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The 'Domestic Fuels' Initiative'

Paper 2

The European Environmental Bureau (EEB)

Introduction and summary

The Domestic Fuels Initiative (DFI) has been developed through a number of papers presented by the Czech Republic on behalf of several MSs and industry groups. The European Environmental Bureau (EEB) produced an initial paper in response to the Initiative, followed by a presentation at the Informal Intermediate Meeting in Seville in June 2014.

This second paper starts by summarising the EEB's case to date:

- That there is no case for additional BATaels for plants burning fuels with a S-content 1.5 – 3.0% (S-total, dry basis) and an ash content >/= 25% (dry basis), operating simultaneously.
- That plants burning fuels >3.0% S-content risk operating in breach of design limits, thereby breaching the legal requirements for BAT set out in IED Art 3.10(a)

It then builds on these earlier conclusions by using data posted on BATIS to show that all PC reference plants – above and below 3% fuel S-content – can meet the BATaels set out in D1 BAT Conclusion 21. Further, no case has been made to show that the one FBC reference plant with a fuel S-content >3.0% cannot also meet them.

Reference is then made to additional data presented by the DFI to show that the BATaels set out in D1 BAT Conclusion 21 are applicable to plants burning fuels with a S-content of up to 3.5%.

The DFI case addressed by the EEB to date

A key part of the DFI was the proposal that there should be separate BATaels for fuels that have a S-content 1.5 – 3.0% (S-total, dry basis) and an ash content >/= 25% (dry basis), operating simultaneously. The EEB tabulated the relevant data for all TWG survey reference plants burning fuels that exceeded one or both of those criteria:

Table 1

Plant	S-content wt-% (dry)	Ash-content wt-% (raw)	Combustion technology	Total rated thermal input
170	3.22	18.83	PC	908

167	none	26.97	PC	796
127-1	1.5	6.2	PC	2,100
127-2	1.5	6.2	PC	2,100
133	1.77	8.37	PC	1,256
* 23 *	2.86	37 (dry = 25)	PC	890
117-1	3.2	6.6	PC	2,465
117-2	3.2	6.6	PC	2,465
183	3.97	38.61	FBC	164
18-1	0.72	29.6	FBC	115
18-2	0.72	29.6	FBC	127

This data shows that within the DFI proposed S/ash range, the reference plant with the most demanding fuel is plant 23, an existing plant under IED with yearly average SOx emissions of ~110 mg/Nm^3.

Reference to Table 2 shows that plant 23 is well within the SOx BATaels set out D1 BAT conclusion 21 for the combustion of coal and lignite with a S-content <3.0%:

Table 2

Combustion plant rated thermal input (MW_{th})	BATael (mg/Nm^3)				Monitoring frequency
	New plants (yearly average)	Existing plants (yearly average)	New plants (daily average)	Existing plants (daily average)	
50 – 100	150 – 200	150 – 400	ND	ND	Continuous measurement[2]
100 – 300	80 – 150	**80 – 200**			
>300 (pulverised combustion)	10-75	**10 – 130**	25 – 110	25 – 220	
>300 (fluidised bed boilers)[1]	20 – 150	20 – 180	ND		

[1] The lower end of the range is achieved by high efficiency wet FGD system. The higher end can be achieved by boiler / in-bed sorbent injection.
[2] Only SO_2 is continuously measured. SOx is periodically measures (e.g. during calibration).

Given that this is the most demanding fuel burned by any reference plant <3.0% fuel S-content, there is no case for specifying any additional BATaels for plants burning fuels within the S/ash ranges specified in the DFI.

In support of its case for higher-S fuels, the DFI documents make several references to plants burning fuels with S-contents >3.0% risking operating in breach of FGD design limits e.g. –

> ..... *where sulphur S_t^d content reaching the 3% level introduces significant risk for keeping the emission limits in case of* ***any deviation of FGD from designed parameters.*** [emphasis added]

However, instead of supporting its case, this evidence undermines it in that IED Art 3.10(a) suggests that any plants operating in this way cannot be BAT:

> ***'best available techniques' means the most effective and advanced stage in the development of activities and their methods of operation*** *which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:*
>
> *(a)* ***'techniques' includes*** *both the technology used and* ***the way in which the installation is*** *designed, built, maintained,* ***operated*** *and decommissioned;* [emphasis added]

Design parameters denote the ranges within which plant will operate effectively. If plant operation is challenging these parameters, then by definition, it is sub-optimal and does not comply with the requirement to represent the most effective means of operation.

Therefore, to summarise EEB submissions to date:

- Plants with a fuel S-content of <3.0% are already covered by D1 BAT Conclusion 21.
- Plants with a fuel S-content >3.0% risk operating in breach of FGD design limits, in which case the burning of these fuels cannot be BAT

This paper now considers further the situation of plants with fuel S-content >/= 3.0%.

Plants with fuel S-content >/= 3.0%

Table 1 shows that there are 3 PC reference plants burning fuels with a S-content >/=3.0% i.e. 170 and 117-1 and -2. The following data has been drawn from BATIS:

Table 3

Plant	Size (MWth)	Total fuel S-content (% dry)	Fuel ash content (% raw)	Age	Operating hours (NOC)	SOx removal (%)	Yearly average SOx emissions (mg/Nm^3) including uncertainty
170	908	3.22	18.83	1991 no retrofits	7755	98.49	122.06
117-1	2655	97.2% lignite @ 3.2% S 2.8% waste @ 1.2% S Average S-content = 3.14%	97.2% lignite @ 6.6% ash 2.8% waste @ 14.8% ash Average ash-content = 6.83%	2001 no retrofits	8306	95.6	299.3
117-2	2465	97.2% lignite @ 3.2% S 2.8% waste	97.2% lignite @ 6.6% ash 2.8% waste	2001 no retrofits	7921	94.4	320

		a@1.2% S Average S-content = 3.14%	@ 14.8% ash Average ash-content = 6.83%				

This data shows that:

- Whilst the BATaels set out in D1 BAT conclusion 21 are stated as not including plants burning fuels with S-contents >3.0%, this is undermined by plant 170 which, with a fuel S-content of 3.22%, is able to comply with the BATael range for PC plants > 300 MWth
- Compared with plant 170, plants 117-1 and -2 are larger, burn fuels with lower S and ash contents, operate for more hours and are newer. However, they have significantly higher yearly average SOx emissions
- The higher SOx emissions are due to the significantly lower SOx removal efficiencies of plants 117-1 and -2
- Plants 117-1 and -2 are a decade newer than plant 170, so there is no reason why their FGD systems cannot achieve the same or better desulphurisation rates and therefore SOx emission than plant 170
- It is therefore clear that PC reference plants burning fuels with a S-content >/=3.0% can comply with the BATaels set out in D1 BAT conclusion 21. That BATael range should therefore be applicable to all PC plants >300 MWth, with fuel S-contents of at least up to 3.22%.

In addition to the above PC plants, Table 1 also identifies plant 183 as an FBC reference plant with a fuel S-content >3.0% – the only one. Again available data from BATIS is summarised below:

Table 4

Plant	Size MWth	Total fuel S-content (% dry)	Fuel ash content (% raw)	Age	Operating hours (NOC)	SOx removal (%)	Yearly average SOx emissions (mg/Nm^3) including uncertainty
183 (NV)	164.36	63.5% lignite @ 3.97% S 29.95% wood chips @ 0.01% S 0.57% HFO @ ? 5.43% straw @ 0.06% S 0.54% seeds @ 0.18% S	63.5% lignite @ 38.61% ash 29.95% wood chips @ 1.27% ash 0.57% HFO @ ? 5.43% straw @ 6.19% ash 0.54% seeds @ 13.96%	1961/1981 retrofitted with FBC 2006	2446	N/A	288.9

		Average S content = 2.55%	ash Average ash content = 25.45%				

This data shows that:

- As a reference plant, 183 is weakened by the fact that the questionnaire survey data was not validated. This is especially significant when the non-validated plant in question is the only one relevant to a particular category of BATael.
- The high S fuel (lignite) makes up just under 2/3 of the plant fuel diet. The SOx emission would have to be increased to consider this plant as a reference for the performance of FBC on higher S fuel
- Very importantly, no data is provided for SOx removal efficiency. Plant 183 is BFBC which according to D1 has a SOx removal potential 80-90%[1]. It is not known whether Plant 183 is operating on this range of removal efficiencies, but even if it is, there is potentially room for improvement on a scale that could halve reported SOX emissions
- This potential over-estimation of achievable SOx emissions by FBC is further enhanced by the fact that the BATIS data for Plant 183 represents operation at the lower end of mid-merit.
- It is therefore entirely possible that Plant 183 is operating within the 80-200 mg/Nm^3 D1 BATael for plants 100-300 MWth (see Table 2)

DFI additional data sets

The DFI's more recent submissions introduce selective data from non-reference plants. Two significantly but not wholly overlapping sets of such data are:

- An excel sheet of plant and fuel data for 56 plants, of which 33 are non-reference plants
- CZ Annex 5 which focuses on SOx removal efficiencies for 45 plants, 26 of which are non-reference plants

Table 5 presents data drawn from these two DFI data bases for plants burning fuel with a S-content above the 3.22 % level of the reference plants that have been shown to be able to meet the SOx BATaels set out in D1 Bat Conclusion 21. It must be emphasised that this data lacks the underlying additional data provided by the questionnaires of reference plants and is, as such, less robust.

Table 5

Plant	Fuel S content % total dry	Fuel ash content % dry	% SOx removal efficiency	
			Meeting IED Annex V, section 5	Not meeting IED Annex V, section 5

1 D1 LCP revised BREF, section 5.1.1.5.2

Maritsa East 1	5.4	35.84	Unit 1 (98.28%) Unit 2 (98.32)	
Maritsa East 1	5.02	34.62		Units 1,2,5,6 (95.55%) Units 7,8 (93.43%)
Maritsa East 1	4.5	32.18	N/A	
Brikel	4.66	29.09	98.00%	
Maritsa 3	4.25	24.28		95.88%
Opatovice	3.4	23.5	N/A	

Looking firstly at Opatovice, this has a fuel S content that is 5.6% larger than that of reference plant 170. If all other things were equal and this translated into a proportionate increase in SOx emissions, Opatovice could still comply with the SOx BATael presented in D1 BAT Conclusion 21. This conclusion is further strengthened by the fact that what limited data is available shows that things are unequal in a way that suggests that the difference between the emissions of Plant 170 and Opatovice is <5.6% – plant 170 has a much higher dry ash content i.e. 42.51% compared with 23.5% at Opatovice.

Taking these factors into account, it is reasonable to conclude that plants with a fuel S-content up to 3.5% are already covered by D1 BAT Conclusion 21.

It therefore appears that very few plants have any potential problem with the D1 SOx BATaels and that these are all non-reference plants with a fuel S-content above these levels.

Plants with fuel S-content >3.5%

Addressing these plants within the context of a Technical Working Group is unsatisfactory for 2 reasons:

- Being all non-reference plants, they lack the validation and supporting detail that is provided by a completed TWG questionnaire.
- The nature of the data provided by the DFI proscribes a debate in terms of desulphurisation rates, to the exclusion of achieved SOx emissions. It is a significant failing of the DFI that it has opted to proscribe the debate in this way.

However, it can be concluded that at these elevated fuel S-contents, plants are increasingly likely to be operating in breach of FGD design limits i.e. they cannot be BAT

Conclusion

This second paper has built upon work previously undertaken by the EEB in its initial paper on the Domestic Fuels Initiative and in its presentation at the Informal Intermediate Meeting in Seville in June 2014. In further developing its position, the EEB has drawn upon additional non-reference plant data provided in DFI documents, together with TWG reference plant data posted on BATIS.

The EEB's submissions have therefore concluded that:

- The BATaels set out in D1 BAT Conclusion 21 are applicable to plants burning fuels with a S-content of up to 3.5%
- That plants burning fuels with S-content above this level are particularly at risk of operating in breach of design limits, thereby breaching the legal requirements for BAT set out in IED Art 3.10(a)