

Natural Resources Wales permitting decisions

**Western Bio-Energy Limited
(Western Wood Energy Plant-
Margam) Decision Document**

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Permit Variation

The variation number is: PAN-011056
The permit number is: EPR/ZP3939GL/V005
The operator is: Western Bio-Energy Limited
The Installation is located at: Longlands Lane, Port Talbot, SA13 2NR

We have decided to issue the variation for Western Wood Energy Plant - Margam operated by Western Bio-Energy Limited.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

The variation sought to add 5 new waste types that could be used in combustion at the facility, and to implement Selective Non-Catalytic Reduction (SNCR) on the combustion plant. Alternative feedstocks are required for the electricity generating biomass combustion plant, in response to changing availability. SNCR is a technique that can be used to abate emissions of oxides of nitrogen (NO and NO₂, together referred to as NO_x). The plant has previously operated close to the emission limit for NO_x, and additional abatement is required in order to accommodate the additional waste types, which it was anticipated could otherwise result in an increase in NO_x emissions.

We have allowed the additional wastes proposed, having regard for possible environmental impacts. We have allowed the installation of SNCR for NO_x control, following receipt of information on proposed system commissioning, assessment of possible impacts of altered emissions to air (particularly on protected habitats), and having set monitoring requirements and an emission limit. These ensure that possible emissions to air of by-products of SNCR, Ammonia (NH₃) and Nitrous Oxide (N₂O) are minimised alongside NO_x abatement.

Purpose of this document

This decision document:

- explains how the application has been determined
- provides a record of the decision-making process
- shows how all relevant factors have been taken into account
- justifies the specific conditions in the permit other than those in our generic permit template.

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Key issues of the decision

Receipt and processing of application

Confidential information

A claim for commercial or industrial confidentiality has not been made.

We have not identified information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on commercial confidentiality.

Consultation

Consultation on this Normal Variation was not required.

Legislation

NRW is satisfied that this decision is compatible with its general purpose of pursuing the sustainable management of natural resources in relation to Wales and applying the principles of sustainable management of natural resources

All applicable European directives as implemented in domestic legislation have been considered in the determination of the application.

Biodiversity, Heritage, Landscape and Nature Conservation

The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat.

A full assessment of the application and its potential to affect the sites / habitats has been carried out as part of the permitting process. We consider that the application will not affect the features of the sites / habitats.

Emission limits

Emission limits have been placed on the permit to ensure that the impact of the installation on human health and the environment are insignificant:

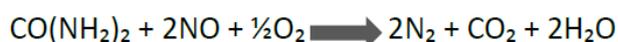
- An emission limit of 10 mg/Nm³ (at 6% oxygen) for ammonia has been set. This limit will be protective both of ambient concentrations of ammonia, but also of deposition of nutrient nitrogen and acid associated with ambient ammonia concentration and other nitrogen-containing species.

The Installation and Proposed Changes

Western Wood Energy Plant – Margam, is a biomass fuelled steam-raising plant which generates electricity using steam turbines. It has a rated input of 47.5 MW_{th} (equating to up to 160,000 tonnes per annum of biomass) and exports up to 14MW_e of electricity. It has a single travelling grate combustor unit for chipped fuel, and employs fabric filters for control of particulate emissions. The main emissions to air are oxides of nitrogen, carbon monoxide and particulate, released via a 55 m high stack. The fuel characteristics and composition means that air pollution control techniques for acid gases (such as SO₂ and HCl) are not required.

Until now, optimisation of primary combustion (such as combustion system and secondary air optimisation) was sufficient to control emission of other pollutants, including NO_x, therefore secondary measures such as catalytic or non-catalytic NO_x reduction were unnecessary. However, the plant has previously operated close to the daily NO_x emission limit of 250 mg/m³ (@6% O₂), and the operator now considers it necessary to implement SNCR for secondary NO_x control.

The SNCR system will inject aqueous urea (CO(NH₂)₂) into the combustion chamber at around 950° - 1000° C, controlling NO_x according to the chemical reaction below, whereby NO is reduced to N₂ (nitrogen):



The proposed SNCR system is supplied by the company that provided the boiler, therefore ensuring compatibility of the equipment and technique. While SNCR reduces NO_x, unwanted additional emissions of ammonia can result from the breakdown of urea, if it is not all used in the reduction of NO according to the reaction above; so-called “ammonia slip”. Therefore optimisation of the SNCR system involves obtaining maximum NO reduction, while minimising excess urea. Similarly, N₂O can form from a side reaction in the SNCR system, particularly at higher temperature and with higher urea usage. Once again system optimisation is required during

commissioning and ongoing operation to minimise impact from all possible emitted pollutants.

The plant is subject to the Industrial Emissions Directive (IED) Chapter 2, as it carries out an activity listed in Annex I, namely “Disposal or recovery of waste in waste incineration plants or in waste co-incineration plants: (a) for non-hazardous waste with a capacity exceeding 3 tonnes per hour”. As such, it is required to apply best available techniques (BAT) and we as regulator are required to ensure that BAT is applied. However, as the plant only burns biomass, as defined in IED article 3(31)b, then the plant is not subject to IED Chapter IV for waste incineration plants and waste co-incineration plants, as Article 42(2)a(i) excludes such plant from the requirements.

Similarly, while the plant is required to apply BAT, the operation does not fall directly within the scope of any one BAT reference (BREF) document, and therefore under Article 14(6) Natural Resources Wales as competent authority, must determine BAT for the process. In determining the permit variation, we have therefore made primary reference to the Waste Incineration BREF (but recognising its requirements may be more onerous than is appropriate for this facility), and also to:

- the Large Combustion Plant BREF (but recognising the plant capacity is lower)
- The Waste Treatment BREF
- Limits contained in the Medium Combustion Plant Directive (while recognising this is not strictly a BAT document)
- Environment Agency “Environmental permitting Technical Note 5/1(18)” draft reference document for the incineration / combustion of waste wood [in small waste incineration plant] (but recognising that the plant capacity is higher)

In response to changing market conditions and fuel availability, the operator has sought to add 5 further fuel types to their permitted waste fuel types. For further information see below – “The permit conditions – Waste types”. As a result of the proposed additional fuels, we asked the operator to re-assess, and confirm whether the plant was still correctly considered as a waste co-incineration plant, and not an incineration plant, according to our [guidance](#). We have reviewed the operators response and are satisfied that the plant remains a co-incineration plant whose main purpose is the generation of electricity.

Environmental Risk Assessment

Air

Application of Environment Agency guidance 'risk assessments for your environmental permit'

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in Environment Agency guidance 'Air emissions risk assessment for your environmental permit' and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media. It is usually considered at the point where the magnitude of the concentration is greatest. The methodology provides a simple method of calculating maximum PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC. In this case, the applicant has not chosen to calculate PC using a screening method, but instead has provided detailed air dispersion modelling from the outset.

Assessment of Impact on Air Quality using Air Dispersion Modelling

The Applicant's assessment of the impact of air quality is set out in the report "*Existing Biomass Power Plant, Margam - Installation of SNCR - atmospheric Dispersion Modelling of the Application*" (SLR Ref 110.05697.00010 Version No: Rev1, April 2020) which was submitted as part of the application, and in supplementary information "*Existing Biomass Power Plant, Margam - Installation of SNCR – Air quality response to the Schedule 5 Notification*" (SLR Ref 410.05697.00013 Version No: Rev1, March 2021), which was submitted in response to our Schedule 5 notice requiring further information. The overall assessment comprises:

- Dispersion modelling of emissions to air from the operation of the incinerator, including assessment of potential impact on human health.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites (*which was substantially updated in the additional information provided*).

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the incinerator chimney and its impact on local air quality. The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon human health and ecological receptors. These assessments predict the potential effects on local air quality from the Installation's stack emission.

The air impact assessments, and the dispersion modelling has been based on the Installation operating continuously at the relevant long-term emission limit values, i.e. the maximum permitted emission rate. Once PCs have been calculated using dispersion modelling, they are compared with relevant Environmental Standards (ES).

As the installation is already operating, and the majority of Emissions and Emission Limit Values (ELV) are unaltered, it is therefore unnecessary to re-model these emissions, which have previously been fully assessed. Therefore in this instance, the operator has only modelled emissions which are changing and which have an ES, i.e. ammonia (NH₃), and, for the purposes of determining the resultant effect on nutrient nitrogen deposition (primarily associated with ammonia in this case), then also the continuing emissions of NO_x and SO₂. For the purposes of modelling, it is assumed that ammonia emissions before the introduction of SNCR were zero, an approach

which we accept as we would expect emissions from combustion without NO_x abatement with urea or ammonia to be negligible.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably precautionary. The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by Natural Resources Wales to establish the robustness of the Applicant's air impact assessment.

It is noted that while N₂O is a potential emission from the process, it has no ES, because it does not cause a significant localised effect, and instead is important globally as a greenhouse gas. It is not therefore relevant in impact assessment via dispersion modelling and is discussed elsewhere in this document.

The relevant ES for ammonia are:

- 180 µg/m³ annual limit (human health) Environmental Assessment Level (EAL)
- 2500 µg/m³ hourly limit (human health) Environmental Assessment Level (EAL)
- 1 µg/m³ annual limit (ecological protection) Environmental Standard -

As shown the ecological standard is significantly lower than for protection of health, but there is no short term limit for ecological protection. ES are described further in the Environment Agency web guide 'Air emissions risk assessment for your environmental permit'. Further information is provided in the section below on environmental standards which only apply to habitats and conservation sites, such as for nutrient nitrogen deposition.

Using standard criteria in guidance, PCs are screened out as Insignificant if the long-term process contribution is less than 1% of the relevant ES; and the short-term process contribution is less than 10% of the relevant ES.

The long term 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;

- The threshold provides a substantial safety margin to protect health and the environment.

The short term 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider that the Applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant. However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedances of the relevant ES are likely. This is done through detailed audit and review of the Applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of an AAD limit value is identified, we may require the Applicant to go beyond what would normally be considered BAT for the Installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedances are considered likely, the application is subject to the requirement to operate in accordance with BAT.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on

local air quality from the Installation's stack emissions using the AERMOD (version 18081) dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model in the original application used 5 years of meteorological data collected from the weather station at St Athan between 2009 and 2013. This is the closest available weather station, and is near the coast, as is the installation. We asked the applicant why more recent data was not used, and rather than providing a detailed explanation they provided updated the modelling using meteorological data from 2015-19. We accept this approach, and note the high level of consistency between the original and updated modelled results. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following assumptions.

- First, they assumed that the ELV for Ammonia (NH₃) would be 10 mg/m³ (@10% O₂), which is the performance guarantee level indicated in the application.
- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate.

We are in agreement with this conservative approach. The assumptions underpinning the model have been checked and are reasonably precautionary.

Background ammonia data has been obtained for Castle Cary, a rural background monitor about 98km from the installation. The applicant did look for data from closer sources, such as Neath Port Talbot Borough Council, but although they monitor a range of pollutants, ammonia is not monitored. Castle Cary is the second closest monitor, as ammonia is not monitored at a large number of locations, and gives a higher background than the closest, Narbeth (about 70km from the installation). Although industrial operations can be sources of ammonia (in this instance, the nearby steelworks being of relevance), it is estimated that 89% of atmospheric ammonia comes from agriculture ([Ammonia | Air Pollution Information System \(apis.ac.uk\)](https://apis.ac.uk)). In considering whether the background data was appropriate, we looked at National Atmospheric Emissions Inventory (NAEI) data, which indicated that use of Castle Cary data is a precautionary approach, as modelled ammonia sources there are higher than

in the vicinity of the installation ([UK Emissions Interactive Map \(beis.gov.uk\)](https://beis.gov.uk)). This background was used for human health ES; habitat specific backgrounds were used for protected ecological sites, as explained below.

As well as calculating the peak ground level concentration, the Applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area, representing impacted human and ecological receptors.

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by Natural Resources Wales to establish the robustness of the Applicant's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites. Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions, unless specifically noted otherwise.

The Applicant's modelling predictions are summarised in the following sections.

Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predictions for ammonia are as follows. The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. For screening purposes, and with reference to the human health ES we have conservatively assumed that the maximum concentrations occur at the location of receptors. Data presented in the applicant's reports indicates that modelled impact at receptors is equivalent or lower in all cases.

Maximum Ground Level Concentration of ammonia, annual mean:

(2009-13 meteorological data)

- PC 0.05 µg/m³ NH₃, 0.03% of ES
- PEC 4.36 µg/m³ NH₃, 2.42% of ES

and (2015-19 meteorological data)

- PC 0.06 µg/m³ NH₃, 0.03% of ES
- PEC 4.37 µg/m³ NH₃, 2.43% of ES

Maximum Ground Level Concentration of ammonia, hourly average:

(2009-13 meteorological data)

- PC 7.36 $\mu\text{g}/\text{m}^3$ NH_3 , 0.29% of ES
- PEC 16.0 $\mu\text{g}/\text{m}^3$ NH_3 , 0.64% of ES

and (2015-19 meteorological data)

- PC 7.09 $\mu\text{g}/\text{m}^3$ NH_3 , 0.28% of ES
- PEC 165.07 $\mu\text{g}/\text{m}^3$ NH_3 , 0.63% of ES

From the data above the emissions of ammonia can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES, with respect of standards for human health. Predicted process contributions are substantially below the significance threshold, giving a high degree of confidence in the conclusions.

Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation subject to the review referred to below.

Consideration of Local Factors

It is noted that while the immediate surrounding of the site is relatively flat, as is land to the west, ground level rises steeply to the north-east of the site from approximately 9m above ordinance datum to approximately 210m within 1.3 km of the site. This has the potential to affect dispersion modelling significantly, but is accounted for in the modelling, which considers topography.

Neath Port Talbot Borough council has declared an Air Quality Management Area (AQMA) with respect to 24-hour mean PM_{10} particulate matter. The Taibach Margam AQMA is approximately 440m to the north of the installation at its nearest point. However, we consider that the proposed change, installation of SNCR, does not have the potential to significantly affect PM_{10} concentrations, and so is not relevant to this determination. Baseline PM_{10} emissions from the installation were considered when

the site was originally permitted. There is no AQMA declaration for ammonia or NO₂ in the vicinity, therefore no further consideration in respect of the AQMA is required.

Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.

The following sites, protected ecological sites have been considered. The principal potential impacts of the proposed Variation arise from the changed emissions to atmosphere, as described above and modelled by the applicant. During the determination, we asked the operator for more information on possible impacts on protected sites, via a Schedule 5 notice. We provided them with site-specific critical levels and loads, where we had more accurate information than was readily available in the public domain. These are used in the section below. Unless otherwise stated, figures below are derived from modelling using the 2015-19 meteorological data, as provided in our response to our Schedule 5 Notice requiring further information.

Sites Considered

The following sites protected under The Conservation of Habitats and Species Regulations 2017 (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) sites are located within 10Km of the Installation:

- Kenfig / Cynffig SAC (UK0012566) (“ER3” in application information)
- Glaswelltiroedd Cefn Cribwr / Cefn Cribwr Grasslands SAC (UK0030113) (“ER4” in application information)

The following Sites of Special Scientific Interest are located within 2Km of the Installation:

- Eglwys Nunydd Reservoir (“ER1” in application information)
- Margam Moors (“ER2” in application information)

The following non-statutory local wildlife and conservation sites are located within 2Km of the Installation:

- Eglwys Nunydd (local wildlife site boundary differs from SSSI listed above)
- Junction 38 Wetland Complex
- Margam Country Park
- A large number (32) of discrete areas of ancient and other woodland (some of which are within Margam Country Park, and others of which form continuous areas of woodland but with discrete blocks of designation).

Habitats Assessment

In light of the conclusions of an appropriate assessment, and taking account of the advice received from protected sites advisors, it has been established that the proposed plant conversion will have No adverse effect on site integrity of any Emerald Network site, taking into account any conditions or restrictions as applicable, either alone or in-combination with other plans and projects. This is explained and documented in our habitats regulations assessment which is available separately.

The Operator provided information on potential impacts of the installation conversion on Emerald Network sites within a 10km screening distance, which enabled Natural Resources Wales to produce a Habitats Regulations Appropriate Assessment (HRA). Potential impacts of the existing permitted operation were unaltered from previous consented operation, so did not require re-assessment. Other potential impacts (e.g. disturbance, accidents) were also considered and were screened out from further assessment.

The table below shows the maximum ground level impact of aerial pollutants from the converted installation on the different Emerald Network sites, as predicted by detailed dispersion modelling.

Pollutant	ES / EAL ($\mu\text{g}/\text{m}^3$)	Background ⁽¹⁾	Process Contribution (PC) ⁽¹⁾	PC as a % of ES	“ In combination” process Contribution (ICPC) ⁽¹⁾	PC IC as a % of ES	Predicted Environmental Concentration (PEC) ⁽¹⁾	PEC as % ES
Kenfig / Cynffig SAC (ER3)								
Ammonia ($\mu\text{g}/\text{m}^3$)	1 ⁽²⁾	0.73	<0.01	0.1	0.009	1.0	0.74	74 ⁽³⁾
N Deposition (kg N/ha/yr)	8		0.01	0.09	0.062	0.87	-	-
Acidification (Keq/ha/yr) ⁽⁴⁾	<i>Min_{Cl}</i> <i>Max_N</i> 1.053	<i>0.6N +</i> <i>0.2S =</i> 1.1	<0.01	0.41	0.0114	1.7	0.075 ⁽⁵⁾	75
Glaswelltiroedd Cefn Cribwr / Cefn Cribwr Grasslands SAC (ER4)								
Ammonia ($\mu\text{g}/\text{m}^3$)	3	1.07	0.01	0.24	0.003	0.34	-	- ⁽³⁾
N Deposition (kg N/ha/yr)	15		0.05	0.36	0.025	0.53	-	-
Acidification (Keq/ha/yr) ⁽⁴⁾	<i>Min_{Cl}</i> <i>Max_N</i> 1.011	<i>0.9N +</i> <i>0.2S =</i> 1.1	0.03	3.11	0.0046	3.6	1.14	112.8
	<i>Max_{Cl}</i> <i>Max_N</i> 2.018	<i>0.9N +</i> <i>0.2S =</i> 1.1	0.03	1.56	0.0046	1.8	1.14	56.3
<p>(1) Units as given per table row.</p> <p>(2) The lichen and bryophyte sensitivity standard for ammonia has been assigned for this assessment as the presence of these features has been recorded in the site Management Plan for at least one of the sections of the site.</p> <p>(3) There was a minor anomaly in the additional information provided by the applicant (Table 3-4 etc). This was clarified by email dated 07/04/21.</p> <p>(4) The critical load figures for acid deposition are quoted as a range – from <i>Min_{Cl}</i> to <i>Max_{Cl}</i>, for each of three parameters (Max S, Min N and Max N). For screening purposes, the <i>Min_{Cl}Max_N</i> is used. For more detailed assessment, it may be appropriate to use the <i>Max_{Cl}Max_N</i>, and it has been confirmed appropriate in this case. For further explanation of the acid deposition parameters, see (apis.ac.uk – guide and apis.ac.uk – critical load tool).</p> <p>(5) Background value was not provided by applicant as they determined that the impact screened out against the <i>Max_{Cl}Max_N</i>. As explained above, our first assessment is against <i>Min_{Cl}Max_N</i>, so we obtained background value for consideration from APIS (apis.ac.uk). Figures in <i>italics</i> are therefore recalculated by NRW from applicant data.</p>								

Process contributions from the installation alone, other than acidification at Cefn Cribwr, can be considered insignificant, as all PCs are less than the 1% of long term ES threshold. The process contribution of acid deposition at Cefn Cribwr cannot be considered insignificant as it exceeds 1% of the long term ES, and is considered further below.

Consideration of the possible effect of the installation “in combination” with other permissions, plans and projects is also required under legislation, and was done by adding In combination process contributions (PCICs) from other relevant projects identified by the operator in order to determine the overall PEC, as shown in the table above. The only other development identified which may not be fully accounted for in background data, is the nearby Margam Green Energy Plant (Longlands Lane, Margam, Port Talbot, SA13 2SU). This plant began operation in 2018, so will be partly included in background data; thus including it as a separate process contribution represents a conservative approach. The total PCIC was <1% for nutrient nitrogen deposition, and for ammonia at Cefn Cribwr. However, because PCIC was >1% for ammonia at Kenfig, and for acid deposition at both Cefn Cribwr and Kenfig, the proposed activity “in combination” could not be considered insignificant and is considered further below.

For the PC and in combination PCICs which did not screen out as insignificant, the PEC was also considered. The PEC for ammonia at Kenfig was below 100% of the ES, as predicted by detailed modelling (74%). The PEC for acid deposition was also below 100% of the Min_CMax_N (used for screening) at Kenfig on the basis of detailed modelling (75%). Acid deposition PEC for Cefn Cribwr was 113% of the Min_CMax_N used for screening, so further assessment was required. Expert advice was sought from within NRW, which was that the Max_CMax_N could be used for the appropriate assessment, as shown in the table above, for which the PEC was 56.3% of the ES. It was therefore concluded that while the proposed project, including in-combination assessment, could not be considered to have “no likely significant effect”, it could be concluded that the project would have no adverse effect on site integrity, either alone, or in combination with other projects.

It is noted that the air quality impacts predictions shown in the table are based on the applicant’s proposed “beyond BAT” lower ammonia ELV of 10 mg/Nm³ @6% O₂. (see above). This was proposed as site-specific BAT by the applicant, as the expected guaranteed performance level of the SNCR equipment proposed. It is not considered “mitigation” for the Emerald Network sites, but rather intrinsic to the project specification.

The Habitats assessment was reviewed by Natural Resources Wales' protected sites technical specialists, who agreed with the assessment's conclusions that there would be no adverse effect on site integrity.

SSSI Assessment

In light of the conclusions of an "Appendix 4" assessment required under the Countryside and Rights of Way Act 2000, and taking account of the advice received from protected sites advisors, it has been established that the proposed plant conversion is not likely to damage any SSSI, taking into account any conditions or restrictions as applicable. This is explained and documented in our Appendix 4 assessment which is available separately and summarised below.

The Operator provided information on potential impacts of the installation conversion on SSSIs within a 2km screening distance, which enabled Natural Resources Wales to produce an Appendix 4 assessment. The main issue considered was the emissions to air from the main stack, and potential impact on SSSIs. Potential impacts of the existing permitted operation were unaltered from previous consented operation, so did not require re-assessment. Other potential impacts (e.g. disturbance, accidents) were also considered and were screened out from further assessment.

The table below shows the maximum ground level impact of aerial pollutants from the converted installation on the relevant SSSIs, as predicted by detailed dispersion modelling.

Pollutant	ES / EAL (1)	Back-ground (1)	Process Contribution (PC) (1)	PC as % of ES	Predicted Environmental Concentration (PEC) (1)	PEC as % ES
Eglwys Nynydd Reservoir SSSI (ER1)						
Ammonia ($\mu\text{g}/\text{m}^3$)	Not sensitive					
N Deposition (kg N/ha/yr)	Not sensitive (2)					
Acidification (Keq/ha/yr)	Not sensitive (2)					
Margam Moors SSSI (ER2)						
Ammonia ($\mu\text{g}/\text{m}^3$)	3	-	<0.01	0.1	-	-
N Deposition (kg N/ha/yr)	20-30	-	0.02	0.12	-	-
Acidification (Keq/ha/yr) (3)	<i>Min_{Cl}</i> <i>Max_N</i> 2.8	-	0.01	<i>0.49</i>	-	-
<p>(1) Units as given per table row.</p> <p>(2) The SSSI is listed for wintering wildfowl and is not considered directly sensitive to aerial pollutants. In a broader sense, the site is protected by application of BAT to permitted installations of this type.</p> <p>(3) The critical load figures for acid deposition are quoted as a range – from <i>Min_{Cl}</i> to <i>Max_{Cl}</i>, for each of three parameters (Max S, Min N and Max N). For screening purposes, the <i>Min_{Cl}Max_N</i> is used. For further explanation of the acid deposition parameters, see (apis.ac.uk – guide and apis.ac.uk – critical load tool). Figures in <i>italics</i> are therefore recalculated by NRW from applicant data, as they made initial assessment against <i>Max_{Cl}Max_N</i>.</p>						

Emissions from the installation can be considered insignificant, as all PCs are less than the 1% of long term ES threshold.

The Operator's assessment was used by Natural Resources Wales Permitting Service to prepare an Appendix 4 assessment potential impact of the proposed plant conversion on SSSIs. This was reviewed by the Natural Resources Wales' protected sites technical specialists, who agreed with the assessment's conclusions, that the proposal is not likely to damage the special features of the SSSIs. This decision was taken in accordance with our guidance, and following consultation with relevant NRW specialists.

Assessment of other conservation sites

Conservation sites are protected in law by legislation. The Habitats Directive provides the highest level of protection for SACs and SPAs, domestic legislation provides a lower but important level of protection for SSSIs. Finally the Environment Act provides more generalised protection for flora and fauna rather than for specifically named

conservation designations. It is under the Environment Act that we assess other sites (such as local wildlife sites) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other International and national legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites, that they are not of considerable importance. Local sites link and support EU and national nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs SPAs and Ramsars we consider the contribution PC, the background levels and the "in-combination" effects of other potential plans and projects in making an assessment of impact. For SSSIs we consider the contribution PC and the background levels in making an assessment of impact. In assessing other sites under the Environment Act we look at the impact from the Installation alone in order to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Emerald Network or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC SPA and SSSI features are more stringent than those for other nature conservation sites. Therefore we would generally conclude that the Installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the Operator is using BAT to control emissions. The table below shows pollutant process contributions to other conservation sites calculated by the Operator.

Pollutant	ES / EAL (1)	Process Contribution (PC) (1)	PC as % of ES
Ancient woodland x32 discrete designations as identified with the Operator (ER5) (2)			
Ammonia (µg/m ³)	3	0.05	1.8
N Deposition (kg N/ha/yr)	5-15	0.70	14
Acidification (Keq/ha/yr)	MinCl MaxN 1.856	0.52	28
Junction 38 wetland complex LWS (ER6)			

Pollutant	ES / EAL (1)	Process Contribution (PC) (1)	PC as % of ES
Ammonia ($\mu\text{g}/\text{m}^3$)	Not sensitive		
N Deposition (kg N/ha/yr)	10-15	0.18	1.8
Acidification (Keq/ha/yr)	Min _{Cl} MaxN 2.8	<i>0.13</i>	<i>4.7</i>
Eglwys Nunydd LWS (ER7)			
Ammonia ($\mu\text{g}/\text{m}^3$)	Not sensitive		
N Deposition (kg N/ha/yr)	10-15	0.05	0.46
Acidification (Keq/ha/yr)	Min _{Cl} MaxN 2.8	<i>0.03</i>	<i>0.9</i>
Margam Park LWS (ER8)			
Ammonia ($\mu\text{g}/\text{m}^3$)	1	0.04	4.4
N Deposition (kg N/ha/yr)	5-15	0.34	6.8
Acidification (Keq/ha/yr)	Min _{Cl} MaxN 1.856	<i>0.20</i>	<i>10.6</i>
<p>(1) Units as given per table row.</p> <p>(2) It is noted that the assessment of impacts at ecological receptor ER5 is based upon the maximum predicted ground-level concentration / PC at any location across the considered 32 ancient woodland designations. This is for simplicity/brevity, rather than list 31 other ancient woodland sites, where the predicted impact is lower.</p> <p>(3) The critical load figures for acid deposition are quoted as a range – from Min_{Cl} to Max_{Cl}, for each of three parameters (Max S, Min N and Max N). For screening purposes, the Min_{Cl}MaxN is used. For further explanation of the acid deposition parameters, see (apis.ac.uk – guide and apis.ac.uk – critical load tool). Figures in <i>italics</i> are therefore recalculated by NRW from applicant data, as they made initial assessment against Max_{Cl}MaxN.</p>			

While most of the the PCs are >1% and we cannot therefore conclude that impacts are insignificant, the PCs are below the critical levels or loads. We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further below.

Emission limits

We have decided that emission limits should be set for the parameters listed in the permit.

The following additional substance has been identified as being emitted in potentially significant quantities and an ELV has been set for this substances.

- Ammonia: 10 mg/m³ (@6% O₂).

It is considered that the ELV will ensure that significant pollution of the environment is prevented and a high level of protection for the environment secured. As explained below we have imposed a stricter ELV than BAT as a precautionary measure following information from the operator that such a lower limit is technically achievable and to ensure the protection of habitats receptors (for ammonia and nutrient nitrogen deposition), as this emission concentration was the basis of impacts modelling undertaken.

Consideration was given to the need for an ELV for N₂O. With reference to BAT, the magnitude of expected emissions, and the predominantly global rather than local impact of the pollutant, we have determined that an ELV is not required. However, we have set a requirement for periodic monitoring of the pollutant (see below) to ensure that emissions remain in control, and could take further regulatory action if indicative performance expectations are not met.

Monitoring

We have decided that monitoring should be carried out for the parameters listed in the variation notice, using the methods detailed and to the frequencies specified.

Additional air emission monitoring requirements have been imposed in order to ensure that the ELV for ammonia is not exceeded, and that the expected performance in respect of N₂O is achieved.

Note that while the format of Table S4.1 has been updated, and various footnotes etc amended for clarity, none of the emission limits or monitoring requirements other than metals (Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)) has been changed by this variation. The requirement to measure the metals identified above was added, with the agreement of the operator, to correct an historic anomaly in the permit, whereby monitoring was expected, and had been conducted routinely, but was missed from the originally issued permit. For all periodic monitoring, required frequency has been clarified in the table as Bi-annual. This reflects the decision recorded in the permitting history (CAR_NRW0022682, 21/06/16) to change frequency from 3-monthly to “as once every 6 months”.

Process monitoring has been updated. The operator has agreed that residue testing will be undertaken, to ensure that the proposed new waste types do not result in a significant change to the residue quality. The wording of the requirements for residue testing in table S4.4 has been amended to reflect this.

Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.

Reporting

We have specified additional reporting in the permit, to include annual reporting of urea usage. This is so that we can monitor utilisation and performance of the SNCR system.

We made this decision in accordance with the BREF for Waste Incineration, and our normal permitting practice for these and similar installations.

Fire Prevention and mitigation

Our Fire Prevention & Mitigation Plan Guidance (FPMP), GN16, applies to all permitted waste management operators to ensure on site fires are prevented. This includes installations which are permitted to receive combustible waste. Western Wood Energy Plant – Margam, did not previously have an FPMP as its existing permit pre-dated the FPMP requirement, and we have taken a phased approach to implementation.

Our guidance states that variations to existing permits will require an FPMP in order to add a new material, or include a new activity, or to increase the amount of waste materials stored at any one time.

The applicant did not submit an FPMP with their variation application. We did consider requiring submission and approval of an FPMP before we determined the variation. However, given that there was no new permitted activity, the amount of waste being stored is low and was not increasing, and the new wastes proposed were very similar

in character to existing wastes, we therefore have allowed an alternative approach. We have included an improvement condition (as shown in Annex 1), which requires that an FPMP be developed and submitted to Natural Resources Wales for approval within 6 months of the issue of the permit variation, and which then requires implementation of any required improvement actions within a further 12 months from such approval. We consider that this is a proportionate, risk-based approach in this case.

We have added our standard template permit conditions relating to Fire prevention to the permit, numbered 3.6 in the Variation Notice.

Odour, Noise and Fugitive Emissions

None of odour, noise or fugitive emissions are expected to change significantly as a result of the proposed variation. It is considered that existing implemented measures and conditions are sufficient to control any potential pollution. It is noted that the application includes the addition of a canopy over the existing bottom ash storage area. This is mainly for operator welfare and to improve working conditions, and will have negligible environmental impact.

Operating techniques and BAT assessment

We have reviewed the techniques used by the operator and compared these with the relevant BRefs and guidance notes. We are satisfied that appropriate techniques will be in place to ensure that only permitted wastes, including those added by this Variation, will be used in the process. We are also satisfied that appropriate techniques will be used to install, commission, and utilise the SNCR system for NO_x control, while limiting emissions of ammonia and nitrous oxide.

The proposed techniques and emission levels for priorities for control are in line with or exceed the benchmark levels contained in relevant BREFs and guidance and we consider them to represent appropriate techniques for the facility. We consider that the emission limits included in the permit reflect the BAT for the installation, as detailed below for the SNCR system.

When the original permit application was made, we accepted that primary NO_x control measures only were BAT. The original application noted that any benefit afforded by secondary NO_x control had to be considered against the side-effects of such a system, namely emissions of ammonia and the global warming gas nitrous oxide.

Given the historic NO_x emission level performance, and the expectation that proposed additional waste fuels could further increase NO_x formation, the operator has now proposed to install a selective non-catalytic NO_x reduction system (SNCR), and we accept this change in approach. The applicant has considered both SNCR and selective catalytic reduction (SCR) and justified the technique selection in a BAT assessment which they submitted with their Variation application.

We have assessed the proposed addition of SNCR, and consider that the abatement technique is BAT for the process and proposed fuels. In reaching this decision, we have considered that it will improve NO_x emissions performance while retaining the current daily ELV, and will concurrently minimise emission of, and impact from, side-effect pollutants nitrous oxide and ammonia. The applicant has submitted an H1 assessment showing that the generation of N₂O will have a limited global warming

potential (GWP) of 1752 tonnes per annum CO₂ equivalent, and air dispersion modelling of the impact of ammonia, which is discussed further below.

Our determination of BAT is based on an indicative performance of 10 mg/m³ for N₂O (@6% O₂), which will be subject to monitoring but not emission limit, and to an ELV for ammonia of 10 mg/m³ for NH₃ (@6% O₂), as explained above. The ammonia limit is considered to be going “beyond BAT” performance with reference to the WI BREF, which specifies a BAT associated emission level (BAT-AEL) of 22.5 mg/m³ for NH₃ (@6% O₂), and is based on performance guarantees offered by the technology provider and the operator. It is also better than the performance indicated in the LCP BREF for larger but otherwise comparable combustion plant than Margam (noting that lower limits are usually associated with larger plant).

Our determination of BAT is also based on the existing NO_x ELV of 250 mg/m³ (@6% O₂), which we consider BAT for this process, having regard for a number of potentially relevant BAT emission levels for NO_x from the combustion of solid fuels, which range from 225 mg/m³ (existing plant, 2019 WI BREF) to 650 mg/m³ (MCPD directive), and are generally in the range 225-275 for broadly similar plant (all @6% O₂). We do not consider it reasonable to implement the WI BAT-AEL of 225 mg/m³ in full, given both the technical differences between this plant and one subject to the full requirements of IED Chapter IV and the WI BREF, and the significantly higher BAT values for some other combustion processes which are similarly relevant references. We will, however, consider emissions performance against current limits, in any future permit review, in assessing whether lower ELVs can be achieved.

We have required information on the proposed commissioning of the SNCR system as part of our permit determination, and found plans to be satisfactory in protecting the environment during the changes. We have included an Improvement Condition in the variation notice to report on the commissioning and optimisation of the SNCR system, as detailed in Annex 1.

The permit conditions

Updating permit conditions variation

We have updated some previous permit conditions to those in the new generic permit template where these required review as part of variation determination. The new conditions have similar meaning to those in the previous permit.

The operator has agreed that the new conditions are acceptable in an email dated 20/04/21 which is saved on our document management system.

Waste types

We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility. The following additional wastes are permitted as a result of this variation – further detail is given in the Permit Variation Notice Table S3.2:

Waste code	Description
02 03 04	Materials unsuitable for consumption or processing that are exempt from the requirements of Chapter IV of the Industrial Emissions Directive 2010/75/EU.
03 01 99	Wastes not otherwise specified that are exempt from the requirements of Chapter IV of the Industrial Emissions Directive 2010/75/EU. (Non-hazardous waste wood fibre and pellets only.)
19 05 01	Non-composted fraction of municipal and similar wastes that are exempt from the requirements of Chapter IV of the Industrial Emissions Directive 2010/75/EU. (Oversize arboricultural cuttings removed from pre-composting collections, consisting of non-hazardous virgin wood only.)
20 01 38	Wood other than that mentioned in 20 01 37 that is exempt from the requirements of Chapter IV of the Industrial Emissions Directive 2010/75/EU.

We are satisfied that the operator can accept these wastes for the following reasons:

- The wastes are all “excluded” biomass as defined in article (3)(31)(b) of the industrial emissions directive.
- They are similar in characteristics to previously permitted wastes.
- Additional clarification has been provided as to the nature / limitations of waste under certain codes, particularly with respect to the “99” code.
- SNCR will also be introduced, to control NO_x emissions, which it is anticipated may otherwise increase as a result of the additional wastes combusted.
- Other than this, no new or significantly increased environmental risks have been identified as a result of the additional waste materials.

We have excluded the wastes code 02 01 99 because, during determination and in response to our questions, the applicant determined that waste code 19 05 01 was in fact more appropriate, and in effect withdrew their application for the 02 01 99 code. The proposed waste material (Oversize arboricultural cuttings removed from pre-composting collections, consisting of non-hazardous virgin wood only) is permitted to be used. We have included the waste code 03 01 99 which was originally requested (“Non-hazardous waste wood fibre and pellets only”) as, although the applicant has subsequently identified that already permitted code 03 01 05 was suitable, given the apparent ambiguity, we consider it appropriate to allow whichever code may be relevant in the specific instance. We have disregarded the applicants request to add code 19 12 07 as it was already permitted (without further restriction) by previous Variation Notice V004.

We made these decisions with respect to waste types with reference to our guidance, including the BRef for waste incineration, and draft Environmental Permitting Technical Note 5/1(18) for incineration/combustion of Waste wood, 2018. It is noted that certain of the permitted EWCs would not be allowed for Small waste incineration plant, but these are justified in this specific instance, given the additional controls on the plant as delivered through the bespoke environmental permit.

Improvement conditions

Based on the information on the application, we consider that we need to impose improvement conditions. Details of the improvement conditions used can be found at Annex 1, and include one condition relating to the commissioning of the SNCR system, and one relating to the fire prevention and mitigation plan as detailed above.

OPRA

The OPRA score at permit issue is 116. Revised OPRA charging sheet issued with variation documents.

ANNEX 1: Improvement Conditions

Table S1.3 Improvement programme requirements

Reference	Requirement	Date
IC9	The Operator shall submit a written report to Natural Resources Wales for approval describing the commissioning, optimisation and performance of the Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NO _x), while limiting emissions of N ₂ O and NH ₃ . The report shall summarise the environmental performance of the SNCR system as installed against the design parameters set out in the Variation Application. The report shall include an assessment of the measured level of NO _x , N ₂ O and NH ₃ emissions that can be achieved under optimum operating conditions, and refer to Emission limit values specified in the Permit and performance levels indicated in the variation application. The report shall also include details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 6 months of the completion of commissioning of the SNCR system
IC10	<p>The Operator shall submit a Fire Prevention and Mitigation Plan (FPMP) to Natural Resources Wales for approval. The FPMP shall meet the requirements of Natural Resources Wales Guidance Note 16 and shall cover all wastes used on site, and shall also include a proposed timetable for implementation of any improvement actions identified as necessary.</p> <p>If required by Natural Resources Wales, the operator shall submit further revisions to the FPMP, and/or responses to specific questions, for approval, within a time required by Natural Resources Wales.</p> <p>The operator shall implement any improvement actions identified as necessary according to a timetable set or approved by Natural Resources Wales, and in any case within 12 months of approval of the FPMP. If necessary, the Operator shall submit an updated Fire Prevention and Mitigation Plan (FPMP) to Natural Resources Wales for approval on completion of these works</p> <p>The improvement condition will be considered complete when any required improvements are completed, and a final FPMP approved by Natural Resources Wales</p> <p>https://naturalresources.wales/permits-and-permissions/environmental-permits/guidance-to-help-you-comply-with-your-environmental-permit/?lang=en</p>	<p>FPMP to be submitted within 6 months of permit variation V005</p> <p>Improvements (if required) to be completed to approved timetable and at least within 12 months of approval of the FPMP.</p> <p>Revised FPMP (if required) to be completed within 3 months of completion of improvements</p>