

Wind farm

Wind farm	Inch Cape	Inch Cape
Variant	40x250m	72x167m
Lattitude (o)	56.4	56.4
Number of turbines	40	72
Turbine model	250m	167m
Number of blades	3	3
Rotor radius (m)	125	83.5
Minimum rotor height	27.6	32.6
Maximum blade width (m)	7.8	6
Rotation speed (rpm) - Jan	6.73	10.26
Rotation speed (rpm) - Feb	6.34	9.67
Rotation speed (rpm) - Mar	6.35	9.68
Rotation speed (rpm) - Apr	5.50	8.38
Rotation speed (rpm) - May	5.03	7.66
Rotation speed (rpm) - Jun	4.69	7.15
Rotation speed (rpm) - Jul	4.41	6.72
Rotation speed (rpm) - Aug	4.71	7.19
Rotation speed (rpm) - Sep	5.54	8.45
Rotation speed (rpm) - Oct	6.17	9.41
Rotation speed (rpm) - Nov	6.53	9.96
Rotation speed (rpm) - Dec	6.64	10.12
Pitch (o) - Jan	10	10
Pitch (o) - Feb	10	10
Pitch (o) - Mar	10	10
Pitch (o) - Apr	10	10
Pitch (o) - May	10	10
Pitch (o) - Jun	10	10
Pitch (o) - Jul	10	10
Pitch (o) - Aug	10	10
Pitch (o) - Sep	10	10
Pitch (o) - Oct	10	10
Pitch (o) - Nov	10	10
Pitch (o) - Dec	10	10
Proportion of time in operation - Jan	0.89	0.89
Proportion of time in operation - Feb	0.85	0.85
Proportion of time in operation - Mar	0.86	0.86
Proportion of time in operation - Apr	0.77	0.77
Proportion of time in operation - May	0.74	0.74
Proportion of time in operation - Jun	0.71	0.71
Proportion of time in operation - Jul	0.69	0.69
Proportion of time in operation - Aug	0.72	0.72
Proportion of time in operation - Sep	0.78	0.78
Proportion of time in operation - Oct	0.86	0.86
Proportion of time in operation - Nov	0.87	0.87
Proportion of time in operation - Dec	0.88	0.88

Birds

Species	Gannet	Kittiwake
Length (m)	0.935	0.39
Wingspan (m)	1.725	1.075
Flight speed (m/s)	14.9	13.1
Flapping (0) or gliding (1)	0	0
Nocturnal activity factor (1=0%, 2=25%, 3=50%, 4=75%, 5=100%)	1	2
Proportion at rotor height Opt 2 27m	0.061	0.077
Proportion at rotor height Opt 2 32m	0.036	0.047
Density (birds/km ²) - Jan = mean across all three years	0.151	0.200
Density (birds/km ²) - Feb = mean across all three years	0.556	0.048
Density (birds/km ²) - Mar = mean across all three years	0.579	0.570
Density (birds/km ²) - Apr = mean across all three years	2.175	0.612
Density (birds/km ²) - May = mean across all three years	4.328	0.839
Density (birds/km ²) - Jun = mean across all three years	3.777	1.998
Density (birds/km ²) - Jul = mean across all three years	3.629	3.682
Density (birds/km ²) - Aug = mean across all three years	5.134	0.487
Density (birds/km ²) - Sep = mean across all three years	1.512	2.495
Density (birds/km ²) - Oct = mean across all three years	1.036	1.591
Density (birds/km ²) - Nov = mean across all three years	0.193	0.628
Density (birds/km ²) - Dec = mean across all three years	0.000	0.348
Avoidance rate 1	0.989	0.989
Avoidance rate 1 max	0.991	0.991
Avoidance rate 1 min	0.987	0.987
Avoidance rate 2	0.992	
Avoidance rate 2 max	0.994	
Avoidance rate 2 min	0.990	

Opt2 IC40 GX

Calculation for collision rate													
Species	Gannet												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Probability of collision during single rotor crossing	0.061	0.060	0.060	0.057	0.056	0.055	0.054	0.055	0.057	0.059	0.060	0.060	
Proportion of time in operation	0.890	0.850	0.860	0.770	0.740	0.710	0.690	0.720	0.780	0.860	0.870	0.880	
Total frontal area of all turbines (km2)	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	
Proportion of daytime active	0	0	0	0	0	0	0	0	0	0	0	0	
Flux Factor	14918	62253	89060	389810	924357	840046	808589	1015856	245290	141495	20168	0	
Potential number of transits through rotor-swept area	905	3777	5404	23653	56089	50973	49064	61641	14884	8586	1224	0	276199
Collisions per year no avoidance	49	191	277	1043	2326	1996	1844	2450	666	436	64	0	11343
Avoidance Rate 0.989	1	2	3	11	26	22	20	27	7	5	1	0	125
Avoidance Rate 0.991	0	2	2	9	21	18	17	22	6	4	1	0	102
Avoidance Rate 0.987	1	2	4	14	30	26	24	32	9	6	1	0	147

Opt2 IC72 GX

Calculation for collision rate													
Species	Gannet												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Probability of collision during single rotor crossing	0.078	0.077	0.077	0.073	0.071	0.070	0.069	0.070	0.073	0.076	0.077	0.078	
Proportion of time in operation	0.890	0.850	0.860	0.770	0.740	0.710	0.690	0.720	0.780	0.860	0.870	0.880	
Total frontal area of all turbines (km2)	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	
Proportion of daytime active	0	0	0	0	0	0	0	0	0	0	0	0	
Flux Factor	17937	74853	107085	468708	1111447	1010072	972247	1221465	294936	170134	24250	0	
Potential number of transits through rotor-swept area	646	2694	3854	16868	39998	36350	34989	43958	10614	6123	873	0	196966
Collisions per year no avoidance	45	175	254	949	2106	1802	1660	2214	606	400	59	0	10271
Avoidance Rate 0.989	0	2	3	10	23	20	18	24	7	4	1	0	113
Avoidance Rate 0.991	0	2	2	9	19	16	15	20	5	4	1	0	92
Avoidance Rate 0.987	1	2	3	12	27	23	22	29	8	5	1	0	134

Opt2 IC40 KI

Calculation for collision rate													
Species	Kittiwake												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Probability of collision during single rotor crossing	0.049	0.049	0.049	0.048	0.047	0.047	0.047	0.047	0.048	0.049	0.049	0.049	
Proportion of time in operation	0.890	0.850	0.860	0.770	0.740	0.710	0.690	0.720	0.780	0.860	0.870	0.880	
Total frontal area of all turbines (km2)	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	1963495	
Proportion of daytime active	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Flux Factor	26851	6531	97047	113052	175959	426268	794707	96992	433241	252963	85141	44857	
Potential number of transits through rotor-swept area	2059	501	7443	8670	13495	32692	60948	7439	33227	19400	6530	3440	195844
Collisions per year no avoidance	91	21	313	320	473	1091	1966	252	1242	812	279	149	7008
Avoidance Rate 0.989	1	0	3	4	5	12	22	3	14	9	3	2	77
Avoidance Rate 0.991	1	0	3	3	4	10	18	2	11	7	3	1	63
Avoidance Rate 0.987	1	0	4	4	6	14	26	3	16	11	4	2	91

Opt2 IC72 KI

Calculation for collision rate													
Species	Kittiwake												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Probability of collision during single rotor crossing	0.061	0.060	0.060	0.059	0.058	0.057	0.057	0.057	0.059	0.060	0.061	0.061	
Proportion of time in operation	0.890	0.850	0.860	0.770	0.740	0.710	0.690	0.720	0.780	0.860	0.870	0.880	
Total frontal area of all turbines (km2)	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	1577086	
Proportion of daytime active	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	
Flux Factor	32285	7852	116689	135934	211573	512544	955555	116623	520929	304162	102374	53937	
Potential number of transits through rotor-swept area	1534	373	5543	6457	10050	24346	45389	5540	24744	14448	4863	2562	145846
Collisions per year no avoidance	84	19	288	292	431	993	1786	229	1135	745	257	138	6398
Avoidance Rate 0.989	1	0	3	3	5	11	20	3	12	8	3	2	70
Avoidance Rate 0.991	1	0	3	3	4	9	16	2	10	7	2	1	58
Avoidance Rate 0.987	1	0	4	4	6	13	23	3	15	10	3	2	83