

# Environment Agency

## Review of an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

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

The Permit number is: EPR/BR6996IC  
The Operator is: Esso Petroleum Company Limited  
The Installation is: Fawley Refinery  
This Variation Notice number is: EPR/BR6996IC/V005

A Variation Notice EPR/BR6996IC/V005 has been issued to consolidate all previous variations to the conditions of permit BR6996IC and to combine this permit with permit JP3631KW, which was transferred to Esso Petroleum Company Limited on 04/03/2010 (original permit QP3536LT) from Npower Cogen Trading Limited.

### What this document is about

All Environmental permits which permit the operation of large combustion plant (LCP), need to be varied to implement the specific provisions for LCP (as defined by articles 28 and 29 of the IED), given in the Industrial Emissions Directive (IED), Chapter III (Ch III), which introduce new Emission Limit Values (ELVs) and monitoring requirements that are set out in Annex V, Part 1 of which is applicable to existing LCP (as defined in Article 30(2)).

Article 32 of the IED provides a period of transition towards the new ELVs for some combustion plants via the Transitional National Plan (TNP), however this is not applicable to refinery combustion plants.

In order to assess the operator's ability to comply with IED Ch III, in relation to refinery combustion plants, we issued a notice requiring information, under regulation 60(1) of the Environmental Permitting Regulations (EPR). The information requested for each permitted LCP included details of the type and size of the unit and the types of fuels which it burns. A copy of the regulation 60 notices and the operator's response is available on the public register.

This is our decision document, which explains the conditions of the consolidated variation notice that we have issued and is a record of our decision-making process that shows how we have taken into account all relevant factors in reaching our position.

Some administrative updates have been made, namely to update the site address and the name of the registered office. We have updated the table of other Part A installations relating to this permit to include permit ZP3133RH, issued 04/11/2016, which now forms part of this installation but is operated by a third party.

## **How this document is structured**

Glossary

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

Annex 1: Copy of Regulatory Position Statement RPS/BR6996IC/16/02/2017.

## GLOSSARY

BAT	best available techniques
BREF	best available techniques reference document
CCGT	combined cycle gas turbine
DEFRA	Department for the Environment, Food and Rural Affairs
EIONET	Environmental Information and Observation Network
ELV	Emission limit value set out in either IED or LCPD
EPR	Environmental Permitting (England and Wales) Regulations 2016
GT	gas turbine
IED	<i>“Industrial Emissions Directive”</i> means Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) as published in The Official Journal
LCP	large combustion plant – combustion plant subject to Chapter III of IED
LCPD	large combustion plant directive 2001/80/EC
MCR	maximum continuous rating
MFF	multi fuel fired
MFF Protocol	IED Chapter III Protocol for Multi-fuel Firing Refinery Combustion Plants granted a Permit prior to 7th January 2013, version 5.
OCGT	open cycle gas turbine
NERP	National Emissions Reduction Plan
WHB	waste heat boiler

## **1 Our decision**

We have decided to issue Variation Notice BR6996IC/V005 to the Operator. This permits them to continue to operate the Installation, subject to the conditions in the notice.

We consider that, in reaching this 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.

## 2 How we reached our decision

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

We issued notices under Regulation 60(1) of the EPR 2010 (Regulation 60 Notice) on 05/08/2015 requiring the Operator to provide information for each large combustion plant (LCP) on the refinery and the Cogen Plant that they operate, including:

- The type, size and configuration of the combustion plant
- Specification of the fuels which the LCP can fire and for multi-fuel fired plant, the range of fuel firing ratios that could be used by the plant
- Details of the proposed method for assigning periods of start-up and shutdown
- For multi-fuel fired plants; a proposed methodology for assessing which ELVs should apply, as calculated in accordance with Articles 40(2), or set according to Article 40(3) and procedure for verifying compliance with the relevant ELV
- For higher efficiency gas turbines where they wish to apply for the emission limit derogation (Annex V, Part 1 paragraph 6, note 2), the energy efficiency details of the LCP.

The responses to the Regulation 60 Notices were received from the Operator on 30/09/2015. We considered the responses were in the correct form and contained sufficient information for us to begin our determination of the permit reviews.

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

### 3 The legal framework

The 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.

We consider that, in issuing the Consolidated Variation Notice, this 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 Chapter III**

The table below shows how relevant requirements of IED ChIII have been addressed by the permit conditions.

<b>IED Article Reference</b>	<b>IED requirement</b>	<b>Permit condition</b>
30(2)	Setting emission limit values for plant granted a permit before 7 January 2013	3.1.2
37	Notification of malfunction and breakdown of abatement equipment	4.3.1 and Schedule 6
38	Monitoring of air emissions in accordance with Annex V Pt 3	3.6, 3.7
39	Application of compliance criteria to emission limit values in accordance with Annex V Part 4	Schedule 4, Table S4.1a
40	Multi-fuel firing	Schedule 4, Table S4.1a
41(a)	Determination of start-up and shut-down periods	2.3.7 Schedule 1, Table S1.2
Annex V Pt 1	Emission limit values for plant permitted before 7 <sup>th</sup> January 2013	Schedule 4, Table S4.1a
Annex V Pt 1(6(1))	Definition of natural gas	Schedule 7, Interpretation
Annex V Pt7	Refinery multi-fuel firing SO <sub>2</sub> derogation	Schedule 4, Table S4.1a

## **4. Key Issues**

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

The table below summarises the amendments to permit conditions and related tables and schedules following the issue of the variation and consolidation. Detailed information is provided in the subsequent paragraphs.

Conditions	
2.3.7 and Table S1.2	Condition added relating to specification of start-up and shutdown periods for LCP as specified in table S1.2
3.1.6	Template IED condition added to specify the requirement of periodic groundwater and soil monitoring requirements, already included in Cogen permit JP3631KW.
3.7.1	Template condition added relating to monitoring requirements under IED for LCP.
3.7.2	Template condition added relating to action required in the event of CEMS monitoring results for > 10 days a year being invalid.
3.7.7	Template IED condition added relating to CEMS monitoring requirements for LCP.
Table S1.1	Amended to include Cogen Plant activities previously permitted under JP3631KW. Amended to add/amend information relating to emission points A29 and A30.
Table S1.3	Amended to update completion dates for outstanding Improvement Conditions, and to show Improvement Conditions that have been completed. A new Improvement Condition has been added: <ul style="list-style-type: none"> <li>Improvement Condition IC38 added requiring the operator to carry out a review of soot blowing activities on SP4 (emission point A1, LCP 152), the performance of the current dust analyser, propose a methodology for calculating mass emissions for approval and to implement any improvements and measures identified to reduce soot blowing.</li> </ul>
Schedule 2	Updated site plan incorporating the area previously permitted separately by permit JP3631KW (Cogen Plant) and the areas permitted for the treatment and re-use of oily wastes under permit ZP3133RH.
Table S3.1	Updated to remove specifications for alternative liquid fuels, H <sub>2</sub> S content in refinery fuel gases and raw material content of water treatment chemicals. These restrictions related only to the Cogen plant when operated by Npower Cogen Trading Ltd to provide controls to raw materials received from and effluent discharged to Esso Petroleum Company Ltd. They are no longer relevant since the permit was transferred to Esso Petroleum Company Ltd and the operation of the Cogen plant has been integrated within the refinery operation.  Updated to include maximum content of natural gas in gaseous fuel mixtures as a percentage of the total.  Updated to specify no liquid firing on the Cogen plant (LCP 144, emission point A29).
Table S4.1a	Table amended to include new source descriptions for LCPs, and Cogen Plant emission points.  Inclusion of LCP emission limit values and monitoring requirements in line with IED. Where tighter emission limits already apply, these remain unchanged.  Notes to table: <ul style="list-style-type: none"> <li>removed where no longer relevant;</li> <li>added to reflect IED requirements; and</li> <li>added to show units currently shut down for clarity</li> </ul> Amended to add/amend information in relation to emission points A29 and A30.
Table S4.1b	Sulphur dioxide annual mass limit updated. Note to table deleted as no longer relevant.
Table S4.2a	NERP allocation table deleted as no longer relevant.
Table S4.3	Table S4.3a amended to remove historic SO <sub>2</sub> limits and to add annual mass NO <sub>x</sub> limits for specified emission points. Table renumbered from S4.3a to S4.3



	following deletion of Table S4.3b.
Table S4.3b	Table relating to internal effluent transfer from the Cogen Plant into the refinery sewer systems deleted as no longer relevant.
Table S5.1, S5.3 and S5.4	Updated to include monitoring and reporting (including reporting forms) for LCP plant and Cogen Plant.
Schedule 7	Interpretations amended/added to incorporate terms relevant to Cogen Plant and IED

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

- **LCP 14** is changed to **LCP 152**;
- **LCP 15** is changed to **LCP 151**;
- **LCP 16** is changed to **LCP 147**;
- **LCP 17** is changed to **LCP 148**;
- **LCP 18** is changed to **LCP 145**;
- **LCP 20** is changed to **LCP 150**;
- **LCP 21** is changed to **LCP 146**; and
- **LCP 144** for the Cogen Plant is added.

The table below summarises the rating, configuration and fuel options for each LCP.

<b>LCP Number and source</b>	<b>Unit rating MW</b>	<b>Configuration</b>	<b>Total stack MW</b>	<b>Fuel options</b>
<b>LCP 145</b> ENSR Exxol-N-Finer <sup>1</sup>	1 x 50 1 x 19	Vent via a single windshield at emission point <b>A7</b>	69	Capable of multi-fuel firing. Operates on 100% gaseous fuels.
<b>LCP 147</b> PH-1 <sup>1</sup> Powerformer	1 x 21.5 1 x 43.7 1 x 10.5 1 x 7.1	Vent via a single windshield at emission point <b>A3</b> .	82.8	Capable of multi-fuel firing Operates on 100% gaseous fuels.
<b>LCP 148</b> PH-2 <sup>1</sup> Powerformer	1 x 16 1 x 27 1 x 70 1 x 17 1 x 35	Vent via a single windshield at emission point <b>A5</b> .	165	Capable of multi-fuel firing Operates on 100% gaseous fuels.
<b>LCP 150</b> PS/PV1 <sup>1</sup> Distillation unit	1 x 37.9 1 x 23.9	Vent via a single windshield at emission point <b>A8</b>	61.8	Capable of multi-fuel firing Operates on 100% gaseous fuels.
<b>LCP 151</b> PS/PV3 <sup>1</sup> Distillation unit	1 x 125 1 x 38.7	Vent via a single windshield at emission point <b>A2</b>	163.7	Capable of multi-fuel firing Operates on 100% gaseous fuels
<b>LCP 152</b> SP4 <sup>1</sup> Steam plant	2 x 400	Vent via single windshield at emission point <b>A1</b> .	800 limited to 499	Capable of multi-fuel firing Operates on a mixture of gaseous and liquid fuels.

<b>LCP 146</b> GTG/HRSG <sup>1</sup> Gas Turbine and Heat Recovery Steam Generation plant	1 x 196 GT and HRSG	Vent via emission point <b>A16</b>	196	Capable of multi-fuel firing Operates on 100% gaseous fuels with occasional liquid fuel (generally greater than 50%) during periods of abnormal operation.
<b>LCP 144</b> Cogen <sup>1</sup> Gas Turbine and Heat Recovery Steam Generation plant	1 x 451 Gas Turbine and Waste Heat Boiler	Vent via emission point <b>A29</b>	451	Capable of multi-fuel firing Operates on 100% gaseous fuels. Can operate in auxiliary mode using the HRSG only to maintain steam demand in abnormal operations.

<sup>1</sup> Operator's identifier.

### Fuel Options

Gaseous fuels include natural gas, refinery fuel gas (RFG), recovered flare gas and LPG enrichment within a common ring main and distillation/isomerisation off gases or MEDAL gas direct to local furnaces/gas turbines.

Liquid fuels include vacuum distillation residue, residfinate, back-up distillate and diesel.

### RFG fuel classification

Residue is not defined for the purpose of Article 40, but is generally viewed as something which is left over after an element of greater worth has been removed. The provisions of Part 7 of annex V specifically excludes gas turbines and gas engines, which suggests that other combustion plants using gaseous distillation and conversion residues, are covered. RFG is a gaseous fuel derived from distillation and conversion processes and therefore can be considered a distillation and conversion residue from the refining of crude oil.

Where RFG is burned in combination with another fuel, e.g. natural gas, the SO<sub>2</sub> emission limits in Section 7 of Annex V can apply; which for plant granted a permit before 27 November 2002 is 1000mg/m<sup>3</sup>.

Application of Article 40(3) instead of Articles 40(1) or 40(2) is discretionary. We decided to apply that discretion to RFG firing taking into account general government policy, broader economic considerations, such as security of supply and whether there was any legitimate expectation raised with the industry sector that the Industrial Emissions Directive would result in little change for UK Refineries.

### Net Rated Thermal Input

Some of the ELVs set in Annex V vary according to the Net Rated Thermal Input of the CP. In other words how much fuel it is designed to burn The Applicant has provided the Net Thermal Input for each LCP, as above, along with historical evidence of fuel usage to support these values.

### Minimum start-up load and Minimum shut-down load

Article 14(1)(f) of IED requires that provision is made in the permit conditions for "other than normal" operating conditions such as start-up and shut down operations. We have addressed this in section 2.3 'Operating Techniques' of the permit. It is necessary therefore to define the period of start-up or shut-down. The Operator has defined the "minimum start-up load" and "minimum shut-down load" for each LCP in their response to question 2f of the Regulation 60 Notice, in terms 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.

We agree with all of these definitions. Reference to the definitions in the Regulation 60 response have been incorporated into the operating techniques specified in Table 1.2. These are referenced in standard permit condition 2.3.7, which defines the period of start-up and shut-down.

#### Compliance Route

Article 32(1)(b) excludes LCPs firing distillation and conversion residues from the refining of crude oil, from inclusion in the transitional national plan.

The above LCPs are covered by IED Article 30(2) which applies to all permits for installations containing combustion plants which have been granted a permit before 7 January 2013. Annex V Part 1 sets out emission limit values (ELVs) for combustion plants referred to in Article 30(2); unless a derogation or special provision, such as that given in article 40(3) for MFF plant firing distillation and conversion residues, applies.

The operator has not applied to rely on any derogation provision in article 30 from the ELVs specified in Annex V. Details of the sections of the IED that are relevant for setting emission limit values are summarised below.

#### Emission Limit Values

Emission Limit Values have been set in accordance with the values specified in Annex V Part 1 of the IED, except for the SO<sub>2</sub> ELV from RFG firing, which is specified in Annex V Part 7.

These 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 O<sub>2</sub> content of 6% for solid fuels and 3% for liquid and gaseous fuels. For this purpose, refinery fuel gas (RFG) is a gaseous fuel.

As before, in addition to emission limits set at a combustion unit level, we will continue to impose site-wide annual mass emission limits for SO<sub>2</sub>. The MFF units will need to be fired such that, in combination with other sources of SO<sub>2</sub>, site-wide emissions remain within the current annual mass emission limit. In this way, gains in the reduction of SO<sub>2</sub> to air will be maintained. This delivers our obligations to protect and improve the environment and is consistent with the principle of 'no-deterioration'

#### **Multifuel firing emission limits**

All combustion plants covered by this decision document are multifuel fired and use distillation and conversion residues from the refining of crude oil as a fuel. Article 40(2) makes specific provision for determination of the applicable ELVs for such plant, which may be applied at the discretion of the competent authority. We recognise the differences between refinery fuels and commercial fuels, in relation to their composition and variability, which will have an impact on their associated combustion emissions, so we have decided to apply the calculation methodology provided in article 40(2) to these combustion plants, for emissions of NO<sub>x</sub>, dust and where relevant CO.

The methodology is as follows:

- (a) where, during the operation of the combustion plant, the proportion contributed by the determinative fuel to the sum of the thermal inputs delivered by all fuels is 50% or more, the emission limit value is set in Part 1 of Annex V for the determinative fuel;
- (b) where the proportion contributed by the determinative fuel to the sum of the thermal inputs delivered by all fuels is less than 50 %, the emission limit value is determined in accordance with the following steps:
  - (i) *taking the emission limit values set out in Part 1 of Annex V for each of the fuels used, corresponding to the total rated thermal input of the combustion plant;*
  - (ii) *calculating the emission limit value of the determinative fuel by multiplying the emission limit value, determined for that fuel according to point (i), by a factor of two, and subtracting from this product the emission limit value of the fuel used with the lowest emission limit value as set out in Part 1 of Annex V, corresponding to the total rated thermal input of the combustion plant;*
  - (iii) *determining the fuel-weighted emission limit value for each fuel used by multiplying the emission limit value determined under points (i) and (ii) by the thermal input of the fuel concerned and by dividing the product of this multiplication by the sum of the thermal inputs delivered by all fuels;*
  - (iv) *aggregating the fuel-weighted emission limit values determined under point (iii).*

The determinative fuel is; the fuel with the highest ELV set out in Part 1 of Annex V, or where 2 fuels both have the highest ELV, whichever has the highest thermal input.

When calculating the applicable ELVs for the MFF units, we have taken into account the following:

- Gas and liquid fuel flow rates into individual furnaces are measured in real time.
- Gaseous fuels are mixed in the ring main not at the burner tip, therefore the actual ratio of the gaseous fuels cannot be measured at the burner front and is considered to be constant throughout the ring main.
- The calorific value of the refinery fuels is calculated using a variety of historical data sources and some calculation factors;
- The proportion of natural gas in the gaseous fuel mix never exceeds 50%. The remainder is made up from process gases such as refinery fuel gas, recovered flare gas and distillation off-gases.

In principal the ELV should vary over time “dynamically” according to the actual fuel ratio fired in that instance; however, this is not always practicable and in these cases a representative fixed ELV has been determined according

to section 6(III) of the MFF Protocol. For a specific combustion plant where a dynamic ELV is not practicable, the reasons for this are discussed in the table below.

Additional provision is made for SO<sub>2</sub> emissions from plants firing distillation and conversion residues from the refining of crude oil, in Article 40(3) and Part 7 of Annex V. All these plants were granted a permit before 27 November 2002, therefore the applicable emission limit is 1 000 mg/Nm<sup>3</sup>.

**Compliance with Emission Limit Values:**

Part 3 of Annex V requires that SO<sub>2</sub>, NO<sub>x</sub>, dust and CO are monitored continuously for combustion plants with a rated thermal input of >100MW  
Part 4 of Annex V specifies the compliance criteria for emissions measured continuously as follows:

- (a) no validated monthly average value exceeds the relevant emission limit values set out in Parts 1 and 2;
- (b) no validated daily average value exceeds 110% of the relevant emission limit values set out in Parts 1 and 2;
- (c) in cases of combustion plants composed only of boilers using coal with a total rated thermal input below 50MW, no validated daily average value exceeds 150% of the relevant emission limit values set out in Parts 1 and 2,
- (d) 95% of all the validated hourly average values over the year do not exceed 200% of the relevant emission limit values set out in Parts 1 and 2.

Points (a),(b) & (d) are reflected in the emission limit value set for the relevant reference period (see table below). Point (c) is not relevant to any of the combustion plants covered by this decision document.

The table below summarises the emission limits and monitoring requirements for each LCP, making reference to relevant sections of Annex V of the IED and pertinent technical characteristics. Where existing, tighter ELVs are already in place, these have been carried forward into this variation, to ensure no deterioration in environmental performance.

Emission Point	Parameter	Existing ELV	IED Annex V relevant sections	New ELV (mg/m3) and reference period where relevant	Monitoring
A1 LCP 152 (SP4) <sup>1</sup>	NO <sub>x</sub>	No limit set, releases controlled under the NERP	Part 1 (4) Note 1 and Part 1 (6) Note 4  Part 3 (1)	424 Calendar monthly mean of validated hourly averages.	CEMS installed and operational for all parameters including oxygen.
				466 Daily mean of validated hourly averages	
				848 95% of validated hourly averages within a calendar year	
	Dust	No limit set, releases controlled under the NERP	Part 1 (7) Note 1 and Part 8  Part 3 (1) and 3 (8)	30 Calendar monthly mean of validated hourly averages.	
33 Daily mean of validated hourly averages					

Emission Point	Parameter	Existing ELV	IED Annex V relevant sections	New ELV (mg/m3) and reference period where relevant	Monitoring
				60 95% of validated hourly averages within a calendar year	
	CO	No limit set.	Part 1 (6) Part 3 (1) and 3 (8)	No limit set Limit only applies when 100% natural gas firing.	
	SO <sub>2</sub>	4000	Part 7 Part 3 (1) and 3 (8)	1000 - Calendar monthly mean of validated hourly averages. 1000 - daily mean of validated hourly averages 1000 - 95% of validated hourly averages within a calendar year	
<p>LCP 152 (SP4) comprises 2 x 400 MW furnaces; however, the Annex V ELVs considered in determining the applicable ELVs are for a plant with a total rated thermal input of &lt; 500 MW. The reasons for this are:</p> <ul style="list-style-type: none"> <li>• The current configuration is based on one furnace in operation, with the second providing top-up capacity as required.</li> <li>• Neither furnace currently operates at maximum capacity.</li> <li>• A software interlock is applied at all times to restrict the thermal input to less than 500MW. This is in accordance with Environment Agency Regulatory Guidance Note 2 and 'IED Chapter III Protocol for Multi-fuel Firing Refinery Combustion Plants granted a Permit prior to 7th January 2013' Version 4.</li> </ul> <p>The operational capacity of the LCP is restricted to less than 500MW by condition 2.1.1 and Table S1.1.</p> <p>The unit is fired on a mixture of gaseous and liquid fuels on the basis of minimum liquid firing.</p> <p>LCP 152 (SP4) is a MFF combustion plant for which the determinative fuel is residfinate (a liquid refinery fuel). The other fuels fired are RFG and natural gas. Table S3.1 controls the specification of raw material inputs.</p> <p>It is not possible to apply a dynamic ELV for LCP 152 (SP4) for the following reasons:</p> <ul style="list-style-type: none"> <li>• The RFG composition fluctuates significantly and cannot be controlled, so the calorific value varies considerably.</li> <li>• RFG contains 15-70% hydrogen and H<sub>2</sub>S that elevate the combustion temperature, which alters the correlation between liquid/gaseous fuel ratio and ELV. A reliable alternative correlation could not be derived from the data available.</li> <li>• RFG Calorific value is calculated using a variety of historic data sources and some calculation factors;</li> <li>• The fuel firing ratio varies almost constantly and is not a primary control parameter</li> <li>• Residfinate is a hydrotreated liquid fuel with low nitrogen content. Therefore the correlation between NO<sub>x</sub> emissions associated with burning commercial liquid fuels is not seen with this fuel</li> </ul> <p>Fixed ELVs for NO<sub>x</sub> and dust have been set for LCP 152 (SP4) according to the following:</p> <ul style="list-style-type: none"> <li>• Using the Article 40(2) methodology, calculating the ELV, for each day between 1 January 2013 and 31 December 2015 based on the actual fuel fired that day</li> <li>• Taking into account the distribution of the calculated ELVs and the standard deviation.</li> <li>• Determining the median ELV value for each year and for the full data set</li> <li>• Setting the fixed ELV to the mean of the annual median values</li> </ul> <p>The period 2013-2015 is considered representative because residfinate fuel was not introduced into the unit until 2013.</p> <p>The median value is considered representative of normal operation, as the data set produced a normal distribution with a small standard deviation.</p>					

Emission Point	Parameter	Existing ELV	IED Annex V relevant sections	New ELV (mg/m3) and reference period where relevant	Monitoring
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We have compared the proposed ELV with the actual emissions measured during the period 2013-2015 and the operator's ability to comply was found to be high (>99%), therefore the ELV is considered appropriate.

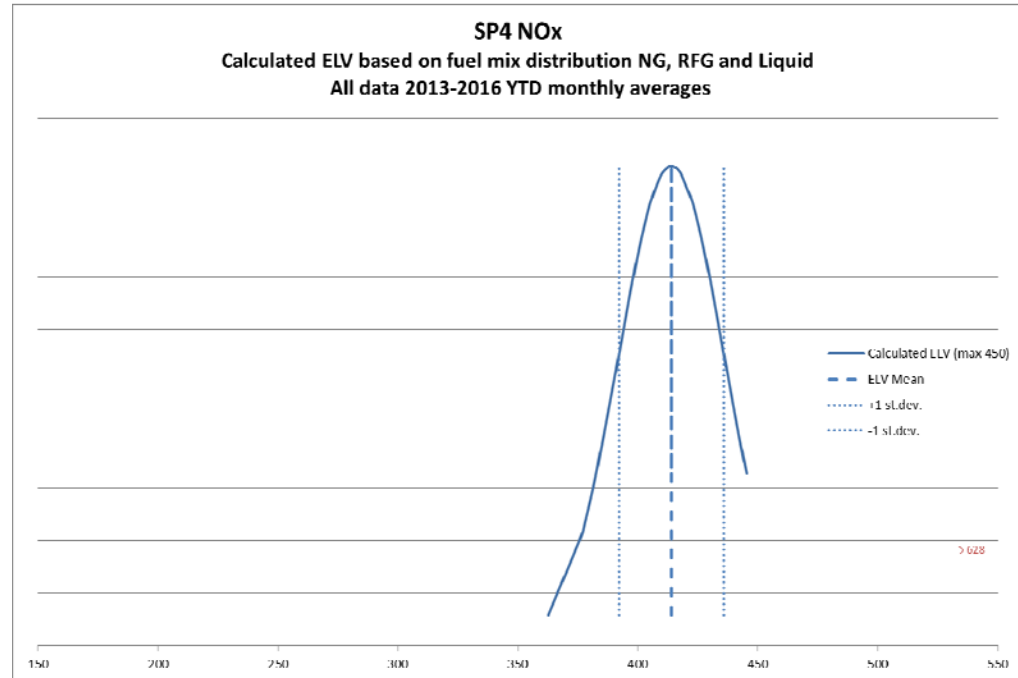


Figure 1. Data distribution for calculated NO<sub>x</sub> ELV for 2015-2016

Table 1. Summary of results from data analysis

	Year				Mean of median values for years 2013-2015
	2013	2014	2015	2013-2016 to date	
<b>Calculated NO<sub>x</sub> ELV</b>					
<b>Median</b>	419	439	414	422	424
<b>Calculated dust ELV</b>					
<b>Median</b>	29	32	29	30	30

Condition 3.1.2 and table S4.1a, note 3 requires the operator to review fuel ratios on an annual basis, or following a significant change, to confirm whether the fixed ELV is still representative of the fuel used. If a significant change is noted the ELV may require variation.

It is recognised that setting a fixed ELV on the basis of representative fuel fired, may at times create artificial emissions headroom. In order to prevent deterioration in environmental performance (no backsliding), we have also included an annual mass emission limit for NO<sub>x</sub> in table S4.3. The limit of 913 tonnes has been calculated from the typical flue gas flow rate during normal operation and takes into account additional loading during periods of planned maintenance to the gas turbines.

<b>A2 LCP 151 (PS/PV3)<sup>1</sup></b>  <b>A5 LCP148 (PH2)<sup>1</sup></b>	NO <sub>x</sub>	No limit set, releases controlled under the NERP	Part 1 (6) Note 4  Part 3 (1) and 3 (8)	300 – Calendar monthly mean of validated hourly averages.  330 – daily mean of validated hourly averages  600 – 95% of validated hourly averages within a calendar year	CEMS installed and operational for all parameters including oxygen.
	SO <sub>2</sub>	A2 4000 A5 2500	Part 7  Part 3 (1) and 3 (8)	1000 – Calendar monthly mean of validated hourly averages.	
				1000 – daily mean of validated hourly averages	
				1000 – 95% of validated hourly averages within a calendar year	
	CO	No limit set.	Part 1 (6)  Part 3 (1) and 3 (8)	No limit set. Limit only applies when 100% natural gas firing.	
Dust	No limit set, releases controlled under the NERP	Part 1 (8)  Part 3 (1) and 3 (8)	5.0 – Calendar monthly mean of validated hourly averages.	Periodic – at least every 6 months	
<p>LCP 151 (PS/PV3) and LCP 148 (PH2) are MFF combustion plants, with a rated thermal input greater than 100MW, firing a mixture of RFG &amp; natural gas from the gas ring-main. RFG is the determinative fuel. The proportion of heat input from the RFG will always exceed 50% therefore Article 40(2)(a) applies, so we have set the ELVs to the Annex V values for the determinative fuel.</p> <p>Monitoring returns show that dust emissions:</p> <ul style="list-style-type: none"> <li>from LCP 148 (PH2) are consistently below 5 mg/m<sup>3</sup> (highest reported result since permit issue was 4 mg/m<sup>3</sup> in 2013); and</li> <li>from LCP 151 (PS/PV3) have been consistently below 5 mg/m<sup>3</sup> since the removal of oil firing in February 2016.</li> </ul> <p>Therefore, in accordance with the MFF Protocol, we do not require continuous monitoring of dust. Periodic monitoring is required to demonstrate dust levels remain below 5 mg/m<sup>3</sup>.</p> <p><b>Note:</b> At the time the Regulation 60 submission was made, LCP 151 (PS/PV3) was fired on different types of liquid and gaseous fuels. In February 2016, the oil firing capability was removed. The ELVs have therefore been set for firing on gaseous fuels only.</p>					
<b>A3 LCP 147 (PH1)<sup>1</sup></b>  <b>A7 LCP 145 (ENSR)<sup>1</sup></b>  <b>A8 LCP 150 (PS/PV1)<sup>1</sup></b>	NO <sub>x</sub>	No limit set, releases controlled under the NERP	Part 1 (6) Note 4  Part 3 (3)	330	Periodic – at least every 6 months
	Dust	No limit set, releases controlled under the NERP	Part 1 (8)  Part 3 (3)	5.5	
	SO <sub>2</sub>	2500	Part V  Part 3 (3)	1000	
	CO	No limit set.	Part 1 (6)  Part 3 (3)	No limit set. Limit only applies when 100% natural gas firing.	



	<p>LCP 147 (PH1), LCP 145 (ENSR) and LCP 150 (PS/PV1) are MFF combustion plants, with a rated thermal input less than 100MW, firing a mixture of RFG &amp; natural gas from the gas ring-main. RFG is the determinative fuel. The proportion of heat input from the RFG will always exceed 50% and Article 40(2)(a) applies, so we have set the Annex V values for the determinative fuel.</p> <p>The rated thermal input of these LCPs is less than 100MW, so we have required 6 monthly periodic monitoring of emissions, in accordance with paragraph 3 of part 3 to Annex V.</p> <p>LCP 147 (PH1) comprises two furnaces that have a rated thermal input greater than 15MW, with aggregate capacity &gt; 50MW and two smaller furnaces of 10.5 and 7.1 MW. According to the aggregation rules in Article 29, the input of the 2 smaller units should not be considered when assessing the aggregate thermal rating of the combustion plant.</p>
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<b>A16 LCP 146 (GTG/ HRSG)<sup>1</sup></b>	NO <sub>x</sub>	No limit set.	Part 1 (6) Note 2  Part 3 (1)	120 - Calendar monthly mean of validated hourly averages  132 - daily mean of validated hourly averages  240 - 95% of validated hourly averages within a calendar year	CEMS installed and operational for all parameters including oxygen.	
	CO	No limit set.	Part 1 (6)  Part 3 (1)	No limit set – continuous monitoring required		
	SO <sub>2</sub>	850	Continued from existing permit	850 – validated hourly average		
	Dust	No limit set	Part 3 (1)	No limit set – continuous monitoring required		
	<p>LCP146 (GTG/HRSG) is a gas turbine (GT), with a rated thermal input greater than 100MW, which during normal operation burns refinery fuel gas only. The emission limits above apply during normal periods of gas firing.</p> <p>For NO<sub>x</sub> we have set the relevant Annex V ELVs for gas turbines firing gases other than natural gas.</p> <p>Following completion of Improvement Condition 21, monitoring results showed the measured levels of dust from LCP146 (GTG/HRSG), to be consistently very low (&lt; 5mg/m<sup>3</sup>). Therefore there is no additional justification for setting a dust ELV for this plant.</p> <p>There is an ELV for SO<sub>2</sub> in the current permit which has been retained to ensure no deterioration.</p> <p>Evidence provided by the operator shows that the above ELV for NO<sub>x</sub> cannot be met. There is an improvement project to install steam injection for NO<sub>x</sub> emission control, scheduled for completion in October 2018. The scheduling of this work is timed to minimise the impact of this unit being offline. We are confident that this improvement will be implemented at this time and so we have issued Regulatory Position Statement RPS/BR6996IC/16/02/2017 suspending any enforcement action in relation to this non-compliance. The RPS specifies actions to be taken by the operator during the period of non-compliance compliance. Provided these actions are completed within the specified timescales, we will not take any enforcement action. A copy of the RPS is appended in Annex 1 to this decision document.</p>					
<b>A16 LCP 146 (GTG/ HRSG)<sup>1</sup></b>  Firing on a mixture of liquid fuel and refinery fuel gas	NO <sub>x</sub>	No limit set.	Part 1 (6) Note 2  Part 3 (1)	90 - Calendar monthly mean of validated hourly averages.  99 - daily mean of validated hourly averages  180 - 95% of validated hourly averages within a calendar year	CEMS installed and operational for all parameters including oxygen	
	CO	No limit set.	Part 1 (6)  Part 3 (1)	No limit set – continuous monitoring required		
	SO <sub>2</sub>	850	Continued from existing permit	850 – validated hourly average		
	Dust	No limit set	Part 3 (1)	No limit set – continuous monitoring required		
	<p>LCP146 (GTG/HRSG) also has the capability to be operated on a mixture of gaseous and liquid fuels to maintain security of steam supply.</p> <p>Generally &gt; 50% liquid fuel is used when firing on liquid fuels, therefore for these periods we have set the emission limits for GTs fired on liquid fuels, in accordance with article 40(2)(a).</p>					

	<p>The applicable emission limit values for GTs are:</p> <ul style="list-style-type: none"> <li>• 90 mg/m<sup>3</sup> for GTs fired on light and middle distillates</li> <li>• 150 mg/m<sup>3</sup> for GTs fired on liquid fuels which do not operate for more than 1500 hours per year.</li> </ul> <p>Although liquid firing is unusual it is not practical to restrict the periods of liquid firing, therefore the limit of 90mg/Nm<sup>3</sup> has been set for all periods of liquid firing.</p> <p>The pre-existing limit of 850mg/Nm<sup>3</sup> for SO<sub>2</sub> emissions will continue to apply during periods of liquid firing.</p> <p>Compliance with the above ELVs for periods of liquid firing shall be reported, including the reason liquid firing was required.</p>													
<b>A29 LCP 144 (Cogen GTG and HRSG)<sup>1</sup></b>	NO <sub>x</sub>	110 Daily mean	Part 1 (6) Note 2  Part 3 (1)	77 Calendar monthly mean of validated hourly averages. 85 Daily mean of validated hourly averages 154 95% of validated hourly averages within a calendar year	CEMS installed and operational for all parameters including oxygen.									
	SO <sub>2</sub>	95 Daily mean and 95% of validated hourly averages within a calendar year	Continued from existing permit	95 Daily mean of validated hourly averages 95 95% of validated hourly averages within a calendar year										
	CO	25 Daily mean 30 95% of validated hourly averages	Continued from existing permit	25 Daily mean of validated hourly averages 30 95% of validated hourly averages within a calendar year										
	<p>LCP144 (Cogen GTG/HRSG) is a MFF gas turbine (GT), with a rated thermal input greater than 100MW, which in normal operation burns a mixture of MEDAL gas, which is a refinery fuel and natural gas that is imported and fed directly to the unit.</p> <p>The operator's has indicated the unit operates at an efficiency &gt;75%. This has been audited during site meetings and we are satisfied that this is correct. A summary of the annual calculated efficiency since 2014 is shown in table 3 below.</p> <p>Table 3. LCP 144 calculated efficiency</p> <table border="1" data-bbox="391 1549 1390 1675"> <thead> <tr> <th>Year</th> <th>Calculated efficiency %</th> </tr> </thead> <tbody> <tr> <td>2014</td> <td>78.1</td> </tr> <tr> <td>2015</td> <td>78.2</td> </tr> <tr> <td>2016 year to date</td> <td>79</td> </tr> </tbody> </table>					Year	Calculated efficiency %	2014	78.1	2015	78.2	2016 year to date	79	
	Year	Calculated efficiency %												
	2014	78.1												
2015	78.2													
2016 year to date	79													
<p>It is not possible to apply a dynamic ELV to LCP144 for the following reasons:</p> <ul style="list-style-type: none"> <li>• Calorific value of the MEDAL gas is calculated using a variety of historic data sources and some calculation factors;</li> <li>• MEDAL gas is a refinery gas stream which has a high hydrogen content. It is inherently different to hydrocarbon-based fuel; the higher hydrogen and sulphur content results in higher NO<sub>x</sub> emissions compared to commercial fuels. Over averaging periods, these factors cancel each other out. However, on an</li> </ul>														

instantaneous basis this is not the case.

- The fuel firing ratio can vary significantly and frequently and is not pre-determined;

We have therefore set a fixed ELV for NO<sub>x</sub> that is based on a fuel mixture that is representative of the mix of fuels fired for the majority of the time.

A fixed ELV for NO<sub>x</sub> has been set for LCP144 (Cogen GTG/HRSG) according to the following:

- Using the Article 40(2) methodology, calculating the ELV, for each day between January 2010 and December 2015 based on the actual fuel fired that day
- Taking into account the distribution of the calculated ELVs and calculate the standard deviation.
- Determining the median ELV value for each year and for the full data set
- Setting the fixed ELV to the average of the annual median values

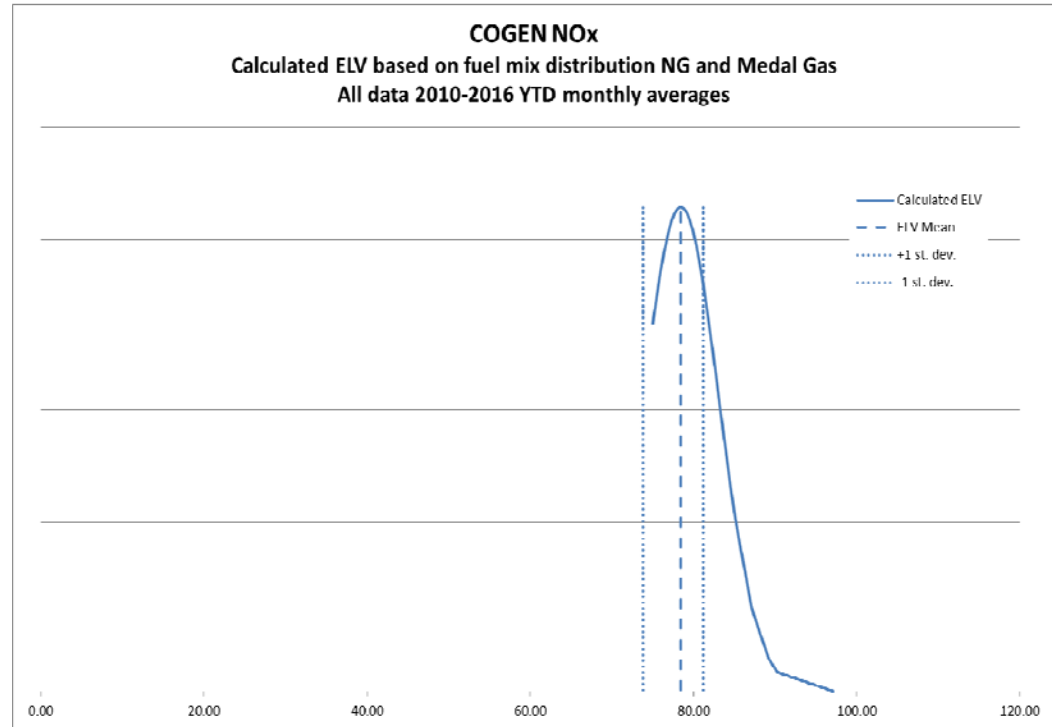


Figure 2. Data distribution for calculated NO<sub>x</sub> ELV for 2010-2016

Table 2 Data distribution for calculated NO<sub>x</sub> for 2010-2016

	2010	2011	2012	2013	2014	2015	2010-2015	Mean of median values for years 2010 - 2015
<b>Median</b>	78	76	77	76	77	76	78	77

The ELV set is 77mg/Nm<sup>3</sup>

The period 2010-2015 is considered representative as the mixture of MEDAL gas and natural gas has been used throughout this period.

The median value is considered representative of normal operation, as the data set produces a distribution with a small standard deviation.

We have compared the proposed ELV with the actual emissions measured during the period 2010-2015 and as the operator's ability to comply was found to be high, the ELV is considered appropriate.

The existing permit has ELVs set for NO<sub>x</sub>, CO and SO<sub>2</sub>. Where these limits are stricter than the requirements of IED they have been retained to ensure no deterioration.

	It is recognised that setting a fixed ELV on the basis of representative fuel fired may provide additional emissions headroom at times. In order to prevent deterioration in environmental performance (no backsliding), we have included an annual mass emission limit for NO <sub>x</sub> of 700 tonnes, in table S4.3. The limit has been calculated using typical fuel calorific value and flow rate during normal operation value in accordance with the calculation for gas turbines set out in the Joint Environmental Programme protocol.				
<b>A29 LCP 144 (Cogen GTG and HRSG)<sup>1</sup></b>  Auxiliary firing only	NO <sub>x</sub>	No limit set	Part 1 (6) Note 4  Part 3 (1)	100 mg/m <sup>3</sup> Calendar monthly mean of validated hourly averages.	CEMS installed and operational for all parameters including oxygen.
				110 mg/m <sup>3</sup> Daily mean of validated hourly averages	
				200 mg/m <sup>3</sup> 95% of validated hourly averages within a calendar year	
	SO <sub>2</sub>	No limits set	Part V  Part 3 (3)	35 mg/m <sup>3</sup> Calendar monthly mean of validated hourly averages.	
				38.5 mg/m <sup>3</sup> Daily mean of validated hourly averages	
				70 mg/m <sup>3</sup> 95% of validated hourly averages within a calendar year	
	CO	No limits set	Part 1 (6)  Part 3 (1)	100 mg/m <sup>3</sup> Calendar monthly mean of validated hourly averages.	
				110 mg/m <sup>3</sup> Daily mean of validated hourly averages	
				200 mg/m <sup>3</sup> 95% of validated hourly averages within a calendar year	
	<p>In addition to normal operation, LCP 144 (Cogen GTG/HRSG) may also operate in auxiliary mode (also known as Cold Air Firing) where the boiler is run without the Gas Turbine (GT). This mode of operation is required to maintain steam supply across the site when the GT is unavailable, to avoid shutting refinery units down.</p> <p>The boiler operates on gaseous fuels and this is currently restricted to natural gas only. Emission Limit Values have been set in accordance with the IED Annex V Part 1 paragraphs (3),(6) &amp; (8) applicable to boilers. Operation in this mode is subject to there being a credible plan to recover the operation of the gas turbine to minimise this operation. Should the operator wish to fire other gaseous fuels in this mode, this will need to be agreed with us prior to operation and appropriate ELVs set. Notes 13 and 14 below have been added to Table S4.1a to reflect this:</p> <p>Note 13 These Emission Limit Values apply only when the HRSG is operating in auxiliary mode (also known as Cold Air Firing) under emergency conditions where there is a credible plan to recover the operation of the Gas Turbine.</p> <p>Note 14 The use of other gaseous fuels and associated ELVs shall be agreed in writing with the Environment Agency.</p>				

<sup>1</sup> Operator's identifier.

### Monitoring & standards

Standards for assessment of the monitoring location and for measurement of oxygen have been added to the permit template for clarity.

### Additional IED requirements not specific to Chapter III

1. Improvement Condition IC 38 has been included which requires the operator to carry out a review of soot blowing activities on SP4 to include:
  - an assessment of the conditions under which soot blowing is required
  - the frequency and duration of soot blowing events
  - a methodology for estimating the mass emissions of dust during soot blowing
  - a review of the current dust analyser and proposals for implementing improvements

Soot blowing is a significant source of dust emissions. The purpose of this improvement condition is to investigate the conditions that generate soot, so that instances of soot blowing can be minimised and to examine the process of soot blowing to determine if it can be optimised to reduce dust emissions.

2. Condition 3.1.6 relating to protection of soil, groundwater and groundwater monitoring, was already present in the Cogen Plant permit JP3631KW and has been included in the variation in compliance with IED requirements.

### Reporting

Tables S5.3 and S5.4 have been updated to include the reporting requirements and associated reporting forms to meet the requirements of the IED chapter III.

### Operator Performance Risk Assessment (OPRA)

The OPRA spreadsheet has been reviewed to include the Cogen Plant activities and emissions. The amended spreadsheet will form the basis of future subsistence charges. The overall score has been amended from 576 to 617. Following the issue of the consolidated permit, subsistence charges under permit JP3631KW shall no longer be collected as this permit is fully superseded.



## Regulatory Position Statement RPS/BR6996IC/16/02/2017

### Industrial Emissions Directive, Chapter III non-compliance

**The Environment Agency agrees not to enforce the Industrial Emissions Directive (IED) Chapter III emission limit values (ELVs) specified below, in relation to the permit specified below, provided the operator responsible for the permit complies**

#### Background

In order to implement IED Chapter III, which relates to large combustion plants (LCPs), we have reviewed permits with LCPs and varied the permit to include Chapter III compliant conditions and emission limit values (ELVs) where appropriate. Operators have informed us of their intended compliance route via their response to a Regulation 60 Notice for Information. It is apparent from the responses to these Notices that not all sites are able to immediately comply with the full requirements. As the Competent Authority we are required to issue Chapter III compliant permits and there is no provision to derogate from these conditions. However, in particular circumstances we can apply regulatory discretion, when enforcing these conditions to allow the operator reasonable opportunity to comply. We record such decisions in a regulatory position statement.

#### Environment Agency regulatory position statement

The Environment Agency agrees not to take enforcement action in relation to the permit conditions specified below, provided the operator complies with the requirements specified in each case.

Any enforcement action taken by the Environment Agency will be in accordance with its Enforcement and Sanctions Guidance which can be found at:  
<https://www.gov.uk/government/publications/environment-agency-enforcement-and-sanctions-statement>

#### Activities covered by this Regulatory Position Statement

Operator and location: Esso Petroleum Company Limited, Fawley Refinery

Permit Variation number: EPR/BR6996IC/V005

#### Relevant provisions of the industrial emissions directive:

- Chapter III: Article 30(2)
- Annex V, Part 1, paragraph 5 - NO<sub>x</sub> ELV (90 mg/Nm<sup>3</sup>) for gas turbines using light and middle distillates as liquid fuels
- Annex V, Part 1, paragraph 6 - NO<sub>x</sub> ELV (120 mg/Nm<sup>3</sup>) for gas turbines (including CCGT) using other gas as fuel.

**Relevant Permit conditions:**

Condition 3.1.2 and Table S4.1a; Point source emissions to air from LCP No. 146 (emission point A16), ELVs for NO<sub>x</sub> from Gas Turbine and Heat Recovery Steam Generation plant fired on:

refinery fuel gas only: calendar monthly mean ELV of 120 mg/m<sup>3</sup>, and corresponding daily and hourly ELVs.

a mixture of liquid fuel and refinery fuel gas: calendar monthly mean ELV of 90 mg/m<sup>3</sup>, and corresponding daily and hourly ELVs.

**Background to RPS:**

Emissions of NO<sub>x</sub> from this LCP do not currently comply with the above ELVs. The unit is fed from, and is one of the main steam suppliers to, the catalytic cracker. A project is scheduled for completion in October 2018 to install steam injection for NO<sub>x</sub> control (Unit 3 NO<sub>x</sub> Reduction Project). The scheduling of this work is timed to minimise the impact of this unit being offline. The Compliance Assessment Plan for 2017-18 will include compliance activities to check and review project progress and confirm precise timescales closer to project implementation.

**Requirements for the operator:**

1. The operator will install steam injection on LCP146, to control NO<sub>x</sub> emissions, before the end of October 2018, or as otherwise agreed with the Environment Agency under point 3 below.
2. The operator shall provide quarterly updates on the progress of the project until October 2018.
3. The operator shall inform the Environment Agency, as soon as practicable of any circumstances that could result in a delay to the October 2018 implementation timescale.
4. Within 3 months of installation of the steam injection, the operator shall confirm that the system is commissioned and that the relevant ELVs can now be met, so that the RPS is no longer required.