Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010 (as amended)

Consultation on our decision document recording our decision-making process

The Permit Number is:	EPR/BR5213IG
The Variation Number is:	EPR/BR5213IG/V005
The Applicant / Operator is:	PPG Industries (UK) Limited
The Installation is located at:	Leigh Road, Hindley Green, Wigan, WN2 4XG
Consultation commences on:	24 August 2016
Consultation ends on:	22 September 2016

What this document is about

This variation Application (**EPR/BR5213IG/V005**) has been made to make changes to variation EPR/BR5213IG/V004, to include a Technical Derogation supporting a time limited delay in meeting the new Industrial Emissions Directive (IED) BAT Associated Emission Levels (BAT AEL's) for dust and hydrogen fluoride (HF).

Variation EPR/BR5213IG/V004 – Background to permit review

This Variation was issued 15 May 2015 following a review of conditions in the permit to deliver compliance with BAT conclusions.

Article 21(3) of the IED requires the Environment Agency to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication of updated decisions on BAT conclusions.

We reviewed the permit for this Installation by comparing the information received in response to a Regulation 60 notice, against the revised BAT Conclusions for the Glass industry sector published on 8 March 2012.

Article 15(4) of the IED enables a competent authority to allow derogations from BAT AEL's stated in BAT Conclusions under specific circumstances.

We rejected the derogation submitted with the Regulation 60 response on 24 February 2015 because:

- The Operator proposed changing to a boron free formulation to reduce releases and there was insufficient evidence that these primary abatement measures alone would achieve compliance with the BAT AEL's.
- The Operator rejected the option of installing wet scrubbers to reduce releases of dust because the cost benefit analysis (which did not follow the Green Book guidelines), showed that the environmental benefits were lower than the costs. Our analysis for dust (using the Green Book guidelines) demonstrated that the environmental benefits did exceed the costs. Since wet scrubbers will also remove HF, further benefits would be shown if HF was included in the assessment.

We issued the variation to deliver compliance with the BAT standards and the BAT AEL's by 8 March 2016, with an accompanying decision document explaining the reasoning for the consolidated variation notice that we issued.

Variation EPR/BR5213IG/V005 – Purpose of this Application (includes Technical Derogation)

This variation Application has been made to make changes to the variation issued, to include a Technical Derogation supporting a time limited delay in meeting the new IED BAT AEL's to allow for the emissions control technology to be installed on the furnaces during their respective scheduled furnace rebuilds.

- Time limited derogation from the BAT AEL's for dust and HF from melting furnace as set out in Table 22 of BAT conclusion 32 and table 25 of BAT conclusion 35 of document 2012/134/EU.
- The date for BAT AEL compliance was 8 March 2016. The derogation request relates to emissions from two furnaces. The derogation request for the first furnace (Furnace 501) is time limited until 1 January 2019. The derogation request for the second furnace (Furnace 502) is time limited until 1 January 2021.
- The basis of the request is derived from the technical characteristics of the installation pursuant to article 15(4)(b) of the IED.

The Application also proposes some changes to monitoring frequencies and methods for several emission points to air.

This is a draft decision document, which accompanies a draft permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the draft permit we are proposing to issue to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

The document is in draft at this stage, because we have yet to make a final decision. Because the Operator has requested a relaxation of certain otherwise mandatory standards, before we make this decision the IED requires us to explain our thinking to the public and other interested parties, to give them a chance to understand that thinking and, if they wish, to make relevant representations to us. We will make our final decision only after carefully taking into account any relevant matter raised in the responses we receive. Our mind remains open at this stage: although we believe we have covered all the relevant issues and reached a reasonable conclusion, our ultimate decision could yet be affected by any information that is relevant to the issues we have to consider. However, unless we receive information that leads us to alter the conditions in the draft Consolidated Variation Notice, or to reject it altogether, we will issue the Notice in its current form with an explanation of how we have addressed consultation responses.

In this document we frequently say "we have decided". That gives the impression that our mind is already made up; but as we have explained above, we have not yet done so. The language we use enables this document to become the final decision document in due course with no more re-drafting than is absolutely necessary.

A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

How this document is structured

- Glossary of terms/acronyms
- Our proposed decision
- How we reached our draft decision
- The legal framework
- Overview of the site and Installation
- Annex 1 - Assessment, determination and decision for Derogation from BAT Conclusions 32 and 35 with associated emission levels (AELs)
- Annex 2 - Review and assessment of changes that are not part of the BAT Conclusions Derogation
- Annex 3 - Advertising and Consultation on the draft decision

Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document.)

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CBA	Cost Benefit Analysis
CEM	Continuous emissions monitor
DD	Decision document
Derogation	from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4) of IED where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended
EQS	Environmental quality standard
EU-EQS	European Union Environmental Quality Standard
FSA	Food Standards Agency
HPA	Health Protection Agency (now PHE – Public Health England)
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
LADPH	Local Authority Director(s) of Public Health

LWS	Local Wildlife Site
PC	Process Contribution
PEC	Predicted Environmental Concentration
PHE	Public Health England
PPS	Public participation statement
PR	Public register
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SGN	Sector guidance note
SPA(s)	Special Protection Area(s)
SSSI(s)	Site(s) of Special Scientific Interest

1 Our proposed decision

We are minded to issue the Variation Notice to the Operator. This will allow it to continue to operate the Installation, subject to the conditions in the Consolidated Variation Notice.

As part of our proposed decision we have decided to grant the Operator's time limited request for a derogation from the requirements of BAT Conclusions 32 and 35 as identified in the Commission Implementing Decision 2012/134/EU BAT Conclusions document.

In order to meet the BAT AEL's associated with BAT 32 and BAT 35 installation of secondary abatement is required and the Operator proposes to do this during the next scheduled furnace rebuilds. We have assessed the benefits of fitting secondary abatement by shutting down now, against the costs and decided that the costs are disproportionate to the value of damage to the environment. The temporary higher emission limits will in the interim prevent significant pollution of the environment and harm to human health.

The way we assessed the Operator's requests for derogation and how we subsequently arrived at our conclusion is recorded in Annex 1 to this document.

The Operator has also proposed changes to the monitoring and reporting at various emission points to air. The way we have assessed this is recorded in Annex 2 to this document.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the permit will ensure that a high level of protection is provided for the environment and human health.

This Application is to operate an Installation which is subject principally to the Industrial Emissions Directive (IED).

The draft Variation contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the permit, we have considered the Application and accepted the details are sufficient and satisfactory to make the standard condition appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our draft decision

2.1 Receipt of Application

The Application was submitted on 22 January 2016 and duly made on 23 March 2016. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination; see below.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

2.2 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued an information notice on 9 May 2016. A copy of the information notice was placed on our public register together with the response received 6 June 2016.

In addition to our information notice, we received additional information during the determination by email as follows:

24 March 2016:

- Updated Supporting Information document (Ref 47075514 / LERP0001, dated March 2016)

10 May 2016:

- Wigan site Health and Safety aspects review for Hot Tap installation of Emission Control – May 2016

- In production "Hot Tap" installation of Emission Control Risk review – 29 April 2016

13 July 2016:

- Emissions data and proposed monitoring

We made a copy of this information available to the public in the same way as the response to our information notice.

2.3 Consultation and web publicising

The consultation requirements were identified and implemented. The decision was taken in accordance with RGN 6 High Profile Sites, our Public Participation Statement and our Working Together Agreements.

We are required to consult on our draft decision for derogations, we have done this by publishing this draft decision document and associated draft consolidated Variation Notice on .Gov website.

3 The legal framework

The Variation will be issued, if appropriate, under Regulation 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 which also have to be addressed.

We consider that, if we issue the Variation, it 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.

4 Overview of the site and Installation

The main purpose of the activity at the Installation is the manufacture of continuous filament glass fibre. The principal use of the products is in plastics reinforcement for a wide range of industrial, automotive and energy applications.

The glass filament produced by the plant is manufactured in a continuous form, known as 'E glass', and has specific properties such as low electrical conductivity and high strength. The filaments have a diameter of a few ten thousandths of a millimetre. The process operates 24 hours per day and 365 days per year with an annual melting capacity of 84,250 tonnes of glass.

The process involves the introduction of several raw materials comprising finely ground silica, calcium and alumina bearing minerals from selected sites dependent on quality and level of trace elements. Small quantities of other minerals that give the glass its unique properties are also used in the process.

The melting process converts the raw materials to glass in a furnace fuelled with oxygen enriched natural gas ("oxy-fuel"). Temperatures in the melter can reach around 1,600^{o}C. Emissions to air from the furnaces are directed via two stacks, one at 36m (furnace 501) and one at 47m (furnace 502).

The Operator currently uses a batch formulation known as the Environmentally Friendly Batch (EFB). This technique is utilised on both furnaces to reduce the quantities of boron particles and fluoride emissions from the plant. Alternative batch formulations and use of emission control techniques such as scrubbers form part of the plans to further reduce the quantities of emissions from the site. Details are provided in Annex 1 of this document.

Gaseous reaction and combustion products are released to air via the main furnace stacks. The main pollutants are oxides of nitrogen, sulphur dioxide, hydrogen fluoride and dust. Oxy-fuel firing has a major influence on the reduction of oxides of nitrogen, as there is less atmospheric nitrogen available for conversion. There is also a corresponding reduction in dust emissions.

Annex 1: Assessment, determination and decision for Derogation from BAT Conclusions 32 and 35 with associated emission levels (AEL's)

The IED enables a competent authority to allow derogations from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4):

By way of derogation from paragraph 3, and without prejudice to Article 18, the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:

> *(a) the geographical location or the local environmental conditions of the installation concerned; or*
>
> *(b) the technical characteristics of the installation concerned.*

The competent authority shall document in an Annex to the permit conditions the reasons for the application of the first subparagraph including the result of the assessment and the justification for the conditions imposed.

A summary of any derogations granted is also recorded in the Annex to the conditions of the Consolidated Variation Notice in accordance with the requirement of IED Article 15(4) as described above.

The Operator has requested a derogation from compliance with the BAT AEL values included in BAT Conclusions BAT 32 and BAT 35 on the basis of the technical characteristics of the Installation.

As part of their response they stated that the reason for their derogation request was to allow the proposed emissions control technology to be installed when the furnaces are next taken out of service for their scheduled rebuilds in 2018 and 2020. This criteria is described in Defra guidance - "the practicability ....of interrupting the activity so as to install improved emission control upon the pollutant(s)"[1].

[1] "Industrial emissions Directive EPR Guidance on Part A installations" Defra, February 2013. Paragraph 4.41.

On review and assessment of this information we have decided to grant the derogations requested by the Operator in respect to the AEL values described in BAT Conclusions 32 and 35, but have included other Emission Limit Values in the Consolidated Variation Notice that will ensure suitable protection of the environment and human health.

The way in which we have considered, assessed and determined the derogation request is detailed below.

1a **Derogation** from BAT 32 (dust)

The requirements for BAT 32 are set out below:

BAT 32
is to reduce dust emissions from the waste gases of the melting furnace by using one or a combination of the following techniques (raw material modification and secondary abatement techniques):

Technique (1)	Applicability
(i) Reduction of the volatile components by raw material modifications The formulation of batch compositions without boron compounds or with low levels of boron is a primary measure for reducing dust emissions which are mainly generated by volatilisation phenomena. Boron is the main constituent of particulate matter emitted from the melting furnace	The application of the technique is limited by proprietary issues, since the boron-free or low-boron batch formulations are covered by a patent
(ii) Filtration system: electrostatic precipitator or bag filter	The technique is generally applicable. The maximum environmental benefits are achieved for applications on new plants where the positioning and characteristics of the filter may be decided without restrictions
(iii) Wet scrubbing system	The application to existing plants may be limited by technical constraints; i.e. need for a specific waste water treatment plant

(1) A description of the secondary treatment systems is given in Sections 1.10.1 and 1.10.7.

	BAT AEL kg/tonne melted glass)	**Derogation-Furnace 501 (kg/tonne melted glass)**		**Derogation-Furnace 502 (kg/tonne melted glass)**	
Dust	< 0.045 – 0.09	0.3 Note 1	Until 01 January 2019	0.3 Note 1	Until 01 January 2021
Note 1: Emission limit in the original permit.					

Dust emissions are predominantly from sulphates and borates associated with the production of borosilicate glass.

The Operator currently uses a batch formulation known as the Environmentally Friendly Batch (EFB). This technique is utilised on both furnaces to reduce the quantity of boron particles (dust) from the plant.

Secondary abatement is required to meet the BAT AEL, and currently there is no abatement in place.

1b **Derogation** from BAT 35 (HF)

The requirements for BAT 35 are set out below:

BAT 35
is to reduce (HCl) and HF emissions from the melting furnace by using one or a combination of the following techniques (selection of raw materials, fluorine content of batch formulations and secondary abatement techniques):

Technique (1)	Applicability
(i) Selection of raw materials for the batch formulation with a low content of chlorine and fluorine	The technique is generally applicable within the constraints of the batch formulation and the availability of raw materials
(ii) Minimisation of the fluorine content in the batch formulation The minimisation of fluorine emissions from the melting process may be achieved as follows: — minimising/reducing the quantity of fluorine compounds (e.g. fluorspar) used in the batch formulation to the minimum commensurate with the quality of the final product. Fluorine compounds are used to optimise the melting process, help fiberisation and minimise filament breakage — substituting fluorine compounds with alternative materials (e.g. sulphates)	The substitution of fluorine compounds with alternative materials is limited by quality requirements of the product
(iii) dry or semi-dry scrubbing, in combination with a filtration system	The technique is generally applicable
(iv) wet scrubbing	The technique is generally applicable within technical constraints; i.e. need for a specific waste water treatment plant.

(1) A description of the techniques is given in Sections 1.10.4 and 1.10.6.

	BAT AEL kg/tonne melted glass)	Derogation-Furnace 501 (kg/tonne melted glass)		Derogation-Furnace 502 (kg/tonne melted glass)	
HF	< 0.02 – 0.07	0.3 Note 1	Until 01 January 2019	0.3 Note 1	Until 01 January 2021
Note 1: Emission limit in the original permit and variation EPR/BR5213IG/V004.					

HF emissions are primarily generated from the presence of fluorine in batch materials, where it is used as a melting flux and to improve fiberisation. At this Installation it is also present in significant levels in the clay.

The Operator currently uses a batch formulation known as the Environmentally Friendly Batch (EFB). This technique is utilised on both furnaces to reduce the quantity of HF emissions from the plant.

Secondary abatement is required to meet the BAT AEL, and currently there is no abatement in place.

1.1 **Derogations justification criteria**

The Operator requested time limited derogations from BAT 32, to reduce dust emissions and BAT 35, to reduce HF emissions, in accordance with BAT Conclusions in Commission Implementing Decision 2012/134/EU, on the basis of technical characteristics of the installation.

The time limited aspect of the derogation is based on the expectation for a revised BREF to be finalised and adopted in 2022, which would fall within the existing timeframes for the furnace rebuilds, but just beyond the inspirational eight year BREF cycle.

Compliance with the BAT AEL's was a requirement from 8 March 2016. Compliance cannot be achieved without shutting down the Installation.

The nature of the glass industry is such that once a glass furnace is fired, it should remain in a hot state until the point at which the furnace is in need of significant repair (or "rebuild") to allow it to continue to operate. This is normally when adjustments to the furnace and associated abatement are applied.

Through effective maintenance and significant experience in furnace management the life of many PPG furnaces can exceed seven years and it is therefore not unusual for the furnaces to extend their expected life to 15 to 22 years before a complete rebuild is required.

Furnace life-time is extended whenever possible and based on the current state of the furnaces the next rebuilds will be required by the end of 2020. A complete furnace rebuild takes in excess of 1.5 years to plan and implement, with major repairs and changes undertaken at the end of the furnace life-time in accordance with a schedule applied across the company.

This means that a time-limited derogation would be required until the planned rebuilds are completed by the end of 2020, with full compliance with BAT AEL's achieved by 01 January 2021.

1.2 Options considered

In their Application the Operator considered four options (2 to 5) for meeting the BAT AEL's. They have proposed to implement option 3, which is a combination of dry filtration (ceramic/bag filters) and scrubbing (lime injection) at the NEXT furnace rebuild.

OPTION	DESCRIPTION	COMPLIANCE DATE
1 **Base case**	Business as usual	Not applicable – not compliant
2	Secondary abatement (dry filtration & Scrubbing) **EARLY** furnace rebuild	January 2018
3	Secondary abatement (dry filtration & Scrubbing) **NEXT** furnace rebuild	January 2019-furnace 501 January 2021-furnace 502
4	Secondary abatement (dry filtration & Scrubbing) hot tap **RETROFIT**	end 2017
5	Secondary abatement (wet scrubber) hot tap **RETROFIT**	2018

1.2.1 Option 1- Base Case-Business as usual

No primary controls or secondary abatement will be applied at the site to reduce dust or HF emissions. This would require no extra infrastructure, equipment cost or change in raw materials, but would not achieve any reduction in emissions.

Whilst it is recognised that this approach would not meet the BAT AEL's, this option is used to present a baseline to demonstrate the scale of environment impact reduction through the other proposed options.

1.2.2 Option 2- Secondary Abatement-Early Furnace Rebuild (January 2018)

Secondary abatement through the installation of two dry filtration units with lime injection (i.e. one per furnace) would be applied to meet the dust and HF BAT AEL's and so achieve IED compliance.

A time-limited derogation would still be required until January 2018 with the rebuilds completed by the end of 2017. This timeframe is considered realistic for an early rebuild, as there is still a period of planning, design and preparation required before the furnace rebuilds can take place which can typically take 10 to 12 months. Carrying out the rebuild itself would take up to four months for each furnace. This results in an overall project time of up to 18 months, which gives sufficient time to develop and implement plans.

Installation of the abatement at the time of furnace rebuilds provides a number of benefits as it allows the ability to design and install the system without restrictions which enables the optimisation of the positioning of the systems, in order to ensure that maximum dust capture can be achieved, and that volatile boron species do not pass through the filter unabated. i.e. the ability to install a more efficient system.

If this approach is undertaken, to optimise the efficiency of the abatement system, this means that the furnace rebuilds currently planned to take place during 2018 and 2020 would need to be brought forward to 2017.

1.2.3 Option 3-Secondary Abatement-Next Planned Furnace Rebuild (January 2021)

It is assumed that the abatement systems are applied to both furnaces at the time of the next planned rebuilds. This means that BAT AEL's would be achieved albeit at a later date; however a time-limited derogation would be required until the planned rebuilds are completed by 2021.

This option would enable the site to meet the BAT AEL's January 2021 (furnace 501 by January 2019), and although the cost implications for the abatement equipment will remain high, overall costs are lower than Option 2 as there is no loss of residual value in the existing furnaces.

1.2.4 Option 4-Secondary Abatement (Dry system) -'Hot Tap' Retrofit (end 2017)

It would be possible to install the abatement systems as "hot taps" into the existing furnaces whilst they remain operational. A realistic timeframe to purchase, install and commission is approximately 14 to 18 months.

However, as stated in the BREF, the maximum environmental benefits of secondary abatement are achieved for applications on new plants where the positioning and characteristics of such abatement may be decided without restrictions. In the case of a "hot tap" into the existing furnaces, this would be installed into the side of the stack at the most accessible and convenient point, considering the health and safety aspects.

In comparison, installation at shut down and rebuild would enable the optimisation of the positioning of the abatement systems, in order to ensure maximum dust capture can be achieved, and that volatile boron species do not pass through the filter unabated.

The 'hot tap' method would have significant health and safety implications, due to the hot works (>400^{o}C) that would be involved in tapping into the furnace system and the use of craneage to connect equipment to the stacks. Furnace 502 has a recuperator which poses further issues for this approach as the connection would need to be at the top of the stack beyond the recuperator.

There are significant risks in managing the construction and erection of steelwork with additional risks at furnace 502 due to the proximity of the gas station, oxygen line and electrical substations to the lifting/craneage operations.

The Operator concludes that the risks associated with the installation of abatement whilst operational are not acceptable.

Details of the health and safety implications are provided in the following documents:

- Wigan site Health and Safety aspects review for Hot Tap installation of Emission Control – May 2016
- In production “Hot Tap” installation of Emission Control Risk review – 29 April 2016

A time-limited derogation would still be required until the end of 2017.

1.2.5 Option 5-Secondary Abatement (Wet system) -‘Hot-Tap’ Retrofit (2018)

The application of wet scrubbing represents a potential option for abatement of dust and HF; however it introduces additional requirements for the management of aqueous effluent alongside the abatement system. Estimates derived from the installation and operation of similar equipment at PPG facilities in the Netherlands and the USA have been applied to include this option within the assessment.

The assessment of wet scrubbing is undertaken assuming a ‘hot tap’ approach, similar to option 4. However, the additional infrastructure required for management of the aqueous streams generated by the process would result in a longer lead time.

The Operator concludes that the risks associated with the installation of abatement whilst operational are not acceptable (see Option 4 above).

A time limited derogation would be required until 2018.

1.3 Compliance cost estimates

Carrying out a major repair is a significant investment of time and money. Major changes are typically made at the point of a furnace rebuild, with additional costs and risks incurred if changes are made out of schedule.

These include loss of manufacturing capacity, reduction in plant efficiency, potential loss of business and additional costs. A scheduled rebuild enables time for new furnace designs to be completed, contracts for supply and installation to be finalised and the production and fabrication of the required materials. It also enables glass manufacture to be located to other facilities within the group in order to fulfil contracts and maintain market share.

During a scheduled rebuild, production capacity can be relocated to other facilities within the PPG group; however it is generally not possible to do this at short notice. Capacity to manufacture products at other facilities within the group is available but limited.

It is considered likely that loss of manufacturing capacity at short notice could lead to work being lost to competitors either on a short term or permanent basis, which could have large economic implications for the Operator.

In the event of an unscheduled major repair being required, in order that the impacts of production downtime are minimised, all possible options to minimise the 10 to 12 month design and procurement timeframe would be utilised. It is considered that the costs of an unscheduled major repair could therefore be considerably more than a scheduled major repair due to the following factors:

- Premium rates would be incurred for design work to ensure a faster turnaround, likely to be up to 25% greater than normal design costs;
- Premium rates for production and fabrication works, likely to be 5% greater than normal costs;
- The unscheduled major repair would need to run concurrently with other scheduled repairs for the PPG Group. The maintenance team only has limited staff and resources for a finite number of refurbishments per year. An unscheduled event would mean the need to import additional contract staff and resources, such that the engineering and consultancy costs would be significantly increased;
- Contracts for the supply of materials would be awarded to suppliers with shortest lead times, rather than being based on best value or quality of materials. This could lead to additional costs; and
- Contracts for installation would be based on contractor availability rather than skill, cost or best value.

Cost estimates are provided for options 2 to 5 for achieving the BAT AEL's. The base case is to demonstrate the scale of environmental impact reduction achieved with the compliance options.

The costs for the secondary abatement are based on a quote from a manufacturer which uses a Ceramic Catalyst Filter (CCF) system to remove particulates and acid gases. The CCF's are composed of fibrous ceramic materials that can withstand high temperatures up to 1,650^{o}C. Acid gases (HF) are removed with integrated dry sorbent injection of hydrated lime, or other suitable reagent. The Operator claims that this is representative of bag or ceramic filtration.

The cost estimates for the BAT AEL options are summarised below:

1.3.1 Option 2- Secondary Abatement-Early Furnace Rebuild (January 2018)

This option would enable the site to meet the BAT AEL's as close to the 8 March 2016 as possible, however, compliance with the BAT AEL's is not possible unless the plant is shut down, or a short-term derogation until the end of 2017 is applied. This would also have considerable cost implications for the site, due to the loss of residual value in the existing furnaces, and additional costs associated with bringing forward a rebuild within such short timescales (see above).

The residual values of the furnaces are based on the remaining asset life and equivalent value. These figures were based on the planned derogation submission date of October 2015:

Furnace 501 – 33 months remaining asset life and depreciation of £287,000
Furnace 502 – 57 months remaining asset life and depreciation of £1,200,000

The Operator has determined that the accelerated depreciation costs associated with early rebuild of the furnaces to be in the region of £1.5 million.

The estimated capital cost for fitting dry filtration (ceramic filters) to support a single furnace is in the region of £1 million. This excludes civils, duct- and stack-work and delivery and installation. Applying Lang factors to the aspects excluded from the ceramic filter costing provided by the supplier results in an overall estimated capital cost of £1.6 million per furnace, or £3.2 million in total.

Overall operating costs are estimated at £332,000 a year for both furnaces.

1.3.2 Option 3-Secondary Abatement-Next Planned Furnace Rebuild (January 2021)

This option would enable the site to meet the BAT AEL's from 2021, and although the cost implications for the abatement equipment will remain high, overall costs are lower than Option 2 as there is no loss of residual value in the existing furnaces.

The costs associated with the installation of abatement are the same as those presented in Option 2. There are no additional costs for the loss of residual value in the furnace as the furnaces are utilised to the end of their planned life time. Similarly, installing the abatement during a large-scale planned shutdown avoids the additional costs associated with unscheduled furnace shutdowns.

1.3.3 Option 4-Secondary Abatement (Dry system) -'Hot Tap' Retrofit (end 2017)

This option has an anticipated timeline of approximately 12 months which means that the site would meet the BAT-AELs in 2018.

The use of a 'hot tap' method of installation would also incur an additional cost associated with the shut-down and restart of the furnaces outside of the currently scheduled operating period as a consequence of increased costs associated with labour, increased activity, reduced quality and increased waste. This is estimated to be £350,000 per furnace, but would avoid the £1.5 million costs (residual costs) associated with the early rebuild of the furnaces.

Aside from the points above, costs for Option 4 are considered to be the same as Option 3.

The health and safety risks associated with this option are not acceptable.

1.3.4 Option 5-Secondary Abatement (Wet system) -'Hot-Tap' Retrofit (2018)

As with options 2 and 4, a shorter-term derogation until 2018 would be required.

The estimated capital cost for installing a wet scrubber system to both furnaces is in the region of £2.6 million. This excludes civils, duct- and stack-work and delivery and installation. Applying Lang factors associated with the excluded elements results in an overall estimated capital cost of £4.3 million. In addition, the project design and planning requirements (£400,000) and the 'hot-tap' costs (£700,000 across both furnaces) result in a further £1.1 million of costs incurred. Overall operating costs are estimated at £415,000 a year.

The health and safety risks associated with this option are not acceptable.

1.3.5 Summary of Costs for BAT AEL Options

OPTION	DESCRIPTION	CAPITAL COSTS (£M) Note 1	OPERATING COSTS (£M)
2	**EARLY** furnace rebuild	7.5	4.6
3	**NEXT** furnace rebuild	3.9	3.6
4	hot tap **RETROFIT**	6.3	4.7
5	Wet scrubber Note 2 hot tap **RETROFIT**	8.2	6.4

Note 1: Capital costs for the dry filtration system are based on a quote from the manufacturer. The discounted cash flow (DCF) is developed using a standard lifetime for the equipment of 15 years.

Note 2: Wet scrubber costs derived from data provided by the sister site in the Netherlands.

The alternative to implementation of secondary measures at planned rebuild would require both furnaces to be rebuilt with secondary abatement as close as realistically possible to the 8 March 2016 IED compliance date, with a derogation of 9 to 20 months to cover the period of installation, or require the site to shut down for the rebuild and installation of the abatement, so that when the furnaces are then restarted the BAT AEL's are achieved.

On the basis of the health and safety implications of the 'Hot-Tap' in Options 4 and 5 being unacceptable, there are two remaining options, the early furnace rebuilds (option 2) and the next planned furnace rebuilds (option 3).

1.4 Environmental consequences of derogations

The annual emissions of dust and HF from the furnaces are currently 26 and 18 tonnes per annum respectively. These would reduce to at least 6.4 and 4.7 tonnes per annum respectively if the BAT AEL's were met in the shortest possible timeline (this will be beyond the timeline set by the IED). The Operator's proposal will mean that the full reduction will be achieved by 1 January 2021; however there will be a significant reduction by 1 January 2019 when furnace 501 achieves the BAT AEL's.

Pollutant	**CURRENT**	**BAT AEL scenario**
	Tonnes per annum	Tonnes per annum
Dust	26	6.4
HF	18	4.7

1.4.1 Human Health - Short term Assessment

Summary of the current and predicted impact of derogating from the BAT AEL's on **short term** Environmental Quality Standards (EQS) / Environmental Assessment Levels (EAL), represented as Air Quality Standard (AQS).

CURRENT OPERATION – Maximum Predicted off-site impact (short term)							
Pollutant	**Averaging period**	**AQS** Note 1 **µg/m³**	**PC** Note 2 **µg/m³**	**% PC/ AQS µg/m³**	**AC** Note 3 **µg/m³**	**PEC** Note 4 **µg/m³**	**% PEC/ AQS**
PM_{10}	24 Hour	50	2.33	4.7	-	-	-
HF	Hourly av.	160	11.69	7.3	-	-	-

Note 1: Air Quality standard, objective or environmental assessment level

Note 2: Process Contribution

Note 3: Ambient concentration – for short term assumed to be twice the annual AC – further assessment not required, emissions screen out as being insignificant at <10% AQS

Note 4: Predicted Environmental Concentration – PC + AC

BAT AEL's (SECONDARY ABATEMENT) – Maximum Predicted off-site impact (short term)							
Pollutant	**Averaging period**	**AQS** Note 1 **µg/m³**	**PC** Note 2 **µg/m³**	**% PC/ AQS µg/m³**	**AC** Note 3 **µg/m³**	**PEC** Note 4 **µg/m³**	**% PEC/ AQS**
PM_{10}	24 Hour	50	0.43	0.86	-	-	-
HF	Hourly av	160	2.63	1.64	-	-	-
Note 1: Air Quality standard, objective or environmental assessment level Note 2: Process Contribution Note 3: Ambient concentration – for short term assumed to be twice the annual AC– further assessment not required, emissions screen out as being insignificant at <10% AQS Note 4: Predicted Environmental Concentration – PC + AC							

Pollutant	**CURRENT**	**BAT AEL**	**% difference CURRENT & BAT AEL**	**Significance Criteria**
	% PC/ AQS µg/m³	% PC/ AQS µg/m³		
PM_{10}	4.7	0.86	3.84	Insignificant <10%
HF	7.3	1.64	5.66	Insignificant <10%

The CURRENT short term emissions of PM_{10} and HF can be screened out as being insignificant in that the PC is less than 10% of the AQS.

1.4.2 Human Health - Long term Assessment

Summary of the predicted impact of derogating from the BAT AEL on any **long term** Environmental Quality Standards / Environmental Assessment Levels.

CURRENT OPERATION – Maximum Predicted off-site impact (long term)							
Pollutant	**Averaging period**	**AQS** **Note 1** **µg/m³**	**PC** **Note 2** **µg/m³**	**% PC/ AQS** **µg/m³**	**AC** **Note 3** **µg/m³**	**PEC** **Note 4** **µg/m³**	**% PEC/ AQS**
PM_{10}	Annual mean	40	0.66	1.6	16.2	16.9	42.2
$PM_{2.5}$	Annual mean	25	0.66	2.6	11.3	11.9	47.8
HF	Annual mean	16	0.37	2.3	0.30	0.67	4.2
Note 1: Air Quality standard, objective or environmental assessment level Note 2: Process Contribution Note 3: Ambient concentration Note 4: Predicted Environmental Concentration – PC + AC – required where the emissions are >1% of the AQS							

The current long term emissions of PM_{10}, $PM_{2.5}$ and HF are above the insignificant screening criteria of 1% of the AQS. These emissions have been assessed as being unlikely to give rise to significant pollution taking expected modelling uncertainties into account, in that the PEC is less than 100% of the AQS.

BAT AELs (SECONDARY ABATEMENT) – Maximum Predicted off-site impact (long term)							
Pollutant	**Averaging period**	**AQS** Note 1 **µg/m³**	**PC** Note 2 **µg/m³**	**% PC/ AQS µg/m³**	**AC** Note 3 **µg/m³**	**PEC** Note 4 **µg/m³**	**% PEC/ AQS**
PM_{10}	Annual mean	40	0.14	0.35	-	-	-
$PM_{2.5}$	Annual mean	25	0.14	0.56	-	-	-
HF	Annual mean	16	0.11	0.69	-	-	-
Note 1: Air Quality standard, objective or environmental assessment level Note 2: Process Contribution Note 3: Ambient concentration Note 4: Predicted Environmental Concentration – PC + AC - required where the emissions are >1% of the AQS							

For BAT AEL's long term emissions of PM10, $PM_{2.5}$ and HF are screened out as insignificant in that the PC is < 1% of the long term AQS.

Pollutant	**CURRENT**	**BAT AEL**	**% difference CURRENT & BAT AEL**	**Significance Criteria**
	% PC/ AQS µg/m³	% PC/ AQS µg/m³		
PM_{10}	1.6	0.35	1.25	Marginally above 1%
$PM_{2.5}$	2.6	0.56	2.04	Above 1%
HF	2.3	0.69	1.61	Above 1%

The difference in off-site impacts are minimal with only a 1.25% reduction when comparing the PC with the air quality standard for long term impacts of PM_{10} and 2.04% for $PM_{2.5}$. Such reductions in impact would be considered to represent small magnitudes of change and therefore the environmental benefits of this can be considered negligible over the period of the proposed derogation.

With regards to HF emissions, comparison of the PC with the air quality standard leads to a reduction of 1.61% as a result of the installation of secondary abatement. Again it is noted that such reductions would represent small magnitudes of change and therefore the environmental benefits of this can also be considered negligible over the period of the proposed derogation.

In the absence of an emission value for HF, damage costs have been given an economic value by assuming HF is equivalent to sulphur dioxide (SO_2).

The additional costs associated with the installation of secondary measures for compliance with the BAT AEL's as close to 8 March 2016 are considered disproportionate in consideration of the local environmental conditions, where levels of pollutants of interest are <50% of the annual average AQS.

1.4.3 Summary – Environmental Consequences (Human Health)

The impact of the current emissions on the local environment are insignificant for short-term effects and long-term impacts only marginally above the insignificance threshold, the additional costs are considered to be disproportionate to the benefit to the local environment.

Assessment has already been undertaken with the current emission limit values, which will be maintained throughout the period of the derogation. Whilst emissions will be reduced when BAT is met, the existing limits will in the interim prevent significant pollution of the environment or harm to human health.

We have reviewed the modelled impact data presented and agree that the Operator's conclusions can be used for derogation decision making.

1.5 Habitats Assessment

Manchester Mosses Special Area of Conservation (SAC) is located within 10km of the Installation.

There are no Sites of Special Scientific Interest (SSSI) located within 2km of the Installation.

The following non-statutory Local Wildlife Sites (LWS) are located within 2km of the Installation:

- Field by Scowcroft Farm
- Platt Bridge Heath
- Reservoirs East of Leyland Park
- Bickershaw Colliery
- Barlow's Farm 339m Radial
- Wetland & Scrub at Hindley Green
- Disused Railway at Hindley Green

The table below has been taken from the Operators assessment showing the impact at the worst case receptor. It also shows the Operators prediction of the difference between the current and the BAT AEL options at the most impacted receptor.

The Operator confirms that there is no evidence that the current performance results in the deposition of dust and associated vegetation smothering at any of the sites mentioned above. They have therefore confined their assessment to the impact of aerial HF emissions only.

CURRENT OPERATION – Maximum Predicted off-site impact (short term)							
Pollutant	**Averaging period**	**AQS** Note 1 **µg/m³**	**PC** Note 2 **µg/m³**	**% PC/ AQS µg/m³**	**AC** Note 3 **µg/m³**	**PEC** Note 4 **µg/m³**	**% PEC/ AQS**
HF	Daily mean (habitat)	5	0.30	6.0	-	-	-
	Weekly mean (habitat)	0.5		60	0.03	0.33	66
Note 1: Air Quality standard, objective or environmental assessment level Note 2: Process Contribution Note 3: Ambient concentration Note 4: Predicted Environmental Concentration – PC + AC							

BAT AEL's (SECONDARY ABATEMENT) – Maximum Predicted off-site impact (short term)							
Pollutant	**Averaging period**	**AQS** Note 1 **µg/m³**	**PC** Note 2 **µg/m³**	**% PC/ AQS µg/m³**	**AC** Note 3 **µg/m³**	**PEC** Note 4 **µg/m³**	**% PEC/ AQS**
HF	Daily mean (habitat)	5	0.096	1.92	-	-	-
	Weekly mean (habitat)	0.5		19.2	0.03	0.126	25.2
Note 1: Air Quality standard, objective or environmental assessment level Note 2: Process Contribution Note 3: Ambient concentration Note 4: Predicted Environmental Concentration – PC + AC							

1.5.1 Summary – Environmental Consequences (Habitats)

We have reviewed the modelled impact data and agree that the Operator's conclusions can be used for derogation decision making, with the exception of the HF emissions at two of the local wildlife sites when compared to the weekly environmental standard. There will be exceedences of the weekly critical level at Scowcroft Farm and the Disused Railway Line at Hindley Green under the CURRENT scenario.

We also agree that the secondary abatement will result in significant reductions at all of habitat sites.

Current HF emissions contribute to present background measurement and the proposed derogation will not lead to an increase in HF emissions. Once the required improvements are made, the HF emissions will be reduced leading to a reduction of exposure at the sites.

Assessment has already been undertaken with the current emission limit values, the existing limits will in the interim prevent significant pollution of the environment.

1.6 **Costs and Benefits**

The Operator carried out a Cost-Benefit Analysis (CBA) to assess whether the cost of compliance with the BAT AEL's was disproportionate compared to the environmental harm which would be avoided. They took all the costs and benefits of the proposals at various times and discounted them from future values to provide the net present values (NPV). This approach allows a fair comparison to be made of the costs and benefits.

A summary of the Operator's CBA is presented below. A negative NPV demonstrates that the cost of compliance is disproportionate to the environmental harm which would be avoided. The calculation was undertaken using our IED Cost Benefit Analysis Tool (Version 6.9, 2 February 2016).

They conclude that the cost benefit assessment coupled with the predicted level of environmental impact do not support the additional capital investment required for bringing forward the furnace rebuilds to install the secondary abatement on both furnaces by the end of 2017. They conclude that option 3 represents BAT, with the installation of abatement at planned furnace rebuilds.

Table 7.2: Cost/Benefit Assessment of Particulate and HF Control							
Option	**Pollutant**	**Max. emission rate (kg/te glass)**	**Mass release (t/yr)**	**Capital Costs (£M)**	**Operating Costs (£M)**	**Pollution Reduction Benefit (£M)**	**Net Present Value (NPV) (£M)**
Option 1 Current Operations	PM	0.5	26[1]	-	-	-	-
	HF	0.3	18[1]				
Option 2 Secondary Abatement by end of 2017 (Early Rebuild)	PM	0.09	6	7.5	4.6	-9.8	-3.4
	HF	0.07	5				
Option 3 Secondary Abatement by the start of 2021 (Planned Rebuild)	PM	0.09	6[2]	3.9	3.6	-8.5	-
	HF	0.07	5[2]				
Option 4 Secondary Abatement by the end of 2016 (Hot-tap)	PM	0.09	6	6.3	4.7	-10.2	-1.9
	HF	0.07	5				
Option 5 Secondary Abatement (Wet Scrubber) by 2017	PM	0.09	6	8.2	6.4	-10.0	-5.7
	HF	0.07	5				

Notes 1: Based upon annual average emissions from 2009-13 for 501 &502.
2: Emissions quoted are after rebuild. Emissions from 2016-2020 would be 20tpa particulates and 13tpa HF.

Based upon the assessment the immediate application of secondary measures is considered to represent disproportionate cost, and the difference in off-site impacts are minimal as detailed in Sections 1.4 and 1.5 of this document.

The additional costs associated with the installation of secondary measures for compliance with the BAT AEL's as close to 8 March 2016 as possible is considered to be disproportionate to the benefit to the local environment.

We therefore accept that the cost of compliance is disproportionately higher than the value of the damage that would be avoided.

1.7 **Conclusion for BAT 32 and 35 derogation assessment**

We are satisfied that the Operator has demonstrated that the cost of complying with the BAT AEL's by shutting down now, is disproportionate to the value of damage to the environment caused by delaying full implementation until 2021.

We have decided to grant the derogation requested by the Operator in respect to the BAT AEL's values described in BAT 32 and BAT 35 subject to the following conditions in the variation:

- Set ELVs enabling the furnaces to continue to operate at previous emission levels of 0.3 kg/tonne of melted gas for both dust and HF, which are higher than the BAT AEL's of 0.09 and 0.07 kg/tonne of melted glass for dust and HF, in the Consolidated Variation Notice EPR/BR5213IG/V004. Assessment has already been undertaken which confirms that these temporary emission limits will prevent significant pollution of the environment or harm to human health.

- Require secondary abatement to be installed on each furnace. The abatement on the first furnace will be complete by the end of 2018, with abatement on the second furnace complete by the end of 2020. We consider that this is both practical and justifiable. This represents significant investment by the Operator in equipment that will serve future rebuilds, thus future-proofing the Installation.

- Set an improvement condition to provide progress reports in meeting BAT 32 and BAT 35 and the associated BAT AEL's for dust and HF.

The Operator shall submit, for approval by the Environment Agency, a report setting out progress to achieving the BAT conclusion AEL's where a derogation has been applied for and granted. The report shall include, but not be limited to, the following: • Current performance against the BAT conclusion AEL's. • Methodology for meeting the BAT AEL's. • Associated targets / timelines for reaching compliance by 01/01/19 at furnace 501 and 01/01/21 at furnace 502 for emissions of dust and HF at emission points A1 (furnace 501) and A2 (furnace 502) defined in table S3.1 of this permit. • Any alterations to the initial plan – for progress reports The report shall address BAT conclusions 32 and 35. The Operator shall submit reports on progress with the approved compliance plan on a six monthly frequency specified by this condition.	Initial Report 01/12/16 Progress reports by 01/06/17 01/12/17 01/06/18 01/12/18 01/06/19 01/12/19 01/06/20 01/12/20

Annex 2 Review and assessment of changes that are not part of the BAT Conclusions Derogation

The Operator has proposed changes to the monitoring and reporting at various emission points as follows:

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
			Until 8 March 2016	After 8 March 2016		
Emissions from the furnaces A1 and A2						
A1/A2 **501 & 502 furnace stacks**	Oxides of Nitrogen (NO and NO2 expressed as NO_x)	1.5	Monthly	Continuous monitoring	Quarterly extractive sampling and monitoring on a monthly basis by calculation, **until** secondary abatement is installed on the respective furnace. The purchase and installation of a continuous NO_x monitoring system prior to installation of the abatement equipment would not be cost effective as the equipment will not be in a	BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. The surrogate parameter is the monthly mass balance calculation. We agree in principle with the mass balance approach; however the methodology shall be agreed by inspection. In any event, continuous monitoring will be in place once the abatement

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
					suitable location and may not be effective due to changes in the exhaust composition / temperature.	equipment is installed, which will be after 31/12/18 for furnace 501 and after 31/12/20 for furnace 502. We accept the proposal and have included in Table S3.1 of the permit.
A1/A2 **501 & 502 furnace stacks**	Sulphur Dioxide (SO_2)	3.6	Monthly periodic		Annual extractive sampling. Monitoring on a monthly basis by calculation. Historic low extractive results obtained on a quarterly basis over the last five years, 0.28 and 0.22 kg/tonne melted glass on furnaces 501 and 502 respectively. These are well below the permit limit of 1.0kg/tonne melted glass.	BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. The surrogate parameter is the monthly mass balance calculation. We agree in principle with the mass balance approach; however the methodology shall be agreed by inspection. We have set extractive monitoring in accordance with BAT 7 at twice per year. We have set a limit of 1.0 kg/tonne of melted glass, which is lower than the **BAT AEL**. This is the limit already in the permit which is

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
					achievable based on historic results and has been set based on the concept of no backsliding. We have included in table S3.1 of the permit.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
A1/A2 **501 & 502 furnace stacks**	Dust	**0.09**	Continuous monitoring		Continuous monitoring is in place; however extractive monitoring is required to validate the continuous monitoring results. Quarterly extractive sampling and monitoring on a monthly basis by calculation, **until** secondary abatement is installed on both furnaces. MCERTs monitoring equipment will be installed at a suitable location during installation of the secondary abatement systems.	We accept the proposal and have included it in Table S3.1 of the permit. We have set limits higher than the **BAT AEL**, refer to Annex 1 above and table S3.1 of the permit.
A1/A2 **501 & 502 furnace stacks**	Gaseous Fluorides as HF	**0.07**	Monthly	Continuous monitoring	Six monthly extractive sampling and monitoring on a monthly basis by calculation, until secondary abatement is installed on both furnaces. Continuous monitoring will not be required after installation of the secondary	BAT 7 allows for regular periodic measurements, in particular when raw materials containing such substances are used or partial combustion may occur. We agree in principle with the monthly mass balance approach; however the methodology shall be agreed by inspection.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
					abatement.	Based on the effectiveness of the secondary abatement in reducing emissions, we accept the proposal; however we have included an increased monitoring frequency for the first year following installation of the secondary abatement. We have also included provision for increasing the frequency if required to establish compliance. We have included this in Table S3.1 of the permit. We have set limits higher than the **BAT AEL**, refer to Annex 1 above and table S3.1 of the permit.
A1/A2 **501 & 502 furnace stacks**	Gaseous Chloride as HCl	0.05	Half yearly periodic		Annual extractive sampling. Monitoring on a monthly basis by calculation. Secondary abatement is expected to further reduce the already low HCl emissions, 0.015 & 0.012 kg/tonne of melted glass on	BAT 7 allows for regular periodic measurements, in particular when raw materials containing such substances are used or partial combustion may occur. We agree in principle with the monthly mass balance approach; however the methodology shall be agreed by inspection.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
					furnaces 501 and 502 respectively.	We have set extractive monitoring at twice per year; however reduced monitoring may be agreed in writing with the Environment Agency. We have included these requirements in Table S3.1 of the permit.
A1/A2 **501 & 502 furnace stacks**	Carbon Monoxide (CO)	None	None	Continuous monitoring	Quarterly extractive sampling and monitoring on a monthly basis by calculation. Installation of continuous monitoring equipment is deemed not applicable due to both furnaces being oxy-fuel fired, refer to page 333 of the BREF document.	BAT 7 allows for continuous or regular periodic measurements when primary techniques or chemical reduction by fuel techniques are applied for NOx emissions reductions or partial combustion may occur. We consider this to be a critical process parameter to ensure process stability, requiring continuous monitoring in accordance with BAT 7. We have removed the limit and included continuous process monitoring in Table S3.4 of the permit.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
A1/A2 **501 & 502 furnace stacks**	As, Co, Ni, Cd, Se, Cr_{VI} and their compounds (total)	$4.5x10^{-3}$	Yearly periodic	Annual extractive sampling. Monitoring on a monthly basis by calculation.	BAT 7 allows for regular periodic measurements, in particular when raw materials containing such substances are used or partial combustion may occur. We agree in principle with the monthly mass balance approach; however the methodology shall be agreed by inspection. We accept the proposal and have included it in Table S3.1 of the permit.
A1/A2 **501 & 502 furnace stacks**	As, Co, Ni, Cd, Se, Cr_{VI}, Sb, Pb, Cr_{III}, Cu, Mn, V, Sn and their compounds (total)	$13.5x10^{-3}$	Yearly periodic		

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
A3, A6, A7, A9 **501 & 502 Refiner & Forehearth stacks**	Dust	0.09	Half yearly periodic	Annual extractive sampling. Monitoring on a monthly basis by calculation. Historical data demonstrates average results of 0.07, 0.004 & 0.016 kg/tonne of melted glass for the 501 refiner, 501 forehearth and 502 combined refiner/forehearth respectively, well below the permit limit of 0.09 kg/tonne of melted glass.	BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. We agree in principle with the monthly mass balance approach; however the methodology shall be agreed by inspection. We have set extractive monitoring at twice per year; however reduced monitoring may be agreed in writing with the Environment Agency. We have included these requirements in Table S3.1 of the permit.
A3, A6, A7, A9 **501 & 502 Refiner & Forehearth stacks**	Gaseous Fluorides as HF	0.07	Half yearly periodic	Annual extractive sampling. Monitoring on a monthly basis by calculation. Historical data demonstrates average results of 0.07, 0.002 & 0.0015 kg/tonne of melted glass for the 501 refiner, 501 forehearth and	BAT 7 allows for regular periodic measurements, in particular when raw materials containing such substances are used or partial combustion may occur. Based on the effectiveness of the secondary abatement in reducing emissions, we agree in principle with the monthly mass balance approach;

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
				502 combined refiner/forehearth respectively, well below the permit limit of 0.07 kg/tonne of melted glass.	however the methodology shall be agreed by inspection. We accept the proposal and have included it in Table S3.1 of the permit.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
A3, A6, A7, A9 **501 & 502 Refiner & Forehearth stacks**	Gaseous Chloride as HCl	0.05	Half yearly periodic	Annual extractive sampling. Monitoring on a monthly basis by calculation. Historical data demonstrates average results of 0.0008, 0.0006 & 0.0001 kg/tonne of melted glass for the 501 refiner, 501 forehearth and 502 combined refiner/forehearth respectively, well below the permit limit of 0.05 kg/tonne of melted glass.	BAT 7 allows for regular periodic measurements, in particular when raw materials containing such substances are used or partial combustion may occur. We agree in principle with the monthly mass balance approach; however the methodology shall be agreed by inspection. We accept the proposal and have included it in Table S3.1 of the permit.
Emissions from Downstream Processes					
A14-16, A20, A21, A33 (501 Drying) & A31, A32 (502 Drying) **501 & 502 Di-electric drying**	Dust	20 mg/m^3	Yearly periodic	Removal of the 20 mg/m^3 limit and monitoring requirement. Historical data over the last 4 years demonstrates average results of 0.77mg/m^3, well below the permit limit.	BAT 37, Table 27 of the BAT conclusions sets a BAT AEL for downstream processes; however given the nature of the process and the discontinuous operation we accept that there are no sources for dust emissions from the drying areas and di-electric ovens. We have removed the limit and

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)		Operator proposal and justification	Our Assessment Note 2
areas						monitoring requirement in Table S3.1 of the permit.
A14-16, A20, A21, A33 (501 Drying) & A31, A32 (502 Drying) **501 & 502 Di-electric drying areas**	Volatile organic Compounds as carbon)	20 mg/m^3		Yearly periodic	Annual extractive sampling for a representative sample of 4 ovens, all ovens would be sampled over a 2 year period. Historical data over the last 4 years demonstrates average results of 0.013 kg/tonne melted glass, well below the permit limit of 0.09 kg/tonne of melted glass.	Demonstration of compliance is required for each oven, which can be by mass balance calculation. We accept the proposal and have included in Table S3.1 of the permit together with the mass balance calculation for each oven.
A17-19, (binder preparation)	Volatile organic Compounds as carbon	20 mg/m^3	Yearly periodic		Annual extractive sampling. Reduction in binder mixing from a 24/7 operation down to one day only for a period of 5 hours. The release points are roof vent fans and the flammable store extraction fan stack.	BAT 37, Table 27 of the BAT conclusions sets a BAT AEL for downstream processes. We have retained the limit in Table S3.1 of the permit. BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. Based on the limited operation we do not consider that annual extractive sampling is

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
					required. The mass balance approach would be a surrogate parameter. We have included this in the permit; however the methodology shall be agreed by inspection.
A22-A30 (502 hot air drying) & A34-A36 (501 hot air drying)	Dust	20 mg/m^3	Yearly periodic	Annual extractive sampling. Historical data over the last 4 years demonstrates average results of 1.01mg/m^3, well below the permit limit.	BAT 37, Table 27 of the BAT conclusions sets a BAT AEL for downstream processes. We have retained the limit in Table S3.1 of the permit. BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. Based on historical data we have set annual extractive sampling. The mass balance approach would be a surrogate parameter. We have included this in the permit; however the methodology shall be agreed by inspection.

Emission Point	Parameter	BAT AEL Note 1	CURRENT MONITORING REQUIREMENT (EPR/BR5213IG/V004)	Operator proposal and justification	Our Assessment Note 2
A22-A30 (502 hot air drying) & A34-A36 (501 hot air drying)	Volatile organic Compounds as carbon)	20 mg/m^3	Yearly periodic	Annual extractive sampling for a representative sample of 6 ovens, all ovens would be sampled over a 2 year period. Historical data over the last 4 years demonstrates average results of 0.0056 kg/tonne of melted glass, well below the permit limit of 0.09 kg/tonne of melted glass.	BAT 37, Table 27 of the BAT conclusions sets a BAT AEL for downstream processes. We have retained the limit in Table S3.1 of the permit. BAT 7 allows for discontinuous measurements at least twice per year associated with the control of surrogate parameters. Based on historical data we have set annual extractive sampling. The mass balance approach would be a surrogate parameter. We have included this in the permit; however the methodology shall be agreed by inspection.

Note 1: BAT AEL kg/tonne of melted glass unless otherwise stated.
Note 2: The nature of the process is such that mass balance by calculation over the whole year is more representative of the process than a sample collected over a short period of operation e.g. 30 minutes.

ANNEX 3: Advertising and Consultation on the draft decision

This section will report on the outcome of the public consultation on our draft decision.