Environment Agency

Review of an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010 (as amended)

Decision document recording our decision-making process following review of a permit

The Permit number is: EPR/AP3833LW
The Operator is: Centrica Storage Limited
The Installation is: Easington Gas Terminal
This Variation Notice number is: EPR/AP3833LW/V003

What this document is about

All Environmental permits which permit the operation of large combustion plant (LCP), as defined by articles 28 and 29 of the Industrial Emissions Directive(IED), need to be varied to implement the special provisions for LCP given in the IED, by the 1 January 2016 (Article 82(3)). The IED makes special provisions for LCP under Chapter III, introducing new Emission Limit Values (ELVs) applicable to LCP, referred to in Article 30(2) and set out in Annex V.

The IED provides a period of transition towards the new ELVs via Article 32, the Transitional National Plan (TNP). It also makes provision for plant that wish to be exempted from compliance with the new ELVs in Article 33, the Limited Life Derogation (LLD). Other derogations include limited operating hour regimes for sites using 500 hr or 1500 hr derogations. There are also options for exemption from emission limits based on operating hours.

The operator has submitted a response to our notice requiring information, issued under regulation 60(1) of the Environmental Permitting Regulations (EPR), which has provided us with information on which compliance route they wish to follow for each LCP. The response also included specific details relating to each LCP, necessary for accurate implementation the IED requirements. A copy of the regulation 60 notice and the operator's response is available on the public register.

We have reviewed the permit for this installation, including all variations since the last permit consolidation, and referred to the operator's response to the regulation 60 notice requiring information. This is our decision document, which explains the reasoning for the consolidated variation notice that we have issued.

It explains how we have reviewed and considered the compliance routes and, where relevant, the emissions limits proposed by the Operator for each LCP on the installation. This review has been undertaken with reference to the:

- Chapter III and annex V of the IED
- "IED BAT Non-ESI Review Paper, 28 October 2014" produced by the Environment Agency (referred to as the "2014 Non-ESI BAT review paper" in this document)

- "Electricity Supply Industry – IED compliance protocol for Utility Boilers and Gas Turbines", published by the Joint Environmental Programme.

It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position

As well as implementing the chapter III IED compliance of the installation, the consolidated variation notice takes into account and brings together in a single document all previous variations that relate to the original permit issue. It also modernises the entire permit to reflect the conditions contained in our current generic permit template.

The registered office address of the operator has been updated in this variation.

The introduction of new template conditions makes the Permit consistent with our current general approach and philosophy and with other permits issued to installations in this sector. Although the wording of some conditions has changed, while others have been deleted because of the new regulatory approach, it does not reduce the level of environmental protection achieved by the Permit in any way. In this document we therefore address only our determination of substantive issues relating to chapter III review.

How this document is structured

Glossary

1. Our decision
2. How we reached our decision
3. The legal framework
4. Key Issues

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
BREF	best available techniques reference document
Derogation	as set out in Article 15(4) of the IED
ELV	emission limit value set out in either IED or LCPD
GT	gas turbine
IED	Industrial Emissions Directive 2010/75/EC
LCP	large combustion plant – combustion plant subject to Chapter III of IED
LCPD	Large Combustion Plant Directive 2001/80/EC
LLD	Limited Life Derogation
MCR	Maximum Continuous Rating
MSUL/MSDL	Minimum start up load/minimum shut-down load
OCGT	Open Cycle Gas Turbine
Part load operation	operation during a 24 hr period that includes loads between MSUL/MSDL and maximum continuous rating (MCR)

1 Our decision

We have decided to issue the Variation Notice to the Operator. This will allow it to continue to operate the Installation, subject to the conditions in the Consolidated Variation Notice.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The Consolidated Variation Notice contains several conditions that concern the operation of the non-LCP part of the installation taken from our standard Environmental Permit template including the relevant annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the Notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our decision

2.1 Requesting information relating to the requirements of Chapter III of and Annex V to the IED

We issued a Notice under Regulation 60(1) of the Environmental Permitting (England and Wales) Regulations 2010 (a Regulation 60 Notice) on 31/10/14 requiring the Operator to provide information for each LCP they operate, including:

- The type of plant, size and configuration.
- The proposed compliance route.
- Minimum start up and shut down loads.
- The proposed emission limits and how they accord with the 2014 BAT review paper.
- For gas turbines, proposed emission limits for each unit between the MSUL/MSDL and 70% load, with a justification.
- Any request to move from continuous to 6 monthly monitoring, or to derogate from 6 monthly monitoring, with a justification.

The Regulation 60 Notice response from the Operator was received on 31/03/15.

We considered that the response did not contain sufficient information for us to commence determination of the permit review. We therefore issued a further information request to the Operator. Suitable further information was provided by the Operator on 22/06/15.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review.

The Operator made no claim for commercial confidentiality. We have not received any information in relation to the Regulation 60 Notice response that appears to be confidential in relation to any party.

3 The legal framework

The Consolidated Variation Notice will be issued under Regulations 18 and 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;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, in issuing the Consolidated Variation Notice, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document.

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.	Not Applicable
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.	Not Applicable
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;	Not Applicable
37	Provisions for malfunction and breakdown of abatement equipment including notifying the EA.	Not Applicable
38	Monitoring of air emissions in accordance with Ann V Pt 3	3.5, 3.6
40	Multi-fuel firing	Not Applicable
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	Not Applicable
Ann V Pt 1(6(1))	Definition of natural gas	Schedule 6, Interpretation
Ann V Pt 2	Emission limit values	Not Applicable
AnnV Pt 3(1)	Continuous monitoring for >100MWth for specified substances	Not Applicable

IED Article Reference	IED requirement	Permit condition
AnnV Pt 3(2, 3, 5)	Monitoring derogations	3.5.1 Schedule 3, Table S3.1
AnnV Pt3(4)	Measurement of total mercury	Not Applicable
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	Not Applicable
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 SO2 derogation	Not Applicable

4. Key Issues

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

Where relevant and appropriate, we have incorporated the techniques described by the Operator in their Regulation 60 Notice response as specific operating techniques required by the permit, through their inclusion in Table S1.2 of the Consolidated Variation Notice.

The variation notice uses an updated LCP number in accordance with the most recent DEFRA LCP reference numbers. The LCP references have changed as follows:

- **LCP 123** is changed to **LCP 58**

LCP58

This LCP consists of a 72MWth Rolls Royce RB211 Open Cycle Gas Turbine (OCGT) operating as a mechanical drive. It powers a natural gas compressor and operates as the first stage compression in series with GT compressor mechanical drive units offshore.

The LCP operates in response to nominations to inject gas into gas storage and is normally called upon to operate in the injection season (**1 April to 31 October each year**) and also outside this period but for significantly shorter periods.

The LCP load varies in response to commercial nomination size, reservoir backpressure and ambient temperature. The LCP vents to its own dedicated windshield at emission point A2. The unit burns natural gas.

Compliance Route:

The operator has proposed to operate this LCP under the ELV compliance route.

Net Rated Thermal Input:

The Applicant has stated that the Net Thermal Input is 72MWth. They have justified this figure by providing an annex to the Reg 60 notice containing a performance and efficiency summary with thermal efficiency calculation. This data is based on a post overhaul engine test dated 12 December 2011. The test data and data taken from operating and maintenance manual data sheets was used to calculate the net thermal input.

Minimum start up load and Minimum shut-down load:

The Operator has defined the "minimum start up load" and "minimum shut-down load" for the LCP in their response to question 6 of the Reg 60, in terms of the output load (i.e. power generated) as one of three discrete processes or thresholds for operational parameters that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down.

MSUL

The LCP operates in two distinct phases controlled by fuel algorithms that respond to the load demand. These are:
Diffusion mode (none DLE), and
Pre-mix DLE mode
The operator has identified the changeover to Pre-mix DLE mode as being the MSUL.
The changeover point to Pre-mix DLE mode is identified as being circa 12 MW shaft power output (circa 46 % load) but data provided shows that this variable. I.e. on some start-ups the LCP may not have switched over to Pre-mix DLE mode when 12 MW shaft output power is reached (Ref 2: Section 429 page 5).
As a result it is proposed to define MSUL in the permit using the 'any two of three criteria' approach.

MSDL

The operator has identified the changeover from Pre-mix DLE mode to Diffusion mode (none DLE) as being the MSDL.
The changeover point from Pre-mix DLE mode to Diffusion mode (none DLE) is identified as being circa 11 MW shaft power output (circa 42 % load) but data provided shows that this variable. I.e. on some shut downs the LCP may not have switched over from Pre-mix DLE mode to Diffusion mode (none DLE) when 11 MW shaft output power is reached. It is proposed to define MSDL in the permit using the 'any two of three criteria' approach.

We agree with all of 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.

Emission limits:

The LCP normally operates through a nominal injection season from 1st April to 31st October and for shorter periods at times of low gas demand (i.e. Christmas), in response to customer injection nominations.

The LCP load is dependent on the customer nomination rate, the National Grid (compressor suction) pressure and the sealine (compressor discharge) pressure (dependant on the reservoir back pressure which varies through the injection season) and also ambient temperatures.

Averaged annual load profile data provided in the reg 60 response indicates that the LCP operates between MSUL/MSDL and 70% load for approximately 77% of running time, with approximately 15% of running timespent above 70% load where the IEDELV's will apply.

The emissions profile provided by the operator shows that NO_x emissions are elevated between the MSUL/MSDL and 70% loads and hence an appropriate ELV for NOx needs to be set.

1. IED ELVs to be met above 70% load

   The operator has proposed to meet these. Historic emissions monitoring data indicates the ELVs can be met but it is a small data set (total 13 monitoring events only two of which are were carried out above 70% load).

   The EA proposes to set the gas fired gas turbine IED limits for mechanical drives above 70% load.

2. No increase in current permit limits (referred to as 'back sliding')

   Current permit limits are 125 mg/m^3 NOx and 100 mg/m^3 CO and do not apply on start-up or shut down. Start up and shut down are not clearly defined in the current permit and associated application and is at a greater % load than the MSUL and MSDL as defined above.

   Historic emissions monitoring data indicates that the current permit NOx limits cannot be met between MSUL/MSDL (as defined above) and 50% load, but it is a small data set (total 13 monitoring events only one of which was carried out below 50% load). The EA proposes to set a 160 mg/m^3 NOx and limit between MSUL/MSDL and base load on the basis that increasing the current (below 70% load) limit of 125mg/m^3 NOx to 160mg/m^3 is not 'back sliding' because the %load at which MSUL/MSDL is defined has been reduced.

   Data from emissions testing carried out May 2015 indicate the current permit CO limit of 100mg/m^3 cannot be met between MSUL/MSDL and 57% load.

   The IED limit is set at 100 mg/m^3 as per current permit. Adjusted IED limit of 110mg/m^3 (as per Ref 3: Annex V Part 4(1) (a)) would be 'back sliding. The IED ELV compliance is demonstrated since the CO is higher between the load range 54% and 70% compared to above 70%.

   Predictive emissions data indicates high CO emission values at loads below 15WM output when the ambient air temperature is 0 degC

   The EA has set a 100 mg/m^3 CO limit between 70% load and base load, and a 440 mg/m^3 limit between MSUL/MSDL and base load which will apply when ambient air temperature is 5 degrees C or greater.
   An improvement condition will be set to require the operator to submit predictive data on CO loads at ambient temperatures below 5 deg C and to carry out air dispersion modelling of the environmental impact. A further improvement condition will be set to require LCP extractive emissions monitoring at low ambient temperatures across a range of LCP loads.

   A report, due to be issued shortly by the Joint Environmental Programme, indicates that emissions at or above 400mg/Nm^3 carbon monoxide, there may be implications for ambient air quality to do with levels of formaldehyde. Because of this improvement condition IC22 requires the Operator to undertake an air quality assessment for formaldehyde.

   The Agency will review the appropriateness of the CO emission limits below 70% load on review of the data submitted in the improvement condition responses.

Consequently we have accepted the proposed limits and incorporated them into table S3.1 of the permit.

Gas Turbines:

Sulphur dioxide emissions from natural gas firing will be reported on the basis of the fuel sulphur content without continuous or periodic monitoring since only trace quantities of sulphur are present in UK natural gas. Likewise, dust emissions from natural gas firing will be reported on the basis of emission factors without continuous or periodic monitoring. Natural gas is an ash-free fuel and high efficiency combustion does not generate additional particulate matter. The fuel gas is always filtered and, in the case of gas turbines, the inlet air is also filtered resulting in a lower dust concentration in the flue than in the surrounding air.

The IED Annex V ELVs for oxides of nitrogen and carbon monoxide apply to OCGTs, CCGTs and mechanical drive gas turbines when the load is >70%. This has been interpreted as 70% of the rated output load. The rated output load used here is the same as that used for calculating the percentage load when specifying the end of start-up and beginning of shut-down.

Monitoring & standards:

Standards for assessment of the monitoring location and for measurement of oxygen, water vapour, temperature and pressure have been added to the permit template for clarity.

A row has been included in table S3.1 which requires the operator to confirm compliance with BS EN 15259 in respect of monitoring location and stack gas velocity profile in the event there is a significant operational change (such as a change of fuel type) to the LCP.

Resource efficiency metrics:

A more comprehensive suite of reporting metrics has been added to the permit. Table S4.2 “Resource Efficiency Metrics” has been added requiring the reporting of various resource parameters.

Additional IED Chapter II requirements:

Condition 3.1.4 relating to protection of soil, groundwater and groundwater monitoring, has been added in compliance with IED requirements.
Conditions 4.3.1 and 4.3.2 relating to notifications have been amended in compliance with IED requirements.