

BAT guidance for >50 MW_{th} gas and liquid fuel combustion plant exporting electricity under commercial arrangements for <1500 hrs per annum

Introduction

This document sets out guidance on Best Available Techniques (BAT) for use in the regulation of >50 MW_{th} gas and liquid fuel combustion plant (Industrial Emissions Directive (IED) Chapter III plant), which export electricity under commercial arrangements for <1500 hours per annum. 1500 annum will be assessed in accordance with the Limited hours derogation Guidance¹. This includes plant operating in the fast reserve, short term operating reserve (STOR) and peaking markets, and some with Capacity Market agreements. Medium Combustion Plants (MCPs; <50 MW_{th}) including those at Part A(1) installations (as defined in the Environmental Permitting Regulations (EPR, 2017/18)), have separate requirements.

The guidance is intended to be read alongside the DECC report 'Developing Best Available Techniques for combustion plants operating in the balancing market' (Amec Foster Wheeler, 2016)². It does not apply to plant used solely for Black Start or site emergency generation. Coal-fired balancing plant is also not covered, as BAT has already been defined.

This guidance has been developed by the UK regulators of large combustion plant. It will be reviewed to ensure consistency with the revised Large Combustion Plant Best Available Techniques Reference Document (LCP BREF), revised National Emission Ceilings Directive (NECD) and the approach taken by Defra in implementing the MCP Directive (MCPD) and applying additional regulation to <50 MW_{th} generators.

Given the shortfall in supporting evidence for the guidance, it is proposed that EPR permits will include annual reporting requirements to enable the suitability of the guidance to be assessed and developed.

Large combustion plants operating greater than 1500hours per annum are required to meet IED Chapter III limits and any BAT derived ELVs. New plant will also be required to meet Article 14 of the Energy Efficiency Directive.

Background

Recent changes in the electricity supply market have increased the requirement for combustion plant to operate at short notice and for short periods of time. Operating plant in this manner means that they must be able to synchronise with the grid very quickly and this is only feasible for certain types of plant or modes of operation. Such operation is generally most attractive to older plant moving towards end-of-life operation as well as newer, purpose-built plant. In the case of older plant, this may mean operating without the steam cycle, with an associated reduction in overall energy efficiency.

DECC (now BEIS) commissioned a study to examine whether there are additional Best Available Technique (BAT) considerations which should be applied when permitting such plant under EPR. Normally, permit conditions and emission limit values (ELVs) will not be applied that are more stringent than those set out in the LCP BREF or those in the IED. However, where stricter conditions are required to protect environmental quality standards, these will be applied, as required under Article 18 of the IED.

The DECC report focuses on the key environmental outcomes of emissions of oxides of nitrogen (NO_x) and energy efficiency for plant firing natural gas or liquid fuel. It also identifies significant evidence gaps, although certain broad conclusions can be made:

- i) There are different conclusions for new and existing combustion plants and certain types of plant are more suited to a low-hour, rapid-response mode of operation.

- ii) There are plant suited for <500 hrs/yr, 500-1500 hrs/yr and >1500 hrs/yr operation.
- iii) There is also only a sub-set of plant capable of very rapid response to grid demands.

A key requirement of EPR is that Air Quality Standards (AQS) must not be breached by permitted plant, reflecting Article 18 of the IED. Emissions from some rapid start combustion plants (especially diesel engines) can be high and dispersion modelling will be required to show NO_x impacts on AQS. Reductions in NO_x emissions will need to be balanced with the effect on plant efficiency. These considerations may require both annual caps on total hours of generation and on maximum continuous periods of operation.

- iv) Options for retrofitting abatement in this market are limited.
- v) Article 11 of the IED sets out a number of basic obligations on the operator and these are further explained in Section 4.4 of EPR Part A Guidance from Defra and the devolved administrations. These obligations include:
 - all the appropriate preventive measures are taken against pollution,
 - BAT are applied,
 - no significant pollution is caused, and
 - energy is used efficiently.

In addition, and in the case of any installation generating electricity by combustion of fossil fuels, the Part A Guidance requires the Regulator to set permit conditions which ensure that:

- the [thermal] efficiency of electricity generation at the permitted installation is maximised, and
- other relevant basic energy efficiency measures are applied.

The report demonstrates that some combustion plant operating in rapid start and short term modes may not necessarily be delivering these obligations and therefore specific controls for such operation are necessary.

- vi) Chapter III of the IED sets specific conditions for plant operating >1500, <1500 and <500 hrs/yr. Plant operating for >1500 hrs/yr are subject to ELVs, which are minimum standards (i.e. BAT may be tighter). <1500 hrs/yr plant may apply for a derogation for higher ELVs and <500 hrs/yr plant are not subject to ELVs. The latter is recognition of the practicalities of regulating such plant and the inherent lower environmental risk.

BAT requirements

Applies to: IED Chapter III (>50 MW_{th}) gas and liquid-fired thermal combustion plant exporting electricity under commercial arrangements for <1500 hrs per annum.

The minimum BAT standards are set out in Tables 1 and 2 below. Site-specific considerations may require additional measures, but in cases where no significant air quality impacts can be demonstrated, the hourly limits may be relaxed. The points following Table 2 should also be considered.

Table 1. Plant operational constraints

Performance			Constraints	
Category	NO _x emissions compared to 500 mg/Nm ³ (dry, 15% O ₂) threshold	Nameplate efficiency compared to threshold value in Table 2	ELV	Maximum period of commercial generation per annum (hours)
A	Below	Above	IED/LCP BREF limits for 500-1500 plant	1500
B	Below	Above	None	500
C	Below	Below	None	100-500 ¹
D ²	Above	Any	None	100 ³

¹ 500 hrs/yr maximum at threshold efficiency reduced pro rata by 50 hrs/yr per 1% below that figure.

² May move to Category C if the operator can demonstrate no significant impact on air quality.

³ Site-specific limits on the maximum period of **continuous** generation may also apply.

Table 2. Plant efficiency

Plant technology & fuel	Efficiency threshold (%)	
	Existing plant ¹	New plant ¹
Engine & liquid fuel	34.5	37.4
Engine & gas fuel	31.5	35.6
OCGT & liquid fuel	25.7	29.7
OCGT & gas fuel	29.7	35.1

¹ Existing plant is that with a permit application pre-dating the formal issue date of this guidance. New plant is plant other than existing plant. Efficiency is based on nameplate values, in line with the revised LCP BREF. low is <90% of the BREF value, med is 90% - with 1% point of the BREF value and high is > 1% point below BREF value except for new plant which is the BREF value.

Other points:

- Restrictions on periods of generation apply at plant level (as defined in the IED).
- As an alternative to emissions testing, reference emission factors for a technology and fuel combination may be provided as evidence of the NO_x emission concentration.
- As an alternative to nameplate efficiency, evidence may be provided from measurements obtained during commissioning, testing or generation. In the latter case, adjustments will be needed to account for the difference between generation and reference conditions.

References

¹ <http://www.energy-uk.org.uk/publication.html?task=file.download&id=5646>

²Amec Foster Wheeler (June 2016). *Developing Best Available Techniques for combustion plant operating in the balancing market - Final report*. Reference number 37641C001Ri4.