Impact Assessment
- Appendix J: Qualitative Environmental Risk Assessment
- Appendix K: Climate Change Risk Assessment.

2.6.2. Emissions to air consist of both point source releases and fugitive emissions. The main point source emissions will be from the flue gas stack reformers, Hydrogen Production Unit (HPU) flares and pilots and the ammonia storage flares and pilot. The main pollutant from the onshore HPU's is the NO_x emissions from the combustion of natural gas. These emissions will be reduced by the use of Selective Catalytic Reduction (SCR) technology. There will be NH_3 emissions associated with the SCR process and both NO_x and NH_3 can be harmful to nature conservation sites. When NO_x is converted to NO_2 following the release into ambient air it can be harmful to human health. NO_2 and NH_3 also contribute to nitrogen deposition. Flares will be a source of combustion emissions but will be operating in the event of an emergency only.

2.6.3. The stack height and emission levels required to minimise impacts on air quality receptors to 'insignificant' have been determined through an air quality impact assessment, undertaken in accordance with EA guidance. The assessment included dispersion modelling of minimum stack heights and the worst case layout of the installation in relation to receptors.

2.6.4. Fugitive emissions to air will be minimal and are expected to be from leaks and/or accidents. This will be managed through the Operators EMS and good maintenance practice.

2.6.5. Emissions to water consist of both point source releases and fugitive emissions. The point source releases will be associated with discharge of surface water to the external drainage network and discharge of process waters to sewer. The site be constructed with a surface water drainage system which includes oil interceptors, a sump to allow testing for NH_3 in run off waters from the East Site and attenuation ponds to facilitate management of flow rates. If NH_3 is identified in the sump, arrangements will be made to remove this for offsite treatment.

2.6.6. Point source releases to sewer will comprise residual process wastewater and discharges from site welfare facilities.

2.6.7. Fugitive emissions to water will be minimal and are expected to be from leaks and/or accidents. This will be managed through the Operators EMS and good maintenance practice.

2.6.8. Odour is not expected to be an issue at the installation due to the nature of the process, however an Odour Management Plan has been included as part of the application (Appendix I) to manage the risk of fugitive emissions from potential leaks and/or accidents. The main fugitive emission will be NH_3 from potential leaks and controlled emissions from flare stacks, however these emissions are expected to be minimal. Risks associated with fugitive emissions to air have been summarised in the Qualitative Environmental Risk Assessment (Appendix J).

2.6.9. A Noise Impact Assessment and Management Plan have been included within the permit application (Appendices G and H). The predictions of operational sound at the proposed installation have been based on the power sound levels for the major sound sources and details of the acoustic performance of noise mitigation measures already embedded into the designs (e.g. distance from receptors). These details have been provided by the Operator and predictions will be updated where necessary when the site layout has been set. An initial BS 4142 assessment identifies that based on the worst-case scenario, with no additional specific noise mitigation measures incorporated into the project design, there is the potential for adverse/significant adverse impacts at the nearest NSRs (Noise Sensitive Receptors). Additional mitigation has been proposed following the principles of BAT and with those the sound emissions from the proposed installation are predicted to achieve rating levels of no greater than +5 dB above defined background sound level and would be considered to have a low impact at the nearest NSRs when considering the context of the existing environment.

2.6.10. A climate change risk assessment following the Environment Agency's "Adapting to Climate Change: Risk Assessment for Your Environmental Permit' has been carried out to show how the installation will withstand climate change in the future. The risk assessment will be updated as climate change impacts become more significant (see Appendix K).

2.7. Resource Management

2.7.1. All raw materials will be stored in appropriate containers/tanks depending on their classification. All hazardous materials will be stored safely to avoid contamination and will be approved by North East Lincolnshire Council (NELC) through a Hazardous Substance Consent and regulated by the Health and Safety Executive (as the competent authority) through COMAH.

2.7.2. Wastes from the proposed installation are expected to be minimal, and will be appropriately recovered, treated or disposed of via licensed 3rd party.

2.7.3. The Installation requires a power feed of approximately 90MW for landside works which will be supplied with electricity via a connection to the

Immingham substation provided by Northern Power Grid. The voltage level of the supply is approximately 132kV.

2.7.4. Natural gas will be supplied Cadent Gas via a new tie in to an existing gas main on Laporte Road. This will be used for process heating and will be supplemented by use of H_2 rich tail gas from the PSA.

2.7.5. Techniques to manage and improve energy efficiency will include building energy efficiency in through design, operating and controlling the plant with an automated process control system and effective planned preventative maintenance.

2.7.6. Water will be needed primarily for cooling purposes and will be supplied by Anglian Water. The source will be non-potable industrial water. Techniques to improve water efficiency include optimisation of heat use to reduce the need for cooling, water recirculation in coolers and installation of a treatment package during phase 1 that will optimise the recirculating water quality to facilitate further reuse.

2.7.7. Full details of the resource management arrangements is provided in Section 3 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

2.8. Decommissioning and Closure

2.8.1. A plan for the closure and decommissioning of the installation will be developed by the Operator in line with environmental legislation at the time with the required licenses and permits. The decommissioning will likely involve leaving the underground infrastructure in place and removing above ground infrastructure to restore the land to a satisfactory state. See 3 of the Supporting Statement (Document ref: VP3425SV/APP/SS).

3. Application Type

3.1.1. This application is for new bespoke environmental permit for a new Green H2 Production Facility. The application is made under the Environmental Permitting (England and Wales) Regulations 2016, as amended and has been prepared as a bespoke application.

3.1.2. The Operator has completed an enhanced pre-application consultation process with the Environment Agency which has confirmed BAT standards and related guidance to be followed. It also confirmed the application will include the following listed and directly associated activities (DAA):

Table 3. Listed Activities and Directly Associated Activities

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A1	Schedule 1, Section 4.2, Part A (1)(i) Production of inorganic chemicals.	Production of hydrogen from green ammonia.	From receipt of ammonia
Directly Associated Activities			
A2	Directly Associated Activity	Offloading of ammonia from ship	Jetty top-side ammonia offloading infrastructure from connection point to ship, through transfer pipework to the ammonia storage tank.
A3	Directly Associated Activity	Raw material storage	From receipt of raw materials to handling, on-site storage and handling for use.
A4	Directly Associated Activity	Hydrogen liquefaction	From receipt of gaseous hydrogen to transport of liquid hydrogen to hydrogen storage tanks.
A5	Directly Associated Activity	Hydrogen Storage	Storage of hydrogen after liquefaction and loading.
A6	Directly Associated Activity	Vehicle and tanker loading	Hydrogen vehicle loading area.
A7	Directly Associated Activity	Surface water management	Handling of site drainage until discharge to the site surface water system.
A8	Directly Associated Activity	Combustion of waste gas	From the production of waste gas (NH3 or H2) to a flare.