

TECHNICAL ADDENDUM: ASSESSMENT OF EMISSIONS FROM STOWMARKET FLEXIBLE GENERATION FACILITIES

Further Information on impact at ecological receptors of increasing the maximum single event runtime from 2 hours to 4 hours and commencing operations at 0600 hours

(Planning References: DC/18/05096 and DC/18/05102)

1.0 INTRODUCTION

Planning approvals were granted to Precise Energy Ltd & Valence Power Ltd in 2016 (Planning Refs: 2779/16 and 2762/16) for the development of neighbouring Flexible Generation Facilities (FGFs) at Stowmarket Business Park, Stowmarket. The two FGFs become operational in 2017 following approval of minor amendments to the existing planning permissions (Planning Refs: 1854/17 and 1855/17). In 2018, applications to vary the planning permissions were lodged to accommodate the installation of SCR NO_x abatement and increase in annual operating hours from 200hrs to 500hrs per year. The applications were subsequently approved in 2019 (Planning Refs: DC/18/05096 and DC/18/05102).

This Technical Addendum supports Section 73 applications for amendment to the existing planning approvals for the plants to allow the maximum operational event (an occasion when the plant is called into operation) duration for the plants to be extended from 2 hours to 4 hours at any one time, in a 24-hour period. In addition, approval to start daily operations (if required) at the facilities from 0600 hours rather than 0700 hours (as currently specified in the planning approvals) is also sought. No alteration of the maximum annual operating hours is sought for the plants as part of the application.

This report is provided in support of the applications and forms a Technical Addendum to the air quality assessment (AQA) submitted in support of the s.73 applications to vary the planning approvals for the FGFs¹ in 2018. As such, this Technical Addendum should be read in conjunction with the 2018 AQA for full details of the operation of the FGFs and the dispersion modelling approach, input data and settings, as well as for comparative purposes. In addition to the 2018 AQA, additional modelling was also completed in 2019 as part of the environmental permit (EP) applications for the sites². The additional modelling assumed the facilities (alone and in combination) operated continuously across the entire year (rather than only the contractual availability hours), thereby identifying the highest 1-hour mean NO₂ concentrations that could occur if the

¹ Air Quality Assessment for Section 73 Application, Flexible Generation Facilities, Needham Road, Stowmarket (Report Ref:1750106-01/R2018/009); prepared on behalf of Precise Energy Ltd & Valence Power Ltd by PJD Consultants Ltd (October 2018)

² The additional modelling was submitted as a Technical Addendum to the AQA referred to in Footnote 1: Assessment of Emissions from Stowmarket Flexible Generation Facilities - Further Information on Impact of Night Time Operation; prepared on behalf of Precise Energy Ltd & Valence Power Ltd by PJD Consultants Ltd (July 2019); Report Ref: 1750106/R2018/009/TA01 (53pp); Environmental Permit Application reference: EPR/MP3636QC/A001.

facilities came into operation at any time of the day or night. Annual mean concentrations were adjusted to reflect the maximum of 500 hours annual operation. The same approach to the modelling (i.e., assuming continuous operation) was used for the current modelling.

2.0 ADDITIONAL DISPERSION MODELLING AND ASSESSMENT

2.1.1 Background

An increase in maximum duration of any single operational event for the plants would not affect the conclusions of the 2018 AQA with regards the assessment of human health impacts. This is because the maximum potential 1-hour mean NO₂ concentration at each receptor was identified as part of the AQA and this will not change as a result of the proposed changes. In addition, because no increase in the annual operating hours of the plants (up to 500 hours per year) is proposed, there will be no change in long-term impacts at receptor locations (for NO₂ or NO_x) from those predicted in the 2018 AQA and 2019 Technical Addendum.

The proposed increase in maximum operating event duration (i.e., up to 4 hours) would only have an increased impact on 24-hour mean pollutant concentrations because of the potential increase in operating hours across a 24-hour period compared to the approved operational events (i.e., up to 2 hours). There is no air quality standard (AQS) for 24-hour mean NO₂ concentrations for the protection of human health, but there is a 24-hour mean Critical Level for NO_x for the protection of vegetation. Therefore, further dispersion modelling has been undertaken to determine the impact on 24-hour mean NO_x concentrations at ecological receptors considered in the 2018 AQA. Only 24-hour mean NO_x concentrations were considered because, as noted above, no increase in annual operating hours is proposed, therefore there would be no change in impact for annual mean NO_x (or NO₂) concentrations (or nitrogen or acid deposition, which is also based on annual mean concentrations), which were reported in the 2018 AQA and 2019 Technical Addendum.

2.1.2 Modelling and Analytical Approach

The 2018 AQA for the approved facilities included modelling that covered the hours the FGFs are contractually obliged to be available for operation should it be required to meet power demand on the national grid (see **Table C2** in **Appendix C** of the 2018 AQA); however, to ensure a conservative approach to the modelling and ensure the highest concentrations are captured, it has been assumed that the facilities operate continuously throughout the year (as was assumed for the additional modelling completed for the EP). This was achieved by removing the *.var files from the dispersion models used to specify the operational hours of the individual engines. No other alterations were made to the dispersion model set-up for the additional modelling. To estimate the 24-hour mean NO_x concentration at the ecological receptors, model was set to predict a 4-hour rolling mean (to represent the maximum single operating period) and output the highest daily 4-hour mean NO_x concentration. The method

allows for the highest concentration over a four-hour period at any time of the day to be identified. The highest 4-hour mean concentration was then used to calculate the 24-hour mean concentration at receptor locations. The approach is conservative as the results are based on the assumption that the operation of the plant(s) occurs for 4 hours continuously at the same time as the worse case meteorological conditions (with respect to dispersion), which has a low likelihood of occurring in practice.

Full results of the current additional dispersion modelling are presented in **Annex A – Assessment Results** for Site A, Site B and the cumulative impact of both FGFs operating, with a summary of the results provided below. As with the 2018 and 2019 modelling, five years of meteorological data has been used and the results for each year are presented in **Tables A1 to A6** in **Annex A**. The meteorological data set used for the current modelling is the same as used for the 2018 AQA (2013 – 2017) because this allowed direct comparison of the results with those of the 2018 AQA, while still providing a robust analysis of the inter-annual variability of predicted concentrations due to meteorological conditions alone. The figures presented below represent the highest concentrations predicted across the 5-year period. As can be seen in the results for the modelling for each year (see **Annex A**), the highest predicted concentrations can be markedly lower for other years than that presented in *Section 2.2*.

2.1.3 Assessment of Significance

The Environment Agency's guidance³ states that for a detailed modelling assessment, process contributions (PCs) are insignificant where:

- The short-term PC is less than 10% of the short-term environmental standard.

At the detailed dispersion modelling stage, the guidance also states that there are no further criteria for determining whether:

- PCs are significant; or
- PECs are significant or insignificant.

The guidance requires an explanation of how the significance of the impacts was judged and that this must be based on site specific circumstances.

2.2 Impact on Ambient NO_x Concentrations at Ecological Receptors

Combs Wood (SSSI) is located approximately 500m west of the site at the closest point. In addition to this, there is also a local nature reserve (LNR) approximately 700m further to the west beyond the SSSI. The highest 24-hour mean NO_x concentrations at the Combs Wood receptors for Site A and Site B operating in isolation across the 5-

³ Environment Agency and Department for Environment, Food & Rural Affairs – Guidance, Environmental permitting: air dispersion modelling reports <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>

year period modelled are shown in **Table 1** and **Table 2**, respectively; with the highest concentrations for both plants operating together (cumulative) shown in **Table 3**.

The Critical Level (CL) for 24-hour mean NO_x for the protection of vegetation is 75µg/m³. The Air Pollution Information System (APIS) website⁴ gives the annual mean background NO_x concentration for Combs Wood as ranging between 11.6 and 15.0µg/m³, with an average of 12.1µg/m³ (2017 to 2019 mean); whereas a range of 9.7 to 11.8µg/m³ is specified in the DEFRA Background Maps⁵ for the designated site. In order to maintain a conservative approach, twice the upper limit of the APIS background concentration range (i.e., 30 µg/m³) has been added to the predicted 24-hour mean process contribution (PC) from the plants to calculate the predicted environmental concentration (PEC) shown in the tables for each receptor.

Table 1: Highest Predicted 24-Hour Mean NO_x Concentrations (µg/m³) – 8,760hrs Annual Operation (Site A)

Receptor Location	24-hr Mean Process Contribution (µg/m ³)	24-hr Mean PC as Percentage of AQS (%)	24-hr Mean PEC (µg/m ³)	24-hr Mean PEC as Percentage of AQS
E1 (Combs Wood NE)	13.4	18%	43.4	58%
E2 (Combs Wood SE)	9.6	13%	39.6	53%
E3 (Combs Wood SW)	9.8	13%	39.8	53%
E4 (Combs Wood NW)	7.9	11%	37.9	51%

Table 2: Highest Predicted 24-Hour Mean NO_x Concentrations (µg/m³) – 8,760hrs Annual Operation (Site B)

Receptor Location	24-hr Mean Process Contribution (µg/m ³)	24-hr Mean PC as Percentage of AQS	24-hr Mean PEC (µg/m ³)	24-hr Mean PEC as Percentage of AQS
E1 (Combs Wood NE)	13.4	18%	43.4	58%
E2 (Combs Wood SE)	9.2	12%	39.2	52%
E3 (Combs Wood SW)	9.8	13%	39.8	53%
E4 (Combs Wood NW)	8.0	11%	38.0	51%

⁴ <http://www.apis.ac.uk/src1>

⁵ <https://uk-air.defra.gov.uk/data/laqm-background-home>

Table 3: Highest Predicted 24-Hour Mean NO_x Concentrations (µg/m³) – 8,760hrs Annual Operation (Cumulative)

Receptor Location	24-hr Mean Process Contribution (µg/m ³)	24-hr Mean PC as Percentage of AQS	24-hr Mean PEC (µg/m ³)	24-hr Mean PEC as Percentage of AQS
E1 (Combs Wood NE)	26.8	36%	56.8	76%
E2 (Combs Wood SE)	17.9	24%	47.9	64%
E3 (Combs Wood SW)	19.6	26%	49.6	66%
E4 (Combs Wood NW)	15.9	21%	45.9	61%

The results of the 2018 AQA and 2019 Technical Addendum modelling of NO_x emissions showed that long and short-term (for up to 2 hours operation) impacts at the Combs Wood SSSI and LNR were not significant (see *Tables E1-1* and *E2-1* in *Appendix E* of the 2018 AQA). The results of the current modelling for the combined operation of the two FGFs show that the 24-hour mean NO_x PCs exceed the insignificance criterion (<10% of the CL) at each of the receptors and therefore the PCs cannot be considered insignificant. The PECs are all below the CL (maximum of 76% of the CL) for 24-hour mean NO_x concentrations at all the receptors. When considering the results, it is important to remember that, because the facilities only operate intermittently for a maximum of 500 hours per year, the (maximum) four hours continuous operation would have to coincide with the least favourable meteorological conditions for the maximum predicted 24-hour mean PC to occur. As such, the highest predicted impact does not represent a concentration that would definitely occur (as potentially with a continuous source), but rather may occur under a certain set of circumstances which may not actually occur in practice.

A review of the modelling results shows that the meteorological conditions that would give rise to a 24-hour mean PC for the combined operation of the facilities greater than 10% of the CL at receptors occur for less than 4% of the time (at Receptor E1 and lower than this for the other receptor locations). As the facilities would operate for a maximum less than 6% of the time during the year, the likelihood of 24-hour mean NO_x PCs that could not be considered insignificant occurring at the designated sites is low. In addition to this, even with the maximum predicted PCs, the PECs (which embody a conservative background concentration) are well below CL at all receptors. The impacts for each of the FGFs operating in isolation are clearly less (approximately 50%) than the cumulative impacts.

Therefore, the impact of emissions associated with the plants operating for a maximum of four hours per day would not be significant on 24-hour mean NO_x concentrations at the ecological receptors at Combs Wood SSSI or the more distant LNR.

3.0 CONCLUSION

The results of the additional modelling presented herein show that if the FGFs were permitted to operate for up to 4-hours per day (any time during the day or night), the impact predicted at sensitive ecological receptor locations would not be significant. This is on the basis of the low probability of the maximum predicted 24-hour mean PCs actually occurring and the predicted PECs all being well below the Critical Level for 24-hour mean NO_x concentrations, despite the conservative nature of the predicted 24-hour mean PC and PECs.

Annex 1: Additional Modelling Results

Table A1: Highest 24-hour Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Site A)

Discrete Receptors		Easting	Northing	24-hr Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	13.4	11.3	12.7	12.7	13.3
E2	Combs Wood SE	605553	256679	9.6	8.7	7.5	9.0	8.7
E3	Combs Wood SW	605237	256744	9.8	6.3	4.7	7.2	6.0
E4	Combs Wood NW	605414	257082	7.9	6.7	7.9	6.9	7.3

Table A2: Highest 24-hour Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Site B)

Discrete Receptors		Easting	Northing	24-hr Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	13.4	11.4	12.6	12.8	13.4
E2	Combs Wood SE	605553	256679	8.6	8.7	7.7	9.2	9.2
E3	Combs Wood SW	605237	256744	9.8	6.3	4.9	7.2	6.6
E4	Combs Wood NW	605414	257082	8.0	6.4	7.4	7.0	7.4

Table A3: Highest 24-hour Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Cumulative)

Discrete Receptors		Easting	Northing	24-hr Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	26.8	21.8	25.3	25.6	26.7
E2	Combs Wood SE	605553	256679	17.9	17.4	15.2	17.9	17.5
E3	Combs Wood SW	605237	256744	19.6	12.7	9.5	14.4	12.6
E4	Combs Wood NW	605414	257082	15.9	13.1	15.3	13.8	14.7

Table A4: Highest 4-hour Rolling Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Site A)

Discrete Receptors		Easting	Northing	4-hr Rolling Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	80.5	67.9	76.4	76.5	79.6
E2	Combs Wood SE	605553	256679	57.4	52.2	44.9	53.9	52.2
E3	Combs Wood SW	605237	256744	58.7	38.1	28.0	43.0	36.0
E4	Combs Wood NW	605414	257082	47.4	40.0	47.6	41.2	44.1

Table A5: Highest 4-hour Rolling Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Site B)

Discrete Receptors		Easting	Northing	4-hr Rolling Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	80.2	68.3	75.7	76.9	80.3
E2	Combs Wood SE	605553	256679	51.8	52.1	46.5	55.1	55.0
E3	Combs Wood SW	605237	256744	58.7	38.0	29.1	43.2	39.3
E4	Combs Wood NW	605414	257082	48.2	38.3	44.4	41.8	44.3

Table A6: Highest 4-hour Rolling Mean NO_x concentrations at Ecological Receptors for each year of meteorological data (Cumulative)

Discrete Receptors		Easting	Northing	4-hr Rolling Mean Concentration (µg/m ³)				
				2013	2014	2015	2016	2017
E1	Combs Wood NE	605785	256943	160.7	130.6	152.1	153.4	160.0
E2	Combs Wood SE	605553	256679	107.5	104.3	91.4	107.5	105.1
E3	Combs Wood SW	605237	256744	117.3	76.0	57.1	86.3	75.3
E4	Combs Wood NW	605414	257082	95.5	78.3	92.0	83.0	88.3