

# SWCC Summary Report

Manufacturer: **Pika Energy Inc.**  
Wind Turbine: **T701** (240 VAC, 1-phase, 60 Hz)  
Certification Number: **SWCC-13-03**



**CERTIFIED**  
SMALL WIND TURBINE  
Conforms to AWEA 9.1 - 2009  
SWCC-13-03

The above-identified Small Wind Turbine is certified by the Small Wind Certification Council to be in conformance with the AWEA *Small Wind Turbine Performance and Safety Standard* (AWEA Standard 9.1 – 2009). For the SWCC Certificate visit: [www.smallwindcertification.org](http://www.smallwindcertification.org)

## 1. Introduction

This report summarizes the test results of the Pika Energy T701, a 3-blade, upwind, stall regulated, horizontal axis wind turbine with a rotor diameter of 3.0 m and swept area of 7.1 m<sup>2</sup>. All testing was performed on a turbine system utilizing the Pika X3001 grid-tie inverter and a 17 m (55.8') tilt-up tower by the High Plains Small Wind Test Center in Colby, Kansas as part of the US Department of Energy and National Renewable Energy Laboratory (DOE/NREL) Regional Test Center program. Power Performance testing was performed from 07 May 2014 through 14 June 2014. Duration testing was performed from 17 July 2014 through 13 May 2015. Safety and Function testing was performed from July 2014 through April 2015. Acoustic testing was performed on 12 March 2015 and 30 March 2015.

## 2. Turbine Ratings

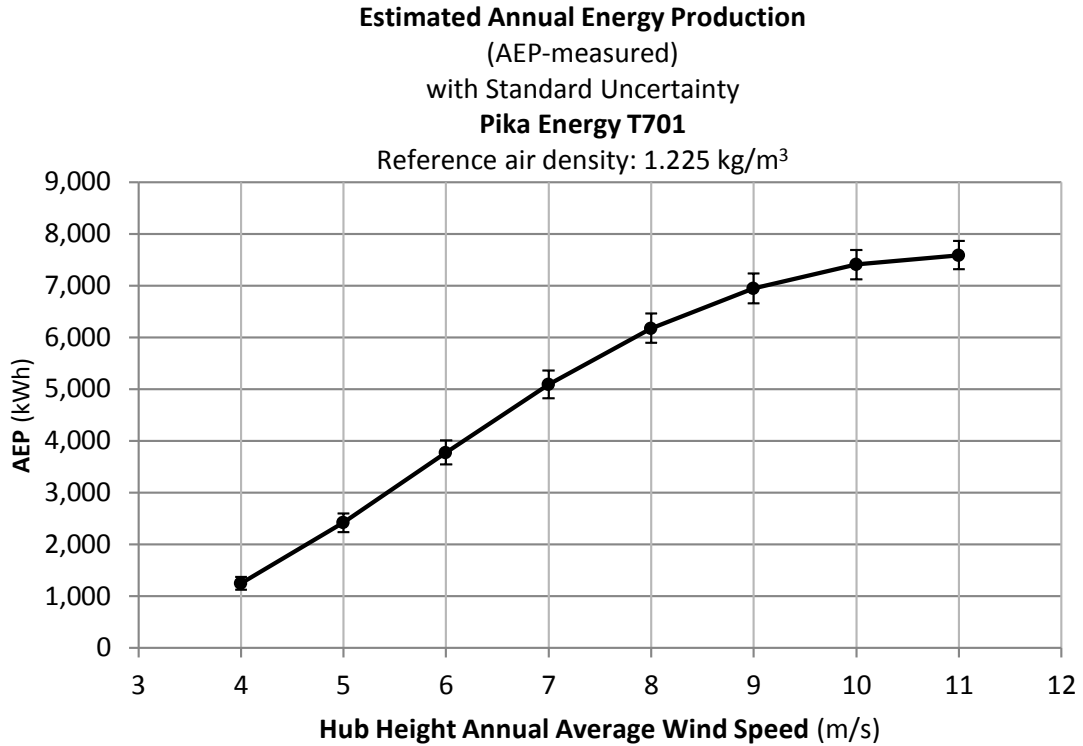
<b>AWEA Rated Annual Energy @ 5 m/s</b>	2,420 kWh
<b>AWEA Rated Sound Level</b>	38.3 dB(A)
<b>AWEA Rated Power</b>	1.5 kW @ 11 m/s
<b>Peak Power</b>	1.7 kW @ 13.5 m/s

## 3. Tabulated Annual Energy Production (AEP)

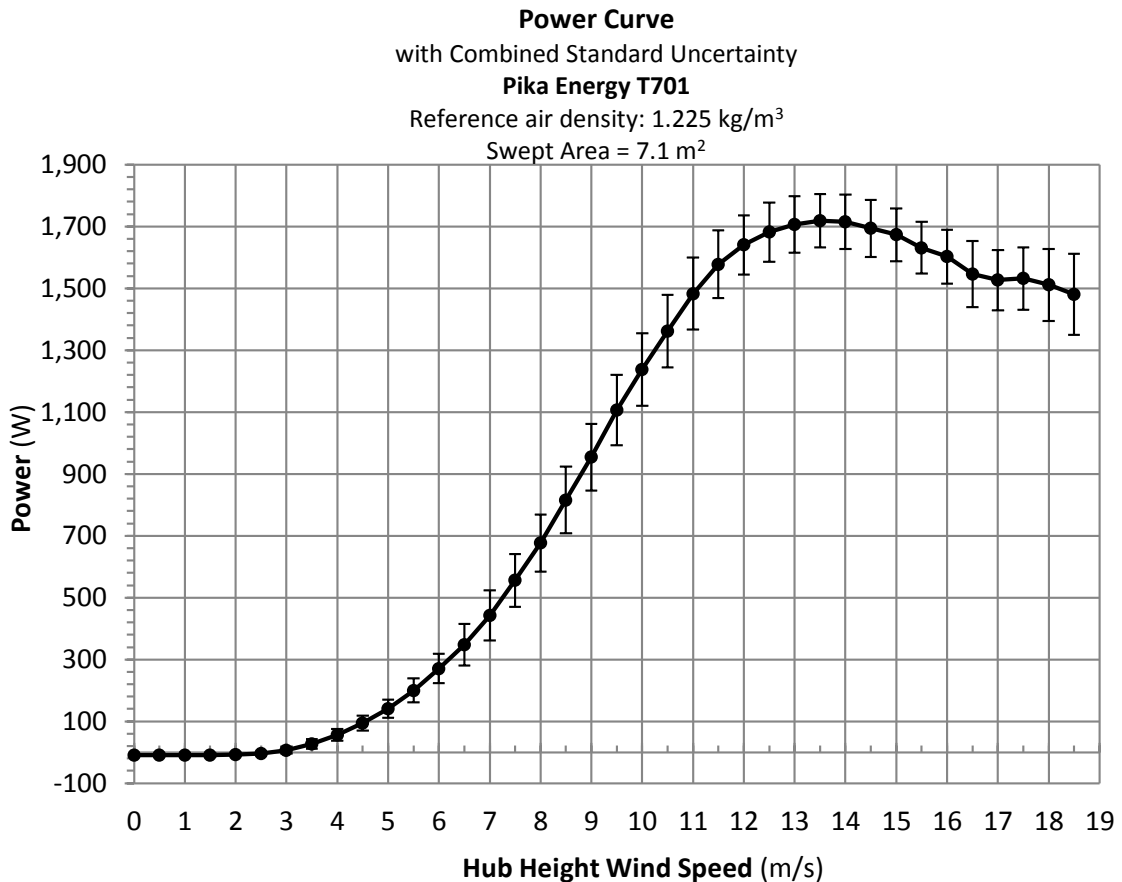
Corrected to a sea level air density of 1.225 kg/m<sup>3</sup>

<b>Hub Height Annual Average Wind Speed (m/s)</b>	<b>AEP Measured (kWh)</b>	<b>Standard Uncertainty in AEP (kWh)</b>	<b>Standard Uncertainty in AEP</b>	<b>AEP Extrapolated (kWh)</b>
4	1,246	120	10%	1,246
5	2,417	183	8%	2,418
6	3,776	235	6%	3,783
7	5,089	268	5%	5,142
8	6,175	283	5%	6,364
9	6,948	290	4%	7,387
10	7,404	287	4%	8,190
11	7,589	278	4%	8,772

#### 4. Annual Energy Production Curve



#### 5. Power Curve



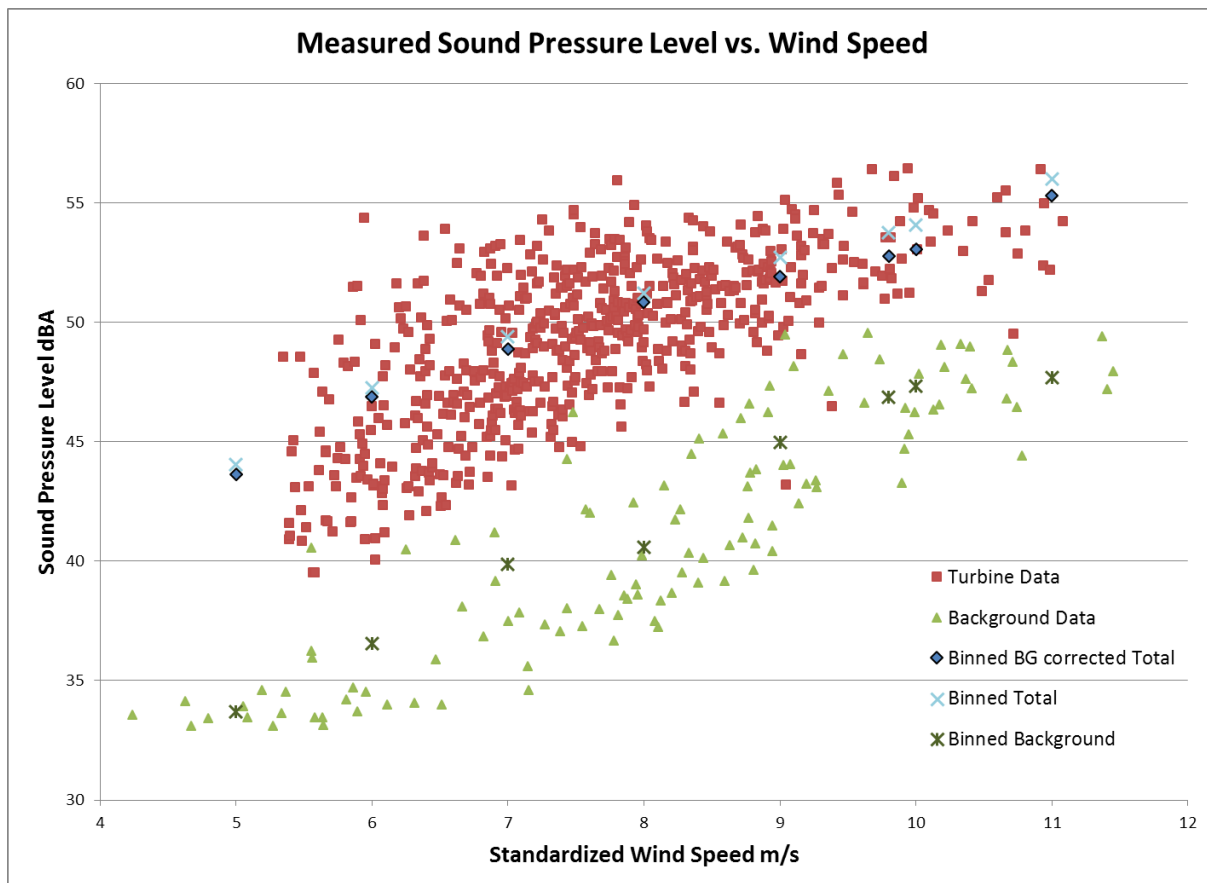
## 6. Tabulated Power Curve

Corrected to a sea level air density of 1.225 kg/m <sup>3</sup>					Category A	Category B	Combined
Bin No.	Hub Height Wind Speed	Power Output	C <sub>p</sub>	1-minute samples	Standard Uncertainty, S <sub>i</sub>	Standard Uncertainty, U <sub>i</sub>	Standard Uncertainty, C <sub>i</sub>
	<i>m/s</i>	<i>Watts</i>			<i>Watts</i>	<i>Watts</i>	<i>Watts</i>
1	0.0	-9	-	12	3	-	-
2	0.5	-9	-	19	1	6	6
3	1.0	-9	-	153	1	6	6
4	1.5	-9	-	237	2	6	6
5	2.0	-7	-	542	2	6	6
6	2.5	-4	-	799	4	6	7
7	3.0	7	0.06	1149	9	6	11
8	3.5	27	0.15	1658	13	7	15
9	4.0	57	0.20	1806	17	9	19
10	4.5	94	0.24	1917	21	11	24
11	5.0	141	0.26	1958	26	14	30
12	5.5	200	0.28	1782	34	18	39
13	6.0	270	0.29	1996	42	23	47
14	6.5	348	0.29	1952	61	26	67
15	7.0	443	0.30	1924	74	33	81
16	7.5	556	0.30	1624	75	42	86
17	8.0	677	0.30	1518	79	47	92
18	8.5	816	0.31	1230	93	56	108
19	9.0	954	0.30	1108	91	59	108
20	9.5	1107	0.30	1053	92	67	114
21	10.0	1237	0.28	868	100	60	117
22	10.5	1362	0.27	783	100	61	117
23	11.0	1483	0.26	757	99	61	117
24	11.5	1578	0.24	678	97	51	110
25	12.0	1640	0.22	630	88	37	95
26	12.5	1682	0.20	585	91	29	95
27	13.0	1707	0.18	559	89	23	92
28	13.5	1719	0.16	456	84	19	86
29	14.0	1715	0.14	408	87	18	89
30	14.5	1695	0.13	388	90	22	92
31	15.0	1673	0.11	299	82	22	85
32	15.5	1631	0.10	262	78	32	84
33	16.0	1603	0.09	198	83	25	87
34	16.5	1546	0.08	149	98	43	107
35	17.0	1527	0.07	99	95	21	97
36	17.5	1532	0.07	49	100	16	101
37	18.0	1511	0.06	52	114	22	116
38	18.5	1481	0.05	25	128	28	131

## 7. Tabulated Acoustic Data

Wind Speed at 10m Height m/s	Apparent Sound Power Level dB(A)	Combined Uncertainty dB(A)
6	79.0	3.6
7	81.0	2.9
8	82.9	2.2
9	84.0	2.4
10	85.1	2.1

## 8. Graphical Acoustic Data



## 9. Duration Testing

The Pika T701 successfully completed a Duration Test for an IEC Class II Small Wind Turbine with an Operational Time Fraction of 99.7%. The highest instantaneous wind speed recorded during the test was 25.6 m/s (57.3 mph). The average turbulence intensity at 15 m/s was 11 %.

## 10. Mechanical Strength Analysis

The mechanical strength analysis was found to be in conformance with IEC 61400-2 as modified by AWEA Standard 9.1 – 2009 for an IEC Class II small wind turbine.

## 11. Safety and Function testing

Safety and Function testing was found to be in conformance with sections 4.3 and 4.4 of AWEA Standard 9.1 – 2009.

## 12. Tower Design Requirements

### Mechanical Connections and Tip Clearance

Figure 1 shows the T701 mechanical layout. The tower top must have 2.5" NPT male pipe thread. For blade tip clearance, a maximum effective tower diameter of 200 mm diameter must be maintained from 500 to 1400 mm below the threaded adapter.

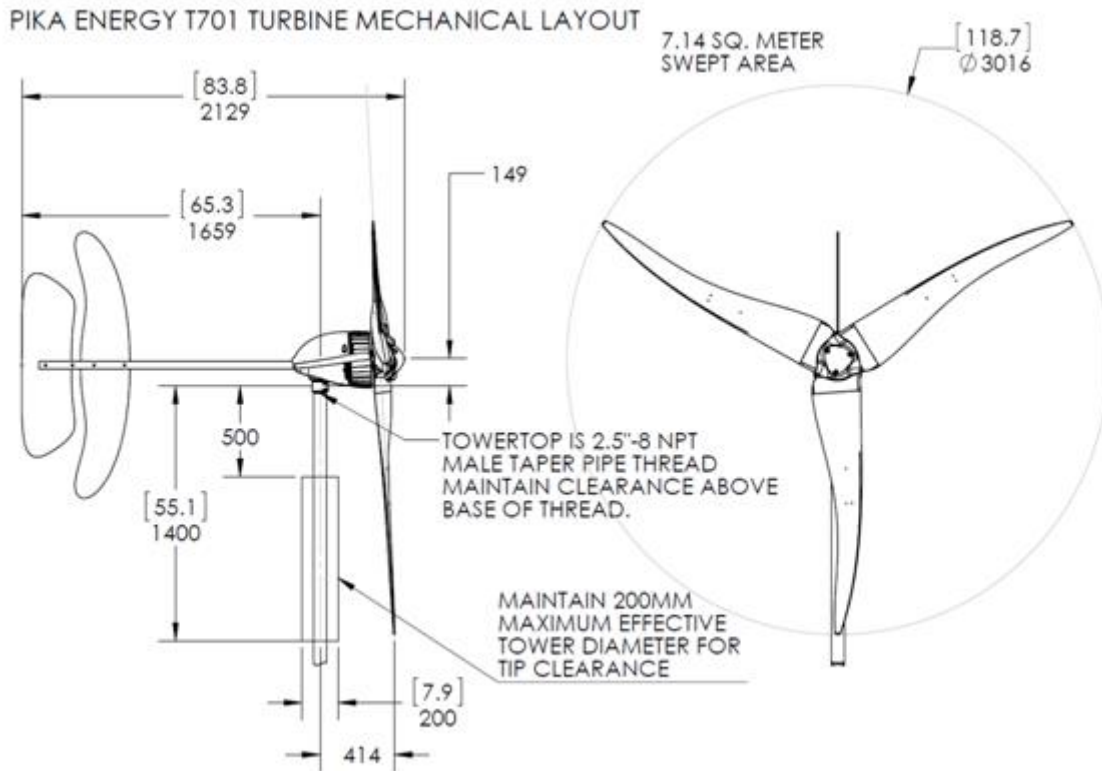


Figure 1: Mechanical layout diagram

### Electrical Connections

Electrical wiring requirements for a T701 installation are found in the installation manual. The tower must allow for 12AWG-2+G UF rated cable to be pulled through the 2.5" male pipe thread at the tower top.

### Tower Top Loads

The maximum FAST model tower top loads for the T701 turbine are summarized in Table 1.

Table 1: Tower Top Loads

Shear force at tower top	1908 N
Bending moment at tower top	700 Nm

### Tower Top Deflection

The maximum allowed tower top deflection is 5% of the tower length when a 1900 N tower top load is applied perpendicular to the tower axis in addition to wind loading on the tower system.