

U.S. DEPARTMENT OF
ENERGY

Office of
**ENERGY EFFICIENCY &
RENEWABLE ENERGY**

Distributed Wind Research, Development, and Testing

Project ID A-1

Alice Orrell

Pacific Northwest National Laboratory



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FY17-FY18 Wind Office Project Organization

“Enabling Wind Energy Options Nationwide”

Technology Development

Atmosphere to Electrons

Offshore Wind

Distributed Wind

Testing Infrastructure

Standards Support and International
Engagement

Advanced Components, Reliability, and
Manufacturing

Market Acceleration & Deployment

Stakeholder Engagement, Workforce
Development, and Human Use Considerations

Environmental Research

Grid Integration

Regulatory and Siting

Analysis and Modeling (cross-cutting)

Project Overview

A1: Distributed Wind Research, Development, and Testing

Project Summary

- Provide distributed wind research, data, and analysis to support and prioritize WETO's research and development activities to achieve program goals.
- Deliverables are primarily reports (annual Distributed Wind Market Report) and related products, educational materials, and input to other WETO initiatives.

Project Objective & Impact

- The research, data, and analysis provided by this project helps guide future investments and decisions by industry, utilities, federal and state agencies, and other interested parties.
- The work helps stakeholders understand and access market opportunities and inform distributed wind industry research and development needs.

Project Attributes

Project Principal Investigator(s)

Alice Orrell
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DOE Lead

Patrick Gilman

Project Partners/Subs

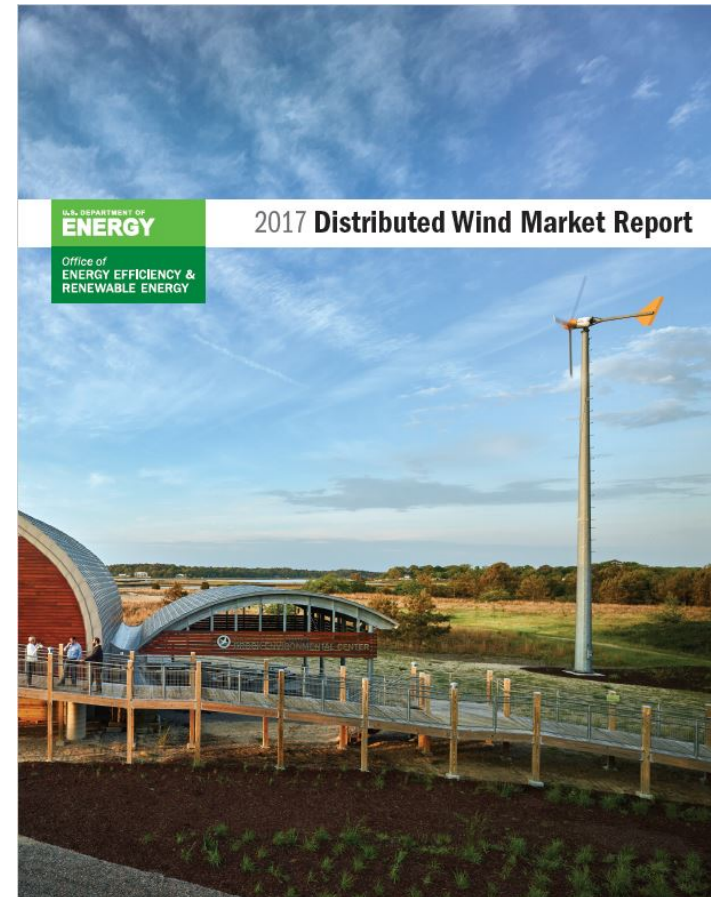
Partners: NREL, FEMP
Subcontractor: David Schulz

Project Duration

October 1, 2012 – September 30, 2022

Technical Merit and Relevance

- Data collection, analysis, and market research allows WETO to make year-to-year comparisons, measure growth, and identify trends in the industry to inform the wind office and industry stakeholders' planning and investments.
- Results are published in annual Distributed Wind Market Report and other reports and educational materials.
- Other market reports concentrate only on U.S. wind projects using turbines greater than 100 kW. This report specifically analyzes the distributed wind sector of the market and details the annual U.S. small wind market.
- Research enables WETO to engage with consumers, government agencies, utilities, and financial institutions to increase their understanding of and confidence and interest in distributed wind.



Approach and Methodology

Data Collection

- Extensive data collection and interview process
 - Turbine manufacturers
 - State and federal agencies
 - Service providers, installers, and developers
 - Federal Aviation Agency
 - American Wind Energy Association
 - Lawrence Berkeley National Laboratory, National Renewable Energy Laboratory
- Data are compiled, cross-referenced, verified, and estimated (when needed)

Data Analysis

The image displays two Excel spreadsheets. The top spreadsheet shows a monthly data table with columns for months (Aug-13 to Sep-14) and rows for various project entries. The bottom spreadsheet is a summary table titled "WIND PROJECT INVESTMENTS AND PERFORMANCE, FISCAL YEARS 2009-17".

Year	State	Project Name	Fiscal Year of Completion	Grant/Annu. Cost (\$)	Guaranteed Cost/Annu. (\$)	Total Project Cost (\$)	WPP (MW)	Year (1) Actual (MW)	Year (2) Actual (MW)	Year (3) Actual (MW)
2011	ALASKA	AKSAY HOMESTEAD PROPERTIES, LLC	2011	\$41,200	\$0	\$15,200	30.40			
2009	ALASKA	BEAR CREEK WIND	2009	\$4,500	\$0	\$30,200	4.50	4.52		
2010	ALASKA	BEAR LAKE INVESTMENT, INC.	2010	\$34,100	\$0	\$30,200	0			
2011	ALASKA	CENTRAL ALASKA ENGINEERING COMPANY	2011	\$16,300	\$0	\$65,400	12.24	5.5	5.5	5.5
2009	ALASKA	CO-DUGLASS LTD.	2009	\$30,000	\$0	\$113,311	42.242			
2011	ALASKA	COOPER VALLEY TELEPHONE COOPERATIVE, INC.	2011	\$44,100	\$0	\$173,650	16.550			
2010	ALASKA	COOPER VALLEY	2010	\$4,500	\$0	\$15,500	5.27	12.240		
2009	ALASKA	FEATHERY RIDGE	2009	\$3,200	\$0	\$13,200	4.50	2.604		
2011	ALASKA	HAWK CANYON CENTRAL CO INC LLC	2011	\$20,000	\$0	\$60,300	11.4			7.67
2010	ALASKA	PALM FOREST	2010	\$13,325	\$0	\$62,500	11.4	3.5	0	6.000
2011	ALASKA	PRINCE OF PEACE ENERGY	2011	\$15,300	\$0	\$65,200	7.700	6.867	6.75	0
2011	ALASKA	WELLS FARGO GEAR SERVICE	2011	\$19,900	\$0	\$79,000	13.111			
2011	ALASKA	WINDUP ALASKA	2011	\$5,100	\$0	\$210,000	0			
2009	CALIFORNIA	BEAR RIVER WIND	2009	\$17,000	\$10,000	\$11,500	10.00	14.940	27.001	
2009	CALIFORNIA	PHILIPPI FIELDS I LLC	2009	\$1,004	\$0	\$68,240	26.480	6.76		0
2010	CALIFORNIA	ELMERSON ENERGY ELECTRIC ASSOCIATION INC	2010	\$5,900	\$0	\$21,644	3.720	0.720	0	0
2014	COLORADO	HEALTH CARE ENERGY	2014	\$19,900	\$0	\$92,200	4.00			
2009	COLORADO	NEVERETT HEALTH PLAN	2009	\$11,500	\$0	\$46,200	9.660	1.60	0.4	0.5
2011	COLORADO	ELMERSON ENERGY WIND PRODUCTS, LLC	2011	\$46,300	\$0	\$14,000	0			60.07
2010	IDAHO	DOHRN FARMERSON HOLDING COMPANY	2010	\$60,000	\$0	\$80,300	8.3	21.420	0	0
2011	IDAHO	INDUSTRIAL POWER CORPORATION CO	2011	\$4,400	\$0	\$25,700	2.901	2.41	0	2.31
2011	IDAHO	WHEELER TED	2011	\$19,200	\$0	\$79,200	34.5			
2010	IDAHO	WIND ENERGY SERVICES LLC	2010	\$5,000	\$0	\$75,100	30.00	13.104		3.440
2011	IDAHO	WIND ELECTRIC INC	2011	\$16,300	\$0	\$69,214	18.277	10	0	10
2009	INDIANA	INDIAN POWER FARM	2009	\$16,100	\$0	\$64,100	0	21.870		11.34
2009	INDIANA	INDIAN POWER	2009	\$16,100	\$0	\$64,100	0	0		11.34
2010	IOWA	ABD POSA, LLC	2010	80	\$99,442	\$121,300	75.420			
2010	IOWA	ACME PARTS CORPORATION	2010	\$20,000	\$0	\$5,300	48.750	28.800	23.310	
2010	IOWA	AG LAND ENERGY 1, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	6041.7	6100.100	6126.070	6021.030
2010	IOWA	AG LAND ENERGY 2, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	4892.5	5760.770	5790.490	5600.493
2010	IOWA	AG LAND ENERGY 3, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	5041.7	6100.100	6126.070	6021.030
2010	IOWA	AG LAND ENERGY 4, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	4862.4	5816.960	5774.713	6075.254
2010	IOWA	AG LAND ENERGY 5, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	4861	5808.840	5805.204	5595.695
2010	IOWA	AG LAND ENERGY 6, LLC	2010	\$100,000	\$2,500,000	\$2,500,000	4901	5805.840	5800.204	5718.658
2010	IOWA	AGRI SPECIAL VENTURES LLC	2010	\$43,002	\$64,014	\$172,250	70.431			
2010	IOWA	AGRI SPECIAL VENTURES	2010	\$7,000	\$0	\$12,000	39.770	44.700	4.970	
2010	IOWA	ANDERSON MARK	2010	\$50,000	\$0	\$95,200	35.227	79.5	15.471	13.267
2010	IOWA	BECK PATRIC	2010	\$46,387	\$53,370	\$112,250	30.720	44.900	26.120	20.074
2010	IOWA	BECK PATRIC	2010	\$15,001	\$0	\$23,141	24.120	13.401	13.401	6.041
2012	IOWA	BEIGGS, JEFF	2012	\$35,000	\$0	\$142,400	39.081	21.344	21.344	
2010	IOWA	BENTON ENERGY SERVICES	2010	\$60,000	\$130,000	\$200,000	106.000	0		44.004
2009	IOWA	BENTON FARM LTD	2009	\$13,700	\$0	\$54,300	10	13.24	5.524	10.000
2009	IOWA	BENTON FARM	2009	\$19,200	\$0	\$60,200	39.800	14.28	28.5	11.0
2010	IOWA	BENTON WIND	2010	\$36,400	\$0	\$143,300	40.500	11.850	21.850	0
2009	IOWA	BREWERS BRIAN	2009	\$39,110	\$70,000	\$138,210	81.231	38.800	36.477	34.310
2009	IOWA	BREWERS BRIAN	2009	\$47,200	\$80,000	\$127,200	81.231	112.860	112.860	63.830
2010	IOWA	BROOKFIELD RENEWABLES LLC	2010	\$50,000	\$0	\$83,100	50	0	0	0.917
2010	IOWA	BROOKFIELD RENEWABLES	2010	\$20,000	\$0	\$20,300	100.4	100.4	100.100	100.400
2010	IOWA	BROOKFIELD RENEWABLES	2010	\$30,000	\$12,000	\$20,800	0	0	0	44.400

Approach and Methodology

- Risk mitigation for stakeholder input and engagement
- Established schedule to successfully publish annual Distributed Wind Market Report every August
- Dedicated graphic designer support

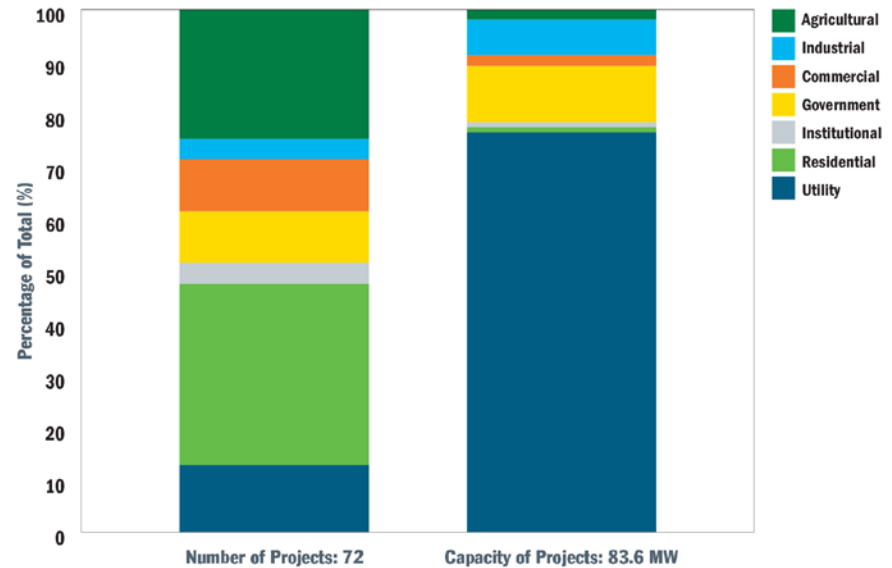


Figure 16. 2017 Distributed wind customer types by number and capacity of projects

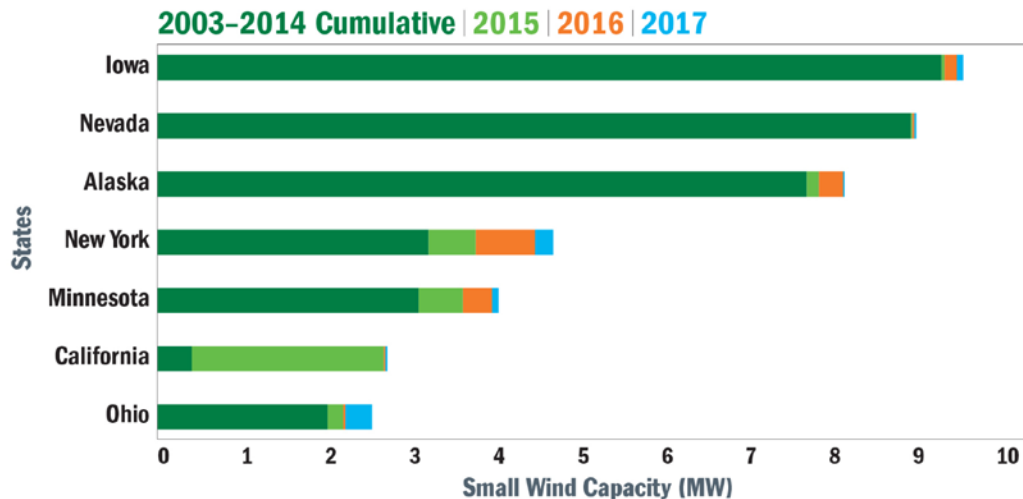


Figure 5. Top states for small wind capacity, 2003-2017

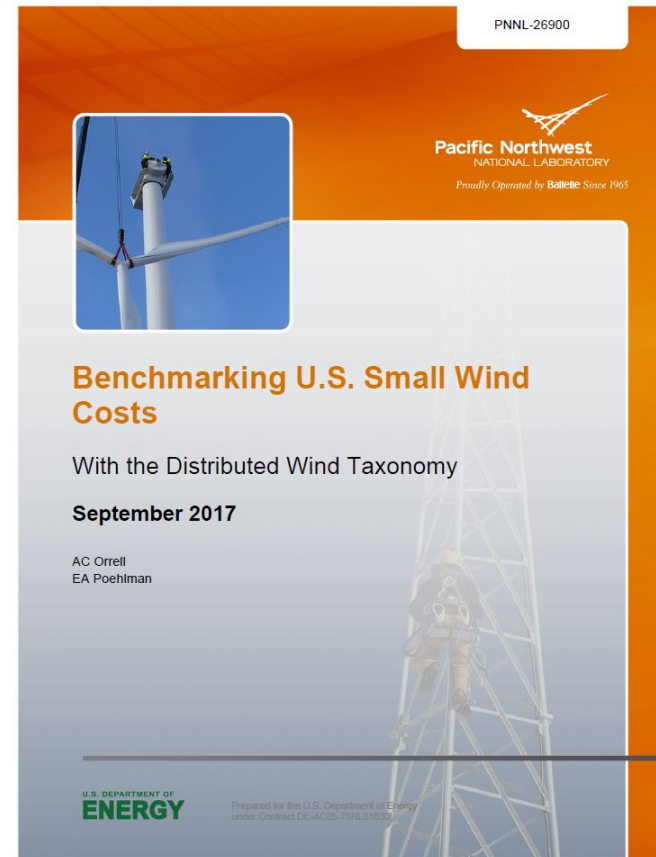
Accomplishments and Progress

Fiscal Year 2017

- Published 2016 Distributed Wind Market Report
- Published Benchmarking U.S. Small Wind Costs report
- Conducted Distributed Wind Workshop for Federal Agencies in March 2017

Fiscal Year 2018

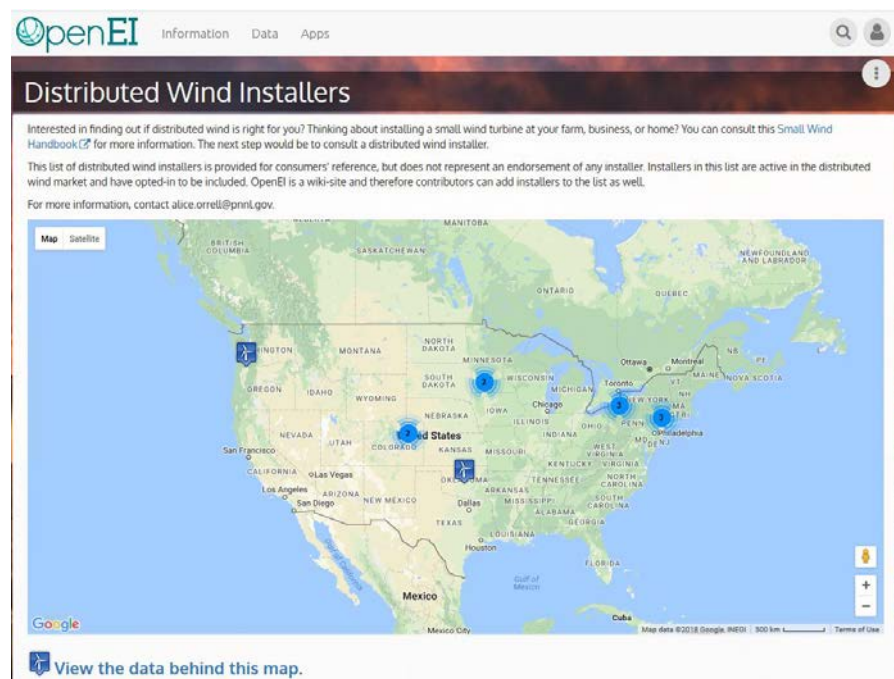
- Published 2017 Distributed Wind Market Report
- Conducted Distributed Wind Workshop for Federal Agencies in February 2018



Accomplishments and Progress

In addition to publications and formal milestones, PNNL's research and analysis informs products and program planning

- Wind Innovations for Rural Economic Development (WIRED) Workshop
- Leasing business model analysis
- Small wind performance analysis
- Installer engagement



Accomplishments and Progress

- **Schedule and Milestone Highlights**

- Benchmarking U.S. Small Wind Costs report was new scope not included in initial FY17 annual operating plan
- All milestones were completed on schedule
- Success of Workshops for Federal Agencies led to FY18 planning for future federal agency education

Task	FY2017								FY2018				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
Q1 Milestone: Outline and Data Plan	█	█											
Q2 Milestone: Workshop for Agencies	█	█	█										
Q3 Milestone: Fact Sheet			█	█	█								
Q4 Milestone: Benchmarking Costs Report			█	█	█	█	█						
Q4 Milestone: Market Report													
Q1 Milestone: Outline and Data Plan									█	█			
Q2 Milestone: Workshop for Agencies									█	█	█		
Q3 Milestone: Fact Sheet											█	█	
Q4 Milestone: Analysis and Planning												█	█
Q4 Milestone: Market Report												█	█

Communication, Coordination, and Commercialization

Dissemination

- Conference presentations
- Report and Fact Sheet publications
- wind.pnnl.gov/distributedwind/asp
- Reddit Ask Me Anything



reddit

ALICE ORRELL AMA ON REDDIT



TOTAL REACH
74,373

1.1k
TOTAL VIEWS



173
TOTAL VOTES

Upcoming Project Activities

- Continue Distributed Wind Market Report
- Co-facilitate with NREL the new International Energy Agency (IEA) Task 41: Enabling Wind to Contribute to a Distributed Energy Future
- Develop new online distributed wind content for Federal Energy Management Program (FEMP) training program

