Core input data

ENTER INPUT DATA HERE! VALUES SHOULD ONLY BE CHANGED ON THIS SHEET. **DO NOT USE EXAMPLE VALUES AS DEFAULTS!** ENTER YOUR OWN VALUES THAT ARE SPECIFIC TO YOUR PARTICULAR SITE.

Note: The input parameters include some variables that can be specified by default values, but others that must be site specific. Variables that can be taken from defaults are marked with purple tags on left hand side.

Click here to move to Payback Time Click here

Click here to return to Instructions Click here

Input data	Expected values: Enter expected value here	Record source of data	Possible range of values: Enter minimum value here	Record source of data	Enter maximum value here	Record source of data
Windfarm characteristics						
Dimensions						
No. of turbines	13	Chapter 3	13	Chapter 3	13	Chapter 3
Lifetime of windfarm (years)	35	Chapter 3	35	Chapter 3	35	Chapter 3
Performance						
Power rating of turbines (turbine capacity) (MW)	6.6	85.8MW / 13 turbines	6.6	85.8MW / 13 turbine	6.6	85.8MW / 13 turbine
Capacity factor	Direct input of capacity fa		Direct input of capacity fa		Direct input of capacity fa	
Enter estimated capacity factor (percentage efficiency)	48.6	Site specific Value from site modelling	48.5	Site specific Value from site modelling	48.7	Site specific Value from site modelling
Backup						
Extra capacity required for backup (%)	5	Standard Value	5	Standard Value	5	Standard Value
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10	Fixed	10	Fixed	10	Fixed
Carbon dioxide emissions from turbine life - (eg. manufacture, construction, decommissioning)	Calculate wrt installed ca		Calculate wrt installed ca		Calculate wrt installed ca	
Characteristics of peatland before windfarm development						
Type of peatland	Acid b		Acid b		Acid b	
Average annual air temperature at site (°C)	9.6	Annual Met Station Data	4.8	Annual Met Station Data	14.4	Annual Met Station Data
Average depth of peat at site (m)	0.81	Appendix 10.2 PMP	0.00	Appendix 10.2 PMP	5.00	Appendix 10.2 PMP
C Content of dry peat (% by weight)	45.6	Lab Data from survey samples	37.8	Lab Data from survey samples	50.7	Lab Data from survey samples
Average extent of drainage around drainage features at site (m)	10.00	Assumed Value	9.00	Assumed Value	11.00	Assumed Value
Average water table depth at site (m)	0.50	Assumed water table depth based on survey observations	0.05	Assumed water table depth based on survey observations	1.00	Assumed water table depth based on survey observations
Dry soil bulk density (g cm^{-3})	0.20	Lab Data from survey samples	0.10	Lab Data from survey samples	0.21	Lab Data from survey samples
Characteristics of bog plants						
Time required for regeneration of bog plants after restoration (years)	10	Standard Value	5	Standard Value	15	Standard Value
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25	Standard Value	0.12	Standard Value	0.31	Standard Value
Forestry Plantation Characteristics						
Method used to calculate CO_2 loss from forest felling	Enter simple data		Enter simple data		Enter simple data	
Area of forestry plantation to be felled (ha)	131.35	Permanent Fell Area from Chapter 14: Forestry	131	Permanent Fell Area from Chapter 14: Forestry	131.5	Permanent Fell Area from Chapter 14: Forestry
Average rate of carbon sequestration in timber (tC ha-1 yr-1)	3.60	Standard Value	3.24	Standard Value	3.96	Standard Value

Note: Capacity factor. The capacity factor of any power plant is the proportion of energy produced during a given period with respect to the energy that would have been produced had the wind farm been running continually and at maximum output (DECC (2004); see also www.bwea.com/ref/capacityfactors.html).
Capacity Factor = Electricity generated during the period [kWh]/ (Installed capacity [kW] x number of hours in the period [h])
We recommend that a site-specific capacity factor ~~site~~ should be used (as measured during planning stage), and should represent the average emission factor expected over the lifetime of the windfarm, accounting for decline in efficiency with age (Hughes, 2012). The 5 year average capacity factor (or "load factor") for UK onshore wind between 2010 and 2014, based on average beginning and end of year capacity, was 29.2% (DUKES, 2015).

Note: Extra capacity required for backup. If 20% of national electricity is generated by wind energy, the extra capacity required for backup is 5% of the rated capacity of the wind plant (Dale et al 2004). We suggest this should be 5% of the actual output. If it is assumed that less than 20% of national electricity is generated by wind energy, a lower percentage should be entered (0%). The House of Lords Economic Affairs Committee report on The Economics of Renewable Energy (Parliamentary Business, 2008) notes that to cover peak demand a '20% margin of extra capacity has been sufficient to keep the risk of a power cut due to insufficient generation at a very low level.' The estimate provided by BERR was a range of 10% to 20% of installed capacity of wind energy. E.ON is reported as proposing that the capacity credit of wind power should be 8%, and The Renewable Energy Foundation proposed the use of the square root of the wind capacity (in GW) as conventional capacity (e.g. 36 GW of wind plant to match 6 GW of conventional plant).

Note: Extra emissions due to reduced thermal efficiency of the reserve power generation ≈ 10% (Dale et al 2004).

Note: Emissions from turbine life. If total emissions for the windfarm are unknown, emissions should be calculated according to turbine capacity. The normal range of CO_2 emissions is 394 to 8147 t CO_2 MW (White & Kulcinski, 2000; White, 2007).

Note: Type of peatland An 'acid bog' is fed primarily by rainwater and often inhabited by sphagnum moss, thus making it acidic (Stoneman & Brooks,1997).
A 'fen' is a type of wetland fed by surface and/or groundwater (McBride et al., 2011).

Note: Time required for regeneration of previous habitat. Loss of fixation should be assumed to be over lifetime of windfarm only. This time could be longer if plants do not regenerate. The requirements for after-use planning include the provision of suitable refugia for peat-forming vegetation, the removal of structures, or an assessment of the impact of leaving them in situ. Methods used to reinstate the site will affect the likely time for regeneration of the previous habitat. This time could also be shorter if plants regenerate during lifetime of windfarm. If so, enter number of years estimated for regeneration.

Note: Carbon fixation by bog plants
Apparent C accumulation rate in peatland is 0.12 to 0.31 t C ha^{-1} yr^{-1} (Turunen et al., 2001; Botch et al., 1995). The SNH guidance uses a value of 0.25 t C ha^{-1} yr^{-1}.

Counterfactual emission factors						
To update counterfactual emission factors from the web [Click here (not yet operational)]					1.002	
Coal-fired plant emission factor (t CO_2 MWh^{-1})	1.002	Data used in online tool	1.002	Data used in online tool	1.002	Data used in online tool
Grid-mix emission factor (t CO_2 MWh^{-1})	0.19338	Data used in online tool	0.19338	Data used in online tool	0.19338	Data used in online tool
Fossil fuel-mix emission factor (t CO_2 MWh^{-1})	0.432	Data used in online tool	0.432	Data used in online tool	0.432	Data used in online tool
Borrow pits						
Number of borrow pits	4	Chapter 3	4	Chapter 3	4	Chapter 3
Average length of pits (m)	58.9	Approximate value based on estimated borrow pit area	40.1	Approximate value based on estimated borrow pit area	78.8	Approximate value based on estimated borrow pit area
Average width of pits (m)	58.9	Approximate value based on estimated borrow pit area	40.1	Approximate value based on estimated borrow pit area	78.8	Approximate value based on estimated borrow pit area
Average depth of peat removed from pit (m)	0.18	Appendix 10.2 PMP	0.10	Appendix 10.2 PMP	0.25	Appendix 10.2 PMP
Foundations and hard-standing area associated with each turbine						
Method used to calculate CO_2 loss from foundations and hard-standing	Enter detailed informatio		Enter detailed informatio		Enter detailed informatio	
Please enter construction data in sheet: Construction input data						
Average depth of peat removed from turbine foundations (m)	0.84		0.84		0.84	
Average depth of peat removed from hard-standing (m)	0.90		0.90		0.90	
Access tracks						
Total length of access track (m)	11490	Chapter 3	11489	Chapter 3	11491	Chapter 3
Existing track length (m)	4020	Chapter 3	4020	Chapter 3	4020	Chapter 3
<u>Length of access track that is floating road (m)</u>	1970	Chapter 3	1969	Chapter 3	1971	Chapter 3
Floating road width (m)	5	Chapter 3	5	Chapter 3	5	Chapter 3
Floating road depth (m)						
Length of floating road that is drained (m)						
Average depth of drains associated with floating roads (m)						
<u>Length of access track that is excavated road (m)</u>	5500	Chapter 3	5499	Chapter 3	5501	Chapter 3
Excavated road width (m)	5	Chapter 3	5	Chapter 3	5	Chapter 3
Average depth of peat excavated for road (m)	0.60	Appendix 10.2 PMP	0.00	Appendix 10.2 PMP	3.00	Appendix 10.2 PMP
<u>Length of access track that is rock filled road (m)</u>						
Rock filled road width (m)						
Rock filled road depth (m)						
Length of rock filled road that is drained (m)						
Average depth of drains associated with rock filled roads (m)						
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)						
Average depth of peat cut for cable trenches (m)						
Additional peat excavated (not already accounted for above)						
Volume of additional peat excavated (m^3)	7209	Appensix 10.2 PMP - Substation Area	7209	Appensix 10.2 PMP - Substation Area	7209	Appensix 10.2 PMP - Substation Area
Area of additional peat excavated (m^2)	8100.0	Appensix 10.2 PMP - Substation Area	8100.0	Appensix 10.2 PMP - Substation Area	8100.0	Appensix 10.2 PMP - Substation Area
Peat Landslide Hazard						
<u>Weblink: Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments</u>	negligible	Fixed	negligible	fixed	negligible	fixed

Note: <u>Area of forestry plantation to be felled</u>. If the forestry was planned to be removed, with no further rotations planted, before the windfarm development, the area to be felled should be entered as zero.

Note: <u>Plantation carbon sequestration</u>. This is dependent on the yield class of the forestry. The SNH technical guidance assumed yield class of 16 m^3 ha^{-1} yr^{-1}, compared to the value of 14 m^3 ha^{-1} yr^{-1} provided by the Forestry Commission. Carbon sequestered for yield class 16 m^3 ha^{-1} y^{-1} = 3.6 tC ha^{-1} yr^{-1} (Cannell, 1999).

Note: <u>Coal-Fired Plant and Grid Mix Emission Factors</u>. Coal-fired plant emission factor (EF) from electricity supplied in 2014 = 0.093 t CO_2 MWh^{-1}; Grid-Mix EF for 2014 = 0.394 t CO_2 MWh^{-1}. Source = DUKES, 2015b.

Note: <u>Fossil Fuel-Mix Emission Factor</u>. The emission factor from electricity supplied in 2014 from all fossil fuels = 0.642 t CO_2 MWh^{-1}. Source = DUKES, 2015b.

Note: <u>Total length of access track</u>. If areas of access track overlap with hardstanding area, exclude these from the total length of access track to avoid double counting of land area lost.

Note: <u>Floating road depth</u>. Accounts for sinking of floating road. Should be entered as the average depth of the road expected over the lifetime of the windfarm. If no sinking is expected, enter as zero.

Note: <u>Length of floating road that is drained</u>. Refers to any drains running along the length of the road.

Note: <u>Rock filled roads.</u> Rock filled roads are assumed to be roads where no peat has been removed and rock has been placed on the surface and allowed to settle.

Note: <u>Depth of peat cut for cable trenches.</u> In shallow peats, the cable trenches may be cut below the peat. To avoid overestimating the depth of peat affected by the cable trenches, only enter the depth of the peat that is cut.

Note: <u>Peat Landslide Hazard</u>. It is assumed that measures have been taken to limit damage (Scottish Executive, 2006, Peat Landslide Hazard and Risk Assessments. Best Practice Guide for Proposed Electricity Generation Developments. Scottish Executive, Edinburgh. pp. 34-35) so that C losses due to peat landslide can be assumed to be negligible. Link: http://www.scotland.gov.uk/Publications/2006/12/21162303/1.

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)	7	HMP	7	HMP	7	HMP
Water table depth in degraded bog before improvement (m)	0.10	Assumption	0.05	Assumption	0.30	Assumption
Water table depth in degraded bog after improvement (m)	0.09	Assumption	0.04	Assumption	0.29	Assumption
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)	10	Standard Value	5	Standard Value	15	Standard Value
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)	35	Chapter 3	35	Chapter 3	35	Chapter 3
Improvement of felled plantation land						
Area of felled plantation to be improved (ha)	87.7	Chapter 14: Forestry	87.8	Chapter 14: Forestry	87.9	Chapter 14: Forestry
Water table depth in felled area before improvement (m)	3.00	Assumed Value Max Allowed	2.70	Assumed Value Max Allowed	3.00	Assumed Value Max Allowed
Water table depth in felled area after improvement (m)	1.00	Assumed Value Max Allowed	0.90	Assumed Value Max Allowed	1.00	Assumed Value Max Allowed
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)	10	Standard Value	5	Standard Value	15	Standard Value
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)	35	Chapter 3	35	Chapter 3	35	Chapter 3
Restoration of peat removed from borrow pits						
Area of borrow pits to be restored (ha)	2	Chapter 3	1.53	Chapter 3	1.53	Chapter 3
Depth of water table in borrow pit before restoration with respect to the restored surface (m)	0.10	Assumed value based on site observations	0.05	Assumed value based on site observations	0.30	Assumed value based on site observations
Depth of water table in borrow pit after restoration with respect to the restored surface (m)	0.09	Assumed value based on site observations	0.04	Assumed value based on site observations	0.29	Assumed value based on site observations
Time required for hydrology and habitat of borrow pit to return to its previous state on restoration (years)	10	Standard Value	5	Standard Value	15	Standard Value
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)	35	Chapter 3	35	Chapter 3	35	Chapter 3
Early removal of drainage from foundations and hardstanding						
Water table depth around foundations and hardstanding before restoration (m)						
Water table depth around foundations and hardstanding after restoration (m)						
Time to completion of backfilling, removal of any surface drains, and full restoration of the hydrology (years)	2	Chapter 3	2	Chapter 3	2	Chapter 3
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	HMP	Yes	HMP	Yes	HMP
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes	HMP	Yes	HMP	Yes	HMP
Will the habitat of the site be restored on decommissioning?	Yes		Yes		Yes	
Will you control grazing on degraded areas?	Yes	HMP	Yes	HMP	Yes	HMP
Will you manage areas to favour reintroduction of species	Yes	HMP	Yes	HMP	Yes	HMP

Note: Period of time when improvement can be guaranteed. This guarantee should be absolute. Therefore, if you enter a value beyond the lifetime of the windfarm you should provide strong supporting evidence that this improvement can be guaranteed for the full period given. This includes the time requirement for the improvement to become effective. For example if time required for hydrology and habitat to return to its previous state is 10 years and the restoration can be guaranteed over the lifetime of the windfarm (25 years), the period of time when the improvement can be guaranteed should be entered as 25 years, and the improvement will be effective for (25 - 10) = 15 years.

Note: Period of time when improvement can be guaranteed. This gurantee should be absolute. Therefore, if you enter a value beyond the lifetime of the windfarm you should provide strong supporting evidence that this improvement can be guaranteed for the full period given. This includes the time requirement for the improvement to become effective. For example if time required for hydrology and habitat to return to its previous state is 10 years and the restoration can be guaranteed over the lifetime of the windfarm (25 years), the period of time when the improvement can be guaranteed should be entered as 25 years, and the improvement will be effective for (25 -10) = 15 years.

Note: Period of time when improvement can be guaranteed. This gurantee should be absolute. Therefore, if you enter a value beyond the lifetime of the windfarm you should provide strong supporting evidence that this improvement can be guaranteed for the full period given. This includes the time requirement for the improvement to become effective. For example if time required for hydrology and habitat to return to its previous state is 10 years and the restoration can be guaranteed over the lifetime of the windfarm (25 years), the period of time when the improvement can be guaranteed should be entered as 25 years, and the improvement will be effective for (25 -10) = 15 years.

Note: Period of time when improvement can be guaranteed. This is assumed to be the lifetime of the windfarm as restoration after windfarm decommissioning is already accounted for in restoration of the site

Note: Restoration of site. If the water table at the site is returned to its original level or higher on decommissioning, and habitat at the site is restored, it is assumed that C losses continue only over the lifetime of the windfarm. Otherwise, C losses from drained peat are assumed to be 100%.

Choice of methodology for calculating emission factors	Site specific (required for planning applications)

Note: Choice of methodology for calculating emission factors. The IPCC default methodology is the internationally accepted standard (IPCC, 1997). However, it is stated in IPCC (1997) that these are rough estimates, and "these rates and production periods can be used if countries do not have more appropriate estimates". Therefore, we have developed more site specific estimates for use here based on work from the Scottish Government funded ECOSSE project (Smith et al, 2007. ECOSSE: Estimating Carbon in Organic Soils - Sequestration and Emissions. Final Report. SEERAD Report. ISBN 978 0 7559 1498 2. 166pp.).

Core input data

ENTER INPUT DATA HERE! VALUES SHOULD ONLY BE CHANGED ON THIS SHEET. **DO NOT USE EXAMPLE VALUES AS DEFAULTS!** ENTER YOUR OWN VALUES THAT ARE SPECIFIC TO YOUR PARTICULAR SITE.

Note: The input parameters include some variables that can be specified by default values, but others that must be site specific. Variables that can be taken from defaults are marked with purple tags on left hand side.

Construction input data

ENTER DETAILS OFCONSTRUCTION HERE!

Note: This data only used in the calculation if the selection "**Enter detailed information**" is made in cell C50 of the Core input data sheet.

Click here to move to Payback Time | Click here

Click here to return to Core input data | Click here

Input data	Expected values Enter expected value here ▼	Record source of data	Possible range of values Enter minimum value here ▼	Record source of data	Enter maximum value here ▼	Record source of data
Construction design **Note - total number of turbines already specified:**	**13**		**13**		**13**	
AREA 1						
Number of turbines in this area	13	Chapter 3	13	Chapter 3	13	Chapter 3
Turbine foundations						
Average depth of peat removed when constructing foundations (m)	0.8	Appendix 10.2 - PMP Chapter 3 - Dimensions calculated based on turbine area	0.8	Appendix 10.2 - PMP Chapter 3 - Dimensions calculated based on turbine area	0.8	Appendix 10.2 - PMP Chapter 3 - Dimensions calculated based on turbine area
Approximate geometric shape of whole dug when constructing foundations	Rectangular 1		Rectangular		Rectangular	
Length at surface (m)	38		38		38	
Width at surface (m)	10		10		10	
Length at bottom (m)	38		38		38	
Width at bottom (m)	10		10		10	
Hardstanding						
Average depth of peat removed when constructing hardstanding (m)	0.9	Appendix 10.2 - Chapter 3 - Dimensions calculated based on hardstanding area	0.9	Appendix 10.2 - Chapter 3 - Dimensions calculated based on hardstanding area	0.9	Appendix 10.2 - Chapter 3 - Dimensions calculated based on hardstanding area
Approximate geometric shape of whole dug when constructing hardstanding	Rectangular 1		Rectangular		Rectangular	
Length at surface (m)	100		100		100	
Width at surface (m)	72		72		72	
Length at bottom (m)	100		100		100	
Width at bottom (m)	72		72		72	
Piling						
Is piling used?	No 2	Chapter 3	No	Chapter 3	No	Chapter 3
Volume of Concrete						
Volume of concrete used (m^3)	9750	750m3 x 13 turbines	9750	750m3 x 13 turbines	9750	750m3 x 13 turbines

Results

PAYBACK TIME AND CO_2 EMISSIONS

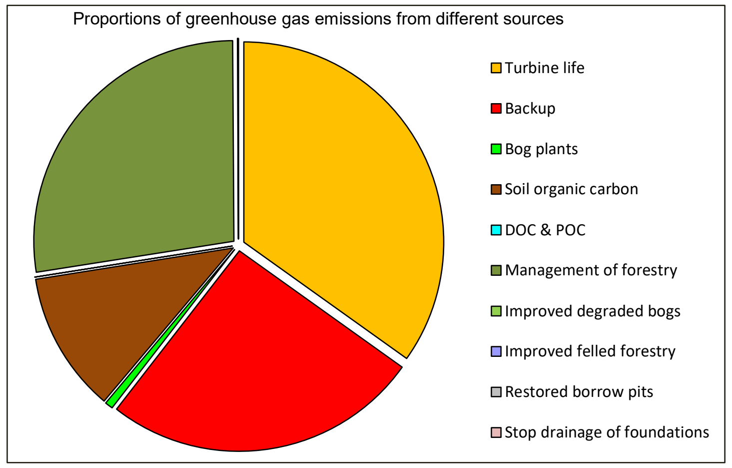
Note: The carbon payback time of the windfarm is calculated by comparing the loss of C from the site due to windfarm development with the carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.

Click here to return to Input data — Click here

Click here to return to Instructions — Click here

	Exp.	*Min.*	*Max.*
1. Windfarm CO_2 emission saving over…			
…coal-fired electricity generation ($tCO_2\ yr^{-1}$)	366012	365259	366765
…grid-mix of electricity generation ($tCO_2\ yr^{-1}$)	70638	70493	70783
…fossil fuel - mix of electricity generation ($tCO_2\ yr^{-1}$)	157802	157477	158126
Energy output from windfarm over lifetime (MWh)	12784852	12758546	12811158
Total CO_2 losses due to wind farm (t CO_2 eq.)			
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	77170	77170	77170
3. Losses due to backup	56822	56822	56822
4. Losses due to reduced carbon fixing potential	1422	555	2153
5. Losses from soil organic matter	25152	209	56259
6. Losses due to DOC & POC leaching	16	204	5819
7. Losses due to felling forestry	60689	54475	66834
Total losses of carbon dioxide	221271	189434	265058
8. Total CO_2 gains due to improvement of site (t CO_2 eq.)			
8a. Change in emissions due to improvement of degraded bogs	155	0	-1415
8b. Change in emissions due to improvement of felled forestry	-24607	13343	-33271
8c. Change in emissions due to restoration of peat from borrow pits	34	0	-204
8d. Change in emissions due to removal of drainage from foundations & hardstanding	0	0	0
Total change in emissions due to improvements	-24419	13343	-34890

RESULTS	*Exp.*	*Min.*	*Max.*
Net emissions of carbon dioxide (t $CO_{2\ eq.}$)	**196852**	**154544**	**278400**
Carbon Payback Time			
…coal-fired electricity generation (years)	0.5	0.4	0.8
…grid-mix of electricity generation (years)	2.8	2.2	3.9
…fossil fuel - mix of electricity generation (years)	**1.2**	**1.0**	**1.8**
Ratio of soil carbon loss to gain by restoration (TARGET ratio (Natural Resources Wales) < 1.0)	**No gains!**	**0.0**	**No gains!**
Ratio of CO_2 eq. emissions to power generation (g / kWh) (TARGET ratio by 2030 (electricity generation) < 50 g /kWh)	**15**	**12**	**22**



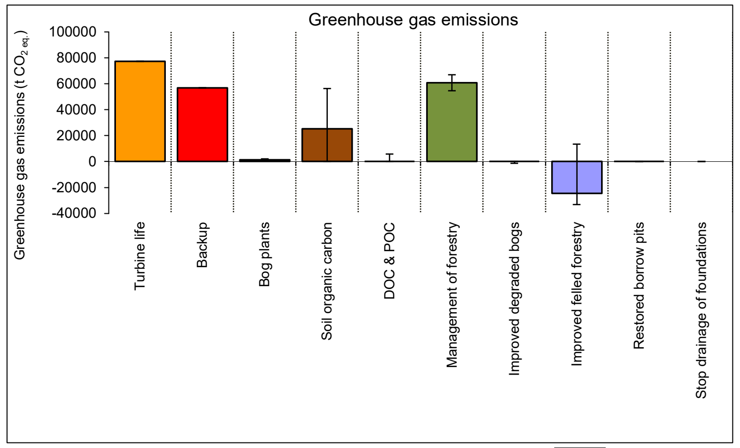
Data used in barchart of carbon payback time using fossil-fuel mix as counterfactual

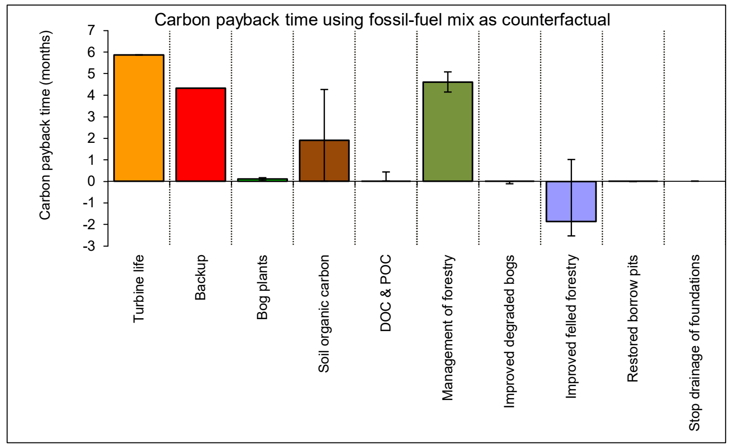
Greenhouse gas emissions

	Exp.	*Min*	*Max*
Turbine life	77170	0	0
Backup	56822	0	0
Bog plants	1422	867	730
Soil organic carbon	25152	24943	31108
DOC & POC	16	0	5804
Management of forestry	60689	6214	6145
Improved degraded bogs	155	155	0
Improved felled forestry	0	0	0
Restored borrow pits	34	34	0
Stop drainage of foundations	0	0	0

Data used in barchart of carbon payback time using fossil-fuel mix as counterfactual

Greenhouse gas emissions				Carbon payback time (months)		
	Exp.	*Min.*	*Max.*	*Exp.*	*Min.*	*Max.*
Turbine life	77170	0	0	6	0	0
Backup	56822	0	0	4	0	0
Bog plants	1422	867	730	0	0	0
Soil organic carbon	25152	24943	31108	2	2	2
DOC & POC	16	-189	5804	0	0	0
Management of forestry	60689	6214	6145	5	0	0
Improved degraded bogs	155	155	-1570	0	0	0
Improved felled forestry	-24607	-37950	-8664	-2	-3	-1
Restored borrow pits	34	34	-238	0	0	0
Stop drainage of foundations	0	0	0	0	0	0
	196852			15		





Check Check Check Check Check Check Check Check Check Check

Results

PAYBACK TIME AND CO_2 EMISSIONS

Note: The carbon payback time of the windfarm is calculated by comparing the loss of C from the site due to windfarm development with the carbon-savings achieved by the windfarm while displacing electricity generated from coal-fired capacity or grid-mix.

Click here to return to Input data — Click here

Click here to return to Instructions — Click here