FEHILY TIMONEY

DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

APPENDIX 7

AIR QUALITY AND CLIMATE

Appendix 7.1 – Climate Calculations

APPENDIX 7.1

Climate Calculations

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 awith a permeable medium eg. sand (m)	0
Average dpeth 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 CO_2 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.

	Exp.	*Min.*	*Max.*
1. Windfarm CO_2 emission saving over…			
…coal-fired electricity generation (tCO_2 yr^{-1})	176323	151834	176323
…grid-mix of electricity generation (tCO_2 yr^{-1})	44697	38489	44697
…fossil fuel - mix of electricity generation (tCO_2 yr^{-1})	76019	65461	76019
Energy output from windfarm over lifetime (MWh)	6158981	5303567	6158981
Total CO_2 losses due to wind farm (t CO_2 eq.)			
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	56338	47929	56338
3. Losses due to backup	42914	22172	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	82908	163149
8. Total CO_2 gains due to improvement of site (t CO_2 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	*Exp.*	*Min.*	*Max.*
Net emissions of carbon dioxide (t $CO_{2\ eq.}$)	**124030**	**82631**	**163149**
Carbon Payback Time			
…coal-fired electricity generation (years)	0.7	0.5	1.1
…grid-mix of electricity generation (years)	2.8	1.8	4.2
…fossil fuel - mix of electricity generation (years)	**1.6**	**1.1**	**2.5**
Ratio of soil carbon loss to gain by restoration (TARGET ratio (Natural Resources Wales) < 1.0)	**No gains!**	**No gains!**	**No gains!**
Ratio of CO_2 eq. emissions to power generation (g / kWh) (TARGET ratio by 2030 (electricity generation) < 50 g /kWh)	**20**	**13**	**31**

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