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.

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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	19		19		19	
Lifetime of windfarm (years)	30	Fixed	25		35	
Performance						
Power rating of turbines (turbine capacity) (MW)	3.5		3		4	
Capacity factor	Direct input of capacity factor		Direct input of capacity factor		Direct input of capacity factor	
Enter estimated capacity factor (percentage efficiency)	0.3		0.3		0.3	
Backup						
Extra capacity required for backup (%)	1.15		1.1		1.2	
Additional emissions due to reduced thermal efficiency of the reserve generation (%)	10		9		11	
Carbon dioxide emissions from turbine life - (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	
Average annual air temperature at site (^oC)	9.8		7.5		12.2	
Average depth of peat at site (m)						
C Content of dry peat (% by weight)	55		50		60	
Average extent of drainage around drainage features at site (m)	15.00		10.00		20.00	
Average water table depth at site (m)	1.50		1.00		2.00	
Dry soil bulk density (g cm^{-3})	0.10		0.09		0.11	
Characteristics of bog plants						
Time required for regeneration of bog plants after restoration (years)	10		5		15	
Carbon accumulation due to C fixation by bog plants in undrained peats (tC ha^{-1} yr^{-1})	0.25		0.2		0.3	
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)	73.6		73.6		73.6	
Average rate of carbon sequestration in timber (tC ha-1 yr-1)	3.60		3.50		3.70	
Counterfactual emission factors						
To update counterfactual emission factors from the web [Click here (not yet operational)]						
Coal-fired plant emission factor (t CO_2 MWh^{-1})						
Grid-mix emission factor (t CO_2 MWh^{-1})						
Fossil fuel-mix emission factor (t CO_2 MWh^{-1})						
Borrow pits						
Number of borrow pits	3		3		3	
Average length of pits (m)	100		100		100	
Average width of pits (m)	90		90		90	
Average depth of peat removed from pit (m)	1.60		1.60		1.60	
Foundations and hard-standing area associated with each turbine						
Method used to calculate CO_2 loss from foundations and hard-standing	Rectangular with vertical walls		Rectangular with vertical walls		Rectangular with vertical walls	
Average length of turbine foundations (m)	20		20		20	
Average width of turbine foundations (m)	20		20		20	
Average depth of peat removed from turbine foundations (m)	1.40		1.40		1.40	
Average length of hard-standing (m)	55		55		55	
Average width of hard-standing (m)	35		35		35	
Average depth of peat removed from hard-standing (m)	1.70		1.70		1.70	
Access tracks						
Total length of access track (m)	22.1		22.1		22.1	
Existing track length (m)	14.5		14.5		14.5	
Length of access track that is floating road (m)	6.4		6.4		6.4	
Floating road width (m)	6		5		7	
Floating road depth (m)	1.00		0.75		1.25	
Length of floating road that is drained (m)	6.4		0		6.4	
Average depth of drains associated with floating roads (m)	0.50		0.40		0.60	
Length of access track that is excavated road (m)	1.2		1.2		1.2	
Excavated road width (m)	7		6		8	
Average depth of peat excavated for road (m)	1.30		1.20		1.40	
Length of access track that is rock filled road (m)	0		0		0	
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)	0		0		0	
Average depth of peat cut for cable trenches (m)						
Additional peat excavated (not already accounted for above)						
Volume of additional peat excavated (m^3)	61780		61780		61780	
Area of additional peat excavated (m^2)	25300.0		25300.0		25300.0	
Peat Landslide Hazard						
Weblink: Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments						
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)						
Water table depth in degraded bog before improvement (m)						
Water table depth in degraded bog after improvement (m)						
Time required for hydrology and habitat of bog to return to its previous state on improvement (years)						
Period of time when effectiveness of the improvement in degraded bog can be guaranteed (years)						
Improvement of felled plantation land						
Area of felled plantation to be improved (ha)						
Water table depth in felled area before improvement (m)						
Water table depth in felled area after improvement (m)						
Time required for hydrology and habitat of felled plantation to return to its previous state on improvement (years)						
Period of time when effectiveness of the improvement in felled plantation can be guaranteed (years)						
Restoration of peat removed from borrow pits						
Area of borrow pits to be restored (ha)	0		0		0	
Depth of water table in borrow pit before restoration with respect to the restored surface (m)						
Depth of water table in borrow pit 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)	5.0		0.0		10.0	
Period of time when effectiveness of the restoration of peat removed from borrow pits can be guaranteed (years)						
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)	30		30		30	
Restoration of site after decomissioning						
Will the hydrology of the site be restored on decommissioning?	Yes		Yes		No	
Will you attempt to block any gullies that have formed due to the windfarm?	Yes		Yes		No	
Will you attempt to block all artificial ditches and facilitate rewetting?	Yes		Yes		No	
Will the habitat of the site be restored on decommissioning?	No		Yes		No	
Will you control grazing on degraded areas?	No		Yes		No	
Will you manage areas to favour reintroduction of species	No		Yes		No	

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

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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.

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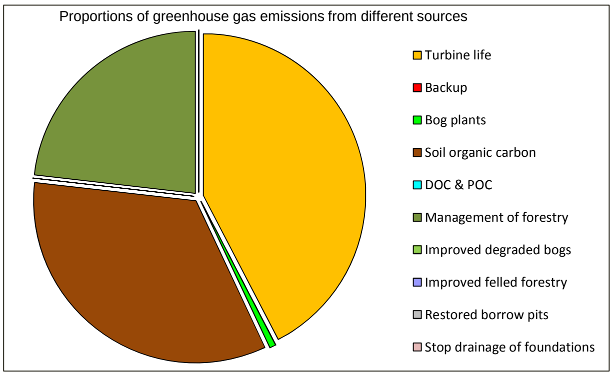
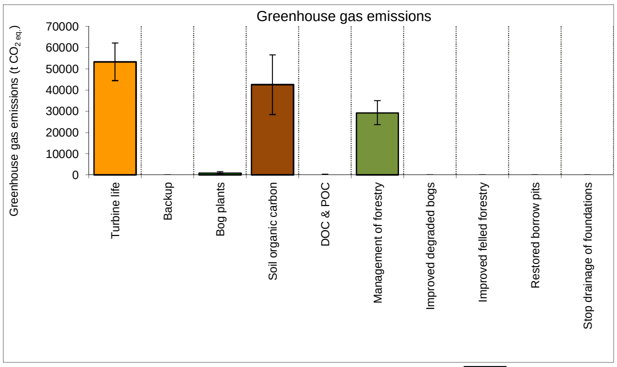
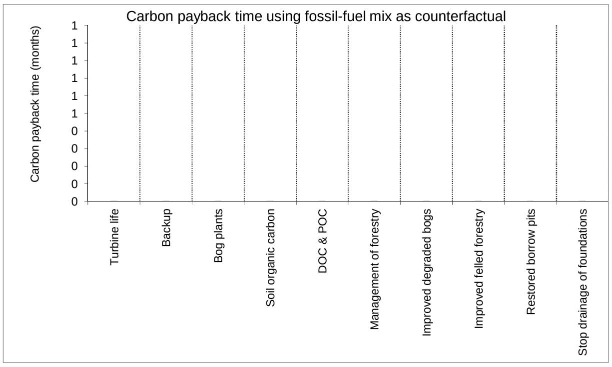
	Exp.	Min.	Max.
1. Windfarm CO_2 emission saving over…			
…coal-fired electricity generation ($tCO_2\ yr^{-1}$)	0	0	0
…grid-mix of electricity generation ($tCO_2\ yr^{-1}$)	0	0	0
…fossil fuel - mix of electricity generation ($tCO_2\ yr^{-1}$)	0	0	0
Energy output from windfarm over lifetime (MWh)	52429	37449	69905
Total CO_2 losses due to wind farm ($t\ CO_2$ eq.)			
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	53251	44375	62127
3. Losses due to backup	0	0	0
4. Losses due to reduced carbon fixing potential	796	379	1464
5. Losses from soil organic matter	42483	28400	56579
6. Losses due to DOC & POC leaching	0	303	0
7. Losses due to felling forestry	29148	23615	34951
Total losses of carbon dioxide	125678	97071	155121
8. Total CO_2 gains due to improvement of site ($t\ CO_2$ eq.)			
8a. Gains due to improvement of degraded bogs	0	0	0
8b. Gains due to improvement of felled forestry	0	0	0
8c. Gains due to restoration of peat from borrow pits	0	0	0
8d. Gains due to removal of drainage from foundations & hardstanding	0	0	0
Total gains	0	0	0

RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide ($t\ CO_{2\ eq.}$)	**125678**	**97071**	**155121**
Carbon Payback Time			
…coal-fired electricity generation (years)	#DIV/0!	#DIV/0!	#DIV/0!
…grid-mix of electricity generation (years)	#DIV/0!	#DIV/0!	#DIV/0!
…fossil fuel - mix of electricity generation (years)	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**
Ratio of soil carbon loss to gain by restoration (TARGET ratio (Natural Resources Wales) < 1.0)	No gains!	No gains!	No gains!
Ratio of CO_2 eq. emissions to power generation (g / kWh) (TARGET ratio by 2030 (electricity generation) < 50 g /kWh)	2397	2592	2219







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