APPENDIX 10-1

REVISED CARBON CALCULATIONS

Payback Time

1. Windfarm CO2 emission saving over...	Exp.	Min.	Max.
...coal-fired electricity generation (t CO2 / yr)	171,425	166,527	176,323
...grid-mix of electricity generation (t CO2 / yr)	33,084	32,139	34,029
...fossil fuel-mix of electricity generation (t CO2 / yr)	73,908	71,796	76,019
Energy output from windfarm over lifetime (MWh)	5,132,484	4,985,842	5,279,126

Total CO2 losses due to wind farm (tCO2 eq.)	Exp.	Min.	Max.
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	49,066	49,003	49,193
3. Losses due to backup	31,675	31,675	31,675
4. Lossess due to reduced carbon fixing potential	1,187	361	2,096
5. Losses from soil organic matter	-3,768	-4,255	-1,204
6. Losses due to DOC & POC leaching	0	0	0
7. Losses due to felling forestry	2,534	2,426	2,646
Total losses of carbon dioxide	80,694	79,210	84,405

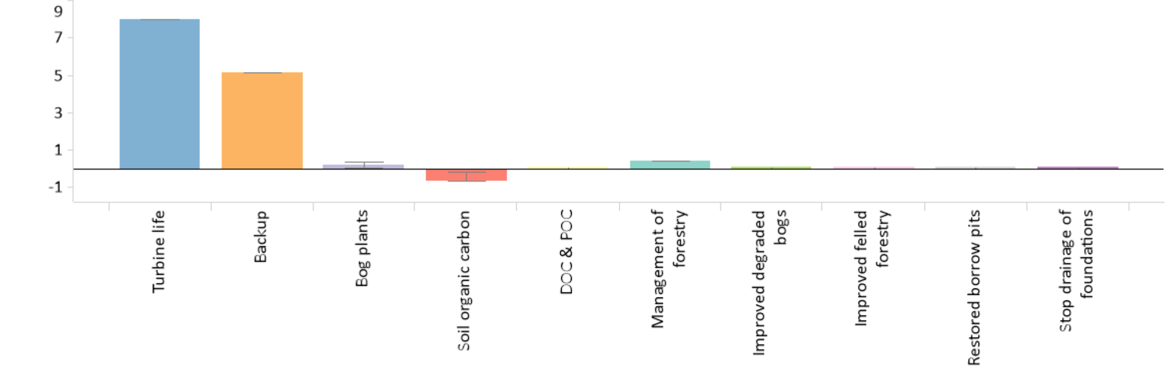
8. Total CO2 gains due to improvement of site (t CO2 eq.)	Exp.	Min.	Max.
8a. Change in emissions due to improvement of degraded bogs	0	0	0
8b. Change in emissions due to improvement of felled forestry	0	0	0
8c. Change in emissions due to restoration of peat from borrow pits	0	0	0
8d. Change in emissions due to removal of drainage from foundations & hardstanding	0	0	0
Total change in emissions due to improvements	0	0	0

RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide (t CO2 eq.)	80,694	79,210	84,405
Carbon Payback Time			
...coal-fired electricity generation (years)	0.5	0.4	0.5
...grid-mix of electricity generation (years)	2.4	2.3	2.6
...fossil fuel-mix of electricity generation (years)	1.1	1.0	1.2
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	No gains!	No gains!	No gains!

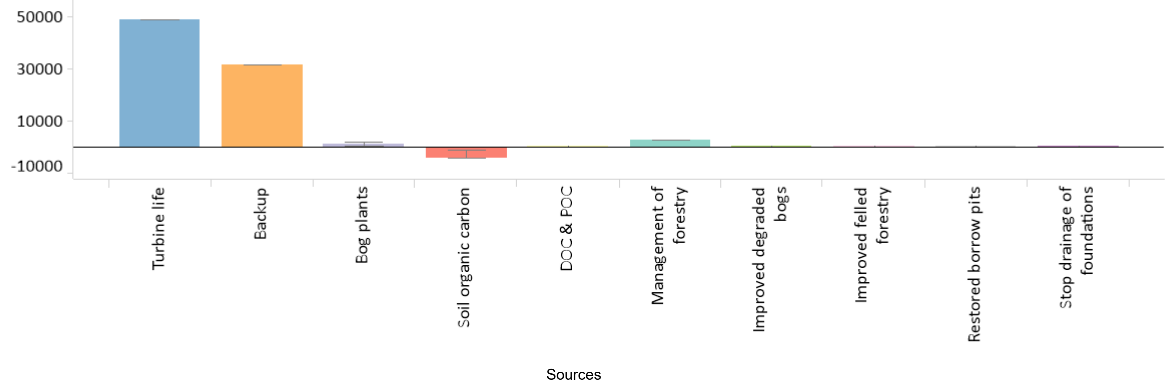
Payback Time - Charts

Payback Time
Payback Time - ChartsInput Data

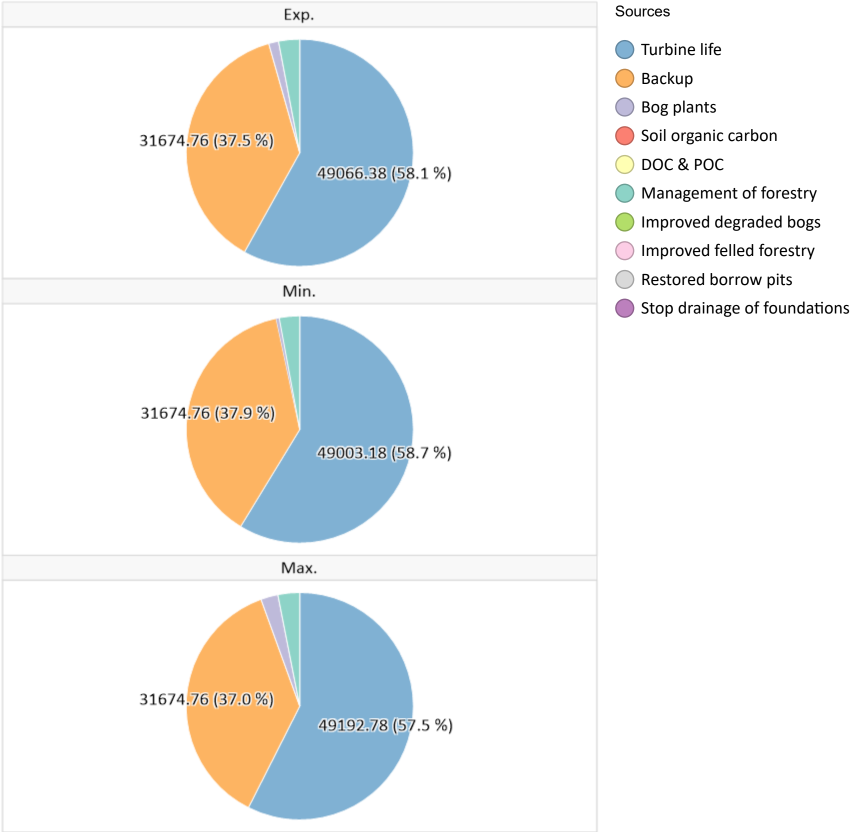
Carbon payback time (months) using fossil-fuel mix as conterfactual



Greenhouse gas emissions (t CO2 eq.)



Proportions of greenhouse gas emissions from different sources



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Carbon Calculator v1.7.0

Ummaa More Location: 53.462592 -7.712471

Enerco

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	9	9	9	Ch 4
Duration of consent (years)	30	30	30	Ch 4
Performance				
Power rating of 1 turbine (MW)	6.2	6.2	6.2	Ch 4
Capacity factor	35	34	36	SEAI
Backup				
Fraction of output to backup (%)	5	5	5	SNH
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	10	10	Fixed
Total CO2 emission from turbine life (tCO_2 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	Acid Bog
Average annual air temperature at site (°C)	9.3	5.7	12.9	CH 10
Average depth of peat at site (m)	0	0	0	0
C Content of dry peat (% by weight)	55	50	60	Default
Average extent of drainage around drainage features at site (m)	15	5	20	Default
Average water table depth at site (m)	0.5	0.1	1	Default
Dry soil bulk density (g cm^{-3})	0.1	0.09	0.11	Default
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	10	5	15	Best Practice
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	0.2	0.3	SNH
Forestry Plantation Characteristics				

5. Loss of soil CO2 (a, b)

Emissions due to loss of soil organic carbon
Loss of C stored in peatland is estimated from % site lost by peat removal (table 5a), CO2 loss from removed peat (table 5b), % site affected by drainage (table 5c), and the CO2 loss from drained peat (table 5d).

5. Loss of soil C02

	Exp.	Min.	Max.
CO2 loss from removed peat (t CO2 equiv.)	-3768.39	-4255.01	-1204.04
CO2 loss from drained peat (t CO2 equiv.)	0	0	0
RESULTS			
Total CO2 loss from peat (removed + drained) (t CO2 equiv.)	-3768.39	-4255.01	-1204.04
Additional CO2 payback time of windfarm due to loss of soil C...			
...coal-fired electricity generation (months)	-0.26	-0.31	-0.08
...grid-mix of electricity generation (months)	-1.37	-1.59	-0.42
...fossil fuel - mix of electricity generation (months)	-0.61	-0.71	-0.19

CO_2 loss from removed peats
If peat is treated in such a way that it is permanently restored, so that less than 100% of the C is lost to the atmosphere, a lower percentage can be entered in cell C10.

5b. CO2 loss from removed peat

	Exp.	Min.	Max.
CO2 loss from removed peat (t CO2)	394.77	0.00	1007.99
CO2 loss from undrained peat left in situ (t CO2)	4163.15	4255.01	2212.03
RESULTS			
CO2 loss atributable to peat removal only (t CO2)	-3768.39	-4255.01	-1204.04

Volume of Peat Removed
% site lost by peat removal is estimated from peat removed in borrow pits, turbine foundations, hard-standing and access tracks. If peat is removed for any other reason, this must be added in as additional peat excavated in the core input data entry.

5a. Volume of peat removed

	Exp.	Min.	Max.
Peat removed from borrow pits			
Area of land lost in borrow pits (m2)	0	0	0
Volume of peat removed from borrow pits (m3)	0	0	0
Peat removed from turbine foundations			
Area of land lost in foundation (m2)	5625	5184	6084
Volume of peat removed from foundation area (m3)	562.5	0	1216.8
Peat removed from hard-standing			
Area of land lost in hard-standing (m2)	13950	13176	14742
Volume of peat removed from hard-standing area (m3)	1395	0	2948.4
Peat removed from access tracks			
Area of land lost in floating roads (m2)	0	0	0
Volume of peat removed from floating roads (m3)	0	0	0
Area of land lost in excavated roads (m2)	37000	36500	37500
Volume of peat removed from excavated roads (m3)	0	0	0
Area of land lost in rock-filled roads (m2)	0	0	0
Volume of peat removed from rock-filled roads (m3)	0	0	0
Total area of land lost in access tracks (m2)	37000	36500	37500
Total volume of peat removed due to access tracks (m3)	0	0	0
RESULTS			
Total area of land lost due to windfarm construction (m2)	56575	54860	58326
Total volume of peat removed due to windfarm construction (m3)	1957.5	0	4165.2

5. Loss of soil CO2 (c,d,e)

Volume of peat drained
Extent of site affected by drainage is calculated assuming an average extent of drainage around each drainage feature as given in the input data.

CO_2 loss due to drainage
Note, CO2 losses are calculated using two approaches: IPCC default methodology and more site specific equations derived for this project. The IPCC methodology is included because it is the established approach, although it contains no site detail. The new equations have been derived directly from experimental data for acid bogs and fens (see Nayak et al, 2008 - Final report).

5c. Volume of peat drained

	Exp.	Min.	Max.
Total area affected by drainage around borrow pits (m2)	0	0	0
Total volume affected by drainage around borrow pits (m3)	0	0	0
Peat affected by drainage around turbine foundation and hardstanding			
Total area affected by drainage of foundation and hardstanding area (m2)	45090	12870	65160
Total volume affected by drainage of foundation and hardstanding area (m3)	2254.5	0	6516
Peat affected by drainage of access tracks			
Total area affected by drainage of access track(m2)	222000	73000	300000
Total volume affected by drainage of access track(m3)	0	0	0
Peat affected by drainage of cable trenches			
Total area affected by drainage of cable trenches(m2)	0	0	0
Total volume affected by drainage of cable trneches(m3)	0	0	0
Drainage around additional peat excavated			
Total area affected by drainage (m2)	0	0	0
Total volume affected by drainage (m3)	0	0	0
RESULTS			
Total area affected by drainage due to windfarm (m2)	267090	85870	365160

5d. CO2 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 CO2 equiv.)	454.66	0	1576.89
Total GHG emissions from Undrained Land (t CO2 equiv.)	454.66	0	1576.89
Calculations of C Loss from Drained Land if Site IS Restored after Decomissioning			
Losses if Land is Drained			
CH4 emissions from drained land (t CO2 equiv.)	-91.89	-152.56	7781.4
CO2 emissions from drained land (t CO2)	19746.09	6812.75	6067.37
Total GHG emissions from Drained Land (t CO2 equiv.)	454.66	0	1576.89
Losses if Land is Undrained			
CH4 emissions from undrained land (t CO2 equiv.)	-91.89	-152.56	7781.4
CO2 emissions from undrained land (t CO2)	19746.09	6812.75	6067.37
Total GHG emissions from Undrained Land (t CO2 equiv.)	454.66	0	1576.89
RESULTS			
Total GHG emissions due to drainage (t CO2 equiv.)	0	0	0

Emission rates from soils
Note, CO2 losses are calculated using two approaches: IPCC default methodology and more site specific equations derived for this project. The IPCC methodology is included because it is the established approach, although it contains no site detail. The new equations have been thoroughly tested against experimental data (see Nayak et al, 2008 - Final report).

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 CO2/ha year)	35.2	35.2	35.2

7. Forestry CO_2 loss

Payback Time
Payback Time - ChartsInput Data

CO_2 loss from forests - calculation using detailed management information
Forest carbon calculator (Perks et al, 2009)

Total potential carbon squestration loss due to felling of forestry for the wind farm (t CO2)	
Total emissions due to cleared land (t CO2)	
Emissions due to harvesting operations (t CO2)	
Fossil fuel equivalent saving from use of felled forestry as biofuel (t CO2)	
Fossil fuel equivalent saving from use of replanted forestry as biofuel (t CO2)	
RESULTS	
Total carbon loss associated with forest management(t CO2)	

Emissions due to forest felling - calculation using simple management data
Emissions due to forestry felling are calculated from the reduced carbon sequestered per crop rotation. If the forestry was due to be removed before the planned development, this C loss is not attributable to the wind farm and so the area of forestry to be felled should be entered as zero.

	Exp.	Min.	Max.
Area of forestry plantation to be felled (ha)	6.4	6.3	6.5
Carbon sequestered (t C ha-1 yr-1)	3.6	3.5	3.7
Lifetime of windfarm (years)	30	30	30
Carbon sequestered over the lifetime of the windfarm (t C ha-1)	108	105	111
RESULTS			
Total carbon loss due to felling of forestry (t CO2)	2534.42	2425.52	2645.52
Additional CO2 payback time of windfarm due to management of forestry			
...coal-fired electricity generation (months)	0.18	0.17	0.18
...grid-mix of electricity generation (months)	0.92	0.91	0.93
...fossil fuel - mix of electricity generation (months)	0.41	0.41	0.42

8. CO2 gain - site improvement

Gains due to site improvement
Note, CO2 losses are calculated using two approaches: IPCC default methodology and more site specific equations derived for this project. The IPCC methodology is included because it is the established approach, although it contains no site detail. The new equations have been thoroughly tested against experimental data (see Nayak et al, 2008 - Final report).

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)	0.496	0.483	0.509
CH4 emissions from improved land (t CO2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO2 ha-1 yr-1)	0.349	-0.609	1.306
CO2 emissions from improved land (t CO2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO2 eqiv.)	0	0	0
3. Losses without improvement			

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	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)	0.496	0.483	0.509
CH4 emissions from improved land (t CO2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO2 ha-1 yr-1)	0.349	-0.609	1.306
CO2 emissions from improved land (t CO2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO2 eqiv.)	0	0	0
3. Losses without improvement			

Borrow Pits

	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)	0.496	0.483	0.509
CH4 emissions from improved land (t CO2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO2 ha-1 yr-1)	0.349	-0.609	1.306
CO2 emissions from improved land (t CO2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO2 eqiv.)	0	0	0
3. Losses without improvement			

Foundations & Hardstanding

	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)	30	30	30
Selected annual rate of methane emissions (t CH4-C ha-1 yr-1)	0.496	0.483	0.509
CH4 emissions from improved land (t CO2 equiv.)	0	0	0
Selected annual rate of carbone dioxide emissions (t CO2 ha-1 yr-1)	0.349	-0.609	1.306
CO2 emissions from improved land (t CO2 equiv.)	0	0	0
Total GHG emissions from improved land (t CO2 eqiv.)	0	0	0
3. Losses without improvement			

3. CO2 loss backup

Emissions due to backup power generation
CO2 loss due to back up is calculated from the extra capacity required for backup of the windfarm given in the input data.

Wind generated electricity is inherently variable, providing unique challenges to the electricity generating industry for provision of a supply to meet consumer demand (Netz, 2004). Backup power is required to accompany wind generation to stabilise the supply to the consumer. This backup power will usually be obtained from a fossil fuel source. At a high level of wind power penetration in the overall generating mix, and with current grid management techniques, the capacity for fossil fuel backup may become strained because it is being used to balance the fluctuating consumer demand with a variable and highly unpredictable output from wind turbines (White, 2007). The Carbon Trust (Carbon Trust/DTI, 2004) concluded that increasing levels of intermittent generation do not present major technical issues at the percentages of renewables expected by 2010 and 2020, but the UK renewables target at the time of that report was only 20%. When national reliance on wind power is low (less than ~20%), the additional fossil fuel generated power requirement can be considered to be insignificant and may be obtained from within the spare generating capacity of other power sectors (Dale et al, 2004). However, as the national supply from wind power increases above 20%, without improvements in grid management techniques, emissions due to backup power generation may become more significant. The extra capacity needed for backup power generation is currently estimated to be 5% of the rated capacity of the wind plant if wind power contributes more than 20% to the national grid (Dale et al 2004). Moving towards the SG target of 50% electricity generation from renewable sources, more short-term capacity may be required in terms of pumped-storage hydro-generated power, or a better mix of offshore and onshore wind generating capacity. Grid management techniques are anticipated to reduce this extra capacity, with improved demand side management, smart meters, grid reinforcement and other developments. However, given current grid management techniques, it is suggested that 5% extra capacity should be assumed for backup power generation if wind power contributes more than 20% to the national grid. At lower contributions, the extra capacity required for backup should be assumed to be zero. These assumptions should be revisited as technology improves.

Assumption: Backup assumed to be by fossil-fuel-mix of electricity generation. Note that hydroelectricity may also be used for backup, so this assumption may make the value for backup generation too high. These assumptions should be revisited as technology develops.

	Exp.	Min.	Max.
Reserve energy (MWh/yr)	24,440	24,440	24,440
Annual emissions due to backup from fossil fuel-mix of electricity generation (tCO2/yr)	1,056	1,056	1,056
RESULTS			
Total emissions due to backup from fossil fuel-mix of electricity generation (tCO2)	31,675	31,675	31,675

1. CO2 emission saving

Emissions due to turbine life
The carbon payback time of the windfarm due to turbine life (eg. manufacture, construction, decomissioning) is calculated by comparing the emissions due to turbine life with carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.

Capacity factor calculated from forestry data

Area name	Value type	Capacity factor (%)	Wind speed ratio	Average site windspeed (m/s)	Annual theoretical energy output (MW / turbine yr)

Capacity factor - Direct input

	Exp.	Min.	Max.
Capacity factor (%)	35.0	34.0	36.0

	Exp.	Min.	Max.
Annual energy output from windfarm (MW/yr)			
RESULTS			
Emissions saving over coal-fired electricity generatio...	171,425	166,527	176,323
Emissions saving over grid-mix of electricity generati...	33,084	32,139	34,029
Emissions saving over fossil fuel - mix of electricity g...	73,908	71,796	76,019

2. CO2 loss turbine life

Emissions due to turbine life
The carbon payback time of the windfarm due to turbine life (eg. manufacture, construction, decomissioning) is calculated by comparing the emissions due to turbine life with carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.

Calculation of emissions with relation to installed capacity

	Exp.	Min.	Max.
Emissions due to turbine frome energy output (t CO2)	5325	5325	5325
Emissions due to cement used in construction (t CO2)	1138	1074	1264

Direct input of emissions due to turbine life

	Exp.	Min.	Max.
Emissions due to turbine life (tCO2/windfarm)			

RESULTS

	Exp.	Min.	Max.
Losses due to turbine life (manufacture, construction, etc.) (t CO2)	49066	49003	49193
Additional CO2 payback time of windfarm due to turbine life			
...coal-fired electricity generation (months)	3	4	3
...grid-mix of electricity generation (months)	18	18	17
...fossil fuel - mix of electricity generation (months)	8	8	8

4. Loss CO2 fixing pot.

Payback Time
Payback Time - ChartsInput Data

Emissions due to loss of bog plants
Annual C fixation by the site is calculated by multiplying area of the windfarm by the annual C accumulation due to bog plant fixation.

	Exp.	Min.	Max.
Area where carbon accumulation by bog plants is lost (ha)	32.37	14.07	42.35
Total loss of carbon accumulation up to time of restoration (tCO2 eq./ha)	37	26	50
RESULTS			
Total loss of carbon fixation by plants at the site (t CO2)	1187	361	2096
Additional CO2 payback time of windfarm due to loss of CO2 fixing potential			
...coal-fired electricity generation (months)	0	0	0
...grid-mix of electricity generation (months)	0	0	1
...fossil fuel - mix of electricity generation (months)	0	0	0

6. CO2 loss DOC & POC

Payback Time
Payback Time - ChartsInput Data

Emissions due to loss of DOC and POC

Note, CO_2 losses from DOC and POC are calculated using a simple approach derived from generic estimates of the percentage of the total CO_2 loss that is due to DOC or POC leaching.

	Exp.	Min.	Max.
Gross CO2 loss from restored drained land (t CO2)	0.00	0.00	0.00
Gross CH4 loss from restored drained land (t CO2 equiv.)	0.00	0.00	0.00
Gross CO2 loss from improved land (t CO2)	0.00	0.00	0.00
Gross CH4 loss from improved land (t CO2 equiv.)	0.00	0.00	0.00
Total gaseous loss of C (t C)	0.00	0.00	0.00
Total C loss as DOC (t C)	0.00	0.00	0.00
Total C loss as POC (t C)	0.00	0.00	0.00
RESULTS			
Total CO2 loss due to DOC leaching (t CO2)	0.00	0.00	0.00
Total CO2 loss due to POC leaching (t CO2)	0.00	0.00	0.00
Total CO2 loss due to DOC & POC leaching (t CO2)	0.00	0.00	0.00
Additional CO2 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

TII Carbon Assessment Tool

Ch 14: Material Assets, Section 14.1.4.1, Table 14-7 to 14-9					Distance Assumptions	TII Embodied Carbon Tool Inputs						TII Transport Inputs		
Material	Total no. Truck Loads	Truck Type	TII Embodied Carbon	TII Traffic	Distance (km)	Category	Sub-Category	Material	Quantity	Unit	Emodied tCO2e	Transport Type	Distance (km)	Transport TCO2e
Concrete	960	Trucks	✓	✓	21.18	Series 1700 Structural Concrete	Concrete - Construction General	Construction - Standard Mix (Average)	7296	m3	2091.712	HGV - Rigid - Average	20328	20.89
Delivery of plant	35	Large artic		✓	129.67							HGV- All - Average	4538.33	4.92
Fencing & gates	3	Large artic		✓	21.18							HGV- All - Average	63.53	0.07
Compound setup	36	Large artic		✓	21.18							HGV- All - Average	762.3	0.83
Steel	25	Large artic	✓	✓	129.67	Series 1800 - Structural Steelwork	General	Anchorages and holding down bolt assemblies	750	tonnes	1,344.83	HGV- All - Average	3241.67	3.52
Ducting and cabling (internal)	264	Large artic		✓	21.18							HGV- All - Average	5590.2	6.06
Grid connection underground electrical cable laying	3,500	Trucks		✓	21.18							HGV - Rigid - Average	74112.5	76.16
Crane (to lift steel)	1	Large artic		✓	129.67							HGV- All - Average	129.67	0.14
Cranes for turbines	12	Large artic		✓	129.67							HGV- All - Average	1556	1.69
Refuelling for Plant	186	Large artic		✓	21.18							HGV- All - Average	3938.55	4.27
Tree Felling	67	Trucks		✓	21.18							HGV - Rigid - Average	1418.73	1.54
Road contruction	5,070	Trucks		✓	21.18							HGV - Rigid - Average	107357.25	110.32
Substation	100	Large artic		✓	129.67							HGV- All - Average	12966.67	14.06
Site maintenance	135	Large artic		✓	21.18							HGV- All - Average	2858.63	3.1
Miscellaneous	90	Large artic		✓	21.18							HGV- All - Average	1905.75	2.07
Total											3,436.54			249.64

List Of Assumptions

Embodied Carbon Assumptions			Traffic Assumptions		
Item	Description	Assumption	Item	Description	Assumption
Volume of Concrete Mixer	Calculation completed based on the average concrete mixer holding 7.6m3 of concrete	7.6	Import (P) Distance	For modelling purposes, the average distance from Port of Galway, Dublin Port, and Shannon Foynes Port for transport of all other materials for the site	129.67
Volume of Average Artic Truck	Calculation completed based on the average artic truck having a carrying capacity of 30 tonnes	30	Quarry (Q) Distance	Distances from identified quarries in Section 4.4.2.1 Deliveries of Stone and Ready-Mix Concrete from Quarries in this EIAR to the Wind Farm Site	21.175
Ducting and cabling (internal)	Embodied carbon of electrical equipment not included as an option in TII Carbon Tool	-	Truck Emissions Factor	Calculated from an HGV - Rigid - Average emission factor as provided in the TII Carbon Tool	0.13
Grid connection cable laying	Embodied carbon of electrical equipment not included as an option in TII Carbon Tool	-	Large Artic Emission Factor	Calculated from an HGV - All - Average emission factor as provided in the TII Carbon Tool	1.07296
Tree Felling	Embodied carbon of tree felling is included in the Macauley Institute Carbon Calculator for Wind Farms on Peatland	-			
Turbine Lifecycle	Embodied carbon of the overall turbine lifecycle is included in the Macauley Institute Carbon Calculator for Wind Farms on Peatland	-			

Please note that the assumptions for the embodied carbon and traffic assumptions are made based on best estimates of material sources. In reality the location of material sources will be dependent on what is available at the time of construction. The implications of distance variations on the estimation for carbon calculations is of a very low magnitude within the context of the overall carbon calculations and considered appropriate for the purposes of assessment in the EIAR.