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# Tees CCPP Project

The Tees Combined Cycle Power Plant Project  
Land at the Wilton International Site, Teesside

## Volume 2 - Annex E1

Regulations – 6(1)(b) and 8(1)

**Applicant:** Sembcorp Utilities UK  
**Date:** November 2017

Annex E1

## Stack Height Assessment

- E1.1 A Preliminary Environmental Information Report (PEIR) was prepared in May 2017 by Environmental Resources Management Ltd (ERM) on behalf of Sembcorp Utilities (UK) Limited (Sembcorp). It presented information on Sembcorp's proposed natural gas fired combined-cycle gas turbine (CCGT) generating station with an output capacity of up to 1,700 MWe (the Project). The station will include up to two turbine units each with a single stack. A 75 m stack height has been proposed and was assessed in the PEIR.
- E1.2 An assessment of impacts on air quality due to emissions to air from the Project was undertaken using detailed dispersion modelling (AERMOD). It is proposed that the Project will meet the future Best Available Technique (BAT) emission limit for NO<sub>x</sub> of 30 mg/m<sup>3</sup> with a stack height of 75 m. The results predicted no significant effects (see PEIR Section 7.4.3 and ES section 7.4.3). In addition, no significant effects on sensitive ecological receptors were predicted at European and nationally designated sites or Local Wildlife Sites.
- E1.3 Following the submission of the PEIR, the Environment Agency requested further information to support the justification of the 75 m stack height and an assessment of the impact of different stack heights on the air quality. This annex presents the results of the dispersion modelling undertaken to assess the sensitivity of the stack height. Results are presented for the maximum off-site concentrations for annual mean NO<sub>2</sub>, 24 hour maximum NO<sub>x</sub> and 1 hour NO<sub>2</sub>, as the 99.79<sup>th</sup> percentile.

- E1.4 The air dispersion model input parameters used in the Project's ES (*Section 7.2.3, and plant design as per Section 5.8*) have been adopted for the stack height assessment. Particularly, the emissions parameters, buildings layout and terrain were kept identical with only the stack height varied.
- E1.5 Using these data, it was determined that the meteorological year giving the highest annual mean process contribution for NO<sub>x</sub> at any off-site location is 2015; 2015 was therefore modelled in this stack height assessment.
- E1.6 Stack heights have been assessed between 35m and 90m in 5m increments; this approach was adopted to clearly identify the 'knee' of the curve, where increasing stack height results in proportionately less decrease in impacts.

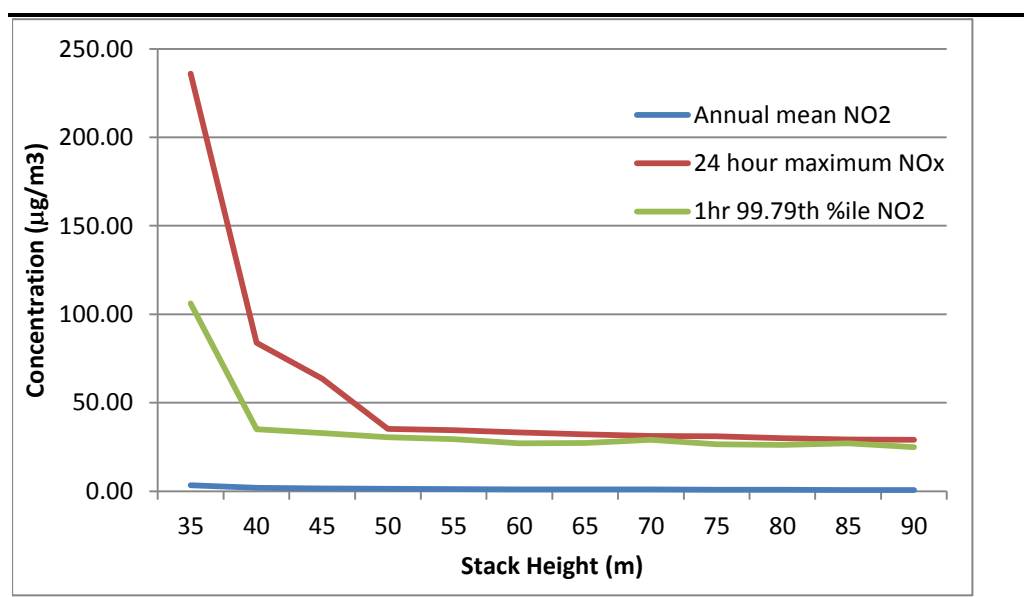
E1.7 The modelled NO<sub>x</sub> annual mean concentrations for all the different stack heights are presented in *Table E3.1* and *Figure E3.1*.

**Table E3.1** *Modelled Annual Mean NO<sub>x</sub> Concentrations*

Height	NO <sub>x</sub> Process Contribution, annual mean, (µg/m <sup>3</sup> )		
	Annual mean NO <sub>2</sub>	24 hr maximum NO <sub>x</sub>	1 hour NO <sub>2</sub> , as the 99.79 <sup>th</sup> percentile
35m	3.45	236	106
40m	1.92	84	35.0
45m	1.50	64	32.8
50m	1.30	35	30.4
55m	1.18	35	29.3
60m	1.09	33	27.1
65m	1.01	32	27.3
70m	0.928	31	29.0
75m	0.852	31	26.5
80m	0.781	30	26.1
85m	0.722	29	27.1
90m	0.668	29	25.0

Notes: The modelling is presented for 2015 meteorological year, as this is the year with the highest off-site annual mean concentration predicted. However, 2015 is not the highest year for the 24hour and 1 hour means, and therefore these figures do not correspond to the maximum off-site impacts reported in the PEIR report. Annual mean NO<sub>2</sub> is calculated using a factor of 70% conversion from NO<sub>x</sub>, and 1 hour NO<sub>2</sub> using a factor of 35% conversion, as per Environment Agency's guidelines.

**Figure E3.1** *Modelled NO<sub>x</sub> Concentrations*



- E1.8 The graph in *Figure E3.1* shows that the 'knee' of the curve is between 40m and 45m. At greater stack heights the decrease in concentrations is close to linear as the stack height increases, for the annual mean, the 24 hour maximum and the 1 hour maximum. However, a stack height of 40m to 45m is impractical in terms of managing environmental impacts on ecological receptors. As identified in the PEIR, the stack height of 75 m is the lowest stack height at which impacts on sensitive human receptors are deemed to be acceptable and not significant on ecological receptors, noting that these are driven by the annual mean. On the basis of the stack height assessment and the conclusions of the PEIR, the 75 m stack height is therefore considered to represent an acceptable balance between reducing the impact on air quality and visual impacts.
- E1.9 However, we are aware of the concerns raised by the local community regarding the visual impact. Following the selection of the gas turbine manufacturer, Sembcorp will carry out a further stack height assessment, air quality assessment and HRA as part of the environmental permit process to confirm the appropriate stack height.