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ICC-SWCC™ Summary Report

Manufacturer: **Shanghai Ghrepower Green Energy Co. Ltd.**

Wind Turbine Model: **FD21-50** (480 VAC, 3-phase, 60 Hz)

Certification Number: **SWCC-15-01-P**

The above-identified Medium Wind Turbine is certified by the Small Wind Certification Council (ICC-SWCC™) - Medium Wind Certification Program. The Power Performance testing and test report were found to be in conformance with IEC 61400-12-1 ed. 1. For the ICC-SWCC Certificate visit: www.smallwindcertification.org

This report summarizes the results of power performance testing of the Shanghai Ghrepower Green Energy Co., Ltd (Ghrepower) FD21-50 in accordance with IEC 61400-12-1 ed.1. The FD21-50 is a 3-blade, upwind, horizontal axis, IEC class II-A wind turbine with a rotor diameter of 21.5 m and swept area of 363 m2. Testing was performed by Intertek Testing Services Shanghai at the Dongying Test Site, China, from May 5, 2014 to June 24, 2014 (Intertek Power Performance test report no. 150101367SHA-001). The FD21-50 was tested on a 36 m monopole tower and utilized one (1) Ghrepower GNW60K3G inverter. Cut-out wind speed for this turbine is 25 m/s; cut-out was not achieved during the test.

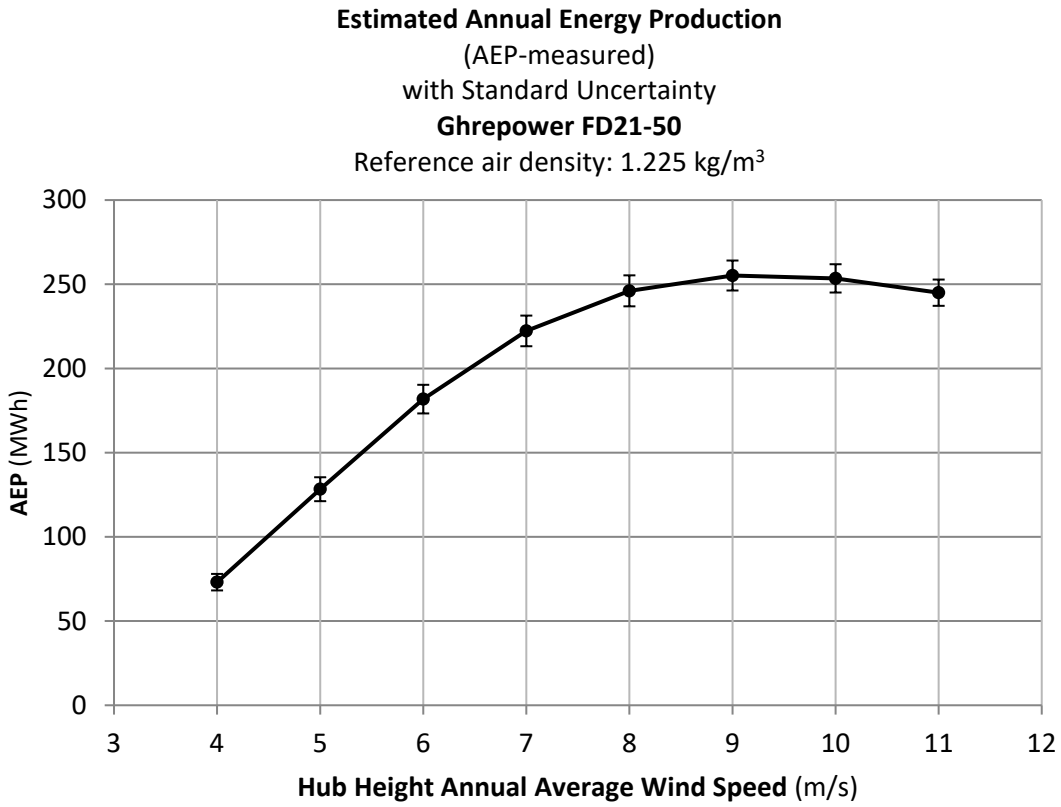
1. Turbine Ratings

Reference Annual Energy @ 5 m/s	128 MWh
Reference Power	61.2 kW @ 11 m/s
Peak Power	65.6 kW @ 13 m/s

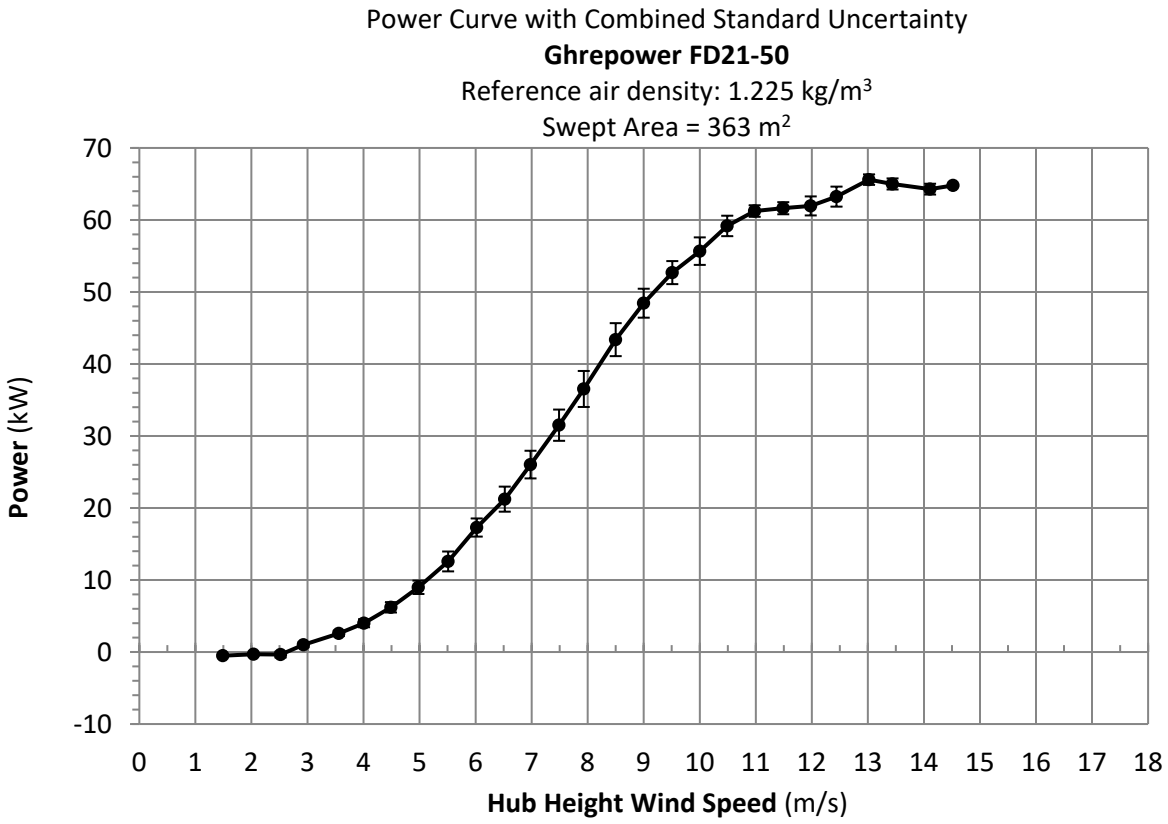
2. Tabulated annual energy production for air density at sea level

Estimated Annual Energy Production (AEP) **Ghrepower FD21-50** Reference air density: 1.225 kg/m^3 Cut-out wind speed: 25 m/s					
Hub Height Annual Average Wind Speed	**AEP-measured (measured power curve)**	**Standard Uncertainty in AEP-measured**		**AEP-extrapolated (extrapolated power curve)**	**Complete if AEP measured is at least 95% of AEP extrapolated**
m/s	*MWh*	*MWh*	*%*	*MWh*	-
4	73.1	4.9	6.7%	73.1	Complete
5	128.3	7.1	5.5%	129.1	Complete
6	181.8	8.5	4.7%	187.5	Complete
7	222.3	9.1	4.1%	241.6	Incomplete
8	246.1	9.2	3.7%	288.6	Incomplete
9	255.2	8.9	3.5%	327.5	Incomplete
10	253.5	8.4	3.3%	357.8	Incomplete
11	245.0	7.8	3.2%	379.8	Incomplete
AEP-measured assumes zero power between highest bin and cutout AEP-extrapolated assumes power in last bin between last bin and cutout					

3. Graph of annual energy production for air density at sea level



4. Graph of measured power curve for air density at sea level

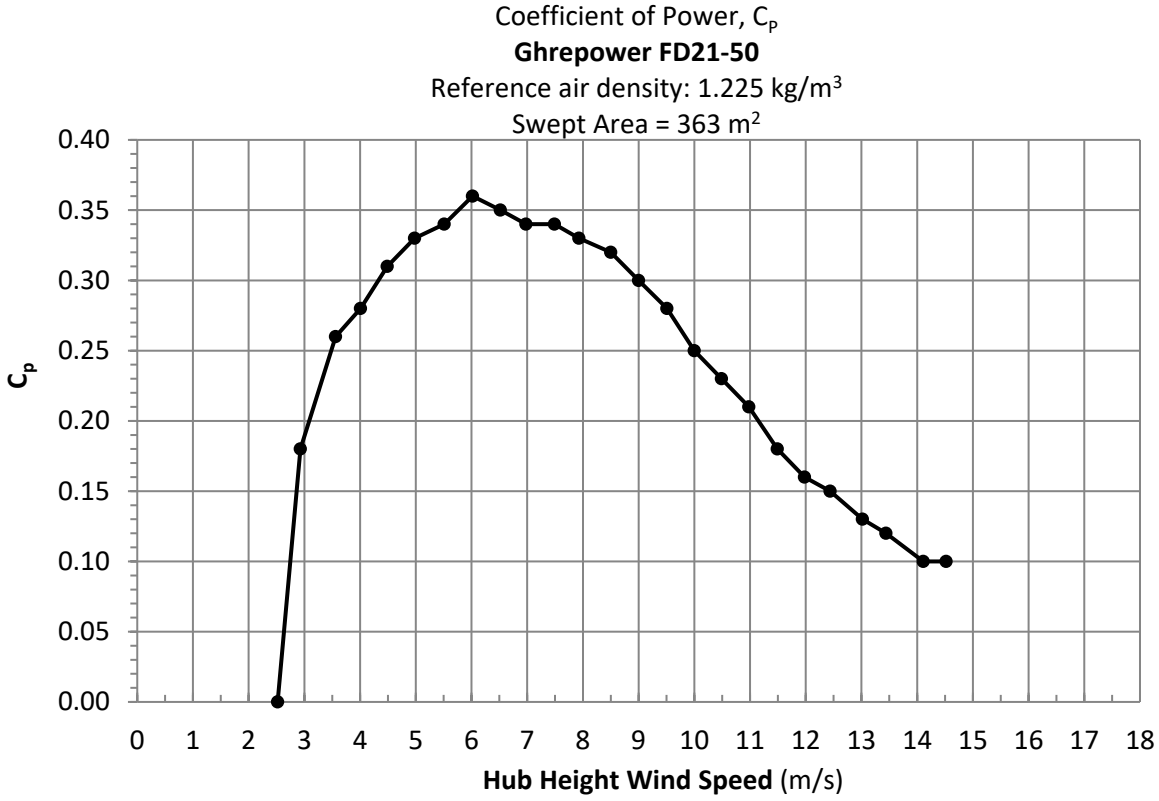


5. Tabulated measured power curve for air density at sea level, swept area = 363 m²

Corrected to a sea level air density of 1.225 kg/m³					Category A	Category B	Combined
Bin No.	**Hub Height Wind Speed**	**Power Output**	**C_p**	**10-minute samples**	**Standard Uncertainty, Si**	**Standard Uncertainty, Ui**	**Standard Uncertainty, Ci**
-	*m/s*	*kW*	-	-	*kW*	*kW*	*kW*
1	1.5	-0.51		3	0.13	0.18	0.22
2	2.0	-0.31		12	0.12	0.17	0.21
3	2.5	-0.36		59	0.04	0.17	0.18
4	2.9	1.00	0.18	57	0.26	0.31	0.40
5	3.6	2.59	0.26	85	0.20	0.28	0.34
6	4.0	4.00	0.28	200	0.10	0.35	0.37
7	4.5	6.21	0.31	177	0.17	0.54	0.56
8	5.0	8.99	0.33	143	0.18	0.70	0.72
9	5.5	12.58	0.34	141	0.21	0.91	0.93
10	6.0	17.29	0.36	148	0.36	1.33	1.38
11	6.5	21.23	0.35	177	0.29	1.22	1.26
12	7.0	26.03	0.34	153	0.30	1.72	1.74
13	7.5	31.50	0.34	131	0.35	1.88	1.92
14	7.9	36.53	0.33	100	0.47	2.12	2.17
15	8.5	43.38	0.32	78	0.71	2.39	2.50
16	9.0	48.44	0.30	52	0.76	2.16	2.29

17	9.5	52.69	0.28	53	0.68	1.89	2.01
18	10.0	55.67	0.25	49	0.61	1.48	1.60
19	10.5	59.17	0.23	32	0.61	1.81	1.91
20	11.0	61.24	0.21	30	0.77	1.20	1.42
21	11.5	61.63	0.18	40	0.54	0.59	0.80
22	12.0	61.95	0.16	26	0.60	0.58	0.84
23	12.4	63.24	0.15	11	0.87	0.99	1.32
24	13.0	65.60	0.13	8	0.37	1.34	1.39
25	13.4	65.00	0.12	3	0.12	0.72	0.73
26	14.1	64.28	0.10	3	0.39	0.67	0.77
27	14.5	64.80	0.10	3	0.21	0.72	0.75

6. Graph of C_p as a function of wind speed for air density at sea level



7. Scatter plot of mean, standard deviation, maximum, and minimum power output as a function of wind speed (sampled data, not normalized to sea level conditions)