



CLEVE HILL SOLAR PARK

RESPONSES TO THE EXA'S WRITTEN QUESTIONS - APPENDICES **Appendix 2 – Transport CO2 Costs Estimation Calculation**

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Transport CO₂ Costs Estimation

As a “belt and braces” approach, an estimate has been made of the carbon footprint of transportation during the construction phase.

Assumptions

Shipping:

It isn't known where the solar PV modules will be manufactured at this stage, as a supplier has not been selected, so the transportation CO₂ costs from China by boat have been calculated. The solar PV module total area in the candidate design (as set out in the Outline Design Principles, Document Reference 7.1) were assumed to be packed into shipping containers, with 5cm space between each panel for packing purposes and, in addition to that 5cm space, only c. 66% of the volume in the container used (to account for the panels and container being a fixed size and being unlikely to fit neatly). This leads to a requirement for approximately 3,500 containers, which is approximately half of a container ship that has capacity for 5,000-7,999 containers. The International Maritime Organisation (IMO) has estimated carbon emissions from this category of ship¹, and from this it is calculated that such a ship emits 420 kgCO₂eq/km. The distance from China to the UK by boat is approximately 25,000 km, and the Development solar PV modules would be responsible for the half of emissions. This leads to an estimated total CO₂ footprint of shipping the solar PV modules from China to the UK of approximately 5,250,000 kgCO₂eq.

HGVs:

Curtins, the transport consultants advising the application for the Development, advise that there are 33,976 HGV movements anticipated, using conservative assumptions, during the construction phase (on the same basis as presented in the ES), including journeys both to the site and away again. Of these, they estimate 38% would arise in transporting the solar PV modules from a port to the Development Site. An average distance from Dover, Ramsgate and Sheerness is c. 46 km. 25% of HGVs would arise from transporting stone from quarries; there are several quarries in the greater Maidstone area, which is c. 65 km from the Development Site. Other HGVs would be required for a variety of reasons, and their movement from the furthest large settlement in Kent, Tunbridge Wells, is assumed, at 104 km. This leads to a total distance travelled by HGVs of approximately 2,450,000 km. CO₂ emissions per km were taken from UK Government statistics quoted by Stephen Hammond (The Parliamentary Under-Secretary of State for

¹ International Maritime Organisation (2014). Third IMO Greenhouse Gas Study 2014. Available at: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf> [accessed 25/06/2019].

Transport)² for a 14-20 t HGV, at the Euro VI standard, at 50 miles per hour, as 0.56 kgCO₂eq/km. This leads to an estimated total CO₂ footprint of HGV transport associated with construction of approximately 1,370,000 kgCO₂eq.

Light duty vehicles (LDVs):

Curtins advise that there are 50,378 LDV movements anticipated, using conservative assumptions, during the construction phase (on the same basis as presented in the ES), including journeys both to the site and away again. Curtins assumed, conservatively, that all LDV movements would be from the furthest large settlement in Kent, Tunbridge Wells, at 104 km. This leads to a total distance travelled by LDVs of approximately 5,240,000 km. CO₂ emissions per km were taken from the UK Government vehicle certification agency, assuming an equivalent to a Ford Mondeo 2.0, using the highest emissions quoted for that vehicle, which identifies emissions of 0.126 kgCO₂eq/km. This leads to an estimated total CO₂ footprint of LDV transport associated with construction of approximately 660,000 kgCO₂eq.

Total transportation emissions:

The total carbon footprint of the transportation associated with the construction of the Development is the sum of that arising from boat, HGV and LDV sources, which is approximately 7,275,000 kgCO₂eq. Clearly there is substantial uncertainty about this figure; whilst conservative assumptions have been used in its estimation, the authors of this note suggest that c. 50% uncertainty should be applied when using this figure.

Emissions per unit:

The total amount of electricity that would be generated by the Development was calculated for the carbon savings section of the ES as 7,574,950 MWh in 25 years, and 12,119,920 MWh in 40 years, of operation. The CO₂ emissions per unit of electricity produced by the Development is therefore calculated as 0.96 kgCO₂eq/MWh for 25 years of operation, and 0.6 kgCO₂eq/MWh for 40 years of operation.

Comparison with the IPCC figure used in the ES:

The higher of these numbers is approximately 2% of the 48 kgCO₂eq/MWh quoted by the IPCC study. Allowing a further 50% increase for the uncertainty in transport emissions estimation leads to an upper estimate of 3% of the IPCC figure.

Therefore, whether or not the IPCC figure includes transportation costs does not materially affect the total life cycle carbon emissions assumed in the ES, and does not affect the conclusions set out in the ES.

² Stephen Hammond, transport written question (March 2013). Large Goods Vehicles: Exhaust Emissions. Available at: <https://www.theyworkforyou.com/wrans/?id=2013-03-01a.144740.h> [accessed 25/06/2019]