Permitting decisions

Variation

We have decided to grant the variation for Wilton Olefins Installation operated by Sabic UK Petrochemicals Limited.

The variation number is EPR/BS3590IE/V011.

We have also carried out an Environment Agency initiated variation to the permit.

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.

Purpose of this document

This decision document provides a record of the decision making process. It summarises the decision making process in the decision checklist to show how all relevant factors have been taken in to account.

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- shows how we have ensured compliance with the Large Combustion Plant BAT conclusions document
- shows how we have ensured compliance with the chapter 3 of the Industrial Emission Directive
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- shows how we have considered the consultation responses

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

Read the permitting decisions in conjunction with the environmental permit and the variation notice. The introductory note summarises what the variation covers.

Key issues of the decision

Contents:

GLOSSARY

Baseload	means: (i) as a mode of operation, operating for >4000hrs per annum; and (ii) as a load, the maximum load under ISO conditions that can be sustained continuously, i.e. maximum continuous rating
BAT	best available techniques
BOFA	boosted over fire air
BREF	best available techniques reference document
CBA	cost benefit analysis
CCGT	combined cycle gas turbine
EED	Energy Efficiency Directive
ELV	emission limit value set out in either IED or LCPD
EUETS	European Union Environmental Trading System
IED	Industrial Emissions Directive 2010/75/EC
LCP	large combustion plant – combustion plant subject to Chapter III of IED
MCR	Maximum Continuous Rating
MSUL/MSDL	Minimum start up load/minimum shut-down load
Part load operation	Operation during a 24 hr period that includes loads between MSUL/MSDL and maximum continuous rating (MCR). Also referred to as low load operation.
SAC	Special Area of Conservation
SCR	selective catalytic reduction
SNCR	selective non catalytic reduction
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

1. Chapter III of the IED

Chapter III of the Industrial Emissions Directive (IED) applies to new and existing large combustion plants (LCPs) that have a total rated thermal input which is greater or equal to 50MW. Articles 28 and 29 explain exclusions to Chapter III and aggregation rules respectively.

The aggregation rule is as follows:

- A LCP has a total rated thermal input ≥50MW.
- Where waste gases from two or more separate combustion plant discharge through a common windshield, the combination formed by the plants are considered as a single large combustion plant.
- The size of the LCP is calculated by adding the capacities of the plant discharging through the common windshield disregarding any units <15MWth.

A “common windshield” is frequently referred to as a common structure or windshield and may contain one or more flues.

Combustion plant on the installation that do not form part of an LCP and so do not come under chapter III requirements, will still aggregate to be part of the Section 1.1 A(1)(a) activity listed in Schedule 1 of the Environmental Permitting regulations if they have a rated thermal input of 1MW thermal input or over.

Chapter III lays out special provisions for LCP and mandatory maximum ELVs are defined in Part 2 of Annex V for new plant, however it is worth noting that BAT requirements may lead to the application of lower ELVs than these mandatory values. Mandatory ELVs cannot be exceeded even if a site specific assessment can be used to justify emission levels higher than BAT.

2. Large Combustion Plant Description and Number

The Permit uses the DEFRA LCP reference numbers to identify each LCP. This variation adds the following new LCP to the permit:

LCP 648,

This new LCP consists of one 85MWth boiler. The fuel used in the combustion units is formed as a by-product of the cracking process, supplemented with natural gas, methane or propane as required i.e. fuel-gas.
Grid reference for stack is NZ 57945 21200.

3. Compliance Route

The Operator has proposed to operate LCP 648 under the ELV compliance route, complying with Article 30(3) and the emission limits set out in Part 2 of Annex V of the IED.

4. Net thermal input

The Operator has stated that the Net Thermal Input of LCP648 is 85MWth.

They have justified this figure by providing manufacturers design data, in their response (received 11/10/17) to question 2 of the schedule 5 notice issued on 29/9/17.

5. Minimum start up load and Minimum shut-down load (MSUL/MSDL)

The Operator has defined the “minimum start up load” and “minimum shut-down load” for LCP648 in their application.

The output load and percentage of the rated output is based on the rated thermal output from the boiler. In this case the MSUL/MSDL is defined as 10 tonnes per hour steam, and 10% of maximum thermal output. The Operator confirmed that these loads are correct in their response (received 11/10/17) to question 3 of the schedule 5 notice issued on 29/9/17.

We agree with these definitions and have set these thresholds in table S1.4 of the permit accordingly. Standard permit condition 2.3.5 has been set to define the period of start up and shut down, referring to the thresholds in this table

6. The Installation's environmental impact

For an installation of this kind, the principal emissions are those to air and water, although we also consider those to land.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment.

6.1 Assessment Methodology

6.1.1 Application of Environment Agency Web Guide for Air Emissions Risk Assessment

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our Web Guide and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of "process contribution (PC)", which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

6.1.2 Use of Air Dispersion Modelling

Air dispersion modelling enables the process contribution to be predicted at any sensitive environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Quality Standards (EQS).

Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels. In a very small number of cases, e.g. for emissions of Lead, the National EQS is more stringent that the EU EQS. In such cases, we use the National EQS standard for our assessment.

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a National EQS. However, National EQSs are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered **Insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant EQS; and
- the **short-term** process contribution is less than **10%** of the relevant EQS.

The **long term** 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedances of the relevant EQS are likely. This is done through detailed audit and review of the Operator's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of an EU EQS is identified, we may require the Operator to go beyond what would normally be considered BAT for the Installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedances are considered likely, the application is subject to the requirement to operate in accordance with BAT.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions **would cause significant pollution**, we would refuse the Application.

6.2 Assessment of Impact on Air Quality

The Operator's assessment of the impact of air quality is set out in the report "Air Quality Assessment for Optimisation of Stack for New Boiler E, Olefins 6 Plant, Wilton, SABIC UK Petrochemicals Ltd, Teesside" Reference 60K26305/000/641/K/003, Rev 2, 07 June 2017 which formed part of the Application. The assessment comprises:

- A screening assessment of emissions to air from the operation of the installation.
- Dispersion modelling of emissions to air from the operation of the installation.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the installation and its impact on local air quality. The impact on conservation sites is considered in section 6.3. Carbon Monoxide was screened out by H1 database and so only NOx emissions were modelled.

The Operator has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the ADMS 5.1 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at Boulmer and Leeming between 2011 and 2015 They used a combination of met data from both stations i.e. temperature, humidity and cloud cover data obtained from Leeming and wind data from Boulmer. Although Boulmer is approximately 1.5 km from seaside, the station is located 100 km north of the facility and might not represent local conditions at the site. Leeming is located 40 km southwest inland, but has a different wind rose to Boulmer i.e. south-east vs. south-west prevailing wind, however, there may be other differences in meteorological conditions as a result of location in relation to the estuary. We included sensitivity to different meteorological data and included Numerical Weather Prediction data in our check modelling. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following scenarios:

Scenario 1 - based on the modified and existing combustion sources plus the new boiler B1703E, discharging from a new stack assessed at three different heights; 35 m, 45m and 55m.

All sources would be emitting NOx at the following new Emission Limit Values (ELVs) rather than at actual predicted concentrations:

- Furnaces A–P: NOx 180 mg/Nm^3;
- VMR furnaces A-C: NOx 180mg/Nm^3;
- Super Heater A-C: NOx 300mg/Nm^3
- Boiler C providing: NOx 450mg/Nm^3
- New boiler E running on fuel F12 to provide 33 te/hr steam: NOx 100mg/Nm^3.

Notes:
a) All ELVs are at standard reference conditions (dry, 273.15 K, 101.3 kPa) and 3% oxygen.

b) The new boiler specification for NOx emissions is 80mg/Nm^3. However, as the ELV is higher, it is used to provide a conservative assessment.

Scenario 2 – minimum flow assessment based on Boiler B1703E operated at 10% volume flow where the mass release is greatly reduced but dispersion is also reduced;

Scenario 3 - maximum flow based on 100% capacity in which mass release increases but dispersion differs due to the higher volume flow.

The Operator used a generic NO_2 background concentration of 12.8 µg/m^3 from Redcar Dormanstown local monitoring station in 2014. We have consulted the Local Authority Annual Status Report and found diffusion tubes at receptors showing values between 12.5 and 22 µg/m^3. We used all these monitoring figures when checking the modelling files submitted by the Operator.

As well as calculating the peak ground level concentration, the Operator has modelled the concentration of key pollutants at a number of specified locations within the surrounding area.

The way in which the Operator used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the Operator's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites.

Our review of the Operator's assessment leads us to agree with the Operator's conclusions.

The Operator's modelling predictions are summarised in the following sections.

6.2.1 Assessment of Air Dispersion Modelling Outputs

The Operator's modelling predictions are summarised in the table below. The Operator's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. The table below shows the ground level concentrations at the most impacted receptor (Meggits Lane) using the worst case scenario stack height of 35m. As "maximum on grid figure" was found to be within the Olefins 6 plant itself, we have not used this.

Whilst we have used the Operator's modelling predictions in the table below, we have made our own simple verification calculation of the percentage process contribution and predicted environmental concentration (PEC). These are the numbers shown in the table below and so may be very slightly different to those shown in the Application, or in the case of short term PEC they are lower as the Operator has used a higher background figure than necessary. These discrepancies do not materially impact on our conclusions.

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC)**	
	µg/m3		**µg/m3**	**µg/m3**	**% of EAL**	**µg/m3**	**% of EAL**
NO2	40	1	12.8	6.2	15.50	19.0	47.5
	200	2	25.6	34.2	17.1	59.8	29.9

1 Annual Mean

2 99.79th %ile of 1-hour means

N.B. the Applicant used a short term background level of 59 µg/m3, whereas double the long term background is just 25.6 µg/m3

N.B. the Operator used a short term background level of 59 µg/m^3 which is the hourly 99.97%ile NO_2 data from Dormanstown monitoring. This is overly conservative for detail modelling as the 99.79th hourly background concentration is unlikely to coincide with the 99.79th model prediction, and so in the above table we have used double the long term background i.e. 25.6 µg/m^3 which is our recommended approach and is still a conservative approach.

From the table above the NOx emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the PEC is less than 100% (taking expected modelling uncertainties into account) of both the long term and short term EQS/EAL .

Within our check of the modelling and sensitivity analysis, the contribution of the new boiler B1703E alone is insignificant and the contribution is small compared to overall predictions. Because of such small prediction and high modelling uncertainties differences in stack heights are minor and so we accept a 40m high stack as BAT for this Installation.

6.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the EU EQS of 40 $\mu g/m^3$ as a long term annual average and a short term hourly average of 200 $\mu g/m^3$.

The table in section 6.2.1 shows that the peak long term PC is greater than 1% of the EU EQS and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EU EQS being exceeded. The peak short term PC is above the level that would screen out as insignificant (>10% of the EU EQS). However it is not expected to result in the EU EQS being exceeded.

(ii) Dust

Dust is not an issue for the new boiler due to it burning process gas, and natural gas only. See Annex 2, BAT conclusion 4, for more details

(iii) Sulphur Dioxide

Sulphur dioxide emissions will be negligible. See Annex 2, BAT conclusion 4, for more details

(iv) Emissions to Air of Carbon Monoxide (CO),

The Operator states that they used the Environment Agency's H1 assessment tool to screen out carbon monoxide emissions as insignificant, and so detailed modelling of CO was not carried out. They provided the data used but did not provide the results of the screening. We used the data provided, and also used the emission limit set in the Permit, to confirm that the peak short term PC for the new boiler will be well below 10% of the EAL/EQS and so can be screened out as insignificant.

6.3 Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.

6.3.1 Sites Considered

The following Habitat sites (i.e. SACs, SPAs and Ramsar sites) are located within 10km of the Installation:

- North York Moors SAC
- Teesmouth and Cleveland Coast SPA and Ramsar.

There are no individual SSSIs within 2km of the proposed Installation (the SSSIs designated within 2km of the site are part of the internationally important designations – see 6.3.2 below).

The following non-statutory local wildlife and conservation site is the only one located within 2 km of the Installation:

- Wilton Woods (Local wildlife site and ancient woodland)

N.B. In their report the Operator reviewed all "Nature Conservation" sites within 10km of the site, and so included SSSI's and non-statutory sites which we have screened out due to their distance from the site being over 2km.

6.3.2 Habitats Assessment

The Operator's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest features of the protected sites, for the emissions from the new boiler.

The Operator modelled the following sites which form part of the Teesmouth and Cleveland Coast SPA and Ramsar:

- Bran Sands (Ramsar ~ 6km NNE of Installation),
- Coatham Sands (SPA and Ramsar, ~5km N of Installation)
- Tees & Hartlepool Foreshore Wetlands (T&HFW) 1,- Jetty 1 (SSSI, SPA, Ramsar ~ 5.5km NE of Installation)
- T&HFW 2 - Seal Sands East (SSSI, SPA and Ramsar ~6.5 km NE of Installation)

They also determined the impacts on the North York Moor SAC and SPA (~8.5km south of the Installation).

The Operator's modelling was for the installation as a whole, rather than just the impacts of the new boiler's emissions. This is overly conservative as the emissions from the rest of the Installation already form part of the background air quality data as the installation has been operating for many years. The modelling of the installation is also based on all emission points emitting at their permitted limits at the same time, which again is a very conservative assumption.

The Operator has assessed the impacts of nutrient nitrogen deposition and acidification following AQTAG06 guidance. We have cross-checked critical levels, critical loads and background values with data from APIS website (Air Pollution Information System, www.apis.ac.uk). The Operator's critical level predictions are presented in tables 20 and 21 of the Air quality assessment report. Contribution to nitrogen and acid critical loads are presented in tables 22 to 25. The Operator predicts that NOx concentrations are unlikely to exceed the critical levels and nitrogen depositions are insignificant at ecological receptors. They have assessed acid deposition against the whole range of acid critical load functions over the whole habitat site, predicting over 1% for the minimum and below 1% for the maximum critical load for some habitats. As discussed above, the modelling was for the whole installation, and when we considered just the new boiler the acid deposition was found to be below 1%. We checked the critical loads in APIS per grid location that displays a unique critical load for each grid square for the most sensitive feature.

The Operator did not assess against the NO_X daily critical level. We reviewed this omission as part of our detailed audit of the application air quality impact assessment and determined that the environmental risks were low. Daily NOx process contributions from the proposed variation are insignificant and there are unlikely to be any predicted exceedances from the whole site.

We carried-out detailed check modelling and sensitivity analysis using ADMS 5.2 and are satisfied that exceedances at sensitive ecological receptors are unlikely as a result of emissions from the new boiler.

6.3.3 Assessment of other conservation sites

Conservation sites are protected in law by legislation. The Habitats Directive provides the highest level of protection for SACs and SPAs, domestic legislation provides a lower but important level of protection for SSSIs. Finally the Environment Act provides more generalised protection for flora and fauna rather than for specifically named conservation designations. It is under the Environment Act that we assess other sites (such as local wildlife sites) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other European and National legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites that they are not of considerable importance. Local sites link and support EU and National nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs, SPAs, Ramsar sites and SSSIs we consider the contribution PC and the background levels in making an assessment of impact. In assessing these other sites under the Environment Act we look at the impact from the Installation alone in order to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Natura 2000 or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC, SPA and SSSI features are more stringent than those for other nature conservation sites.

Therefore we would generally conclude that the Installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the Operator is using BAT to control emissions.

The Operator has assessed the impacts of nutrient nitrogen deposition and acidification following AQTAG06 guidance. We have cross-checked critical levels, critical loads and background values with data from APIS website. The Operator's critical level predictions are presented in table 20 of the Air quality assessment report. Contribution to nitrogen and acid critical loads are presented in tables 22 to 25.

The Operator did not assess against the NO_X daily critical level. We reviewed this omission as part of our detailed audit of the application air quality impact assessment and determined that the environmental risks were low. Daily NOx process contributions from the proposed variation are insignificant and there are unlikely to be any predicted exceedances from the whole site.

The tables in the modelling report show that the PCs are well below the critical levels or loads. We are satisfied that the Installation will not cause significant pollution at the Wilton Wood site. The Operator is required to prevent, minimise and control emissions using BAT, this is considered further in Section 7.

6.4 Emissions to Water

There will be no changes to the impact of the Installation to water as a result of this variation, as there will be no new pollutants released and the Installation will remain within the current emission limits.

6.5 Noise Impacts

The new boiler is located within the larger Olefins Installation, which is in turn located within the wider Wilton International site. The Wilton Industrial site comprises a number of separate industrial processes and operations operated by a number of different organisations. The existing permitted Sabic facility is subject to an agreed noise management plan, with which the agreed nearby sensitive receptors have been assessed for background noise. The nearest sensitive receptors are Wilton Village, Lazenby and Kirkleatham, and are located within 1 km to the south-east, south and east respectively.

We have assessed the use of BAT for noise in Annex 1 of this document (see BAT 17) and conclude that the Operator is complying with the BAT conclusion requirements.

The Operator designs their new plant to their own internal standard to "Not to increase overall plant noise at the boundary fence", consequently noise impacts will not be significant from the site.

No routine venting of steam is likely to cause significant noise levels, as steam venting is carried out for safety reasons and will be minimised. Whenever possible, routine testing of pressure relief valves is completed during 'daylight hours' to minimise public disturbance. In abnormal operating conditions, such as a trip of one of the main steam turbine driven compressors, the new boiler will need to vent pressurised steam through the relief valves. Boiler steam pressure is initially relieved to atmosphere through control valves fitted with silencers but if the pressure continues to rise then the relief valves can lift, in addition to the dump valves. This is a key safety feature to protect the integrity of the new and existing site boilers.
Once the new boiler has fired down, or the machine restarted, then the dumps and relief valves close automatically. Such an event will be dealt with in accordance to the existing noise management plan for the Installation and conditions exist within the permit to control noise nuisance.

To confirm that the measures in place to control noise are adequate for the new boiler, we have set improvement condition IC32 to monitor the noise impacts from the installation and review any changes as a result of the new boiler.

7. Application of Best Available Techniques

7.1 Scope of Consideration

Existing equipment on site, in some cases, pre-dates the 1950's when the earliest Olefins plant was on the Wilton site. The date of design for some plant means that it is has historically been constrained by the original concept and implementation of that design. In 2003, the existing equipment was benchmarked against the relevant and appropriate BAT guidance at that time.

As part of the variation application submission, the Operator has made specific reference to the BAT Reference Document for the Large Volume Organic Chemicals and the BAT Reference Document for LCPs (Final Draft, June 2016).

The new boiler plant, that is part of the focus of this variation application, is a replacement for an existing boiler plant previously installed on Olefins 6. The replacement of the plant has made the application of some BAT techniques cited in the BREF difficult to meet. For example, the application specifies that the feed and steam cycles are pre-existent and therefore the new boiler must operate in harmony with these (and other steam-generating equipment on Olefins 6 site).

The requirement for water recycling of residual aqueous streams will see waste water streams (surface water run-off and cooling water) segregated and treated separately.

In this section, we explain how we have determined whether the Operator's proposals are BATfor the new boiler plant.

Chapter III of the IED specifies a set of maximum ELVs. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be specifically achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter III.

We have reviewed the permit for this installation against the BAT Conclusions for LCPs published on 17/08/2017 in the Official Journal of the European Union.

7.2 Review of compliance with BAT Conclusions

There are 75 BAT Conclusions. Annex 1 provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the new boiler.

7.3 Energy efficiency

7.3.1 Use of energy within the Installation

Having considered the information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that energy is used efficiently within the Installation.

BAT-associated energy efficiency levels (BAT-AEELs) are discussed in Annex 1 BAT 55.

The Application details a number of measures that will be implemented at the Installation in order to increase its energy efficiency – see Annex 1 and the review of compliance with BAT 12 Energy Efficiency elements for further details.

The main factor associated with energy efficiency for this variation, is the beneficial use of process vent gas. For safety reasons, the burners on the current boiler cannot use the refinery gas produced by the furnace so some of it is flared. The new boiler does use it and so flaring of process vent gas should cease when it is commissioned, thus recovering this waste energy stream.

7.3.2 Compliance with Article 14(5) of the Energy Efficiency Directive

Article 14(5)c requires that a new or substantially refurbished industrial installation with a total aggregated net thermal input of more than 20 MW generating waste heat at a useful temperature level, comes under the scope of the EED. In these cases a CBA will be required for connecting to a district heating and/or cooling network.

Before deciding if a CBA is required, it is necessary to assess whether any waste heat at a useful temperature level is generated. For the purposes of 14,5(c) installations, "waste heat" is considered to be heat at the point at which it is finally rejected from the process. Heat which is "lost" during a process (e.g. from insulated pipework transporting steam or hot water) is not considered to be waste heat. It is assumed that waste heat, once recovered, will be in the form of hot water or steam. Where all the available waste heat is already being recovered for use within the installation, no CBA is required.

In order to determine whether the installation is producing waste heat at a "useful temperature" it should be firstly determined whether it is technically feasible to recover the heat in the form of hot water or steam (see section on technical feasibility below) and then see whether there are any heat loads within the appropriate distance which can use the heat at this temperature. District heating schemes in the UK will generally require waste heat at a temperature of 65 ºC or more which is most likely to arise from high-temperature industries e.g. glass, cement etc.

The following factors should be considered to determine whether a scheme is technically feasible:

- The feasibility of capturing waste heat in order to supply it to the user e.g. use of heat exchangers (14,5 (c) installations)
- The compatibility of the heat source(s) and load(s) in terms of temperature and load profiles
- Whether thermal stores or other techniques can be used to match heat source(s) and load(s) which will otherwise have incompatible load profiles
- Whether there is enough demand for heat to allow high-efficiency cogeneration (14,5(a) and 14,5(b) installations)
- For existing installations which are substantially refurbished, the ability to retrofit heat take-off or waste heat recovery (including space considerations)
- Any adverse effects on the environment of recovering waste heat e.g. reduced dispersion of stack gases (14,5(c) installations)
- Alternative proposals to use waste heat within the installation which the operator is committed to implementing (14,5(c) installations)
- For 14, 5(c) installations where the waste heat cannot be recovered, whether a cogeneration plant could supply the heat requirements instead

This application relates specifically to the replacement of a boiler and does not address the possibility of heat recovery from the downstream (existing) steam system to produce heat to other industrial processes or district heating and also there is little realistic potential for the future use of heat in the vicinity of the unit.

Heat recovery by cogeneration (CHP) has been considered but is limited in scope as the project only involves replacing a boiler. The electrical power to steam balance of the cracking plant offers little or no opportunities for cogeneration, with normal heat recovery and feed heating already incorporated, and no new or local heat sinks being available. The gas turbine size for CHP to match the required steam flow (100 te/h) would be in the 30-50MWe size. The power use of Olefins 6 is less than this, so electrical power would need to be exported, and Olefins 6 has no infrastructure for this.

The blowdown systems in use on Olefins 6 maximise the heat recovery by use of flash steam from clean drains (continuous blowdown) to preheat incoming demineralised makeup water in the de-aerator.

The boiler system extracts the optimum heat energy from the fuel, by using an economiser to heat boiler feed water. The stack temperature is 118°C at full load (and even less at part loads), thereby offering minimal opportunity for the use of other local thermal cycles or heat sinks. If the stack temperature were to be lower, then there would be issues with condensation in the stack. Also the preheating of fuel or combustion air is further constrained by the need to control NOx emissions.

It is also unlikely that the new boiler will be operating much above its minimum combustion rate for most of the time and consequently significant quantities of heat will not be available from it.

We have considered the Application and conclude that, given this is simply the installation of a new boiler into existing infrastructure, there is no further opportunity to recover waste heat and so in this case no CBA will be required.

(i) Permit conditions concerning energy efficiency

Condition 1.2.2 has been included in the Permit, which requires the Operator to review the viability of CHP at least every 4 years, or in response to changes that might make CHP viable.

The Operator is required to report energy usage and energy generated under condition 4.2 and table S4.3 in Schedule 4. This will enable the Environment Agency to monitor energy efficiency at the Installation and take action if at any stage the energy efficiency is less than proposed.

8. Emission limits

We have set limits for the new boiler in line with Part 2 Annex V of the IED and emission benchmarks (BAT) given in the BAT conclusions document. As follows:

NOx emission limits,

Reference Period	Limit	Reason
95% of validated **hourly averages** within a calendar year	200 mg/m^3	Paragraph 6, of part 2, of annex 5, of the IED, and the requirement of part 4 of annex 5 of the IED, for hourly limit to be 200% of para 6 limit.
Daily mean of validated hourly averages	100 mg/m^3	Compliance with BAT 56 – see annex 1 of this document for details
Calendar **monthly mean** of validated hourly averages	100 mg/m^3	Paragraph 6, of part 2, of annex 5, of the IED,
Annual mean of validated hourly averages	80 mg/m^3	Compliance with BAT 56 – see annex 1 of this document for details

Carbon Monoxide Emission Limits,

There are no BAT conclusion limits for CO, so Annex V of the IED has been used as follows:

Reference Period	Limit	Reason
95% of validated **hourly averages** within a calendar year	200 mg/m^3	Paragraph 6, of part 2, of annex 5, of the IED, and the requirement of part 4 of annex 5 of the IED, for hourly limit to be 200% of para 6 limit.
Daily mean of validated hourly averages	110 mg/m^3	Paragraph 6, of part 2, of annex 5, of the IED, and the requirement of part 4 of annex 5 of the IED, for hourly limit to be 110% of para 6 limit.
Calendar **monthly mean** of validated hourly averages	100 mg/m^3	Paragraph 6, of part 2, of annex 5, of the IED,

SO_2 Emission Limits,

Reference Period	Limit	Reason
95% of validated **hourly averages** within a calendar year	70 mg/m^3	Paragraph 3, of part 2, of annex 5, of the IED, and the requirement of part 4 of annex 5 of the IED, for hourly limit to be 200% of para 6 limit.
Daily mean of validated hourly averages	70 mg/m^3	Beyond compliance with BAT 57 which would be 90mg/m3 – see annex 1 of this document for details. Instead set in line with hourly average as can't be higher.
Calendar **monthly mean** of validated hourly averages	35 mg/m^3	Paragraph 3, of part 2, of annex 5, of the IED.
Annual mean of validated hourly averages	10 mg/m^3	Compliance with BAT 57 – see annex 1 of this document for details

Dust Emission Limits:

Reference Period	Limit	Reason
95% of validated **hourly averages** within a calendar year	4	Paragraph 8, of part 2, of annex 5, of the IED, and the requirement of part 4 of annex 5 of the IED, for hourly limit to be 200% of para 6 limit. Although in this case monthly limit reduced to 2 and so hourly limit set at 4mg/m3
Daily mean of validated hourly averages	2 mg/m^3	Compliance with BAT 58 – see annex 1 of this document for details
Calendar **monthly mean** of validated hourly averages	2 mg/m^3	Paragraph 8, of part 2, of annex 5, of the IED, sets 5 as a limit, but 2 is required to match BAT limit for daily mean.

Annual mean of validated hourly averages	2 mg/m^3	Compliance with BAT 58 – see annex 1 of this document for details

HCl and HF emission limits,

These have both been set as 1 mg/m^3 for periodic monitoring in line with BAT (see Annex 1 of this documents and BAT 57 for more details).
Emission points A1, A2 and A3,

NOx Emission limits for Furnaces A–P and VMR furnaces A-C have been reduced to 180mg/m^3, at the request of the Operator (section 3.2.1 of air modelling report).

Annex 1: Review of Operating Techniques against BAT Conclusions

The overall status of compliance with the BAT conclusion is indicated in the table below as:

NA Not Applicable
C Compliant
FC Compliant in the future
NC Not Compliant

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
1. GENERAL BAT CONCLUSIONS			
	1.1 Environmental Management Systems		
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.	**C**	As part of the SABIC UK Petrochemicals Business, Olefins operates a fully integrated EHSS and Quality Management System. The EHSS Management System has been certified to the American Chemical Council Technical Specification Responsible Care ® 14001 (2013) and ISO14001 (2004). The Operator confirmed that the sites integrated management systems meet the requirements of BAT 1, in their response (dated 11/10/17) to question 6 of schedule 5 notice dated 28/10/17.
	1.2 Monitoring		
BAT 2	BAT is to determine the net total fuel utilisation and the net mechanical energy efficiency of the 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.	**FC**	Improvement condition IC31 set to provide information, once boiler is commissioned.

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
BAT 3	BAT is to monitor key process parameters relevant for emissions to air and water . Flow, O_2 , Temperature, and pressure, water vapour content.	**C**	Operator confirmed in their response (dated 11/10/17) to question 7 of schedule 5 notice dated 28/10/17 that water vapour content and flow are monitored on a periodic basis. Temperature, pressure and oxygen are all subject to continuous monitoring. No waste water generated from flue gas treatment, so water monitoring NA.
BAT 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.. Relevant pollutants are: • NOx • CO • SO_2 • HCl • HF • Dust • TVOC • Dioxins and furans	**C**	NOx - CEMs monitoring in place, which is in accordance with BAT4 requirements CO – CEMs monitoring in place, which is in accordance with BAT4 requirements SO_2 - The fuel gases that will be used are derived from ethane cracking and consequently will have no sulphur content. The backup/top-up fuel that is to be used is UK natural gas, which can have a maximum sulphur content of 60ppm. Natural gas is only used on Olefins 6 as a start-up and backup fuel and therefore sulphur oxide emission from this source would be even less. Hence the sulphur oxides emissions will be negligible. However, CEMs monitoring will be in place, which is in accordance with BAT4 requirements HCl and HF - No chlorine or Fluorine -containing compounds are anticipated in the fuels and hence no HCl or HF will be emitted. However, BAT 4 footnote 11 indicates monitoring each time that a change of the fuel characteristics may have an impact on the emissions (which should be never) is the minimum frequency. Provision has been made for a sampling point, similar to the other points being used for continuous sampling, on the stack at a similar position, so as to obtain representative samples. Monitoring set in permit in line with BAT 4 requirement. Dust - As all the fuel types are gaseous and have been filtered at the burner gas train inlet, with no or minimal liquid or solid content, the emissions of dust are close to zero. The only credible duct emission is from the physical boiler surfaces themselves – corrosion; debris from the manufacturing process or transport preservation of the boiler components – fuel gas piping, air or flue gas ductwork and boiler heating surfaces. All of these dust sources will be loosened and released during the boiler commissioning phases.

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			However, BAT 4 requires monitoring of dust in the flue gases of boilers using process fuels from the chemical industry the Operator has installed CEMS to do this. This is in compliance with BAT 4 requirements. TVOC – There are no credible volatile organic compounds sources from the boiler. There is a continuous venting of a nominal amount of fuel gas passing the fuel gas density meters (required by the advanced control system); this is not emitted through the boiler stack and no monitoring is in place for this vent. However, BAT 4 and footnote 10 requires that boilers burning process fuels from the chemical industry be monitored for total volatile organic carbon at least every 12 months, or each time that a change of the fuel characteristics may have an impact on the emissions (which should be never). The Operator states provision has been made for a sampling point, similar to the other points being used for continuous sampling, on the stack at a similar position, so as to obtain representative samples. We have set a permit requirement for annual monitoring of TVOCs from the new boiler stack, Dioxins and furans – Footnote 22 states "In the case of process fuels from the chemical industry, monitoring is only applicable when the fuels contain chlorinated substances." As no chlorinated substances are expected, no requirement to monitor for Dioxins and furans has been set.
BAT 5	Monitor emissions to water from flue-gas treatment with at least the frequency given below and in accordance with EN standards	**NA**	No Flue gas treatment is required or appropriate.
	1.3 General environmental and combustion performance		
BAT 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 optimised combustion and to use an		a. N/A as using process gas b. Compliance with BAT 1 will ensure "planned regular maintenance programmes" are in place

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	appropriate combination of the techniques given below.		c. Advanced control system – the operator states this is being used d. The burner system has been designed to achieve carbon monoxide levels not exceeding 30mg/Nm^3 (yearly average). The burner design limits carbon monoxide emissions by active control of fuel: air ratio; physical design of burner component design and disposition; and the furnace size and configuration. The burner designer has offered sophisticated combustion fuel: air ratio controls that include a combination CARI (Combustion Air Requirements Index) / Wöbbe Index / specific gravity meter, to enable accurate and efficient control of both fuel and combustion air and to assist with safe operation of the burner, together with oxygen trim to ensure the fuel: air ratio controls are operating in their most efficient manner. e. Fuel choice – Already using sulphur free gases, so no scope to improve fuel choice, furthermore it is recovering a useful process waste gas that may otherwise be vented.
BAT 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.	**NA**	SCR and SNCR are not required or seen as appropriate for the new boiler
BAT 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	**NA**	Abatement systems are not are not required or seen as appropriate for the new boiler
BAT 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	**C**	(i) & (ii) Response, (dated 11/10/17) to question 8 of schedule 5 notice dated 28/10/17, states that the site fuel gas includes variable quantities of hydrogen, propane and ethane. Consequently the calorific value of the site fuel gas is quite variable. On a periodic basis, but no more than monthly, a sample of the site fuel gas is taken from the gas line for offsite analysis at a laboratory accredited to ISO17025.

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	the fuels used, as part of the environmental management system (see BAT 1): (i) initial full characterisation of fuel.. (ii) regular testing of the fuel… (iii) subsequent adjustment of plant settings…		(ii) & (iii) Due to the potentially wide range of fuel gas compositions that are possible. The burner design includes sophisticated combustion fuel: air ratio controls that include a combination CARI (Combustion Air Requirements Index) / Wöbbe Index / specific gravity meter, to enable accurate and efficient control of both fuel and combustion air and to assist with safe operation of the burner, together with oxygen trim to ensure the fuel: air ratio controls are operating in their most efficient manner.
BAT 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:	**C**	Covered by response to BAT1
BAT 11	Appropriately monitor emissions to air and/or to water during OTNOC.	**C**	Response, (dated 11/10/17) to question 9 of schedule 5 notice dated 28/10/17, states that operation of the boiler during OTNOC will be minimised as far as is practicable. When the boiler is required to operate under OTNOC the CEMs equipment fitted to the stack will continue to operate and monitor emissions. There is the potential that during OTNOC boiler emissions will operate outside the calibrated range of the CEMs. Therefore, the EUETS meters will be checked to confirm the volume of fuel supplied to the boiler during the time period covered by OTNOC and emission values calculated based upon fuel consumption. These calculated values will then be compared to the CEMs derived values for confirmation of accuracy. In the event that the CEMs values appear to be lower than the calculated values the calculated values will be reported on a 'worst case scenario' basis.
	1.4 Energy Efficiency		
BAT 12	In order to increase the energy efficiency of combustion BAT is to use an appropriate combination of the techniques given below: a. Combustion optimisation; b. Optimisation of working medium conditions; c. Optimisation of steam cycle; d. Minimisation of energy consumption; e. Preheating of combustion air;	**C**	a. Combustion optimisation – NA as gas combustion b. Optimisation of working medium conditions - Unable to implement this due to the restrictions of replacing existing plant and having to utilise the same steam cycle and current working conditions. Permissible under BAT12 applicability notes. c. Optimisation of steam cycle – as for b above

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	f. Fuel Preheating; g. Advanced control system; h. Feed water preheating using recovered heat; i. CHP; j. CHP readiness; k. Flue-gas condenser; l. Heat Accumulation; m. Wet Stack; n. Cooling Tower discharge; o. Fuel pre-drying; p. Minimisation of heat losses; q. Advanced materials; r. Steam Turbine upgrade; s. Supercritical steam conditions.		d. Minimisation of energy consumption - The new boiler has a much larger economiser than the boilers it is replacing so as to maximise feedwater pre-heating. The existing plant already includes feedwater preheating to recover heat from boiler blow down and this facility will be extended to include the new boiler. e. Preheating of combustion air - considered but is constrained by the need to control nitrogen oxide emissions. Permissible under BAT12 applicability notes. f. Fuel Preheating - this is addressed but is constrained by the need to control nitrogen oxide emissions. Permissible under BAT12 applicability notes. g. Advanced control system – incorporated . h. Feed water preheating using recovered heat - The new boiler has a much larger economiser than the boilers it is replacing so as to maximise feedwater pre-heating. The existing plant already includes feedwater preheating to recover heat from boiler blow down and this facility will be extended to include the new boiler. i. CHP – See section 7.3.2 of this document. CHP not proposed, Permissible under BAT12 applicability notes. j. CHP readiness; see element i above. k. Flue-gas condenser – NA as no CHP l. Heat Accumulation – NA as no CHP m. Wet Stack – NA as no FGD n. Cooling Tower discharge– NA as no FGD o. Fuel pre-drying – NA for gaseous fuels p. Minimisation of heat losses - NA for gaseous fuels

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			q. Advanced materials - with the new high pressure boiler being a replacement for an existing boiler and having to operate the same steam cycle and working conditions as the existing boiler, steam header and distribution system and steam turbine drives mean that the possibility of optimisation and use of advanced materials isn't possible (see b. above) r. Steam Turbine upgrade – Steam turbine is part of existing system, so not covered by this review. s. Supercritical steam conditions., NA for units under 600Mth.
	1.5 Water usage and emissions to water		
BAT13	In order to reduce water usage and the volume of contaminated waste water discharged, BAT is to use one or both of the techniques given below.	**NA**	The waste water streams (surface water run-off, cooling water and waste water from flue gas treatment (latter not relevant in this case) are to be segregated and treated separately. a. The boiler is part of an existing chemicals installation which will be subject to a sector review in the future, so the use of surface water run off and cooling water use should be considered as part of this review. b. NA as burning gaseous fuel.
BAT14	To prevent the contamination of uncontaminated waste water and to reduce emissions to water, BAT is to segregate waste water streams and to treat them separately, depending on the pollutant content.	**C**	The waste water streams surface water run-off, cooling water are to be segregated and treated separately.
BAT15	In order to reduce emissions to water from flue-gas treatment, BAT is to use an appropriate combination of the techniques given below…	**NA**	No flue gas treatment
	1.6 Waste Management		
BAT16	In order to reduce the quantity of waste sent for disposal from the combustion and/or	**NA**	None of elements apply

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	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		
	1.7 Noise Emissions		
BAT17	In order to reduce noise emissions, BAT is to use one or a combination of the techniques given below: a. Operational Measures b. Low-noise equipment c. Noise Attenuation d. Noise Control equipment e. Appropriate Location of equipment…	**C**	a. Operational Measures – Operator has confirmed that these have been considered and incorporated where appropriate. Inspection and maintenance of equipment has been the subject of a separate reliability study of the equipment and selected components of it. The plant is outside, so "closing of doors and windows…" is not applicable. Equipment will be operated by experienced staff. Noisy activities will be avoided at night time where possible. Noise control will be undertaken during maintenance operation where practicable. b. Low-noise equipment - Low noise equipment has been specified and selected where possible. c. Noise Attenuation - The chosen plant location in the existing infrastructure prohibits insertion of abatement obstacles d. Noise Control equipment - Silencing to 80dBA has been applied to the boiler. Continuously noise-producing equipment, such as the FD fan, and the air and flue gas ductwork, have been acoustically treated to attain this. Intermediately noise-producing equipment, such as the start-up steam vent (90dBA) and boiler relief valves (110dBA), have been specified for the listed noise level. e. Appropriate Location of equipment… This is not applicable relevant due to replacement nature of Boiler E, limiting the location of plant and equipment
2. BAT CONCLUSIONS FOR THE COMBUSTION OF SOLID FUELS			
BAT18 to 26		**NA**	LCP burning gaseous fuels only
3. BAT CONCLUSIONS FOR THE COMBUSTION OF LIQUID FUELS			

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
BAT 27 to 39		**NA**	LCP burning gaseous fuels only
4. BAT CONCLUSIONS FOR THE COMBUSTION OF GASEOUS FUELS			
	4.1 BAT conclusions for the combustion of natural gas		
BAT 40		**NA**	LCP primarily burning process gas, which is covered by section 5, BAT 55 to BAT BAT59
	4.2 BAT conclusions for the combustion of iron and steel process gases		
BAT 46 to 51		**NA**	LCP not burning these gases
	4.3 BAT conclusions for the combustion of gaseous and/or liquid fuels on offshore platforms		
BAT 52 to 54		**NA**	LCP not burning these gases
5. BAT CONCLUSIONS FOR MULTI-FUEL-FIRED PLANTS			
	5.1. BAT conclusions for the combustion of process fuels from the chemical industry, Unless otherwise stated, the BAT conclusions presented in this section are generally applicable to the combustion of process fuels from the chemical industry, individually, in combination, or simultaneously with other gaseous and/or liquid fuels. They apply in addition to the general BAT conclusions given in Section 1		
BAT 55	In order to improve the general environmental performance of the combustion of process fuels from the chemical industry in boilers, BAT is to use an appropriate combination of the techniques given in BAT 6 and below… Perform fuel pre-treatment on and/or off the site of the combustion plant to improve the environmental performance of fuel combustion	**C**	The fuel gases that will be used are derived from ethane cracking and will have no sulphur, chlorine, fluorine or heavy metal content. Natural gas is only used on Olefins 6 as a start-up and backup fuel. Therefore sulphur dioxide, HCL, HF heavy metal and dioxin emissions from fuels will be negligible. As all the fuel types are gaseous and will be filtered at the burner gas train inlet, with no or minimal liquid or solid content, the emissions of dust will be close to zero.
BAT 55	BAT-associated energy efficiency levels (BAT-AEELs) for …New…boiler using gaseous process fuels from the chemical industry, including when mixed with natural gas and/or other gaseous fuels.	**C**	This plant attains the required fuel utilisation, with a calculated AAEF being 95.1% @ 100% MCR (using fuel F12), and 90.4% at minimum rate (using fuel F10).

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	Total fuel utilisation 78-95%		
BAT 55	In order to prevent or reduce NO_X emissions to air while limiting CO emissions to air from the combustion of process fuels from the chemical industry, BAT is to use one or a combination of the techniques given below: a. Low Nox Burners b. Air Staging c. Fuel Staging d. FGR e. Water/steam addition f. Fuel choice g. Advanced Control System h. SNCR i. SCR	**C**	BAT is to use one or a combination of techniques, i.e. not all have to be applied. a. Low-NOx burners (LNB). This is applied; b. Air staging. This is not applied due to the size of the boiler and number of burners; c. Fuel staging. This is applied; d Flue-gas recirculation. This is applied; e. water/steam addition. This is not currently to achieve the nitrogen oxide emission requirements but could be incorporated as a potential future modification, if required; f. Fuel choice. This is applicable and generally is governed by the range of fuel type (gaseous,) and compositions (minimal nitrogen content) being considered; g. Advanced control system. This has been applied; h. Selective non-catalytic reduction (SNCR). This is not applied, and while not specifically stated in BAT 57, the applicant considers this not applicable for a plant of this size (85MWth). Whilst they have given no evidence for this, we accept that SNCR is unnecessary as the impacts of NOx from the boiler are insignificant and not all NOx reduction techniques are required to comply with BAT55. i. Selective catalytic reduction (SCR). This is not applied, and as stated in BAT 57 , is not considered applicable for plants, under 100MWth, such as this.
BAT 56 Table 34	BAT-associated emission levels (BAT-AELs) for NOX emissions to air from the combustion of 100 % process fuels from the chemical industry in .. new.. boilers…. Gases only: Yearly 20-80mg/m^3, Daily 30 – 100mg/m^3	**C**	Applicant states new boiler will achieve nitrogen oxide levels of no more than 80mg/Nm^3 (yearly average) and 100mg/Nm^3 (daily average). Modelling was based on 100mg/m^3. Daily average emission limit set in permit as 100mg/m^3, in line with BAT 56. N.B. this is lower than the 110mg/m3 allowed under IED annex V part 2. Yearly average set in permit as 80mg/m^3 in line with BAT56.
BAT 57	In order to reduce SO_X, HCl and HF emissions to air from the combustion of process fuels from the chemical industry in boilers, BAT is to use one or a combination of the techniques given below	**C**	The only applicable option is fuel choice. The fuel is in effect sulphur , chlorine and fluorine free, and so no other option is needed. Clearly the only choice in fuel is to recover the process gas as otherwise it would be wasted (flared).

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
BAT 57 Table 35	BAT-associated emission levels (BAT-AELs) for SO_2 emissions to air from the combustion of 100 % process fuels from the chemical industry in boilers: Yearly 10 to 110mg/m^3 Daily 90 to 200mg/m^3	**C**	Sulphur emissions during normal operating conditions with be negligible, due to sulphur free fuel being used. As sulphur dioxide emissions will be negligible, emission limits have been set in permit in line with the lower range of BAT 57 requirements, i.e. 10mg/m^3 per year. However, need to go beyond BAT for daily mean as IED hourly limit is just 70 mg/m^3, and the daily limit cannot be higher than this.
Bat 57 Table 36	BAT-associated emission levels (BAT-AELs) for HCl and HF emissions to air from the combustion of process fuels from the chemical industry in new boilers. HCL 1-7mg/m^3 HF 1-3 mg/m^3	**C**	HCl and HF emissions will be negligible due to the fuel used. As emissions should be negligible, emission limits have been set in line with the lower range of BAT 57 requirements, i.e. 1mg/m^3.
BAT 58	In order to reduce emissions to air of dust, particulate-bound metals, and trace species from the combustion of process fuels from the chemical industry in boilers, BAT is to use one or a combination of the techniques given below: a. ESP b. Bag Filter c. Fuel Choice d. Dry FGD e. Wet FGD	**C**	As all the fuel types are gaseous and have been filtered at the burner gas train inlet, with no or minimal liquid or solid content, the emissions of dust are close to zero. Thus in this case fuel choice is the one technique proposed and we accept this is sufficient to comply with BAT58.
BAT58 table 37	BAT-associated emission levels (BAT-AELs) for dust emissions to air from the combustion of mixtures of gases and liquids composed of 100 % process fuels from the chemical industry in….new…. boilers under 300MWth: Daily 2-10 mg/m^3 Yearly 2-5 mg/m^3		Dust emissions expected to be close to zero. As the operator states dust emissions are expected to be close to zero, we have set emission limits to comply with the lower end of BAT58 limits, i.e. 2 mg/m^3.
6. BAT CONCLUSIONS FOR THE CO-INCINERATION OF WASTE			

BAT C No.	Summary of BAT Conclusion requirement for Large Combustion Plants	Status NA/ C / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
BAT 59 to 71		**NA**	LCP not burning waste
7. BAT CONCLUSIONS FOR GASIFICATION			
BAT 72 to 75		**NA**	LCP not a gasifier

Annex 2: Meeting the requirements of the IED

The table below shows how each requirement of the IED has been addressed by the permit conditions.

IED Article Reference	IED requirement	Permit condition
30(6)	If there is an interruption in the supply of gas, an alternative fuel may be used and the permit emission limits deferred for a period of up to 10 days, except where there is an overriding need to maintain energy supplies. The EA shall be notified immediately.	N/A
32(4)	For installations that have applied to derogate from the IED Annex V emission limits by means of the transitional national plan, the monitoring and reporting requirements set by UK Government shall be complied with.	N/A
33(1)b	For installations that have applied to derogate from the IED Annex V emission limits by means of the Limited Life Derogation, the operator shall submit annually a record of the number of operating hours since 1 January 2016;	N/A
37	Provisions for malfunction and breakdown of abatement equipment including notifying the EA.	N/A
38	Monitoring of air emissions in accordance with Ann V Pt 3	3.5, 3.6
40	Multi-fuel firing	N/A – Site fuel gas will be used primarily, with natural gas only used as a startup and backup fuel, i.e. there will be no simultaneous firing of the 2 fuels.
41(a)	Determination of start-up and shut-down periods	2.3.5 Schedule 1 Table S1.4
Ann V Pt 1(1)	All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O2 content of 6 % for solid fuels, 3 % for combustion plants, other than gas turbines and gas engines using liquid and gaseous fuels and 15 % for gas turbines and gas engines.	Schedule 6, Interpretation
Ann V Pt 1	Emission limit values	3.1.2 Schedule 3, Table S3.1
Ann V Pt 1	For plants operating less than 500 hours per year, record the used operating hours	N/A
Ann V Pt 1(6(1))	Definition of natural gas	Schedule 6, Interpretation
Ann V Pt 2	Emission limit values	3.1.2 Schedule 3, Table S3.1
AnnV Pt 3(1)	Continuous monitoring for >100MWth for specified substances	3.5, 3.6 Schedule 3, Table S3.1
AnnV Pt 3(2, 3, 5)	Monitoring derogations	3.5.1 Schedule 3, Table S3.1
AnnV Pt3(4)	Measurement of total mercury	N/A

IED Article Reference	IED requirement	Permit condition
AnnV Pt3(6)	EA informed of significant changes in fuel type or in mode of operation so can check Pt3 (1-4) still apply	2.3.1 Schedule 1, Table S1.2
AnnV Pt3(7)	Monitoring requirements	3.5.1 Schedule 3, Table S3.1
AnnV Part 3(8,9,10)	Monitoring methods	3.5, 3.6
AnnV Pt 4	Monthly, daily, 95%ile hourly emission limit value compliance	3.5.1 Schedule 3, Table S3.1
AnnV Pt7	Refinery multi-fuel firing SO_2 derogation	N/A

Annex 3: Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified any information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on confidentiality.
Consultation/Engagement	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website. We consulted the following organisations: Public Health England Redcar and Cleveland Borough Council Health and Safety Executive The comments and our responses are summarised in the consultation section.
The facility	
The regulated facility	We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN 2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits. The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.
The site	
Extent of the site of the facility	The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility including the discharge points. The plan is included in the permit.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of nature conservation and/or protected species or habitat. We have assessed the application and its potential to affect all known sites of nature conservation and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process. We consider that the application will not affect any sites of nature conservationand/or protected species or habitats identified.

Aspect considered	Decision
	For further details, see section 6.3 of the key issues section of this document. We have not consulted Natural England on the application. The decision was taken in accordance with our guidance.
Environmental risk assessment	
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator's risk assessment is satisfactory. See key issues section for impacts of emissions to air and noise.
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit. The operator provided updated operating techniques documents in an email dated 28/11/17 which supersede all documentation provided in the original permit application, subsequent variation applications and minor technical agreements. Table S1.2 has been amended to reflect this.
Operating techniques for emissions that do not screen out as insignificant	Emissions of oxides of nitrogen cannot be screened out as insignificant. We have assessed whether the proposed techniques are BAT. The proposed techniques for emissions that do not screen out as insignificant are in line with the techniques and benchmark levels contained in the technical guidance and we consider them to represent appropriate techniques for the facility. The permit conditions ensure compliance with relevant BREFs and BAT Conclusions and ELVs deliver compliance with BAT-AELs. See Annex 1of this document, specifically BAT 55 and BAT 56 for more details.
Operating techniques for emissions that screen out as insignificant	Emissions of • CO • SO2 • HCl • HF • Dust TVOChave been screened out as insignificant (see section 5.2.2 and Annex 1 BAT 4 of this document for more details), and so we agree that the applicant's proposed technique is are BAT for the installation. We consider that the emission limits included in the installation permit reflect the BAT for the sector. See key issue section 8 for more details.

Aspect considered	Decision
Permit conditions	
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that: IC31 - Once commissioned the operator can provide us with the net total fuel utilisation and the net mechanical energy efficiency of the boiler B1703E (LCP 648). Required by BAT conclusion BAT 2. IC32 – Once commissioned, the operator can submit a new noises assessment to demonstrate that the new boiler has caused no increase in noise levels off site. See section 6.5 of key issues section for details.
Emission limits	ELVs have been added for emissions from the new boiler. See key issues, section 8 for more details.
Monitoring	We have decided that monitoring should be added for the parameters specified in BAT conclusion reference BAT4 of Annex 1 of this document using the methods detailed and to the frequencies specified. These monitoring requirements have been imposed in order to comply with the requirements of chapter III of the IED and the LCP BAT conclusions document. Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.
Reporting	We have added reporting in the permit for the following parameters: New boiler emission point A4b: • NOx, • SO_2, • Carbon Monoxide, • Dust • HCL • HF • TVOC We made these decisions in accordance with of chapter III of the IED and the LCP BAT conclusions document.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Technical competence	Technical competence is required for activities permitted.

Aspect considered	Decision
	We are satisfied that the operator is technically competent.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards. Any unique condition, that is a condition distinct from a site specific condition needed to deliver the legislative standards need to be justified Provide additional text if needed, for example where specific comment on the growth duty is made by the applicant in their application.

Consultation

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public, and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from
Public Health England 7/7/17
Brief summary of issues raised
No specific issues raised
Summary of actions taken or show how this has been covered
N/A

Response received from
Redcar and Cleveland Borough Council 20/6/17
Brief summary of issues raised
Redcar and Cleveland Borough Council are not aware of any current noise or amenity issues at the site that would have implications for the variation.
Summary of actions taken or show how this has been covered
N/A

Response received from
Health and Safety Executive 19/6/17
Brief summary of issues raised
HSE have no comments to make concerning the application.
Summary of actions taken or show how this has been covered
N/A