

Appendix 16.1 Payback Time and CO₂ Emissions

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Online reference code: ODAG-U0M3-AAIX v7

Table 16.1.1: Windfarm CO₂ emission saving over...

	Expected	Minimum	Maximum
...coal-fired electricity generation (t CO ₂ / yr)	283,276	256,461	312,841
...grid-mix of electricity generation (t CO ₂ / yr)	86,674	78,469	95,720
...fossil fuel-mix of electricity generation (t CO ₂ / yr)	141,947	128,510	156,762
Energy output from windfarm over lifetime (MWh)	8,331,654	7,542,978	9,201,219

Table 16.1.2: Total CO₂ losses due to wind farm (tCO₂ eq.)

	Expected	Minimum	Maximum
2. Losses due to turbine life (eg. manufacture, construction, decommissioning)	52,240	42,575	63,450
3. Losses due to backup	46,512	46,512	46,512
4. Losses due to reduced carbon fixing potential	2,834	1,056	5,946
5. Losses from soil organic matter	8,984	-9,074	18,638
6. Losses due to DOC & POC leaching	42	9	90
7. Losses due to felling forestry	28,833	24,614	33,346
Total losses of carbon dioxide	139,444	105,691	167,981

Table 16.1.3: Total CO₂ gains due to improvement of site (t CO₂ eq.)

	Expected	Minimum	Maximum
8a. Change in emissions due to improvement of degraded bogs	0	0	0
8b. Change in emissions due to improvement of felled forestry	-4,736	-3,367	-6,303
8c. Change in emissions due to restoration of peat from borrow pits	-609	-67	-898
8d. Change in emissions due to removal of drainage from foundations & hardstanding	-2,794	-1,436	-4,394
Total change in emissions due to improvements	-8,139	-4,869	-11,596

Table 16.1.4: Results

	Expected	Minimum	Maximum
Net emissions of carbon dioxide (t CO ₂ eq.)	131,305	94,096	163,112
Carbon Payback Time			
...coal-fired electricity generation (years)	0.5	0.3	0.6
...grid-mix of electricity generation (years)	1.5	1.0	2.1

	Expected	Minimum	Maximum
...fossil fuel-mix of electricity generation (years)	0.9	0.6	1.3
...fossil fuel-mix of electricity generation (years)	0.5	0.3	0.6
Ratio of soil carbon loss to gain by restoration (not used in Scottish applications)	1.11	-0.78	3.85
Ratio of CO ₂ eq. emissions to power generation (g/kWh) (for info. only)	16	10	22