

Natural Resources Wales Permitting Decisions

IQE Newport semiconductor facility Decision Document

Application for a Normal Variation

The application number is: PAN-024249

The permit variation number is: EPR/AB3893FZ

The operator is: IQE Silicon Compounds Limited

The Installation is located at: Newport Semiconductor Facility, Imperial Park,
Celtic Way, Celtic Lakes, Newport, NP10 8BE

Purpose of this document

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Unless the decision document specifies otherwise, we have accepted the applicant's proposals.

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Glossary of acronyms and definitions used in this document

AEL - Associated emission level
AMP - Accident management plan
BAT - Best available techniques
BRef - BAT Reference document
COMAH-Control of Major Accident Hazard
DAA - Directly associated activity.
EAL - Environment assessment level
ELV - Emission limit value
EMS - Environmental management system
EPR - Environmental permitting regulation (2016)
GaA - Gallium Arsenide
GaN -Gallium Nitride
HRA - Habitats regulatory assessment
IED - Industrial Emissions Directive (2010)
InP- Indium phosphide
NIA - Noise impact assessment
NMP - Noise management plan
NO_x - Oxides of nitrogen (NO,NO₂ and N₂O)
PC - Process contribution
PEC - Predicted environmental concentration
SAC - Special Area of Conservation
SCR -Site condition report
SPA - Special Protection Area
SSSI - Site of Special Scientific Interest

1. Executive summary

1.1. Application summary

IQE Silicon Compounds Limited (the operator) have applied to vary the permit for Newport Semiconductor Manufacturing Facility to reflect the expansion of the production lines at the site. The site manufactures wafer for the semiconductor industry using metal organic chemical vapour deposition (MOCVD) which occurs within dedicated reactors. The operator is proposing to increase the number of reactors (where MOCVD is undertaken) from 20 to 92. 72 of the new reactors are used for gallium nitride (GaN). The new reactors will result in emissions of ammonia, chlorine, carbon monoxide and oxides of nitrogen to air. Emissions from each of the reaction will be abated using a plasma abatement or chemisorption (depending on the process).

The operator has also applied for 10 of the 20 existing reactors used for gallium arsenide (GaAs) and indium phosphide (InP) to also be used for gallium nitride (GaN) and had been used for research and development. The other 10 reactors will remain unchanged.

As a result of the addition of the new reactors the site will make other changes to the installation:

- Addition of new raw materials being accepted and stored on site. This includes new gas cylinders being stored in dedicated gas cylinder bunker and ammonia stored in a dedicated tank.
- Addition of 2 x 5MWth backup diesel generators for emergency use when power outage occurs. These are subject to the Medium Combustion Plant Directive (MCPD), classed as new limited hours (50 hours per year) Medium Combustion Plants (put into operation after 20/12/2018) and Specified Generators that are excluded.
- Addition of 8 new natural gas fired steam boilers on site, 4 are already existing (and share a single emission stack) while the other four are new (each will have their own emission stack). 5 of the boilers (3 new and 2 existing) will be duty

boilers and other 3 (1 new and 2 existing) will be used as backup boilers. All boilers are below 1 MWth and are therefore not subject to MCPD.

- Addition of new land to the south east of the site where new auxiliary equipment including cooling systems, new steam boilers and backup generators are to be located.

These changes will result in new point source emissions to air from the 72 new reactors (A5-A8, 18 reactors per emission point), backup diesel generator (A9 and A10), new steam boilers (A12-A15). The operator has also applied to add the emission point for the existing boilers (A11) and additional emission point for 10 of the existing reactor (A4a) which is used during etch cycles but for normal operation using GaN will emit through the existing emission point A4. The 1 of the 5 new gas storage bunkers will have an extraction through an existing emission point A2 while the other four new gas storage bunkers will have individual emission points to air (A16-A19) each equipped with an abatement plant.

1.2. Our decision

We have decided to issue the variation for IQE Newport semiconductor facility operated by IQE Silicon Compounds Limited.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

2. Receipt of the application

The application was received on 21/12/2024. In order for us to be able to consider the application duly made, we needed more information. We requested further information relating to:

- containment
- the noise impact assessment
- the odour risk assessment
- the general environmental risk assessment

A letter requesting this information was sent to the applicant on 12/07/2024. A response to this was received on the 22/07/2024 with further clarification being received on the 07/08/2024. Upon receipt of this information, on 07/08/2024, we were able to consider the application duly made. This means we considered it was in the correct form and contained sufficient information for us to begin our determination, but not that it necessarily contained all the information we would need to complete that determination.

3. Confidential information

A claim for commercial or industrial confidentiality has been made. We have accepted the applicants claim for commercial confidentiality and the relevant information has been excluded from the public register. The decision was taken in accordance with our guidance on commercial confidentiality. A Notice confirming this was issued to the applicant on 14/08/2024 and is available on the public register to view.

4. Legislation

The variation is issued, under Regulation 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* as described by the IED;
- a *plant* as described by Schedule 25A covering the Medium Combustion Plant (MCP) Directive
- subject to aspects of the Well-Being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016 which also have to be addressed.

We address the legal requirements directly where relevant in the body of this document. NRW is satisfied that the decision on this application is consistent with its general purpose of pursuing the sustainable management of natural resources (SMNR) in relation to Wales and applying the principles of SMNR. In particular, NRW acknowledges that it is a principle of sustainable management to take action to prevent significant damage to ecosystems. We consider that, in issuing the variation a high

level of protection will be delivered for the environment and human health through the operation of the Installation in accordance with the permit conditions. NRW is satisfied that this decision is compatible with its general purpose of pursuing the sustainable management of natural resources in relation to Wales and applying the principles of sustainable management of natural resources

As the EPR regulator in Wales, NRW are required to determine any duly made permit application. This means that we must decide either to grant, or to refuse the variation based upon an objective assessment of the proposals against the detailed legal requirements of EPR. Our public participation statement¹ gives more information on what can, and cannot, be taken into account when making our permitting decision.

The application, and this decision document, only considers the permitting of the facility under EPR as described throughout the document. We only assess the installation and its impacts and cannot take into consideration indirect impacts which are not as a direct result of activity within the installation boundary.

Any proposed development and wider associated activities will be required to be compliant with all relevant and applicable law, for example, environmental law, health and safety law, planning law. This other legislation acts largely independently of EPR (although they may be inter-related). Such other matters are beyond both the scope of this document, and of our regulatory remit and expertise and are not relevant to our EPR permitting decision. Ensuring compliance with all other regulation and obtaining any required consents (such as planning permission) is the responsibility of those undertaking the development and is regulated by the relevant appropriate authority for each.

5. Consultation

No consultation has been carried out on this application because the variation is not substantial or of high public interest. This decision was made in accordance the

¹ [Natural Resources Wales / Public participation: how you can take part in our permit and licence consultations](#)

Environment Permitting Regulations (EPR), our statutory Public Participation Statement¹ and our Regulatory Guidance.

6. Requests for information

Further information was requested during determination by way of a Schedule 5 Notice requiring the applicant to provide further information relating to noise impact assessment. The Schedule 5 Notice was sent on 19/09/2024 with a deadline for response of 04/10/2024.

The applicant's response to the Schedule 5 Notice was provided on 03/10/2024 with additional information received on the 04/10/2024. The additional information supplied satisfied the requirements of the Schedule 5 Notice.

Several informal information requests were also made via email. These related to confirmation on the fuel used by the backup generators and BAT 19.

A copy of the information notice and e-mails requesting further information were placed on our public register as were the responses when received.

7. The Installation

7.1. The existing permitted activities

The regulated facility is currently an Installation which comprises the following activities listed in Part 2 of Schedule 1 to the Environmental Permitting Regulations:

- Section 4.2 Part A1(c) - Manufacturing (other than the application of a glaze or vitreous enamel) involving the use of or recovery of, any compound of any of the following elements—(i) antimony; (ii) arsenic; (iii) beryllium; (iv) gallium; (v) indium; (vi) lead; (vii) palladium; (viii) platinum; (ix) selenium; (x) tellurium; (xi) thallium, where the activity may result in the release into the air of any of those elements or compounds or the release into water of any substance listed in paragraph 7 (1) of Part 1 of this Schedule.

An installation may also comprise “directly associated activities”, which at this Installation includes:

- Water treatment plant - Pre-treatment of process water by reverse osmosis.
- Foul sewer discharge - Operation of system for the collection and discharge of process emissions via emission point S1.
- Receipt of raw materials - Receipt of gases, substrates and other raw materials used in the process.
- Waste handling and storage - Storage of liquid and solid wastes arising from the process.
- Emissions to air from gas storage bunker (emission point A2) and local exhaust ventilation (emission point A3).

Together, these listed and directly associated activities comprise the existing Installation.

7.2. Changes to the installation

There are no new Schedule 1 activities to be added to the permit as a result of the variation. The proposed new reactors fall under the existing Schedule 1 activity and so the limits of this activity will be changed following the variation. The changes will increase the total number of reactors from 20 to 92. As forementioned, 10 of these reactors are used for the purposes of research and development but will also be used alongside the other 82 will be used for full time production.

The variation will add the following directly associated activities:

- Emissions from gas storage bunkers and local exhaust ventilation - Release of air emissions from extraction from 6 x gas storage bunkers (two of the gas storage bunkers emit through emission point A2 and the other four through emission points A16-A19) equipped with chemisorption abatement.
- Surface water discharge (this is an existing activity but will be added to the permit as part of this variation for completeness) - Discharge of rain water runoff. via emission point W1.
- Natural gas fired steam boilers - 8 steam boilers. 4 steam boilers (operational pre-2018) to discharge through one emission stack (A11) and the other 4 (3 duty 1 standby) to be discharged through individual stacks (A12-A15).

- Cooling systems - Operation of cooling systems for the provision of cooling water.

The two 5 MWth emergency generators being added are above the 1 MWth and classed as Medium Combustion Plants under the Medium Combustion Plant Directive (MCPD) and Schedule 25A of the Environmental Permitting Regulations (as amended). As they are to operate less than 500 hours a year (50 hours as emergency generators) they are “Limited Operating Hours MCP” and therefore exempt from emission limits outlined in MCPD. The MCPs are also exempt Specified Generators (as they are on an installation).

These installation activities, directly associated activities and the MCP activities are listed in the permit under Table S1.1 (With reference AR1-AR10).

8. Operation of the installation

8.1. Operator competence

The applicant is the sole operator of the Installation. We are satisfied that the applicant is the person who will have control over the operation of the Installation after the variation is issued; and that they will be able to operate the Installation so as to comply with the conditions included in the permit. The decision was taken in accordance with EPR RGN 1 Understanding the meaning of operator².

Relevant Convictions

The applicant has declared they have no relevant convictions.

NRW's COLINS Database has been checked to confirm there are no relevant convictions. No relevant convictions were found.

8.2. Environmental Management System

The applicant has stated in the application that they will implement an Environmental Management System (EMS) that will meet the requirements for an EMS in our “How

² [RGN 1 Understanding the meaning of 'operator' \(naturalresources.wales\)](#)

to comply with your environmental permit” guidance³ and BAT 1 for common wastewater and waste gas treatment/ management systems in the chemical sector .

The applicant has submitted a summary of the EMS with their application and has confirmed that it complies with BAT. The EMS is certified to ISO14001:2015

We have reviewed the application and are satisfied that appropriate management systems and management structures will be in place for this Installation, and that sufficient resources are available to the Operator to ensure compliance with all the Permit conditions.

Accident management

The EMS includes an accident management plan which has been amended to include the new activities. The applicant has provided a risk assessment that outlines the additional sections that are to be added to the accident management plan. We have reviewed this and are satisfied that appropriate controls are in place to help reduce the occurrence and impact of any accident that occur. The site has an existing accident management plan which has been amended to reflect the changes to the site.

In order to ensure that the management system proposed by the applicant sufficiently manages the residual risk of accidents, permit condition 1.1.1a requires the implementation of a written management system which addresses the pollution risks associated with, amongst other things, accidents.

The site is currently classified as a lower tier COMAH site. After V003 the site would have the capacity to exceed the threshold of upper tier COMAH however as the site will increase production in a phase approach, it would not be at full capacity after issue and therefore would not immediately exceed the upper COMAH tier following the variation. The applicant will approach Health and Safety Executive and Natural Resources Wales to revise the site’s compliance with COMAH prior to exceeding the upper tier as outlined in section 2.8.7 of their application document “IQE

³ [Natural Resources Wales / Guidance to help you comply with your environmental permit](#)

8.3. Operating techniques

Installation activities and assessment of Best Available Techniques

The applicant has described the proposed equipment and operating techniques and compared these against the relevant guidance notes / Best Available Techniques conclusions (BATc) which for an installation of this type is Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW) published 30th May 2016.

The applicant had also considered the BATc for Common Waste Gas Management and Treatment Systems in the Chemical Sector (WGC) (published 6th December 2022). Following the UK's exit from the European Union, EU BAT/BREFs set the basis for permit conditions within the UK up to 1st January 2021, after which a transition period for the UK's departure from the process was completed. Existing EU BAT conclusions continue to have effect in the UK through the EU Withdrawal Act 2018, however the UK no longer needs to meet the requirements of any new EU BAT Conclusions published after 1st January 2021. This includes the EU WGC BAT conclusions which were published in 2022.

The UK Government and devolved nations have been given the power to define UK-wide BAT under the EU Withdrawal Act and Environment and Wildlife Regulations and this work is on-going.

While we are not legislatively bound to the EU WGC BAT conclusions, in the absence of UK BAT for this sector we still consider them to represent best practice until UK BAT has been determined and consider them relevant for the determination of this permit variation application.

We have reviewed the techniques proposed and consider them in line with them to represent BAT at this installation. A summary of how the applicants proposal will comply with the BAT conclusions for CWWWG BRef is outlined in Annex 4 of this document.

We have specified that the applicant must operate the permit in accordance with descriptions in the application. See section 12.2 of this document for more information on how we have incorporated the variation into the permit and how emission limit values have been set.

Efficient use of raw materials, water and energy

Having considered the information submitted in the application, we are satisfied that the applicant will ensure that raw energy, water energy is used as efficiently as possible.

The operator will be required to report energy usage under condition 4.2 and Schedule 4 of the permit. The following parameters are required to be reported:

- Energy usage
- Water usage

This will enable us to monitor energy recovery efficiency at the Installation.

Avoidance, recovery or disposal of wastes produced by the activities

Having considered the information submitted in the application, we are satisfied that the waste hierarchy referred to in Article 4 of the WFD will be applied to the generation of waste and that any waste generated will be treated in accordance with this Article.

We are satisfied that waste from the Installation that cannot be recovered will be disposed of offsite using a method that minimises any impact on the environment. Permit condition 1.4.1 of the permit will ensure that this position is maintained.

9. The site

9.1. Site Plan

The applicant has proposed to add land to the facility as part of this variation and has provided a an updated plan which we consider is satisfactory, showing the extent of the site of the facility and its emission points (including the new emission points).

The updated plan will be included in the varied permit and the operator will be required to carry on the permitted activities within the site boundary.

9.2. Site Condition Report

The applicant has provided a description of the condition of that land they are adding to the facility in a Site Condition Report. We have reviewed this and consider this description is satisfactory. The decision was taken in accordance with our guidance on site condition reports – guidance and templates (H5)⁴.

9.3. Site protection: potentially polluting substances and prevention measures

The operator has a duty to ensure that soil and groundwater are protected in order to meet the requirements of Articles 14 (1)(b), 14(1)(e) and 16(2) of the IED.

The applicant has outlined in their application that all hazardous liquids (including liquid ammonia for the reactors and the liquids used for the cooling systems) are to be contained in tanks with which are to be bunded (110% of the volume of the tank) on concrete ground.

The process equipment is located indoors on concrete surface and the reactor units themselves would provide containment that will prevent polluting substance reaching the environment in the event of a leak.

Based upon the information in the application we are satisfied appropriate measures will be in place to protect the site and its surroundings from polluting substances. We made this decision in reference to the guidance [How to comply with your environmental permit \(naturalresources.wales\)](#).

10. Environmental Risk Assessment

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration; accidents, fugitive emissions to air and water; as well as point source releases to air, water, sewer and discharges to ground or

⁴ [Environmental Permitting Regulations , Guidance for applicants H5, Site Condition Report, Guidance and Template \(naturalresources.wales\)](#)

groundwater, global warming potential and generation of waste. All these factors have been considered during the determination and the relevant risks from this proposal are discussed in this and other sections of this document.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of emissions from the Installation on human health and the environment and what measures we are requiring ensuring a high level of protection.

In line with our guidance, the applicant has provided an environmental risk assessment with the application which identifies and the sources of key risks from the installation / variation, possible pathways and receptors. This risk assessment and further assessments provided by the applicant and/or completed by NRW will be discussed in further detail below.

10.1. Assessment of impact on air quality

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the emission stacks (both new and existing emission points) and its impact on local air quality.

The applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon human health in line with relevant guidance⁵. These assessments predict the potential effects on local air quality from the Installation's stack emission.

The air impact assessment and the dispersion modelling has been based on three different scenarios to reflect the different operations that occur on site, including the situations. These have been outlined by the applicant as;

- Scenario 1a - Emissions of phosphine and arsine from reactors 1-10 manufacturing GaA and InP and Emissions of emissions of ammonia, chlorine, carbon monoxide and oxides of nitrogen from reactors 11-92 manufacturing Gallium nitride.

⁵ [Air emissions risk assessment for your environmental permit - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit)

- Scenario 1b - As above but reactors 11-20 manufacturing GaA and InP (with emissions of phosphine and arsine) instead of gallium nitride.
- Scenario 2 - Same as scenario 1a but with the 2x emergency diesel backup generators online. The applicant used scenario 1a as the basis as it represented the higher nitrogen contribution (and therefore represent higher impact from emissions of NO_x).

The following substances were identified as being present in the emissions (for all three scenarios) and were assessed against the environmental standard for human health (detailed later in this section) and ecological sites (see [Section 11](#)):

- Phosphine
- Arsine
- Ammonia
- Oxides of nitrogen (expressed as NO_x)
- Carbon monoxide
- Particulate matter (when diesel generators are operational)
- Propane

The site may also emit trace amounts of metal organics and propane. The applicant has stated that the concentration of these are very minimal and are insignificant.

The gallium nitride reactors (72 new and 10 existing) have an etch cycle to remove layers (resulting in chlorine emissions) prior to the normal process (resulting in ammonia and VOC emission). As such two abatement are required for the different processes:

- During the etch cycle the Gallium Nitride will have emission of chlorine which is treated by chemisorption.
- During normal operation the reactors will emit ammonia and VOCs which is abated by plasma conversion abatement. For the two normal operations, the modelling has assumed that all listed emissions and sources will occur continuously (24 hours a day, seven days a week).

Each reactor is equipped with an interlock which will shut down operation in the event that the plasma abatement system is not operational.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably precautionary. The way in which the applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by Natural Resources Wales modelling specialists to establish the robustness of the applicant's air impact assessment.

The applicant has calculated process contributions (PC) at all identified sensitive receptor locations. These receptors include the following receptors

- Powis Close
- Pencarn Avenue
- Sir Bigg Avenues
- Tredgar House Caravan site
- St Joseph's High School
- Imperial Way, Commercial Properties
- Imperial Courtyard, Commercial Property
- Teddies Nursery
- Celtic Springs Guest House

The modelling results for each pollutant will be discussed separately below (results from the worst case scenario modelled have been discussed for each).

Phosphine

Emissions of phosphine were assessed against environmental standard of 42000 ng/m³. At sensitive receptor locations, the maximum predicted PC from the site (worst case from both normal scenarios) was predicted to be 0.04 ng/m³ which is less than 1% (9.5x10⁻⁵%) of the environmental standard. Therefore, in accordance with the relevant guidance⁶, impacts screened out as insignificant.

Arsine

The highest short term process contribution of arsine from the site was predicted to be 0.11 ng/m³ which is 2.3x10⁻⁴% of the environmental standard of 48000 ng/m³. The highest long term process contribution was predicted to be 0.002ng/m³ or 1.3x10⁻⁴%

of the environmental standard of 1600 ng/m³. Therefore, as the process contribution was less than 10% of the environmental standard for short term and less than 1% of the environmental standard for long term, the emissions from the site screen out as insignificant in accordance with the relevant guidance.

Chlorine

Emissions of chlorine were assessed against environmental standard of 290 µg/m³. At sensitive receptor locations, the maximum predicted PC from the site was predicted to be 0.27 ng/m³ which is less than 1% (9×10^{-5} %) of the environmental standard. Therefore, in accordance with the relevant guidance⁶, impacts screened out as insignificant.

Ammonia

Ammonia also screened out as insignificant for both long term and short term emissions with short term (2.1 ng/m³) being less than 10% (8.4×10^{-5} %) of the short term critical level and the long term (0.04 ng/m³) being less than 1% (2.2×10^{-5} %) and as such screen out as insignificant.

Particulate matter

The applicant had assessed for particulate matter (as PM₁₀) when the diesel generators are operational under worst case permitted scenario (50 hours per year). The highest short term process contribution was 0.3 µg/m³ which is 0.6% of the environmental standard of 50 µg/m³. As the short term process contribution is less than 10% of the environmental standard, impact can be screened out as insignificant in accordance with the relevant guidance.

Based upon the information in the application we are satisfied that there will be no adverse impact on human health as result of the emissions to air.

Emission limits

There is no likely risk that the emissions would be at any quantity to pose impact to the environment or human health, as demonstrated by the air quality modelling. Details on emission limits are discussed in Section 12.3.

10.2. Assessment of impact to surface and ground water

There is no change to direct discharge to surface water. The only discharge to surface water consist of uncontaminated rainwater runoff from the yard (via an interceptor).

All process water is discharged to sewer under a trade effluent consent.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent pollution of ground and surface water.

10.3. Emissions to sewer

The proposal includes a discharge to sewer. All process effluent is to be discharged under a Dwy Cymru water discharge consent.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent pollution of surface waters as a result of the sewer discharge.

10.4. Fugitive emissions

The applicant has identified the following potential fugitive emissions in their environmental risk assessment:

- fugitive emissions to surface water
- fugitive emissions to air from gas storage (chlorine, ammonia)

The application details measures which will be in place for preventing and minimising fugitive emissions. As outlined in Section 9.3 the process activities occur inside the building and sits on a hardstanding (impermeable) concrete surface with sealed drainage. Gas cylinders for the gases used in the process (chlorine and propane) are stored either within the reactor bays or dedicated storage bunkers. All storage bunkers are equipped with ventilation and include a chemisorption scrubber fitted would clean the gas in the event of a leak.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise fugitive emissions and to prevent pollution from fugitive emissions.

Permit condition 3.2.1 requires that emissions of substances not controlled by emission limits (i.e., fugitive emissions) shall not cause pollution. Condition 3.2.2 requires that a management plan shall be developed if pollution is subsequently identified.

10.5. Assessment of odour impact

There are odour sensitive receptors within the vicinity of the installation. These include the following residential receptors located;

- Powis Close (approximately 450 meters south east of the site)
- Edmundsbury Road (located approximately 440 meters east of the site)
- Pencarn Avenue (located approximately 250 meters north east of the site).
- Cardiff Road 350 meters to the north
- Blacksmiths Way 750 meters to the north

The applicant has identified the following sources of odour in their environmental risk assessment:

- Ammonia from storage tanks
- Ammonia from normal operations
- Chlorine from normal operations

The emissions of ammonia are treated using the plasma abatement plant. As referenced in Section 10.1, the reactors have an interlock which would stop operation if the plasma abatement is not in operation and as such reduce the risk of unabated ammonia from being released into the environment.

Given the very low predicted concentrations of ammonia and chlorine at the nearest receptors under normal operations and the mitigation in place (abatement) the proposal has a low risk of odour pollution and is unlikely to cause odour issues at the nearby receptors.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where not practicable to minimise the effects of odour.

Condition 3.3.1 in the permit will also require that emissions from the activities are free from odour at levels likely to cause pollution outside the site. We are satisfied that this will be sufficiently protective in conjunction with the measures described by the applicant for minimising odour at the installation.

10.6. Noise and vibration assessment

There are noise sensitive receptors within the vicinity of the installation.

The applicant has identified the following sources of noise in their environmental risk assessment:

- Noise from the chiller units
- Extractor fans
- Transformers
- Backup diesel generator (during power outage)

The applicant had modelled for two situations that could occur 1) during normal operations which reflect the typical (worst-case) noise from the site and 2) under a emergency scenario (where there would be a power outage in the area) and testing where the backup diesel generators would be used.

The applicant had submitted a noise impact assessment that uses computer modelling to predict noise impact at the identified noise sensitive receptors. The noise impact assessment was revised (see Section 6 and PAN-024249 Schedule 5 Notice (on the public register) for more detail) as the initial report and modelling included noises that originated from the existing site in the background⁶. The revised noise impact

⁶ Step 2 of the guidance: [Noise and vibration management: environmental permits - GOV.UK](https://www.gov.uk/guidance/noise-and-vibration-management-environmental-permits) “When you apply for a variation, do not include noise from the existing site (before changes) as part of the background or the residual sound levels. Your noise impact assessment must consider all the noise resulting from the proposed variation – the existing site and the variation together”

assessment included noise sources from both existing and proposed equipment and outlined the predicted worst case scenario at the nearby receptors.

The worst case scenario under normal operations predicted that the nearest residential receptor (Powis Close located approximately 400 meters south east of the installation) would have a level of +5dB above background at Powis. BS4142 guidance states that a sound level of around +5dB above background is an indicator of adverse impacts likely depending on context.

The applicant had stated that the impact is low adverse impact likely based on context. The context the applicant had used to justify why the impact was low adverse impacts was based on the noise levels inside the residential receptors would not exceed 35 dB during day and 30 dB at night and that the existing area has many industries with similar soundscapes.

Assuming that background is representative and given the similar sounds from other existing industries in the area and the context argument used by the applicant, the proposal is unlikely to be significant adverse impact.

However, an improvement condition will be imposed (see Annex 2) requiring the operator to conduct noise monitoring within 3 months of the site being commissioned to establish if the assumptions in the noise impact assessment are correct. If the noise impacts are higher than predict NRW may request a noise management plan be submitted and implemented as outlined in condition 3.4.2 (a) and (b) of the permit

The worst case scenario under emergency operation and testing scenario was predicted at +6dB above background at one receptor (Powis Close) which would represent a risk of adverse impact under BS4142 guidance. However the testing scenarios would only occur for less than 1 hour per month, during daytime hour between 9 am and 5 pm. Owing to the infrequent operation of the testing individual engines for testing, the duration of adverse impact (less than 1 hour between 9 am – 5 pm at a single receptor) and the existing area having similar sounds form industries in the area (notably the data centres adjacent to this installation) the noise is unlikely to cause any long term impacts at the receptors.

All of the other receptors were predicted to have either negligible or minor adverse impacts (+3 dB at Pencarn avenue).

Overall, we are satisfied that the likelihood of emergency operation of the site is extremely low and have permitted the facility accordingly with regard to the impact of emergency operation.

Conditions 3.4.1 of the permit requires noise from the activities to be below that which could cause pollution outside the site.

We are satisfied (on the basis that the assumptions are correct which would be verified by the improvement condition) that this will be sufficiently protective in conjunction with the measures described by the applicant for minimising noise at the installation.

11. Impact on National Site Network Sites, SSSIs and non-statutory sites

The applicant has used the relevant screening distance criteria to identify relevant protected conservation sites which could be at risk from the proposal. We are in agreement with the screening distances used.

A full assessment of the variation application and its potential to affect the identified sites identified has been carried out as part of the permit determination process. National Site Network sites, Sites of Special Scientific Interest (SSSI) and non-statutory conservation sites will be discussed separately below.

11.1. The National Site Network

The following National Site Network sites are located within 10 km of the installation:

- Seven Estuary (SAC, SPA, Ramsar)
- River Usk (SAC)

A Habitat Regulations Assessment (HRA) was completed to assess the potential to affect any of the sites identified. The project was screened for likelihood of significant effects and, taking account of the advice received from NRW's protected sites advisors, is considered not likely to have a significant effect on any National Site Network site (as documented in section 3.2 of OGN 200 Form 1, or section 5 if applicable). The full assessment is available to view on the public register.

11.2. Sites of Special Scientific Interest (SSSI)

Only one SSSI (Gwent Level – St Brides) is located within 2 km of the installation.

As a Section 28G Authority as defined in the Countryside Rights of Way Act 2000 permitting teams within NRW has a legal duty, under Section 28I of the Wildlife and Countryside Act 1981, to consult with NRW for formal advice when permitting an activity which has been determined to be likely to damage the features of a SSSI.

To determine if consultation is required, a SSSI Assessment was completed. The assessment concluded the permission is not likely to damage any of the flora, fauna or geological or physiological features which are of special interest because of conditions. Therefore, no consultation with NRW's protected sites advisors is required.

A copy of the assessment is available to view on the public register.

11.3. Non-statutory conservation sites

The following relevant non-statutory sites are located within 2 km of the installation.

Local Wildlife Sites:

- Celtic Springs
- Coed Ffynon-Oer
- Duffryn Pond
- LG Duffryn Site 1 (South Lake Drive)
- LG Duffryn Site 2
- Afon Ebbw River
- Cwm Pensidan

There were also 20 x designated ancient woodland within the 2 km screening distance.

As discussed, the variation is associated with new emissions to air (refer to section 10.1 for more detail). The applicants modelling assessed the impact of these emissions on the identified non-statutory conservation sites.

The only pollutants that have an environmental standard for assessment on local sites are ammonia and oxides of nitrogen. However as shown in section 10.1, the emissions of the other substances had been shown to be very low and therefore unlikely cause impacts to the local ecological receptors.

Ammonia

The highest ammonia PC (from all scenarios) was predicted to be 0.057 ng/m³ at Celtic Springs local wildlife site. This is 0.0057% of the lower critical level for the site (1000 ng/m³ (1µg/m³)). Therefore, in accordance with the relevant guidance the impacts from ammonia on non-statutory sites can be considered insignificant as the PC at the most impacted receptor is less than 100%.

Oxides of Nitrogen

The highest NO_x PC for normal operations (Using scenario 1a as this had the higher NO_x for normal operations) was predicted to be 0.78 µg/m³ at Celtic Springs local wildlife site. This is 1.04% of the short term critical level (75 µg/m³) and 0.23% of the long term critical level (30 µg/m³). Therefore, in accordance with the relevant guidance the impacts from ammonia on non-statutory sites can be considered insignificant as the PC at the most impacted receptor is less than 100%.

For NO_x emissions under the emergency scenario (i.e. with the use of backup generators), the highest short term process contribution was predicted to be 29.3 µg/m³. This is 39.1% of the short term critical load. Therefore, in accordance with the relevant guidance the impacts from ammonia on non-statutory sites can be considered insignificant as the PC at the most impacted receptor is less than 100%.

Based upon the information in the application we are satisfied that there will be no adverse impact to the non-statutory conservation sites identified.

12. The Permit Conditions

12.1. Updating permit conditions during consolidation

As a result of the consolidation, permit conditions have been updated where relevant to incorporate the variation. This includes the addition of conditions relating to the new proposed MCP activity.

The operator has agreed that the new conditions are acceptable.

12.2. Incorporating the variation

We have specified that the applicant must operate the permit in accordance with descriptions in the application, including additional information received as part of the determination process.

These descriptions have been specified in the Operating Techniques table (Table S1.2) in the permit.

12.3. Emission Limits

Article 14(3) of IED states that BAT conclusions shall be the reference for permit conditions. Article 15(3) further requires that under normal operating conditions; emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions.

We have not set limits for chlorine and ammonia due to the very low emission rate.

We have decided that emission limits should be set for NO_x from the thermal (plasma) abatement from the reactors (emission point A4 and A5-A8). This limit has been derived from the EU BAT conclusions for CWG. As discussed in section 8.3, we consider this to represent best practice in the absence of a UK equivalent.

As the applicant has made a declaration under Article 6 (8) of the medium combustion plant directive (MCPD) that the two backup generators (A9 and A10) are to operate less than 500 hours per year, these are exempt from compliance with the emission limits for set out in the MCPD and as such we have not set emission limits for A9 and A10 but put monitoring for CO emissions as required by MCPD.

12.4. Monitoring

We have decided that monitoring should be carried out for the parameters listed in Schedule 3 of the permit using the methods and to the frequencies specified in those tables. These monitoring requirements have been imposed in order to demonstrate compliance with the emissions limits in the permit.

For emissions to air, the methods for continuous and/or periodic monitoring are in accordance with [Natural Resources Wales / Guidance to help you comply with your environmental permit](#)).

Although the 2 new MCPs (backup generators, A9 and A10) are not subject to permit limits, monitoring for carbon monoxide has been imposed as to comply with the requirements of the MCPD.

Based on the information in the application and the requirements set in the conditions of the permit we are satisfied that the monitoring techniques, personnel and equipment employed by the Operator will have either MCERTS certification or MCERTS accreditation as appropriate.

12.5. Reporting

We have specified the reporting requirements in Schedule 4 of the Permit to ensure data is reported to enable timely review by Natural Resources Wales to ensure compliance with permit conditions and to monitor the efficiency of material use and waste recovery at the installation.

We have specified reporting for emissions of NO_x, CO, ammonia and chlorine from the 72 x GaN reactors (reactors 21-92) (emissions points A5-A8) and the 10x

GaN/GaA/InP reactors (reactors 11-20) (emission points A4 and A4a). The reporting is in line with EU BAT (see Section 12.3 for more detail).

We have also specified reporting requirements for CO for the two backup generators (A9 and A10) once every 5 years in line with the requirements of MCPD.

12.6. Raw Materials

We have specified limits and controls on the use of fuels for the MCP which is specified in Tables S1.1 and in Schedule 8 of the permit.

We have not specified any other limits on raw materials. The storage of gases and hazardous liquids will be controlled through the supporting document which is integrated into the permit through the operating techniques table (Table S1.2).

12.7. Improvement conditions

Based on the information on the application, we consider that we need to impose improvement conditions. Details of the improvement conditions used can be found at Annex 2.

As outlined in Section 10.6, the improvement condition is to measure the noise impact from the equipment on the nearby residential receptors when the site is fully functioning to ensure that the assumptions made in the noise impact assessment and modelling are correct impacts are no more than what was outlined in the noise impact assessment.

13. OPRA

The agreed OPRA score at the installation is 23. This will form the basis for ongoing subsistence fee's.

The OPRA score has changed as a result of this variation. The new agreed score is now 23 (was 32). This will form the basis for ongoing subsistence fee's.

ANNEX 1: Pre-Operational Conditions

No pre-operational conditions set.

ANNEX 2: Improvement Conditions

Reference	Requirement	Date
IC4	Following successful commissioning and establishment of routine steady operation ¹ , the Operator shall undertake a BS 4142:2014+A1:2019 noise impact assessment following guidance set out in Noise and Vibration Management: Environmental Permits and Method implementation document (MID) for BS 4142, to demonstrate that impacts do not exceed those specified in the Noise impact assessment "5223588 IQE noise impact assessment report, revision 4b.docx"	Within 12 months of issue of variation V003 or as otherwise agreed in writing by Natural Resources Wales

¹ Routine steady operation is defined as "normal operation" consists of any operation of the plant not including shut-down and abnormal operation, unless additional definitions are agreed in writing with Natural Resources Wales

ANNEX 3: Consultation Reponses

No consultation carried out as part of this variation as it was not required (see section 5).

ANNEX 4: BAT Assessment

BAT Conclusions for **common waste water and waste gas treatment/ management systems in the chemical sector** in the Official Journal of the EU on 30/05/2016. There are 22 BAT Conclusions. This checklist provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the permit. For definitions and acronyms see the BAT Conclusions Document: [COMMISSION IMPLEMENTING DECISION \(EU\) 2016/ 902 - of 30 May 2016 - establishing best available techniques \(BAT\) conclusions, under Directive 2010/ 75/ EU of the European Parliament and of the Council, for common waste water and waste gas treatment/management systems in the chemical sector - \(notified under document C\(2016\) 3127\) \(europa.eu\)](#)

BATc number	Summary of BAT Conclusion requirement	Status/comment One of the following: Not Applicable, Currently Compliant , Compliant in the future , Not Compliant
1	BAT 1. 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;	Compliant – Management responsible for implementation of EMS and will commit to improve all aspects of the EMS
	ii) an environmental policy that includes the continuous improvement of the installation by the management;	Compliant – See above
	(iii) planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;	Compliant – The environment policy maintains management commitments

<p>(iv) implementation of procedures paying particular attention to:</p> <ul style="list-style-type: none"> (a) structure and responsibility; (b) recruitment, training, awareness and competence; (c) communication; (d) employee involvement; (e) documentation; (f) effective process control; (g) maintenance programmes; (h) emergency preparedness and response; (i) safeguarding compliance with environmental legislation; 	<p>Compliant – As outlined in application document on environment management systems</p>
<p>(v) checking performance and taking corrective action, paying particular attention to:</p> <ul style="list-style-type: none"> (a) monitoring and measurement (see also the 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 or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; 	<p>Compliant – As outlined in application document on environment management systems</p>
<p>(vi) Review of the EMS and its continuing suitability, adequacy and effectiveness by senior management;</p>	<p>Compliant – As outlined in application document on environment management systems</p>

	(vii) following the development of cleaner technologies;	Compliant – EMS will contain obligations for sector benchmarking
	(viii) consideration for the environmental impacts from the eventual decommissioning of the plant at the design stage of a new plant, and throughout its operating life;	Compliant – As outlined in application document on environment management systems
	(ix) application of sectoral benchmarking on a regular basis;	
	(x) waste management plan (see BAT 13).	Compliant – see BAT 13
	Specifically for chemical sector activities, BAT is to incorporate the following features in the EMS	
	(xi) on multi-operator installations/sites, establishment of a convention that sets out the roles, responsibilities and coordination of operating procedures of each plant operator in order to enhance the cooperation between the various operators;	Not applicable- Single operator installation
	(xii) establishment of inventories of waste water and waste gas streams (see BAT 2).	Compliant – See BAT 2
	In some cases, the following features are part of the EMS:	
	(xiii) odour management plan (see BAT 20);	Not applicable – No Likely odour pollution as a result of the variation
	(xiv) noise management plan (see BAT 22).	
2	In order to facilitate the reduction of emissions to water and air and the reduction of water usage, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:	

(i) information about the chemical production processes, including:	
(a) chemical reaction equations, also showing side products;	Compliant
(b) simplified process flow sheets that show the origin of the emissions;	
(c) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;	
(ii) information, as comprehensive as is reasonably possible, about the characteristics of the waste water streams, such as:	
(a) average values and variability of flow, pH, temperature, and conductivity;	Compliant (applicant has trade effluent consent). The data would be monitored as a requirement
(b) average concentration and load values of relevant pollutants/parameters and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, salts, specific organic compounds);	
(c) data on bioeliminability (e.g. BOD, BOD/COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. nitrification));	
(iii) information, as comprehensive as is reasonably possible, about the characteristics of the waste gas streams, such as:	
(a) average values and variability of flow and temperature;	Compliant routine monitoring undertaken at site
(b) average concentration and load values of relevant pollutants/parameters and their variability (e.g. VOC, CO, NOX, SOX, chlorine, hydrogen chloride	
(c) flammability, lower and higher explosive limits, reactivity;	
(d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust	

3	For relevant emissions to water as identified by the inventory of waste water streams (see BAT 2), BAT is to monitor key process parameters (including continuous monitoring of waste water flow, pH and temperature) at key locations (e.g. influent to pretreatment and influent to final treatment)	Compliant -Waste water streams limited to pre-treatment and cooldown
4	BAT is to monitor emissions to water in accordance with EN standards with at least the minimum frequency given below. 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.	
	Refer to monitoring emissions to water table in BRef document	Not applicable - no direct emissions to surface water. Emissions to sewer will be monitored in line with any requirements of the trade effluent consent.
5	BAT is to periodically monitor diffuse VOC emissions to air from relevant sources by using an appropriate combination of the techniques I-III or, where large amounts of VOC are handled, all of the techniques I-III.	
	I./ sniffing methods (e.g. with portable instruments according to EN 15446) associated with correlation curves for key equipment;	Compliant – Reactors are fitted with gas detection which would detect any leaks (see BAT 19)
	II. optical gas imaging methods;	
	III. calculation of emissions based on emissions factors, periodically validated (e.g. once every two years) by measurements.	

6	BAT is to periodically monitor odour emissions from relevant sources in accordance with EN standards.	
	Emissions can be monitored by dynamic olfactometry according to EN 13725. Emission monitoring may be complemented by measurement/estimation of odour exposure or estimation of odour impact.	Not applicable- Low risk of odour emissions from the site.
7	In order to reduce the usage of water and the generation of waste water, BAT is to reduce the volume and/or pollutant load of waste water streams, to enhance the reuse of waste water within the production process and to recover and reuse raw materials.	Compliant – Water use is monitored on site and new equipment will be monitored
8	In order to prevent the contamination of uncontaminated water and to reduce emissions to water, BAT is to segregate uncontaminated waste water streams from waste water streams that require treatment.	Compliant – site has segregation of surface run off (to surface water drain) and process water (sent to sewer)
9	In order to prevent uncontrolled emissions to water, BAT is to provide an appropriate buffer storage capacity for waste water incurred during other than normal operating conditions based on a risk assessment (taking into account e.g. the nature of the pollutant, the effects on further treatment, and the receiving environment), and to take appropriate further measures (e.g. control, treat, reuse).	Compliant – all process occurs in doors on sealed drainage and discharge to sewer. All external tanks have secondary containment and are segregated from surface water drain.
10	In order to reduce emissions to water, BAT is to use an integrated waste water management and treatment strategy that includes an appropriate combination of the techniques in the priority order given below	
	(a) Process-integrated techniques	Compliant – waste water is generally low volume and concentration.
	(b) Recovery of pollutants at source	

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(c) Waste water pretreatment	
(d) Final waste water treatment	
In order to reduce emissions to water, BAT is to pretreat waste water that contains pollutants that cannot be dealt with adequately during final waste water treatment by using appropriate techniques.	Not applicable- Volume of waste water from reactors is very low and unlikely to cause problems for the waste water treatment works (WWTW). The applicant discharges under a trade effluent consent which will have limits to ensure the WWTW can handle the effluent.

In order to reduce emissions to water, BAT is to use an appropriate combination of final waste water treatment techniques.

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Preliminary and primary treatment	
(a) Equalisation	Not applicable- no direct discharge to surface water - effluent is low concentration and discharge to sewer where it is treated at an effluent treatment plant
(b) Neutralisation	
(c) Physical separation, e.g. screens, sieves, grit separators, grease separators or primary settlement tanks	
Biological treatment (secondary treatment), e.g	
(d) Activated sludge process	Not applicable- no direct discharge to surface water - effluent is low concentration and discharge to sewer where it is treated at an effluent treatment plant
e) Membrane bioreactor	
Nitrogen removal	
(f) Nitrification/denitrification	

Phosphorus removal		Not applicable- no direct discharge to surface water - effluent is low concentration and discharge to sewer where it is treated at an effluent treatment plant
(g) Chemical precipitation		
Final solids removal		
(h) Coagulation and flocculation		Not applicable- no direct discharge to surface water - effluent is low concentration and discharge to sewer where it is treated at an effluent treatment plant
(i) Sedimentation		
(j) Filtration (e.g. sand filtration, microfiltration, ultrafiltration)		
(k) Flotation		
BAT-AELs for direct emissions of TOC, COD and TSS to a receiving water body		
Parameter	BAT-AEL	Not applicable - No directed emissions of process water to surface (discharge to sewer)
Total organic carbon (TOC)	10-33 mg/l	
Chemical oxygen demand (COD)	30-100 mg/l	
Total suspended solids (TSS)	5.0-35 mg/l	
BAT-AELs for direct emissions of nutrients to a receiving water body		
Adsorbable organically bound halogens (AOX)	0.20-1.0 mg/l	Not applicable - No directed emissions of process water to surface (discharge to sewer)
Chromium (expressed as Cr)	5.0-25 µg/l	
Copper (expressed as Cu)	5.0-50 µg/l	
Nickel (expressed as Ni)	5.0-50 µg/l	
Zinc (expressed as Zn)	20-300 µg/l	

13	In order to prevent or, where this is not practicable, to reduce the quantity of waste being sent for disposal, BAT is to set up and implement a waste management plan as part of the environmental management system (see BAT 1) that, in order of priority, ensures that waste is prevented, prepared for reuse, recycled or otherwise recovered	Compliant - waste management plan will form part of the environment management system. The operator will apply waste hierarchy for recycling and disposal
14	In order to reduce the volume of waste water sludge requiring further treatment or disposal, and to reduce its potential environmental impact, BAT is to use one or a combination of the techniques given below.	
	(a) Conditioning	Not applicable - no direct discharge to surface water - effluent is low concentration and discharge to sewer where it is treated at an effluent treatment plant
	(b) Thickening/dewatering	
	(c) stabilisation	
	(d) Drying	
15	In order to facilitate the recovery of compounds and the reduction of emissions to air, BAT is to enclose the emission sources and to treat the emissions, where possible.	Compliant – The reactors are enclosed and fitted with leak detectors The reactors also have an interlock which will shut off the reactors if the plasma abatement plant is not operational
16	In order to reduce emissions to air, BAT is to use an integrated waste gas management and treatment strategy that includes process-integrated and waste gas treatment technique	Compliant – The design and operation of the equipment means that the systems is enclosed. The abatement plants are linked to the process equipment.

17	In order to prevent emissions to air from flares, BAT is to use flaring only for safety reasons or non-routine operational conditions (e.g. start-ups, shutdowns) by using one or both of the techniques given below.	
	(a) Correct Plant Design	Not Applicable – No flaring installed on site
	(b) Plant management	
18	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use one or both of the techniques given below.	
	(a) Correct design of flaring devices	Not Applicable – No flaring installed on site
	(b) Monitoring and recording as part of flare management	
19	In order to prevent or, where that is not practicable, to reduce diffuse VOC emissions to air, BAT is to use a combination of the techniques given below	
	Techniques related to plant design	
	(a) Limit the number of potential emission sources	Compliant – Reactors are fitted with detection alarms
	(b) Maximise process-inherent containment features	Compliant gas bunkers fitted with abatement if accidental release occurs
	(c) Select high-integrity equipment (see the description in Section 6.2)	Compliant all equipment is highly integrated
	(d) Facilitate maintenance activities by ensuring access to potentially leaky equipment	Compliant all pipe work full accessible for maintenance
	Facilitate maintenance activities by ensuring access to potentially leaky equipment	

	(e) Ensure well-defined and comprehensive procedures for plant/ equipment construction and assembly. This includes using the designed gasket stress for flanged joint assembly (see the description in Section 6.2)	Compliant
	(f) Ensure robust plant/equipment commissioning and handover procedures in line with the design requirement	Compliant
	Techniques related to plant operation	
	(g) Ensure good maintenance and timely replacement of equipment	Compliant– Maintenance practices in place. Reactors equipped with leak detection. Propane distribution doubled piped to contain any leaks
	(h) Use a risk-based leak detection and repair (LDAR) programme (see the description in Section 6.2)	
	(i) As far as it is reasonable, prevent diffuse VOC emissions, collect them at source, and treat the	
20	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
	(i) a protocol containing appropriate actions and timelines;	Not applicable- site is unlikely to have odour issues as outlets have sufficient abatement equipped.
	(ii) a protocol for conducting odour monitoring;	
	(iii) a protocol for response to identified odour incidents;	
(iv) an odour prevention and reduction programme designed to identify the source(s); to measure/estimate odour exposure; to characterise the contributions of the sources; and to implement prevention and/or reduction measures.		

21	In order to prevent or, where that is not practicable, to reduce odour emissions from waste water collection and treatment and from sludge treatment, BAT is to use one or a combination of the techniques given below	
	(a) Minimise residence times	Not applicable- No directed emissions of process water to surface (discharge to sewer)– While there is some treatment prior to discharge to sewer, there is no effluent treatment plant on site that could produce odours
	(b) Chemical treatment	
	(c) Optimise aerobic treatment	
	(d) Enclosure	
	(e) End-of-pipe treatment	
22	In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to set up and implement a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
	(i) a protocol containing appropriate actions and timelines;	Applicability subject to outcome of improvement condition IC 4 - If noise pollution is perceived (as shown in noise monitoring) then NRW would ask applicant to submit a noise management plan under condition 3.4.2
	(ii) a protocol for conducting noise monitoring	
	(iii) a protocol for response to identified noise incidents;	
	(iv) a noise prevention and reduction programme designed to identify the source(s), to measure/estimate noise exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.	
23	In order to prevent or, where that is not practicable, to reduce noise emissions, BAT is to use one or a combination of the techniques given below	

(a) Appropriate location of equipment and buildings	<p>Applicability subject to outcome of improvement condition IC 4</p> <p>The reactors and processes are located indoors However some of the auxiliary equipment (extraction fans, water cooling systems) are located outdoors.</p>
(b) Operational measures	<p>Applicability subject to outcome of improvement condition IC 4</p>
(c) Low-noise equipment	
(d) Noise-control equipment	
(e) Noise abatement	