

Establishment of Small Wind Turbine Regional Test Centers



Small and Community WINDPOWER

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Presentation Overview

- Background – Why RTCs?
- Regional Test Center Project
- Status
- Lessons Learned

Background – Why RTCs?

Questions

- How can consumers make an apples-to-apples comparison between different small wind turbines (SWTs)?
- How can state incentive program managers objectively determine eligibility for incentive program funds?

NREL PIX #15030 – Skystream 3.7



NREL PIX #16391 –
Endurance 5kW



NREL PIX #12434 –
Bergey 10kW



NREL PIX #13311 –
Jacobs 20kW



NREL PIX #17523 – Gaia 11kW

Background – Why RTCs?

Answer: Certification

Problems with certification in the U.S. prior to 2010

- Certification testing was time consuming and expensive
- Lack of U.S.-based SWT certification testing (basically limited to NREL's Independent Testing project at the NWTC)
- Lack of a U.S.-based certification agent
- No real market pressure for certification testing



Nikko 1kW installed at RTC (West Texas A&M/Alternative Energy Institute). NREL PIX #19540.

Recent Developments

Within the past few years, DOE, NREL, and some states have worked with the North American SWT industry to create a SWT certification infrastructure with the goal of increasing the number of certified turbine models and gaining greater consumer confidence in SWT technology.

The American Wind Energy Association (AWEA) released the **AWEA Small Wind Turbine Performance and Safety Standard (AWEA Standard 9.1 – 2009)** in December 2009.

The **Small Wind Certification Council (SWCC)** and **Intertek**, North American certification bodies, began accepting applications for certification to the AWEA standard in 2010.

Numerous organizations begin to offer SWT field testing for certification in 2010.

RTC Project Background and Scope

Project Purpose:

- Expand small wind turbine testing capability within the United States to allow cost effective performance testing of small wind turbines (rotor swept area $\leq 200 \text{ m}^2$)

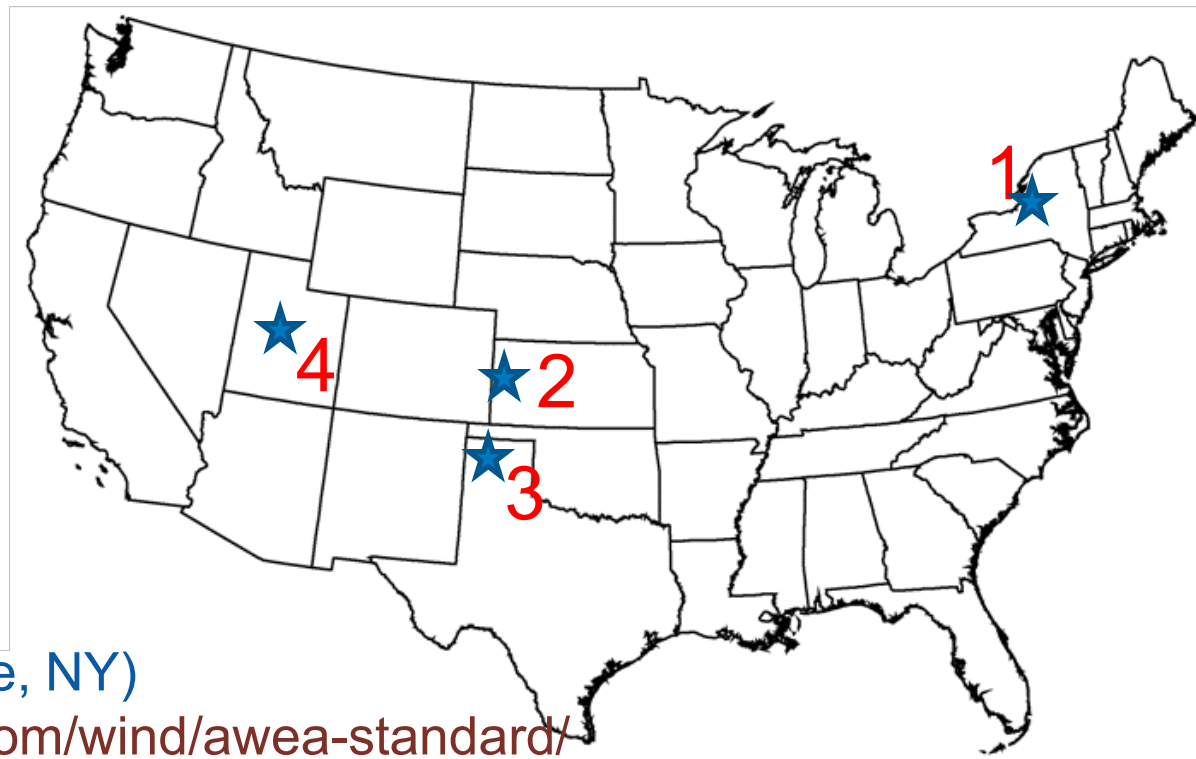
Strategy

- Establish Regional Test Centers (RTCs) capable of testing small wind turbines to the IEC and AWEA standards
- NREL contributes funds and technical assistance (via a subcontract) to RTCs to conduct an initial round of turbine testing. RTCs were selected via competitive solicitation.

Scope

- Establish **four** Regional Test Centers (RTCs) capable of conducting small wind testing to the IEC standard, plus any additional AWEA tests that are not in the IEC standards
- Support the testing of a total of **eight** small wind turbines (two per RTC) to the AWEA (and IEC) standards.

Regional Test Center Partners



1. Intertek (Syracuse, NY)

<http://www.intertek.com/wind/awea-standard/>

2. Kansas State University/Colby Community College (Colby, KS)

<http://www.ece.ksu.edu/psg/HighPlainsSWTC/index.html#>

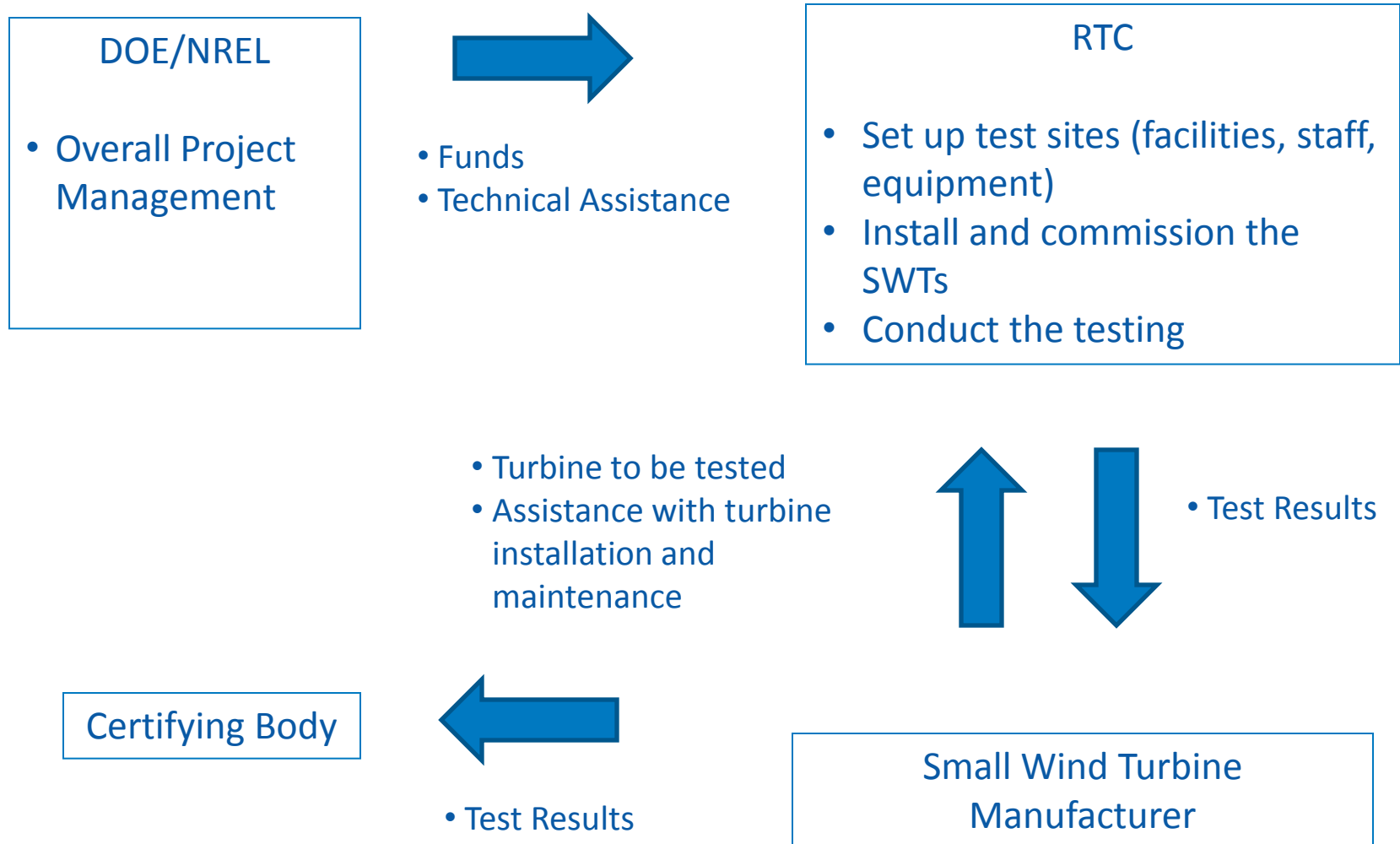
3. West Texas A&M/Alternative Energy Institute (Canyon, TX)

<http://www.windtestcenter.org/>

4. Windward Engineering (Spanish Fork, UT)

<http://windwardengineering.com/our-work/projects-2/nrel>

RTC Project Overview



RTC Certification Test - Duration

Duration (IEC 61400-2):

- Investigates structural integrity and material degradation (corrosion, cracks, deformations); quality of environmental protection of the wind turbine; and the dynamic behavior of the turbine
- “Turbines must achieve an operational time fraction of at least 90% over a minimum of 2,500 operating hours and six months (over a range of wind speeds) with no major failures, significant degradation of wind turbine components, or degradation in power production at comparable wind speeds.”

IEC 61400-2 Ed.2 Design requirements for small wind turbines,
Section 9.4 (Page 99)

RTC Certification Test – Power Performance



Windward Engineering RTC; site of future Windspire 1.2kW turbine pad. NREL PIX #19541.

Power Performance (IEC 61400-12-1):

- Measures output of the turbine vs. wind speed
- Estimates the turbine's annual energy production
- Provides an independent check of the manufacturers' claimed performance.

RTC Certification Test – Safety and Function



Kansas State University/Colby Community College RTC: Site Development in Progress. NREL PIX #19580 and #19581.

Safety and Function (IEC 61400-2):

Verifies that the wind turbine displays the behavior predicted in the design and that provisions relating to personnel safety are properly implemented.

IEC 61400-2 Ed.2 Design requirements for small wind turbines,
Section 9.6 (Page 107)

RTC Certification Test – Acoustic Noise

Acoustic Noise Emissions (IEC 61400-11):

- Determines the turbine's noise-emission characteristics
- Is mandatory under the AWEA standard. If not testing to the AWEA standard, may or may not be required depending on the certification body.

NREL Support

- Site visits (confirm general readiness, commissioning)
- Technical assistance for the Data Acquisition System
- Review test plans
- Review of data
- Review of draft test reports
- NREL staff available for informal consultation & technical assistance
- Annual SWT Testing Workshop



Potencia Hummingbird (10 kW) wind turbine installed at RTC (West Texas A&M/Alternative Energy Institute). NREL PIX #19571.

Time Line

Date Scheduled	Task	Lead
2012	Testing completed Test reports completed and posted on Web	RTCs
Feb 2011	Initial testing begins	RTCs
Jan 2011	First RTC turbine installed	RTCs, manufacturers
Jul-Aug 2010	Subcontracts with RTCs finalized	NREL/RTCs
Feb 2010	RTC partners selected	NREL
Dec 2009	RTC RFP closes	NREL
Oct 2009	RTC RFP released	NREL
May 2009	Sources Sought notice closes	NREL
Apr 2009	Sources Sought notice released	NREL
Nov 2008	Project begins	NREL

Status of RTC Turbine Testing

RTC/Turbine	Status
Intertek – Fortis Montana 5kW – Jacobs 31-20 (20kW)	All test plans completed; commissioning report completed; testing completed; site calibration pending Installation underway; turbine commissioning tentatively scheduled for early fall 2011
Kansas State University/Colby Community College – 1Sky Energy 7.5kW – under discussion	Site development in progress; no site calibration needed Installation delayed pending resolution of manufacturer problem with a component supplier
West Texas A&M/Alternative Energy Institute – Potencia Hummingbird (10kW) – Nikko 1kW	Turbine installed; testing pending Turbine installed and commissioned; testing started
Windward Engineering – Endurance S-343 (5kW) – Windspire 1.2kW	Testing underway Testing underway

Lessons Learned

Lesson Learned	Discussion
Test location site selection	Wind resource Terrain (flat site preferred) Construction access Low background noise
Length of time to set up a site	For a green field site plan, at least a year from initial discussions to turbine installation
Premature certification testing	Manufacturers should not take shortcuts in turbine development
Involve the certification body early	This will prevent problems later. Mandatory, if testing is conducted by an unaccredited test organization
Carefully study and understand the standard	Participation in round robin testing helps develop a consistent interpretation of standards among different organizations
NEPA (For federally funded projects)	NEPA approval is not necessarily quick and easy. NEPA approvals for the RTCs took 4-8 months.

Questions?

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http://www.nrel.gov/wind/smallwind/regional_test_centers.html

http://www.nrel.gov/wind/smallwind/independent_testing.html