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/SP3730BW
The Operator is: SSE Generation Limited
The Installation is: Weston Point Salt Works CHP Plant
This Variation Notice number is: EPR/SP3730BW/V002

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 responses 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 responses also include 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 responses 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 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.

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

Annex 1 – Review and assessment of operators air quality assessment model by AQMAU

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
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 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 a Notice under Regulation 60(1) of the Environmental Permitting (England and Wales) Regulations 2010 (a Regulation 60 Notice) on 09/12/14 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.
- 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 Regulation 60 Notice response from the Operator was received on 30/03/15.

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 29/05/15, and 03/08/15.

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 Regulation 60 Notice response 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 Regulation 60 Notice response generally satisfactory at receipt, we did in fact need more information in order to complete our permit review assessment, and issued further information requests by e-mail on 06/10/15 about use of gas oil, 08/10/15 about a NOx emission value used in the air dispersion model, and 27/10/15, asking about the size of the diesel start engine and fire pumps. A copy of the further information request was placed on our public register.

2.3 Alternative compliance routes

In their Regulation 60 Notice response, the operator initially requested multiple compliance routes be considered for their LCP because at that point they had not decided which route they wanted to apply for. The routes requested were:

a. Article 32 – TNP
b. Article 30(2) Annex V Part 2 500hour emergency operation

We were only able to issue the variation notice for single compliance routes per LCP (other than TNP which can apply by pollutant), and the operator confirmed which route they wanted in the variation notice, by email dated 01/10/15. The confirmed route was:

Article 30(2) Annex V Part 2 500hour emergency operation

This is what is considered in this decision document.

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.	2.3.5
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	2.3.7 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	2.3.6, 4.2.2d
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	N/A
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	N/A
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

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.

This LCP has previously operated as a CHP comprising a gas turbine (GT), fired heat recovery boiler (HRSG), steam turbine and auxiliary boiler. The operator has proposed a change of operation, subject of this variation, to operate the gas turbine only, in open cycle. Exhaust gases will vent through the bypass stack which is 45m in height. The remaining plant will be mothballed. The GT utilises steam to control formation of oxides of nitrogen (NO_x) during combustion. This steam will no longer be available and therefore emission concentrations of NO_x will increase from the GT. To look at the effect of this a dispersion model has been prepared to assess the impact on receptors

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

- **LCP 260** is changed to **LCP 311**

LCP 311

This LCP consists of a 125 MWth OCGT which vents via a flue within a single windshield at emission point denoted as A2 - bypass stack in the current permit. The unit has previously operated as part of a CHP and has burned natural gas and gas oil. It will now burn only natural gas, with gas oil only used during start-up or as a standby fuel during a national, natural gas interruption.

Compliance Route:
The operator has proposed to operate this LCP under the Article 30(2) Annex V Part 2 500 hour emergency operation compliance route. This is a change of operation from the CHP operation currently permitted.

The current permit allows operation of a CHP plant comprising a gas turbine (GT), fired heat recovery steam generator (HRSG) and a steam turbine (ST). The gas turbine relies on steam produced by the boiler to reduce NOx formation during combustion in the GT, by reducing the flame temperature.

The proposed change in operation of the GT to <500hr emergency operation will mean that the hot gases are exhausted to atmosphere from the GT bypass stack. These would normally have gone into the heat recovery boiler to generate steam and some of this steam would have been used to reduce NOx formation. As this will no longer be available there will be an increased NOx emission from the GT, however, the dispersion and hence effect will, to some extent, be balanced by the hotter gas emitted.

To examine the effect of this change in operation on air quality the operator has produced an air dispersion model which compares two scenarios; the effect of emissions from full plant operation as a CCGT to those of the proposed OC operation without steam for NOx control. The modelling assessment concluded that the process contribution from Weston Point CHP plant to ground level nitrogen dioxide concentrations resulting from both scenarios modelled was less than 1% of the long and short term objectives and, therefore, can be classed as insignificant

The model adopted a worst case scenario by assuming that the plant operates all year in each mode for comparison purposes, which is not, and will not be the case. Therefore the human health and ecological impacts will be much less when operating in the proposed mode <500hr emergency operation.

The study concluded that no health based ambient air quality standards or guidelines are predicted to be exceeded and that there will be no significant adverse effects on the sensitive feature at local ecological sites.

The model provided by the operator was audited by the Environment Agency, Air Quality Model Assessment Unit, and a report produced dated 27-10-15 Ref: AQMAU_C1343_RP01. This report is attached to this decision document as Appendix 1. They have concluded that the applicants conclusions with respect to human health can be used for permit determination. They were unable to replicate the applicants modelling predictions, however, their check modelling confirmed that there will not be any appreciable increase of impact as a result of operating the plant in OC without steam for NO_x reduction.

These conclusions were based on an emission value for NO_x of 185mg/m^3 understood to have been provided by the manufacturer. To confirm that this could be achieved we asked the operator by e-mail dated 08-10-15 to demonstrate this. The operator has not yet carried out testing to demonstrate this and we have therefore set an improvement condition IC 8, requiring that the operator carries out monitoring of the GT in open cycle without steam for NO_x control to confirm that the emission is in line with the dispersion model, prior to any commercial operation.

IC 8 Prior to operation of the gas turbine in open cycle for commercial purposes and without a steam supply for control of emissions of oxides of nitrogen, the operator shall submit a report to the Environment Agency in writing for approval. The report shall contain details of monitoring of the gas

turbine emissions in open cycle without steam for control of oxides of nitrogen. The report shall also either:

I) provide confirmation of the findings of the assessment of the impact of emissions through air quality modelling submitted with this variation application
Or
II) further assess the impact based on monitoring data without steam using our H1 guidance or an equivalent methodology.

Net Rated Thermal Input:
The Applicant has stated that the net thermal input is 125MWth. They have justified this figure by providing reference to the gas turbine acceptance test to ISO2314 standard, undertaken in May 1996, by John Brown Engineering, during commissioning of the plant. They have also confirmed that no upgrades to the gas turbine generator have been made since that date that would significantly affect the performance of this piece of plant. We have accepted this figure and will look to review details of the performance test during routine audit.

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 being (i.e. electricity generated) 25MWe; and this output load as a percentage of the rated thermal output of the combustion plant (62%), together with switch to pre-mix combustion mode.

At a meeting to discuss MSUL/MSDL they provided three discrete processes or thresholds for operational parameters, in addition to output load, which can be met at the end of start-up or start of shut-down; outlined in their response dated 23-07-15 to a request for further information.

These are:

- the point where the combustion mode switches to fully premixed steady state combustion mode, or 'idle speed'. This will be shown when the Gas Turbine control signal for Idle Speed (Full Speed No Load) is made. On shutdown, the reverse will be true when the full speed no load signal comes off.
- flue gas temperature of equal to or greater than 258°C;
- fuel flow capacity of equal to or greater than 4000 m^3 / hr = 26.7%, of total fuel flow capacity.

We agree with these definitions. However, like the operator we also note that both flue gas temperature, and fuel flow, to some extent, can vary with ambient temperature conditions. We have therefore set a combination of load and criteria to define end of start-up or commencement of shutdown, without

using temperature or fuel flow which vary with ambient temperature. These thresholds have been set in Table S1.4 as follows:

Table S1.4 Start-up and Shut-down thresholds		
Emission Point and Unit Reference	"Minimum start up load" Load in MW and as percent of rated power output (%) and when the criteria listed below has been met	"Minimum shut-down load" Load in MW and as percent of rated power output (%) and when the criteria listed below has been met
A2 LCP311	Load equal to or <25MW; 62% Switch to full pre-mix steady state combustion. Indicated by Mk V Control Logic Signal for idle speed is made (full speed, no load).	Load <25 MW; 62% No pre-mix steady state combustion. Indicated by Mk V Control Logic Signal for Idle speed comes off (<full speed, no load).

Emission limits:
The operator has proposed to operate <500hour emergency operation. Annex V of IED (Point 6) provides derogation from NOx and CO emission limit values for gas- fired plants as follows:
"Gas turbines and gas engines for emergency use that operate less than 500 operating hours per year are not covered by the emission limit values set out in this point. The operator of such plants shall record the used operating hours."
In the document EnvC WGEREG 09/15 - Draft 1.1. Protocols for IED Annex V 500 Limited Hours Derogations - July 2015, it is stated that we believe any operation below 500 hours per year constitutes "emergency use" in accordance with this derogation.

We have therefore not applied ELV`s and required calculation of emission concentration using calculation in the permit, Table S3.1 and also recording of operating hours, Table S4.3.

A comparison of current permit limits to those in the revised permit for <500hr emergency operation is outlined in the table below. The operator has provided air dispersion modelling data demonstrating that the emissions that can be achieved will not cause significant pollution. We have reviewed the operator's assessment of the environmental risk and consider it to be satisfactory.

Parameter	**Existing mg/m^3**	**Reference Period**	**Annex V mg/m^3**	**New Permit limit mg/m^3**
NO_x	–	95%ile of hourly averages	100	Not set
NO_x	75mg/m^3	24 hourly	55	Not set

		averages		
NO_x	_	Monthly averages	50	Not set
CO	100mg/m^3 (periodic sample)	95%ile of hourly averages	200	Not set
CO	-	24 hourly averages	110	Not set
CO	-	Monthly averages	100	Not set

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 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.

Energy efficiency:
The installation no longer operates as a 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 operator normally uses natural gas as fuel, however, the current permit allows use of gas oil for up to 100days/year during operation, and as a standby fuel. The operator in their response to an e-mail question 06-10-15 has confirmed that they will only use gas oil in small amounts during start-up of the GT. Since it is BAT to use the cleaner gas fuel, gas oil use has been limited in Table 1.1, to use during start-up as identified by the operator, and periods of national gas supply interruption only. This means that potential usage will be significantly less than currently assessed and permitted.

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.

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 3.1.3 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 operators air quality assessment model by AQMAU
Ref: AQMAU_CP1343_RP01, 27 October 2015