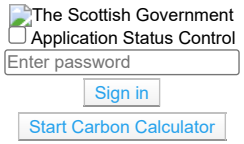
5.6MW Carbon Calculator

Cover

CARBON CALCULATOR TOOL v . .

Help About...

Scottish Government and SEPA users only:



This tool calculates payback time for windfarm sited on peatlands using methods given in Nayak et al, 2008 (http://www.gov.scot/Publications/2008/06/25114657/0) and revised equations for GHG emissions (Nayak, D.R., Miller, D., Nolan, A., Smith, P. and Smith, J.U., 2010, Calculating carbon budgets of wind farms on Scottish peatland. Mires and Peat 4: Art. 9. Online: http://mires-and-peat.net/pages/volumes/map04/map0409.php

Admin

CARBON CALCULATOR TOOL v . . - APPLICATION STATUS CONTROL

Help

Reference Code: Search

Windfarm Name	Version	Methodology used for calculating emission factors	Status Date	Status
No data available in table				

PreviousNext

Selected:

Saved Signed-off | Received Consented Refused Withdrawn

Revert to original status

Start

CARBON CALCULATOR TOOL v . .

- Will the site be drained on construction of the windfarm?
- Is the soil at the site highly organic?
- Does windfarm construction require a significant amount of deforestation?
  i.e. is removal in excess of keyholing the turbines within the forest boundary?

If you already have an Application Reference, type it here (or paste it in the first box):

Search

New application

CoreInput

Core input data
1. Windfarm characteristics 2. Peatland 3. Bog plants 4. Forestry Plantation 5. Emission factors 6. Borrow pits 7. Foundations and hard-standing 8. Access tracks 9. Cable trenches 10. Additional peat 11. Improvement actions 12. Restoration after decomissioning 13. Methodology & application details
Forestry input data
Construction input data
Save ☐ Signed off for submission

Note: Results are only available once ALL data are correct and complete, and a new version will be created.

New app...

Ref: X33G-TW2E-8EXH v

MENU≡

Help

Core input data | Forestry input data | Construction input data

Windfarm characteristics Page 1 of 12

Expected values	Minimum	Maximum
Dimensions		
Number of Turbines: 14		
Chapter 2: Project Description	14	14
Duration of consent (years): 35		
Chapter 2: Project Description	35	35
Performance		
Power rating of 1 turbine (MW): 5.6		
Chapter 2: Project	5.6	6.6

Payback Time

Payback Time

1. Windfarm CO2 emission saving over...	Exp.	Min.	Max.
...coal-fired electricity generation (t CO2 / yr)	221,144	214,826	268,081
...grid-mix of electricity generation (t CO2 / yr)	60,954	59,213	73,891
...fossil fuel-mix of electricity generation (t CO2 / yr)	108,168	105,078	131,127
Energy output from windfarm over lifetime (MWh)	8,413,104	8,172,730	10,198,742

Total CO2 losses due to wind farm (tCO2 eq.)	Exp.	Min.	Max.
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	70,626	70,499	83,896
3. Losses due to backup	54,084	54,084	63,742
4. Lossess due to reduced carbon fixing potential	1,903	955	2,971
5. Losses from soil organic matter	-2,193	-6,825	14,368
6. Losses due to DOC & POC leaching	14	0	2,960
7. Losses due to felling forestry	16,364	15,721	17,094
Total losses of carbon dioxide	140,798	134,434	185,031

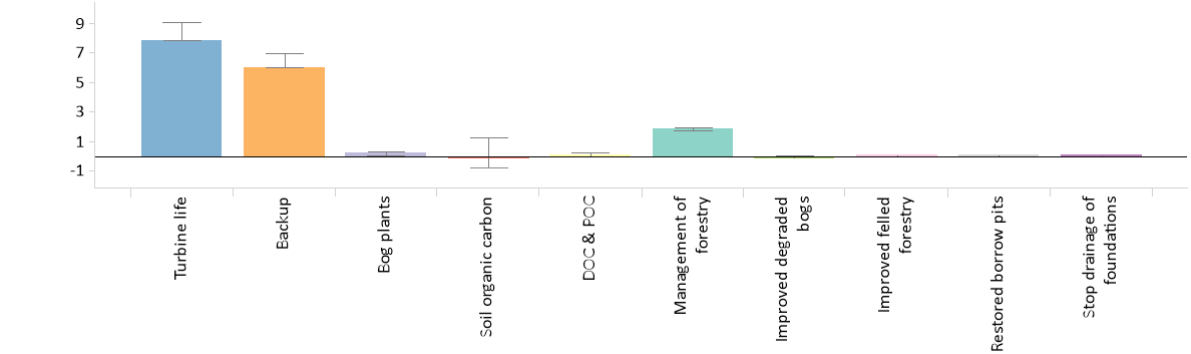
8. Total CO2 gains due to improvement of site (t CO2 eq.)	Exp.	Min.	Max.
8a. Change in emissions due to improvement of degraded bogs	-329	0	-1,699
8b. Change in emissions due to improvement of felled forestry	0	0	0
8c. Change in emissions due to restoration of peat from borrow pits	0	0	0
8d. Change in emissions due to removal of drainage from foundations & hardstanding	0	0	0
Total change in emissions due to improvements	-329	0	-1,699

RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide (t CO2 eq.)	140,469	132,735	185,031
Carbon Payback Time			
...coal-fired electricity generation (years)	0.6	0.5	0.9
...grid-mix of electricity generation (years)	2.3	1.8	3.1
...fossil fuel-mix of electricity generation (years)	1.3	1.0	1.8
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	-6.62	-4.02	No gains!

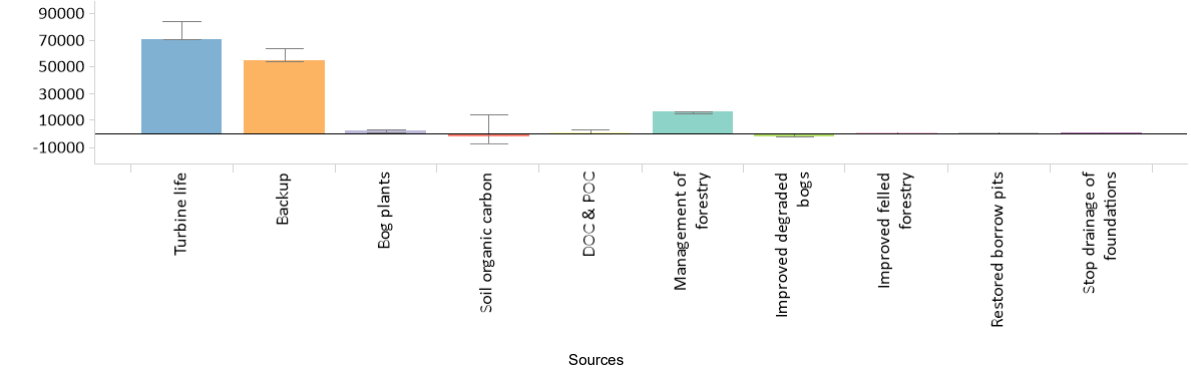
Payback Time - Charts

Payback Time

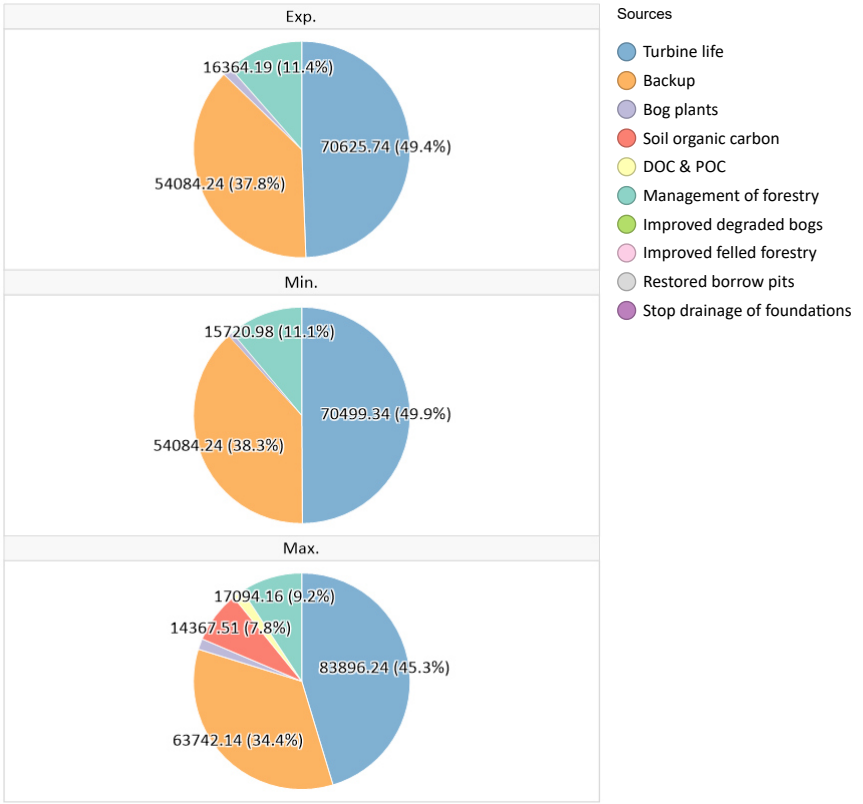
Carbon payback time (months) using fossil-fuel mix as conterfactual



Greenhouse gas emissions (t CO2 eq.)



Proportions of greenhouse gas emissions from different sources



View

Payback Time

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Carbon Calculator v1.6.1

Gortyrahilly Wind Farm Location: 51.900255 -9.21366

Gortyrahilly Wind DAC

Core input data

Input data	Expected value	Minimum value	Maximum value	Source of data
Windfarm characteristics				
Dimensions				
No. of turbines	14	14	14	Chapter 2: Project Description
Duration of consent (years)	35	35	35	Chapter 2: Project Description
Performance				
Power rating of 1 turbine (MW)	5.6	5.6	6.6	Chapter 2: Project Description
Capacity factor	35	34	36	Chapter 10: Air and Climate
Backup				
Fraction of output to backup (%)	5	5	5	SNH Calculator Guidance
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	Chapter 6: Biodiversity
Average annual air temperature at site (°C)	9.975	9.7	10	Chapter 10: Air and Climate
Average depth of peat at site (m)	0.365	0	3.5	Chapter 8: Soils and Geology
C Content of dry peat (% by weight)	55	50	60	Default Value
Average extent of drainage around drainage features at site (m)	10	5	15	Chapter 9: Hydrology and Hydrogeology
Average water table depth at site (m)	0.5	0.1	1	Chapter 9: Hydrology and Hydrogeology
Dry soil bulk density (g cm^{-3})	0.1	0.09	0.11	Default Value
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	10	5	15	Best Practice in Bog Restoration Ireland

6.6MW Carbon Calculator

Cover

CARBON CALCULATOR TOOL v . .

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The Scottish Government
Application Status Control
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Sign in
Start Carbon Calculator

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Core input data | Forestry input data | Construction input data

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Performance		
Power rating of 1 turbine (MW): 6.6		
Chapter 2: Project Description	5.6	6.6
Capacity factor		
Direct input (% estimated capacity factor)		

Payback Time

Payback Time
Payback Time - ChartsInput Data

1. Windfarm CO2 emission saving over...	Exp.	Min.	Max.
...coal-fired electricity generation (t CO2 / yr)	260,635	214,826	268,081
...grid-mix of electricity generation (t CO2 / yr)	71,839	59,213	73,891
...fossil fuel-mix of electricity generation (t CO2 / yr)	127,484	105,078	131,127
Energy output from windfarm over lifetime (MWh)	9,915,444	8,172,730	10,198,742

Total CO2 losses due to wind farm (tCO2 eq.)	Exp.	Min.	Max.
2. Losses due to turbine life (eg. manufacture, construction, decomissioning)	83,707	70,499	83,896
3. Losses due to backup	63,742	54,084	63,742
4. Lossess due to reduced carbon fixing potential	1,903	955	2,971
5. Losses from soil organic matter	-2,193	-6,825	14,368
6. Losses due to DOC & POC leaching	14	0	2,960
7. Losses due to felling forestry	16,364	15,721	17,094
Total losses of carbon dioxide	163,537	134,434	185,031

8. Total CO2 gains due to improvement of site (t CO2 eq.)	Exp.	Min.	Max.
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8d. Change in emissions due to removal of drainage from foundations & hardstanding	0	0	0
Total change in emissions due to improvements	-329	0	-1,699

RESULTS	Exp.	Min.	Max.
Net emissions of carbon dioxide (t CO2 eq.)	163,208	132,735	185,031
Carbon Payback Time			
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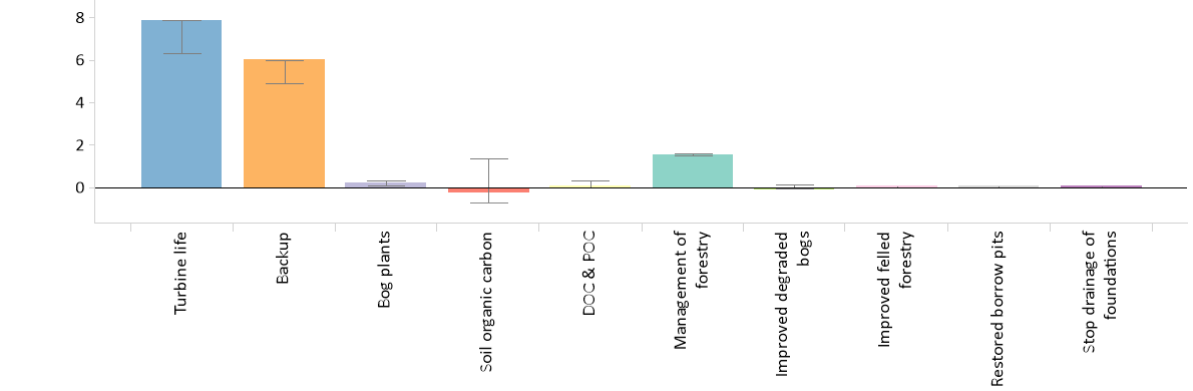
...fossil fuel-mix of electricity generation (years)	1.3	1.0	1.8
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	-6.62	-4.02	No gains!
Ratio of CO2 eq. emissions to power generation (g/kWh) (for info. only)	16.46	13.01	22.64

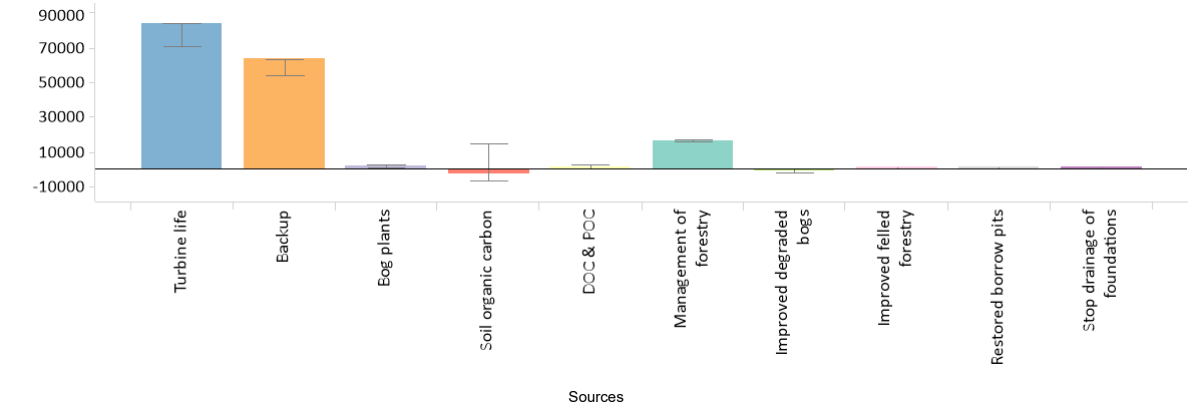
Payback Time - Charts

Payback Time
Payback Time - ChartsInput Data

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



Greenhouse gas emissions (t CO2 eq.)



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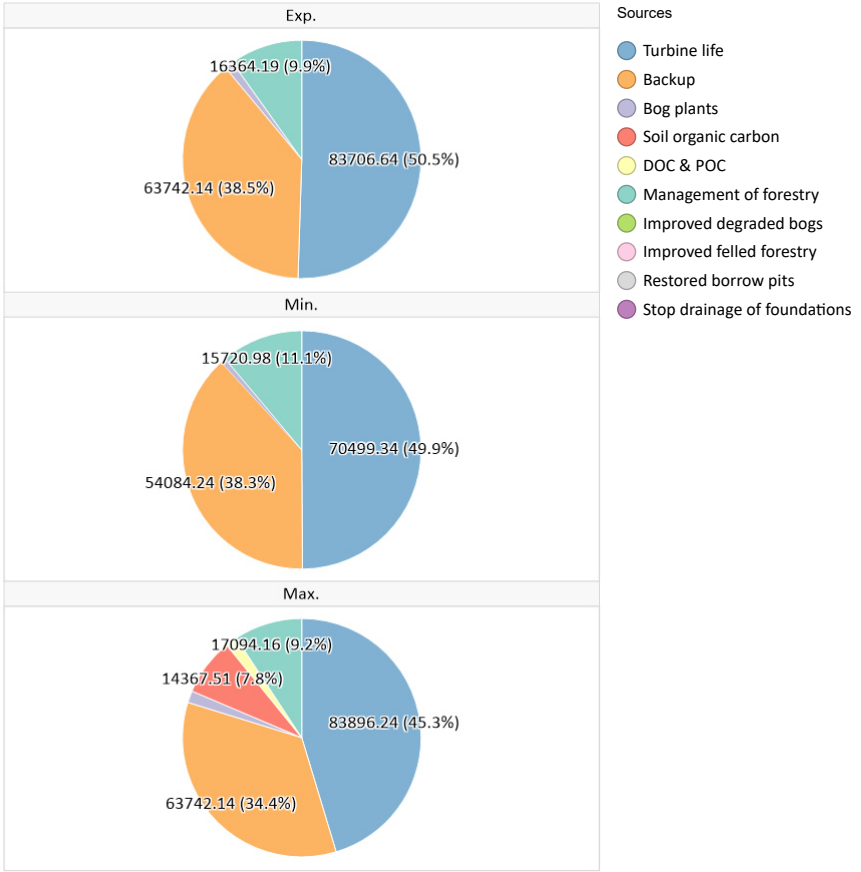

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Dry soil bulk density ($g\ cm^{-3}$)	0.1	0.09	0.11	Default Value
Characteristics of bog plants				
Time required for regeneration of bog plants after restoration (years)	10	5	15	Best Practice in Bog Restoration Ireland
Carbon accumulation due to C fixation by bog plants in undrained peats ($tC\ ha^{-1}\ yr^{-1}$)	0.25	0.24	0.26	Default Value
Forestry Plantation Characteristics				

Input data	Expected value	Minimum value	Maximum value	Source of data