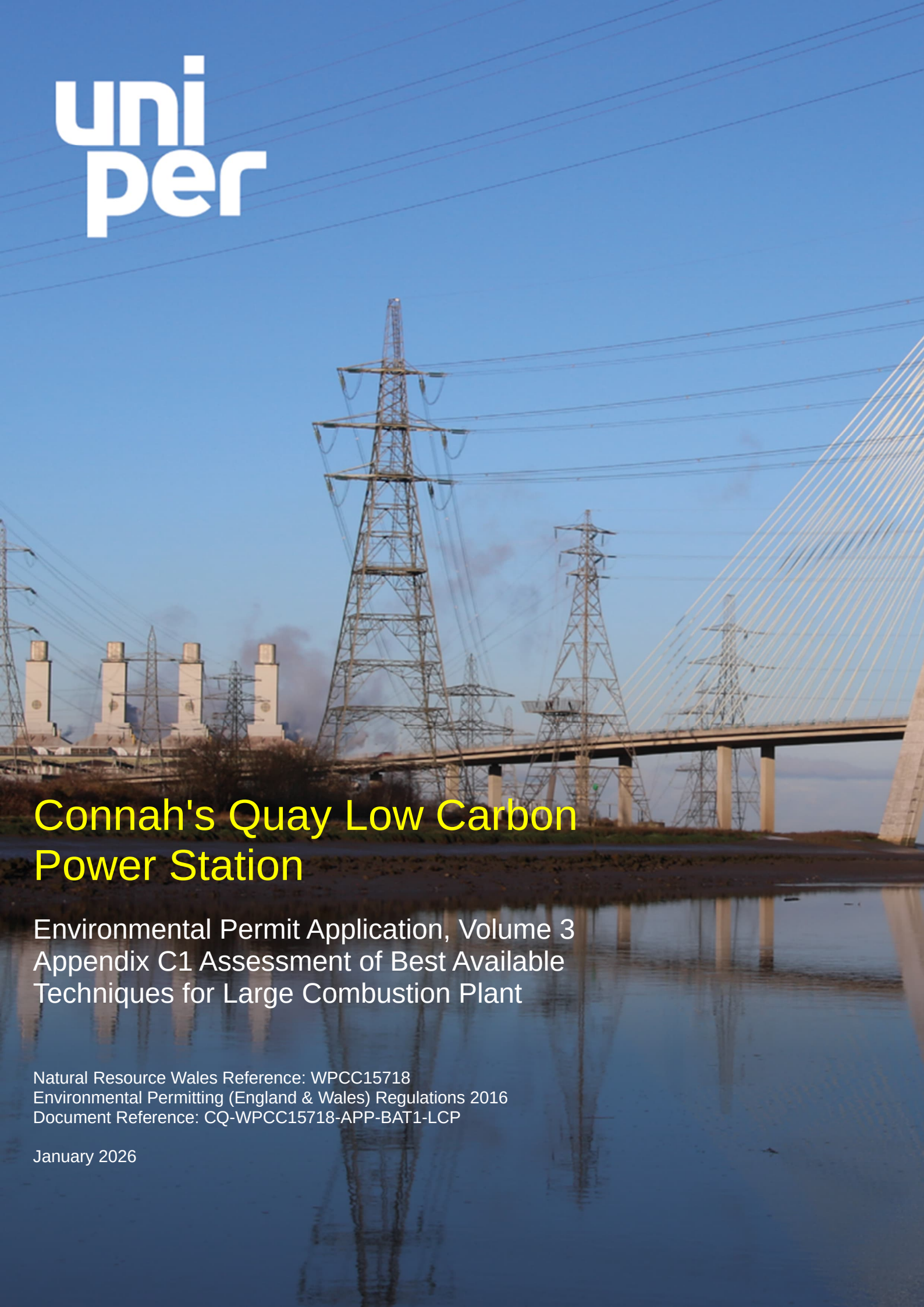

Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 3 Appendix C1 Assessment of Best Available Techniques for Large Combustion Plant

Natural Resource Wales Reference: WPCC15718
Environmental Permitting (England & Wales) Regulations 2016
Document Reference: CQ-WPCC15718-APP-BAT1-LCP

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Table of Contents

Figures

No table of figures entries found.

Tables

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
DCC	Direct Contact Cooling
DCO	Development Consent Order
DCS	Distributed Control System
DLN	Dry Low-Nox

Abbreviation	Term
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	
g	Gram
GC	Gas Chromatograph
GIS	Geographic Information System
GMIs	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
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
LWS	Local Wildlife Sites
m	Meters
m^3	Cubic Meter
MCERTs	Monitoring Certification Scheme
MCP	Medium Combustion Plant

Abbreviation	Term
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
NOx	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
SOx	Sulphur Oxides
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
ST	Steam turbine
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

Abbreviation	Term
VOC	Volatile Organic Compounds
WEEE	Waste Electrical and Electronic Equipment
WFD	Water Framework Directive
WWTP	Waste Water Treatment Plant

1. Report Context

1.1 Introduction

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

The purpose of this report is to demonstrate that the Proposed Installation will be designed and operated in accordance with best available techniques (BAT) for Large Combustion Plant (LCP).

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 (NH_3) to reduce oxides of nitrogen (NOx) 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 (CO_2) from the exhaust gas within a packed column (absorber), via a weak acid-base reaction. The CO_2-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 CO_2-rich solvent exits the absorber, and passes through a lean/rich heat exchanger, and then into the desorber. The CO_2 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 CO_2 rich vapour exits the top of the desorber, and passes through a reflux stage to maximise solvent-CO_2 separation. The CO_2 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 CO_2 is then metered and exported to transport and storage network's CO_2 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 NOx, NH_3 and carbon monoxide (CO). The CCP will be designed to capture a minimum of 95% of the CO_2 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 CO_2 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 CO_2 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 CO_2 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 CO_2 Pipeline Project'), which will transport CO_2 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 CO_2 will be stored in depleted offshore gas reservoirs in Liverpool Bay.

A high-level process flow diagram for the Proposed Installation is provided in Volume IV of the permit application.

The Proposed Installation will be designed to optimise the capture of CO_2 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.

1.3 BAT Considerations

This BAT assessment 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 BAT conclusions for Large Combustion Plant (LCP BRef).[1] Where not specifically covered in the LCP BRef consideration has been given to the use of emergency back-up generators (EA BAT Guidance[2] and the standards required for storage of liquids (BRef for Storage)[3].

The main application document ('Supporting Statement') (Document reference: WPCC15718-APP-SS) provides an overall view of the permit application being made for the Proposed Installation. Separate BAT assessments have been prepared for the LCP CCGT technology and operation, Post-Combustion Carbon Capture plant, the Energy Efficiency and for cooling of the Proposed Installation.

This document should be read in conjunction with the Supporting Statement (Document reference: WPCC15718-APP-SS). A detailed description of the operations at the Proposed Installation and how it will be operated is provided in Section 4 of the Supporting Statement and has not been included here to avoid repetition.

As only the CCGT plant falls within the definition of LCP, this document only covers the assessment of the selection and operation of the CCGT plant (without CCP) against the BAT techniques identified in the LCP BRef.

For assessment of BAT for carbon capture, energy efficiency and cooling please refer to the separate assessments:

- BAT Assessment for Post Combustion Carbon Capture (Appendix C2; Document Reference WPCC15718-APP/BAT2-PCC).
- BAT Assessment for Energy Efficiency (Appendix C3; Document Reference: WPCC15718-APP-BAT3-EE).
- BAT Assessment for Cooling (Appendix C4; Document Reference: WPCC15718-APP-BAT4-COOL).

[1] EU Best Available Techniques (BAT) Reference Document for Large Combustion Plants (July 2017)
[2] Environment Agency, August 2023, Emergency Backup Diesel Engines on Installations: Best Available Technique (BAT)
[3] .European Commission (2005). "BRef on Emissions from Storage"

2. Approach to BAT Appraisal

Article 3 (10) of the Industrial Emissions Directive (IED)[4] defines BAT as "the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where not practicable, generally reduce emission and impact on the environment as a whole".

The Directive continues to provide further definition as follows:

- "available techniques" are those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the cost and advantages, whether or not the techniques are used or produced inside the United Kingdom, as long as they are reasonably accessible to the Operator.
- "best techniques" are the most effective in achieving a high general level of protection of the environment as a whole.
- "techniques" are both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

BAT may be demonstrated by either:

- compliance with the sector-level, indicative BAT performance such as Sector Guidance Notes provided by the Environment Agency or in the European Commission 'Reference Documents on BAT' (BRefs) and their associated BAT conclusions; or
- by conducting an installation-specific, options appraisal of candidate techniques.

The indicative BAT provided in the European BRef/BAT Conclusion documents is based on an analysis of the costs and typical benefits for typical, or representative, plants within that sector. When assessing the applicability of the sectoral, indicative BAT standards at the installation level, departures may be justified on the grounds of the technical characteristics of the installation concerned, its geographical location and the local environment.

2.1 Site Specific Consideration of BAT

At this early stage of development from concept to full scale operational plants, and in recognition of the novel technology associated with the CCP, there is a need to apply a 'technology-neutral' approach within the derivation of BAT. This is driven by the combined requirements:

- of the Technology Licensors requiring commercial confidentiality of their process and solvent blend to be maintained;
- to allow the Front-End Engineering Design (FEED) process to progress post consent without limiting options for later technology selections; and
- to determining indicative BAT and BAT Achievable Emission Levels (BAT-AELs) for the plant within this development stage such that they are consentable, taking into account environmental sensitivities and conditions at a particular site, with site-specific BAT assessments for choice of solvent and technology to be undertaken at the detailed design stage..

At the time of writing, there are currently two competitive FEED designs under consideration by the Applicant. Therefore, we have approached the appraisal of BAT by considering:

- the information available from each Technology Licensor with respect to its proposed capture process;
- a technology neutral approach where technology specific information is not yet developed; and
- assessment of a worst-case emissions profile for each Technology Licensor.

[4] European Parliament and Council of European Union, November 2010, Directive 2010/75/EU on Industrial Emissions (Integrated Pollution Prevention Control)

The design of the Proposed Installation will continue to be refined until the completion of the detailed design stage. A number of the design aspects and features of the Proposed Installation cannot be confirmed until the Principal Contractor(s) have been appointed. Wherever an element of flexibility is maintained, a worst-case scenario has been considered

Uniper will confirm the final technology selected as part of Permit pre-operational conditions.

The approach to BAT has been agreed with Natural Resource Wales (NRW) during the pre-application discussions.

1. General BAT Conclusions for Large Combustion Plant

Table 1 : BAT Conclusions for the LCP Process

BAT No.		BATc	Demonstration of BAT – Operator Response	Operating to BAT?
1		**Environmental Management Systems** In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:		
	i.	Commitment of the management, including senior management;	Uniper UK has a well-established Environmental Management System (EMS), accredited to ISO 14001:2015. The Proposed Installation will be incorporated into the existing ISO 14001:2015 framework. Further detail of the EMS is provided in Section 3 of the Supporting Statement (Document reference: WP0015178/APP/SS). The Uniper Health, Safety, Security, Environment (HSSE) & Sustainability Policy Statement (September 2023) has been signed by the management board. Existing procedures, including Generation Management Instructions (GMIs), define embedded roles and responsibilities, which, where appropriate, include senior management, such as plant managers. Leadership teams are generally available during EMS audits and surveillance checks.	Yes
	ii.	Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;	The Health, Safety, Security, Environment (HSSE) & Sustainability Policy Statement (September 2023) and the Health, Safety, Security, Environment, and Sustainability Business Policy establish the framework for continuous improvement and environmental impact reduction.	Yes
	iii.	Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;	The organisational context is centrally addressed, taking into account the impacts of Uniper's business, potential environmental implications, and other effects on operations. The Uniper EMS documentation outlines the process for establishing SMART objectives and targets, designed to support continuous improvement. These objectives are systematically monitored, tracked, and reviewed using structured online systems.	Yes
	iv.	• Implementation of procedures paying particular attention to: • structure and responsibility • recruitment, training, awareness and competence • communication • employee involvement • documentation • effective process control • planned regular maintenance programmes • emergency preparedness and response • safeguarding compliance with environmental legislation;	• The Uniper organisational chart is maintained within the Uniper Management Framework. As a functional organisation, Uniper UK reports to its head office in Düsseldorf, Germany, with generating assets managed under Energy Assets within the COO area. • Uniper UK's management system is structured around multiple GMIs (see response to section i), which define management instructions. Training awareness and competency requirements are outlined in the Uniper Competency Framework Handbook, specifying the necessary skills and the level of competence required for each role. Key areas include, but are not limited to, maintenance strategy, maintenance planning and scheduling, change management, emissions monitoring, waste management, emissions trading, environmental permitting, and safety rules. Training programmes are managed locally to ensure staff training needs are met, with GMIMAN009 detailing learning, development, and training requirements. • Central GMI procedures establish communication requirements and maintain a compliance register to track adherence to GMIs and applicable legislation. Centrally held procedures define management system activities, while site-specific procedures address location-specific aspects. Both document types specify applicable personnel along with their roles and responsibilities. • Maintenance operations are managed using SAP and controlled through a series of management procedures to ensure maintenance activities are scheduled, planned, and executed to the required standards. • Uniper GMI MAN013 - Emergency Procedure outlines the requirements for sites to assess potential emergencies and threats and develop emergency response plans. Additionally, the Connah's Quay asset has a 24-hour emergency contract in place to provide assistance in managing environmental incidents.	Yes
	v.	Checking performance and taking corrective action, paying particular attention to: a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED-installations – ROM) b) corrective and preventive action c) maintenance of records d) independent (where practicable) internal and external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;	**Monitoring and Measurement** • The Proposed Installation will implement operational procedures that define permit requirements for monitoring emissions to air and water. These procedures will outline roles and responsibilities, competency requirements for personnel, and specific monitoring parameters in accordance with permit stipulations, including hourly, daily, and annual emission limits. They will also detail maintenance protocols, control measures, emergency response actions for abnormal operating conditions, and reporting obligations. • Similar to the existing power station, the Proposed Installation stacks will be equipped with CEMS, maintained and calibrated in accordance with manufacturer and regulatory requirements, with MCERTS-certified CEMs installed where applicable. CEMs will be used to monitor NOX, CO, and NH3. The CCP will also be monitored periodically for amines, total nitrosamine and formaldehyde. • In addition to the above pollutant species to ensure continuous performance tracking and regulatory compliance, the Proposed Installation will also monitor flue gases for stack flow, oxygen, water vapour, stack gas temperature, and stack gas pressure in line with BS EN 14181. All monitoring equipment will be MCERTS certified and will undergo regular maintenance and calibration to guarantee accuracy. • All plant equipment will be routinely maintained by competent contractors, with stringent contractor management procedures enforcing competency requirements. Plant defects will be managed through site systems such as SAP and Synergi Life, an action management software. The Proposed Installation will be automated, continuously monitoring equipment performance and detecting any non-conformance or deviations from operating parameters. The system will enable timely corrective action, preventing breaches of permitted emission levels. **Corrective and Preventative Action**	Yes

			• The Low Carbon Power Station will be controlled and operated via an automated control system (such as a Distributed Control System (DCS)) to continuously monitor the operation of the plant and equipment at the Proposed Installation. Any non-conformance or deviation in normal operating parameters will be identified by the DCS to allow the operator to take action to avoid a breach of permitted emission levels. **<u>Maintenance of Records</u>** • EMS documentation will establish requirements for record storage and retention periods. The current Uniper GMI MAN 005 - Management of Information sets out existing record retention requirements, which are likely to apply to the Proposed Installation. **<u>Audits</u>** • The EMS will be subject to periodic internal audits as part of the integrated internal audit programme. Additionally, external verifiers will conduct surveillance and certification audits to ensure compliance.	
	vi.	Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;	GMI MAN 019 outlines the requirements and structure for conducting management reviews, which are carried out using a combined approach with safety and asset management. These reviews identify any changes in the organisation's context, particularly in relation to interested parties, environmental aspects and impacts, risks and opportunities, objectives and targets, trends in non-conformities, audit results, legal compliance, and resource allocation. Reviews are typically conducted every 6 months.	Yes
	vii.	Following the development of cleaner technologies;	The risks and opportunities register will be updated periodically, at least every six months, to identify potential plant improvements.	Yes
	viii.	Consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant, and throughout its operating life including; a) avoiding underground structures b) incorporating features that facilitate dismantling c) choosing surface finishes that are easily decontaminated d) using an equipment configuration that minimises trapped chemicals and facilitates drainage or cleaning e) designing flexible, self-contained equipment that enables phased closure f) using biodegradable and recyclable materials where possible;	The Proposed Installation will be regulated under the Environmental Permitting Regulations 2016 (as amended) ("EP Regs") which requires sites to have a decommissioning plan in place to manage such considerations. The initial outline structure of the plan is presented in Section 8 of the Supporting Statement (Document reference: WPCC15718/APP/SS) will be developed prior to commencement of operations and will be subject to regular reviews to ensure that correct site operations are reflected in the plan. The design of the Proposed Installation will consider appropriate measures to minimise the impact of future decommissioning. Where possible: • existing infrastructure will be used, e.g. common abstraction and discharge points with existing station; • underground structures will be avoided where sensible, although the site will still require the use of concrete foundations and piping for cooling water and drainage.	Yes
	ix.	Application of sectoral benchmarking on a regular basis.	The Proposed Installation will be regulated under the EP Regs, which requires the application of BAT to the operation of such a facility; this includes the requirement to undertake sectoral benchmarking as and when revised sector guidance is issued (e.g. EA BAT reference document) and to implement compliance with the sector guidance within 4 years of issue. This is implemented through the Regulation 61 notice process. The initial benchmarking will be completed during commissioning and will provide the baseline for future monitoring.	Yes
		Specifically for this sector, it is also important to consider the following features of the EMS, described where appropriate in the relevant BAT:		
	x.	Quality assurance/quality control programmes to ensure that the characteristics of all fuels are fully determined and controlled (see BAT 9).	The Proposed Installation will combust natural gas, which must meet a nationally agreed specification. The measurement of the fired natural gas composition and the optimisation of fuel quality, including the combustion properties outlined in BAT 9, will be integrated into the site's control and management systems, as is the case with the existing asset. Natural gas composition will be measured using an onsite gas chromatograph. While the operator will not have or require an ongoing monitoring procedure to manage fuel quality, appropriate equipment, such as a gas chromatograph (GC), will be in place for continuous fuel quality testing on an expected 5 – 15 minutes measurement cycle. Additionally, the parameters listed under BATc 10 for natural gas will be recorded.	Yes
	xi.	A management plan in order to reduce emissions to air and/or to water during other than normal operating conditions, including start-up and shutdown periods (see BAT 10 and BAT 11).	The Proposed Installation and associated control systems will be designed to minimise the potential for OTNOC events to occur and operational conditions outside normal parameters will be addressed as required following the finalised design process. If an assessment determines the need, a site-specific OTNOC management plan will be implemented to prevent or reduce emissions to air and water during such periods. Emissions will be monitored in accordance with permit requirements, with continuous monitoring of emission points where necessary. Appropriate alarms will be set to provide instant notifications to operators. Startup and shutdown periods will be minimised to reduce emissions and optimise efficiency. The Proposed Installation will be operated using an automated control system to continuously monitor the operation of the plant and equipment at the site. Any non-conformance or deviation in normal operating parameters is expected to be identified by the automated control system to allow operators to take action to avoid OTNOC events. Operators shall be trained to monitor plant operation and take appropriate action(s) in the event of a potential OTNOC event being identified. Start up and Shutdown procedures shall be put in place with the aim to minimise the time during which the plant is operating at non-optimal conditions and operators shall be trained in the appropriate actions required should the potential for an OTNOC event be identified. The Proposed Installation will be maintained through a comprehensive, proactive preventative maintenance programme, managed via computer software such as SAP. All plant components will be included in site-specific preventative maintenance schedules, with maintenance frequency determined by component duty and manufacturer requirements. This programme is supported by risk assessments to identify environmentally critical plant (ECP) and includes emergency procedures for plant failure. Emissions will be recorded during OTNOC periods, and in the event of an accident or environmental incident, a thorough investigation will be conducted. Any necessary corrective or preventive actions will then be implemented.	Yes
	xii.	A waste management plan to ensure that waste is avoided, prepared for reuse, recycled or otherwise recovered, including the use of techniques given in BAT 16.	The Proposed Installation will produce minimal waste streams and opportunities to avoid/reduce waste generation further will also be assessed during the FEED process. The Proposed Installation will include dedicated appropriate waste storage areas on site; with the waste handling procedure outlined in a dedicated procedure which will be developed prior to commencement of operations. Further details provided in response to BAT 16.	Yes

	xiii.	A systematic method to identify and deal with potential uncontrolled and/or unplanned emissions to the environment, in particular: a) emissions to soil and groundwater from the handling and storage of fuels, additives, by-products and wastes b) emissions associated with self-heating and/or self-ignition of fuel in the storage and handling activities.	The potential for fugitive emissions will be regularly reviewed as part of the EMS environmental aspect and impact identification procedure and on a daily basis through on-going site observations. The EMS will include a procedure describing the processes to be followed with respect to the monitoring and reporting of emissions (both routine and unplanned) for regulatory compliance (outside of those required under the EP Regs). Additionally, the EMS will have a site-specific emergency plan and accident management plan to cover management of abnormal emissions and accidents.	Yes
	xiv.	A dust management plan to prevent or, where that is not practicable, to reduce diffuse emissions from loading, unloading, storage and/or handling of fuels, residues and additives.	Due to type of the Proposed Installation, the potential for dust generation at the site is minimal. Therefore, no specific dust management plan is proposed to be developed for the Installation. Dust will be treated along with fugitive emissions and responded to in line with relevant procedures.	Yes
	xv.	A noise management plan where a noise nuisance at sensitive receptors is expected or sustained, including; a) a protocol for conducting noise monitoring at the plant boundary a) a noise reduction programme b) a protocol for response to noise incidents containing appropriate actions and timelines c) a review of historic noise incidents, corrective actions and dissemination of noise incident knowledge to the affected parties.	An assessment of potential noise sources at the Proposed Installation and their impact on sensitive receptors in the vicinity has been conducted as part of the Environmental Impact Assessment for the proposed installation and is presented in Appendix J. The existing CCGT at the site (CQ Power Station) employs several operational measures to minimise noise production, including preventative maintenance regimes to ensure equipment remains in optimal condition. A similar approach will be undertaken for the Proposed Installation. Where necessary attenuators will be used such as on cooling towers (depending on technology), GT exhaust areas, and other locations with high gas flow. Details of the proposed mitigation measures are presented in the Noise Management Plan (Appendix K). Noise emissions from the installation will be monitored in accordance with BS 4142 standards.	Yes
	xvi.	For the combustion, gasification or co-incineration of malodourous substances, an odour management plan including: a) a protocol for conducting odour monitoring b) where necessary, an odour elimination programme to identify and eliminate or reduce the odour emissions c) a protocol to record odour incidents and the appropriate actions and timelines d) a review of historic odour incidents, corrective actions and the dissemination of odour incident knowledge to the affected parties.	The existing Connah's Quay Power Station and the Proposed Installation uses deodorised natural gas directly from the National Transmission System (NTS) as a fuel, therefore is not likely to generate odour. An odour management plan is therefore not deemed necessary. However, procedures are in place to review any complaints received, including those related to odour.	Yes
		Monitoring		
2		BAT is to determine the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the gasification, IGCC and/or combustion units by carrying out a performance test at full load, according to EN standards, after the commissioning of the unit and after each modification that could significantly affect the net electrical efficiency and/or the net total fuel utilisation and/or the net mechanical energy efficiency of the unit. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	In alignment with existing Uniper practices, the new Proposed Installation will establish a procedure for monitoring and reporting plant operations including fuel and energy consumption. Energy efficiency reviews are a core part of Uniper's processes and will be conducted regularly at the proposed installation, particularly following commissioning and outages. Operational data will be regularly reviewed and reported in accordance with current protocols. The installation will also adhere to permit requirements for four-yearly energy efficiency reviews and will comply with ESOS and SECR obligations. Periodic performance tests will be conducted in accordance with applicable standards to determine net electrical efficiency and other key parameters. During commissioning, a heat rate test will be performed to evaluate both gross and net electrical efficiency. Operators will carry out unit performance tests to assess net electrical efficiency alongside other parameters. These performance tests will be conducted by Uniper Technologies or the Original Equipment Manufacturer (OEM) in general accordance with specific standards detailed in the OEM test procedures.	Yes
3		BAT is to monitor key process parameters relevant for emissions to air and water including those given below. a) Flue gas – Flow – Periodic or continuous determination. b) Flue gas – oxygen content, temperature and pressure - Periodic or continuous determination. c) Flue gas – Water vapour content - Periodic or continuous measurement. d) Waste water from flue-gas treatment – Flow, pH, and temperature – Continuous measurement.	In line with expected permit requirements for a CCGT, the Proposed Installation will continuously monitor stack flow, oxygen, water vapour, stack gas temperature, and stack gas pressure. All parameters will be monitored in accordance with BS EN 14181. Real-time data will be used to optimise system performance and maintain compliance with emission limits. All monitoring equipment will be regularly maintained and calibrated to ensure accurate measurements are recorded.	Yes
4		BAT is to monitor emissions to air with at least the frequency given below and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	When the plant is operating in abated mode (i.e. the CCP is running), emissions will be released to air via the absorber stack. However, when the CPP plant is non-operational, the HRSG will be used in unabated mode (i.e. no carbon capture) and the HRSG will use a dedicated bypass stack for emissions to air from the CCGT plant. When the HRSG stack is operational, the flue gases will be monitored for NOx and CO using MCERTS certified Continuous Emissions Monitoring system (CEMs) in accordance with BS EN 14181. Oxygen and water vapour will be also continuously monitored to enable correction of emissions to reference conditions. The HRSG stack will meet the BAT-AELs through use of primary measures. All equipment will be MCERTS certified in accordance with permit requirements and tested by appropriately certified laboratories and personnel. Continuous monitoring using CEMs will be used along with periodic monitoring via standard reference methods.	Yes

Parameter	Standard	Minimum frequency	Monitoring associated with
NOx	Generic EN standards	Continuous(1)	Bat 42, BAT 43
CO	Generic EN standards	Continuous(1)	BAT 49, BAT 56

		NH_3	Generic EN standards	Continuous[1]	BAT 7	The CCGT plant operating in abated mode will be able to achieve the required BAT-AELs by the use of primary abatement measures and the use of secondary flue-gas treatment such as SCR on the absorber stack which will be installed upstream for the control of emissions of nitrogen oxides (NOx). Ammonia will be continuously monitored at the outlet of the SCR on the absorber stack. The emissions from the CCP are described within the separate CCS BAT assessment.	
		[1] For gas turbines, periodic monitoring is carried out with a combustion plant load of > 70 %.					
5		BAT is to monitor emissions to water from flue-gas treatment in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.				The Proposed Installation will incorporate SCR for the control of NOx emissions in the absorber flue gas to ensure the BAT AELs are not exceeded and for optimisation of the CCP. Monitoring of emissions to water from absorber flue gas cooling (that may contain ammonia from SCR) is described in the CCS BAT Assessment but will include monitoring of the discharges in accordance with the site discharge consent. All monitoring of emissions to water will be in accordance with the relevant ISO/national/international standards.	Yes
		General Environmental and Combustion Performance					
6		In order to improve the general environmental performance of combustion plants and to reduce emissions to air of CO and unburnt substances, BAT is to ensure an optimised combustion and to use an appropriate combination of the techniques given below:					Yes
		Technique	**Description**	**Applicability**			
	a)	Fuel blending and mixing	Ensure stable combustion conditions and/or reduce the emission of pollutants by mixing different qualities of the same fuel type.	Generally applicable.		The Proposed Installation will have a contractual agreement to receive natural gas from the NTS, ensuring compliance with specified quality criteria. The primary fuel for the transmission system will be natural gas as detailed in BAT 1 (x). Using an advanced control system to control the combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring.	
	b)	Maintenance of the combustion system	Regular planned maintenance according to supplier's recommendations.	Generally applicable.		All plant and equipment at the Proposed Installation will be regularly maintained, including the combustion system, by qualified maintenance contractors.	
	c)	Advanced control system	The use of a computer-based automatic system to control the combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring.	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and / or control command system.		The Proposed Installation operations will be monitored and operated by suitably trained site personnel and managed via an automated control system such as a Distributed Control System (DCS) to continuously monitor the operation of the plant and equipment at the Proposed Installation. Any non-conformance or deviation in normal operating parameters shall be identified by the DCS to allow operators to take action to avoid a breach of permitted emission levels.	
	d)	Good design of the combustion equipment	Good design of furnace, combustion chambers, burners and associated devices.	Generally applicable to new combustion plants.		Selection of experienced suppliers with continuous supervision of engineering, construction and commissioning by Uniper's engineering team. Operation of the CCGT units will be controlled by trained site operators using an automated control system, which will incorporate controlling the operation of the plant and also recording data on the plant performance.	
	e)	Fuel Choice	Select or switch totally or partially to another fuel(s) with a better environmental profile (e.g. with low sulphur and/or mercury content) amongst the available fuels, including in start-up situations or when back-up fuels are used.	Applicable within the constraints associated with the availability of suitable types of fuel with a better environmental profile as a whole, which may be impacted by the energy policy of the Member State, or by the integrated site's fuel balance in the case of combustion of industrial process fuels.		The site will combust natural gas, which must meet a nationally agreed specification. Natural gas composition will be monitored as detailed in BAT 1(x). In addition, the process will use an advanced control system to control combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring. The Proposed Installation will use dry low NOx burners to regulate NOx emissions and ensure compliance with BAT AELs.	
7		In order to reduce emissions of ammonia to air from the use of selective catalytic reduction (SCR) and/or selective non-catalytic reduction (SNCR) for the abatement of NOx emissions, BAT is to optimise the design and/or operation of SCR and/or SNCR (e.g. optimised reagent to NOx ratio, homogeneous reagent distribution and optimum size of the reagent drops).				The Proposed Installation will incorporate SCR for the control of NOx emissions in the absorber flue gas to ensure the BAT AELs are not exceeded and for optimisation of the CCP. Continuous monitoring for ammonia slip will be included on the flue stack to ensure reagent dosing is optimised while ensuring BAT-AELs for NH_3 are not exceeded.	Yes
		BAT – Associated Emission Levels					
8		In order to prevent or reduce emissions to air during normal operating conditions, BAT is to ensure, by appropriate design, operation and maintenance, that the emission abatement systems are used at optimal capacity and availability.				The emissions abatement systems will be designed, operated and maintained to ensure use at optimal capacity and availability, as described in response to BAT 6 and BAT 4. The Proposed Installation employs advanced emission abatement systems, including a SCR system for NOx control on the absorber stack and a CCP for CO_2 removal, both designed for optimal capacity and availability. CEMS will track key parameters such as NOx, CO_2, residual O_2, and NH_3 slip, with real-time data used to optimise system performance and maintain compliance with emission limits. Robust maintenance schedules and predictive diagnostics will ensure high reliability and availability of the abatement systems. Automated controls will dynamically adjust the CCGT fuel-to-air ratio and abatement processes to maintain efficiency during normal and transient operating conditions, while protocols will be in place to minimise emissions during startup, shutdown, or equipment malfunctions.	Yes
9		In order to improve the general environmental performance of combustion and/or gasification plants and to reduce emissions to air, BAT is to include the following elements in the quality assurance/quality control programmes for all the fuels used, as part of the environmental management system (see BAT 1):				The natural gas feed is provided by the UK grid network to a nationally agreed specification for all listed parameters. A performance test of the CCGT will be carried out during plant commissioning including full characterisation of fuel to meet target efficiency and performance.	Yes

	i. Initial full characterisation of the fuel used including at least the parameters listed below and in accordance with EN standards. ISO, national or other international standards may be used provided they ensure the provision of data of an equivalent scientific quality; ii. Regular testing of the fuel quality to check that it is consistent with the initial characterisation and according to the plant design specifications. The frequency of testing and the parameters below are based on the variability of the fuel and an assessment of the relevance of pollutant releases (e.g. concentration in fuel, flue-gas treatment employed); iii. Subsequent adjustment of the plant settings as and when needed and practicable (e.g. integration of the fuel characterisation and control in the advanced control system). Initial characterisation and regular testing of the fuel can be performed by the operator and/or the fuel supplier. If performed by the supplier, the full results are provided to the operator in the form of a product (fuel) supplier specification and/or guarantee. Natural gas — LHV Natural gas — CH_4, C_2H_6, C_3, C_4+, CO_2, N2, Wobbe index			The measurement of the fired natural gas composition and the optimisation of fuel quality—including the combustion properties outlined in BAT 9—are embedded within the site's control and management systems. Input gas streams will be monitored as outlined in BAT 1(x). In addition, the process will use an advanced control system to control combustion efficiency and support the prevention and/or reduction of emissions. This also includes the use of high-performance monitoring.	
	General Environmental and Combustion Performance				
10	In order to reduce emissions to air and/or to water during other than normal operating conditions (OTNOC), BAT is to set up and implement a management plan as part of the environmental management system (see BAT 1), commensurate with the relevance of potential pollutant releases, that includes the following elements: • appropriate design of the systems considered relevant in causing OTNOC that may have an impact on emissions to air, water and/or soil (e.g. low-load design concepts for reducing the minimum start-up and shutdown loads for stable generation in gas turbines); • set-up and implementation of a specific preventive maintenance plan for these relevant systems; • review and recording of emissions caused by OTNOC and associated circumstances and implementation of corrective actions if necessary; • periodic assessment of the overall emissions during OTNOC (e.g. frequency of events, duration, emissions quantification/estimation) and implementation of corrective actions if necessary.			The Proposed Installation will conduct a risk-based review through the EMS process, including an assessment of potential OTNOC impacts. The Proposed Installation design shall incorporate flexibility features, such as minimised start-up and shutdown times, maximised load ramp rates, and to keep as many systems in a hot-start ready state while the rest of the plant is shutdown to avoid a full "cold start" of the facility and to reduce the lead time before CO_2 can be exported. A low minimum load capability will allow the plant to remain operational during periods of low electricity demand, avoiding unnecessary shutdowns and subsequent start-ups. Start-up times (cold, warm, hot) will be optimised to align with state-of-the-art standalone CCGT performance while maintaining the CO2 capture rate during start-up., All starts, stops, and load changes (except post-inspection starts) will be fully automated. The proposed asset will be operated using an automated control system that continuously monitors the plant and equipment. Any non-conformance or deviation from normal operating parameters will be detected, allowing operators to take timely action to prevent OTNOC events. Emissions to air and water will be continuously monitored, with early warning alarms set to notify plant operators of potential issues. Start-up and shutdown times will be minimised to reduce emissions and fuel inefficiencies, while control systems ensure that emission limits are maintained when operating at low load. Operators will be trained to monitor plant operations and take appropriate actions in response to potential OTNOC events. Start-up and shutdown procedures will be implemented to minimise periods of non-optimal operation, and operators will be trained in the necessary actions required should an OTNOC event occur. The Proposed Installation will follow a comprehensive preventative maintenance program, managed via SAP software. All plant components are included within site-specific maintenance schedules, with maintenance frequency determined by component duty cycles and manufacturer recommendations. A risk assessment supports this program to identify environmentally critical plant (ECP) and establish emergency procedures for plant failure.	Yes
11	BAT is to appropriately monitor emissions to air and/or to water during OTNOC.			Flue gases will be monitored using MCERTS-certified Continuous Emissions Monitoring Systems (CEMs) in accordance with BS EN 14181. This system will capture emissions data during OTNOC situations, providing valuable information for subsequent incident investigations. There will be periodic assessments conducted to evaluate the frequency, duration, and impact of such event. Water discharges will also be monitored in line with permit requirements during OTNOC, with control measures in place to mitigate the risk of out-of-specification water being discharged from the site.	Yes
	Energy Efficiency				
12	In order to increase the energy efficiency of combustion, gasification and/or IGCC units operated ≥ 1 500 h/yr, BAT is to use an appropriate combination of the techniques given below.				
	Technique	**Description**	**Applicability**	The anticipated electrical efficiency of the CCGT plant at ISO conditions will be circa 52% LHV after carbon capture. The electrical efficiency will be circa 61 - 64% for CCGTs operating without carbon capture, which is in line with the BAT-AEEL having a thermal input of >600MWth.	
a.	Combustion optimisation	Optimising the combustion minimises the content of unburnt substances in the flue- gases and in solid combustion residues	Generally applicable	Energy efficiency is a key priority for Uniper's existing and proposed assets. Combustion optimisation and advanced control systems will be employed alongside online monitoring to ensure combustion processes remain efficient and fully optimised. Additionally, online monitors will continuously record air emissions, ensuring compliance with permitted air emission limits. Specific control settings for the combustion units shall be pre-set in the control system to achieve efficient combustion and optimise plant efficiency.	Yes
b.	Optimisation of the working medium	Operate at the highest possible pressure and temperature of the working medium gas or steam, within the constraints associated with, for example, the control of NOX emissions or the characteristics of energy demanded		The Proposed Installation will also adhere to permit requirements for four-yearly energy efficiency reviews and will comply with ESOS and SECR obligations. Periodic performance tests will be conducted in accordance with applicable standards to determine net electrical efficiency and other key parameters. During commissioning, a heat rate test will be performed to evaluate both gross and net electrical efficiency. During commissioning, a heat rate test will be performed to evaluate both gross and net electric efficiency.	Yes
c.	Optimisation of the steam cycle	Operate with lower turbine exhaust pressure by utilisation of the lowest possible temperature of the		The efficiency will be driven by the design of the CCGT including the HRSG. The Proposed Installation will be designed to exploit optimum steam pressure and temperature settings to maximise the overall efficiency. Optimisation of the steam cycle will initially take place during plant commissioning.	Yes

		condenser cooling water, within the design conditions			
d.	Minimisation of energy consumption	Minimising the internal energy consumption (e.g. greater efficiency of the feed-water pump)		All plant and equipment will be designed or specified and maintained to ensure optimal operation.	Yes
e.	Preheating of combustion air	Reuse of part of the heat recovered from the combustion flue-gas to preheat the air used in combustion	Generally applicable within the constraints related to the need to control NOX emissions	The option of including a combustion air preheater for the GT shall be investigated during FEED to reduce the minimum emission-compliant load further and increase the efficiency in part-load operation and hence enhance the flexibility of the CCGT with CCP.	Yes
f.	Fuel preheating	Preheating of fuel using recovered heat	Generally applicable within the constraints associated with the boiler design and the need to control NOX emissions	Preheating of fuel using recovered heat will be considered during FEED processes.	Yes
g.	Advanced control system	Computerised control of the main combustion parameters enables the combustion efficiency to be improved	Generally applicable to new units. The applicability to old units may be constrained by the need to retrofit the combustion system and/or control command system	The DCS will display and record the plant operating parameters required for best practice process control and minimisation of environmental impacts. The DCS will also include typical CEMs information. The Proposed Installation operational data will allow the plant processes and maintenance procedures to be reviewed and optimised. The data available via the DCS will also allow reporting of plant performance and environmental compliance.	Yes
h.	Feed-water preheating using recovered heat	Preheat water coming out of the steam condenser with recovered heat, before reusing it in the boiler	Only applicable to steam circuits and not to hot boilers. Applicability to existing units may be limited due to constraints associated with the plant configuration and the amount of recoverable heat	Feed-water / condensate pre-heating is foreseen in the final stage of the HRSG, in order to utilise the flue gas heat. Further heat utilisation on even lower temperature levels will be investigated during the FEED.	Yes
i.	Heat recovery by cogeneration (CHP)	Recovery of heat (mainly from the steam system) for producing hot water/steam to be used in industrial processes/activities or in a public network for district heating. Additional heat recovery is possible from: — flue-gas — grate cooling — circulating fluidised bed	Applicable within the constraints associated with the local heat and power demand. The applicability may be limited in the case of gas compressors with an unpredictable operational heat profile	The ST will be used to recover heat from the GT flue gas. In terms of off-site use of heat, a preliminary CHP Readiness Assessment has been prepared and is provided as Appendix L. The design will retain the flexibility to enable future implementation of CHP, although the viability is constrained by several factors including: • The high internal heat demand of the CCP which reduces the heat available for export; and • The expected dispatchable operating regime of the plant, which may not align with the consistent heat supply needs of potential off-site users. The CHP potential will be periodically reviewed as part of the applicant's ongoing compliance with environmental permit requirements and should future opportunities for viable CHP integration emerge the CHP assessment will be updated accordingly.	Yes
j.	CHP readiness	See description in Section 10.8.2.	Only applicable to new units where there is a realistic potential for the future use of heat in the vicinity of the unit	The plant has the potential to supply heat to other users and will be designed to be CHP ready. Further details are in the CHP Readiness Report presented as Appendix L in Volume III of the permit application.	Yes
k.	Flue-gas condenser	See description in Section 10.8.2.	Generally applicable to CHP units provided there is enough demand for low- temperature heat	The flue gases from the Proposed Installation would be introduced to one or more absorber column(s), which contain a liquid amine-based chemical solvent, to absorb the CO_2 and remove it from the exhaust gases. The solvent to be used is the subject of ongoing FEED but would be an aqueous solution of amines. The alkaline nature of the solvent would mean that it would selectively absorb acidic gases such as CO_2. If a heat exchanger is required, waste heat from the steam condensate stream would be used to increase the thermal buoyancy of the treated, washed flue gas, before release from the top of the absorber column(s) via dedicated absorber stack(s) for dispersion to the atmosphere. This will be confirmed at FEED.	Yes
l.	Heat accumulation	Heat accumulation storage in CHP mode	Only applicable to CHP plants. The applicability may be limited in the case of low heat load demand	As an amount of usable heat remains in the gas turbine exhaust gases, these would be passed into a HRSG to recover the useful heat in order to produce steam (at various pressures) to generate further electricity via a separate steam turbine set, and for heating of process streams within the CCP.	Yes
m	Wet stack		Generally applicable to new and existing units fitted with wet FGD	Wet FGD not used at the Proposed Installation.	N/A
n.	Cooling tower discharge	The release of emissions to air through a cooling tower and not via a dedicated stack	Only applicable to units fitted with wet FGD where reheating of the flue-gas is necessary before release, and where the unit cooling system is a cooling tower	Wet FGD not used at the Proposed Installation.	N/A
o.	Fuel pre-drying	The reduction of fuel moisture content before combustion to improve combustion conditions	Applicable to the combustion of biomass and/or peat within the constraints associated with spontaneous combustion risks (e.g. the moisture content of peat is kept above 40 % throughout the delivery chain). The retrofit of existing plants may be restricted by the extra calorific value that can	The Proposed Installation uses natural gas as a fuel, so this is not required.	N/A

				be obtained from the drying operation and by the limited retrofit possibilities offered by some boiler designs or plant configurations		
	p.	Minimisation of heat losses	Minimising residual heat losses, e.g. those that occur via the slag or those that can be reduced by insulating radiating sources	Only applicable to solid-fuel-fired combustion units and to gasification/IGCC units	The Proposed Installation uses natural gas as a fuel, so this is not required.	N/A
	q.	Advanced materials	Use of advanced materials proven to be capable of withstanding high operating temperatures and pressures and thus to achieve increased steam/combustion process efficiencies	Only applicable to new plants	The Proposed Installation will be designed using materials capable of withstanding operating temperatures and pressures integral to the design to optimise operations.	Yes
	r.	Steam turbine upgrades	This includes techniques such as increasing the temperature and pressure of medium- pressure steam, addition of a low-pressure turbine, and modifications to the geometry of the turbine rotor blades	The applicability may be restricted by demand, steam conditions and/or limited plant lifetime	The proposed ST is a new three-pressure level reheat steam turbine. There will be a low-pressure turbine, which is fed by IP turbine exhaust through crossover pipe.	Yes
	s.	Supercritical and ultra-supercritical steam conditions	Use of a steam circuit, including steam reheating systems, in which steam can reach pressures above 220,6 bar and temperatures above 374 °C in the case of supercritical conditions, and above 250 – 300 bar and temperatures above 580 – 600 °C in the case of ultra-supercritical conditions	Only applicable to new units of ≥ 600 MWth operated > 4 000h/yr. Not applicable when the purpose of the unit is to produce low steam temperatures and/or pressures in process industries. Not applicable to gas turbines and engines generating steam in CHP mode. For units combusting biomass, the applicability may be constrained by high- temperature corrosion in the case of certain biomasses	The steam circuit includes reheating systems as well as superheaters, evaporators, and economisers therefore supercritical steam is not applicable.	N/A
		Water usage and emissions to water				
13		In order to reduce water usage and the volume of contaminated wastewater discharged, BAT is to use one or both of the techniques given below.				
		Technique	**Description**	**Applicability**		
	a.	Water recycling	Residual aqueous streams, including run-off water, from the plant are reused for other purposes. The degree of recycling is limited by the quality requirements of the recipient water stream and the water balance of the plant.	Not applicable to wastewater from cooling systems when water treatment chemicals and/or high concentrations of salts from seawater are present.	At the Proposed Installation, the following methods are considered to minimise water usage and reduce the volume of contaminated wastewater: • Wastewater Recycling: Process Effluent and water run off may be reused in the process after treatment, provided the streams are free of amine contamination, and other quality requirements. • The cooling tower design will utilise a recirculating water-cooling circuit, which includes chemical treatment package(s) to maintain the water quality for longer, reducing quantity of blowdown. • Rainwater Harvesting: Clean surface water runoff from building roofs could be collected through a rainwater harvesting system, such as a cistern, using gutters, pumps, and minimal treatment to enable water reuse.	Yes
	b.	Dry bottom ash handling	Dry, hot bottom ash falls from the furnace onto a mechanical conveyor system and is cooled down by ambient air. No water is used in the process.	Only applicable to plants combusting solid fuels.	The Proposed Installation uses natural gas as a fuel, so this is not required	N/A
14		In order to prevent the contamination of uncontaminated wastewater and to reduce emissions to water, BAT is to segregate wastewater streams and to treat them separately, depending on the pollutant content.			All wastewater streams will be appropriately segregated, treated and disposed of via the existing discharge point or for effluents where pollutant load is not acceptable (e.g. amine contaminated streams) these will be collected and removed from site for third party disposal. The drainage philosophy includes: • Process Closed Drains System – to collect drainage directly from equipment and piping and includes and water with potentially hazardous pollutants from the chemicals, amine and ammonia drains. • Open Drains System – wastewater/run off from production/processing areas, curbs, drip trays, sample points etc. that is potentially contaminated with oil. • Storm water drain system – Clean rainwater site runoff. • Sanitary Drains Systems. Process areas handling chemicals and/or oil are kerbed with sumps to collect wastewater. For potentially chemical contaminated wastewater, the sump contents are tested and appropriately routed: to the stormwater system if it meets stormwater discharge criteria, to the wastewater treatment plant (WWTP) if non-amine chemicals are present or for amine contaminated wastewaters to temporary storage prior to third party removal for off-site disposal.	Yes

				Areas where wastewater could be contaminated with oil from leaks and drips have the wastewater collected in local sumps and pumped to an interceptor and oil skimmer.	
15		In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques, and to use secondary techniques as close as possible to the source in order to avoid dilution.		The flue gas stream is cooled through a DCC system which will generate a blowdown stream that will be treated and reused in the process. This will minimise emissions to water. Water present in the solvent circuit is contaminated with amine, and so will not be discharged to any water emissions points and will be collected for removal from site for off-site treatment and disposal.	Yes
		Waste management			
16		In order to reduce the quantity of waste sent for disposal from the combustion and/or gasification process and abatement techniques, BAT is to organise operations so as to maximise, in order of priority and taking into account life-cycle thinking: a) waste prevention, e.g. maximise the proportion of residues which arise as by-products; b) waste preparation for reuse, e.g. according to the specific requested quality criteria; c) waste recycling; d) other waste recovery (e.g. energy recovery), e) by using appropriate techniques.		As part of the already established processes at Uniper, the impact of waste generation in the lifecycle of an installation is carefully considered. Uniper procedures (both local and central) require that the waste hierarchy is always considered when dealing with waste. During construction, decommissioning and demolition phases, as well as during unit outages, specific waste management plans are implemented to manage generated waste that is compliant, cost effective and reducing impact on the environment. The Proposed Installation will be required to comply with a centrally held management instruction procedure that sets out duty of care requirements and other legal requirements for dealing with generated waste. Most sites have a local procedure or a management plan "appendix" that deals with waste compliance at the site. The proposed installation will develop a site-specific waste management procedure prior to commencement of operations detailing the waste storage and handling procedures. Uniper competency frameworks also require that certain staff at installations have the appropriate training and knowledge in order to advise on waste matters.	Yes
		Noise emissions			
17		In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below			
		Technique	**Description**	**Applicability**	
	a.	Operational measures	These include: -improved inspection and maintenance of equipment -closing of doors and windows of enclosed areas, if possible -equipment operated by experienced staff -avoidance of noisy activities at night, if possible -provisions for noise control during maintenance activities.	Generally applicable	The Proposed Installation will implement a maintenance schedule, likely managed in SAP, to ensure optimal operation of all plant and equipment, thereby mitigating noise risks. Similar to the existing power plant, where necessary the Proposed Installation will put in place several operational measures to minimise noise production. These may include: • Preventive maintenance schedules to maintain equipment efficiency. • Noise attenuation in cooling towers, GT exhaust areas, and other high gas flow zones. • Acoustic enclosures around equipment with high noise emission levels. The Proposed Installation will follow a site-specific management plan for monitoring, reporting, and controlling environmental noise emissions, as required under its Environment Permit. The initial version of this is presented in Appendix J Additionally, the site conducts a four-yearly BS 4142 assessment to monitor noise emissions. Any noise complaints will be recorded and addressed in accordance with permit requirements and the Environmental Management System (EMS).	Yes
	b.	Low-noise equipment	This potentially includes compressors, pumps and disks	Generally applicable	The Proposed Installation is a new plant, and all equipment will be selected to avoid noise impacts either via inherent design qualities, or where a noise risk exists, via the installation of noise attenuation measures.	Yes
	c.	Noise attenuation	Noise propagation can be reduced by inserting obstacles between the emitter and the receiver. Appropriate obstacles include protection walls, embankments and buildings	Generally applicable to new plants	The existing Connah's Quay Power Station utilises noise attenuation in cooling towers, gas turbine exhaust areas and other areas of high gas flow. The Proposed Installation is a new plant, and all equipment will be selected to avoid noise impacts either via inherent design qualities, or where a noise risk exists, via the installation of noise attenuation measures	Yes
	d.	Noise-control equipment	This includes: -noise-reducers -vibration or acoustic insulation, or vibration isolation -enclosure of noisy equipment -soundproofing of buildings	The applicability may be restricted by lack of space	The Noise Management Plan for the proposed installation will outline key equipment that must be checked at regular intervals to ensure installed noise control measures effectively attenuate plant noise levels. During outages, inspections of key noise control measures will be conducted, including integrity checks on: • Safety valve silencers. • Non-safety steam atmospheric vent silencers. • Plant enclosures. • Building fabric. • Inlet silencers for Gas Turbine Compressors. These measures help maintain operational efficiency while minimising noise emissions.	Yes

	e.	Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver and by using buildings as noise screens.	Generally applicable to new plants	During the design phase of the Proposed Installation, careful consideration will be given to the location of equipment and buildings to ensure noise levels are effectively managed. Wherever possible, equipment will be strategically positioned to minimise noise impact on surrounding receptors, helping to reduce potential disturbances in the local area.	Yes
BAT 18-39 are not applicable at the proposed installation due to type of fuel used i.e. coal and/or lignite, solid biomass and/or peat, liquid fuels, gas-oil-fired gas turbines.						
	Energy efficiency					
40	In order to increase the energy efficiency of natural gas combustion, BAT is to use an appropriate combination of the techniques given in BAT 12 and below.					
	Technique	**Description**	**Applicability**			
	Combined cycle	See description in Section 10.8.2	Generally applicable to new gas turbines and engines except when operated < 1 500 h/yr. Applicable to existing gas turbines and engines within the constraints associated with the steam cycle design and the space availability. Not applicable to existing gas turbines and engines operated < 1 500 h/yr. Not applicable to mechanical drive gas turbines operated in discontinuous mode with extended load variations and frequent start-ups and shutdowns. Not applicable to boilers.	The anticipated electrical efficiency of the CCGT plant at ISO conditions will be circa 52% after carbon capture. The electrical efficiency will be 61 - 64% for CCGTs without carbon capture which is in line with the BAT-AEEL having a thermal input of >600MWth. When operating in dispatchable mode, the electrical efficiency of the CCGT plant will be affected. The electrical output from the CCGT plant will also provide for the parasitic electrical requirements for the CCP and other utilities on site. A separate BAT assessment has been undertaken for the overall energy efficiency of the proposed installation.	Yes
41	Emissions from boilers using gas				No gas-fired boilers proposed.	N/A
	NOx, CO, NMVOC and CH4 emissions to air					
42	In order to prevent or reduce NOx emissions to air from the combustion of natural gas in gas turbines, BAT is to use one or a combination of the techniques given below:					
	Technique	**Description**	**Applicability**			
	Advanced Control System	See description in Section 10.8.3. This technique is often used in combination with other techniques or may be used alone for combustion plants operated < 500 h/yr	The applicability to old combustion plants may be constrained by the need to retrofit the combustion system and/or control command system.	Operation of the CCGT units will be controlled by trained site operators using an automated control system, which will be used to control and optimise the operation of the plant and also record data on the plant performance, which can also be used by the operations team to identify potential issues.		Yes
	Water / Steam Addition	See description in Section 10.8.3	The applicability may be limited due to water availability.	Water/steam addition for NOx control is not applied at the plant as Dry Low NOx burners are used for NOx control during abated and unabated operation and SCR is also used on the absorber during abated operation for NOx control. Water availability for colling requirements will be managed through the site abstraction license/storage of other supplies on site to ensure water is available when needed to reduce/prevent emissions.		Yes
	Dry Low NOx Burners (DLN)		The applicability may be limited in the case of turbines where a retrofit package is not available or when water/steam addition systems are installed.	The design of the CCGT includes use of Dry Low NOx burners to minimise NOx emissions, supporting efficient and environmentally responsible operation.		Yes
	Low Load Design Concept	Adaptation of the process control and related equipment to maintain good combustion efficiency when the demand in energy varies, e.g. by improving the inlet airflow control capability or by splitting the combustion process into decoupled combustion stages	The applicability may be limited by the gas turbine design.	Not applicable as this is limited by the turbine design. Operational efficiency characteristics of the plant vary according to the load.		N/A
	Low NOx Burners (LNB)	See description in Section 10.8.3	Generally applicable to supplementary firing for heat recovery steam generators (HRSGs) in the case of combined-cycle gas turbine (CCGT) combustion plants.	The CCGT will have Dry Low NOx burners in place to ensure minimum emissions of NOx, therefore LNBs and supplementary firing are not considered to be required.		Yes
	Selective Catalytic Reduction (SCR)		Not applicable in the case of combustion plants operated < 500 h/yr. Not generally applicable to	The installation will incorporate SCR for the control of NOx emissions in the absorber flue gas to ensure the BAT AELs are not exceeded and for optimisation of the CCP. Continuous monitoring for ammonia slip will be included on the absorber flue stack to ensure reagent dosing is optimised while ensuring BAT-AELs for NH3 are not exceeded.		Yes

			existing combustion plants of < 100 MWth		
43	Emissions from engines using gas			No gas fired engines proposed	N/A
44	In order to prevent or reduce CO emissions to air from the combustion of natural gas, BAT is to ensure optimised combustion and/or to use oxidation catalysts. BAT Associated Emission Levels (BAT-AELs) for the Combustion of Natural Gas in New CCGTs >50MWth (Unabated operation).				
	Pollutant	**Yearly Average**	**Daily average or average over the sampling period**	The CCGT will be equipped with advanced combustion control system to monitor and adjust combustion parameters (e.g. air-to-fuel ratio, temperature and pressure) in real time to ensure optimised combustion and minimise CO. To ensure compliance with relevant BAT-AELs, CEMs will be used to continuously monitor CO emissions.	
	NOx	10-30 mg/Nm^3	15-40 mg/Nm^3	The proposed installation is expected to comply with associated BAT-AELs.	Yes
	CO	5-30 mg/Nm^3 (indicative BAT-AEL)	-	The proposed installation is expected to comply with associated BAT-AELs.	Yes
	For plants with a net electrical efficiency (EE) greater than 55%, a correction factor may be applied to the higher end of the BAT-AEL range, corresponding to [higher end] x EE / 55, where EE is the net electrical efficiency of the plant determined at ISO baseload conditions				

2. Emergency Back-up Generators

Emergency generators at the site are required to meet the requirements in the Environment Agency "BAT Guidance for Emergency Backup Diesel engines in installations[5] and will be used for emergency backup power supply.

The generators will have capacity more than or equal to 1 megawatt thermal (MWth) and less than 50MWth burning any fuel. The assessment of BAT for the generators is presented in the table below.

Table 2. BAT Assessment for Emergency Backup Diesel Engines

Item No.	BAT Standard	Demonstration of BAT – Operator's Response	Operating to BAT
1	**Emission Requirements:** ▪ Engines must be optimised to reduce emissions. ▪ Combustion plant specification sheets that keep to one or more of the former 2g TA Luft and United States Environment Protection Agency (EPA) Tier 2 (or equivalent) standards are acceptable proof of BAT plant. ▪ Approximately 750mg per m^3 NO_x (as NO_2) at 15% O_2 standard temperature and pressure, dry, 273K and 101.3kPa (equivalent to 2,000mg per m^3 at 5% O_2 – commonly termed '2g') at a typical emergency load (usually greater than 67% of standby power rating). A copy of engine specification sheet should be supplied with application. Your stack design should ensure good flue gas dispersion. Stacks should be vertical and emissions should not be obstructed by caps or cowls.	• Engines will be optimised and meet the relevant standards; • The generator stack will ensure good flue gas dispersion: and • Vertical stacks will be employed unobstructed by caps or cowls.	Yes
2	**Operational** Testing and Maintenance plan in place for all site equipment within the installation boundary, including the backup generator diesel engines. To meet standards for operational controls these will include; – diesel engines to be tested one at a time, – they will not be tested for more than 50 hours per annum, – or during periods of poor air quality.	Diesel engines will be included in the Operational Maintenance Plan that will be in place before commissioning Uniper can confirm that operated engines will be tested individually, and testing won't exceed 50 hrs/annum.	Yes

[5] 3. Environment Agency, August 2023, Emergency Backup Diesel Engines on Installations: Best Available Technique (BAT)

3. Storage BAT

The BRef document for LCP does not specifically cover the storage and handling of materials. Therefore in respect of the storage and handling of materials such as amines the BAT requirements for storage of such chemicals is defined within European Commission (2005). "BRef on Emissions from Storage". The assessment against the BAT for storage is detailed below.

Table 3. BAT Assessment for Storage – General Requirements

Item No.	BAT Standard	Demonstration of BAT – Operator's Response	Operating to BAT
1	**Storage of Liquids and Liquified Gases – General Principals to Prevent and Reduce Emissions** Emissions minimisation principle in tank storage, BAT is to abate emissions from tank storage, transfer and handling that have a significant negative environmental effect. This is applicable to large storage facilities allowing a certain time frame for implementation.	Storage tanks will be designed to appropriate industry codes and standards (i.e. environmental and safety) including compliance with CIRIA C736[6] containment requirements. Emissions to atmosphere will be minimised through appropriate tank seal design, and application of vent scrubbers where environmentally harmful vapours may occur. Storage, transfer and handling of chemicals on site will be undertaken in line with standard operating and maintenance procedures established within the Company's IMS in order to prevent / reduce emissions. Fuels, solvents and other chemicals required, such as caustic soda, sulphuric acid and diesel will be supplied to site by truck and stored in individual atmospheric tanks.	Yes
2	**Open Top Tanks** If emissions to air occur, BAT is to cover the tank by applying: A) a floating cover, B) a flexible or tent cover, or C) a rigid cover. Additionally, with an open top tank covered with a flexible, tent or a rigid cover, a vapour treatment installation can be applied to achieve an additional emission reductions.	Not in use	N/A
3	**Emissions To Air From Fixed Roof Tanks** For the storage of volatile substances which are toxic (T), very toxic (T+), or carcinogenic, mutagenic and reproductive toxic (CMR) categories 1 and 2 in a fixed roof tank, BAT is to apply a vapour treatment installation. For other substances BAT is to apply a vapour treatment installation, or to install an internal floating roof. Direct contact floating roofs and non-contact floating roofs are BAT. For tanks < 50 m3, BAT is to apply a pressure relief valve set at the highest possible value consistent with the tank design criteria.	Tanks and storage areas will be designed according to relevant international standards (i.e. environmental and safety) including compliance with CIRIA C736 containment requirements. The tank design for each material is still subject to FEED but consideration of a floating roof or a vapour treatment system on the vents will be considered for the amine storage.	Yes
4	**Emissions To Air From Horizontal Tanks** For the storage of volatile substances which are toxic (T), very toxic (T+), or CMR categories 1 and 2 in an atmospheric horizontal tank, BAT is to apply a vapour treatment installation. The selection of the vapour treatment technology has to be decided on a case-by-case basis. For other substances, BAT is to do all, or a combination, of the following techniques, depending on the substances stored:	Horizontal tanks are anticipated to be used for: • 98 wt% sulphuric acid • Sulphuric acid Dilution Tank (Technology Licensor No 1) • 20 wt% caustic soda • Caustic Dilution Tank (Technology Licensor No 1) • Sodium Hypochlorite • NH_3 storage tank (Technology Licensor No 1) • NH_3 dilution tank (Technology Licensor No 1) • Fuel Oil/Diesel Tank design is still subject to FEED, however, it is anticipated that: a. Chemical tanks which have a sufficiently high anticipated emission level of harmful vapour will be fitted with scrubbers on the vent lines to prevent release of hazardous substances. b. Fuel oil/diesel tanks will be fitted with a flame arrestor on their atmospheric vents.	Yes

[6] CIRICA C736 "Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises", published 2014.

5	**Emissions to air from Pressurised storage** Pressurised storage is used for storing all categories of liquefied gases, from non-flammable up to flammable and highly toxic. The only significant emissions to air from normal operation are from draining. BAT for draining depends on the tank type, but may be the application of a closed drain system connected to a vapour treatment installation.	Technology Licensor No 2 is proposing a pressurised tank for NH_3. A vapour balancing connection will be utilised during tanker unloading to ensure safety of NH_3 off-loading. Additionally, the design will include NH_3 gas detection and monitoring systems. NH_3 tank will be blanketed with N_2 and set to an operating pressure to avoid vapourisation at normal/site ambient operating temperatures.	Yes
6	**Emission to air from Underground and Mounded Tanks** For the storage of volatile substances which are toxic (T), very toxic (T+), or CMR categories 1 and 2 in an underground or mounded tank, BAT is to apply a vapour treatment installation. For other substances, BAT is to do all, or a combination, of the following techniques, depending on the substances stored:	Technology Licensor No 2 is proposing underground storage tanks including the solvent drain vessel, which should be empty most of the time, the contaminated water vessel and the flue gas drain vessel. No vapour treatment installation is considered to be required.	Yes
7	**Fugitive emissions from transfer and handling - Piping** BAT is to apply aboveground closed piping in new situations. For existing underground piping it is BAT to apply a risk and reliability based maintenance approach. BAT is to minimise the number of flanges by replacing them with welded connections, within the limitation of operational requirements for equipment maintenance or transfer system flexibility	Piping system design shall be based on the requirements of relevant codes and standards e.g. American Society of Mechanical Engineers (ASME) B31or BS 1560 Circular Flanges for Pipes, Valves and Fittings. BAT will be achieved by minimising the number of flanges, without compromising operational requirements. Flange numbering and placement will be finalised during detailed design. Inspection programmes will be implemented in line with standard operating and maintenance procedures established within the Company's EMS in order to prevent / reduce emissions.	Yes
8	**Vapour Treatment** BAT is to apply vapour balancing or treatment on significant emissions from the loading and unloading of volatile substances to (or from) trucks, barges and ships.	As outlined in No 5 above, Technology Licensor No 2 is proposing a vapour balancing connection will be utilised during tanker unloading of NH_3 to ensure safety.	Yes
9	**Fugitive emission from transfer and handling - Valves** BAT for valves include: • correct selection of the packing material and construction for the process application • with monitoring, focus on those valves most at risk (such as rising stem control valves in continual operation) • applying rotating control valves or variable speed pumps instead of rising stem control valves • where toxic, carcinogenic or other hazardous substances are involved, fit diaphragm, bellows, or double walled valves • route relief valves back into the transfer or storage system or to a vapour treatment system.	BAT will be achieved for valve selection by balancing process requirements and minimising fugitive emissions. Valve monitoring and maintenance programmes will be developed during detailed design. Valves will be purchased in accordance with the pipe class, valve material and trim is specified to suit the fluid service. The majority of these techniques are covered as part of inherent GIIP design choices around valves related to the storage	Yes
10	**Fugitive emission from transfer and handling- Pumps and Compressors** BAT for pumps and compressors includes: • proper fixing of the pump or compressor unit to its base-plate or frame • having connecting pipe forces within producers' recommendations • proper design of suction pipework to minimise hydraulic imbalance • alignment of shaft and casing within producers' recommendations • alignment of driver/pump or compressor coupling within producers' recommendations when fitted • correct level of balance of rotating parts • effective priming of pumps and compressors prior to start-up • operation of the pump and compressor within producers' recommended performance range (The optimum performance is achieved at its best efficiency point.) • the level of net positive suction head available should always be in excess of the pump or compressor • regular monitoring and maintenance of both rotating equipment and seal systems, combined with a repair or replacement • Sealing System in Pumps- BAT is to use the correct selection of pump and seal types for the process application. • Sealing system in Compressors- BAT for compressors transferring non-toxic gases is to apply gas lubricated mechanical seals. • BAT for compressors, transferring toxic gases is to apply double seals with a liquid or gas • barrier and to purge the process side of the containment seal with an inert buffer gas. In very high pressure services, BAT is to apply a triple tandem seal system.	Pump and compressor selection will be undertaken during detailed design, and will take into consideration process requirements, reliability, and fugitive emissions All pumps will be designed, manufactured, assembled, installed and aligned according to relevant specification (e.g. API 610 or ISO 5199 or equivalent). All compressors will be designed, manufactured, assembled, installed and aligned according to relevant API or equivalent specification . All major equipment rotating components shall be balanced to relevant standards. Pumps shall be selected to have the Rated Operating Point close to the Best Efficiency Point (BEP) wherever possible. Shaft seals for pumps and compressors shall be selected as per guidelines of relevant API or equivalent standards.	Yes
11	**Soil protection around tanks – containment** BAT for above ground tanks containing flammable liquids or liquids that pose a risk for significant soil pollution or a significant pollution of adjacent watercourses is to provide secondary containment, such as: • tank bunds around single wall tanks;	All environmentally harmful liquids and soluble solids will be stored / handled on an impervious, hard-surfaced and bunded areas to act as a barrier to prevent pollution. Each storage tank will have a containment bund/ alternative secondary containment system which will comply with requirements of CIRIA C736.	Yes

	• double wall tanks; • cup-tanks; • double wall tanks with monitored bottom discharge; For building new single walled tanks containing liquids that pose a risk for significant soil pollution or a significant pollution of adjacent watercourses, BAT is to apply a full, impervious, barrier in the bund. BAT for underground and mounded tanks containing products that can potentially cause soil pollution is to: • apply a double walled tank with leak detection, see Section 4.1.6.1.16, or • to apply a single walled tank with secondary containment and leak detection.	Bunds will be constructed around the tanks to contain spillage, sized to contain 110% of the overflow volume of the largest tank within the bunded area, while providing sufficient freeboard for precipitation 24-hour, 25-year rainfall event. A risk-based leak detection and repair programme will be in place before operations commence.	
12	**Operational procedures and training** BAT is to implement and follow adequate organisational measures and to enable the training and instruction of employees for safe and responsible operation of the installation as described in Section 4.1.6.1.1 of BRef.	Operational procedures and training will include: • Emergency response plans and communication plans for internal purposes and to/for external locations are available and kept up to date. They allow swift intervention of internal and external rescue/support teams and, therefore, might reduce any negative consequences caused by an accident . • Operating instructions are available and followed. They contain information pertaining to the operation of the installation, e.g. plans for monitoring and maintenance, for precautions against malfunctions and for dealing with any that occur • The company has, in its possession, relevant records and documentation on the storage mode (e.g. design data/drawings, inspection and maintenance records, etc. • Training and instruction of employees are both carried out on a regular basis. Employees are informed, among other things, about hazards to the workforce and potential consequences for the environment.	Yes
13	**Storage Tank** a. BAT is to implement and maintain operational procedures – e.g. by means of a management system. b. BAT is to apply leak detection on storage tanks containing liquids that can potentially cause soil pollution. c. c. BAT is to achieve a 'negligible risk level' of soil pollution from bottom and bottom-wall connections of aboveground storage tanks	The management system will include operational procedures for addressing leak detection. Level gauges and tank alarms will be installed on liquid tanks. A gas detection system will be installed to detect leaks of CO_2. A leak detection and repair programme will be included in the plant's operating and maintenance philosophies as part of the management system. Liquid tanks will be contained within a bunded area/ alternate secondary containment system	Yes
14	**Inspection and maintenance** BAT is to apply a tool to determine proactive maintenance plans and to develop risk-based inspection plans.	Inspection and maintenance plans will be developed as part of the operating and maintenance programme..	Yes
15	**Leak detection and repair programme** For large storage facilities, according to the properties of the products stored, BAT is to apply a leak detection and repair programme	Level gauges and tank alarms will be installed on liquid tanks. A gas detection system will be installed to detect leaks of CO_2. A leak detection and repair programme will be included in the plant's operating and maintenance philosophies as part of the EIMS.	Yes
16	**Monitoring of VOC**	Fugitive VOC emissions arise from leaks in plant components and chemical storage facilities. The design will minimise leaks through measures such as using welds over flanges, reducing pipeline components, and specifying low-leak equipment. Emissions will be further controlled with process-inherent containment features like solvent hygiene management, flue gas pre-treatment, and washes/filters. Maintenance access to leaky equipment will be ensured, and standard operating and maintenance procedures within the Company's EMS will minimise fugitive emissions during operations.	Yes
17	**Instrumentation and automation to detect leakage** BAT is to apply leak detection on storage tanks containing liquids that can potentially cause soil pollution. The four different basic techniques that can be used to detect leaks are: • release prevention barrier system • inventory checks • acoustic emission method • soil vapour monitoring. The applicability of the different techniques depends on the tank type and is discussed in detail in Section 4.1.6.1.7	Level gauges will be added to the storage tanks to monitor liquid levels; this will assist in the identification of any leaks. In addition, inventory checks will be undertaken as part of the operational procedures Requirement for leak detection on each of the tanks will be decided on a risk based approach of potential soil/groundwater contamination determined by substance being stored as per standard design and safety requirements. The type of leak detection method is to be established in detailed design.	Yes

18	**Location and layout** BAT is to locate a tank operating at, or close to, atmospheric pressure above ground. However, for storing flammable liquids on a site with restricted space, underground tanks can also be considered. For liquefied gases, underground, mounded storage or spheres can be considered, depending on the storage volume**.**	Selection of location of each tank will be finalised during finalisation of the overall site layout and subject to consideration in HAZOP.	Yes
19	**Tank Colour** BAT is to apply either a tank colour with a reflectivity of thermal or light radiation of at least 70 %, or a solar shield on aboveground tanks which contain volatile substances, see Section 4.1.3.6 and 4.1.3.7 respectively of BRef.	During FEED tank external shell colour/paint standards will be reviewed to confirm they align with the BAT requirement to achieve thermal reflectivity of at least 70% for tanks storing volatile substance	Yes
20	**Dedicated system** BAT is to apply dedicated systems. Dedicated systems are generally not applicable on sites where tanks are used for short to medium-term storage of different products.	The tanks and associated systems will be dedicated systems and will not change duty as part of normal operation.	Yes
21	**Leakage due to corrosion and/or erosion** Corrosion is one of the main causes of equipment failure and can occur both internally and externally on any metal surface. BAT is to prevent corrosion by: A) selecting construction material that is resistant to the product stored B) applying proper construction methods C) preventing rainwater or groundwater entering the tank and if necessary, removing water that has accumulated in the tank D) applying rainwater management to bund drainage E) applying preventive maintenance, and F) where applicable, adding corrosion inhibitors, or applying cathodic protection on the inside of the tank**.**	This is an integral part of design development and the BAT details are expected to be incorporated where appropriate taking into consideration the materials being stored and transported.	Yes

3. Conclusion

On the basis of the assessment against the required BAT Conclusions, as shown in Section 3, 4 and 5, it is considered that the proposed installation will be designed and operated in compliance with:

- the LCP-BRef;
- the BAT for the back-up generators; and
- the BAT for Storage.