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Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 1
Non-Technical Summary

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Glossary

Abbreviation	Term
ADMS	Atmospheric Dispersion Modelling System
AEELs	Associated Energy Efficiency Levels
AELs	Associated Emission Levels
AEP	Annual Exceedance Probability
AGI	Above-Ground Installation
AMP	Accident Management Plan
AN	Absolute Non-hazardous
AoD	Above Ordnance Datum
AQAL	Air Quality Assessment Levels
ASME PTC	American Society of Mechanical Engineers Performance Test Codes
BAT	Best Available Techniques
BAT AEL	Best Available Technique-Associated Emission Level
BAT-AEEL	Best Available Technique Associated Energy Efficiency Level
BATc	Best Available Technique Conclusions
bgl	Below Ground Level
BGS	British Geological Survey
BRef	Best Available Techniques Reference Document
BS ISO	British Standards (BS) Versions of International Organization for Standardization (ISO) Standards
BS EN	British Standard (BS) Implementations of European Standards (EN)
CBM	Condition-Based Maintenance
CCGT	Combined Cycle Gas Turbine
CCP	Carbon Capture Plant
CCS	Carbon Capture Storage
CEMP	Construction Environmental Management Plan
CEMs	Continuous Emissions Monitors
CHP	Combined Heat and Power
C&IEA	Construction and Indicative Enhancement Area
CM	Corrective Maintenance
COO	Chief Operating Officer
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CoPC	Contaminants of Potential Concern
CQPS	Connah's Quay Power Station
CSM	Conceptual Site Model
DAHS	Data Acquisition and Handling System
DCC	Direct Contact Cooling
DCO	Development Consent Order

Abbreviation	Term
DCS	Distributed Control System
DLN	Dry Low-Nox
DPA	Dispatchable Power Agreement
ECP	Environmentally Critical Plant
ELV	Emission Limit Value
EMS	Environmental Management System
ENI	Operator of the CO ₂ transport and storage network.
EPR	Environmental Permitting Regulations
EQS	Environmental Quality Standards
ES	Environmental Statement
ESOS	Energy Savings Opportunity Scheme
FCC	Flintshire County Council
FEED	Front-End Engineering Design
FEH	Flood Estimation Handbook
g	Gram
GC	Gas Chromatograph
GIS	Geographic Information System
GMI	Generation Management Instructions
GT	Gas Turbine
GTP	Gas Treatment Plant
GW	Gigawatt
ha	hectare
HP	High Pressure
HRSGs	Heat Recovery Steam Generators
HSSE	Health, Safety, Security, Environment
HVO	Hydrotreated Vegetable Oil
IED	Industrial Emissions Directive
IP	Intermediate Pressure
ISO	International Organization for Standardization
Keq	Kiliequivalent
kg	Kilogram
km	Kilometre
kV	Kilovolt
kW	Kilowatt
LCP	Large Combustion Plant
LEL	Lower Explosive Limits
LHV	Lower Heating Value
LNB	Low NOx Burners
LoW	List of Waste
LP	Low Pressure

Abbreviation	Term
LWS	Local Wildlife Sites
m	Meters
m ³	Cubic Meter
MCERTs	Monitoring Certification Scheme
MCP	Medium Combustion Plant
MH	Mirror Hazardous
MSDS	Material Safety Data Sheet
MSUL	Minimum Start-Up Load
MW	Megawatt
MWe	Megawatt Electrical
MWth	Megawatt Thermal
N ₂	Nitrogen
NGET	National Grid Electricity Transmission Plc
NH ₃	Ammonia
Nm ³	Normal Cubic Meter
NO _x	Oxides of Nitrogen
NRW	Natural Resources Wales
NTS	National Transmission System
NVZ	Nitrate Vulnerability Zones
O ₂	Oxygen
OEM	Original Equipment Manufacturer
OTNOC	Other Than Normal Operating Conditions
PAH	Polycyclic Aromatic Hydrocarbons
PC	Process Contributions
PCB	Polychlorinated Biphenyls
PCC	Post-combustion Carbon Capture
PdM	Predictive Maintenance
PFA	Paraformaldehyde
PEIR	Preliminary Environmental Information Report
PM	Preventive Maintenance
RAMS	Risk Assessment and Method Statement
SAC	Special Area of Conservation
SAP	Systems, Applications, Products
SCR	Selective Catalytic Reduction
SECR	Streamlined Energy and Carbon Reporting
SO _x	Sulphur Oxides
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
ST	Steam turbine

Abbreviation	Term
SuDS	Sustainable Drainage Systems
SVOC	Semi-Volatile Organic Compounds
TBC	To Be Confirmed
Te/Yr	Temperature Element per Year
T&S	Transport and Storage
TPH	Total Petroleum Hydrocarbons
UK	United Kingdom
VOC	Volatile Organic Compounds
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WTP	Waste Water Treatment Plant

1. Introduction

1.1 Context

This report has been prepared by AECOM Limited ('AECOM') on behalf of Uniper UK Limited, referred to as 'the Operator', in support of the new bespoke Environmental Permit application for the proposed Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture Plant (CCP) ("Proposed Installation").

The purpose of this report is to provide a Non-Technical Summary (NTS) for the application which provides a high-level overview of the Proposed Installation. It has been developed to accord with the Natural Resource Wales (NRW) guidance on "Information Needed in an Installations Environmental Permit Application".

This application is made in connection with the application for a Development Consent Order (DCO) (Application Reference EN010166) that is being submitted for the construction, operation and maintenance of the Proposed Installation. The Environmental Statement for the DCO Application is provided for information with the application.

The application has been prepared using concept engineering information provided by the Operator related to the initial design parameters of the Proposed Installation, available information about the local environment, and the required BAT standards. The project is currently undergoing Front End Engineering Design (FEED) with two potential Technology Licensors and as such the EP Application adopts a methodology consistent with the 'Rochdale Envelope' approach used in the DCO application. Therefore, where possible, conservative or worst-case assumptions are used within the application, including information and assessment of two different Technology Licensors, 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 the final selected technology 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

The design of the Proposed Installation is subject to ongoing technical studies, to provide flexibility and to align with the current grid connection, but it is expected to comprise the development of up to two CCGT units achieving a net electrical output capacity of up to 1,380 megawatts (MW; referred to as MWe for electrical output) (with CCP operational) onto the national electricity transmission network.

The Proposed Installation will generate electricity from combustion of natural gas within a CCGT. Hot exhaust gas from the combustion process will be used to drive the gas turbine (GT), and steam which will be generated from the heat of the exhaust gas, in the heat recovery steam generator (HRSG), will be used to drive the steam turbine (ST). The exhaust gas will then pass through pre-treatment stages, including selective catalytic reduction (SCR) using ammonia (NH₃) to reduce oxides of nitrogen (NO_x) in the gas and be subsequently cooled via a direct contact cooler (DCC), in the CCP. The CCP will use an amine-based solvent to absorb carbon dioxide (CO₂) from the exhaust gas within a packed column (absorber), via a weak acid-base reaction. The CO₂-depleted exhaust gas then passes through water and acid wash sections and is released to atmosphere via a stack. Continuous Emissions Monitoring System (CEMs) equipment will be located within the stack to monitor pollutants to air.

The CO₂-rich solvent exits the absorber, and passes through a lean/rich heat exchanger, and then into the desorber. The CO₂ is liberated from the solvent by heat, supplied by low pressure steam from the HRSG in normal operation. This steam is supplied to the desorber reboiler. The now lean/rich solvent will be recirculated within the plant. The CO₂ rich vapour exits the top of the desorber, and passes through a reflux stage to maximise solvent-CO₂ separation. The CO₂ vapour is conditioned to reduce water and oxygen to transport and storage network's specifications after entering a low pressure compressor to compress the gas to export pipeline pressure (8-43 Bara). The CO₂ is then metered and

exported to transport and storage network's CO₂ pipeline which is operated by ENI. The solvent will accumulate impurities over time, and these will be removed via a solvent reclaiming process which will be a thermal process, either continuously via a slipstream or as a batch process.

The CCP emissions will be residual pollutants from the combustion and treatment processes, including NO_x, NH₃ and carbon monoxide (CO). The CCP will be designed to capture a minimum of 95% of the CO₂ emissions from the CCP as an annual average of all normal operating conditions. There may also be trace pollutants within the flue gas, including trace levels of solvent and solvent break-down products from within the process. Emissions will be minimised using the water and acid wash steps on the absorber and monitored at the emission point within the abated flue gas stack prior to release. In addition to the CCP emission point, there will be an intermittent-use emission point from the stack, serving the HRSG exhaust. Emissions from the CCP emissions stack, and HRSG stack will meet the emission limits for LCP under the Industrial Emissions Directive.

Other supporting infrastructure and plant to the Proposed Installation will include the storage of solvent, caustic soda, sulphuric acid and water-treatment chemicals, demineralisation water treatment plant to produce high-purity water for use in boilers, blending, closed loop cooling and other processes. It will include an electric auxiliary boiler for start-up and dispatchability support, emergency diesel generators for safe shutdown during a power failure scenario, closed surface water drainage and appropriate treatment facilities, and infrastructure for natural gas import and conditioning and CO₂ conditioning and export. The number and thermal rating of the emergency generator(s) will be determined during detailed design and will be classed as medium combustion plant (MCP).

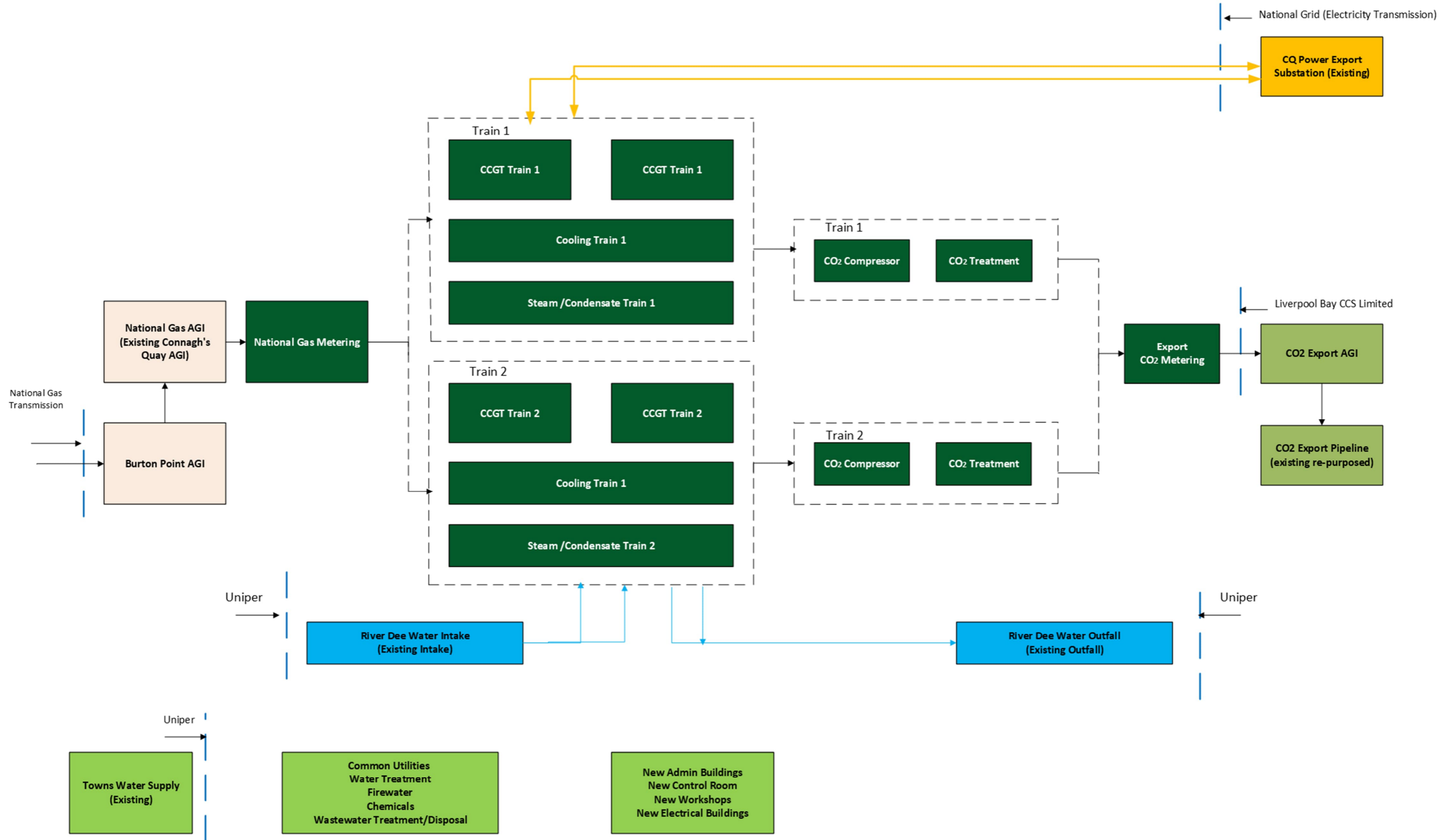
The Proposed Installation will also be supported by natural gas supply, existing potable water supply, existing water abstraction and discharge, electrical connections, utilities, access works and CO₂ export connection. The water abstraction for the Proposed Installation's cooling system will be in line with the extraction at the existing Connah's Quay Power Station and is not expected to exceed the current abstraction permit requirements. Process water and/or wastewater from the site will also be discharged to the existing Connah's Quay Power Station lagoon before being purged into the River Dee.

The Proposed Installation will make use of CO₂ transport and storage networks owned and operated by Liverpool Bay CCS Limited, currently under development as part of the HyNet Carbon Dioxide Pipeline Project (referred to as the 'HyNet CO₂ Pipeline Project'), which will transport CO₂ captured from existing and new industries in North Wales and North-West England, as well as from new hydrogen production facilities that are proposed as part of HyNet North West Project. The captured CO₂ will be stored in depleted offshore gas reservoirs in Liverpool Bay.

The Proposed Installation will be designed to optimise the capture of CO₂ when operating in dispatchable mode, while minimising emissions and waste generation and maximising energy efficiency. BAT assessments have been prepared to demonstrate the Proposed Installation will be designed and operated in accordance with BAT for Large Combustion Plant (LCP), Energy Efficiency (EE), Post-Combustion Carbon Capture (PCC) plant design and Cooling.

A high-level process flow diagram for the Installation is provided in Plate 1 below.

Plate 1. Proposed Process Schematic



The Proposed Installation will be designed to optimise the capture of carbon dioxide from the power station operating in dispatchable mode, while minimising emissions and waste generation and maximising energy efficiency. While individual BAT assessments have been prepared to address best available techniques for Large Combustion Plant, Energy Efficiency, Post-Combustion Carbon Capture plant design and cooling, the system will be integrated to address multimedia effects across the Proposed Installation as a whole.

2. Application Summary

2.1 Site Location and Current Condition

The address of the Proposed Installation is:

Connah's Quay Power Station
Kelsterton Road
Connah's Quay
Deeside
Flintshire
CH5 4BP

The Proposed Installation is centred at grid reference SJ 27347 71374 and located approximately 1.8 kilometres ('km') north-west of the Connah's Quay city centre, in Flintshire, north-east Wales.

The Proposed Installation covers an area of approximately 36.2 hectares (ha). The existing Connah's Quay Power Station is located to the south-east and agricultural fields to the north-west. The installation boundary is shown on Figure 2 (Permit Application, Volume IV).

The Proposed Installation is also bordered to:

- the east and south-east by the existing National Grid 400 kilovolt ('kV') Deeside Substation;
- the south and south-west by the North Wales Main Line railway;
- to the south and south-west is land predominantly rural in nature, with interspersed residential properties and agricultural land;
- to the north and north-east by the River Dee and its Estuary, including peripheral floodplain marshland.

The site has flat, low-lying coastal topography with typical ground levels ranging between approximately 6 to 8 metres (m) Above Ordnance Datum (AOD).

The Dee Estuary is designated as a Ramsar site, Special Area of Conservation (SAC) (River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid SAC), Special Protection Area (SPA) (Dee Estuary / Aber Afon Dyfrdwy SPA) and Site of Special Scientific Interest (SSSI) (Afon Dyfrdwy (River Dee) SSSI) due to its size and topography, its assemblage of diverse marine, coastal, and intertidal habitats, and its importance for passage and wintering waterfowl and intertidal plant species.

The nearest residential receptors to the site are located along Kelsterton Road, with the closest receptor being approximately 20 m from the site.

A Site Condition Report (SCR) (Document Reference: CQ-WPCC15718-APP-SCR) is provided in Environmental Permit Application, Volume III, Appendix A. The SCR sets out to record the current condition of the site, gives a description of the substances that will be present on-site as part of the facility and assesses the likelihood of emissions to ground and groundwater occurring during the operation of the facility. The SCR identified the potential for contamination to present at elevated concentrations which may pose harm to receptors because of the type of land use (heavy industrial and landfilling) undertaken at the Site. However, generally the likelihood of the linkage being realised was mainly assigned as low rating. The overall risk rating of low to moderate is not uncommon for industrial and brownfield sites.

2.2 The Operator

The Proposed Installation will be operated by Uniper UK Limited.

The Operator is a UK-based company, wholly owned by Uniper SE (Uniper) through Uniper Holding GmbH.

Uniper is a European energy company with global reach and operations in more than 40 countries. It has about 7,500 employees and plays a key role in ensuring a secure energy supply in Europe, particularly in its core markets of Germany, the United Kingdom, Sweden, and the Netherlands. Uniper's 14 gigawatts of flexible power generating capacity make it a mainstay of reliable power production. Uniper is a leading gas trader and one of Northwestern Europe's most important LNG importers, and its broad procurement portfolio enhances supply security.

Uniper is committed to investing around €8 billion (~£6.9 billion) in growth and transformation projects between 2023 until the early 2030s. This includes developing new renewables projects, investing in renewable and low-carbon gases such as hydrogen, and new CCS or hydrogen ready power plants and by progressively transforming its existing fleet into Europe's leading source of decarbonised power. Together, these steps will enable the Uniper Group's Scope 1, 2, and 3 emissions to be carbon-neutral by 2040¹.

In the UK, Uniper owns and operates a flexible generation portfolio of six power stations, a fast-cycle gas storage facility, two high pressure gas pipelines, and regasification capacity at the Grain LNG terminal in Kent. Uniper makes its power production available to the market through its trading activities and provides balancing customised services to the UK system operator. Uniper are also progressing CCS and hydrogen projects, and expanding our onshore wind and solar portfolio, to further support energy security in the UK.

The design of the Proposed Installation demonstrates Uniper's commitment to deliver on its aim to accelerate the transition to a decarbonised future. The Proposed Installation will be built with a clear route to decarbonisation, being equipped with post-combustion carbon capture technology, consistent with Uniper's commitments to low-carbon power. It is intended that the Proposed Installation will connect to infrastructure that will be delivered by the Hynet Cluster for the transport and offshore geological storage of carbon dioxide.

2.3 Management Arrangements

The site will be operated under an ISO14001 certified Environmental Management System (EMS). The EMS will include operating procedures to manage the various aspects of the operation of the plant, including but not limited to emissions monitoring, accident management, waste minimisation, resource 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.

The site is anticipated to 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.

Full details of the proposed management system are provided in Environmental Permit Application, Volume II, Section 3 of the Supporting Statement (Document Reference: CQ-WPCC1571-/APP-SS) and a copy of the ISO 14001 certificate is provided in Environmental Permit Application, Volume III, Appendix B.

¹ Group wide scope for 1, 2 and 3 emissions including offsetting, where economically viable. Scope 1 and 2 emissions are heading towards neutrality by 2040 as part of the EU Emissions Trading System (EU ETS). Scope 3 emissions will decrease in time with market developments, customer behaviour and political goals.

2.4 The Process

The design of the Proposed Installation has just commenced the FEED stage with two technology licensors undertaking FEED design. The description of the anticipated process for the Proposed Installation has taken a technology neutral approach where design is largely based on pre-FEED information and providing additional detail on key differences between the Technology Licensors approach where FEED information is available.

The Proposed Installation will generate electricity from combustion of natural gas within a CCGT, using hot gas from the combustion process to drive the gas turbine (GT), and steam generated from the heat of the hot gas, in the heat recovery steam generator (HRSG), which is used to drive the steam turbine (ST)

Exhaust gases from the CCGT process will be treated through a selective catalytic reduction (SCR) process to reduce emissions NO_x. The flue gas is then cooled before entering an amine based CCP which enables CO₂ from the flue gas stream to be removed using chemical absorption (absorber). The CO₂-rich solvent is then passed to a heat exchange process to separate the CO₂ from the solvent (desorber) and the CO₂ is compressed to pipeline export pressure and is then conditioned to remove the remaining oxygen and water to meet pipeline specification. CO₂ will then be exported from site.

A slipstream of solvent from the desorber will be passed through a thermal reclamation process (batch or continuous) to remove degradation products and recover solvent which is passed back to the solvent storage tank for reuse in the process.

The steam exhausting from the ST and CCP will be cooled and condensed. The condensation of steam exiting the ST will be achieved using a separate circuit of cooling water that will be recirculated through mechanical draught hybrid cooling towers. Cooling water will be sourced via the existing licensed abstraction at the existing power plant and purge discharge will utilise the existing purge storage ponds prior to discharge at the existing permitted W1 discharge point. No changes are proposed to the current abstraction or discharge conditions.

Full details of the Proposed Installation's technology and processes are provided in Environmental Permit Variation, Volume II, Section 4 of the Supporting Statement (Document Reference: CQ-WPCC15718-APP-SS).

2.5 Best Available Techniques

The design and operation of the Proposed Installation is intended to meet the indicative requirements of Best Available Techniques (BAT) as defined for large combustion plant, energy efficiency, industrial cooling systems and emerging techniques for post combustion carbon capture. The BAT standards used for the assessment are described in full in Environmental Permit Application, Volume III, Appendix C which is made up of:

- Appendix C1 - Best Available Techniques for Large Combustion Plant (LCP) (Document Reference: CQ-WPCC15718-APP-BAT1-LCP);
- Appendix C2 - Best Available Techniques for Post-Combustion Carbon Capture (PCC) (Document Reference: CQ-WPCC15718-APP-BAT2-PCC);
- Appendix C3 – Best Available Techniques for Energy Efficiency (Document Reference: CQ-WPCC15718-APP-BAT3-EE); and
- Appendix C4 – Best Available Techniques for Cooling (Document Reference: CQ-WPCC15718-APP-BAT4-COOL).

2.6 Monitoring Arrangements

The Proposed Installation will implement a structured approach to monitoring in accordance with BAT standards and which will include:

- Infrastructure inspection and monitoring via planned preventative maintenance;

- Process monitoring and control via a Distributed Control System (DCS); and
- Environmental monitoring of emissions to air and water using continuous and periodic monitoring in accordance with defined monitoring standards. The CEMS will be subject to regular controlled testing by means of an annual calibration test in accordance with the relevant British Standard (BS EN 14181). This will be undertaken by an approved organisation accredited to BS EN ISO 17025.

Full details of the proposed monitoring arrangements are provided in Environmental Permit Application, Volume II, Section 6 of the Supporting Statement (Document Reference: CQ-WPCC15718/APP/SS).

2.7 Environmental Emissions

Full details of the emissions from the Proposed Installation and associated mitigation and management techniques are provided in Sections 4 and 5 of the Supporting Statement (Document Reference: WPCC15718/APP/SS) in Environmental Permit Application, Volume II.

2.7.1 Point Source Releases to Air

The main point source releases to air during normal operations (abated mode) are the 145m high CPP absorber stack (one per Train) from both the combustion and carbon capture processes as the exhaust gas from the CCGT plant will pass directly into the capture plant for CO₂ removal during abated mode. The main emissions will comprise the combustion gases NO_x and carbon monoxide (CO) from the CCGT, ammonia slip from the SCR and amine and their degradation products from the CCP.

There would also be a HRSG stack (one per Train) which would be operational when the Proposed Installation is operating in unabated mode (combustion emissions only, no carbon capture taking place). This mode of operation is estimated to be <5% of the year.

The Proposed Installation has been designed to ensure that the emissions from the process will comply with the IED Emission Limit Values (ELV), the BAT conclusions for LCP and will not result in local air quality exceeding national air quality objectives.

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 NRW guidance. The assessment included dispersion modelling of minimum stack heights and the worst-case layout of the Proposed Installation in relation to receptors. The air quality assessment (Document Reference: CQ-WPCC15718-APP-AQA) is attached as Environmental Permit Application, Volume III, Appendix G .

2.7.2 Fugitive Releases to Air

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. Risks associated with fugitive emissions to air have been summarised along with the proposed controls and mitigations in the Qualitative Environmental Risk Assessment (ERA) (Document Reference: CQ-WPCC15718-APP-ERA). The ERA is attached in Appendix E in Environmental Permit Application, Volume III.

2.7.3 Point Source Releases to Water

Point source releases to water from the Proposed Installation include:

- Clean surface water which is not classed as effluent and that can be discharged with minimal treatment through a new discharge point (W4) in line with current discharge limits for W2 and W3 in the permit (EPR/NP3037AF) for the existing power plant;
- Cooling purge water from the cooling system which after testing will be sent to the existing purge storage pond prior to discharge via existing discharge point W1 in line with the current discharge limits in EPR/NP3037AF;
- Process water (non-amine contaminated) from the CCGT and CCP processes will be treated through a wastewater treatment process and recirculated for reuse in the plant. Process water

which can't be recirculated will, following testing, be sent to the SDX tank prior to discharge via existing discharge point W1 in line with the current discharge limits in EPR/NP3037AF;

- Black and grey wastewater (non-cooling and non-process) including foul drainage from permanent welfare facilities, will be directed to an underground septic tank for storage and settling. The treated black and grey wastewater will then either be discharged to the River Dee with main cooling water purge discharge at W1 or to be removed by specialist contractors.

A temporary on-site wastewater treatment system, comprising a Moving Bed Biofilm Reactor (MBBR), will be installed at the start of construction to treat black and grey wastewater prior to discharge. This will ensure that untreated sewage is not discharged. Treated effluent will be discharged via the existing permitted outfall (W1) with the main cooling water purge to the River Dee, in accordance with permit (EPR/NP3037AF) conditions. Amine contaminated process water from the CCP or contaminated surface water from process areas will be removed from site via tanker for off-site disposal at a suitably permitted waste facility.

There are no emissions to sewer or ground water expected from the Proposed Installation.

2.7.4 Fugitive Releases to Water

Potential fugitive emissions to water will be minimal and are expected to be from operational accidental spillages, leaks and potential runoff of hazardous fire-fighting chemicals. Potential impacts associated with the accidental spillage of polluting materials during the operational phase will be mitigated by way of planned preventative maintenance.

Risks associated with fugitive emissions to water have been summarised along with the proposed controls and mitigations in the Qualitative Environmental Risk Assessment (Document Reference: CQ-WPCC15718-APP-ERA). The ERA is attached in Appendix E in Environmental Permit Application, Volume III.

2.7.5 Releases to Land

All areas on site, with the exception of any landscaped areas (which will be located away from process areas), will be covered in hardstanding and therefore no direct emissions to land will occur as a result of the operation of the Proposed Installation.

2.7.6 Odour

The Proposed Installation is not expected to be a significant source of odour emissions, due to the contained nature of the process system. However, with all such systems, there is the risk of fugitive emissions from potential leaks and/or accidents. Storage of NH₃ for the SCR plant, and storage and use of amines with CCP may have the potential to generate odour if accidental releases occur. To minimise the potential for odour to occur, fixed roof storage tanks will be used and the site will implement a Leak Detection and Repair (LDAR) plan.

Any reports of odour will be logged and complaints to the site investigated.

2.7.7 Noise

The potential noise sources on site include:

- Motors, pumps and drives;
- Fans from the cooling system; and
- Vent stacks.

A Noise Impact Assessment (Document Reference: CQ-WPCC15718-APP-NIA) has been completed and is presented in Appendix I of Environmental Permit Application, Volume III. A Noise Management Plan (Document Reference: CQ-WPCC15718-APP-NMP) is presented at Appendix J in Environmental Permit Application, Volume III.

2.8 Environmental Impacts

The environmental emissions from the Proposed Installation have been evaluated for potential impact on sensitive receptors through the following assessments:

- Environmental Permit Application, Volume III - Appendix E Qualitative Environmental Risk Assessment (Document Reference: CQ-WPCC15718-APP-ERA)
- Environmental Permit Application, Volume II - Appendix F H1 Assessment
- Environmental Permit Application, Volume II - Appendix G Air Quality Assessment (Document Reference: CQ-WPCC15718-APP-AQA)
- Environmental Permit Application, Volume II - Appendix I Noise Assessment (Document Reference: CQ-WPCC15718-APP-NIA)

2.8.1 Qualitative ERA

The Qualitative ERA (Document Reference: CQ-WPCC15718-APP-ERA) was completed in accordance with NRW's "How to Carry Out a Risk Assessment for an Environmental Permit" Guidance. The ERA evaluated the impacts associated with:

- Fugitive releases to air, land and water including amenity risks and odour;
- Accidents, abnormal operations and fire risk; and
- Evaluated the potential impact from climate change.

The risk assessments also presented the proposed control and mitigation measures that will be implemented at the Proposed Installation.

The assessment concluded that providing the proposed controls and mitigation measures are in place to reduce the likelihood and impact of the identified risks there should be no significant impact on sensitive receptors.

2.8.2 H1 Assessment

H1 is a screening tool used by the regulators to evaluate if detailed modelling assessments are required. The screening assessment was completed for the abated and unabated operations for both Technology Licensor No 1 and No 2 and showed that short term impacts of NO_x and formaldehyde along with long-term impacts of ammonia and nitrosamines could not be screened as insignificant. Therefore, a detailed dispersion assessment was required.

2.8.3 Air Quality Assessment

Detailed dispersion modelling has been used to calculate the concentration of pollutants at identified sensitive receptors and these have been compared with National Air Quality Strategy objectives, and Critical Levels and Critical Loads for ecosystems.

The assessment assumed that the Proposed Installation operates continuously (24 hours a day for 365 days a year) as this is considered to represent the reasonable worst case scenario in terms of the annual average operational emissions. The assessment evaluated four scenarios:

- operation of two CCGT Trains in unabated mode with the Front End Engineering Design (FEED) 1 Design, referred to as the "Unabated FEED 1 scenario". In this mode emissions would occur via the Heat Recovery Steam Generator (HRSG) stacks (abnormal temporary operating scenario e.g. periods when the CO₂ transport and storage system is not available);
- operation of two CCGT Trains in unabated mode with the FEED 2 Design, referred to as the "Unabated FEED 2 scenario". In this mode emissions would occur via the Heat Recovery Steam Generator (HRSG) stacks (abnormal temporary operating scenario e.g. periods when the CO₂ transport and storage system is not available);

- operation of two CCGT Trains with Absorber trains for Carbon Capture with the FEED 1 Design, referred to as the "Abated FEED 1 scenario". In this mode emissions would occur via the Absorber stacks; and
- operation of two CCGT Trains with Absorber trains for Carbon Capture with the FEED 2 Design, referred to as the "Abated FEED 2 scenario". In this mode emissions would occur via the Absorber stacks.

The air quality assessment assumed that the ELVs would be met for the operational Proposed Installation as required under the IED and in accordance with use of BAT under the Environmental Permitting Regime. The assessment showed:

- For the FEED 1 and FEED 2 abated scenarios, the predicted annual average and short-term impacts at all human health receptors can be screened out from the need for further assessment. In the case of N-Amine, impacts of greater than 1% of the NDMA EAL are predicted at discrete receptors, however the predicted environmental concentrations in most cases are below 70% of the environmental assessment levels and can therefore be screened out from the need for further assessment.
- For the unabated scenario, the predicted annual average and short-term impacts at all human health receptors can be screened out from the need for further assessment.
- A precautionary assessment on sensitive ecological receptors, based on the worst-case scenario, concludes that overall, the impacts of the development on local ecological sites are very limited and below screening thresholds at the majority of these sites. Where long-term impacts are above the threshold, they comprise a low proportion of the Environmental Standard (less than 2%) and any exceedances of the Environmental Standard are dominated by background sources. Where short-term impacts exceed the screening threshold they remain below the Environmental Standard by a significant margin. Taking into account the numerous worst-case assumptions used in the assessment, it is reasonable to conclude that the air quality impacts will not have significant effects on the local ecological sites.
- An assessment of stack height has demonstrated that a release height of 145 m for the absorber stacks and 120m to 130m above ground level for the HRSG stacks is predicted to provide a sufficient degree of dispersion such that ground level PCs are below NRW's significance screening criteria for long term and short-term health impacts .

2.8.4 Noise Impact

The BS 4142 assessment has considered the sound during the common overnight operational mode of the existing Power Station, the Proposed Installation and the combined existing Power Station and Proposed Installation.

The initial BS 4142 assessment suggests a significant adverse impact for the Proposed Installation, when the local context is considered it suggests the Proposed Installation would have an impact broadly comparable to that which has arisen from operation of the existing Power Station.

In the context of an ambient sound climate influenced by road traffic, sound from various operational states of the existing Power Station has not given rise to public complaint recently and a broadly similar outcome could be expected for the Proposed Installation.

Overall, as proposed in the DCO ES, it is considered that the site context means that sound from the Proposed Installation, could potentially result in an adverse, but not significant impact on nearby NSRs.

An initial Noise Management Plan (Document Reference: CQ-WPCC15718-APP-NMP) has been included in Appendix J of Environmental Permit Application, Volume III. Furthermore, during detailed design, an operational noise control scheme (including noise limits where agreed with the local authority) will be prepared and secured by a Requirement of the draft DCO

2.9 Resource Management

Full details of the resource management arrangements are provided in Section 4.4 of the Supporting Statement (Document Reference: CQ-WPCC15718-APP-SS) in Environmental Permit Application, Volume II.

1.3.1. Water

Water will be required for multiple purposes on the CCGT and CCP of differing degrees of water quality.

- Potable water will be required for multiple purposes including domestic and sanitary uses, firewater uses, and feed for a demineralisation plant.
- Demineralisation processes will be used to remove dissolved solids and other impurities present so to achieve the required quality to be used as process water and as make-up water for the HP steam/water cycle
- Cooling water required for the Proposed Installation will be sourced from the existing cooling water supply abstracted from the River Dee, via a new make-up connection pipe to the existing cooling water settling pond.

The Proposed Installation will be equipped with a wastewater treatment plant to treat process water and recirculate back to the demineralization plants as raw feed water or for other process reuse thus minimizing water use.

2.9.1 Raw Materials

Raw materials used at the facility will be periodically reviewed to ensure that they are all appropriate for use and that consumption is optimised.

All raw materials will be stored in appropriate containers/tanks depending on their classification. All hazardous materials will be stored safely to avoid contamination.

2.9.2 Waste

Waste minimisation, in relation to use of raw materials such as solvents, has been included in the design process to promote efficient use of raw materials.

All waste generated at the Proposed Installation will be managed in line with the waste hierarchy and disposed of by licensed waste contractors where necessary in accordance with existing Uniper procedures and waste contracts.

2.9.3 Energy

The final plant design will be subject to detailed design by the FEED contractors, who have confirmed that the net output will be up to 1,380 MWe.

The main energy input to the Proposed Installation will be natural gas as fuel to the CCGT plant. Natural gas will be supplied by the existing connection to National Gas' National Transmission System (NTS). The supply will be branched to provide separate supply pipelines to the existing Connah's Quay Power Plant and one to the Proposed Installation. Each supply branch will be metered separately so that energy consumption can be monitored.

A back-up generator (s) will be used onsite at times of grid outage and maintenance. These will be fueled by diesel and/or HVO. Details of the generator (s) have yet to be finalized but are anticipated to be at least 6 MWth input and classed as Medium Combustion Plant (MCP).

The total internal electricity auxiliary (parasitic) load of the Proposed Installation is estimated to be 100 -150 MWe per hour depending on the final technology selection and will be drawn from energy generated by the CCGT.

Techniques to manage and improve energy efficiency will include integrating energy efficiency in the design, operation and control of the plant with an automated process control system and effective planned preventative maintenance.

2.10 Decommissioning and Closure

A plan for appropriate decommissioning and closure of the Proposed Installation at the end of its operating life will be developed by the operator. The plan will ensure that the site is returned to the baseline condition.

Decommissioning would be undertaken safely, in line with specific procedures and subject to risk assessment and permit to work schemes, and with regard to the environmental legislation at the time of decommissioning. The required licences and permits would also be acquired.

3. Application Type

This application is for a new bespoke environmental permit for a gas-fired electricity generating station (power station) with post combustion carbon capture plant. The application is made under the Environmental Permitting (England and Wales) Regulations 2016, as amended and has been prepared as a bespoke application.

It was confirmed during pre-application discussions with Natural Resource Wales (NRW), that the application will include the listed activities and directly associated activities as shown in Table 1 below:

Table 1 Listed Activities and Directly Associate Activities

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A1	Section 1.1 A(1) (a): Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more	Operation of two CCGT plants, each comprising one gas turbine, fired on natural gas, with a Heat Recovery Steam Generator (HRSG), steam turbine and generators for the production of electricity Emergency backup generator.	Combustion of natural gas in a CCGT. From receipt of natural gas to discharge of exhaust gases and wastes, raw materials to and supply of electricity, and from water intake to water discharge. Permitted to operate in single or double two-shifting mode. From fuel supply to the generator to flue gas emissions
A2	Schedule 1, Part 1, Chapter 6, Section 6.10, Part A Carbon capture and storage: Capture of carbon dioxide streams from an installation for the purposes of geological storage.	Operation of a carbon capture plant involving the treatment of exhaust gas from the HRSG into the capture plant using an amine-based solvent to extract CO ₂ followed by compression, oxygen removal and dehydration of the CO ₂ for off-site transportation and long-term storage, and release of CO ₂ -abated flue gas to atmosphere.	From receipt of exhaust gases from the HRSG in the carbon capture plant to the treatment of exhaust gas prior to export of CO ₂ from the installation or release to atmosphere of CO ₂ .

Directly Associated Activity

A3	Directly Associated Activity	Surface water drainage. Handling and storage of site drainage until discharge to the site surface water system.	Generation and handling of water to the point of discharge into the current final discharge lagoon.
A4	Directly Associated Activity	Raw water treatment, storage and delivery. De-ionising and/or other treatment of cooling water	From receipt of abstracted water to point of use, handling, to dispatch to cooling water purge system.
A5	Directly Associated Activity	Raw materials handling and storage - receipt, storage and handling of amine solvent, water treatment chemicals, ammonia, fuel and lubricating oils, turbine cleaning chemicals and all other raw materials.	From receipt of raw materials to their point of use.
A6	Directly Associated Activity	Solvent reclaiming or regeneration	TBC

Activity Ref No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A7	Directly Associated Activity	Operation of a Wastewater Treatment Plant. Treatment of wastewater (e.g. cooling water, etc)	From receipt of effluent from process to the point of release to discharge point.
A8	Directly Associated Activity	Effluent Discharge. Discharge to existing final discharge lagoon of cooling water blow-down, steam condensate, and treated direct contact cooler effluent.	From release of effluents from process and/or wastewater treatment plant to discharge at emission point W1 into the lagoon.
A9	Directly Associated Activity	Waste Management. Waste generation and handling.	From generation of waste to dispatch from the installation.
A10	Directly Associated Activity	Operation of electrical transformers to support the installation. Generator step-up transformer: one per generating unit. Station transformers: multiple smaller units for local distribution. Unit auxiliary transformer: one per generating unit supplying auxiliaries.	Transformers and associated equipment contain insulating oil and potentially gas insulation stored within secondary containment systems sized to hold at least 110% of the largest volume Operation maintained within manufacturer's limits for voltage, load, and temperature Regular inspections and maintenance to prevent oil or gas leaks or spills
A11	Directly Associated Activity	Electric auxiliary boiler providing steam/heat for use within the CCP.	TBC

4. Structure of Application

The application pack is structured as follows:

Table 2. Application Structure

Application Section	Subsection	Document Name	Document Reference
Volume I	Application Forms	Part A Form	-
		Part B2 Form	-
		Part B3 Form	-
		Part F1 Form	-
	NTS	Non-Technical Summary	CQ-WPCC15718-APP-NTS
Volume II	SS	Supporting Statement	CQ-WPCC15718-APP-SS
Volume III	Appendix A	Site Condition Report	CQ-WPCC15718-APP-SCR
	Appendix B	Management System Certificates	-
	Appendix C	Assessment of Best Available Techniques for Large Combustion Plan	CQ-WPCC15718-APP-BAT1-LCP
		Assessment of Best Available Techniques for Post-Combustion Carbon Capture	CQ-WPCC15718-APP-BAT2-CCP
		Assessment of Best Available Techniques for Energy Efficiency	CQ-WPCC15718-APP-BAT3-EE
		Assessment of Best Available Techniques for Cooling	CQ-WPCC15718-APP-BAT4-COOL
	Appendix D	Material Safety Data Sheets	-
	Appendix E	Qualitative Environmental Risk Assessment	CQ-WPCC15718-APP-ERA
	Appendix F	H1 Screening	-
	Appendix G	Air Quality Assessment	CQ-WPCC15718-APP-AQA
	Appendix H	CO ₂ Management Plan	CQ-WPCC15718-APP-CO2MP
Appendix I	Noise Impact Assessment	CQ-WPCC15718-APP-NIA	
Appendix J	Noise Management Plan	CQ-WPCC15718-APP-NMP	

Application Section	Subsection	Document Name	Document Reference
	Appendix K	CHP Readiness Statement	EN010166/APP/7.5
Volume IV	Drawings and Plans	Site Location Plan	Figure 1
		Installation Boundary	Figure 2
		Site Layout	Figure 3-1 and 3-2
		Emission Point Plan	Figure 4-1 and 4-2
		Human Health Receptor Plan	Figure 5
		Ecological receptor Plan	Figure 6
		Block Flow Diagram Licensor 1	Figure 7
		Block Flow Diagram Licensor 2	Figure 8
		Drainage Philosophy Licensor 1	Figure 9
		Drainage Philosophy Licensor 2	Figure 10
		Existing Connah's Quay Installation Boundary	Figure 11
		Indicative Phased Changes to Proposed Installation Boundary	Figure 12

