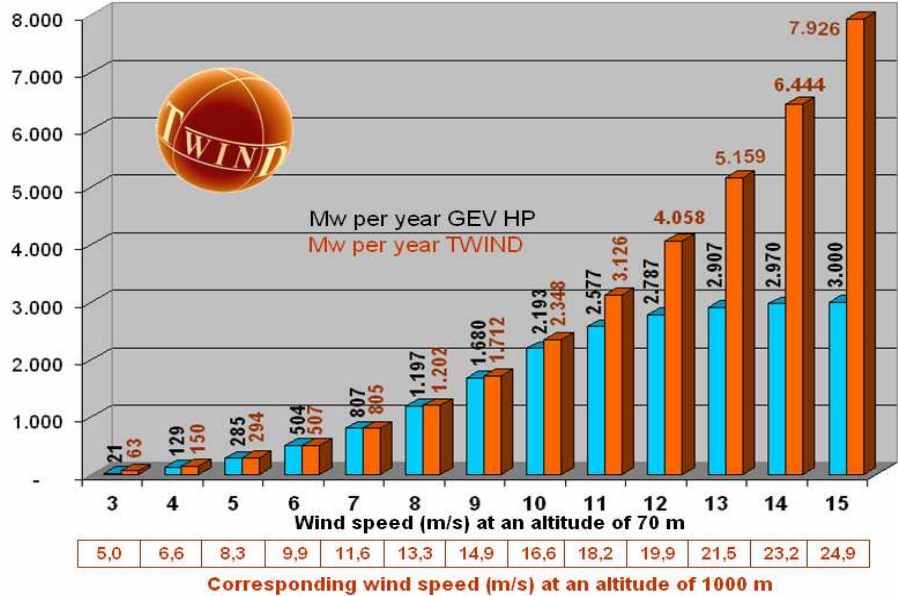


# TWIND™

## CALCULATION TABLE USED TO COMPARISON TWIND Vs TRADITIONAL WIND POWER GENERATORS

VERGNET OFFICIAL DATA	Wind speed (m/s) at an altitude of 70 m	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0
		Power Kw	7	43	95	168	269	399	560	731	859	929	969	990
VERGNET generator model GEV HP 11MW with rotor diameter of 62 m and positioned at a height of 70 m	MW/h per year (3.000 hours per year)	21	129	285	504	807	1.197	1.680	2.193	2.577	2.787	2.907	2.970	3.000
	Corresponding wind speed (m/s) at an altitude of 1000 m (α=0,20)	5,1	6,8	8,5	10,2	11,9	13,6	15,3	17,0	18,7	20,4	22,1	23,8	25,5
TWIND generator composed by two balloons with a diameter of 12 metres working at an altitude of 1000 m	MW/h per year (6.900 hours per year)	63	150	294	507	805	1.202	1.712	2.348	3.126	4.058	5.159	6.444	7.926



Ø Balloon (m)	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Amount of helium gas (m3)	904	904	904	904	904	904	904	904	904	904	904	904	904	904
Balloon lifting power (Kg)	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008	1.008
Front surface balloon (m2)	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Balloon surface (m2)	452	452	452	452	452	452	452	452	452	452	452	452	452	452
Weight Balloon (0,267Kg/m2)	121	121	121	121	121	121	121	121	121	121	121	121	121	121
Ø max parachute (m)	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Max parachute surface (m2)	279	279	279	279	279	279	279	279	279	279	279	279	279	279
Max weight parachute (0,230Kg/m2)	64	64	64	64	64	64	64	64	64	64	64	64	64	64
Weight various parts of aerostatic module (Kg)	160	160	160	160	160	160	160	160	160	160	160	160	160	160
Residual lifting power (cable excluded) (Kg)	1487	1487	1487	1487	1487	1487	1487	1487	1487	1487	1487	1487	1487	1487
Maximum length (m) cable (0,267 Kg/m)	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569	5.569
Linear movement (m)	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410	1410
Time used to linear movement (min)	4,6	3,5	2,8	2,3	2,0	1,7	1,5	1,4	1,3	1,2	1,1	1,0	0,9	0,9
Cable length (m)	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729	1.729
Residual lifting power of module (Kg)	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025	1025
Altitude (m)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Air density (g/m3)	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117	1.1117
Wind speed (m/s)	5,1	6,8	8,5	10,2	11,9	13,6	15,3	17,0	18,7	20,4	22,1	23,8	25,5	25,5
Wind hours per year	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900	6.900
<b>ACTIVE PHASE</b>														
Cx parachute OPEN	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Watt per m2 (0,5*p*v^3/Cx)	74	175	343	592	940	1403	1998	2741	3648	4736	6022	7521	9251	9251
Exposed surface (m2)	279	279	279	279	279	279	279	279	279	279	279	279	279	279
Kw on OPEN aerostatic module	20,6	48,9	95,5	165,0	262,0	391,0	556,7	763,7	1016,5	1319,7	1677,9	2095,6	2577,5	2577,5
Hours of exposure to the wind (50%)	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450
Mwh per year (Kw*exposure hours)	71	169	329	569	904	1.349	1.921	2.635	3.507	4.553	5.789	7.230	8.892	8.892
<b>PASSIVE PHASE</b>														
Cx parachute CLOSED	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Watt per m2 (0,5*p*v^3/Cx)	15	35	69	118	188	281	400	548	730	947	1.204	1.504	1.850	1.850
Exposed surface (m2)	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Kw on CLOSED aerostatic module	1,7	4,0	7,7	13,4	21,3	31,7	45,2	62,0	82,5	107,1	136,1	170,0	209,1	209,1
Hours of exposure to the wind (50%)	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450	3.450
Mwh per year (Kw*exposure hours)	6	14	27	46	73	109	156	214	285	369	470	587	722	722
<b>ENERGY PERFORMANCE</b>														
Mwh active phase - Mwh h passive phase	65,4	154,9	302,6	522,9	830,4	1239,6	1764,9	2421,0	3222,4	4183,5	5319,0	6643,3	8171,0	8171,0
Loss in power generation (3%)	2,0	4,6	9,1	15,7	24,9	37,2	52,9	72,6	96,7	125,5	159,6	199,3	245,1	245,1
<b>POWER OUTPUT - Mwh per year</b>	<b>63</b>	<b>150</b>	<b>294</b>	<b>507</b>	<b>805</b>	<b>1.202</b>	<b>1.712</b>	<b>2.348</b>	<b>3.126</b>	<b>4.058</b>	<b>5.159</b>	<b>6.444</b>	<b>7.926</b>	<b>7.926</b>