Energy Trust Small Wind Program Update

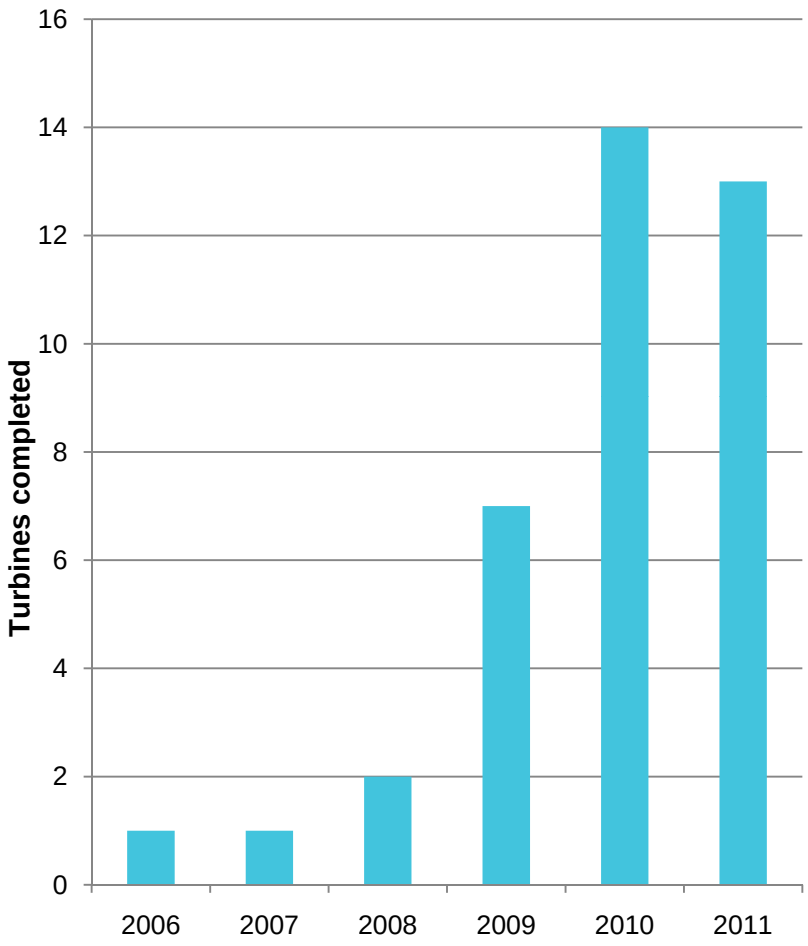
Renewable Advisory Council, June 9, 2012

EnergyTrust of Oregon

Wind program background

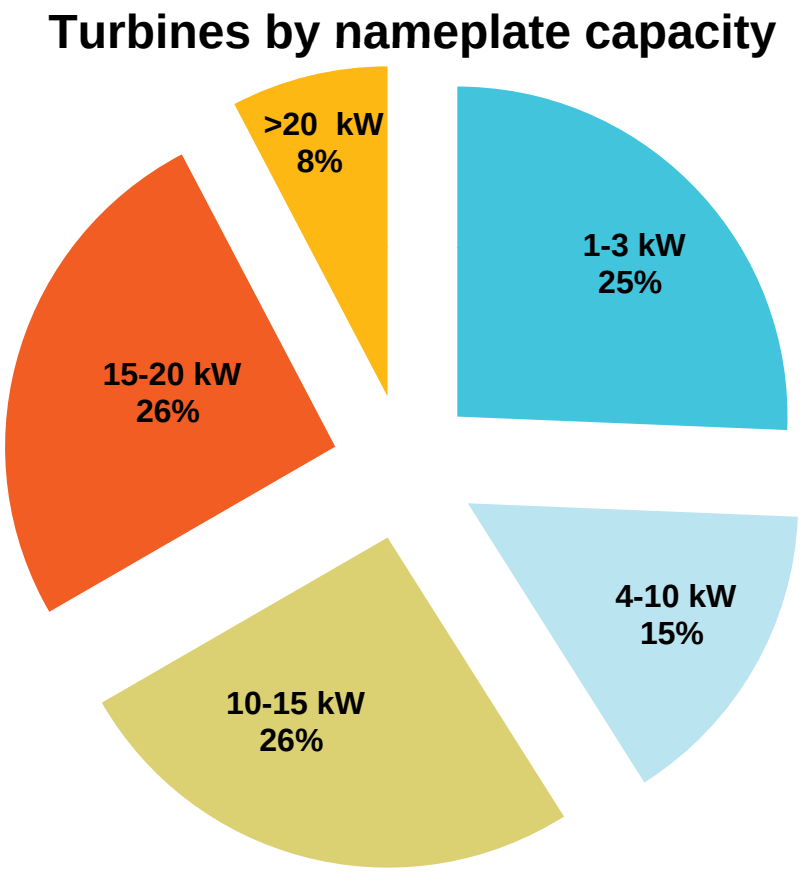
Small wind turbines supported by Energy Trust

- Energy Trust small wind program has shown modest success
- Numbers have leveled off

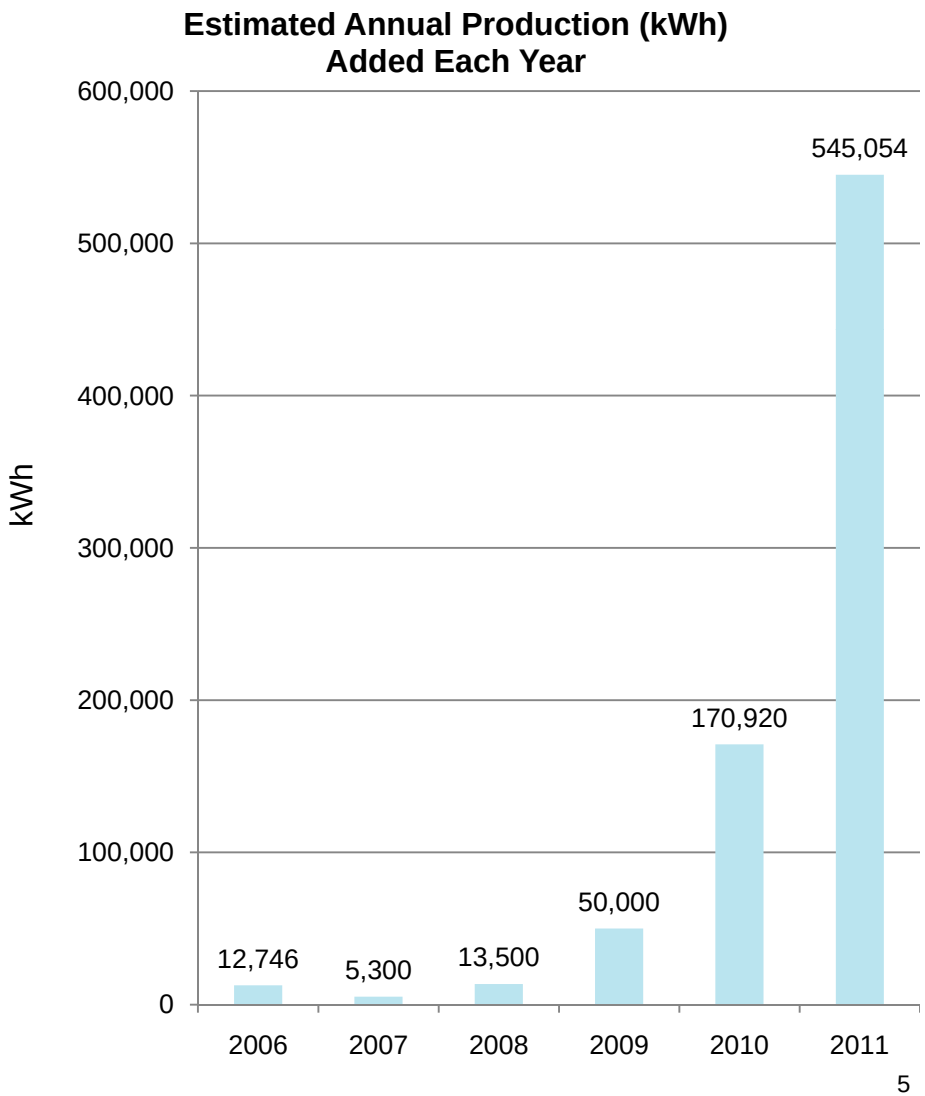


Most turbines are very small

- 25% are < 3 kW
- 8% are > 20 kW



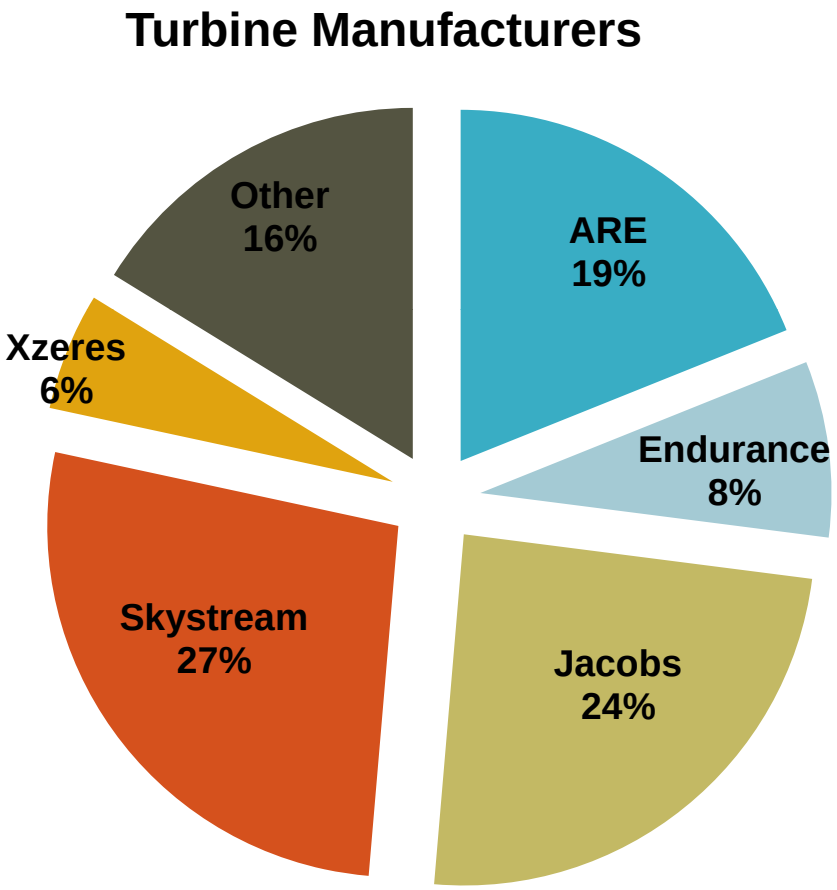
Estimated production of turbines



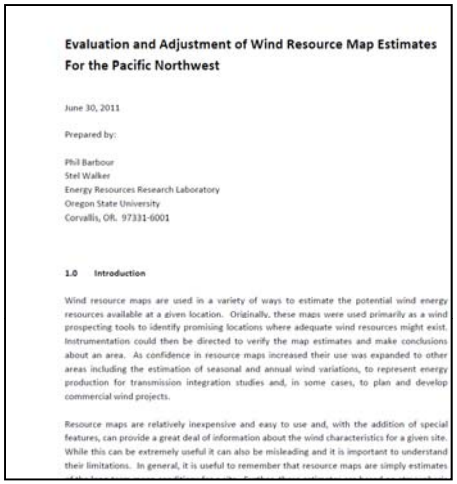
- Over half of 2011 estimated production from one 225 kW Siva turbine in Silverton
- Estimates often high

Few companies represented in Oregon

- Some listed turbine companies don't have representatives here
- Good news: new Energy Trust of Oregon incentives have spurred renewed interest
- Bergey, Gaia and Endurance have all accelerated their marketing efforts in Oregon



Program Evaluation Studies



Evaluation and Adjustment of Wind Resource Map Estimates For the Pacific Northwest

June 30, 2011

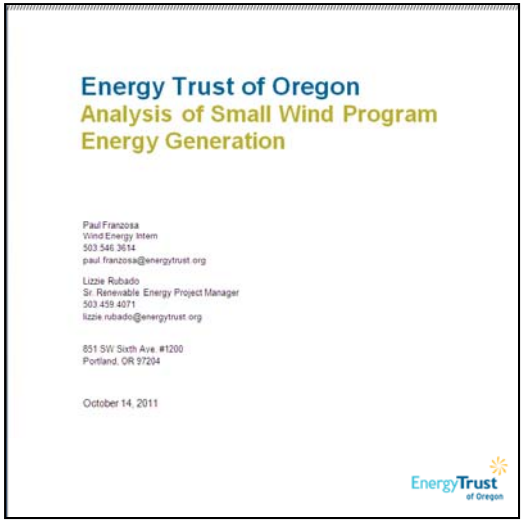
Prepared by:

Phil Barbour
Stel Walker
Energy Resources Research Laboratory
Oregon State University
Corvallis, OR. 97331-6001

1.0 Introduction

Wind resource maps are used in a variety of ways to estimate the potential wind energy resources available at a given location. Originally, these maps were used primarily as a wind prospecting tools to identify promising locations where adequate wind resources might exist. Instrumentation could then be directed to verify the map estimates and make conclusions about an area. As confidence in resource maps increased their use was expanded to other areas including the estimation of seasonal and annual wind variations, to represent energy production for transmission integration studies and, in some cases, to plan and develop commercial wind projects.

Resource maps are relatively inexpensive and easy to use and, with the addition of special features, can provide a great deal of information about the wind characteristics for a given site. While this can be extremely useful it can also be misleading and it is important to understand their limitations. In general, it is useful to remember that resource maps are simply estimates



Energy Trust of Oregon
Analysis of Small Wind Program Energy Generation

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October 14, 2011

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- Phil Barbour and Stel Walker at OSU concluded an important study of wind map estimates
- Lizzie Rubado and Paul Franzosa completed an analysis of Small Wind Energy Generation

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Lizzie re-evaluated incentive structure, recommended a production-based system

Model	Capacity (kW)	Capacity at 11 m/s	Rotor Diameter (m)	Avg. Installed Cost	Energy Generation			Current Incentive	
					@ 10 mph	@ 11 mph	@ 12 mph		
BWC XL.1	1	1.0	2.5	No Data	987	1,266	1,563	$ 4,500	
Skystream 3.7	2.4	2.2	3.7	$ 19,000	1,568	2,074	2,614	$ 10,800	$
Xzeres 110	2.5	2.5	3.6	$ 35,000	2,307	2,954	3,639	$ 11,250	$
Proven P7	2.5	2.5	3.5	$ 32,000	2,437	3,022	3,639	$ 11,250	$
e400	3	3.0	4.0	No Data	2,802	3,526	4,229	$ 13,500	
S-343	5	5.0	6.0	$ 56,450	4,668	5,981	7,341	$ 22,500	$
R9000	5	4.6	5.5	No Data	6,110	7,702	9,364	$ 22,500	
Proven P11	6	5.2	5.5	$ 65,000	6,997	9,136	11,524	$ 24,750	$
Excel	10	8.2	7.0	$ 74,000	7,464	9,745	12,292	$ 31,500	$
Xzeres 442SR	10	9.7	7.2	$ 90,000	11,447	14,578	17,865	$ 32,400	$
Jacobs 31-20	20	17.0	9.4	$ 117,500	12,191	16,337	21,021	$ 42,300	$
P 35-2	14	12.5	8.5	$ 100,000	13,265	17,658	22,300	$ 38,250	$
GW133	11	10.7	13.0	$ 130,000	18,921	23,973	28,994	$ 45,000	$
E – 3120	50	56.6	19.2	$ 370,000	71,592	90,574	109,766	$ 86,400	$
Northwind 100	100	81.0	21.0	550,000	88,735	113,617	140,164	$ 94,500	$

	INCENTIVE STRUCTURE		
	GENERATION ≤	9,500	kW
100 feet			Bas
300 feet	$ 5.00		kW
@ hub height			
0.3	47500	GENERATION >	9,500	kW
25%	875	$ 40,000		Bas
2		$ 1.75		kW
Calculated using SeventhWind			
Based on ETO and NYSERDA historical averages, and avg of guyed and freestanding towers		GENERATION >	125,000	kW
Assumed to be residential				Bas
				kW

- Based on successful NYSERDA model
- Incentives generous to partially make up for loss of BETC

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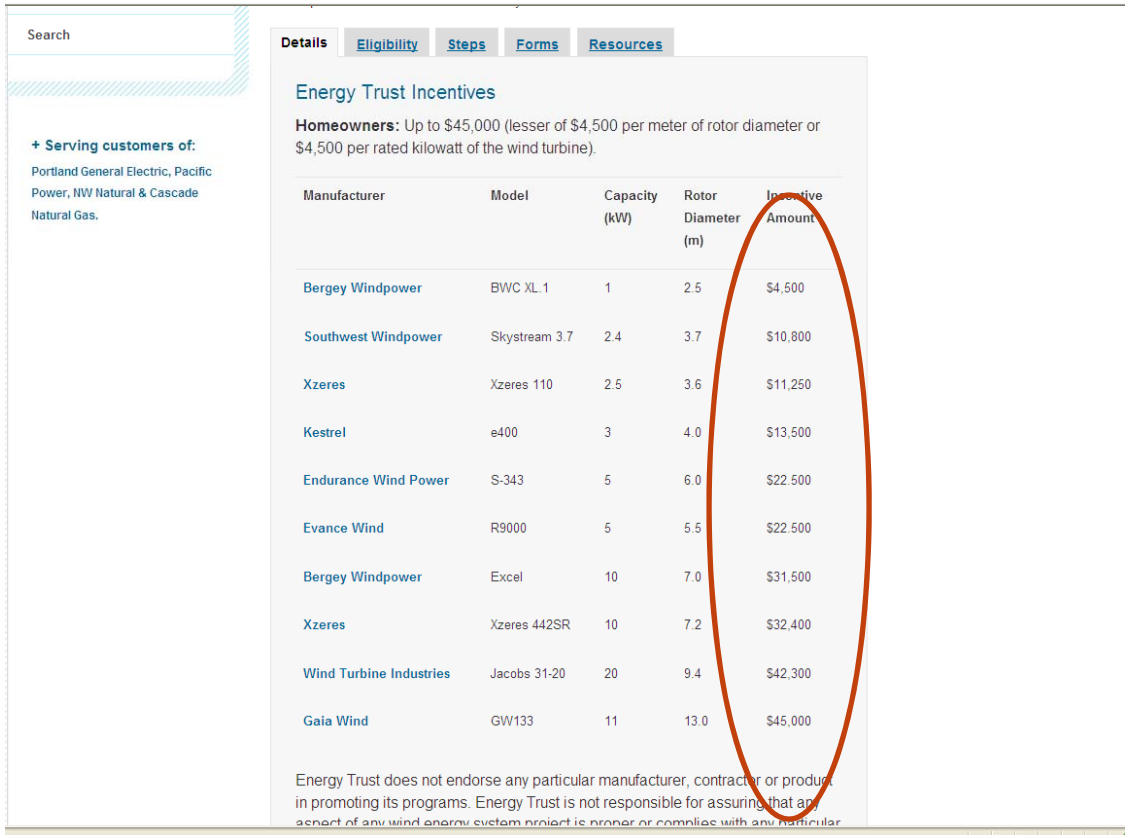
Challenges and Solutions for the Wind Program going forward

Incentives were fixed regardless of site or strength of resource

Incentive formerly based on nameplate capacity or swept area



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Portland General Electric, Pacific Power, NW Natural & Cascade Natural Gas.

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Energy Trust Incentives

Homeowners: Up to $45,000 (lesser of $4,500 per meter of rotor diameter or $4,500 per rated kilowatt of the wind turbine).

Manufacturer	Model	Capacity (kW)	Rotor Diameter (m)	Incentive Amount
Bergey Windpower	BWC XL.1	1	2.5	$4,500
Southwest Windpower	Skystream 3.7	2.4	3.7	$10,800
Xzeres	Xzeres 110	2.5	3.6	$11,250
Kestrel	e400	3	4.0	$13,500
Endurance Wind Power	S-343	5	6.0	$22,500
Evance Wind	R9000	5	5.5	$22,500
Bergey Windpower	Excel	10	7.0	$31,500
Xzeres	Xzeres 442SR	10	7.2	$32,400
Wind Turbine Industries	Jacobs 31-20	20	9.4	$42,300
Gaia Wind	GW133	11	13.0	$45,000

Energy Trust does not endorse any particular manufacturer, contractor or product in promoting its programs. Energy Trust is not responsible for assuring that any aspect of any wind energy system project is proper or complies with any particular

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New Production-based Incentive

- New incentive based on estimated annual Average Energy Output (AEO):
  - $5.00/kWh <= 9,500 kWh
  - $1.75/kWh>9,500
- Based on estimate by Wind Analytics

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Wind estimates based on old map, varied widely, often inaccurate

Change:

- Contract with Wind Analytics for more accurate estimate of wind speed and production

WIND ANALYTICS

WIND TURBINE COMPARISON

COST CONSIDERATIONS

Wind turbine capacity, required tower height, and installed cost are first considered when selecting turbines that meet your project goals.

Installing a wind turbine on a taller tower usually results in more energy generated, but is also more expensive. Capacity refers to the maximum power a wind turbine can generate at a given wind speed, more capacity does not always mean more energy.

WIND CONSIDERATIONS

Matching the optimal wind turbine power curve to your wind speed distribution will maximize energy.

The wind speed distribution on your property is calculated. This is then matched to a database of verified wind turbine power curves, based on your energy needs, to determine the best fit.

SELECTED WIND TURBINE CHOICES

Gaia-Wind	
21,814 kWh/typical year	
Rated Capacity	11.0 kW
Rotor Diameter	13.0 m
Tower Height	36.6 m
Installed Cost	$140,000
Net Cost	$70,951
Energy Per Year	21,814 kWh
Site 1	

Gaia-Wind	
42,248 kWh/typical year	
Rated Capacity	11.0 kW
Rotor Diameter	13.0 m
Tower Height	36.6 m
Installed Cost	$280,000
Net Cost	$175,191
Energy Per Year	42,248 kWh
Sites 1 & 2	

Endurance wind power	
69,793 kWh/typical year	
Rated Capacity	50.0 kW
Rotor Diameter	19.2 m
Tower Height	36.6 m
Installed Cost	$389,000
Net Cost	$235,988
Energy Per Year	69,793 kWh
Site 1	

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Wind Analytics | 20 Jay Street, Suite 936 Brooklyn, NY 11201 | Toll free: 855 808 WIND (9463) | sales@windanalytics.com

REPORT

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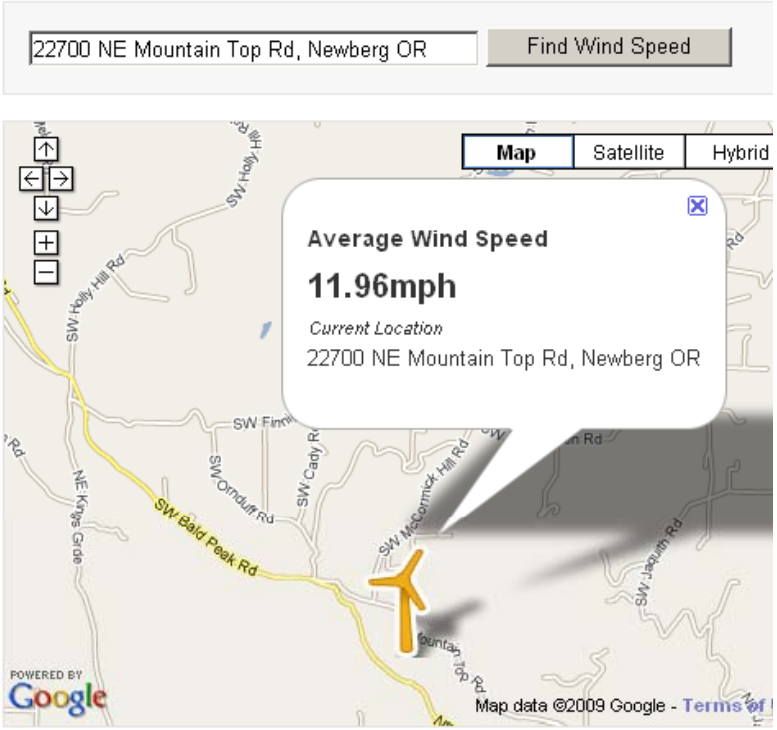
Web-based wind map misleading

Change:

- Remove the map
- Require initial consultation with trade ally or Energy Trust



Click on the map to see wind speed for the location at that point.

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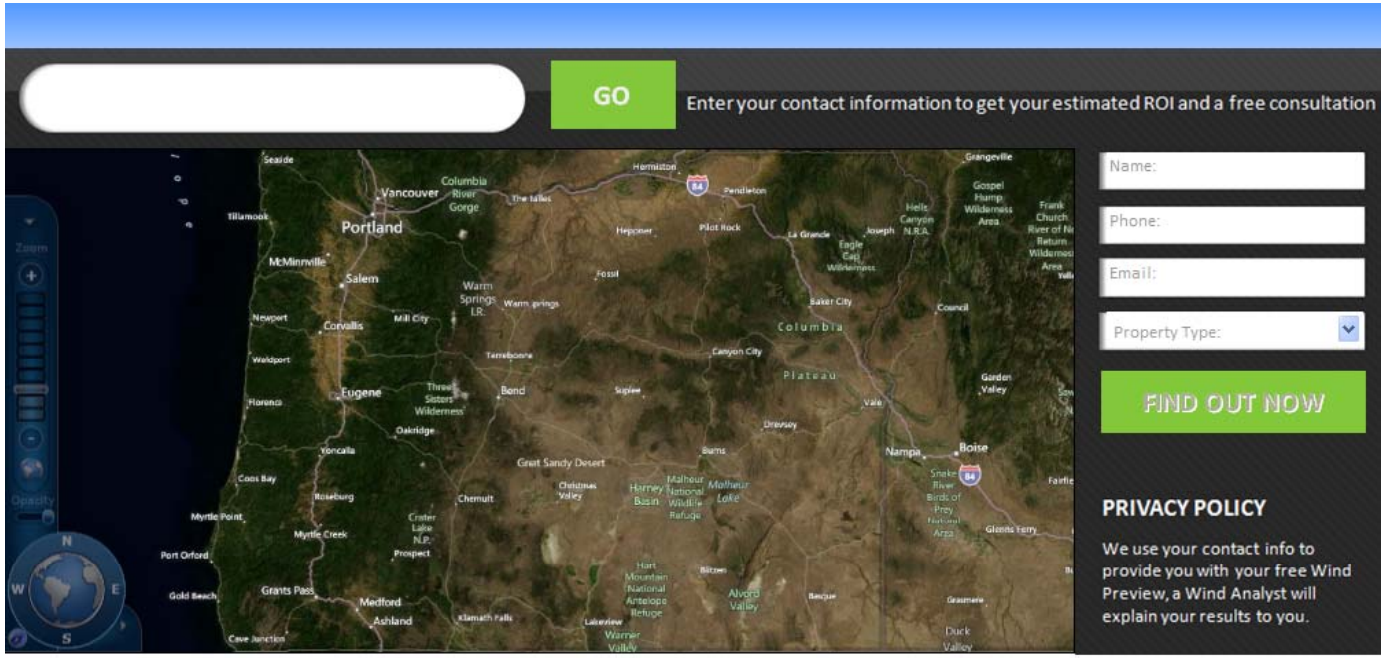
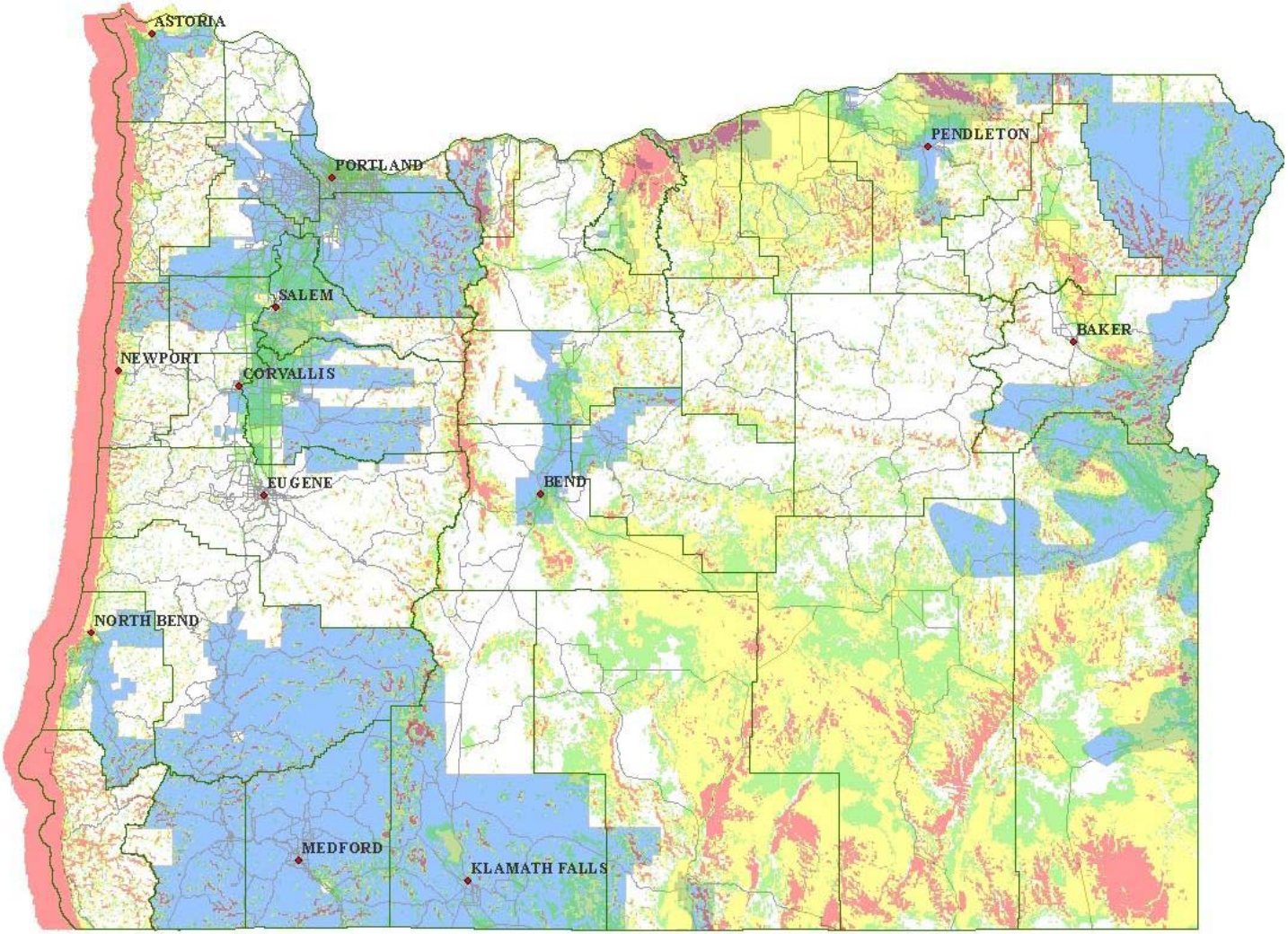
Update web map with state-of-the-art wind modeling tool

- Will introduce new web portal tool by Wind Analytics



Energy Trust Territory presents challenges for wind



Turbines untested, sometimes unreliable

Change:

- Certification to AWEA 9.1-2009 by the Small Wind Certification Council

Small Wind Certification Council

Independent Certification of Small Wind Turbines

For Consumers | For Applicants | For Stakeholders | FAQs | Certified Turbines | Applicant Turbines

SWCC Applicant Turbines

SWCC Certified Turbines | SWCC Applicant Turbine Status | Printer Friendly Version | Subscribe to RSS Feed

A full listing of SWCC Applicants, including turbines with Conditional Temporary Certification and Pending Applications, and past milestone dates for Certified Turbines, are shown below. To sort, click on column headings once for ascending and twice for descending.

NOTE: To compare ratings of fully certified turbine models, see Certified Turbines table

Applicant	Turbine	Under Contract [1]	Under Test[2]	Reports Submitted[3]	Certification Granted[4],[5]	Certification Number[6]
American Zephyr Corporation	Airdolphin GTO	05/20/2010	02/12/2010			Under Test
Bergey Windpower Co.	Excel 5	05/27/2010	04/14/2011			Under Test
Bergey Windpower Co.	Excel 10	06/15/2010	06/24/2010	08/01/2011	11/16/2011	SWCC-10-12
BerMc Controls, Inc.	HC30KW	12/20/2011				Application Pending
BRI Energy Solutions, LTD	Vbine 10-05	01/31/2011	08/19/2011			Under Test
Dyocore Inc	SolAir 800	09/12/2011				Application Pending
Endurance Wind Power Inc.	Endurance S-343	06/07/2010	07/09/2011			Under Test
Enertech, Inc.	Enertech E13	09/27/2010				Application Pending
Evance Wind Turbines Ltd.	Evance R9000	08/13/2010	08/13/2010 Certified Under MCS		Conditional Temporary Certification 05/13/2011	SWCC-10-27
Eveready Diversified Products (Pty) Ltd.	Kestrel e400nb 3.5kW 48Vdc	06/18/2010				Application Pending

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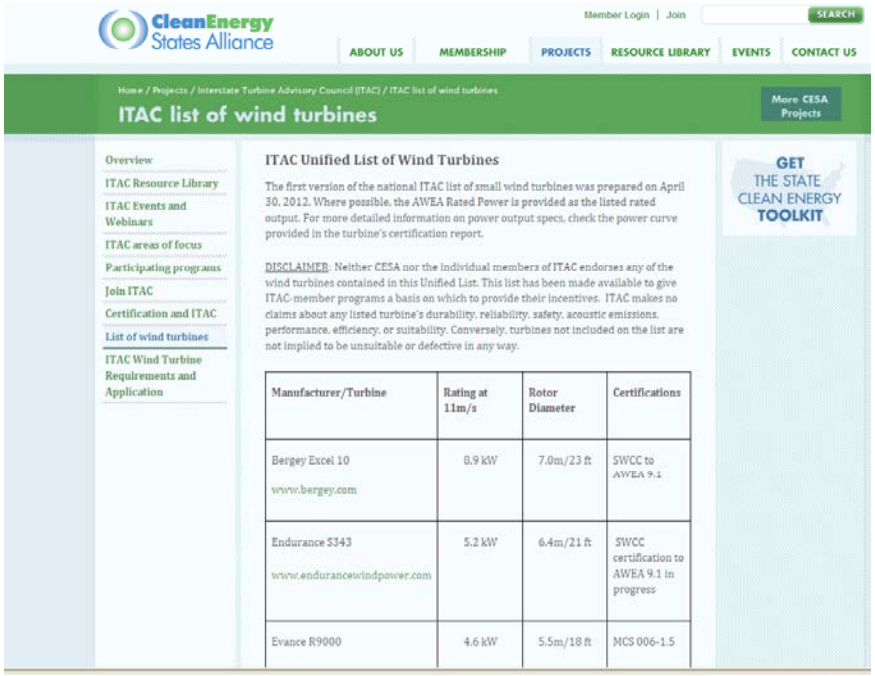
Turbine companies sometimes unproven, unreliable

- Joined with 7 other states: CA, NJ, MA, WI, MN, NV, NY to form the *Interstate Turbine Advisory Council (ITAC)*
- Share resources, expertise and increase market influence
- Require listing by ITAC for incentives



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ITAC list of wind turbines

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ITAC Wind Turbine Requirements and Application

ITAC Unified List of Wind Turbines

The first version of the national ITAC list of small wind turbines was prepared on April 30, 2012. Where possible, the AWEA Rated Power is provided as the listed rated output. For more detailed information on power output specs, check the power curve provided in the turbine's certification report.

DISCLAIMER: Neither CESA nor the individual members of ITAC endorses any of the wind turbines contained in this Unified List. This list has been made available to give ITAC-member programs a basis on which to provide their incentives. ITAC makes no claims about any listed turbine's durability, reliability, safety, acoustic emissions, performance, efficiency, or suitability. Conversely, turbines not included on the list are not implied to be unsuitable or defective in any way.

Manufacturer/Turbine	Rating at 11m/s	Rotor Diameter	Certifications
Bergey Excel 10 www.bergey.com	8.9 kW	7.0m/23 ft	SWCC to AWEA 9.1
Endurance S343 www.endurancewindpower.com	5.2 kW	6.4m/21 ft	SWCC certification to AWEA 9.1 in progress
Evance R9000	4.6 kW	5.5m/18 ft	MCS 006-1.5

GET THE STATE CLEAN ENERGY TOOLKIT

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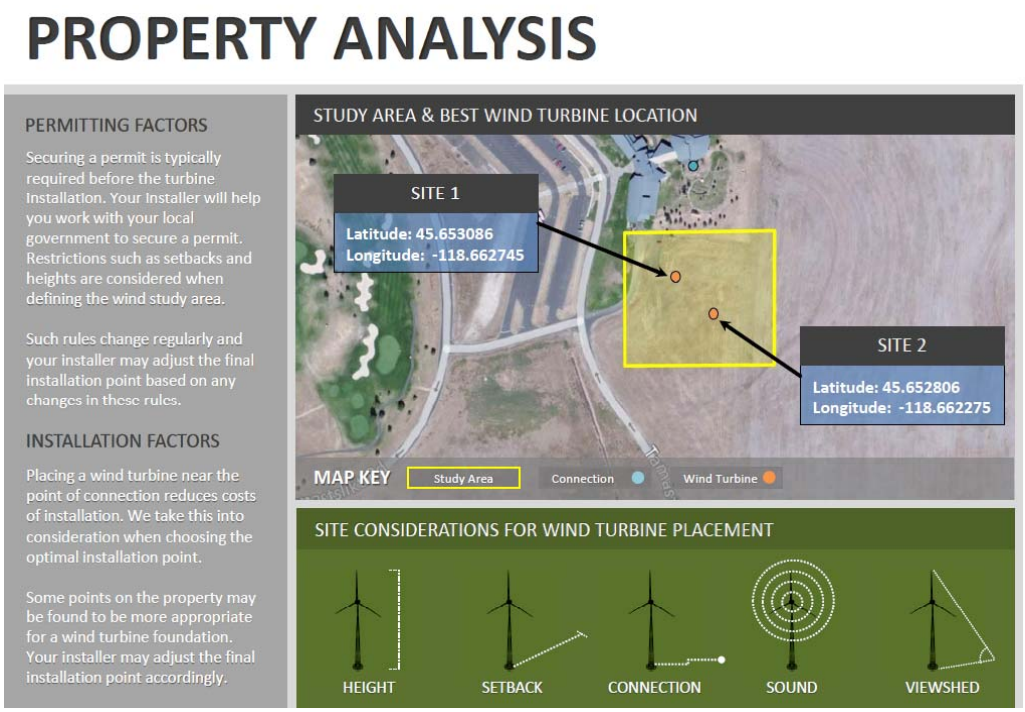
Turbine not always sited at optimal place on property

WIND ANALYTICS

Change:

- Provide at least two wind resource estimates for each property



REPORT

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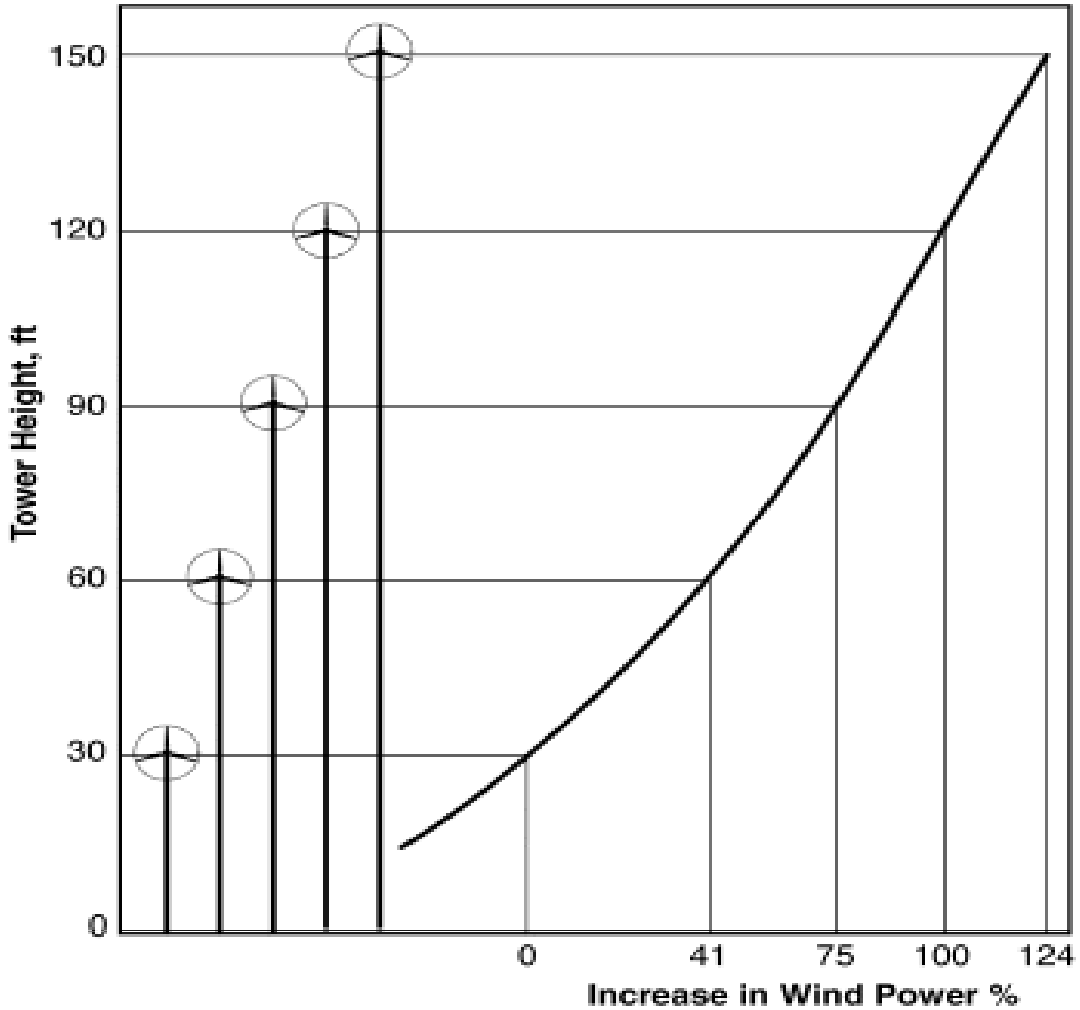
No incentive to increase tower height

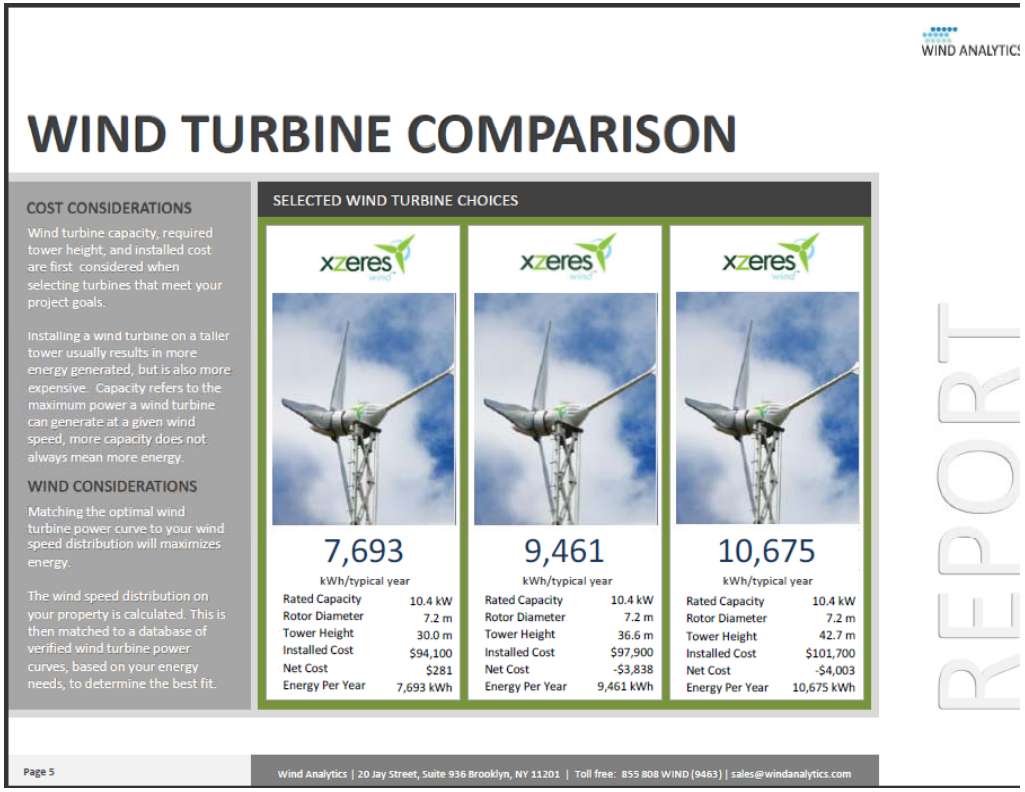


- Former incentive was static regardless of tower height

Wind Analytics Report

Change:

- Provide estimates of greater production and larger incentive check by increasing tower height
- Increase minimum height to 70 ft.



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SELECTED WIND TURBINE CHOICES

	7,693 kWh/typical year	9,461 kWh/typical year	10,675 kWh/typical year
Rated Capacity	10.4 kW	10.4 kW	10.4 kW
Rotor Diameter	7.2 m	7.2 m	7.2 m
Tower Height	30.0 m	36.6 m	42.7 m
Installed Cost	$94,100	$97,900	$101,700
Net Cost	$281	-$3,838	-$4,003
Energy Per Year	7,693 kWh	9,461 kWh	10,675 kWh

REPORT

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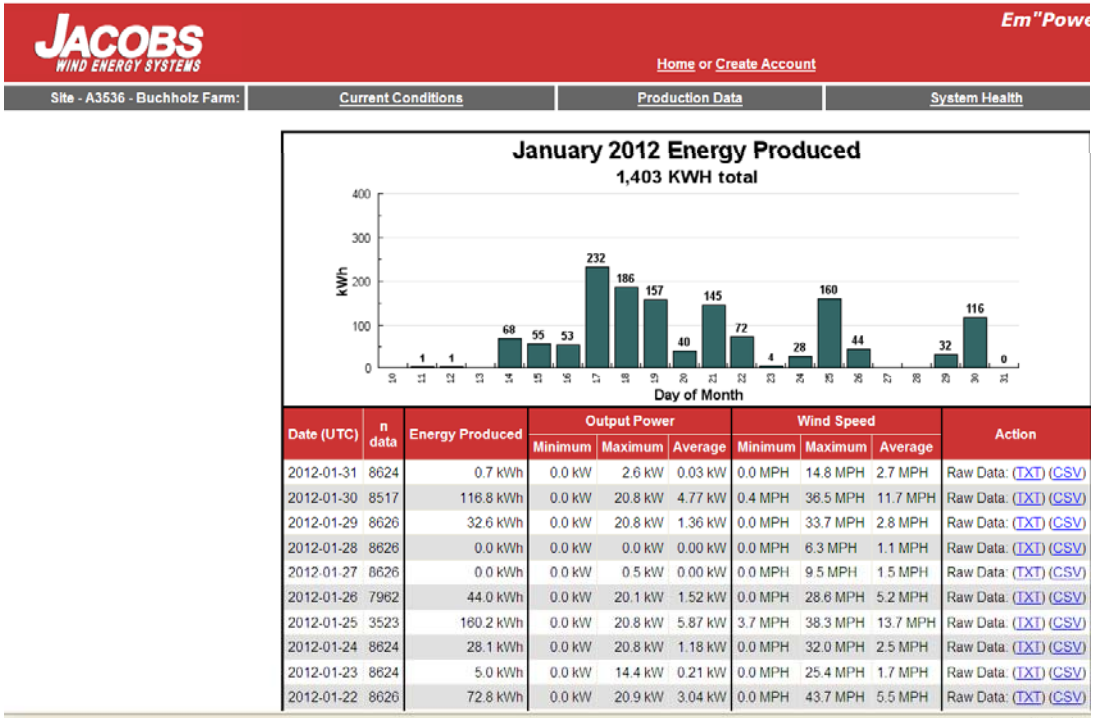
Data monitoring incomplete



Date (UTC)	n data	Energy Produced	Output Power			Wind Speed			Action
			Minimum	Maximum	Average	Minimum	Maximum	Average	
2012-01-31	8624	0.7 kWh	0.0 kW	2.6 kW	0.03 kW	0.0 MPH	14.8 MPH	2.7 MPH	Raw Data: (TXT) (CSV)
2012-01-30	8517	116.8 kWh	0.0 kW	20.8 kW	4.77 kW	0.4 MPH	36.5 MPH	11.7 MPH	Raw Data: (TXT) (CSV)
2012-01-29	8626	32.6 kWh	0.0 kW	20.8 kW	1.36 kW	0.0 MPH	33.7 MPH	2.8 MPH	Raw Data: (TXT) (CSV)
2012-01-28	8626	0.0 kWh	0.0 kW	0.0 kW	0.00 kW	0.0 MPH	6.3 MPH	1.1 MPH	Raw Data: (TXT) (CSV)
2012-01-27	8626	0.0 kWh	0.0 kW	0.5 kW	0.00 kW	0.0 MPH	9.5 MPH	1.5 MPH	Raw Data: (TXT) (CSV)
2012-01-26	7962	44.0 kWh	0.0 kW	20.1 kW	1.52 kW	0.0 MPH	28.6 MPH	5.2 MPH	Raw Data: (TXT) (CSV)
2012-01-25	3523	160.2 kWh	0.0 kW	20.8 kW	5.87 kW	3.7 MPH	38.3 MPH	13.7 MPH	Raw Data: (TXT) (CSV)
2012-01-24	8624	28.1 kWh	0.0 kW	20.8 kW	1.18 kW	0.0 MPH	32.0 MPH	2.5 MPH	Raw Data: (TXT) (CSV)
2012-01-23	8624	5.0 kWh	0.0 kW	14.4 kW	0.21 kW	0.0 MPH	25.4 MPH	1.7 MPH	Raw Data: (TXT) (CSV)
2012-01-22	8626	72.8 kWh	0.0 kW	20.9 kW	3.04 kW	0.0 MPH	43.7 MPH	5.5 MPH	Raw Data: (TXT) (CSV)

Change:

- Require on-line monitoring when available from manufacturer
- Developing monitoring data analysis tool

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Challenges remain

- Marketing: how can we assist our trade allies to identify the market?
- A few good companies are not yet represented in OR
- Wind resource variable: how do we distinguish between a bad wind year and a bad site?
- How can we best track and analyze data we receive from future monitoring?

Thank you

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