Appendix 7.1
GHG Emission Factors

Introduction

This Technical Appendix to the Climate Chapter (Chapter 7) reports the raw data and emissions factors used to carry out the GHG assessment. This Appendix is intended to be read as part of the wider Climate Chapter, which includes the methodology and assumptions used within the assessment.

Emissions calculations apply the following format:

Activity data x emissions factor = emissions in mass of CO2e

Construction of the Proposed Development

A large number of data sources have been supplied by the Applicant to estimate emissions from construction. These are summarised at a high-level in **Table 7.1** below.

It has been assumed that the construction period will last for a duration of 48-months.

Table 7.1 Estimated construction emissions

Component	Quantity	Methodology	Distance travelled by sea	Distance travelled by HGV
Battery storage (BESS)	3,200,000 kWh	Using publicly available data, assumed 0.6 tonnes per 100 kWh.	21,013 km	500 km
BESS containers and control containers	1150 No. BESS containers & 385 No. control containers	Using publicly available data, assumed 560 kg per unit.	N/A	100 km
Solar PV Modules	1,500,000 No.	Using publicly available data, assumed a weight of 23 kg per module.	21,907 km	339 km
Inverters	2,700 No.	Assumed 116 kg per unit, as per data supplied by applicant.	50%: 20,137 km 50%: 4,324 km	50%: 358 km 50%: 494 km

Component	Quantity	Methodology	Distance travelled by sea	Distance travelled by HGV
PV framework	23,200t	Using publicly available data, assumed a weight of 29 t per MW.	4,356 km	575 km
Springwell Substation	1 No.	Assumed constructed in UK. Modelled using One Click LCA software.	N/A	Default material delivery distances supplied by One Click LCA software.
Transformers	6 No.	Using publicly available data, assumed 174 t per transformer.	1,767 km	268 km
Inverter Transformer Stations	270 No.	Using publicly available data, assumed 890 kg per unit.	50%: 21,907 km 50%: 4,324 km	50%: 348 km 50%: 500 km

Operation of the Proposed Development

The Proposed Development is anticipated to have an installed capacity of 800MW, and generation of 952,320MWh in the first year. A degradation factor of 0.4% has been applied each year to account for year-on-year reduction in yield.

Table 7.2 Estimated energy generation

Year of operation	Year	Energy generation (MWh)
Construction	2026	-
Construction	2027	-
Construction	2028	-
Construction	2029	-
1	2030	952,320

Year of operation	Year	Energy generation (MWh)
2	2031	948,511
3	2032	944,717
4	2033	940,938
5	2034	937,174
6	2035	933,425
7	2036	929,692
8	2037	925,973
9	2038	922,269
10	2039	918,580
11	2040	914,906
12	2041	911,246
13	2042	907,601
14	2043	903,971
15	2044	900,355
16	2045	896,753
17	2046	893,166
18	2047	889,594
19	2048	886,035
20	2049	882,491
21	2050	878,961
22	2051	875,445
23	2052	871,944
24	2053	868,456

Year of operation	Year	Energy generation (MWh)
25	2054	864,982
26	2055	861,522
27	2056	858,076
28	2057	854,644
29	2058	851,225
30	2059	847,820
31	2060	844,429
32	2061	841,051
33	2062	837,687
34	2063	834,336
35	2064	830,999
36	2065	827,675
37	2066	824,364
38	2067	821,067
39	2068	817,782
40	2069	814,511
TOTAL		**35,266,691**

Table 7.3 Emission Factors

Category	Description	EF	Unit	Source
Worker transportation	Average Diesel Car	0.169826449	kgCO2e/km	Defra 2023
	Average Petrol Car	0.163908534	kgCO2e/km	Defra 2023
	Average BEV	0.054796442	kgCO2e/km	Defra 2023
Material Disposal	Metals - Landfill	1.2643491	kgCO2e/t	Defra 2023

Category	Description	EF	Unit	Source
	Metals - Recycling	0.984911723	kgCO2e/t	Defra 2023
	Metals - combustion		kgCO2e/t	Defra 2023
	Mineral Oil - recycling	21.28080724	kgCO2e/t	Defra 2023
	Mineral Oil - combustion	21.28080724	kgCO2e/t	Defra 2023
	Insulation - recycling	0.984911723	kgCO2e/t	Defra 2023
	Insulation - landfill	1.23401391	kgCO2e/t	Defra 2023
Material use	Steel	2.73	kgCO2e/kg	ICE 2019
	Insulating paper	1.76	kgCO2e/kg	https://www.sciencedirect.com/science/article/pii/S2352484722020157
	Copper	3.81	kgCO2e/kg	ICE 2019
	Steel	2.46	kgCO2e/kg	ICE 2019
	Mineral Oil	1401	kgCO2e/t	Defra 2023
	Steel	23	kgCO2e/m2	TATA Steel 2020
	Glass	1.44	kgCO2e/kg	ICE 2019
	Aluminium	14.6	kgCO2e/kg	ICE 2019
	Plastic	3.31	kgCO2e/kg	ICE 2019
	Silicon	16	kgCO2e/kg	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3926088#:~:text=It%20is%20sho

Category	Description	EF	Unit	Source
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Material transportation	Average HGV's	0.096957467	kgCO2e/tkm	Defra 2023
	General Cargo Ship	0.013212769	kgCO2e/tkm	Defra 2023
Fuel use	Gas Oil	2.755408979	kgCO2e/litre	Defra 2023