

**Opbrengsten overzicht de Veenwijken**

Variant	Fabrikant	WEC	Rotor diameter	Rated Power (kW)	hh	WEC Yearly Yield (kwh)	Full load hours	Aantal Wecs	Geinstalleerd MW	Gross Park Yield (kwh)	Park Yield (kwh) -15% (efficiency)	avg.WEC Yield (kwh)
1	Siemens	SWT108	108	3000	135	9.190.525	3.064	10	30	91.905.245	78.119.458	7.811.946
2	Siemens	SWT108	108	3000	135	9.190.525	3.064	16	48	147.048.392	124.991.133	7.811.946
3	Enercon	E-101	101	3000	99	7.886.295	2.629	8	24	63.090.362	53.626.807	6.703.351
4	Gamesa	G90	90	2000	80	5.195.292	2.598	15	30	77.929.387	66.239.979	4.415.999
5	Siemens	SWT108	108	3000	100	8.421.684	2.807	10	30	84.216.842	71.584.316	7.158.432

Variant 1 Voornemen op 135 meter - 10 turbines van circa 3 MW  
- ashoogte tot 135 meter en rotordiameter van 90-110 meter

Variant 2 Maximale invulling - 16 turbines van circa 3 MW  
- ashoogte tot 135 meter en rotordiameter van 90-110 meter

Variant 3 Minimale invulling - 8 turbines van circa 3 MW  
- ashoogte tot 100 meter en rotordiameter van 90-100 meter

Variant 4 Kleinere windturbines - 15 turbines van circa 2 MW  
- ashoogte tot 80 meter en rotordiameter van 80-90 meter

Variant 5 Voornemen op 100 meter - 10 turbines van circa 3 MW  
- ashoogte tot 100 meter en rotordiameter van 90-110 meter

# Energy Yield Calculation SWT-3.0-108

Power Curve: **POWER CURVE SWT-3.0-108**  
Rated Power 3000 kW

## PROJECT DATA:

Project Name: WP de Veenwieken  
Site Name: variant 1 , variant 2

Annual Energy Production **W: 9.989.701 [kWh/a]**  
Average Wind Speed in Hub Height **v<sub>h</sub>: 7,02 [m/s]**

## WEC-DATA:

Rated Power P<sub>n</sub>: 3.000 [kW] Rotor Diameter D<sub>r</sub>: 108,0 [m]  
Hub Height H<sub>h</sub>: 135,0 [m] Swept Area A<sub>r</sub>: 9.160,9 [m<sup>2</sup>]

## METEOROLOGICAL DATA:

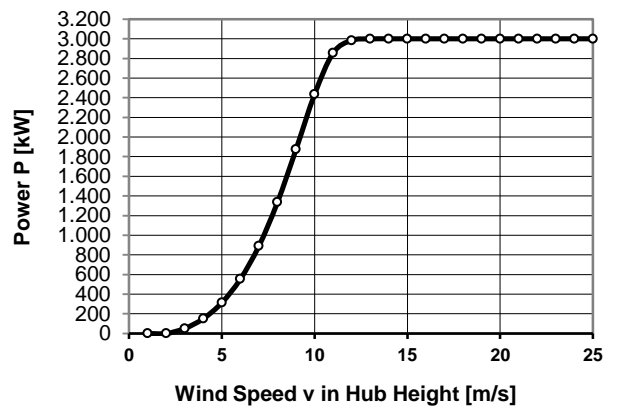
Standard Air Density ρ: 1,225 [kg/m<sup>3</sup>] Shear Factor α: 0,15 [-]  
Reference Height H<sub>x</sub>: 99,0 [m] Scale Parameter A: 7,92 [m/s]  
Wind Reference Height v<sub>x</sub>: 6,70 [m/s] Form Parameter k: 2,32 [-]

Calculated by:

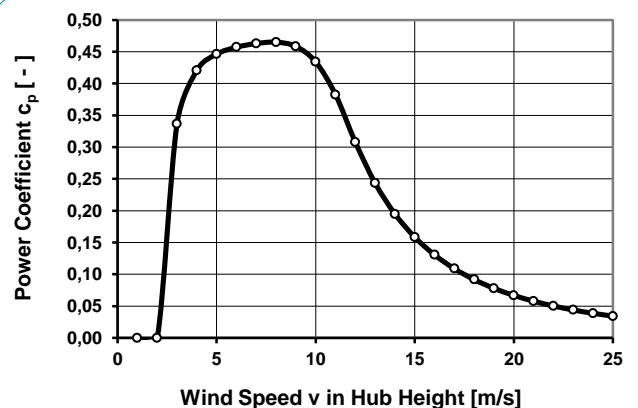
WEC-Marking:

Wind	Distribution	Power Curve Standard Air Density	Energy Production	Power Coefficient Standard Air Density
v [m/s]	H [h/a]	P [kW]	W [kWh/a]	c(p) [-]
1	169	0,0	0	0,00
2	401	0,0	0	0,00
3	640	51,0	32.644	0,34
4	846	151,0	127.672	0,42
5	987	313,0	308.972	0,45
6	1.048	554,0	580.364	0,46
7	1.025	891,0	913.182	0,46
8	931	1.336,0	1.244.470	0,47
9	790	1.875,0	1.481.119	0,46
10	627	2.435,0	1.525.829	0,43
11	466	2.856,0	1.329.848	0,38
12	324	2.984,0	967.842	0,31
13	212	2.999,0	635.298	0,24
14	130	3.000,0	389.158	0,19
15	74	3.000,0	223.368	0,16
16	40	3.000,0	120.124	0,13
17	20	3.000,0	60.497	0,11
18	10	3.000,0	28.515	0,09
19	4	3.000,0	12.571	0,08
20	2	3.000,0	5.180	0,07
21	1	3.000,0	1.994	0,06
22	0	3.000,0	716	0,05
23	0	3.000,0	240	0,04
24	0	3.000,0	75	0,04
25	0	3.000,0	22	0,03

Power Curve SWT108 (Standard Air Density)



Power Coefficient SWT108 (Standard Air Density)



# Energy Yield Calculation E-101



Power Curve: calculated (Vers. 2.0, 06.02.2014)

## PROJECT DATA:

**Project Name:** Wp de Veenwieken  
**Site Name:** variant 3

**Annual Energy Production** **W:** 8.572.060 [kWh/a]  
**Average Wind Speed in Hub Height** **v<sub>h</sub>:** 6,70 [m/s]

## WEC-DATA:

**Rated Power** P<sub>n</sub>: 3.000 [kW] **Rotor Diameter** D<sub>r</sub>: 101,0 [m]  
**Hub Height** H<sub>h</sub>: 99,0 [m] **Swept Area** A<sub>r</sub>: 8.011,8 [m<sup>2</sup>]

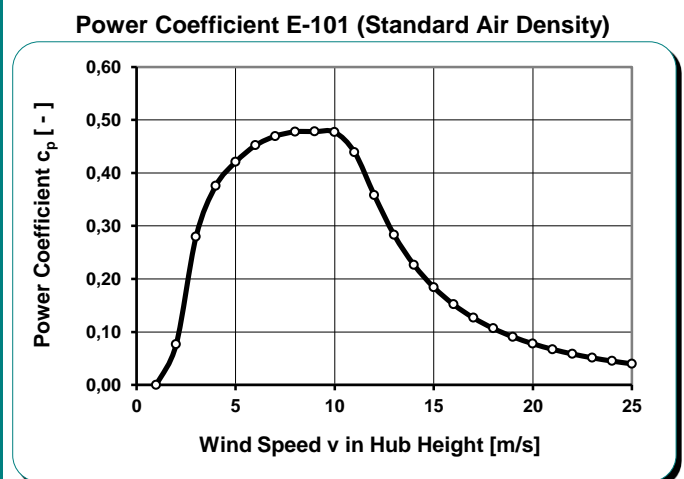
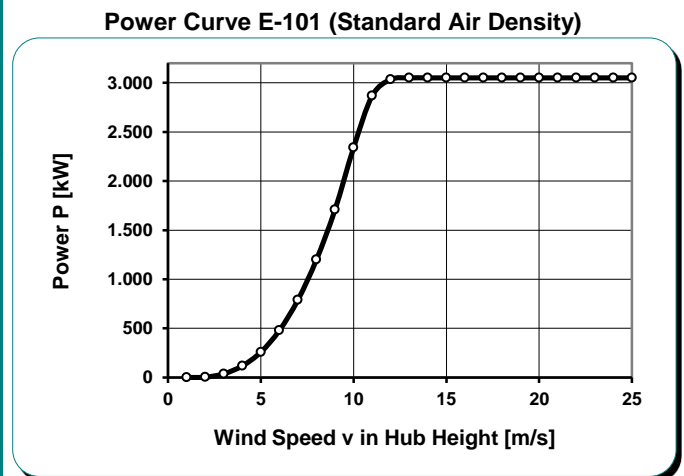
## METEOROLOGICAL DATA:

**Standard Air Density** ρ: 1,225 [kg/m<sup>3</sup>] **Shear Factor** α: 0,15 [-]  
**Reference Height** H<sub>x</sub>: 99,0 [m] **Scale Parameter** A: 7,56 [m/s]  
**Wind Reference Height** v<sub>x</sub>: 6,70 [m/s] **Form Parameter** k: 2,32 [-]

Calculated by:

WEC-Marking:

Wind	Distribution	Power Curve Standard Air Density	Energy Production	Power Coefficient Standard Air Density
v [m/s]	H [h/a]	P [kW]	W [kWh/a]	c(p) [-]
1	188	0,0	0	0,00
2	444	3,0	1.333	0,08
3	704	37,0	26.053	0,28
4	920	118,0	108.520	0,38
5	1.057	258,0	272.686	0,42
6	1.099	479,0	526.378	0,45
7	1.048	790,0	827.945	0,47
8	924	1.200,0	1.108.379	0,48
9	755	1.710,0	1.291.697	0,48
10	575	2.340,0	1.344.520	0,48
11	407	2.867,0	1.166.871	0,44
12	269	3.034,0	814.966	0,36
13	165	3.050,0	503.816	0,28
14	95	3.050,0	288.632	0,23
15	50	3.050,0	153.979	0,18
16	25	3.050,0	76.450	0,15
17	12	3.050,0	35.304	0,13
18	5	3.050,0	15.152	0,11
19	2	3.050,0	6.039	0,09
20	1	3.050,0	2.234	0,08
21	0	3.050,0	766	0,07
22	0	3.050,0	243	0,06
23	0	3.050,0	72	0,05
24	0	3.050,0	19	0,04
25	0	3.050,0	5	0,04



# Energy Yield Calculation G90 2.0MW

Power Curve: **POWER CURVE G90 2.0MW**  
 Rated Power 2000 kW 2.0MW 105.1db(A)

## PROJECT DATA:

Project Name: **WP de Veenwieken**  
 Site Name: **Variant 4**

Annual Energy Production **W: 5.647.057 [kWh/a]**  
 Average Wind Speed in Hub Height **v<sub>h</sub>: 6,49 [m/s]**

## WEC-DATA:

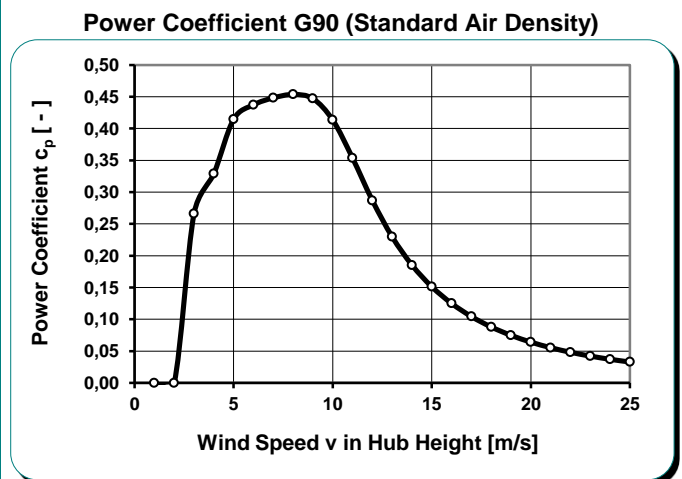
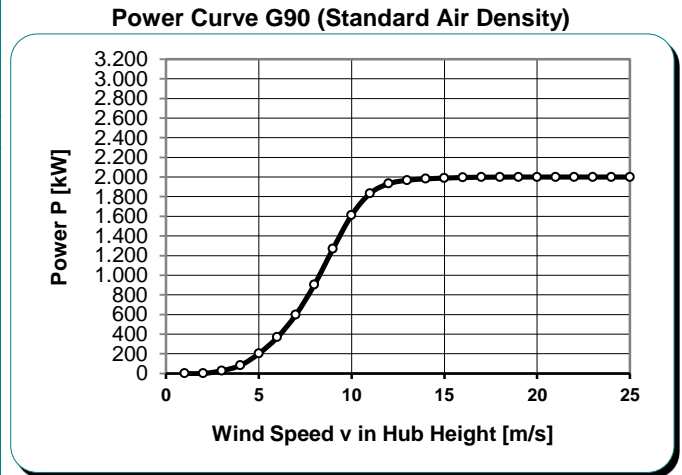
Rated Power P<sub>n</sub>: 2.000 [kW] Rotor Diameter D<sub>r</sub>: 90,0 [m]  
 Hub Height H<sub>h</sub>: 80,0 [m] Swept Area A<sub>r</sub>: 6.361,7 [m<sup>2</sup>]

## METEOROLOGICAL DATA:

Standard Air Density ρ: 1,225 [kg/m<sup>3</sup>] Shear Factor α: 0,15 [-]  
 Reference Height H<sub>x</sub>: 99,0 [m] Scale Parameter A: 7,32 [m/s]  
 Wind Reference Height v<sub>x</sub>: 6,70 [m/s] Form Parameter k: 2,32 [-]

Calculated by: WEC-Marking:

Wind	Distribution	Power Curve Standard Air Density	Energy Production	Power Coefficient Standard Air Density
v [m/s]	H [h/a]	P [kW]	W [kWh/a]	c(p) [-]
1	202	0,0	0	0,00
2	477	0,0	0	0,00
3	751	28,0	21.035	0,27
4	973	82,0	79.773	0,33
5	1.105	202,0	223.186	0,41
6	1.131	368,0	416.288	0,44
7	1.058	599,0	633.954	0,45
8	911	905,0	824.832	0,45
9	725	1.270,0	921.164	0,45
10	535	1.611,0	861.216	0,41
11	365	1.834,0	669.932	0,35
12	231	1.932,0	447.254	0,29
13	136	1.967,0	267.638	0,23
14	74	1.981,0	146.878	0,19
15	37	1.989,0	74.463	0,15
16	18	1.995,0	34.921	0,12
17	8	1.998,0	15.131	0,10
18	3	1.999,0	6.056	0,09
19	1	2.000,0	2.239	0,07
20	0	2.000,0	763	0,06
21	0	2.000,0	240	0,06
22	0	2.000,0	70	0,05
23	0	2.000,0	19	0,04
24	0	2.000,0	5	0,04
25	0	2.000,0	1	0,03



# Energy Yield Calculation SWT-3.0-108

Power Curve: **POWER CURVE SWT-3.0-108**  
Rated Power 3000 kW

## PROJECT DATA:

Project Name: **WP de Veenwieken**  
Site Name: **Variant 5**

Annual Energy Production **W: 9.154.005 [kWh/a]**  
Average Wind Speed in Hub Height **v<sub>h</sub>: 6,71 [m/s]**

## WEC-DATA:

Rated Power P<sub>n</sub>: 3.000 [kW] Rotor Diameter D<sub>r</sub>: 108,0 [m]  
Hub Height H<sub>h</sub>: 100,0 [m] Swept Area A<sub>r</sub>: 9.160,9 [m<sup>2</sup>]

## METEOROLOGICAL DATA:

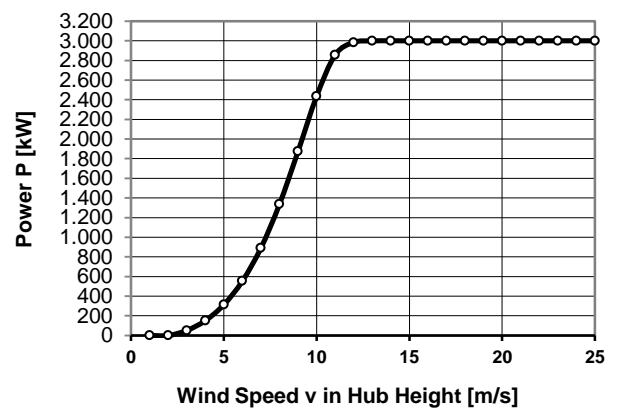
Standard Air Density ρ: 1,225 [kg/m<sup>3</sup>] Shear Factor α: 0,15 [-]  
Reference Height H<sub>x</sub>: 99,0 [m] Scale Parameter A: 7,57 [m/s]  
Wind Reference Height v<sub>x</sub>: 6,70 [m/s] Form Parameter k: 2,32 [-]

Calculated by:

WEC-Marking:

Wind	Distribution	Power Curve Standard Air Density	Energy Production	Power Coefficient Standard Air Density
v [m/s]	H [h/a]	P [kW]	W [kWh/a]	c(p) [-]
1	187	0,0	0	0,00
2	443	0,0	0	0,00
3	702	51,0	35.801	0,34
4	917	151,0	138.497	0,42
5	1.055	313,0	330.108	0,45
6	1.097	554,0	607.916	0,46
7	1.047	891,0	933.257	0,46
8	924	1.336,0	1.234.578	0,47
9	757	1.875,0	1.418.757	0,46
10	576	2.435,0	1.403.507	0,43
11	409	2.856,0	1.167.957	0,38
12	270	2.984,0	806.855	0,31
13	167	2.999,0	499.704	0,24
14	96	3.000,0	287.023	0,19
15	51	3.000,0	153.503	0,16
16	25	3.000,0	76.422	0,13
17	12	3.000,0	35.395	0,11
18	5	3.000,0	15.240	0,09
19	2	3.000,0	6.095	0,08
20	1	3.000,0	2.263	0,07
21	0	3.000,0	779	0,06
22	0	3.000,0	249	0,05
23	0	3.000,0	73	0,04
24	0	3.000,0	20	0,04
25	0	3.000,0	5	0,03

Power Curve SWT108 (Standard Air Density)



Power Coefficient SWT108 (Standard Air Density)

