Carbon Calculator v1.8.1

Killean Wind Farm Location: 55.647899 -5.6217

RES

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	9	9	9	Volume 1 Chapter 2 Proposed Development Description
Duration of consent (years)	50	50	50	Volume 1 Chapter 2 Proposed Development Description
Performance				
Power rating of 1 turbine (MW)	6.6	6.6	6.6	Volume 1 Chapter 2 Proposed Development Description
Capacity factor	43.77	43	44	Volume 1 Chapter 2 Proposed Development Description
Backup				
Fraction of output to backup (%)	5	0	5	Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands, Technical Note, Version 2.10.0, Para 19.
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	Volume 1 Chapter 2 Proposed Development Description
Average annual air temperature at site (°C)	12	8	15	Nearest met office station: Machrihanish https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcggqkdp5
Average depth of peat at site (m)	0.6	0	5	Volume 2 Chapter 9: TA9.1 PLHRA
C Content of dry peat (% by weight)	55.5	49	62	Birnie et al. 1991
Average extent of drainage around drainage features at site (m)	10	5	25	Site specific values are not available. Standard values are from "Windfarm Carbon Calculator Web Tool, User Guidance".

Input data	Expected value	Minimum value	Maximum value	Source of data
Average water table depth at site (m)	0.1	0.05	0.2	Site specific values are not available. Standard values are from "Windfarm Carbon Calculator Web Tool, User Guidance". Values for 'intact peat' have been used.
Dry soil bulk density (g cm^{-3})	0.2	0.18	0.22	Lilly et al. 2010
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	5	2	15	Site specific values are not available. Conservative estimates have been used.
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	0.12	0.31	Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands, Technical Note, Version 2.10.0, para 25.
Forestry Plantation Characteristics				
Area of forestry plantation to be felled (ha)	41.3	41	42	Volume 1 Chapter 2 Proposed Development Description
Average rate of carbon sequestration in timber (tC ha^{-1} yr^{-1})	3	2.4	3.6	Cannel, 1999, Growing trees in the UK to sequester carbon. Sitka spruce, YC 16, 3.6 tC ha-1 yr-1 over 55 years Beech, YC 6, about 2.4 tC ha-1 yr-1 over 92 years
Counterfactual emission factors				
Coal-fired plant emission factor (t CO2 MWh^{-1})	0.945	0.945	0.945	
Grid-mix emission factor (t CO2 MWh^{-1})	0.207	0.207	0.207	
Fossil fuel-mix emission factor (t CO2 MWh^{-1})	0.424	0.424	0.424	
Borrow pits				
Number of borrow pits	6	6	6	Volume 1 Chapter 2 Proposed Development Description
Average length of pits (m)	140	140	140	Volume 1 Chapter 2 Proposed Development Description
Average width of pits (m)	84	84	84	Volume 1 Chapter 2 Proposed Development Description
Average depth of peat removed from pit (m)	0.46	0.21	0.83	Volume 2 Chapter 9: TA9.2 PMP
Foundations and hard-standing area associated with each turbine				
Average length of turbine foundations (m)	0	0	0	

Input data	Expected value	Minimum value	Maximum value	Source of data
Average width of turbine foundations (m)	0	0	0	
Average depth of peat removed from turbine foundations(m)	0	0	0	
Average length of hard-standing (m)	0	0	0	
Average width of hard-standing (m)	0	0	0	
Average depth of peat removed from hard-standing (m)	0	0	0	
Volume of concrete used in construction of the ENTIRE windfarm				
Volume of concrete (m^3)	0	0	0	
Access tracks				
Total length of access track (m)	10502	10501	10503	Volume 1 Chapter 2 Proposed Development Description
Existing track length (m)	4925	4925	4925	Volume 1 Chapter 2 Proposed Development Description
Length of access track that is floating road (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Floating road width (m)	5	5	5	Volume 1 Chapter 2 Proposed Development Description
Floating road depth (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Length of floating road that is drained (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Average depth of drains associated with floating roads (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Length of access track that is excavated road (m)	5577	5576	5578	Volume 1 Chapter 2 Proposed Development Description
Excavated road width (m)	5	5	5	Volume 1 Chapter 2 Proposed Development Description
Average depth of peat excavated for road (m)	0.4	0.4	0.4	Volume 2 Chapter 9: TA9.2 PMP
Length of access track that is rock filled road (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Rock filled road width (m)	5	5	5	Volume 1 Chapter 2 Proposed Development Description
Rock filled road depth (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description

Input data	Expected value	Minimum value	Maximum value	Source of data
Length of rock filled road that is drained (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
Average depth of drains associated with rock filled roads (m)	0	0	0	Volume 1 Chapter 2 Proposed Development Description
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	N/A
Average depth of peat cut for cable trenches (m)	0	0	0	N/A
Additional peat excavated (not already accounted for above)				
Volume of additional peat excavated (m^3)	15259	15259	15259	Volume 2 Chapter 9: TA9.2 PMP
Area of additional peat excavated (m^2)	17474	17474	17474	Volume 2 Chapter 9: TA9.2 PMP
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				
Improvement of degraded bog				
Area of degraded bog to be improved (ha)	17.6	17.6	17.6	Volume 2 Chapter 7 TA7.6 BEMP
Water table depth in degraded bog before improvement (m)	0.3	0.1	0.5	Site specific values are not available. Standard values are from “Windfarm Carbon Calculator Web Tool, User Guidance”. Values for 'degraded peat' have been used.
Water table depth in degraded bog after improvement (m)	0.1	0.05	0.3	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web Tool, User Guidance" and values for 'intact peat' have been used to make an estimate of water table depth.
Time required for hydrology and habitat of bog to	10	5	15	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web Tool, User

Input data	Expected value	Minimum value	Maximum value	Source of data
return to its previous state on improvement (years)				Guidance" and values for 'intact peat' have been used to make an estimate.
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	50	50	50	The duration of consent for this development is 50 years.
Improvement of felled plantation land				
Area of felled plantation to be improved (ha)	10	10	10	Volume 2 Chapter 7 TA7.6 BEMP
Water table depth in felled area before improvement (m)	0.3	0.1	0.5	Site specific values are not available. Standard values are from “Windfarm Carbon Calculator Web Tool, User Guidance”. Values for 'degraded peat' have been used.
Water table depth in felled area after improvement (m)	0.1	0.05	0.3	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web Tool, User Guidance" and values for 'intact peat' have been used to make an estimate of water table depth.
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	10	5	15	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web Tool, User Guidance" and values for 'intact peat' have been used to make an estimate.
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	50	50	50	The duration of consent for this development is 50 years.
Restoration of peat removed from borrow pits				
Area of borrow pits to be restored (ha)	7	7	7	Volume 2 Chapter 7 TA7.6 BEMP
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.3	0.1	0.5	Site specific values are not available. Standard values are
Depth of water table in borrow pit	0.1	0.05	0.3	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web

Input data	Expected value	Minimum value	Maximum value	Source of data
after restoration with respect to the restored surface (m)				
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	5	15	Site specific values are not available. Standard values from "Windfarm Carbon Calculator Web
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	50	50	50	The duration of consent for this development is 50 years.
Early removal of drainage from foundations and hardstanding				
Water table depth around foundations and hardstanding before restoration (m)	0.3	0.1	0.5	Site specific values are not available. Standard values are from “Windfarm Carbon Calculator Web Tool, User Guidance”. Values for 'degraded peat' have been used.
Water table depth around foundations and hardstanding after restoration (m)	0.1	0.05	0.3	Site specific values are not available. Standard values are from “Windfarm Carbon Calculator Web Tool, User Guidance”. Values for 'intact peat' have been used.
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	0.25	0.1	0.3	These parameters are estimated values which refer to the removal of drainage around foundations and hardstandings after construction, not the removal of hardstandings and turbine foundations after decommissioning.
Restoration of site after decomissioning				
Will the hydrology of the site be restored on decommissioning?	Yes	Yes	Yes	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes	Yes	Yes	This will form part of a decommissioning and restoration plan for the site in the future.
Will you attempt to block all artificial ditches and	Yes	Yes	Yes	This will form part of a decommissioning and restoration plan for the site in the future.

Input data	Expected value	Minimum value	Maximum value	Source of data
facilitate rewetting?				
Will the habitat of the site be restored on decommissioning?	Yes	Yes	Yes	
Will you control grazing on degraded areas?	Yes	Yes	Yes	This will form part of a decommissioning and restoration plan for the site in the future.
Will you manage areas to favour reintroduction of species	Yes	Yes	Yes	This will form part of a decommissioning and restoration plan for the site in the future.
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
1				
Number of turbines in this area	9	9	9	Volume 1 Chapter 2 Proposed Development Description
Turbine foundations				
Depth of hole dug when constructing foundations (m)	0.2	0.2	0.2	Volume 2 Chapter 9: TA 9.2 PMP
Aproximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	Volume 1 Chapter 2 Proposed Development Description
Diameter at bottom	30	30	30	
Diameter at surface	30	30	30	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	0.4	0.4	0.4	Volume 2 Chapter 9: TA 9.2 PMP
Aproximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	Volume 1 Chapter 2 Proposed Development Description
Length at surface	55	55	55	
Width at surface	35	35	35	
Length at bottom	55	55	55	
Width at bottom	35	35	35	

Input data	Expected value	Minimum value	Maximum value	Source of data
1				
Piling				
Is piling used?	No	No	No	Volume 1 Chapter 2 Proposed Development Description
Volume of Concrete				
Volume of concrete used (m^3) in the entire area	7200	7200	7200	Volume 1 Chapter 2 Proposed Development Description