

## **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/UP3230LR  
The Operator is: Phillips 66 Limited  
The Installation is: Humber Refinery  
This Variation Notice number is: EPR/UP3230LR/V012

A Variation Notice EPR/UP3230LR/V012 has been issued to consolidate all previous variations to the conditions of permit EPE/UP3230LR.

#### **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 notice 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.

## **How this document is structured**

### Glossary

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

5.

## **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	“Industrial Emissions Directive” 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 EPR/UP3230LR/V012 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 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 30/10/2015.

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 on 16/11/2015. Suitable further information was provided by the Operator on 14/12/2015.

The Operator claimed that certain information was commercially confidential and should be withheld from the public register. We considered this request and determined that the information was not commercially confidential. Apart from the issues and information just described, we have not received any information in relation to the Regulation 60 Notice response that appears to be confidential in relation to any party.

### 3 The legal framework

The 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.

IED Article Reference	IED requirement	Permit condition
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 5
38	Monitoring of air emissions in accordance with Annex V Pt 3	3.3, 3.6
39	Application of compliance criteria to emission limit values in accordance with Annex V Part 4	Schedule 3, Table S3.1
40	Multi-fuel firing	Schedule 3, Table S3.1
41(a)	Determination of start-up and shut-down periods	2.3.2 Schedule 1, Table S1.2
Annex V Pt 1	Emission limit values for plant permitted before 7 <sup>th</sup> January 2013	Schedule 3, Table S3.1
Annex V Pt 1(6(1))	Definition of natural gas	Schedule 6, Interpretation
Annex V Pt 7	Refinery multi-fuel firing SO <sub>2</sub> average emission limit values	Schedule 3, Table S3.1

## 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.

<b>Conditions</b>	
2.3.2 and Table S1.2	Condition added relating to specification of start-up and shutdown periods for LCP as specified in table S1.2
3.6.1	Template condition added relating to monitoring requirements under IED for LCP.
3.6.2	Template condition added relating to action required in the event of CEMS monitoring results for > 10 days a year being invalid.
3.6.7	Template IED condition added relating to CEMS monitoring requirements for LCP.
Table S1.1	Amended to amended to reflect the current plant configuration.
Table S1.3	Amended to update completion dates for outstanding Improvement Conditions, and to show Improvement Conditions that have been completed.
Table S2.1	Updated to include maximum content of natural gas in gaseous fuel mixtures as a percentage of the total.
Table S3.1	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.</li> </ul>
Table S3.3a	Table renumbered to S3.3 following deletion of table S3.3b and amended to remove historic SO <sub>2</sub> limits.
Table S3.3b	NERP allocation table removed as historic NERP limits no longer apply.
Table S4.1, S4.3 and S4.4	Updated to include monitoring and reporting (including reporting forms) for LCP plant.
Schedule 6	Interpretations amended/added to incorporate terms relevant to 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 9 is changed to LCP 259;**
- **LCP 10 is changed to LCP 260;**
- **LCP 11 is changed to LCP 261**
- **LCP 12 is changed to LCP 262**
- **And LCP 13 is changed to LCP 263.**

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>
LCP 125	2 x 51 1 x 25	Vent via a single windshield at emission point <b>A10.</b>	127	Capable of multi fuel firing on RFG and Natural Gas.
LCP 259	1 x 63 1 x 57 1 x 20 (1 x 9)	Vent via a single windshield at emission point <b>A1a.</b>	140	Capable of multi fuel firing on RFG and Natural Gas.
LCP 260	1 x 95 1 x 49 1 x 21	Vent via a single windshield at emission point <b>A5.</b>	165	Capable of multi fuel firing on RFG and Natural Gas.
LCP 261	1 x 50 1 x 33 1 x 24 (2 x 9)	Vent via a single windshield at emission point <b>A3.</b>	107	Capable of multi fuel firing on RFG and Natural Gas.
LCP 262	1 x 30 1 x 20 1 x 15	Vent via a single windshield at emission point <b>A6a</b>	65	Capable of multi fuel firing on RFG and Natural Gas.
LCP 263	2 x 38	Vent via a single windshield at emission point <b>A19.</b>	76	Capable of multi fuel firing on RFG and Natural Gas.

### Fuel Options

Gaseous fuels include natural gas, refinery fuel gas (RFG).

### 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 2.3.2, 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:

- 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 1000 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.

Phillips 66 Limited isolated gas turbines GTA 13, GTA 14 and supplementary firing bringing the capacity of the Combined Heat and Power unit to 42 MWth

(release point A14) and is no longer classified as an LCP therefore Table S1.1 has been amended to reflect the current plant configuration. Permit requirements in respect of Chapter III/Annex V are no longer applicable for this unit.

Emission Point	Parameter	Existing ELV	IED Annex V relevant section	New ELV and reference period	Monitoring
A1a	NOx	No limit set, releases controlled under the NERP	Part 1 (4) Note 1 and Part 1 (6) Note 4	300 mg/m <sup>3</sup> - daily mean of validated hourly average	CEMS
				330 mg/m <sup>3</sup> - daily mean of validated hourly average	
				600 mg/m <sup>3</sup> - 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	5 mg/m <sup>3</sup> - daily mean of validated hourly average	
				5.5 mg/m <sup>3</sup> - daily mean of validated hourly average	
				10 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	SO <sub>2</sub>	No limit set, releases controlled under the NERP and by a permit restriction of the sulphur content of RFG	Part 7	1000 mg/m <sup>3</sup> - calendar monthly mean	
				1000 mg/m <sup>3</sup> - daily mean of validated hourly average	
				1000 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	CO	No limit set.	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	No limit set.	
A3	NOx	No limit set, releases controlled under the NERP	Part 1 (6) Note 4	300 mg/m <sup>3</sup> - daily mean of validated hourly average	CEMS
				330 mg/m <sup>3</sup> - daily mean of validated hourly average	

				600 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	Dust	No limit set, releases controlled under the NERP	Part 1 (8)	5 mg/m <sup>3</sup> - daily mean of validated hourly average 5.5 mg/m <sup>3</sup> - daily mean of validated hourly average 10 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	SO <sub>2</sub>	No limit set, releases controlled under the NERP and by a permit restriction of the sulphur content of RFG	Part 7	1000 mg/m <sup>3</sup> - calendar monthly mean 1000 mg/m <sup>3</sup> - daily mean of validated hourly average 1000 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	CO	No limit set.	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	No limit set.	
A5	NOx	No limit set, releases controlled under the NERP	Part 1 (4) Note 1 and Part 1 (6) Note 4	300 mg/m <sup>3</sup> - daily mean of validated hourly average 330 mg/m <sup>3</sup> - daily mean of validated hourly average 600 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	CEMS
	Dust	No limit set, releases controlled under the NERP	Part 1 (7) Note 1 and Part 8	5 mg/m <sup>3</sup> - daily mean of validated hourly average 5.5 mg/m <sup>3</sup> - daily mean of validated hourly average 10 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	SO <sub>2</sub>	No limit set, releases controlled	Part 7	1000 mg/m <sup>3</sup> - calendar monthly mean 1000 mg/m <sup>3</sup> - daily mean of validated hourly	

		under the NERP and by a permit restriction of the sulphur content of RFG		average 1000 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	CO	No limit set.	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	No limit set.	
A6a	NOx	No limit set, releases controlled under the NERP	Part 1 (4) Note 1 and Part 1 (6) Note 4	300 mg/m <sup>3</sup>	Periodic – at least every 6 months
	Dust	No limit set, releases controlled under the NERP	Part 1 (7) Note 1 and Part 8	5 mg/m <sup>3</sup>	
	SO <sub>2</sub>	No limit set, releases controlled under the NERP and by a permit restriction of the sulphur content of RFG	Part 7	1000 mg/m <sup>3</sup>	
	CO	No limit set	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	-	
A10	NOx	300 mg/m <sup>3</sup>	Part 1 (4)	200 mg/m <sup>3</sup> - daily mean	CEMS

		No limit set	Note 1 and Part 1 (6) Note 4  LCP commissioned after November 2002	of validated hourly average 220 mg/m <sup>3</sup> - daily mean of validated hourly average 400 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	Dust	5 mg/m <sup>3</sup>	Part 1 (7) Note 1 and Part 8	5 mg/m <sup>3</sup> - daily mean of validated hourly average	
		No limit set		5.5 mg/m <sup>3</sup> - daily mean of validated hourly average 10 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	SO <sub>2</sub>	35 mg/m <sup>3</sup>	Part 7 LCP commissioned after November 2002	35 mg/m <sup>3</sup> - Calendar monthly mean.	
		No limit set		600 mg/m <sup>3</sup> - Daily mean of validated hourly average	
				600 mg/m <sup>3</sup> - 95% of validated hourly averages within a calendar year	
	CO	No limit set	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	No limit set.	
A19	NOx	No limit set, releases controlled under the NERP	Part 1 (4) Note 1 and Part 1 (6) Note 4	300 mg/m <sup>3</sup>	Periodic – at least every 6 months
	Dust	No limit set, releases controlled under the NERP	Part 1 (7) Note 1 and Part 8	5 mg/m <sup>3</sup>	
	SO <sub>2</sub>	No limit set, releases controlled under the NERP and	Part 7	1000 mg/m <sup>3</sup>	

		by a permit restriction of the sulphur content of RFG			
	CO	No limit set	Part 1 (6) Limit only applies when 100% natural gas firing.  Part 3 (1) and 3 (8)	No limit set.	

Monitoring & standards

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

Continuous Emissions Monitoring (CEMs)

In their response to the Regulation 60 Notice Phillips 66 Limited are unable to immediately comply with the full requirements for CEMs. To this effect we have agreed a timescale allowing Phillips 66 Limited time to comply.

Reporting

Tables S4.3 and S4.4 have been updated to include the reporting requirements and associated reporting forms to meet the requirements of the IED chapter III.