

## TECHNICAL APPENDIX 14.3.1

### Carbon Calculator Input Values



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# 1 Carbon Calculator Input Values

## 1.1 Introduction

1.1.1 The Scottish Government Carbon Calculator Online Tool Version 1.6.0 was used in the assess the carbon impact of the proposed Development. The input parameters are outlined below.

## 1.2 Bulk Density

1.2.1 Maximum input values were input for bulk density in the calculator for the proposed Development. Site specific bulk density values returned from the lab were atypically high, however this does not reflect the observed peat conditions on site which were considered to be typical of blanket bog. Typical carbon content and moisture content values were recorded by the lab in all samples except a small number which can be argued to be mainly mineral soil and not peat.

## 1.3 Water Table Depth

1.3.1 For the purpose of the carbon calculator, an assumption of water table depth was made based on site observations. A high water table close to the ground surface (0.1m) was used to reflect a worst case scenario.

Carbon Calculator v1.6.0

Kilgallioch Windfarm Extension Location: 54.994713 -4.753586

ScottishPower Renewables

**Core input data**

<b>Input data</b>	<b>Expected value</b>	<b>Minimum value</b>	<b>Maximum value</b>	<b>Source of data</b>
<b>Windfarm characteristics</b>				
<u>Dimensions</u>				
No. of turbines	11	11	11	EIAR Chapter 4
Duration of consent (years)	40	40	40	EIAR Chapter 4
<u>Performance</u>				
Power rating of 1 turbine (MW)	5.6	5.6	5.6	EIAR Chapter 4
Capacity factor	26.6	23.94	29.26	BEIS Value Used
<u>Backup</u>				
Fraction of output to backup (%)	5	5	5	standard
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	10	10	Fixed
Total CO <sub>2</sub> emission from turbine life (tCO <sub>2</sub> MW <sup>-1</sup> ) (eg. manufacture, construction, decommissioning)	Calculate wrt installed capacity	Calculate wrt installed capacity	Calculate wrt installed capacity	
<b>Characteristics of peatland before windfarm development</b>				
Type of peatland	Acid bog	Acid bog	Acid bog	EIAR Chapter 7
Average annual air temperature at site (°C)	8.6	7.74	9.46	annual met station data
Average depth of peat at site (m)	0.96	0.86	1.06	EIAR Chapter 7
C Content of dry peat (% by weight)	40	19	52	Lab data from survey samples
Average extent of drainage around drainage features at site (m)	10	9	11	EIAR Chapter 8
Average water table depth at site (m)	0.1	0.05	0.3	observed during survey
Dry soil bulk density (g cm <sup>-3</sup> )	0.3	0.29	0.3	maximum value allowed
<b>Characteristics of bog plants</b>				
Time required for regeneration of bog plants after restoration (years)	10	5	15	standard
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha <sup>-1</sup> yr <sup>-1</sup> )	0.25	0.12	0.31	SNH guidance
<b>Forestry Plantation Characteristics</b>				
Area of forestry plantation to be felled (ha)	5.8	5.22	6.38	EIAR Chapter 14
Average rate of carbon sequestration in timber (tC ha <sup>-1</sup> yr <sup>-1</sup> )	3.6	3.24	3.96	SNH guidance
<b>Counterfactual emission factors</b>				
Coal-fired plant emission factor (t CO <sub>2</sub> MWh <sup>-1</sup> )	0.92	0.92	0.92	
Grid-mix emission factor (t CO <sub>2</sub> MWh <sup>-1</sup> )	0.25358	0.25358	0.25358	
Fossil fuel-mix emission factor (t CO <sub>2</sub> MWh <sup>-1</sup> )	0.45	0.45	0.45	
<b>Borrow pits</b>				

<b>Input data</b>	<b>Expected value</b>	<b>Minimum value</b>	<b>Maximum value</b>	<b>Source of data</b>
Number of borrow pits	2	2	2	EIAR Chapter 4
Average length of pits (m)	99.3	89.4	109.2	EIAR Chapter 4
Average width of pits (m)	99.3	89.4	109.2	EIAR Chapter 4
Average depth of peat removed from pit (m)	0.4	0.1	0.68	EIAR Chapter 7
<b>Access tracks</b>				
Total length of access track (m)	24410	23548	25272	EIAR Chapter 4
Existing track length (m)	15790	15790	15790	EIAR Chapter 4
<u>Length of access track that is floating road (m)</u>	1870	1683	2057	EIAR Chapter 4
Floating road width (m)	5	5	5	EIAR Chapter 4
Floating road depth (m)	0	0	0	EIAR Chapter 4
Length of floating road that is drained (m)	94	0	187	EIAR Chapter 4
Average depth of drains associated with floating roads (m)	0.3	0	0.3	EIAR Chapter 4
<u>Length of access track that is excavated road (m)</u>	6750	6075	7425	EIAR Chapter 4
Excavated road width (m)	5	5	5	EIAR Chapter 4
Average depth of peat excavated for road (m)	1	0.9	1.1	EIAR Chapter 7
<u>Length of access track that is rock filled road (m)</u>	0	0	0	EIAR Chapter 4
Rock filled road width (m)	5	5	5	EIAR Chapter 4
Rock filled road depth (m)	0	0	0	EIAR Chapter 4
Length of rock filled road that is drained (m)	0	0	0	EIAR Chapter 4
Average depth of drains associated with rock filled roads (m)	0	0	0	EIAR Chapter 4
<b>Cable trenches</b>				
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	EIAR Chapter 4
Average depth of peat cut for cable trenches (m)	0	0	0	EIAR Chapter 4
<b>Additional peat excavated (not already accounted for above)</b>				
Volume of additional peat excavated (m <sup>3</sup> )	2832	2549	3115	EIAR Chapter 4 and 7
Area of additional peat excavated (m <sup>2</sup> )	6025	5423	6628	EIAR Chapter 4 and 7
<b>Peat Landslide Hazard</b>				
Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments	negligible	negligible	negligible	Fixed
<b>Improvement of C sequestration at site by blocking drains, restoration of habitat etc</b>				
<u>Improvement of degraded bog</u>				
Area of degraded bog to be improved (ha)	10.93	9.84	12.02	EIAR Chapter 8

Input data	Expected value	Minimum value	Maximum value	Source of data
Water table depth in degraded bog before improvement (m)	0.1	0.05	0.3	observed during site survey
Water table depth in degraded bog after improvement (m)	0.09	0.04	0.29	EIAR Chapter 7
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	10	5	15	EIAR Chapter 8
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	40	40	40	life of windfarm
<u>Improvement of felled plantation land</u>				
Area of felled plantation to be improved (ha)	0	0	0	N/A
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	EIAR Chapter 8
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	40	40	40	life of windfarm
<u>Restoration of peat removed from borrow pits</u>				
Area of borrow pits to be restored (ha)	2.02	1.82	2.22	EIAR Chapter 4
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.1	0.05	0.3	observed in site survey
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.09	0.04	0.29	EIAR Chapter 7
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	5	15	standard
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	40	40	40	life of windfarm
<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
Water table depth around foundations and hardstanding after restoration (m)	0	0	0	N/A
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	2	2	2	EIAR Chapter 4
<u>Restoration of site after decommissioning</u>				
<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	EIAR Chapter 8
Will you manage areas to favour reintroduction of species	Yes	Yes	Yes	EIAR Chapter 8
<u>Methodology</u>				
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
Kilgallioch Extension Windfarm				
Number of turbines in this area	11	11	11	EIAR Chapter 4
Turbine foundations				
Depth of hole dug when constructing foundations (m)	0.42	0.38	0.46	EIAR Chapter 7
Aproximate geometric shape of whole dug when constructing foundations	Circular	Circular	Circular	EIAR Chapter 4
Diameter at bottom	30	30	30	
Diameter at surface	37	37	37	
Hardstanding				
Depth of hole dug when constructing hardstanding (m)	0.47	0.42	0.52	EIAR Chapter 7
Aproximate geometric shape of whole dug when constructing hardstanding	Rectangular	Rectangular	Rectangular	EIAR Chapter 4
Length at surface	81	81	81	
Width at surface	56	56	56	
Length at bottom	81	81	81	
Width at bottom	56	56	56	
Piling				
Is piling used?	No	No	No	EIAR Chapter 4
Volume of Concrete				
Volume of concrete used (m <sup>3</sup> ) in the entire area	8593	7734	9452	EIAR Chapter 4



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