

UK REGULATORS' LARGE COMBUSTION PLANT BEST AVAILABLE TECHNIQUES
INTERPRETATION DOCUMENT

Introduction

This document sets out the UK Regulators' interpretation of the main issues raised in the Large Combustion Plant BAT Reference Document (LCP BRef) Conclusions that were published in the Official Journal on 17th Aug 2017. It is intended to inform the BATc review process that will implement the BRef. This address significant general issues and issues specific to the electricity supply sector. This is not the definitive interpretation for all aspects of the LCP BRef, and will be updated with these aspects through further revisions. These aspects include co-incineration, chemicals, iron and steel, integrated gasification combined cycle and other issues which may arise during the permit reviews.

Summary

The UK Regulators: The Environment Agency (EA), Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA) have, in consultation with industry, identified the high priority issues raised within the BRef conclusions and set our interpretation of them: These issues are:

1. Approach to BRef Ranges
2. Confidence Intervals
3. Averaging periods (BRef and IED Annex V)
4. Indicative BAT
5. Effective dry low NO_x (DLN) level
6. High Efficiency Combined Cycle Gas Turbines (CCGT)
7. Pre 2003 Gas turbines
8. Selective Non Catalytic Reduction (SNCR) for coal/biomass <1500hpa
9. Selective Catalytic Reduction(SCR) for coal/biomass
10. Monitoring requirements
 - a. Mercury
 - b. HCl and HF
11. BAT for Flue Gas Desulphurisation Waste Water Treatment discharges
12. Associated emission levels(AELs) and Associated environmental performance levels
13. Associated emission levels(AELs) for emergency plant

1. Approach to BRef Ranges

The BAT conclusions often express the BAT Associated Emission Levels (AELs) as a range. This means that an approach must be adopted within the UK when setting emission limit values (ELVs) in Environmental permits. Each technique, or combination of techniques, can result in different performance levels depending on how the process is designed, built, operated and maintained. However, if an operator of an installation can demonstrate that the process is BAT and the emissions are within the BAT-AEL range, an appropriate ELV will be set to reflect the emissions from the process. If footnotes are included in the BATc that give indications that a particular value in the range is achievable using a specified technique, this should be read as an indication of the likely emissions achievable when using that technique, and does not mean necessarily that value should be included as an ELV in a permit, other ELVs may be appropriate on a site specific basis.

DEFRA/Welsh Government has issued Part A Guidance to the Environment Agency and Natural Resources Wales that instructs inspectors to take the top of the range as the permitting value, unless compliance with an Air Quality standard requires a lower value. If

a permit already contains and ELV tighter than the BRef range, this will remain in place (“no backsliding”). Should an operator make an application for an ELV tighter than the top of the BRef range, then this will be included in the permit.

SEPA policy is to assess whether the operation is BAT, and, where the emissions are within the BAT-AEL range for that pollutant, to set the ELVs in the permit to reflect the achievable emissions. Where a process is determined to be BAT, but the emissions are outwith the BAT-AEL range, derogation should be considered (in accordance with SEPA’s procedure for BATc reviews and derogation assessment).

2. Confidence Intervals

Confidence Intervals are the recognised approach to dealing with the uncertainty associated with monitoring techniques. Usually an agreed level of uncertainty is subtracted from measured data for the purpose of reporting against emission limit values and verifying whether compliance has been achieved. Confidence intervals are recognised and described in the revised final draft Joint Research Council Reference Report on Monitoring of emissions to air and water (ROM), although there is no specific guidance on whether they should be applied to BRef BAT-AELs. In addition, Annex V to the Industrial Emission Directive (IED) sets ELVs for sulphur dioxide, oxides of nitrogen and dust from large combustion plants and sets out the confidence intervals that should be subtracted from the measured values when reported against the ELVs.

The BAT-AELs in the LCP BAT conclusions were derived from “as measured” data i.e. the confidence interval was not subtracted so we must determine how to apply the BAT-AELs as ELVs in installation permits and how to require the operator to report against them. The BRef is silent on this.

The key issue is that, should monitoring data indicate that an ELV has been exceeded, no enforcement action can be taken unless there is legal certainty of the breach.

We have therefore concluded that Confidence Intervals will be taken into account when reporting against ELVs set to implement the BAT conclusions. For SO₂, NO_x and dust, these will be the confidence interval values set out in Annex V.

- a) CEMS. The confidence intervals set out in Annex V of the IED will be subtracted from data reported from CEMS for CO, SO₂, NO_x, and dust. For other species (eg HCl) the values set out in Annex VI will be used. Where the IED does not specify a confidence interval we will use agreed values.
- b) Confidence intervals will be applied to annual averages as it has been demonstrated that systematic and calibration uncertainties are of a similar order to those for short term averages.
- c) Periodic monitoring. The as measured data will be reported and the confidence interval used by the Regulator to assess compliance with the ELV.

3. Averaging Periods

The BRef sets out AELs based on daily averages and as an annual mean of hourly averages (the latter only for combustion plant operating >1500hpa). The IED however, sets ELVs as hourly (95%ile over a year), daily and monthly averages.

The IED ELVs must still be met but, on the whole, the BRef AELs are tighter. Therefore where both the BRef and the IED require an ELV over the same averaging period (e.g. daily), only the tighter value will be set in the permit.

Article 15(3) of the IED requires that emission limit values be set to ensure compliance with the BAT conclusions, it goes on to say that different averaging periods may be applied as long as they ensure compliance with the BAT conclusions. Should such an approach be adopted, then the Regulator must assess the results of the emission monitoring at least annually to ensure that the BAT conclusion is met.

Article 15(3)b allows the use of alternative averaging periods to those specified in the BRef conclusions and the BRef includes an example of how a monthly average could be set as a surrogate for the annual average of hourly values. A study was carried out by the Joint Environmental Programme (JEP) on CCGTs which concluded that a monthly average of 110% of the annual value would ensure compliance. We have considered this but do not support the findings on the grounds that:

- a. The study was based on the average ratio between annual and monthly compliance over a number of CCGTs, some of which would not have been in compliance
- b. The Regulator would be tasked with an annual assessment of ensuring compliance and any non-compliance would then be deemed to be retrospective. Any compliance methodology should be transparent.

We therefore conclude that compliance with the annual average should be demonstrated through setting an ELV as the average of the hourly values over the year

4. Indicative AELs

The BRef includes a number of AELs which are described as “indicative”.

- a) Emission levels that are indicative of BAT should be met as a principle but there is no requirement to use Art15(4) to derogate from an indicative AEL. Instead an appropriate BAT justification would be required for deviation from the AEL. CO AELs. The BRef sets indicative AELs for CO throughout for plant operating >1500hours. No CO AEL is specified for plant operating <1500hours pa. It is therefore necessary to define how indicative AELs will be met. In the case of CO we have concluded:

Recognising the inter-relationship between CO and NO_x emissions in some combustion systems, deviation from CO indicative emission levels may be accepted where an appropriate BAT assessment shows that the CO indicative emission level cannot be achieved when meeting a mandatory NO_x BAT AEL. It is also recognised that some older plant were not specifically designed to meet the current CO AELs. Such deviation from the CO indicative emission level will require a BAT justification which will be assessed by the regulator. Any IED Chapter III requirements for CO will still apply.

- b) AELs for plant <500hpa

The BRef conclusions state throughout that the AELs are indicative for plant which operate <500hpa. As with any indicative AEL, a justification must be made should a plant wish to exceed value.

5. Effective Dry Low NO_x operation

The AELs set for gas turbine operation are set from the point at which the dry low NO_x system (DLN) becomes effective. Chapter III of the IED however, requires compliance

with the Annex V ELVs from 70% load. The UK has also applied a daily ELV from the end of start-up (MSUL) (and start of shut down-MSDL). In order to avoid having 3 sets of ELVs we have decided to apply the BRef AELs from a site specific effective DLN load value and continue to apply the daily value from MSUL/SD. Should an operator of a GT request a DLN value >70% then this will be addressed on a site-specific basis to ensure that the IED ELV is still met.

6. Highly Energy-Efficient CCGTs

We have recently been in discussion with operators who are considering the installation of new highly energy-efficient CCGTs. These are intended to achieve efficiencies of greater than the top of the range set out in the BRef conclusions (i.e. 60.5%). This efficiency increase is achieved through higher temperatures within the turbine, resulting in a potential for higher NO_x emissions. The guarantees being given by the manufacturers are sometimes higher than the BAT-AEL range for NO_x in the BATc. High energy efficiency is highly desirable from an environmental perspective, due to lower CO₂ emissions per KWh generated. As the energy efficiency is higher than the BRef range, we are considering whether these units are beyond the scope of the BRef. They were not considered during the development of the BAT conclusions as there was insufficient data.

We have therefore agreed with operators that a generic methodology to support this view should be made including the following:

- A description of the technology and why NO_x emission concentrations are higher.
- Impact on g/MWh of CO₂ and NO_x – as far as can be quantified from the data available
- Consideration of the benefits of higher efficiency (CO₂, resource use) relative to change in NO_x
- Consideration of costs, benefits and dis-benefits (ammonia slip, energy penalty) of SCR
- consideration of implications for National Emissions Ceiling Directive.

The purpose of the generic methodology is to ascertain whether the overarching environmental assessment and benefits of highly energy efficient CCGTs would be compromised as a result of the literal application of the BAT-AELs as they are set out in the BRef.

If we are content with the assessment we would establish a principle of the units being beyond the scope of the BRef and then undertake site specific assessments during any permit application determinations. Alternatively, the generic methodology can be considered as part of any site specific derogation if Article 15(4) remains the appropriate route.

7. Pre 2003 Gas Turbines

Table 24 of the BRef Conclusions includes the following:

Table 24 - BAT-associated emission levels (BAT-AELs) for NO_x emissions to air from the combustion of natural gas in gas turbines

Type of combustion plant	Combustion plant total rated thermal input(MWth)	BAT-AELs (mg/Nm ³)(¹)(²)	
		Yearly average(³)(⁴)	Daily average or average over the sampling period

Gas turbine put into operation no later than November 2003, or existing gas turbine for emergency use and operated <500h/yr	≥50	No BAT-AEL	60-140 ⁽¹²⁾ ⁽¹³⁾
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Footnote 13 states that these levels are indicative.

The wording as written appears to indicate that this applies to any gas turbine put into operation before 27 November 2003. This would be inconsistent with the rest of table 24 that includes mandatory AELs for existing plant. We have taken the view that the intention of this wording was to distinguish between all pre 2003 gas turbines that operate for <500hpa, and post 2003 emergency gas turbines that operate <500hpa. Therefore existing plant that operate >500hpa will be subject to the AELs.

8. Selective Non Catalytic Reduction on coal and Biomass Plant.

BAT 20 states that the applicability of SNCR to coal and biomass boilers may be limited in the case of boilers operating <1500hpa and with highly variable loads.

An operator would need to provide justification regarding the operating hours and the variability of the load. This may need to be in conjunction with request for any Article 15(4) derogation should not installing SNCR affects the plant's ability to meet emission limit values that do not exceed the BAT-AEL.

Where secondary abatement is already installed, the concept of no backsliding would apply.

9. Selective Catalytic Reduction on coal and biomass plants

BAT 20 makes a similar statement regarding SCR on certain coal and biomass boilers including retrofitting combustion plants >300MWth operated between 500 and 1500hpa.

Our approach here is the same-as paragraph 8.

10. Monitoring Requirements

- a) Mercury. BAT 4 states that monitoring Hg emissions to air from combustion plant using solid fuels >300MWth should be continuous, but footnote 13 to the table states:

If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of fuel...may have an impact on the emissions, but in any case at least once every six months.

We have agreed the following approach. "Sufficiently stable" emission levels will be demonstrated through quarterly reporting of monthly Hg fuel content. This will be carried out in advance of the implementation of the emission monitoring requirements and utilise accepted retention factors along with a calculated demonstration that BRef BAT conclusions are being met for each category of plant. Once this demonstration has been made, the following will be required:

- i) <500hpa plant
Our approach for plant operating <500 hours per year is that plant should not be run for monitoring purposes alone, either measurement or calibration. We will

require estimation techniques, either site-specific or generic factors based on fuel content.

- ii) >500hpa
Periodic monitoring will be used.
- b) HCl and HF. BAT 4 stipulates that HCl and HF monitoring should be carried out every 3 months unless

If the emission levels are proven to be sufficiently stable, periodic measurements may be carried out each time that a change of fuel...may have an impact on the emissions, but in any case at least once a year.

We have agreed the following approach. "Sufficiently stable" emissions will be demonstrated through quarterly reporting of monthly Cl and F fuel content. This will be carried out in advance of the implementation of the emission monitoring requirements and utilise accepted retention factors along with a calculated demonstration that BRef BAT conclusions are being met for each category of plant. . Once this demonstration has been made, the following will be required:

- i) <500hpa plant
Our approach for plant operating <500 hours per year is that plant should not be run for monitoring purposes alone, either measurement or calibration. We will require estimation techniques, either site-specific or generic factors based on fuel content.
- ii) >500hpa
Annual Periodic monitoring will be used, noting that the AEL applied will correspond to >1500hpa or <1500hpa operation.

11. BAT for Flue Gas Desulphurisation Waste Water Treatment

a. Limestone/Gypsum

Limestone-gypsum FGD WWTP should be monitored for BAT-AEL compliance at an appropriate WWTP discharge point either within the installation, or at the installation boundary or final mixed discharge location. The exact location should be justified on a site-specific basis, taking into account current performance compared to the BAT-AELs There should be no backsliding from current ELVs without appropriate justification.

Where monitoring for BAT-AEL compliance purposes takes place upstream of the final discharge point the monitoring value corresponding to BAT-AEL compliance may differ from the numeric value in the BREF and will need to be set reflecting the specific installation arrangements. ELVs more stringent than those derived from the BAT-AELs may be required to ensure compliance with an environmental quality standard in the receiving water body or to ensure target potential/status for Water Framework Directive compliance.

Background concentration and intake loads should be considered if explicitly indicated in the BAT conclusions (i.e. TOC) or where the discharge returns the abstracted water to the same water body and the background concentration or intake load is significant in comparison to the effluent discharge. In these circumstances the BAT-AEL concentration should be regarded as relating to differential concentration.

b. Seawater FGD

BAT-AEL implementation for SWP FGD will be determined on a site-specific basis taking into account the principles set out above for limestone-gypsum FGD plant.

12. AEPLs and AEELs

The BRef includes BAT conclusions for associated environmental performance levels and associated energy efficiency levels (AEPLs and AEELs). In general, we have interpreted this to mean there is an clear expectation the AEPL/AEEL/AEL will be met. An appropriate BAT justification must be made for any deviation from the value.

13. Associated emission levels for <500hpa natural and liquid fuel fired GTs and engines

The General Considerations state

The BAT-AELs set out in these BAT conclusions may not apply to liquid-fuel-fired and gas-fired turbines and engines for emergency use operated less than 500 h/yr, when such emergency use is not compatible with meeting the BAT-AELs.

We have interpreted this to apply to a generator operated for the sole purpose of maintaining a power supply at a site during an on- site emergency and during a black start.

Where combustion plant are operating to support the Grid, indicative BAT applies. BAT will be determined in response to the Reg 61 notices. Reporting against BAT will be through the use of monitoring or emission factors, as appropriate, every 1500 operating hours.