Carbon Calculator v1.6.1
Hoy Wind Farm   Location: 58.826026   -3.249132
Orkney Islands Council

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	6	6	6	EIA Chapter 3 Proposed Development
Duration of consent (years)	25	25	25	Indicative lifetime of wind farm for assessment. consistent with Chapter 9 Ornithology Chapter 13 Socioeconomics
Performance				
Power rating of 1 turbine (MW)	4.8	4.8	4.8	EIA Chapter 3 Proposed Development
Capacity factor	38.3	34.47	42.13	EIA Chapter 1 Introduction (BEIS 2019 capacity factor)
Backup				
Fraction of output to backup (%)	5	5	5	Standard value
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	10	10	Fixed
Total CO2 emission from turbine life (tCO2 MW^{-1}) (eg. manufacture, construction, decommissioning)	Calculate wrt installed capacity	Calculate wrt installed capacity	Calculate wrt installed capacity	
Characteristics of peatland before windfarm development				
Type of peatland	Acid bog	Acid bog	Acid bog	EIA Appendix 11.2
Average annual air temperature at site (°C)	8	7.2	8.8	From annual met data
Average depth of peat at site (m)	0.637	0.573	0.701	EIA Appendix 11.2 PMP
C Content of dry peat (% by weight)	47.8	43.6	50.7	Lab data average from survey samples
Average extent of drainage around drainage features at site (m)	10	9	11	EIA Chapter 8 Ecology
Average water table depth at site (m)	0.1	0.05	0.3	Survey observations
Dry soil bulk density (g cm^{-3})	0.25	0.2	0.3	Default values used
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	10	5	15	Standard value
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	0.12	0.31	Default SNH values used
Forestry Plantation Characteristics				
Area of forestry plantation to be felled (ha)	0	0	0	No forestry to be felled
Average rate of carbon sequestration in timber (tC ha^{-1} yr^{-1})	3.6	3.24	3.96	SNH guidance standard value
Counterfactual emission factors				
Coal-fired plant emission factor (t CO2 MWh^{-1})	0.92	0.92	0.92	
Grid-mix emission factor (t CO2 MWh^{-1})	0.25358	0.25358	0.25358	
Fossil fuel-mix emission factor (t CO2 MWh^{-1})	0.45	0.45	0.45	

Input data	Expected value	Minimum value	Maximum value	Source of data
Borrow pits				
Number of borrow pits	1	1	1	EIA Chapter 3 Proposed Development
Average length of pits (m)	30	27	50	EIA Chapter 3 Proposed Development and PMP
Average width of pits (m)	20	18	50	EIA Chapter 3 Proposed Development and PMP
Average depth of peat removed from pit (m)	0.34	0.31	0.37	From Appendix 11.2 PMP
Access tracks				
Total length of access track (m)	5115	4724	5507	EIA Chapter 3 Proposed Development - Existing + New access tracks
Existing track length (m)	1200	1200	1200	EIA Chapter 3 Proposed Development
<u>Length of access track that is floating road (m)</u>	0	0	0	N/A no floating road
Floating road width (m)	5	5	5	N/A no floating road
Floating road depth (m)	0	0	0	N/A no floating road
Length of floating road that is drained (m)	0	0	0	N/A no floating road
Average depth of drains associated with floating roads (m)	0	0	0	N/A no floating road
<u>Length of access track that is excavated road (m)</u>	3915	3524	4307	EIA Chapter 3 Proposed Development
Excavated road width (m)	5	5	5	EIA Chapter 3 Proposed Development
Average depth of peat excavated for road (m)	0.5	0.45	0.55	Appendix 11.2 PMP
<u>Length of access track that is rock filled road (m)</u>	0	0	0	N/A
Rock filled road width (m)	5	5	5	N/A
Rock filled road depth (m)	0	0	0	N/A
Length of rock filled road that is drained (m)	0	0	0	N/A
Average depth of drains associated with rock filled roads (m)	0	0	0	N/A
Cable trenches				
Length of any cable trench on peat that does not follow access tracks and is lined with a permeable medium (eg. sand) (m)	0	0	0	EIA Chapter 3 Proposed Development
Average depth of peat cut for cable trenches (m)	0	0	0	EIA Chapter 3 Proposed Development
Additional peat excavated (not already accounted for above)				
Volume of additional peat excavated (m^3)	33430.8	30087.72	36773.88	Appendix 11.2 PMP - excavated cuttings, met mast & substation
Area of additional peat excavated (m^2)	81096	72986	89206	Appendix 11.2 PMP - excavated cuttings, met mast & substation
Peat Landslide Hazard				
Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	negligible	negligible	negligible	Fixed
Improvement of C sequestration at site by blocking drains, restoration of habitat etc				
<u>Improvement of degraded bog</u>				
Area of degraded bog to be improved (ha)	28.52	25.668	31.372	Appendix 11.2 PMP and Habitat Management Plan
Water table depth in degraded bog before improvement (m)	0.5	0.45	0.55	Assumed from site surveys
Water table depth in degraded bog after improvement (m)	0.25	0.225	0.275	Assumed from site surveys
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	10	5	15	Standard value
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	25	25	25	Indicative lifetime of wind farm for assessment

Input data	Expected value	Minimum value	Maximum value	Source of data
<u>Improvement of felled plantation land</u>				
Area of felled plantation to be improved (ha)	0	0	0	N/A no felled plantation
Water table depth in felled area before improvement (m)	0	0	0	N/A
Water table depth in felled area after improvement (m)	0	0	0	N/A
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	10	5	15	Standard value
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	25	25	25	Indicative lifetime of wind farm for assessment
<u>Restoration of peat removed from borrow pits</u>				
Area of borrow pits to be restored (ha)	0.06	0.054	0.066	EIA Chapter 3
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.35	0.315	0.385	Assumed from site survey
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.2	0.18	0.22	Assumed from site survey
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	5	15	Standard value
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	25	25	25	Indicative lifetime of wind farm for assessment
<u>Early removal of drainage from foundations and hardstanding</u>				
Water table depth around foundations and hardstanding before restoration (m)	0	0	0	N/A no early removal
Water table depth around foundations and hardstanding after restoration (m)	0	0	0	N/A no early removal
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	2	2	2	Post construction
Restoration of site after decommissioning				
<u>Will the hydrology of the site be restored on decommissioning?</u>	Yes	Yes	Yes	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Yes	Yes	CEMP
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes	Yes	Yes	CEMP
<u>Will the habitat of the site be restored on decommissioning?</u>	Yes	Yes	Yes	
Will you control grazing on degraded areas?	Yes	Yes	Yes	HMP
Will you manage areas to favour reintroduction of species	Yes	Yes	Yes	HMP
Methodology				
Choice of methodology for calculating emission factors	Site specific (required for planning applications)			

Forestry input data

N/A

Construction input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Hoy Wind Farm				
Number of turbines in this area	6	6	6	Chapter 3 Proposed Development
Turbine foundations				
Depth of hole dug when constructing foundations (m)	0.75	0.675	0.825	Appendix 11.2 PMP
Aproximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	Chapter 3 Proposed Development
Diameter at bottom	15	15	15	
Diameter at surface	15	15	15	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	0.73	0.657	0.803	Appendix 11.2 PMP
Aproximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Chapter 3 Proposed Development (square root hardstanding area)
Length at surface	70.7	70.7	70.7	
Width at surface	70.7	70.7	70.7	
Length at bottom	70.7	70.7	70.7	
Width at bottom	70.7	70.7	70.7	
Piling				
Is piling used?	No	No	No	Chapter 3 Proposed Development
Volume of Concrete				
Volume of concrete used (m^3) in the entire area	4302	3872	4732	calculated from information in Chapter 3 Proposed Development