An emissions budget for the budget for the Whitlee wind-power site - parameters

		F		J	L	M
	Site details		**Turbine base areas**		**Quarries**	
4	No of turbines	140	Side of base excavation (m)	20	Width	Length
5	Turbine capacity (MW)	2.3	Hard standing length (m)	50	200	100
6	Total life (years)	25	Hard standing width (m)	20	420	313
7			**Access tracks**		350	150
8	**On-site construction**		Total length (m)	78,000	280	116
9	Concrete as reported (tonnes)	120,000	Length laid over peat (m)		245	210
10	Aggregate as reported (m^3)	2,000,000	Width (m)	7	340	264
11	Aggregate as calculated (m^3)	398,686	Depth (m)	0.5	160	149
12	Aggregate as defaults (m^3)	317,500	Width of ditches (m)	5	393	240
13			**Base ballast**			
14	**Operational variables**		Volume/turbine (m^3)	500	**Compounds**	
15	Load factor (%)	30	**Peat**		100	100
16	Displacement efficiency (%)	90	Mean depth (m)	2.2	12	8
17	Displacement rate (tCO_2/MWh)	0.430	**Deforestation**		23	12
	Weight this for transport (%)	100	Total emissions (t/CO_2)		50	20

Payback time (years)	
Low scenario	6.5
Medium scenario	17.4
High scenario	31.5

An emissions budget for the Whitelee wind-power site - details

Constants & conversions	
Sequestration rate (gm C/m^2/year)	19
Conversion of C to CO_2 by weight	3.67
Carbon weight in peat (tonnes/m^3)	0.055
Proportion of cement in concrete (%)	12
Density of concrete (tonnes/m^3)	2.4
Density of aggregate (tonnes/m^3)	2
Weight of steel per turbine (tonnes)	32
Weight of concrete per turbine (tonnes)	1000
Volume of ballast/turbine (m^3)	500
Track/base overlap factor	1.5

Degradation Extent (metres)	
Low scenario	5
Medium scenario	50
High scenario	100
CO_2 cost of:	
turbine manufacture (tonnes/MW)	594.7
transport (tonnes/MW)	594.7
cement manufacture (tonnes CO_2/tonne)	0.8
ballast quarrying (tonnes CO_2/tonne)	0.1
steel manufacture (tonnes CO_2/tonne)	2

Site performance	
No of turbines	140
Installed capacity per turbine (MW)	2.3
Total IC (MW)	322.0
Load Factor (%)	30
Annual output (MWh)	846,216
Displacement Efficiency (%)	90
Thermal CO_2 equivalent (tCO_2)	327,486
Access track length (m)	78,000
Access track width (m)	7
Access track depth (m)	0.5
Site Lifetime (years)	25
Deforestation	
CO_2 emitted (tonnes)	0
Emissions (tonnes CO_2) from:	
Turbine manufacture and transport	382,980
Concrete manufacture	29,760
Aggregate for tracks, ballast, etc	400,000
Sequestration loss (= low scenario)	
Weighted track length (m)	76,950
Area lost to tracks (m^2)	2,039,175
Area lost to turbine bases (m^2)	126,000
Area lost to hard standings (m^2)	140,000
Area lost to quarries (m^2)	658,810
Area lost to compounds (m^2)	11,372
Total area lost (m^2)	2,975,357
Thus, site lifetime fixation loss (t/CO_2)	5,187

Accrued oxidation loss (tonnes CO_2)	
Low scenario	
Total volume of peat destroyed (m^3)	6,545,785
Thus, CO_2 emitted (tonnes)	1,321,267
Medium scenario	
Weighted track length (m)	67,500
Peat destroyed by tracks (m^3)	17,300,250
Peat destroyed by turbine bases (m^3)	4,435,200
Peat destroyed by quarries (m^3)	2,401,762
Peat destroyed by compounds (m^3)	22,818
Total (m^3)	24,160,030
Thus, CO_2 emitted (tonnes)	4,876,702
High scenario	
Weighted track length (m)	57,000
Peat destroyed by tracks (m^3)	32,150,250
Peat destroyed by turbine bases (m^3)	14,907,200
Peat destroyed by quarries (m^3)	-
Peat destroyed by compounds (m^3)	22,818
Total (m^3)	47,057,450
Thus, CO_2 emitted (tonnes)	9,498,546
Total site emissions (tonnes CO_2)	
Low scenario	2,139,194
Medium scenario	5,694,629
High scenario	10,316,473
Payback time (years)	
Low scenario	**6.5**
Medium scenario	**17.4**
High scenario	**31.5**