

FURTHER INFORMATION IN SUPPORT OF AN AIR QUALITY IMPACT ASSESSMENT OF EMISSIONS FROM SMALL BOILERS PROPOSED AT THE WOODYARD, CHEADLE

UK RENEWABLE ENERGY LIMITED – JULY 2024

Introduction

An air quality impact assessment of emissions from small boilers proposed at The Woodyard in Cheadle was submitted to Staffordshire Moorlands Council in June 2024.

A request for some further information was received on 28th June 2024, and this short report provides the response from the UK Renewable Energy Limited team. It is noted here that, for ease of review, although each of the issues raised has been included for consideration, they are not presented in the order that they were originally requested.

Question 1:

The AQ assessment utilises the emission rates within the RHI Certificate. While the certificate applies to GF175, GF210 and GF295 models for the purpose of the RHI scheme, only the emissions from the GF175 were assessed for the certificate. This results in uncertainty in the emission rates and impacts when applying it to the GF210 and GF295 and this is not accounted for in the assessment. Actual figures for the GF210 and GF295 models should be used for impacts on human health.

In Response:

No other information has been made available from the technology provider. However, when preparing assessments for local planning authorities, assuming the relevant model is listed on the RHI certificate, it has previously been acceptable to apply the emissions data stated, even if the model to be installed was not the specific model tested. The RHI certificate is applicable to each of the boiler types listed and therefore, in the absence of any other data, the emission rates should also be acceptable.

Question 2:

The short-term impacts have been considered at the nearest receptor building. Residential gardens are closer to the stacks, approximately 25m and are relevant exposures for the purpose of human health assessment which do not appear to have been considered.

In Response:

The extent of the garden areas is unclear. However, on the basis that the nearest, apparently accessible, green open space is a garden associated with a residential property, a sensitivity check has been prepared, modelling a garden receptor at grid reference 398905, 342252. This is assumed to be the garden associated with Wren Cottage and is situated approximately 18 m to the south-west of the nearest boiler. The results are presented below and suggest that although cumulative contributions of NO_x as NO₂ (1.2675 µg m⁻³) would continue to screen from any further required assessment, the cumulative concentrations of particulate matter (0.583 µg m⁻³) do require some further consideration.

See response to item 4 below for information regarding the further assessment.

Tool for Nitrogen Dioxide from discharges < 10m high	Additional Comments/Information
The emissions of NO_x in tonnes per annum are calculated at your given distance from the stack that give rise to maximum annual mean concentrations less than 1 µg/m³ Enter required information in Yellow Cells Resulting Emission in Red Bold Distance from nearest sensitive receptor 18 m Discharge height 5.5 m NO₂ Background concentration (include roadside contribution at relevant receptors) 8.811613 µg/m³ Maximum Emission Rate 1.83 tonnes per annum Note: use actual emission rates and there is no need to further scale your emission rates If your known tonnes per annum are less than that calculated above you do not need to proceed, if your emissions are greater than that calculated refer to LAQM.TG16 for further advice Go Back to List of Tools	

Tool for PM ₁₀ from discharges < 10m high or fugitive sources	Additional Comments/Information
The target emissions of PM₁₀ in g/s are calculated for your given source (fugitive at ground level or stack < 10m). Greater emission rates may result in exceedance of the 24-hour objective for PM₁₀ in England, Wales and Northern Ireland or the annual mean objective in Scotland. Enter required information in Yellow Cells Resulting Emission in Red Bold Distance from nearest sensitive receptor 18 m Discharge height 5.5 m PM₁₀ Background concentration (include roadside contribution at relevant receptors) 11.04121 µg/m³ Location Rest of UK Maximum Emission Rate 0.200 tonnes per annum If your known tonnes per annum are less than that calculated above you do not need to proceed, if your emissions are greater than that calculated refer to LAQM.TG16 for further advice This tool should not be used for the assessment of some fugitive sources which are not easily quantified. These include: • Quarrying and mineral extraction sites • Landfill sites • Coal and major stockyards, or materials handling • Major construction sites Go Back to List of Tools	

Question 3:

The choice of background pollutant values used in the assessment will also require clarification and justification.

In Response:

An explanation of the background data obtained from the UK-AIR website was provided on page 4 of the air quality assessment. This data was applied to the Industrial Emissions Screening Tool. The SCAIL calculation methodology incorporates background data from within the tool and in this case, NO_x (as NO₂) at most of the receptor locations was 7.13 µg m⁻³, which is lower than that obtained from the UK-AIR website (8.81 µg m⁻³).

The background concentration of particulate matter (as PM₁₀) applied by SCAIL was marginally higher than that obtained from UK-AIR, being 11.52 µg m⁻³ at most locations, having been applied as 11.04 µg m⁻³ for the area around the site in the Industrial Emissions Screening Tool.

It is noted that the pollutant background data was similar from each data source, ranging from 7.13 to 9.46 $\mu\text{g m}^{-3}$ NO_x as NO_2 and 11.04 – 12.6 $\mu\text{g m}^{-3}$ PM_{10} , with no significant influences such as busy roadways likely to affect any of the receptor locations. As such, although minor differences would be reported when applying any of the higher or lower background values, these would not change the fundamental conclusions of the assessments.

Question 4:

The four new boilers have been grouped into a single stack for the purpose of the assessment. Clarification is required on why this is as this could have an impact on the emission predictions which is not discussed in the assessment and another cause for uncertainty.

In Response:

The close proximity of the new boilers and their release points means that it is appropriate for their emissions to be combined, similar to how they would be assessed in detailed dispersion modelling. The SCAIL assessment has assumed the total annual mass release from the four boilers, and reducing the number of operational boilers down at any one time would in turn reduce the mass release of pollutant at that time.

However, it is recognised that the additional changes required to the input values when combining the release points can impact on the output values, especially when undertaking basic modelling and hence, a sensitivity analysis has been prepared and is reported here.

Table 1 over page reports the worst-case results predicted for either of the two 210 kW boilers and 295 kW boilers, assuming that any individual boiler might be run in isolation. The number and capacity of the boilers chosen for the site are designed to ensure flexibility in operation and to build in an element of resilience should one or more boilers require maintenance at any time. However, considering that the new boilers are designed to usually run in minimum combinations of two, with 1 x 210 and 1 x 295 capacity boilers configured to provide two sets of 505 kW capacities, an additional model has been run to predict the process contributions from each 505 kW combination. The highest process contributions are recorded at the garden location, and hence, only those results are reported here. All other contributions are lower and screen as insignificant, or otherwise not significant.

In order to provide an absolute worst-case combination, the results from modelling the individual 210 and 295 kW boilers are then combined in Table 2, and the process contribution from the existing boiler is also added. It is noted here that emissions from the existing boiler should already be accounted for in any background concentration that is applied to the assessment, and thus its addition here is likely to result in an overly conservative assessment. Additionally, process contributions from the 505 kW combination of boilers plus the existing boiler are presented, as a more realistic assessment of the likely impact of the boiler combinations that may be fired at any one time.

The results show that the impact of the individual boilers and combinations are generally either screened as insignificant, or otherwise not significant. That is, the long-term PC is either less than 1 % of the assessment level, or is greater than 1 % but the PEC remains within 70 % of the assessment level, and where the short-term PC is either less than 10 % of the assessment level, or is more than 10 % but is less than 20 % of the assessment level minus twice the long-term background concentration.

The one exception to the results being screened is where the results of individual modelling of the existing boiler, a single 210 kW boiler and a single 295 kW boilers are summed. In this case, the table, reports the short-term PEC and calculates this to equate to 24.2 % of the short-term assessment level, suggesting therefore that this cannot be screened. However, when assessing the combined short-term PC (34.15 $\mu\text{g m}^{-3}$) against the assessment level minus twice the background concentration (185.74 $\mu\text{g m}^{-3}$), the PC equates to 18.4 % and therefore, even when modelling the boilers individually and assuming no beneficial impact of the co-location of the new boilers, the process contribution will remain well within each of the assessment levels and will not result in any significant impact when modelling likely combinations.

Table 1 Process Contributions at Receptor Number 5 When Modelling Individual Units or Intended Combinations of Boilers

NO₂ PC at Receptor Number 5 from:	LT PC	% of AQS	Background	LT PEC	% of AQS	ST PC	% of AQS	Background	ST PEC	% of AQS
210 kW Boiler	0.61	1.5%	7.13	7.74	19.4%	13.15	6.6%	14.26	27.41	13.7%
295 kW Boiler	0.85	2.1%	7.13	7.98	20.0%	18.47	9.2%	14.26	32.73	16.4%
505 kW Combination	0.658	1.6%	7.13	7.788	19.5%	18.66	9.3%	14.26	32.92	16.5%
Existing Boiler	0.23	0.6%	7.13	7.36	18.4%	2.53	1.3%	14.26	16.79	8.4%
PM₁₀ PC at Receptor Number 5 from:	LT PC	% of AQS	Background	LT PEC	% of AQS	ST PC	% of AQS	Background	ST PEC	% of AQS
210 kW Boiler	0.4	1.0%	11.52	11.92	29.8%	0.85	1.7%	23.04	23.89	47.8%
295 kW Boiler	0.56	1.4%	11.52	12.08	30.2%	1.18	2.4%	23.04	24.22	48.4%
505 kW Combination	0.43	1.1%	11.52	11.95	29.9%	0.80	1.6%	23.04	23.84	47.7%
Existing Boiler	0.14	0.4%	11.52	11.66	29.2%	0.61	1.2%	23.04	23.65	47.3%

Table 2 Total Process Contributions at Receptor Number 5 When Summing the Results from Table 1 in Recognised Combinations

NO₂ PC at Receptor Number 5 from:	LT PC	% of AQS	Background	LT PEC	% of AQS	ST PC	% of AQS	Background	ST PEC	% of AQS
Sum of Existing, 210 kW and 295 kW Boilers	1.69	4.2%	7.13	8.82	22.1%	34.15	17.1%	14.26	48.41	24.2%
Sum of Existing Boiler and 505 kW Combination	0.888	2.2%	7.13	8.018	20.0%	21.19	10.6%	14.26	35.45	17.7%
PM₁₀ PC at Receptor Number 5 from:	LT PC	% of AQS	Background	LT PEC	% of AQS	ST PC	% of AQS	Background	ST PEC	% of AQS
Sum of Existing, 210 kW and 295 kW Boilers	1.10	2.8%	11.52	12.62	31.6%	2.64	5.3%	25.2	27.84	55.7%
Sum of Existing Boiler and 505 kW Combination	0.57	1.4%	11.52	12.09	30.2%	1.41	2.8%	25.2	26.61	53.2%

Question 5:

It should be noted that within the application it states that not all burners may operate at the same time and as these do not operate on a continuous feed, there is potential that there will be periods where the boilers are heating up and cooling down at differing time with the potential to generate smoke and odour. Where 5 burners in operation, this could prolong the experience of nearby residents during these periods and this is not considered within the impact assessment. Given the proximity to residential gardens, this will need to be given consideration particularly during summer periods as well when the burners are likely to remain in operation.

In Response:

As detailed in the Biomass Boiler Information Request Form that was completed and submitted in support of the planning application, the proposed Glen Farrow boiler units are manually loaded systems. As with any liquid or solid fuel boilers, some smoke may be created on start-up. However, the strict controls and operational procedures employed will minimise any potential for smoke creation, and UK Renewable Energy Limited's experience of operating the Glen Farrow systems indicates that smoke during start-up usually only lasts for a matter of minutes for any one boiler.

The process controls employed to minimise smoke creation start with the fuel, which is sourced from suppliers from the Biomass Suppliers List [BSL] who have been externally accredited and are included on the BSL by OFGEM / Woodsure. The virgin wood is clean and dry (approximately 23 % moisture content but guaranteed less than 25 % moisture). The boilers each incorporate a process logic controller (PLC) that control the boiler fans and combustion air to ensure that the furnace temperature is raised as quickly as possible, promoting partial gasification of the fuel, and thereby quickly passing through the stage where smoke may be produced. Similarly, the PLC controls the burn-out of any fuel remaining on the bed during shut-down and as such, smoke is not generally produced at this time.

Although the Glen Farrow units are manually loaded, operatives are trained, and load the boilers efficiently and effectively, thereby minimising any potential for overloading or underfeeding the system or cooling of the furnace during loading. The entire system will also be regularly inspected by the operators in line with the manufacturers recommendations. The boilers are cleaned and deashed monthly and are serviced annually by a HEATAS Engineer, with additional servicing, cleaning and maintenance commissioned as required.

Finally, the combination of the small boiler units of varying capacities has been purposely configured to ensure flexibility of operation and resilience of the system. Each boiler can modulate within its own set range in order to ensure that variable heat loads are managed as efficiently as possible. However, in addition, the units can be combined in any given configuration to ensure that the drying skips are provided with the correct levels of heat at all times. The boilers are proposed to provide heat to biomass drying skips, and are therefore required principally in cooler, wetter weather, when the biomass fuel will not dry as effectively, under ambient conditions. As the ambient temperature drops, or during periods of wet weather, one or more of the units can be called upon to provide the required level of drying air to the skips, although as previously discussed, it is anticipated that, during the majority of the time, the boilers will work in two x 505 kW configurations to provide the required amount of heat to each skip, whilst maintaining the flexibility of resilience should any of the boilers require maintenance at any time (scheduled or otherwise).

As such, the potential for smoke to occur during operation is minimal and will only occur for short periods. Although smoke cannot be prevented completely when starting up a solid fuel boiler, the integral controls and strict operational and maintenance procedures applied to the boilers will minimise the possibility and duration of any release, and the use of good quality, virgin fuels will negate the potential for odours to be released from the boiler systems.