SHEPHERD'S RIG WIND FARM
AEI TECHNICAL APPENDIX 21.1

OCTOBER 2019

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PAYBACK TIME AND CO_2 EMISSIONS

1. Windfarm CO_2 emission saving over...	Exp.	Min.	Max.
...coal-fired electricity generation (t CO_2 / yr)	146,734	105,376	177,908
...grid-mix of electricity generation (t CO_2 / yr)	40,444	29,045	49,037
...fossil fuel-mix of electricity generation (t CO_2 / yr)	71,772	51,542	87,020
Energy output from windfarm over lifetime (MWh)	3,987,333	2,863,469	4,834,469

Total CO_2 losses due to wind farm (tCO_2 eq.)	Exp.	Min.	Max.
2. Losses due to turbine life (eg. manufacture, construction, decommissioning)	61,945	49,519	65,718
3. Losses due to backup	27,653	19,868	29,802
4. Lossess due to reduced carbon fixing potential	515	124	1,072
5. Losses from soil organic matter	9,369	-2,413	166,497
6. Losses due to DOC & POC leaching	0	0	1
7. Losses due to felling forestry	0	0	0
Total losses of carbon dioxide	99,483	67,097	263,089

8. Total CO_2 gains due to improvement of site (t CO_2 eq.)	Exp.	Min.	Max.
8a. Change in emissions due to improvement of degraded bogs	0	0	0
8b. Change in emissions due to improvement of felled forestry	0	0	0
8c. Change in emissions due to restoration of peat from borrow pits	-105	0	-161
8d. Change in emissions due to removal of drainage from foundations & hardstanding	-519	0	-1,810
Total change in emissions due to improvements	-624	0	-1,971

RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide (t CO_2 eq.)	98,859	65,126	263,089
Carbon Payback Time			
...coal-fired electricity generation (years)	0.7	0.4	2.5
...grid-mix of electricity generation (years)	2.4	1.3	9.1
...fossil fuel-mix of electricity generation (years)	1.4	0.7	5.1
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	15.02	-1.22	No gains!
Ratio of CO_2 eq. emissions to power generation (g/kWh) (for info. only)	24.79	13.47	91.88

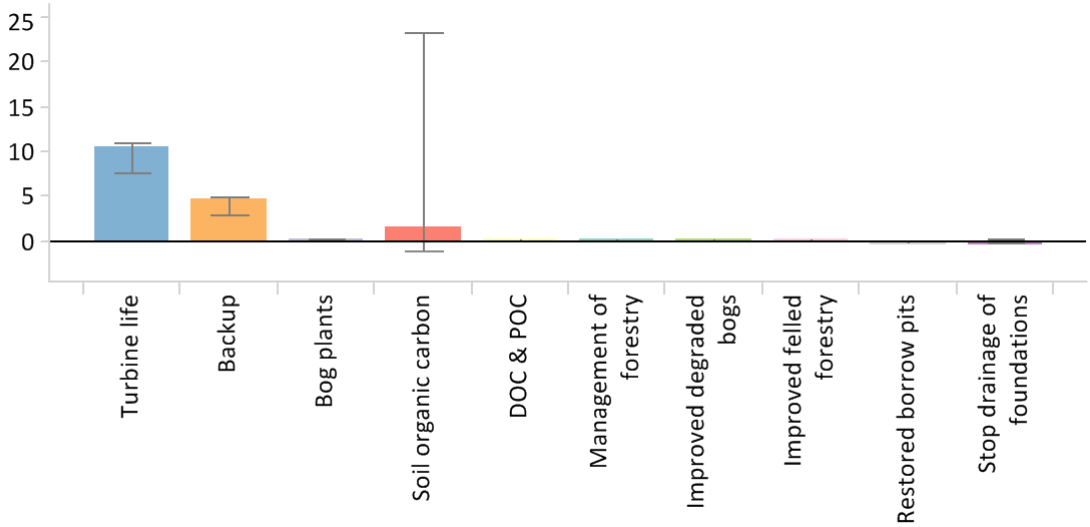
PAYBACK TIME CHARTS

Payback Time - Charts

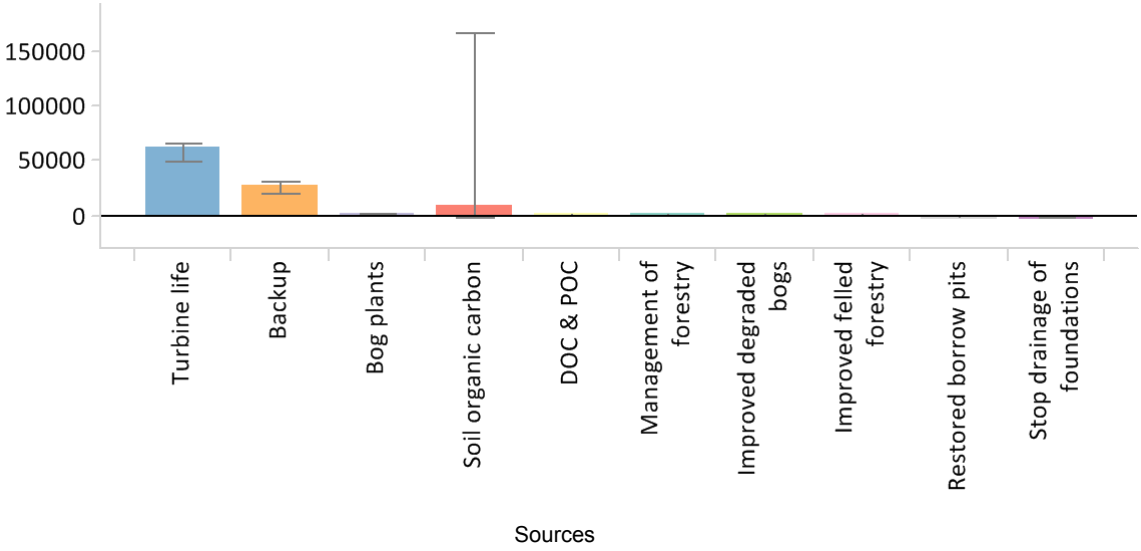
Payback Time

Payback Time - ChartsInput Data

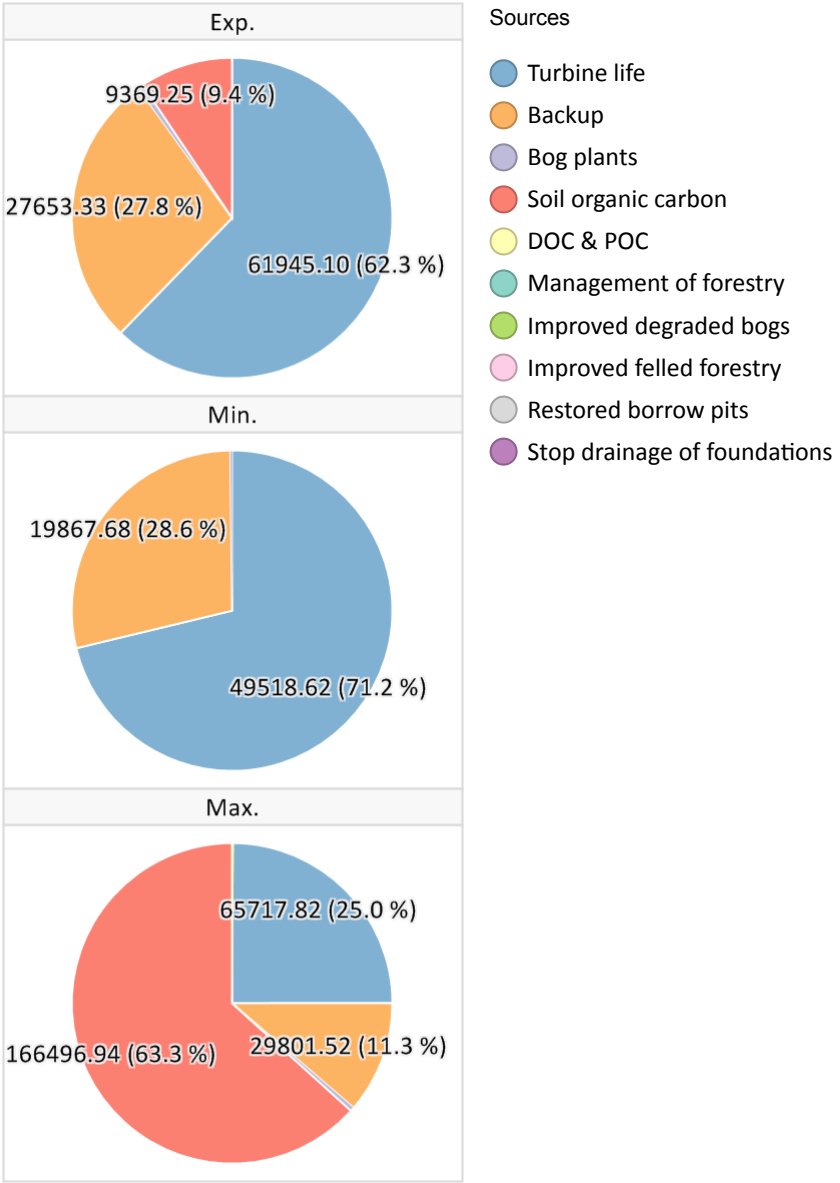
Carbon payback time (months) using fossil-fuel mix as conterfactual



Greenhouse gas emissions (t CO2 eq.)



Proportions of greenhouse gas emissions from different sources



INPUT DATA

Carbon Calculator v1.6.0
Shepherd's Rig Wind Farm Location: 55.217298 -4.165693
Infinergy

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	17	16	18	AEI Section 4.1
Duration of consent (years)	25	25	25	AEI Section 4.1
Performance				
Power rating of 1 turbine (MW)	4.2	3.6	4.2	AEI Section 4.1
Capacity factor	25.5	22.7	29.2	Calculated from average.
Backup				
Fraction of output to backup (%)	3.93	3.5	4	AEI Section 4.1
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	Peat Slide Risk Assessment Technical Appendix
Average annual air temperature at site (°C)	6.5	3	10	Calculated from climate averages for area.
Average depth of peat at site (m)	0.5	0	4.5	Peat Slide Risk Assessment Technical Appendix
C Content of dry peat (% by weight)	53.23	19.57	53.24	Scottish Government Guidance - Guidance on Developments on Peatland - Site Surveys
Average extent of drainage around drainage features at site (m)	5	1	10	Technical estimation - further refined after drainage installed.
Average water table depth at site (m)	0.5	0.4	0.6	Technical estimation.
Dry soil bulk density ($g\ cm^{-3}$)	0.132	0.072	0.293	Scottish Government Guidance - Guidance on Developments on Peatland - Site Surveys
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	2	2	2	Not applicable to Proposed Development
Carbon accumulation due to C fixation by bog plants in undrained peats ($tC\ ha^{-1}\ yr^{-1}$)	0.25	0.12	0.31	SNH Guidance -Carbon Payback Calculator: Guidelines on Measurements
Forestry Plantation Characteristics				
Area of forestry plantation to be felled (ha)	0	0	0	AEI Section 7.11
Average rate of carbon sequestration in timber ($tC\ ha^{-1}\ yr^{-1}$)	3.6	2.5	4.7	Scottish Government and SNH Guidance

Input data	Expected value	Minimum value	Maximum value	Source of data
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	
Borrow pits				
Number of borrow pits	2	2	2	EIAR Borrow Pit Assessment Technical Appendix
Average length of pits (m)	135	125	145	EIAR Borrow Pit Assessment Technical Appendix
Average width of pits (m)	72.5	60	85	EIAR Borrow Pit Assessment Technical Appendix
Average depth of peat removed from pit (m)	0.5	0.5	4.5	AEI Peat Slide Risk Assessment Technical Appendix
Foundations and hard-standing area associated with each turbine				
Average length of turbine foundations (m)	20.8	20.8	20.8	Figure 4.3
Average width of turbine foundations (m)	20.8	20.8	20.8	Figure 4.3
Average depth of peat removed from turbine foundations(m)	1	1	1	Peat Slide Risk Analysis Technical Appendix
Average length of hard-standing (m)	62.5	62.5	62.5	Figure 4.4
Average width of hard-standing (m)	25	25	25	Figure 4.4
Average depth of peat removed from hard-standing (m)	0.5	0	4.5	Peat Slide Risk Analysis Technical Appendix
Volume of concrete used in construction of the ENTIRE windfarm				
Volume of concrete (m^3)	10066	10066	11066	Section 4.3.68
Access tracks				
Total length of access track (m)	9600	8650	10150	Section 4.3.24
Existing track length (m)	1150	1150	1150	Calculated from CAD drawings.
Length of access track that is floating road (m)	0	0	0	No applicable to Proposed Development
Floating road width (m)	5	5	7	No applicable to Proposed Development
Floating road depth (m)	0	0	0	No applicable to Proposed Development
Length of floating road that is drained (m)	0	0	0	No applicable to Proposed Development
Average depth of drains associated with floating roads (m)	0	0	0	No applicable to Proposed Development
Length of access track that is excavated road (m)	4000	3500	4500	Section 4.3.24
Excavated road width (m)	5	5	5	Section 4.3.24 and following sections
Average depth of peat excavated for road (m)	0.5	0.5	0.5	Peat Slide Risk Analysis Technical Appendix
Length of access track that is rock filled road (m)	4450	4000	4500	Section 4.3.24
Rock filled road width (m)	5	5	5	Section 4.3.27
Rock filled road depth (m)	0.6	0.5	0.7	Table 4.2
Length of rock filled road that is drained (m)	4450	4000	4500	Section 4.3.24
Average depth of drains associated with rock filled roads (m)	0.5	0.5	0.5	Chapter 4
Cable trenches				

Input data	Expected value	Minimum value	Maximum value	Source of data
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	No applicable to Proposed Development
Average depth of peat cut for cable trenches (m)	0.5	0	4.5	Peat Slide Risk Assessment Technical Appendix
Additional peat excavated (not already accounted for above)				
Volume of additional peat excavated (m^3)	0	0	0	No applicable to Proposed Development
Area of additional peat excavated (m^2)	0	0	0	No applicable to Proposed Development
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)	0	0	0	Not applicable to Proposed Development
Water table depth in degraded bog before improvement (m)	0	0	0	Not applicable to Proposed Development
Water table depth in degraded bog after improvement (m)	0	0	0	Not applicable to Proposed Development
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	2	2	2	Not applicable to Proposed Development
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	2	2	2	Not applicable to Proposed Development
Improvement of felled plantation land				
Area of felled plantation to be improved (ha)	0	0	0	Not applicable to Proposed Development
Water table depth in felled area before improvement (m)	0.5	0.4	0.6	Not applicable to Proposed Development
Water table depth in felled area after improvement (m)	0.45	0.3	0.55	Not applicable to Proposed Development
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	2	2	2	Not applicable to Proposed Development
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	2	2	2	Not applicable to Proposed Development
Restoration of peat removed from borrow pits				
Area of borrow pits to be restored (ha)	2.2	2.2	2.2	Borrow Pit Assessment Technical Appendix
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.5	0.4	0.6	Technical average used.
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.45	0.3	0.55	Technical estimation - refined when restoration taken place.
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	5	5	5	Technical average used.
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	10	10	10	Technical average used.
Early removal of drainage from foundations and hardstanding				

Input data	Expected value	Minimum value	Maximum value	Source of data
Water table depth around foundations and hardstanding before restoration (m)	0.5	0.4	0.6	Technical average used.
Water table depth around foundations and hardstanding after restoration (m)	0.45	0.3	0.55	Technical estimation - refined once restoration taken place.
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	2	2	2	Technical estimation - refined once restoration taken place.
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	Worst case scenario used.
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes	Yes	Yes	Worst case scenario used.
Will the habitat of the site be restored on decommissioning?	No	No	No	
Will you control grazing on degraded areas?	n/a	n/a	n/a	Not applicable to Proposed Development
Will you manage areas to favour reintroduction of species	No	No	No	Expected continual use as commercial forestry.
Methodology				
Choice of methodology for calculating emission factors	Site specific (required for planning applications)			

Forestry input data

N/A

Construction input data

N/A

1 WINDFARM CO_2 EMISSION SAVING

Capacity Factor - Direct Input	**Exp.**	**Min.**	**Max.**
Capacity factor (%)	25.5	22.7	29.2

	Exp.	**Min.**	**Max.**
Annual energy output from windfarm (MW/yr)			
RESULTS			
Emissions saving over coal-fired electricity generation (tCO_2/yr)	146,734	105,376	177,908
Emissions saving over grid-mix of electricity generation (tCO_2/yr)	40,444	29,045	49,037
Emissions saving over fossil fuel - mix of electricity generation (tCO_2/yr)	71,772	51,542	87,020

2 CO_2 LOSS DUE TO TURBINE LIFE

Calculation of emissions with relation to installed capacity	**Exp.**	**Min.**	**Max.**
Emissions due to turbine frome energy output (t CO_2)	4017	3457	4578
Emissions due to cement used in construction (t CO_2)	2719	2719	2719

RESULTS	**Exp.**	**Min.**	**Max.**
Losses due to turbine life (manufacture, construction, etc.) (t CO_2)	61945	49519	65718
Additional CO_2 payback time of windfarm due to turbine life			
...coal-fired electricity generation (months)	5	6	4
...grid-mix of electricity generation (months)	18	20	16
...fossil fuel - mix of electricity generation (months)	10	12	9

3 CO_2 LOSS DUE TO BACKUP

	Exp.	Min.	Max.
Reserve energy (MWh/yr)	24,581	17,660	26,490
Annual emissions due to backup from fossil fuel-mix of electricity generation (tCO_2/yr)	1,106	795	1,192
RESULTS			
Total emissions due to backup from fossil fuel-mix of electricity generation (tCO_2)	27,653	19,868	29,802

4 LOSS OF CO_2 FIXING POTENTIAL

	Exp.	Min.	Max.
Area where carbon accumulation by bog plants is lost (ha)	20.82	10.44	34.92
Total loss of carbon accumulation up to time of restoration (tCO_2 eq./ha)	25	12	31
RESULTS			
Total loss of carbon fixation by plants at the site (t CO_2)	515	124	1072
Additional CO_2 payback time of windfarm due to loss of CO_2 fixing potential			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	0
...fossil fuel - mix of electricity generation (months)	0	0	0

5 LOSS OF SOIL CO_2

5. Loss of CO_2	**Exp.**	**Min.**	**Max.**
CO_2 loss from removed peat (t CO_2 equiv.)	9369.25	-2413.3	150235
CO_2 loss from drained peat (t CO_2 equiv.)	0	0	16261.8
RESULTS			
Total CO_2 loss from peat (removed + drained) (t CO_2 equiv.)	9369.25	-2413.3	166497
Additional CO_2 payback time of windfarm due to loss of soil CO_2			
...coal-fired electricity generation (months)	0.77	-0.27	11.23
...grid-mix of electricity generation (months)	2.78	-1	40.74
...fossil fuel - mix of electricity generation (months)	1.57	-0.56	22.96

5a. Volume of Peat Removed	**Exp.**	**Min.**	**Max.**
Peat removed from borrow pits			
Area of land lost in borrow pits (m^2)	19575	15000	24650
Volume of peat removed from borrow pits (m^3)	9787.5	7500	110925
Peat removed from turbine foundations			
Area of land lost in foundation (m^2)	7354.88	6922.24	7787.52
Volume of peat removed from foundation area (m^3)	7354.88	6922.24	7787.52
Peat removed from hard-standing			
Area of land lost in hard-standing (m^2)	26562.5	25000	28125
Volume of peat removed from hard-standing area (m^3)	13281.3	0	126563
Peat removed from access tracks			
Area of land lost in floating roads (m^2)	0	0	0
Volume of peat removed from floating roads (m^3)	0	0	0
Area of land lost in excavated roads (m^2)	20000	17500	22500
Volume of peat removed from excavated roads (m^3)	10000	8750	11250
Area of land lost in rock-filled roads (m^2)	22250	20000	22500
Volume of peat removed from rock-filled roads (m^3)	13350	10000	15750
Total area of land lost in access tracks (m^2)	42250	37500	45000
Total volume of peat removed due to access tracks (m^3)	23350	18750	27000
RESULTS			
Total area of land lost due to windfarm construction (m^2)	95742.4	84422.2	105563
Total volume of peat removed due to windfarm construction (m^3)	53773.6	33172.2	272275

5b. CO_2 Loss from Removed Peat	**Exp.**	**Min.**	**Max.**
CO_2 loss from removed peat (t CO_2)	13854	1713.85	155736
CO_2 loss from undrained peat left in situ (t CO_2)	4484.75	4127.11	5500.75
RESULTS			
CO_2 loss atributable to peat removal only (t CO_2)	9369.25	-2413.3	150235

5c. Volume of Peat Drained	**Exp.**	**Min.**	**Max.**
Total area affected by drainage around borrow pits (m^2)	4350	748	10000
Total volume affected by drainage around borrow pits (m^3)	1087.5	187	22500
Peat affected by drainage around turbine foundation and hardstanding			
Total area affected by drainage of foundation and hardstanding area (m^2)	23647	4195.2	53676
Total volume affected by drainage of foundation and hardstanding area (m^3)	11823.5	2097.6	120771
Peat affected by drainage of access tracks			
Total area affected by drainage of access track(m^2)	84500	15000	180000
Total volume affected by drainage of access track(m^3)	21125	3750	45000
Peat affected by drainage of cable trenches			
Total area affected by drainage of cable trenches(m^2)	0	0	0
Total volume affected by drainage of cable trneches(m^3)	0	0	0
Drainage around additional peat excavated			
Total area affected by drainage (m^2)	0	0	0
Total volume affected by drainage (m^3)	0	0	0
RESULTS			
Total area affected by drainage due to windfarm (m^2)	112497	19943.2	243676
Total volume affected by drainage due to windfarm (m^3)	34036	6034.6	188271

5d. CO_2 Loss from Drained Peat	**Exp.**	**Min.**	**Max.**
Calculations of C Loss from Drained Land if Site is NOT Restored after Decomissioning			
Total GHG emissions from Drained Land (t CO_2 equiv.)	8768.88	311.78	107687
Total GHG emissions from Undrained Land (t CO_2 equiv.)	8768.88	311.78	91425.5
Calculations of C Loss from Drained Land if Site IS Restored after Decomissioning			
Losses if Land is Drained			
CH4 emissions from drained land (t CO_2 equiv.)	-118.17	-42.57	-27.11
CO_2 emissions from drained land (t CO_2)	5387.73	1017.52	14983.3
Total GHG emissions from Drained Land (t CO_2 equiv.)	8768.88	311.78	107687
Losses if Land is Undrained			
CH4 emissions from undrained land (t CO_2 equiv.)	-118.17	-42.57	7.87
CO_2 emissions from undrained land (t CO_2)	5387.73	1017.52	12689.8
Total GHG emissions from Undrained Land (t CO_2 equiv.)	8768.88	311.78	91425.5
RESULTS			
Total GHG emissions due to drainage (t CO_2 equiv.)	0	0	16261.8

5e. Emission Rates from Soils	**Exp.**	**Min.**	**Max.**
Calculations following IPCC default methodology			
Flooded period (days/year)	178	178	178
Annual rate of methane emission (t CH4-C/ha year)	0.04	0.04	0.04
Annual rate of carbon dioxide emission (t CO_2/ha year)	35.2	35.2	35.2
Calculations following ECOSSE based methodology			
Total area affected by drainage due to wind farm construction (ha)	11.25	1.99	24.37
Average water table depth of drained land (m)	0.5	0.6	0.77
Selected emission characteristics following site specific methodology			
Rate of carbon dioxide emission in drained soil (t CO_2/ha year)	17.74	18.9	22.77
Rate of carbon dioxide emission in undrained soil (t CO_2/ha year)	17.74	18.9	15.63
Rate of methane emission in drained soil (t CH4-C/ha year)	-0.01	-0.03	0
Rate of methane emission in undrained soil (t CH4-C/ha year)	-0.01	-0.03	0
RESULTS			
Selected rate of carbon dioxide emission in drained soil (t CO_2/ha year)	17.74	18.9	22.77
Selected rate of carbon dioxide emission in undrained soil (t CO_2/ha year)	17.74	18.9	15.63
Selected rate of methane emission in drained soil (t CH4-C/ha year)	-0.01	-0.03	0
Selected rate of methane emission in undrained soil (t CH4-C/ha year)	-0.01	-0.03	0

6 CO_2 LOSS BY DOC AND POC LOSS

	Exp.	Min.	Max.
Gross CO_2 loss from restored drained land (t CO_2)	0	0	0
Gross CH4 loss from restored drained land (t CO_2 equiv.)	0	0	0
Gross CO2 loss from improved land (t CO_2)	0	0	0
Gross CH4 loss from improved land (t CO_2 equiv.)	0	0	22.03
Total gaseous loss of C (t C)	0	0	0.54
Total C loss as DOC (t C)	0	0	0.22
Total C loss as POC (t C)	0	0	0.05
RESULTS			
Total CO_2 loss due to DOC leaching (t CO_2)	0	0	0.79
Total CO_2 loss due to POC leaching (t CO_2)	0	0	0.2
Total CO_2 loss due to DOC & POC leaching (t CO2)	0	0	0.99
Additional CO_2 payback time of windfarm due to DOC & POC			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	0
...fossil fuel - mix of electricity generation (months)	0	0	0

7 FORESTRY CO_2 LOSS

	Exp.	Min.	Max.
Area of forestry plantation to be felled (ha)	0	0	0
Carbon sequestered (t C ha-1 yr-1)	3.6	2.5	4.7
Lifetime of windfarm (years)	25	25	25
Carbon sequestered over the lifetime of the windfarm (t C ha-1)	90	62.5	117.5
RESULTS			
Total carbon loss due to felling of forestry (t CO_2)	0	0	0
Additional CO_2 payback time of windfarm due to management of forestry			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	0
...fossil fuel - mix of electricity generation (months)	0	0	0

8 CO_2 GAIN – SITE IMPROVEMENT

Degraded Bog	**Exp.**	**Min.**	**Max.**
1. Description of site			
Area to be improved (ha)	0	0	0
Depth of peat above water table before improvement (m)	0	0	0
Depth of peat above water table after improvement (m)	0	0	0
2. Losses with improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	0.486	0.474	0.499
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	-0.396	-1.327	0.535
CO_2 emissions from improved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO_2 eqiv.)	0	0	0
3. Losses without improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	0.486	0.474	0.499
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	-0.396	-1.327	0.535
CO_2 emissions from unimproved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from unimproved land (t CO_2 eqiv.)	0	0	0
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	0	0	0

Felled Forestry	**Exp.**	**Min.**	**Max.**
1. Description of site			
Area to be improved (ha)	0	0	0
Depth of peat above water table before improvement (m)	0.5	0	0.6
Depth of peat above water table after improvement (m)	0.45	0	0.3
2. Losses with improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.012	0.474	0.011
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	16.345	-1.327	11.586
CO_2 emissions from improved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO_2 eqiv.)	0	0	0
3. Losses without improvement			
Improved period (years)	0	0	0
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.013	0.474	-0.001
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	17.738	-1.327	20.759
CO_2 emissions from unimproved land (t CO_2 equiv.)	0	0	0
Total GHG emissions from unimproved land (t CO_2 eqiv.)	0	0	0
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	0	0	0

Borrow Pits	**Exp.**	**Min.**	**Max.**
1. Description of site			
Area to be improved (ha)	2.2	0	2.2
Depth of peat above water table before improvement (m)	0.5	0.4	0.6
Depth of peat above water table after improvement (m)	0.45	0.5	0.3
2. Losses with improvement			
Improved period (years)	5	5	5
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.012	-0.025	0.011
CH4 emissions from improved land (t CO_2 equiv.)	-1.94	0	1.803
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	16.345	16.807	11.586
CO_2 emissions from improved land (t CO_2 equiv.)	92.116	0	65.294
Total GHG emissions from improved land (t CO2 eqiv.)	90.176	0	67.096
3. Losses without improvement			
Improved period (years)	5	5	5
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.013	-0.022	-0.001
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	17.738	13.764	20.759
CO_2 emissions from unimproved land (t CO_2 equiv.)	195.117	0	228.344
Total GHG emissions from unimproved land (t CO_2 eqiv.)	195.117	0	228.344
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	104.941	0	161.248

Foundations and Hardstandings	**Exp.**	**Min.**	**Max.**
1. Description of site			
Area to be improved (ha)	2.365	0	5.368
Depth of peat above water table before improvement (m)	0.5	0	0.6
Depth of peat above water table after improvement (m)	0.45	0	0.3
2. Losses with improvement			
Improved period (years)	23	23	23
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.012	0.474	0.011
CH4 emissions from improved land (t CO_2 equiv.)	-9.593	0	20.23
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	16.345	-1.327	11.586
CO_2 emissions from improved land (t CO_2 equiv.)	455.454	0	732.801
Total GHG emissions from improved land (t CO_2 eqiv.)	445.862	0	753.031
3. Losses without improvement			
Improved period (years)	23	23	23
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	-0.013	0.474	-0.001
CH4 emissions from improved land (t CO_2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO_2 ha-1 yr-1)	17.738	-1.327	20.759
CO_2 emissions from unimproved land (t CO_2 equiv.)	964.729	0	2562.74
Total GHG emissions from unimproved land (t CO_2 eqiv.)	964.729	0	2562.74
RESULTS			
4. Reduction in GHG emissions due to improvement of site			
Reduction in GHG emissions due to improvement (t CO_2 equiv.)	518.867	0	1809.71