

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/RP3438GG
The Operator is: Carrington Power Limited
The Installation is: Carrington Power Station
This Variation Notice number is: EPR/RP3438GG/V004

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.

Notices were served on industry under Regulation 60 (1), Environmental Permitting Regulations (England and Wales) Regulations 2010, requiring information on compliance routes to IED. However, this site was under construction at that time and therefore a Notice was not served. When it became known that the site was likely to operate in 2016 the operator was asked to answer a series of questions which were the same as those included in the Regulation 60(1) Notice. They have submitted a response to these questions as a permit variation application. This has provided us with information on which compliance route they wish to follow for each LCP. The response also includes specific details relating to each LCP, necessary for accurate implementation of the IED requirements. A copy of the e-mail containing the questions and the operator's variation application 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 questions 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 ESI Review Paper, 28 October 2014" produced by the Environment Agency (referred to as the "2014 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. It also includes revisions to the permit arising from the final design of the power station plant to be constructed. These are:

- removal of reference in the monitoring schedules to an alternative water discharge point W2.
- removal of an auxiliary boiler from the permit that is not required
- minor administrative changes including updating of the site address and postcode, and an updated drawing of the permit boundary to reflect removal of the alternate water discharge point and the constructed fence line.

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 and any changes to the operation of the installation.

How this document is structured

Glossary

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

Annex 1 – Review and assessment of changes that are not part of the Chapter III IED derived permit review.

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
CCGT	combined cycle gas turbine
Derogation	as set out in Article 15(4) of the IED
Emergency use	<500 operating hours per annum
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
MCR	Maximum Continuous Rating
MSUL/MSDL	Minimum start up load/minimum shut-down load
OCGT	Open Cycle Gas Turbine
Peaking	500-1500 operating hours per annum
Part load operation	operation during a 24 hr period that includes loads between MSUL/MSDL and maximum continuous rating (MCR)
SCR	selective catalytic reduction
SNCR	selective non catalytic reduction

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 many conditions 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 an e-mail to the Operator containing a series of questions on 08/07/15, asking them to provide information for each LCP they will 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.
- For gas fired plant, whether they wish to apply for derogation from monitoring when on standby fuels.
- Any request to move from continuous to 6 monthly monitoring, or to derogate from 6 monthly monitoring, with a justification.

The response from the Operator was received on 14/08/15 as an application to vary the permit.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review but not that it necessarily contained all the information we would need to complete that determination.

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

2.2 Requests for Further Information during determination

Although we were able to consider the response to our questions in the application to vary the permit generally satisfactory at receipt, we did in fact need more information in order to complete our permit review assessment. We received additional information from the operator relating to the size of the emergency diesel generator on 22-10-15 and the permitted area on 22-10-15. We made a copy of this information available to the public in the same way as the response to our e-mail of questions dated 08-07-15.

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.	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
41(a)	Determination of start-up and shut-down periods	2.3.5 Schedule 1 Table S1.5
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

IED Article Reference	IED requirement	Permit condition
AnnV Pt3(4)	Measurement of total mercury	N/A
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 SO2 derogation	N/A

4. Key Issues

Carrington Power Station is a new plant currently in construction and is scheduled to be commissioned at the end of 2015 and beginning of 2016. Commercial operation is expected to commence in the first quarter of 2016. It will be operated on natural gas only, with no standby fuels. As the site has not commenced operations the operator has been unable to provide any emissions data and therefore could not give a full response to some of the questions we asked and this is explained further below.

The operator has explained that there are two CCGT power trains at the plant, each having a rated thermal input of 753MWt at ISO conditions (15C, 60%RH, 1bar) based on the manufacturers performance data. They also indicate that guarantee performance testing will be carried out during the commissioning phase. We have therefore set an improvement condition (IC 7) to report the results of the performance test, the standard to which it was carried out, and the date, to ensure that we have an “as built” net rated thermal input for the power plant, being the best and most accurate measure of performance.

MSUL/MSDL is proposed by the operator as the point on combined cycle load capability known as Minimum Generation (MG). They state that this is the lowest load to which a generating unit can be dispatched to Grid in order to comply with National Grid code requirements. At Carrington this is 252MW electrical power and 57% of the combined cycle registered capacity for each CCGT power train. They claim that the CCGT power train cannot be dispatched to grid any lower than MG and this is therefore a valid and stable operating point and satisfies the requirements of Implementing Decision 2012/249/EU and MSUL.

Shut down may be initiated anywhere on the load capability from base load downwards and commences when shutdown sequences is triggered. The operator has proposed MG also as a suitable point for MSDL. However, to distinguish it from a genuine shut down and for example partial load rejection, both MG and “shutdown sequence started” must be met to become MSDL.

As the plant is currently being commissioned we have no way of verifying that the registered capacity will be met, or indeed exceeded. It is also possible that commercial thresholds can be varied or vary depending upon the state of the plant and ambient conditions. We have therefore set an improvement condition (IC 8) for the operator to provide a report in writing to the Environment Agency which provides the start-up and shut-down thresholds for both LCP`s taking into account the technical and operational characteristics of the plants, measures to ensure periods of start-up and shut-down are minimised, and requirements for stable generation, safeguarding health and safety. This is to be provided within one month of completion of commissioning.

The plant will be able to meet and exceed IED ELV`s. The current permit sets a daily limit of 50mg/m³ NOx and 100mg/m³ CO. Using the principle of no

backsliding outlined in the “2014 ESI BAT review paper the operator has proposed that this is transposed to the revised permit and is utilised for both MSUL to <70% load, and >70% load. These limits together with the remaining IED ELV`s have been incorporated into Table S3.1. The operator has also proposed to carry out periodic monitoring of SO2 and dust on a six monthly basis as per current permit requirements. This has been accepted and is incorporated into Table S3.1.

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 new LCP numbers in accordance with the most recent DEFRA LCP reference numbers. The LCP references are as follows:

- LCP 406
- LCP 407

LCP 406

This LCP consists of 1 x 753 MWth CCGT (thermal input to be confirmed following completion of IC 7) which vents via a flue within a single windshield at emission point A1. The unit burns natural gas and there is no standby fuel.

LCP 407

This LCP consists of 1 x 753 MWth CCGT (thermal input to be confirmed following completion of IC 7) which vents via a flue within a single windshield at emission point A1. The unit burns natural gas and there is no standby fuel.

Compliance Route:

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

Net Rated Thermal Input:

The Applicant has stated that the thermal input for each LCP is 753MWth (1506MWth). This has been based on the manufacturers data, however, a performance test is going to be undertaken during commissioning. We need a net figure for thermal input that reflects the “as built” situation, the standard for the test specified and the date undertaken. We have therefore set IC 7 which requires a performance test to be carried out by 31/12/16.

IC7 The operator shall provide a report in writing to the Environment Agency for acceptance which provides the net rated thermal input for LCP 406, and

LCP 407. The net rated thermal input is the 'as built' value unless the plant has been modified significantly resulting in an improvement of the plant efficiency or output that increases the rated thermal input (which typically requires a performance test to demonstrate that guaranteed improvements have been realised).

Evidence to support this figure, in order of preference, shall be in the form of:-

- a) Performance test results* during contractual guarantee testing or at commissioning (quoting the specified standards or test codes),*
- b) Performance test results after a significant modification (quoting the specified standards or test codes),*
- c) Manufacturer's contractual guarantee value,*
- d) Published reference data, e.g., Gas Turbine World Performance Specifications (published annually);*
- e) Design data, e.g., nameplate rating of a boiler or design documentation for a burner system;*
- f) Operational efficiency data as verified and used for heat accountancy purposes,*
- g) Data provided as part of Due Diligence during acquisition,*

**Performance test results shall be used if these are available.*

Minimum start up load and Minimum shut-down load:

The Operator has defined the "minimum start up load" and "minimum shut-down load" for each LCP in their response to the questions asked, in terms of:- the output load (power generated) (252MW); and this output load as a percentage of the rated output of the combustion plant (57%).

The output load and percentage of the rated output is based on the point on the combined cycle load capability known as Minimum Generation (MG). They state that this is the lowest load to which a generating unit can be dispatched to Grid in order to comply with National Grid code requirements.

As the plant is currently being commissioned we have no way of verifying that the registered capacity will be met, or indeed exceeded. It is also possible that commercial thresholds can be varied or vary depending upon the state of the plant and ambient conditions. We have therefore set an improvement condition, IC 8, for the operator to provide a report in writing to the Environment Agency which provides the start-up and shut-down thresholds for both LCP's taking into account the technical and operational characteristics of the plants, measures to ensure periods of start-up and shut-down are minimised, and requirements for stable generation, safeguarding health and safety. This is to be provided within one month of completion of commissioning.

IC 8 The operator shall submit a report in writing for approval by the Environment Agency. The report shall define, and provide a justification, of the “minimum start up load” and “minimum shut-down load”, for each unit within the LCP as required by the Implementing Decision 2012/249/EU¹ in terms of:

- i. The output load (i.e. electricity, heat or power generated) (MW); and*
- ii. This output load as a percentage of the rated thermal output of the combustion plant (%).*

And / Or

At least three criteria (operational parameters and / or discrete processes as detailed in the Annex) or equivalent 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 as detailed in Article (9) 2012/249/EU

Emission limits:

The operator has proposed limits for oxides of nitrogen and carbon monoxide in line with, or tighter, than annex V of the IED and the 2014 BAT review paper. Consequently we have accepted the proposed limits and incorporated them into table S3.1 of the permit. A comparison of the existing permit limits, Annex V ELV's and those set in the new revised permit is illustrated in the table below.

Parameter	Existing Permit mg/m3	Reference Period	Annex V mg/m3	New Permit limit mg/m3
NO _x		95%ile of hourly averages	100	100
NO _x	50	24 hourly averages	55	50
NO _x		Monthly averages	50	50
CO		95%ile of hourly averages	200	200
CO	100	24 hourly averages	110	100
CO		Monthly averages	100	100

The current permit requires periodic monitoring of sulphur dioxide and dust. In their response to our questions the operator has proposed periodic monitoring for both sulphur dioxide and dust. In the revised permit these will be reported as six monthly concentrations based upon the fuel sulphur content and dust

concentration as agreed in writing with us. This is on the basis that only trace quantities of sulphur are present in UK natural gas and it is an ash-free fuel. High efficiency combustion in the gas turbine 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. We have accepted the operators proposal for monitoring of both sulphur dioxide and dust, but required monitoring by calculation, and this has been incorporated into table S3.1 of the permit.

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.

“Low Load” Gas Turbine Emission Limits set when the load varies between MSUL/MSDL and base load during the daily reference period: IED Annex V ELVs for GTs apply when the load is >70%. The operator has proposed the same limit when the load varies between MSUL/MSDL and base load during the daily reference period as that >70% load.

- Carbon Monoxide – 100mg/m³
- Nitrogen dioxide – 50 mg/m³

The installation does not have CHP. In line with the DEFRA Part A guidance, to report on the scope for further improvement, a condition has been included for the operator to carry out a 4-yearly efficiency review.

Standby fuels:

The plant runs on natural gas only, no standby fuels have been requested. Gas oil will be used in an emergency generator during a network power outage or for emergency fire pumps.

Reporting efficiency:

In order to ensure the efficiency of plant using fossil fuels or biomass is maximised and regularly recorded, condition 1.2.1(c), condition 4.2.2(b) and table S4.2 have been added to the permit.

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 template for ESI plant. Table S4.2 “Resource Efficiency Metrics” has been added requiring the reporting of various resource parameters, as this is an Electrical Supply Industry (ESI) power plant. This table is being used for all ESI plant.

Additional IED Chapter II requirements:

Condition 3.1.5 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.

Annex 1: Review and assessment of changes that are not part of the Chapter III IED derived permit review.

As well as the changes to the permit required by IED the operator has requested a number of technical and administrative changes as follows:

Deletion of Water Discharge Point W2

At the time of the original permit application in 2008, two discharge points for cooling water to the Manchester Ship Canal were considered and incorporated into the permit as W1 and W2. The operator has now constructed the plant and determined that point W1 will be the point utilised. The dispersion of the cooling water from W1 has been demonstrated by the operators response to pre-operational condition PO6 in the current permit. They have confirmed to the Environment Agency that W1 is a suitable point to discharge the cooling water from the plant. We have therefore agreed to delete all reference to W2 from the permit conditions and monitoring schedule.

A new drawing showing this revised permit boundary has been incorporated into the permit and is subject of condition 2.2.1, Schedule 7. The revised drawing removes the pipeline corridor to discharge point W2 and steep flanks down to the Manchester Ship Canal along the sites NW boundary which were not developed, together with other minor boundary amendments. The boundary shown on the revised drawing now coincides with the facilities constructed fence line. We have not required a partial surrender of the permit as we know that the site is currently undergoing construction/commissioning and that development has not taken place in these areas.

Deletion of references to the Auxilliary Boiler

The current permit includes a 20MWth auxiliary steam raising boiler [Reference in the original permit, Emission Point A3, Table S1.1, Section 1.1 B (a)] intended for use during start-up of the steam turbines. The operator has informed us that this boiler is not required as the gas turbines installed have

Once Through Cooler technology (OTC) that allows each CCGT to generate auxiliary steam in heat exchangers using hot air take-off from the gas turbine compressors. This avoids the need for an auxiliary boiler, and associated emissions, and results in a small improvement in overall emission.

We have agreed with the operators request and deleted all references to the auxiliary boiler from the revised permit.

Minor Text Updates and Typographical Errors

The operator proposed a number of minor changes mainly consolidating variation changes made to the permit since issue in 2008, registered Company address; together with minor changes to the permit introductory note, permit status log, and changes to the sites address. These have been incorporated into the revised permit.