



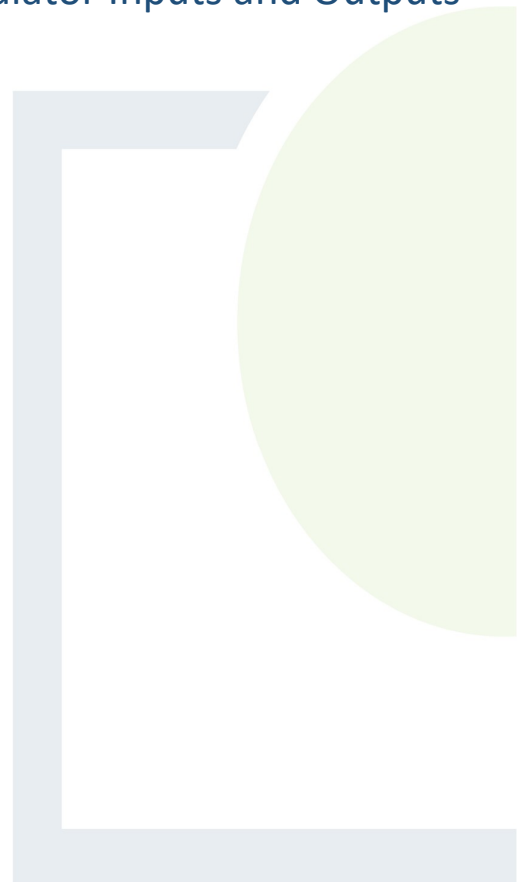
DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX

7.1

AIR QUALITY AND
CLIMATE

Carbon Calculator Inputs and Outputs



Carbon Calculator Inputs for 7.2 MW machine

Carbon Calculator Inputs	Info added to carbon calcs
No. of Turbines	9
Duration of consent	35
Power rating of 1 turbine (MW)	7.2
Capacity factor	31
average depth of peat at site (m)	0.2 - 2.3
average extent of drainage around drainage features at site	n/a
average water table depth (m)	0.5
area of forestry to be felled (ha)	6.01
no. of borrow pits	0
average length of borrow pits (m)	n/a
average width of borrow pits (m)	n/a
average depth of peat removed from pit (m)	n/a
average length of turbine foundation (m)	22.15
average width of turbine foundation (m)	22.15
average depth of peat removed from turbine foundations (m)	0.92
average length of hard standing (m)	88
average width of hard standing (m)	30
average depth of peat removed from hard-standing (m)	0.92
total length of access track (m)	9,360
Existing track length (m)	550
length of access track that is floating road (m)	2,100
Floating road width (m)	5
floating road depth (m)	1
Length of floating road that is drained (m)	2,100
Average depth of drains associated with floating roads (m)	0.3
Length of access track that is excavated road (m)	7260
Excavated road width (m)	5
Average depth of peat excavated for road (m)	0.3
Length of access track that is rock filled road (m)	0
Rock filled road width (m)	0
Rock filled road depth (m)	0
Length of rock filled road that is drained (m)	0
Average depth of drains associated with rock filled roads (m)	0
Length of any cable trench on peat that does not follow access tracks and is lined with a permeable medium eg. sand (m)	0
Average depth of peat cut for cable trenches (m)	0
Volume of additional peat excavated (m3)	0
Area of additional peat excavated (m2)	0

Carbon Calculator Outputs for 7.2 MW machine

Results

PAYBACK TIME AND CO₂ EMISSIONS

Note: The carbon payback time of the windfarm is calculated by comparing the loss of C from the site due to windfarm development with the carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.

	<i>Exp.</i>	<i>Min.</i>	<i>Max.</i>
1. Windfarm CO₂ emission saving over...			
...coal-fired electricity generation (tCO ₂ yr ⁻¹)	176323	176323	176323
...grid-mix of electricity generation (tCO ₂ yr ⁻¹)	44697	44697	44697
...fossil fuel - mix of electricity generation (tCO ₂ yr ⁻¹)	76019	76019	76019
Energy output from windfarm over lifetime (MWh)	6158981	6158981	6158981
Total CO₂ losses due to wind farm (t CO₂ eq.)			
2. Losses due to turbine life (eg. manufacture, construction, decommissioning)	56338	56338	56338
3. Losses due to backup	42914	25749	60080
4. Losses due to reduced carbon fixing potential	116	116	244
5. Losses from soil organic matter	21885	9914	43442
6. Losses due to DOC & POC leaching	0	0	268
7. Losses due to felling forestry	2777	2777	2777
Total losses of carbon dioxide	124030	94894	163149
8. Total CO₂ gains due to improvement of site (t CO₂ eq.)			
8a. Change in emissions due to improvement of degraded bogs	0	0	-230
8b. Change in emissions due to improvement of felled forestry	0	0	-47
8c. Change in emissions due to restoration of peat from borrow pits	0	0	0
8d. Change in emissions due to removal of drainage from foundations & hardstanding	0	0	0
Total change in emissions due to improvements	0	0	-277

RESULTS			
	<i>Exp.</i>	<i>Min.</i>	<i>Max.</i>
Net emissions of carbon dioxide (t CO₂ eq.)	124030	94617	163149
Carbon Payback Time			
...coal-fired electricity generation (years)	0.7	0.5	0.9
...grid-mix of electricity generation (years)	2.8	2.1	3.7
...fossil fuel - mix of electricity generation (years)	1.6	1.2	2.1
Ratio of soil carbon loss to gain by restoration (TARGET ratio (Natural Resources Wales) < 1.0)	No gains! No gains! No gains!		
Ratio of CO₂ eq. emissions to power generation (g / kWh) (TARGET ratio by 2030 (electricity generation) < 50 g /kWh)	20	15	26