Natural Resources Wales permitting decisions

Bespoke variation and consolidation

We have decided to issue the variation for Cardiff Energy Recovery Facility operated by Viridor Waste Management Limited.

The variation number is EPR/LP3030XA/V002.

Consolidation number is EPR/LP3030XA.

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.

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.

Structure of this document

- Key issues
- Annex 1 the decision checklist
- Annex 2 the consultation, web publicising and newspaper advertising responses

Key issues of the decision

Overview of the changes made

A variation application was received from Viridor Waste Management Limited for the Cardiff Energy Recovery Facility, permit number EPR/LP3030XA on 4th March 2014 and Duly Made on 20th March 2014. The variation addresses changes made during the final design phase. These are;

1) The design point for the facility has been changed from 22 tonnes per hour per stream at a net calorific value (NCV) of 9.3 MK/kg to 22.96 tonnes per hour per stream at a NCV of 10.03 MJ/kg, and the operating envelope has been widened. This increases the flexibility of the facility to respond to changes in waste composition through its operating life.

   The annual throughput has not changed and will remain at 350,000 tonnes.

2) The configuration of heating surfaces in the boiler has been changed, so that the evaporator and super heater sections are in a horizontal configuration, rather than a vertical configuration.

3) The recirculation system for air pollution control residues has been improved, which means that less lime is consumed and less residue is produced.

4) Some of the storage volumes for reagents and residues have been adjusted.

5) Change to the name of the facility.

6) Change in the monitoring reference period for carbon monoxide.

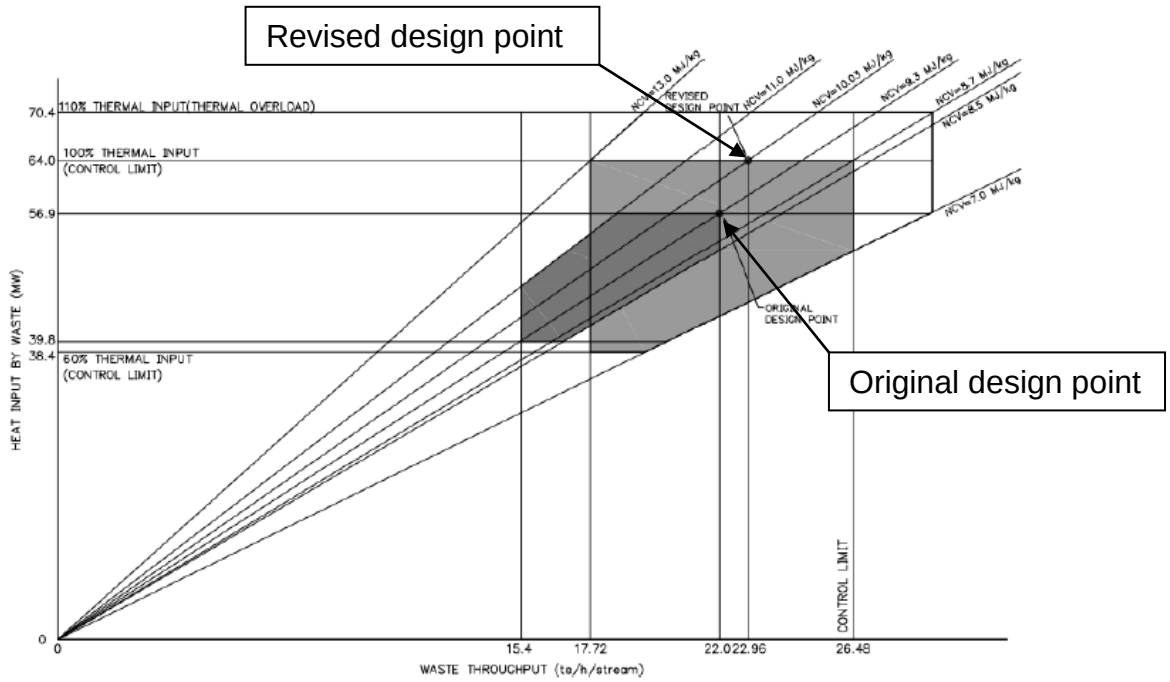
7) Amendment to improvement condition 4.

These changes generally improve the environmental performance of the facility. It is proposed that the facility will generate more electricity and operate more efficiently. It will also consume less lime and produce less hazardous waste. The permit has also been consolidated with associated conditions incorporated into the permit that have arisen from the Industrial Emissions Directive coming into force.

1) The design point

The firing diagram has been revised as a result of the final design. Figure 1 below has the original and revised design points.

Figure 1: Original and revised design point



The revision has been made in order to increase the flexibility of the facility to allow the treatment of wastes with a wider range of net calorific values (NCVs). This will help to ensure that the Facility will be more flexible in adapting to changes in waste composition during its operational lifetime.

Table 1: Overview of original and revised changes

Parameter	Original	Revised	Benefit
Lowest NCV value before the boiler thermal input has to be reduced	8.9 MJ/kg	8.7 MJ/kg	The Facility can process waste with a lower NCV without reducing the thermal input. This helps to maximise the efficiency, if waste with a low energy content is delivered to the Facility.
Highest NCV value before the boiler thermal input has to be reduced	11 MJ/kg	13 MJ/kg	The Facility can process waste with a higher NCV without reducing the thermal input. This helps to maximise the efficiency, if waste with a high energy content is delivered to the Facility.
Maximum continuous rating	9.3 MJ/kg 22 tph 56.8 MW (per line)	10.03 MJ/kg 22.96 tph 64 MW (per line)	The facility is now designed to more efficiently process waste at the expected NCV (10.03 MJ/kg).

The waste throughput of the Facility has been revised to 22.96 tph per line as this equates to 350,000 tpa at a predicted availability of 87% (7,620 hours per annum). The original figure of 22 tph per line equated to 350,000 tpa at an availability of 91.3%. Viridor considers that there is a risk that the facility will not achieve an availability of 91.3% over the long term and therefore operating at a higher throughput for a shorter period of the year provides additional flexibility for the facility.

The changes to the firing diagram, particularly the proposed increase to the thermal input and revised predicted NCV, help to increase the efficiency of the facility.

Table 2: Summary of the plant efficiency improvements

Parameter	Original design	Revised design
Net thermal input	56.8 MW per line 113.6 MW total	64 MW 128 MW total
Electricity Generation (no heat export)	30 MW	34.3 MW
Parasitic Load	4.46 MW (estimated)	5.1 MW
Electricity Export	25.54 MW	29.2 MW
Net efficiency	22.4%	22.8%

2) Boiler design

The original design for the boiler as submitted in the original permit application was for a vertical boiler. During the final design phase the preferred design was changed to that of a horizontal boiler design. The horizontal boiler has three vertical passes with water walls with a horizontal section with evaporators and super heaters and two vertical economiser sections.

The benefits of the horizontal design are that the horizontal sections of the boiler can be cleaned using a rapping system instead of steam, which reduces the parasitic heat load of the plant and therefore increases steam cycle efficiency and the super heaters are more easily maintained and replaced.

Examples of a vertical boiler and a horizontal boiler are shown over the page in Figure 1 and 2.

Figure 2: Example of a vertical boiler

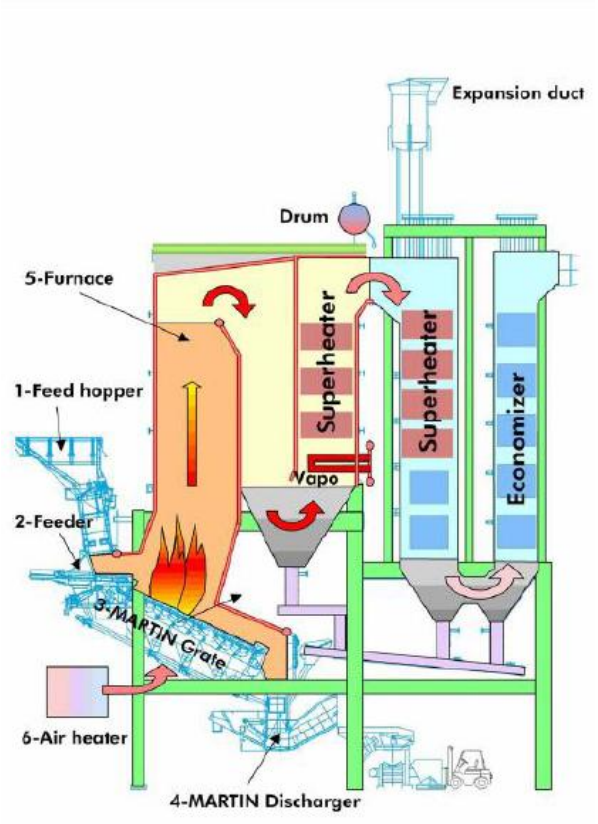
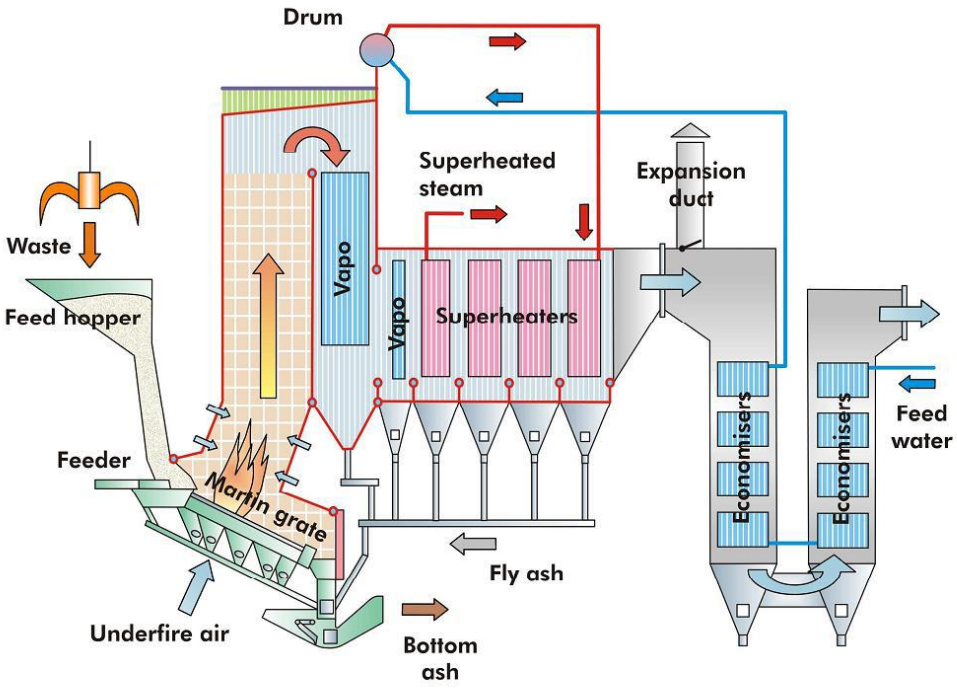


Figure 3: Example of a horizontal boiler



3) Recirculation system

The flue gas treatment design for the Facility has been revised to benefit from technological advances. The improvements in the design reduce the lime consumption and the amount of air pollution control residue (APCr) generated.

The lime consumption has remained at 250 kg/h. This is for a design throughput of 22.96 t/h of waste rather than 22 t/h of waste. The consumption per tonne has reduced from 11.36 kg/t to 10.88 kg/t.

The APCr generated has reduced from 770 kg/h to 746 kg/h. The generation of APCr per tonne has reduced from 35 kg/t to 32.5 kg/t.

The original design of the Facility included provision to recirculate ash and reagents from the bag filter through a buffer silo in which the ash and reagents would be maturated. The maturation process is intended to regenerate the reagents for further reuse. In the revised design, the recirculated ash and reagents are instead processed in a paddle mixer (the "ACTILAB") in which steam is used to regenerate the reagents. This is a much quicker and more effective process because of the mixing action and resulting increased rate of reaction.

4) Storage Changes

Storage changes have been made to the following:

Urea Storage
The Permit Application stated that urea prills would be stored on site in big bags up to approximately 100 m^3 in volume. During the detailed design phase of the project, it was determined that the urea prills would be more easily stored in a silo. The benefits of storing the urea in a silo include that:

(1) staff are not exposed to urea on a daily basis;

(2) staff do not have to handle big bags or transport them around the site; and

(3) the risk of spillages is significantly reduced.

The silo capacity is 50 m^3 and therefore the total quantity of urea stored on site is lower than that originally stated.

Lime Storage
The Permit Application stated that lime would be stored on site in two silos of a total capacity of 240 m^3. During the detailed design phase of the project, the silo design was changed to a single silo of a volume of 300 m^3. This is to provide sufficient storage for 7 days of operation and a full tanker delivery. This should mitigate any reagent supply issues which could force the plant to be shutdown unnecessarily.

Carbon Storage
The Permit Application stated that carbon would be stored in a silo of capacity of 75 m^3 or 80 m^3. During the detailed design phase of the project, the silo capacity was fixed at 80 m^3 as this is a standard size of silo closest to that stated in the original application.

APCr Storage
The Permit Application did not state the storage capacity of the APCr silo. Viridor confirm that two silos, each of 250 m^3 capacity, will be installed for the storage of APCr. The silos are designed to be large enough to support the plant for more than five days of operation in situations when tanker vehicles are unable to visit the site to remove the waste material.

Boiler Water Storage
The Permit Application stated that the boiler feedwater will be stored in two polyethylene tanks of 60 m^3 each. During the detailed design phase, this has been changed to one 115 m^3 The Permit Application stated that the boiler feedwater will be stored in two polyethylene tanks of 60 m^3 each. During the detailed design phase, this has been changed to one 115 m^3 plastic lined carbon steel tank to reduce the footprint of the water storage area.

5) Facility name change

The Operator has requested that the name of the facility be changed from Cardiff Energy from Waste Facility to Cardiff Energy Recovery Facility. This change has been made to the permit and associated documentation.

Assessment of best available techniques (BAT)

The following indicative BAT requirements have changed as a result of the variation application. The following tables has details of how the facility now meets the BAT requirements.

Boiler Design

BAT REQUIREMENT	BAT RESPONSE
Minimising dioxin production by boiler design and operation: Slow rates of combustion gas cooling should be avoided to minimise the potential for the de novo formation of dioxins and furans.	Flue gas cooling will take place within the three vertical passes of the boiler system, the horizontal section with the evaporator and superheater, and the two vertical economiser section. The first vertical chamber comprises the radiant combustion chamber with water walls. The 2nd and 3rd vertical passes include water walls and intermediate water walls. The horizontal pass comprises an evaporator bundle and four superheater bundles. There are two further vertical passes which include economiser bundles. The temperature of flue gases will drop from around 1000°C to 140°C across the boiler. Flow rates in the furnace will initially be low, to minimise ash carryover into the subsequent boiler passes. The reduction in

	the volume of exhaust gas in each pass results in an increase in the flow velocity through the boiler, thereby minimising the residence time at the critical dioxin formation temperature range.
The primary temperature zone of concern is between 450 and 200 °C. However dioxins will still be formed outside this range at a decreasing rate as the temperature moves further away from this core range (see Section 2.2.1.2 of the Guidance). Some references indicate that dioxin de novo synthesis may commence at temperatures as high as 600 °C.	The boiler will have a typical temperature profile as follows: • furnace outlet 900°C; • superheater inlet 700°C; • superheater outlet 420°C; and • economiser outlet 200°C. See below for further comments.
It should be stressed that the philosophy for dioxin control has its emphasis on preventing formation (rather than subsequent abatement) and, as one of the primary sites for formation, the design and operation of the waste heat boiler is important. The main techniques involve maximising the rate of decrease of gas temperature, which is achieved by: • ensuring that the steam/metal heat transfer surface temperature is a minimum (around 170 °C) where the flue gas is in the de novo synthesis temperature range, subject to acid dew point considerations • CFD is used to confirm that there are no pockets of stagnant or low velocity gas • boiler passes are progressively decreased in volume so that the gas velocity increases through the boiler, and • boundary layers of slow moving gas are prevented along the boiler surfaces.	As identified within the sector guidance for the Incineration of Waste (EPR5.01), there are a number of BAT design considerations required for the boiler. The boiler has been designed to minimise the formation of dioxins and furans as follows: Slow rates of combustion gas cooling will be avoided via boiler design to ensure the residence time is minimised in the critical cooling section and avoid slow rates of combustion gas cooling to minimise the potential for de-novo formation of dioxins and furans. The gas residence time in the critical temperature range will be minimised by ensuring high gas velocities exist in these sections. Additional NOx control measures up stream of the boiler and the residence time and temperature profile (between 450 and 200°C) of flue gas will be considered during the detailed design phase to ensure that dioxin formation is minimised throughout the process. Transfer surfaces will be above a minimum temperature of 170°C subject to other reaction considerations. Computational Fluidised Dynamics (CFD) will be applied to the design, where considered appropriate, to ensure gas velocities are in a range that negates the formation of stagnant pockets / low velocities. A copy of the CFD model will be supplied to the Environment Agency (now NRW) following detailed design and prior to commencement of commissioning. Boundary layers of slow moving gas along boiler surfaces have been prevented via design and a regular maintenance schedule to remove build up of any deposits that may have occurred. On-line surface cleaning will be by a combination of techniques including water washing and rapping. Facilities for explosive type cleaning have been installed.
A balance must be maintained, to ensure that these design measures are not made at the expense of a major effect on boiler efficiency.	The boiler is designed for optimal thermal efficiency, taking into account the requirements to minimise the potential for dioxin reformation

Minimising boiler deposits (which contain substances which catalytically enhance dioxin formation) is a problem with most wastes. Municipal waste, in particular, leads to deposits of sodium and potassium sulphates, and to a lesser extent chlorides. Fly ash can then adhere to these deposits to compound the problem. In the initial stages the material is easily removed by an on-line sootblower. As the fouling increases the deposits become fused and can only be removed off-line. Control methods include: • design features to maintain critical surface temperatures below the sticking temperature. This includes not only the arrangement of cooling surfaces, but also avoiding peak combustion temperatures by good waste mixing (where relevant) (see Section 2.1.1 of the Guidance), uniform waste feed (see Section 2.1.2 of the Guidance) and good primary and secondary air control (Section 2.1.4 of the Guidance) additives to prevent sodium and potassium depositing (mixed success) on-line cleaning by: – boiler tube rapping, by striking the tubes (limited success) or lifting and dropping whole banks of tubes (limited experience) – continuously allowing steel shot to fall through the tubes (applied successfully to economiser sections), and – steam or compressed air soot blowing, or • off-line cleaning.	A number of techniques are used to minimise boiler deposits. Design features to be incorporated include: • the boiler is designed large enough to provide low gas velocities and long gas residence times, allowing combustion gases to be fully burned out; • empty passes e.g. water walls with insignificant obstructions in the gas path, between the main furnace area and the heat-exchange bundles to allow gas temperature, and hence fly ash stickiness, to be reduced. • preventing boiler tube fouling by reducing the fly ash content of the flue-gases and allowing the temperature of the flue-gases to be reduced before coming into contact with the heat-exchange bundles; • maintaining critical surface temperatures below the sticking temperature of the particulate materials; • use of specific anti-corrosive alloy claddings such as inconel on boiler tubes to protect tubes from corrosion; • a design adapted to on-line cleaning; • optimal superheater design to provide a steady steam temperature with minimal cleaning; • easy access for inspection and maintenance of all pressure parts; and • on-line surface cleaning by a combination of water washing and rapping, facilities for explosive cleaning are also installed.
NOx reduction techniques may also help to minimise dioxin emissions (see Section 2.2.1.2 and Section 2.1.4.5 of the Guidance).	The design of the combustion system seeks to minimise NOx formation. Applied in combination with use of the proposed SNCR technique, which is based on dry urea prills, the de-NOx techniques may help minimise dioxin emissions.
Minimising releases to water from boilers: Boiler blow-down contains small amounts of solids plus water treatment chemicals – mainly phosphates with possibly small amounts of alkalis, hydrazine and ammonia used for pH control and de-aeration.	The boiler blow-down will be used as quench water for the bottom ash.
Water treatment and de-ionisation plant effluent usually comprise separate acid and alkali streams which are mixed together and pH adjusted for discharge. Soluble and suspended solids content will depend on the original water supply, be it towns water, river or estuary water. Soluble sulphates are also likely to be present from the use of sulphuric acid for regeneration of the ion exchange material. The presence of salts in the release should be considered.	Mixed water treatment and demineralisation regeneration water will be used as quench water for the bottom ash.

Wash water and cleaning solutions, containing for example citric acid, sodium hydroxide, alkali phosphates, iron oxides in suspension, hydrochloric or hydrofluoric acids, may be generated during maintenance. Complex toxic corrosion inhibitors may be present in these liquors.	Wherever possible, wash waters will be collected in the internal drainage system and returned to the main water reception pit for use in the ash quench. Effluent generated during maintenance that is heavily contaminated will be suitably isolated and stored prior to removal off-site by a licensed contractor.
All these liquors should be neutralised or treated on- or off-site to produce an acceptable waste before discharge or disposal to a licensed facility. Alternatively, it may be justified as BAT to incinerate these residues in the incinerator.	Where surplus liquors are generated that cannot be used in the bottom ash quench bath or as a furnace moderator, the surplus liquor will be taken off-site for treatment and disposal, either via a foul sewer connection agreed with Welsh Water or via a tanker.

Air quality assessment

An air quality assessment was submitted as part of the variation application. During NRWs assessment NRW questioned some of the assumptions made by the Operator. As a result NRW recommended the air quality assessment be revised and re-submitted taking the following into consideration:

- Some sensitive receptors were identified which were not included in the air quality assessment e.g. 125 Galleon Way (Dwelling, NGR 319510, 175125), The Conference Centre (319827, 175243), Transform Cosmetic Surgery (Unit 15 – 16, Vanguard Way, 320051, 175634), and Computer World (Vanguard Way, 320054, 175677).
- The maximum critical loads data set was used for assessment at Cardiff Beech Wood Special Area of Conservation (SAC).
- Short-term assessment at the half-hourly Industrial Emissions Directive (IED) Emission Limit Values (ELVs) had not been conducted.
- The average of 5 years of meteorological data had been used rather than the worst year predictions.
- A surface roughness of 0.5m for the meteorological station is not likely to be representative of cultivated land.
- The ‘urban’ option in AERMOD had been selected without full justification for the assumption.

The Applicant conducted further modelling and sensitivity analysis using BREEZE AERMOD (version 7.7) in order to address each of these issues in the Schedule 5 response. NRW have conducted check modelling using BREEZE AERMOD (version 7.9).

The Schedule 5 response gives the long-term and short-term Process Contributions (PCs) at the four additional receptors along with the maximum predicted impact in the grid. The Applicant’s predicted PCs at the four receptors are all less than 1%. NRW check modelling agrees with the Applicant.

The Applicant has assessed against the minimum acid critical load function at Cardiff Beech Wood SAC. They predict acid deposition PCs of less than 1%. NRW check modelling agrees with the Applicant.

The Schedule 5 response gives the short-term PCs at the IED half-hourly ELVs. The Applicant has made predictions for pollutants with a 1-hour standard or less i.e. NO_2, SO_2 (1-hour and 15-minute), TOC, HCl and HF. Their predicted PCs are all less than 10% of the short-term standards. NRW check modelling agrees with the Applicant.

The Schedule 5 response gives the Applicant's 5-year average and maximum of 5-years for short-term and long-term predicted PCs respectively. The tables demonstrate that although the maximums are higher than the average, the increase does not affect the conclusions of the assessment. NRW check modelling used the maximum from all years and sensitivity analysis runs and NRW agree with the Applicant's conclusions.

In the Schedule 5 response the Applicant presents the impacts of reducing the surface roughness at the meteorological site from 0.5m to that of a "typical airport setting" on predicted long-term and short-term NO_2 PCs. The Applicant's sensitivity analysis indicates a slight increase in to the long-term and short-term PCs, however these increase do not influence the outcome of the assessment. NRW check modelling agrees with the Applicant.

In the Schedule 5 response the Applicant presents the impacts of running AERMOD with and without the urban option. The Applicant's sensitivity analysis indicates that the long-term NO_2 PC increases slightly without the use of the urban option, while the short-term NO_2 PC decreases slightly. The Applicant's sensitivity analysis indicates sensitivity to the urban option is not likely to be significant enough to alter the outcome of the assessment. NRW check modelling agrees with the Applicant.

The increase in impacts from the variation compared to the previous air quality assessment conducted in 2008 are likely to be small and do not change the conclusions of the assessment. The Environmental Quality Standards (EQS') for air are not likely to be exceeded due to operations of the EfW facility.

The impacts from operations of the EfW facility are not likely to be significant at habitat and conservation sites when assessed against critical levels and critical loads.

Dioxins and furans intake from the emissions from the EfW facility are likely to be well below the COT TDI (Process Contributions (PCs) are less than 1% of TDI).

Human health risk assessment

The Applicant did not include a Human Health Risk Assessment for dioxins and furans in their permit variation application. A request for the Applicant to demonstrate that human exposure of dioxins and furans impact from all relevant exposure routes was requested in the Schedule 5. The Applicant included a revised HHRA with their Schedule 5 Response.

The Applicant used proprietary software IRAP-h View (version 4.0) for their assessment, which is based on the United States Environmental Protection Agency (US EPA) Human Health Risk Assessment Protocol (HHRAP). They used BREEZE AERMOD to calculate air concentrations and deposition rates from emissions from the facility.

The Applicant has used a US EPA congener profile for their dioxin and furan emissions. For the assessment the Applicant has made predictions against the Committee On Toxicity (COT) Tolerable Daily Intake (TDI) of 2pgWHO-TEQ/kg(BW)/day.

The Applicant has included 22 sensitive receptors. The receptors are a mixture of farm and residential. A receptor at the location of maximum ground level concentration was included as a farm receptor.

The ingestion of drinking water and locally caught fish pathways have been excluded from the Applicant's assessment. They state that: *"the local population does not obtain drinking water from local surface water sources"* and *"consumption of fish from local water bodies within 10km, as a result of either recreational or commercial fishing, is likely to be small (i.e. does not form a regular supplement in the diet) and infrequent."* Based on the location of the Applicant's assumptions are reasonable.

Dioxin-like PCBs have not been included in the Applicant's HHRA. The COT TDI is for dioxins, furans and dioxin-like PCBs. However, dioxin-like PCB emissions are small compared to dioxin and furans and dioxin-like PCB intakes are dominated by the consumption through the fish pathway. Since emissions are likely to be small and locally caught fish is unlikely to be a relevant exposure route in this case, dioxin-like PCBs intake is likely to be insignificant.

The Applicant predicts dioxin and furan intake PCs in the HHRA. At the locations of maximum concentration their predicted intakes are 8.58×10^{-4}pgWHO-TEQ/kg(BW)/day and 4.32×10^{-4}pgWHO-TEQ/kg(BW)/day for adult and child respectively. Their predictions are well below (less than 1%) of the COT TDI of 2pgWHO-TEQ/kg(BW)/day.

NRW have conducted screening checks using the maximum modelled concentration from all our BREEZE AERMOD check modelling and assumed all pathways (including water and fish) are sourced from this location. NRWs screening checks agree with the applicant, the intakes are likely to be less than 1% of the COT TDI.

Annex 1: decision checklist

This document should be read in conjunction with the application and supporting information and permit.

Aspect considered	Justification / Detail	Criteria met Yes
Consultation		
Scope of consultation	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.	✓
Responses to consultation, web publicising and newspaper advertising	The web publicising, consultation and newspaper advertising responses (Annex 2) were taken into account in the decision. The decision was taken in accordance with our guidance.	✓
European Directives		
Applicable directives	All applicable European directives have been considered in the determination of the application.	✓
The site		
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 identified ecological sites has been carried out as part of the permitting process. We consider that the application will not affect the identified sites as the applicant has demonstrated that there will be no significant increase to the process contributions, therefore the conclusions made as part of the original determination still stand.	✓
Environmental Risk Assessment and operating techniques		
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator's risk assessment is satisfactory. Please see the air quality section for details of the risk assessment undertaken.	✓

Aspect considered	Justification / Detail	Criteria met Yes
Operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes. The proposed techniques/ emission levels for priorities for control are in line with the benchmark levels contained in the TGN 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. Please see the BAT assessment section for further details.	✓
The permit conditions		
Updating permit conditions during consolidation.	We have updated previous permit conditions to those in the new generic permit template and as required from the Industrial Emissions Directive as part of permit consolidation. The new conditions have the same meaning as those in the previous permit(s). The operator has agreed that the new conditions are acceptable.	✓
Improvement conditions	Based on the information in the application, improvement condition 4 has been amended from: *The operator shall submit a written proposal to the Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission points A1 and A2, identifying the fractions within the PM10, PM2.5 and PM1.0 ranges. The proposal shall include a proposed timetable to carry out such tests and produce a report on the results.* *On receipt of written approval by the Agency to the proposal and timetable, the operator shall carry out the tests and submit to the Agency a report on the results.* To; *The operator shall submit a written proposal to Natural Resources Wales to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission points A1 and A2, identifying the fractions within the PM10 and PM2.5 ranges. The proposal shall include a proposed timetable to carry out such tests and produce a report on the results.* *On receipt of written approval by Natural Resources Wales to the proposal and timetable, the operator shall carry out the tests and submit to Natural Resources Wales a report on the results.*	✓

Aspect considered	Justification / Detail	Criteria met Yes
	This condition currently requires Viridor to submit a proposal to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from the emission points A1 and A2, identifying the fractions within the 10 micron range (PM10), the 2.5 micron range (PM2.5) and the 1.0 micron range (PM1). Environment Agency Technical Guidance Note (Monitoring) M15 Version 2 (July 2012) is the main source of guidance available to process operators on how to undertake stack emissions monitoring for particulate matter. In the foreword to M15, it is stated that "This note does not discuss quantifying the mass concentration of particulate matter with a diameter of less than 1 micron (PM1) because a practical stack emissions monitoring technique is not available". The current approved method for measuring sized particulate matter in stack gases is EN ISO 23210. This method utilises the same equipment as detailed in the general particulate sampling standard EN 13284-1, apart from the presence of the PM10 and PM2.5 cascading impactor. Sampling equipment to separately measure the PM1 size fraction is not available at this time. Therefore, the PM1 fraction will be measured as part of the PM2.5 fraction measurements within the stack gases. In light of these technical limitations on the methods available for measuring the PM1 size fraction in stack gases, the condition has been amended to remove the requirement to measure PM1 in our exhaust gas emissions.	
Pre operational conditions	All pre operational conditions have been completed and therefore removed from the permit.	
Incorporating the application	We have specified that the applicant must operate the permit in accordance with descriptions in the application, including all additional information received as part of the determination process. These descriptions are specified in the Operating Techniques table in the permit.	✓

Aspect considered	Justification / Detail	Criteria met
		Yes
Monitoring	Monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified. However as part of IED states; Paragraph 1.1 (d) of Part 8 of Annex VI to the Industrial Emissions Directive states that: *"The emission limit values for air shall be regarded as being complied with if ... for carbon monoxide, in case of waste incineration plants:* *- At least 97% of the daily average values over the year do not exceed the emission limit value set out in point 1.5 (a) of Part 3 [50 mg/m3); and* *- At least 95% of all 10 minute average values taken in any 24-hour period or all of the half-hourly average values taken in the same period do not exceed the emission limit values set out in points 1.5 (b) and (c) of Part 3. [100 mg/m3 as half-hourly average value and 150 mg/m3 as 10 minute average value]"* The reference period has been changed from half hourly to the 10 minute average value. This is because it is possible for a very short term peak in carbon monoxide concentration, which can occur if there is a brief disturbance in combustion conditions, to lead to an exceedence of the half-hourly average although the environmental and health impact of a short term peak is completely negligible. If the emission limit is changed to being based on 95% compliance with the 10 minute average limit, occasional short term peaks would not lead to reportable events.	✓
Operator Competence		
Environment management system	There is no known reason to consider that the operator will not have the management systems to enable it to comply with the permit conditions. The decision was taken in accordance with RGN 5 on Operator Competence.	✓

Annex 2: Consultation, web publicising and newspaper advertising responses

Summary of responses to consultation, web publication and newspaper advertising and the way in which we have taken these into account in the determination process.

Responses received from members of the public	
Brief summary of issues raised:	Summary of action taken / how this has been covered
At an EPR license revision, there is opportunity for NRW to review the current license and upgrade it to accord with current information. This is particularly important in this case as the facility has been constructed under the EIA-development permit granted in Feb. 2013 on the basis of much additional information, compared with the 'outline' permit of July 2010.	The permit has been varied to bring in the final design of the facility as well as the requirements of the Industrial Emissions Directive.
This development permit includes a *recycling* facility that processes the incinerator bottom ash (IBA) for use as building material. We understand this change from the plan given an EA permit in 2010 is a substantial change.	There has been no application for a recycling facility to process the IBA. The permit allows for the storage of IBA only.
The application seeks approval for a (small) increase in pollution levels both of the Severn Estuary SAC and of Cardiff's air. We are aware that the EA has issued specific guidance on siting IBA processing facilities in the vicinity of an SAC. Roath Dock within 1-200m of the facility is in hydrodynamic continuity with the Severn Estuary SAC. The Habitats Directive assessment conducted by the EA in 2010 did not cover the IBA storage and recycling facility.	There has been no application for a recycling facility to process the IBA. The permit allows for the storage of IBA only. An air quality assessment has been undertaken for the changes proposed and have been accepted by NRW. There has been no change to any of the emission limit values in the permit.
We conclude that the information	The application was consulted on and

supplied by Viridor with its current application is insufficient to determine a permit to operate the plant in accord with the planning permit. If and when the NRW requests and receives further information from the company, we ask for consultation on it.	all responses received have been addressed in this decision document. No additional information was requested, the applicant was required to revise their air quality assessment and this has been assessed by NRW and accepted.
The plume modelling shows enhanced levels of toxic metals over the Severn Estuary SAC; it needs to give deposition rates and assess the fate of these pollutants, including bioconcentration though the food chain. The levels in waters that enter the estuary eg. from the Roath Dock or in flooding episodes need including. Certain birds inhabiting the area are known to have significantly high levels of some toxic metals in their bodies. The plume modelling shows air pollution by toxic metals around Cardiff Bay's housing and waterfront areas. While this is given as not significant, there are sufficient reason to doubt the adequacy of the modelling	NRW requested that a Human Health Risk Assessment be undertaken as part of the air quality assessment for this variation application. This was submitted as part of their Schedule 5 response. NRWs screening checks agree with the applicant, the intakes are likely to be less than 1% of the COT TDI.
The modelling assumes winds as at Rhoose, which appears to be badly wrong in the Cardiff Bay basin. The Penarth headland significantly affects westerly winds, causing large-scale eddy circulation. The headland and the Leckwith escarpment tend to trap slow easterly winds under anti-cyclonic conditions. Winds have changed in recent years to be more frequently from the south and east than in the Rhoose 10-yr dataset. This may be a feature of climate change, for which we need to plan. The wind modelling needs checking	There are likely to be differences in winds between the Rhoose and the facility location. However, these are unlikely to alter the conclusions of the assessment. The Applicant's assessment conservatively assesses the maximum process contribution in the modelled domain against the air quality standards, with emissions assumed at the maximum permissible concentrations. Their assessment assumes that maximum emissions coincide with the worst-case meteorological conditions observed at Rhoose.

against measurements in the Bay area. The recent spread of smoke from a major fire lasting several days demonstrated the circulatory pattern that took the plume over north Cardiff and back to the city centre.	Our own check modelling and sensitivity analysis indicates that the Applicant's modelling is a reasonable worst-case scenario, while also considering modelling uncertainties
Better modelling is needed to include the Bay topography	The Applicant included terrain in their air dispersion modelling assessment. The AERMOD terrain module has been validated and reviewed and is therefore fit for purpose. The topography in the area is flat and terrain is unlikely to significantly affect dispersion of stack emissions.
The design is not energy-efficient; the current changes make it about 36% efficient or less (only 22.8% if they can't find heat users). The Fichtner document says the facility has been designed to maximise electrical export, retaining the possibility of heat export. In the original Heat Plan for the Permit Application, it was noted that 60 MW of heat export would be achievable for this facility. Instead of maximising efficiency, the facility has been designed with the capability to export 20 MW of heat. This is significantly less than the 29.2MW electricity, whereas CHP incinerators normally supply greater MW of heat than electricity. This design compares badly with the Welsh Government's Waste Sector plan's 'high efficiency' level of 60%. It is designed to fail even the Scottish/SEPA minimum of 40% efficiency. If the NRW allow this design, future tightening of the license to comply with probable policies to force higher efficiency would be severely constrained. The NRW should insist	The original design was set out for heat export but no users were identified. The change in the design enables more electricity generation with the option to supply heat if a user becomes available. Condition 1.2.3 of the permit states; *The operator shall review the practicability of Combined Heat and Power (CHP) implementation at least every 2 years. The results shall be reported to Natural Resources Wales within 2 months of each review*. Collections, Infrastructure and Markets sector plan states that a minimum efficiency level of 60% is desirable and technically achievable for combustion based EfW plants, however, this would only be obtainable through the generation of a heat only supply. As mentioned there have been no heat users identified but the facility has the ability to connect to a heat user if one becomes available. Welsh Government provides funding support to local authority consortia under its Residual Waste Treatment Procurement Programme. It is a

on a design that retains flexibility for future high efficiency, should heat users become available. In his preface to DECC's renewable-heat-incentive scheme, the Minister wrote The heat used in our homes, public buildings, businesses and factories is responsible for around half of all the energy consumed in the UK, and accounts for roughly half of all the UK's carbon emissions. This huge drain on energy resources is not an issue we can ignore. Taking action now to switch from fossil fuels to cleaner and more sustainable green sources of heat will reduce the impact that our heat requirements have on the environment and help ensure the UK has an energy supply that is safe, secure and reliable. Viridor has claimed its plan is Combined Heat-and-Power (CHP); CHP implies meeting quality standards (http://chpqa.decc.gov.uk/) for 'energy efficient operation. NRW should ask Viridor for further information on how they could match up to these standards, then consider imposing license conditions to require steps to do this.	condition of such funding, that: 1) where the solution chosen is an energy from waste plant, the facility shall achieve, as a minimum, the R1 designation for recovery; and 2) the overall plant efficiency shall be as high as possible as can be demonstrated to be value for money and, where possible, the facility should operate or be capable of operating in combined heat and power mode. The Operator has achieved R1 status and has the ability to operate in CHP mode if and when a user becomes available for the heat.
R1 standard EU policy adopted in the UK is that an energy-from-waste facility must meet the minimum energy requirement of the R1 formula. Viridor have failed to show that their facility does that. Cardiff Council has refused to disclose the R1 calculation given them; this is subject of an appeal by Friends of the Earth to the Information Commission. Meanwhile, the claim to meet it is not in the public domain, so cannot be accepted for this license determination. The R1 form supplied	An application for R1 status was received on 4th March 2014 from Viridor. Following determination R1 status was approved on 23rd June. Based on the information that was provided and presented in the application, NRW have concluded that the proposed plant is capable of having an R1 energy efficiency factor equal to or above 0.65 and is an R1 recovery operation under Annex II of Directive 2008/98/EC on Waste, based on the design data provided.

to NRW contains unreal (draft) data. We therefore require that the NRW critically examine Viridor's claim to meet the R1 requirement and insist on disclosure of the emission data and the R1 spreadsheet for the Cardiff plant.	The R1 status will need to be validated when plant acceptance data is available and annually thereafter.