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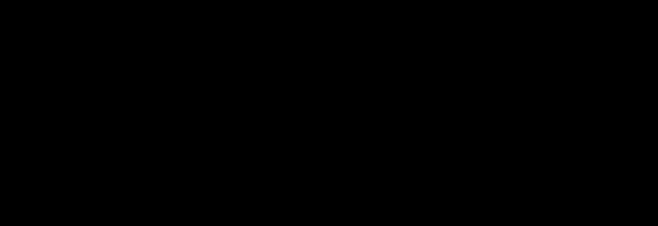
Dunbar Energy Recovery Facility



Viridor Dunbar Waste Services Limited

Supporting Information

Document approval

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Non-Technical Summary

Viridor Dunbar Waste Services Ltd (Viridor) operates the Dunbar Energy Recovery Facility (the ERF). A Pollution Prevention and Control permit (PPC permit) was granted by the Scottish Environment Protection Agency (SEPA) (Ref: PPC/A/1032878). Viridor is applying to vary the PPC permit under the Environmental Authorisations (Scotland) Regulations 2018 (EASR), as amended by the Environmental Authorisations (Scotland) Amendment Regulations 2025.

The ERF consists of a two-line energy from waste plant which is used to recover energy from non-hazardous municipal, commercial and industrial waste by incineration, and a back-up generator for the provision of emergency electrical power.

Viridor is proposing to vary the PPC permit to allow for an increase from 23.95 tonnes per hour (tph) per line to 27.6 tph per line, equivalent to an increase of 3.65 tph per line, or 7.3 tph across the ERF. The proposed annual permitted throughput will increase from 390,000 tonnes per annum (tpa) to 483,552 tpa. To facilitate the proposed increase in the capacity, Viridor is proposing to make a number of upgrades to the combustion controls systems and associated equipment.

Viridor is also proposing to add the waste codes 19 08 01 'screenings from wastewater treatment plants'; and 19 08 05 'sludges from the treatment of urban wastewater'.

This application is supported by a Dispersion Modelling Assessment; Dioxin Pathway Intake Assessment; and an Abnormal Emissions Assessment which have been produced to quantify the impact of the proposals on air quality, human health and ecology during normal operation and abnormal operations as defined within the Industrial Emissions Directive.

As demonstrated within the environmental assessments completed to support the application, the proposed changes will not have a significant impact on human health or the environment.

As the proposed increase in capacity is more than 3 tph, this application is being submitted as a substantial variation to the PPC permit.

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1 Introduction

1.1 Background

Viridor Dunbar Waste Services Ltd (Viridor) operate the Dunbar Energy Recovery Facility (the ERF). A Pollution Prevention and Control permit (PPC permit) was granted by Scottish Environment Protection Agency (SEPA) (Ref: PPC/A/1032878). The latest variation was issued in July 2023. Viridor is applying to vary the PPC permit under the Environmental Authorisations (Scotland) Regulations 2018 (EASR), as amended by the Environmental Authorisations (Scotland) Amendment Regulations 2025.

The ERF consists of a two-line energy from waste plant which is used to recover energy from non-hazardous municipal, commercial and industrial waste by incineration, and a back-up generator for the provision of emergency electrical power. The maximum permitted quantity of waste to be incinerated is currently set at 390,000 tonnes per annum (tpa).

Section 1 of this document provides a brief overview of the application, including the proposed changes and type of variation, whilst section 2 describes the proposed changes in further detail. Section 3 considers additional information for the application, including the environmental impacts associated with the proposed changes.

1.2 Proposed changes

Within this application, Viridor is proposing the following changes to the PPC permit:

- Increase the hourly throughput from 23.95 tonnes per hour (tph) per line to 27.6 tph per line, equivalent to an increase of 3.65 tph per line, or 7.3 tph across the ERF. The proposed annual permitted throughput will increase from 390,000 tpa to 483,552 tpa.
- Add two waste codes: 19 08 01 'screenings' from waste water treatment plants; and 19 08 05 'sludges from the treatment of urban wastewater'.

1.3 Type of variation

SEPA has published guidance titled '*Identifying a substantial change for Industrial Activities*' dated August 2025, which refers to the EASR 2025 and defines a substantial change as:

a change in the nature or functioning, or an extension, of an installation or combustion plant, waste incineration or waste co-incineration plant which SEPA considers may—

(i) have significant negative effect on human health or the environment, or

(ii) which in itself constitutes the carrying on of an activity to which any of schedules 20-24 apply, that reaches any threshold capacity specified in those schedules and includes the activities in sub-paragraphs (2) and (3).

The guidance thereafter clarifies that:

If the proposed change itself would count as a listed activity, then it should be treated as a substantial change i.e. if the increase in the capacity of the plant by itself would exceed the activity threshold.

An assessment for the proposed increase in plant capacity on air quality has been undertaken. A summary of the assessment is presented in section 3.3. As can be seen from the conclusions of the

assessment, the air quality impacts will not have a significant impact on local air quality, the general population or the local community.

Furthermore, as explained in section 2 of this document, the proposed increase in plant capacity is equivalent to 3.65 tph per line. The ERF is a two-line design. Therefore, the overall increase in processing capacity is 7.3 tph.

The threshold for a non-hazardous waste incineration plant within Schedule 20, Part 4, Chapter 5 paragraph 24(a) of the EASR is 3 tph. Therefore, the proposed increase in capacity is more than the threshold in Schedule 20.

To conclude, Viridor considers that this application should be determined as a substantial variation. SEPA's guidance titled '*The Environmental Regulation (Scotland) Charging Scheme 2025*' states substantial variations are 70% of the total of the activity application charge.

2 Proposed changes to capacity

The proposed increase in the permitted capacity of the ERF is to reflect the long-term trend in the net calorific value (NCV) of the waste received at the ERF; modifications which have been made to the combustion control system.

To understand the proposed increase in capacity, it is important to understand how the capacity is calculated. The annual capacity (annual fuel throughput) is calculated as follows:

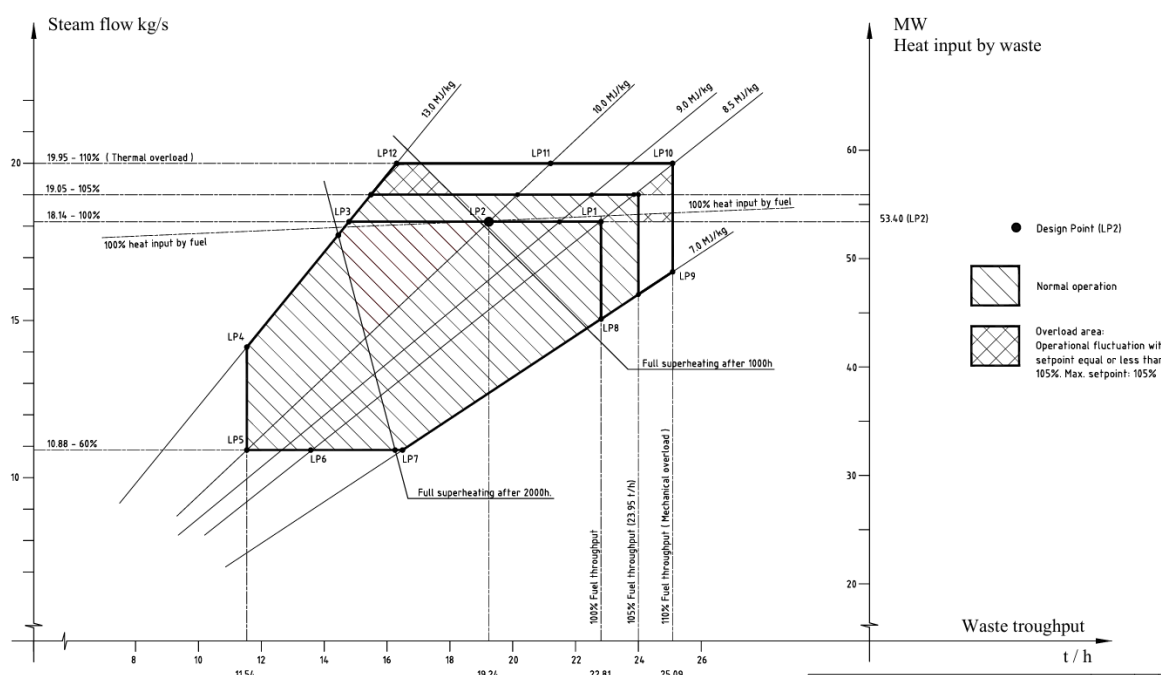
$$\text{Annual Fuel Throughput} = \text{Hourly Throughput} \times \text{Operational Period} \times \text{Number of Lines}$$

The design basis for the capacity as permitted is set out within section 2.1 and as proposed within section 2.2.

2.1 Permitted capacity

For reference purposes the firing diagram for the permitted activity, as per the variation granted in 2023, is presented in Figure 1.

Figure 1: Firing diagram



Source: Babcock and Wilcox, Drawing No. 096447, revision 1 (2018)

The ERF is designed for the combustion of wastes with a NCV of 7 – 13 MJ/kg. The PPC permit allows the ERF to operate at 105% of its thermal capacity – this is equivalent to 56.07 MWth per line (112.14 MWth aggregated), and when processing wastes with an NCV of 8.5 MJ/kg, the ERF will process 23.95 tph per line (47.9 tph in total) of waste.

Based on continual operation (8,760 hours per annum) this equates to an annual throughput of 419,604 tpa; however, it is noted that the PPC permit limits the annual throughput to 390,000 tonnes.

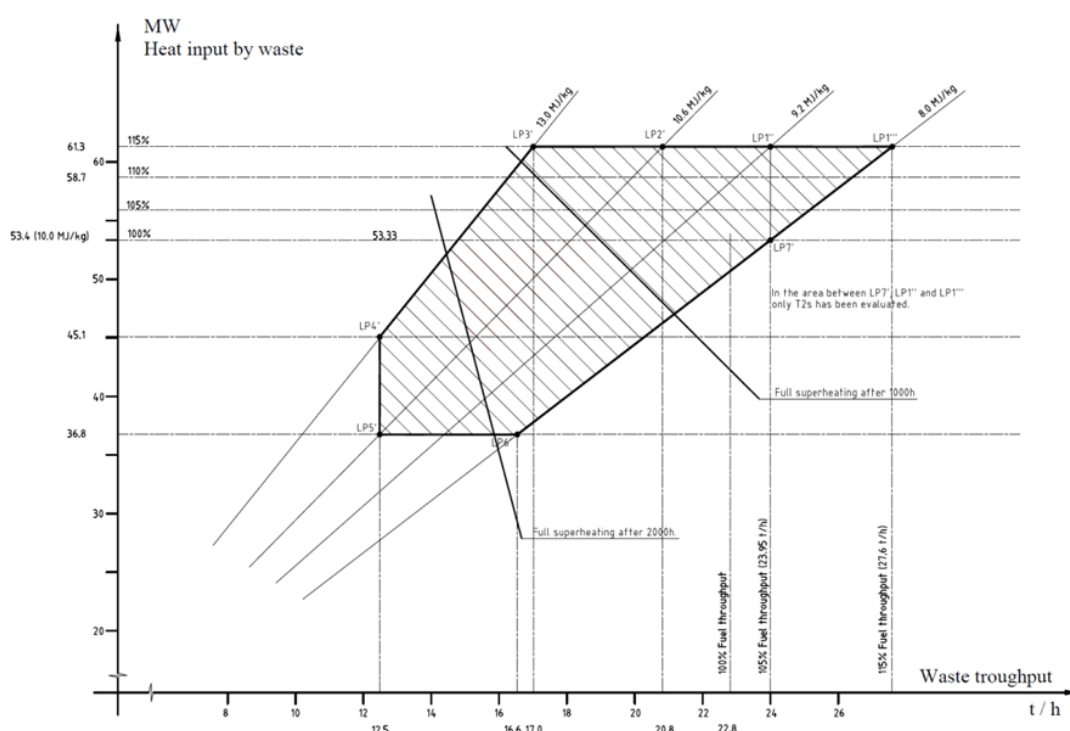
2.2 Proposed capacity

Viridor is proposing to make modifications to the ERF to facilitate changes to the constraints associated with the firing diagram. The Facility is currently designed to process waste with an NCV of 7 – 13 MJ/kg. However, whilst Viridor has experienced a long-term reduction in the NCV of wastes which are received at the ERF, wastes with an NCV as low as 7 MJ/kg are not received. Therefore, Viridor is proposing to increase the lower range NCV of wastes which the ERF is designed to process. Due to the upgrades proposed, refer to section 2.2.1, the ERF will process wastes with an NCV of 8 – 13 MJ/kg.

In addition, changes to the settings within the combustion control system will be implemented to achieve a revised nominal load point of 115% of the thermal capacity of the boiler. This is equivalent to a thermal capacity of 61.38 MWth per line (122.76 MWth aggregated).

The updated firing diagram to facilitate the upgrades proposed is provided in Figure 2.

Figure 2: Firing diagram - proposed maximum load point



Source: Conceptual design data – SNCR (Appendix A)

At the proposed lower design NCV of 8 MJ/kg and maximum thermal input of 61.38 MWth per line, each line will process up to 27.6 tph. Across two lines, this equates to 55.2 tph and 483,552 tpa, based on continuous operation.

Table 1 provides a summary of the capacity changes to the firing diagram which are proposed within this application.

Table 1: Comparison of design parameters – permitted vs proposed

Parameter	Unit	Permitted Capacity	Proposed Capacity
Maximum hourly throughput (per line)	tph	23.95 ⁽¹⁾	27.6 ⁽²⁾
Maximum thermal capacity (per line)	MWth	56.07	61.38
Notes:			
(1) Design NCV of 9 MJ/kg			
(2) Minimum NCV of 8 MJ/kg			

2.2.1 Proposed upgrades for the increase in throughput

As explained in the T2S report (Appendix B) and the SNCR Design Report (Appendix A), the ERF will be able to operate at 115% with minimal upgrades. To facilitate the proposed changes to the capacity, Viridor is proposing to make the following upgrades to the feedwater pumps and flue gas treatment systems:

- Upgrading the feed water pumps and associated supporting equipment. In total three new feed water pumps will be installed - one pump for each boiler 1 and 2, and a standby in the event of failure of the feedwater pump.
- Upgrade/install the following flue gas treatment system to accommodate the increase in flue gas flow rate and volume:
 - powdered activated carbon (PAC) dosing system, one for each boiler;
 - filter bag holders on six baghouses (three new baghouses per boiler)
 - four spare water pumps for the conditioning tower.

In addition, the following additional measures will be considered, if deemed to be required, to facilitate the additional capacity:

- Replace the existing refractory in the first pass with Inconel alloy steel and soot-cleaning in the first pass to decrease the flue gas temperature prior to passing through to the selective non-catalytic reduction (SNCR) and before reaching the superheaters.
- Installation of Inconel baffle walls in the second pass of both boilers. The settings for the water cleaning system installed in second pass will be modified to accommodate the new baffle walls by modifying the programming during re-commissioning
- Replace the existing primary and secondary combustion air fans.
- Install flame front camera to support with combustion control.

Overall, the intention of the proposed upgrades is to reduce deterioration of the plant as a consequence of increase in flue gas temperatures from the increase in hourly throughput of waste, and to treat the flue gas effectively.

As required by the Industrial Emissions Directive (IED), the exhaust gases will be heated to a minimum temperature of 850°C and maintained at or above this temperature for at least two seconds (referred to as T2s) to ensure the effective destruction of dioxins, furans, polycyclic aromatic hydrocarbons (PAHs), and other organic compounds. The report titled '*The T2s equations validity when upgrading to 115%*' (Appendix B) demonstrates that the ERF is modelled to have a retention time of a minimum 4.7 seconds at 115% MCR and 8 MJ/kg. Therefore, allowing for the increase in hourly throughput, the ERF will continue to achieve the T2s requirements stated in the IED.

The proposed increase in capacity will not result in any changes to the infrastructure for the storage and handling of raw materials and residues. The frequency of deliveries of raw materials and collection of residues will increase to ensure the capacities of raw materials and residues storage facilities are not exceeded.

2.2.2 Best Available Techniques for waste incineration

The proposed increase in capacity and associated upgrades remain in accordance with the previous assessments against the Waste Incineration BREF and accompanying Best Available Techniques conclusions (BATc); therefore, a full review against the BATc has not been undertaken. Notwithstanding this, the requirements of BAT 14, BAT 17 and BAT 20 have been reviewed to allow for the increase in capacity (refer to Table 2) to reflect application form requirements and to cross reference to information within the application.

BAT 14 has been reviewed to address section A2-4 (residues) of the application form P-IND-IA2V, which requires an explanation that the requirements for the total organic carbon (TOC) content and loss on ignition of slag and bottom ashes will continue to be met. BAT 17 and BAT 20 further address the change in energy efficiency of the ERF and the potential to impact the flue gas cleaning system.

Table 2: BAT conclusions related to the proposed changes

BAT conclusion	Comment
BAT 14: reduce the content of unburnt substances in slags and bottom ashes, and to reduce emissions to air from the incineration of waste.	Controls currently employed to maintain combustion efficiency and meet environmental standards continue to be applied. These procedures ensure the waste is consistently and fully incinerated, minimising organic residues in the bottom ash and maintaining compliance with BAT 14. The design and modelling for the increased throughput has been undertaken with an assumption of 3% Total Organic Carbon (TOC) in bottom ash. This conservative assumption is within the acceptable levels outlined under BAT 14, ensuring sufficient operational margin to comply with the requirements under all operating conditions. Emissions modelling confirms that existing limits for pollutants continue to be met with the proposed capacity change (Appendix C).
BAT 17: ensure that the flue gas cleaning system (FGC system) and the waste water treatment plant are appropriately designed, operated within their design range, and maintained so as to ensure optimal availability.	No changes to wastewater treatment are required for the change in hourly throughput. An increase in load to 115% results in an increase in flue gas temperatures. The flue gas will be cooled prior to passing to the FGC system to allow the system to maintain efficiency. The FGC system is upgraded to accommodate increase in flow and volume. The upgrades are described in section 2.2.1 to address the changes needed to ensure emissions to air are compliant.
BAT 20: ERF to comply with the BAT-associated energy efficiency levels (BAT-AEELs).	The Heat and Power Plan (Appendix D) demonstrates the existing ERF gross electrical efficiency is 32.4% following the increase in capacity. The benchmark BAT-AEEL is 20-35%, therefore the ERF meets the requirement. The energy efficiency of the ERF is further described in section 3.11.

2.3 Additional waste codes

Viridor is requesting to add two additional waste (EWC) codes which are not currently present within the PPC permit (Table 3). The addition of these waste codes would not alter the nature, scale, or environmental risk profile of the activities currently undertaken at the ERF. The wastes would be received, handled, stored, and processed using existing infrastructure, operational controls, and management procedures.

No changes to plant design, waste handling arrangements, throughput limits, emissions controls, or monitoring requirements are necessary to facilitate the processing of these additional EWC codes. Existing odour management arrangements are sufficient to manage any potential impacts arising from the acceptance of these additional waste streams.

Table 3: *Proposed additional waste codes*

EWC Code	Description
19	Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
19 08	Wastes from waste water treatment plants not otherwise specified
19 08 01	screenings
19 08 05	sludges from the treatment of urban wastewater

3 Additional Information

The following section provides the additional information requested within the PPC permit application forms.

3.1 Management system

Viridor has an Environment Management System (EMS) accredited to ISO 14001. The EMS is not amended because the arrangements and controls for the storage and handling of raw materials and waste are not changing.

3.2 Pre-engagement

Viridor runs a liaison group for the local community and has informed the group of the intended variation. No objections have been raised through that forum to date. The proposed changes are assessed as not presenting a potentially significant impact to the public; therefore, a formal pre-engagement consultation has not been undertaken.

3.3 Environmental risk assessment

A Dispersion Modelling Assessment, Dioxin Pathway Intake Assessment and Abnormal Emissions Assessment has been carried out to support this PPC permit variation.

The Dispersion Modelling Assessment is provided in Appendix C. This has been undertaken to quantify the impact of emissions from the ERF and compare these to the impacts previously consented by SEPA.

In relation to the impacts on human health, emissions from the operation of the ERF will not cause a breach of any Air Quality Assessment Levels (AQAL) under any operational scenarios, and there is no risk of exceeding an AQAL for any metal either on a long or short-term basis.

In relation to the impacts on ecologically sensitive sites, while there is a predicted increase in impacts as a result of the proposed PPC permit variation, the change in impact can be screened out as 'insignificant'. At all identified ecological sites the total impact of the Proposed ERF¹ can be screened out as 'insignificant', with the exception of Outer Firth of Forth and St Andrew's Bay Complex SPA, Barns Ness Coast SSSI, and Woodhall Dean SSSI. Nonetheless, given the impact of the Permitted ERF² and Proposed ERF is broadly similar, the proposed PPC permit variation is not considered to have a significant impact on the integrity of any ecologically designated site.

The change in number of visible plumes between the Permitted and Proposed ERF is of 'low' significance. The maximum number of visible plumes outside the site boundary associated with the Proposed ERF is of 'medium' significance. This is classed as acceptable in accordance with the Integrated Pollution Prevention and Control (IPPC) H1 guidance.

¹ "Proposed ERF" – the impact of the ERF operating at the maximum permitted ELVs at the proposed thermal input of 61.4 MWth with the following operating points within the firing diagram (Figure 2):

- LP1''' – 27.6 tpa with an NCV of 8 MJ/kg; and
- LP3''' – 17.0 tpa with an NCV of 13 MJ/kg.

² "Permitted ERF" – the impact of the ERF operating at the maximum permitted emission limit values (ELVs) at the permitted annual capacity – 56.07 MWth at 23.95 tpa with an NCV of 8.5 MJ/kg using the model inputs as set out in the Air Quality Assessment to support the 2022 PPC permit application.

The results of the Dispersion Modelling Assessment show that the air quality impact of the ERF following the proposed increase in capacity would not have a significant impact on local air quality, the general population or the local community, or ecologically sensitive sites.

A Dioxin Pathway Intake Assessment is provided in Appendix E. The results of the assessment show that, for the hypothetical maximum impacted receptor, the total intake of dioxins and dioxin-like polychlorinated biphenyls (PCBs) remains below the Tolerable Daily Intake (TDI). This total intake accounts for emissions from the Proposed ERF, the cement kiln, and the existing Mean Daily Intake. Therefore, there would not be an appreciable health risk based on the emission of dioxins and dioxin-like PCBs from the Proposed ERF, either alone or cumulatively with other local sources.

An Abnormal Emissions Assessment is provided in Appendix F. There are no predicted exceedences of any of the short term or long-term AQALs associated with abnormal operations, and there will be no exceedences of the TDI for dioxins and dioxin-like PCBs, except for infant intake via breast milk. However, infant intake via breast milk is not expected to result in significant impacts.

It is concluded that during periods of abnormal operation of the Proposed ERF as permissible under the IED (Article 46) is not predicted to give rise to an unacceptable impact on air quality or the environment.

3.4 Fugitive emissions

The increase in annual throughput will be managed through increased operational throughput and movement frequency, not through an increase in waste storage capacity. Waste reception, bunker management, enclosed handling, odour control and fire prevention arrangements will remain unchanged. The proposed variation does not introduce new waste types, new storage areas or increased maximum waste inventory.

Therefore, it is not proposed to produce a fugitive emissions management plan to support this PPC permit variation.

3.5 Emissions to water and sewer

The increase in capacity and associated upgrades described in section 2 does not result in any changes to emissions to water and/or sewer.

3.6 Odour

As this variation is not proposed to result in any changes to the operating techniques for the handling and storage of waste and residues at the ERF, it is not anticipated that there are any changes to the types and amounts of odour generated at the ERF.

Waste reception will remain enclosed and under negative pressure to control fugitive emissions and odour from waste handling activities. The proposed variation will not increase bunker capacity or the maximum quantity of waste stored on site, and waste will continue to be managed within the existing storage arrangements. The existing doors, tipping hall controls and operational procedures will remain in place, which will maintain the current approach to containment, waste handling and odour control.

Therefore, it is not proposed to amend the odour management plan to support this PPC permit variation.

3.7 Noise

The proposed works include replacement and upgrade of existing combustion air, feedwater and flue gas treatment equipment. These changes are not expected to materially alter the noise profile of the ERF because they replace or enhance existing plant items within the current operational envelope. There are no changes to the modes of transport or expected time of waste deliveries – the only change would possibly be an increase in the number of deliveries per day and is not a consideration for the permitting regime. However, these are not expected to result in any significant increases in noise levels.

3.8 Fire

Through implementation of this variation, there are no changes to the quantity or arrangements for the storage of waste within the ERF. Furthermore, it is understood that:

- there is no increase in the potential risk of fire at the ERF, including the volumes or types of wastes which are held at the ERF in the bunker; and
- there are no changes to the proposed management techniques to prevent or mitigate fire associated with this variation.

3.9 Raw material consumption

The proposed increase in capacity results in the consumption of additional quantities of the raw materials currently consumed during the operation of the ERF.

A summary of proposed changes to raw material consumption is presented in Table 4.

Table 4: Raw material consumption

Raw material	Unit	Current annual consumption rate	Proposed annual consumption rate
Activated Carbon	t	158	201
Hydrated Lime	t	5,421	6,881
Ammonia	t	250	317
Gas oil	l	83,807	94,674

Gas oil is used as a start-up (and shutdown fuel). It is not expected that the number of start-up and shutdowns will change from the proposed changes to the combustion control systems. However, the consumption of gas oil will increase because the minimum thermal input required to achieve the conditions necessary for the initial combustion of waste will increase from 32.04 MWth to 36.8 MWth.

The proposed increase in capacity will not result in any changes to the arrangements for the storage and handling of raw materials or any additional types of raw materials to be consumed at the ERF.

3.10 Residue generation

The proposed increase in capacity of the ERF results in the generation of additional residues, as presented in Table 5.

Table 5: Residues generated

Residues	Units	Current generation	Proposed generation
Bottom ash (excluding metals)	tpa	73,304	90,888
Ferrous metals from incineration	tpa	3,736	4,632
Fly ash / Air Pollution Control Residues (APCr)	tpa	9,030	11,196

The residues generated quoted are based on 2025 operational data and have been scaled proportionally to the proposed increase in capacity of the ERF. The proposed increase in capacity will not result in any changes to the arrangements for the storage and handling of residues generated by the ERF. Adequate storage capacity is provided by the existing infrastructure at the ERF.

Whilst the proposed changes may result in a small increase in the volumes of process effluent (boiler blow down) generated by the ERF; no change to the composition of the effluent is expected as a consequence of the increased throughput.

3.11 Energy efficiency

Assuming an availability of 8,760 hours per annum (100%) the ERF is capable of exporting up to 348,648 MWh per annum.

The proposed increase in capacity is considered against the relevant energy efficiency requirements of the waste incineration sector guidance (EPR5.01) and the Waste Incineration BREF (referred to as the WI BREF). As can be seen from the findings presented in Table 6, the maximum capacity of the plant compares favourably with the relevant benchmarks.

Table 6: Energy efficiency

Parameter	Unit	Proposed	Benchmark
Gross power generation, nominal design	MWh/t waste	0.72	0.415 - 0.644
Net power generation, nominal design	MWh/t waste	0.67	0.279 - 0.458
Internal power consumption, nominal design	MWh/t waste	0.05	0.15
Power generation (assumed gross) for 100,000 tpa of waste	MWe	8.2	4.00 - 9.00

The Heat and Power Plan is updated, and presented in Appendix D, to reflect the variation to increase the permitted waste throughput of the ERF. The Plan considers the impact of the increased plant capacity on heat and power performance. The Plan concludes that:

- the ERF will meet the definition of recovery;
- the connection capacity granted by Scottish Power is sufficient to accommodate the maximum electrical output of the ERF;
- there is no reason (within the scope of the Heat and Power Plan) to suggest that the potential heat network outlined in the Plan cannot be implemented; and
- steam extraction from the turbine is considered the most favourable solution.

3.12 Greenhouse gas emissions

A Greenhouse Gas Assessment, presented in Appendix G, calculates the change in greenhouse gas emissions as a result of the proposed increase in the waste processing capacity of the ERF.

From the operation of the ERF, an increase of:

- approximately 100,310 tpa of carbon dioxide equivalent from the generation of power from the incineration of incoming waste within the Facility, compared to generating the equivalent power in a conventional power station; and
- approximately 27,880 tpa of carbon dioxide equivalent compared to the permitted generation power from the thermal treatment of waste.

It should be noted that this assessment methodology of the Greenhouse Gas Assessment does not consider the avoidance of emissions from the disposal of the waste in a landfill, or from any other alternative methods of waste treatment. Therefore, this is considered to be a highly conservative assessment of greenhouse gas emissions associated with the operation of the ERF.

3.13 Letter of authorisation

The letter of authorisation for the declaration of the PPC permit variation application is provided in Appendix H.

Appendices

A Conceptual Design Data – SNCR

B The T2s equations validity when upgrading to 115%

C Dispersion Modelling Assessment

D Heat and Power Plan

E Dioxin Pathway Intake Assessment

F Abnormal Emissions Assessment

G Greenhouse Gas Assessment

H Letter of Authorisation

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