

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/YP3133LL
The Operator is: Keadby Generation Limited
The Installation is: Keadby Power Station
This Variation Notice number is: EPR/YP3133LL/V006

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 includes 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 notices 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. It also provides a justification for the inclusion of any specific conditions in the permit that are in addition to those included in our generic permit template.

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 and includes a number of administrative changes as detailed in annex 1.

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

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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.

Annex 2 - assessment of alternative compliance routes

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)
TNP	Transitional National Plan

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 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 routes.
- Minimum start up and shut down loads.
- The proposed emission limits and how they accord with the 2014 BAT review paper.
- For higher efficiency gas turbines where they wish to apply for the NO_x emission derogation, the energy efficiency details of the LCP.
- 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 23/03/15.

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 10/07/15.

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

In addition to the responses to our further information requests, we received additional information during the determination from the operator on 5 November 2015, regarding part load operation and water emissions, 18 November 2015 regarding water emissions, 19 November 2015 regarding a new site plan and 27 November 2015 regarding MSUL/MSDL. We made a copy of this information available to the public in the same way as the responses to our information requests.

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. The routes requested were:

Emission Limit Value (ELV) and Transitional National Plan (TNP)

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(s) they wanted in the variation notice by email dated 21/12/15 (letter dated 18/12/15). The confirmed route was TNP. 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
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.	3.1.3 Schedule 3, Table S3.3
38	Monitoring of air emissions in accordance with Ann V Pt 3	3.5, 3.6
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	2.3.5, 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	3.5, 3.6 Schedule 3, Table S3.1
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

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

- **LCP 413** is changed to **LCP 202**
- **LCP 414** is changed to **LCP 203**
- **LCP 415** is changed to **LCP 204**

LCP 202 and LCP 203

These LCP's each consist of 2 CCGT's which can both also operate as OCGT. In CCGT mode each LCP vents via their own dedicated 60m windshields at emission points A1(a) & A2(a) respectively. These are 1329 MWth combined. In OCGT mode each LCP vents via their own dedicated 47m emission Points A1(b) & A2(b) respectively. The units burn natural gas and gas oil.

LCP 204

This LCP consists of a 75MWth OCGT used for the Supplemental Balancing Reserve (SBR) market which vents via a dedicated 50m windshield at emission points A3. The unit burns natural gas and gas oil.

Compliance Route:

The operator has proposed to operate all three LCPs under the
Article 32 – TNP

The operator confirmed this compliance route by email dated 21/12/15 (letter dated 18/12/15). Prior to being formally informed of this we assessed all compliance routes requested in the Regulation 60 Notice response. The decision on the two options not brought forward into 2016 can be found in Annex 2.

For plant operating under the TNP, ELVs are set which have been derived for the period 2016 – 30 June 2020 (the duration of the TNP). At the end of this period it is expected that both Annex V and the revised LCP BREF will become applicable, in which case Annex V or the BAT conclusions must be achieved (whichever is stricter), or operators must have applied for a derogation from the BAT conclusion (if that is stricter: Annex V will apply in any event. The operator will apply, at the appropriate time, to vary the permit again to reflect this.

Net Rated Thermal Input:

The Applicant has stated that the Net Thermal Input is for LCP202 & LCP203 is combined at 1329MWth and for LCP204 it is 75MWth. They have not fully justified this figure and improvement condition IC 7 has been included in the permit as below.

IC 7	<p>The operator shall provide a report in writing to the Environment Agency for acceptance which provides the net rated thermal input for LCP202, LCP 203 and LCP 204. 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).</p> <p>Evidence to support this figure, in order of preference, shall be in the form of:-</p> <ul style="list-style-type: none"> 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, <p>*Performance test results shall be used if these are available.</p>	31/12/16
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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. electricity, heat or power generated) as one of three criteria that suit the technical characteristics of the plant, which can be met at the end of start-up or start of shut-down.

These definitions were provided by the operator during the determination of the permit but no written justification has been provided. We have set these thresholds in table S1.5 of the permit and included IC 8 for the operator to provide written justification see IC 8.

IC 8	<p>The Operator shall submit a report in writing to the Environment Agency for acceptance. The report shall define and provide a written 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/EU in terms of:</p> <p>The output load (i.e. electricity, heat or power generated) (MW); and</p> <p>This output load as a percentage of the rated thermal output of the combustion plant (%).</p> <p>And / Or</p> <p>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.</p>	31/03/16
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Emission limits:

TNP compliance route

The operator has requested the ELVs to remain at permit levels as of 31 December 2015.

The ELVs given are in line with annex V of the IED and the 2014 BAT review paper.

Where these limits are above the current hourly ELV the current ELV has been retained. Where there is currently no ELV the annex V ELVs have been given.

The operator has applied for >500 hours operation of the CCGTs, LCP202 and LCP203, in OCGT mode, venting via release points A1(a) and A2(a), and for the OCGT, LCP204, venting via release point A3.

We do not consider operation of a CCGT in OCGT mode for >500 hours to be BAT. The variation has been drafted with LCP202 and LCP203 limited to 500hrs, with no ELVs applying. If the OCGT BAT review paper concludes that open mode can operate for >500hrs then a permit variation may be required.

LCP 204 operates in open cycle mode only. As LCP 204 currently operates in OCGT with no limitations on the hours and currently has ELVs the variation has been drafted with ELVs for LCP204 with no limits on the operating hours.

If the OCGT BAT review paper concludes that open mode cannot operate for unlimited hours then a permit variation may be required.
LCP204 is reserved for the SBR.

We have incorporated the limits into table S3.1 of the permit

NOx on Natural Gas	LCP202 & LCP203	>100MW	Emission points	A1(a) & A2(a)
Reference Period	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		50	50	50
Daily		55	55	55
95% hourly	75	100	100	75

CO on Natural Gas	LCP202 & LCP203	>100MW		
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		100	100	100
Daily		110	110	100
95% hourly	100	200	200	100

NOX on Gas Oil	LCP202 & LCP203	>100MW		
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		90	90	90
Daily		99	99	99
95% hourly	125	180	180	125

CO on Gas oil LCP202 & LCP203 >100MW				
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		100	100	100
Daily		110	110	100
95% hourly	100	200	200	100

NOx on Natural Gas LCP204 75MW				
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		50	N/A	N/A
Daily	-	55	55	55
95% hourly	60	100	N/A	N/A

CO on Natural Gas LCP204 75MW				
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
		110		110

NOx on Gas Oil LCP204 75MW				
	Current	Annex V mg/m ³	Applied for Mg/m ³	New Permit Limit mg/m ³
Monthly		90	N/A	N/A
Daily	-	99	99	99
95% hourly	134	180	N/A	N/A

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CO on Gas Oil	LCP204	75MW		
	Current	Annex V mg/m³	Applied for Mg/m³	New Permit Limit mg/m³
	-	110		110

Gas firing:

Sulphur dioxide emissions from natural gas firing of gas turbines will be reported as six monthly concentrations 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. For gas turbines we have not required any reporting as the dust emissions will always be reported as zero. This is because natural gas is an ash-free fuel and 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.

Oil firing:

Sulphur dioxide emissions from oil firing of gas turbines will be reported as six monthly concentrations on the basis of the known fuel sulphur content without continuous or periodic monitoring. Continuous dust monitoring when firing on gas oil for LCP202 and LCP203 has been required and reported as a daily mean of validated hourly averages for LCP204 six monthly dust monitoring is required.

Gas and oil firing:

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 limits as >70% load.

Energy efficiency:

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 operator normally uses gas fuel and is currently permitted to use distillate oil. Although it is BAT to use the cleaner gas fuel the installation is currently permitted to operate using distillate oil and has ELVs for its use. An impact assessment was undertaken at the time of permit issue. ELVs were determined on the current ELVs as discussed above.

During determination the operator confirmed that they wished to limit the LCPs to <500hrs per annum when using standby fuels therefore there would be no requirement to have CEMS for dust.

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 3.1.6 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.

For LCP202 and LCP203 emission Points A1 and A2 have been amended to be referenced A1(a) and A2(a) this is to distinguish the windshields for the CCGT operation from the bypass OCGT windshields which are emission points A1(b) and A2(b).

The requirements of table S4.4 in the current permit have not been reproduced here as they are thought to be a duplicate of the requirements of tables S4.3 and are now included in table S3.2.

The grid reference of emission point W1 of table S4.3 has been amended to the correct SK reference and is now included in table S3.2.

The requirements for monitoring of discharges to surface water in table S4.3 have been amended to reflect the outcomes of Improvement Conditions IP1 & IP2 as agreed by compliance assessment report ID:A/110202/YP3133LL and are now included in table S3.2.

The operator identified that an extra surface water discharge point, which was discussed previously with us, should be included in this variation. This emission point has been included in table S3.2 as W4. The discharge is from the road drains in the South East corner of the site by the rear gate. The drain is fitted with a penstock valve to enable drainage isolation in the event of an emergency.

An amended drawing of Fig. 2.22-1A has been incorporated into the operating techniques and included in Schedule 7 – Site Plan.

The references in table S1.3, improvement programme requirements, have been changed from IP xx to IC xx.

The DAA activity of oil storage has been removed from Table S1.1 as it is now included in the limits of the specified activity for the Section 1.1 A(1)(a) activity.

Annex 2:

Draft permits and emission tables for compliance route ELV not chosen.

ELV compliance route

The operator requested limits in line with annex V of the IED and the 2014 BAT review paper.

Where these limits are above the current hourly ELV the current ELV has been retained.

The operator applied for >500 hours operation of the CCGTs, LCP202 and LCP203, in OCGT mode, venting via release points A1(a) and A2(a), and for the OCGT, LCP204, venting via release point A3.

We do not consider operation of a CCGT in OCGT mode for >500 hours to be BAT. The variation has been drafted with LCP202 and LCP203 limited to 500hrs, with no ELVs applying. If the OCGT BAT review paper concludes that open mode can operate for >500hrs then a permit variation may be required.

LCP 204 operates in open cycle mode only. As LCP 204 currently operates in OCGT with no limitations on the hours and currently has ELVs the variation has been drafted with ELVs for LCP204 with no limits on the operating hours. If the OCGT BAT review paper concludes that open mode cannot operate for unlimited hours then a permit variation may be required. LCP204 is reserved for the SBR.

The limits we deem suitable are:

NO _x on Natural Gas	LCP202 & LCP203	>100MW	Emission points	A1(a) & A2(a)
Reference Period	Current	Annex V mg/m ³	Applied for Mg/m ³	Environment Agency Decision Limit mg/m ³
Monthly		50	50	50
Daily		55	55	55
95% hourly	75	100	100	75

CO on Natural Gas	LCP202 & LCP203	>100MW	Emission points	A1(a) & A2(a)
	Current	Annex V mg/m ³	Applied for Mg/m ³	Environment Agency Decision

				Limit mg/m³
Monthly		100	100	100
Daily		110	110	100
95% hourly	100	200	200	100

NO_x on Gas Oil LCP202 & LCP203 >100MW				
	Current	Annex V mg/m³	Applied for Mg/m³	Environment Agency Decision Limit mg/m³
Monthly		90	90	90
Daily		99	99	99
95% hourly	125	180	180	125

CO on Gas oil LCP202 & LCP203 >100MW				
	Current	Annex V mg/m³	Applied for Mg/m³	Environment Agency Decision Limit mg/m³
Monthly		100	100	100
Daily		110	110	100
95% hourly	100	200	200	100

NO_x on Natural Gas LCP204 75MW				
	Current	Annex V mg/m³	Applied for Mg/m³	Environment Agency Decision Limit mg/m³
Monthly		50	N/A	N/A
Daily	-	55	55	55
95% hourly	60	100	N/A	N/A

CO on LCP204 75MW Natural Gas				
	Current	Annex V mg/m ³	Applied for Mg/m ³	Environment Agency Decision Limit mg/m ³
	-	110		110

NO _x on Gas LCP204 75MW Oil				
	Current	Annex V mg/m ³	Applied for Mg/m ³	Environment Agency Decision Limit mg/m ³
Monthly		90	N/A	N/A
Daily	-	99	99	99
95% hourly	134	180	N/A	N/A

CO on Gas LCP204 75MW Oil				
	Current	Annex V mg/m ³	Applied for Mg/m ³	Environment Agency Decision Limit mg/m ³
	-	110		