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Distributed Wind Soft Costs: A Beginning

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Acknowledgments

We thank the installers and developers who shared project cost information with us and are patiently answering our follow-up questions.

Presentation Purpose

- (Briefly) describe the distributed wind (DW) soft costs project
- Present summary data from our alpha data set of DW project costs survey
- Seek feedback on initial results and future direction of the project.

Photo from Pika Energy, NREL 33942

Presentation Overview

- Soft Costs Project Overview
- DW Project Taxonomy
  - Soft costs are a subset of the taxonomy
- Alpha Data Set Project Demographics
- Data Summary
- Future Work
- Discussion.

Photo from Robin and Duncan Ross, Arrowhead Spring Vineyards, NREL 26772

Project Overview

Key challenge: The U.S. DW industry has identified high, non-hardware, balance-of-system (soft) costs as a barrier to DW system deployment. Information about the cost details of installed DW turbine systems is limited.

Key opportunity: Follow efforts undertaken by the solar industry, largely under the U.S. DOE SunShot Initiative, to understand and then reduce soft costs associated with DW technologies.

Project scope (FY16-FY18):

- Develop DW taxonomy based on industry input
- Gather initial data sets to alpha test and pre-populate a DW project soft cost spreadsheet; long-term, add to PNNL's master DW database
- Seek additional project cost information to inform a baseline
- Develop a technical report documenting the larger DW taxonomy
  - The taxonomy will be used to establish programmatic goals for DW soft costs.
  - The labs will develop an internal soft cost reduction roadmap providing an initial plan to reduce soft costs and address barriers.

Project Overview

Work to Date

- Developed draft DW project cost taxonomy
- Vetted draft taxonomy with stakeholders at DWEA Conference (September 2015)
- Vetting with industry via phone and in-person interviews (ongoing)
- Collecting an initial project cost data to populate the alpha data set and proof test the taxonomy (in progress)
- Discuss the project cost taxonomy and results from the alpha data set with DOE/team/industry at the Small Wind Conference (in progress).

Future Work (funding Dependent)

- Gather additional project cost information
- Identify soft cost reduction opportunities and develop strategies to pursue
- Identify deployment barriers and develop strategies to address
- Publish DW soft costs technical paper, including soft cost metrics and industry benchmarks.

Soft Costs Defined

Q: What is a "soft cost"?
A: Any non-hardware costs

Examples of soft costs:

- Permitting fees
- Installer/developer profit
- Taxes
- Transaction costs
- Permitting, installation, interconnecting labor
- Indirect corporate costs
- Customer acquisition
- Installation labor
- Supply chain costs

Note:
This initial cost-gathering effort is from the installer/developer point of view.

Distributed Wind Project Taxonomy

Turbine System Equipment
- Turbine, tower, other equipment

Installation
- Site prep and cleanup, foundation, electrical, turbine installation, commissioning
  - Materials, labor, equipment

Supply Chain, Transportation, and Turbine Equipment Logistics

Taxes
- Material, labor, local, state, etc.

ZPIII/Regulatory Requirements
- **Z**oning, **P**ermitting, **I**nspection, **I**nterconnection, **I**ncentives

Site Engineering and Design

Financing

Customer Acquisition

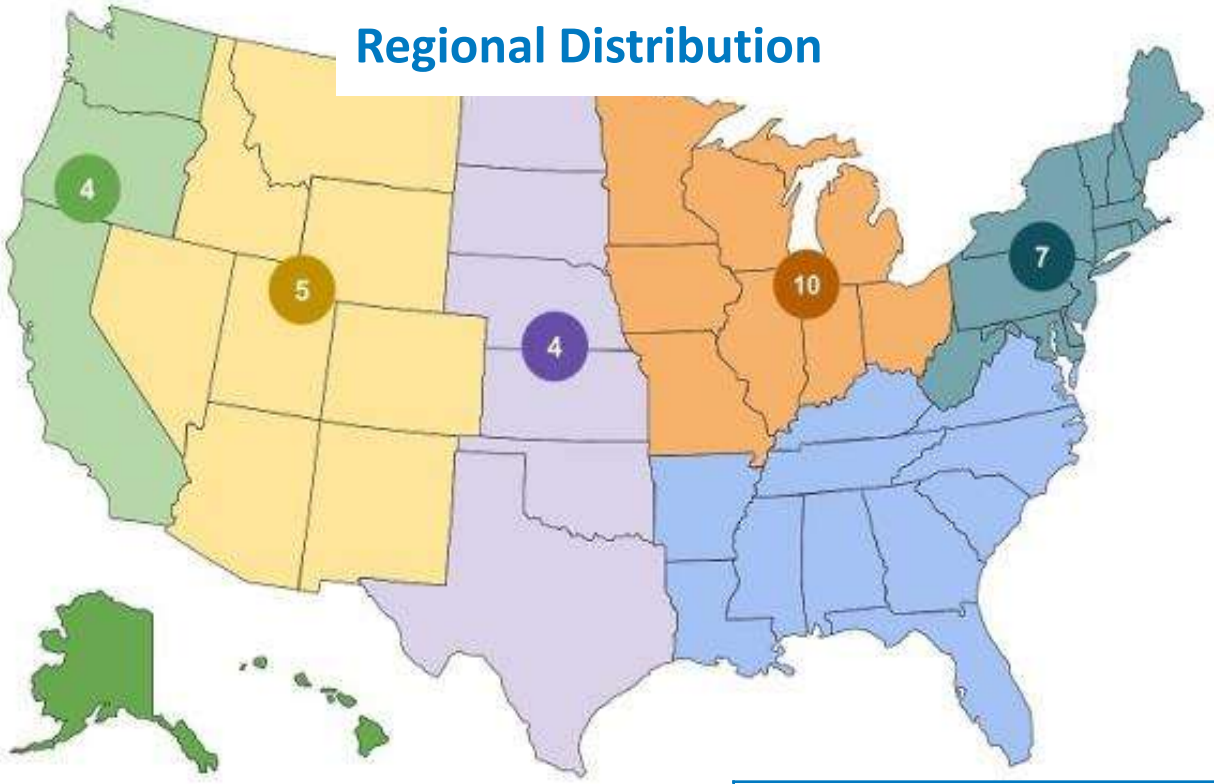
Installer/Developer Overhead and Profit

Other Costs
- Project management
- Other development costs.

Operations & Maintenance (O&M)

Alpha Data Set: Project Demographics

Regional Distribution



# of installers	10
# of projects	30
# of turbine models	13
# of states	13

Turbine Rated Power	# Projects
0 – 20 kW	13
> 20 – 100 kW	11
> 100 – 1,000 kW	3
> 1,000 kW	3

Alpha Data Set: Project Demographics – Utility Type

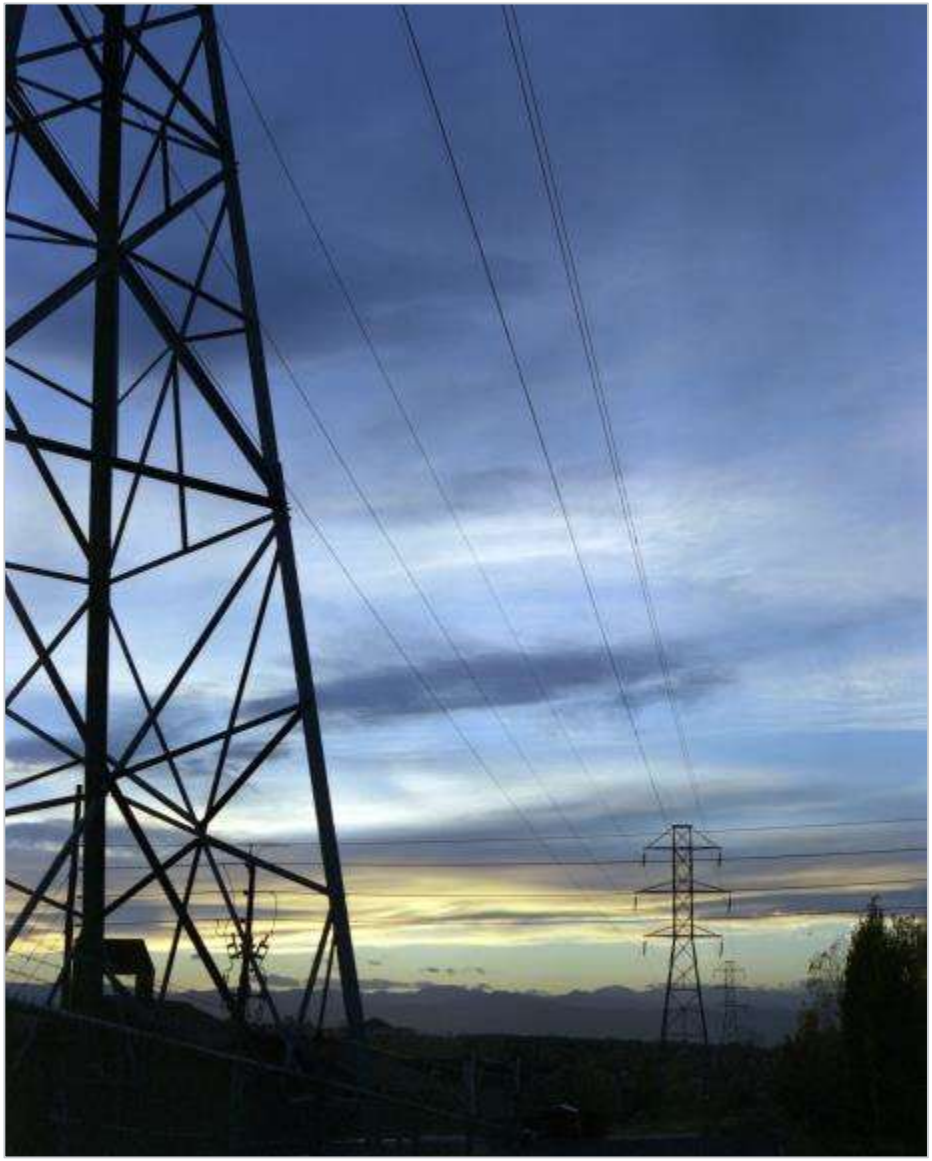


Photo by Warren Gretz, NREL 00002

Utility Type	# Projects
Co-op	9
IOU	17
Muni	3
PUD	1

Alpha Data Set: Project Demographics – Jurisdiction Type

Jurisdiction Type	# Projects
Town/City	5
Township	4
County	19
State	1
Federal Government	1

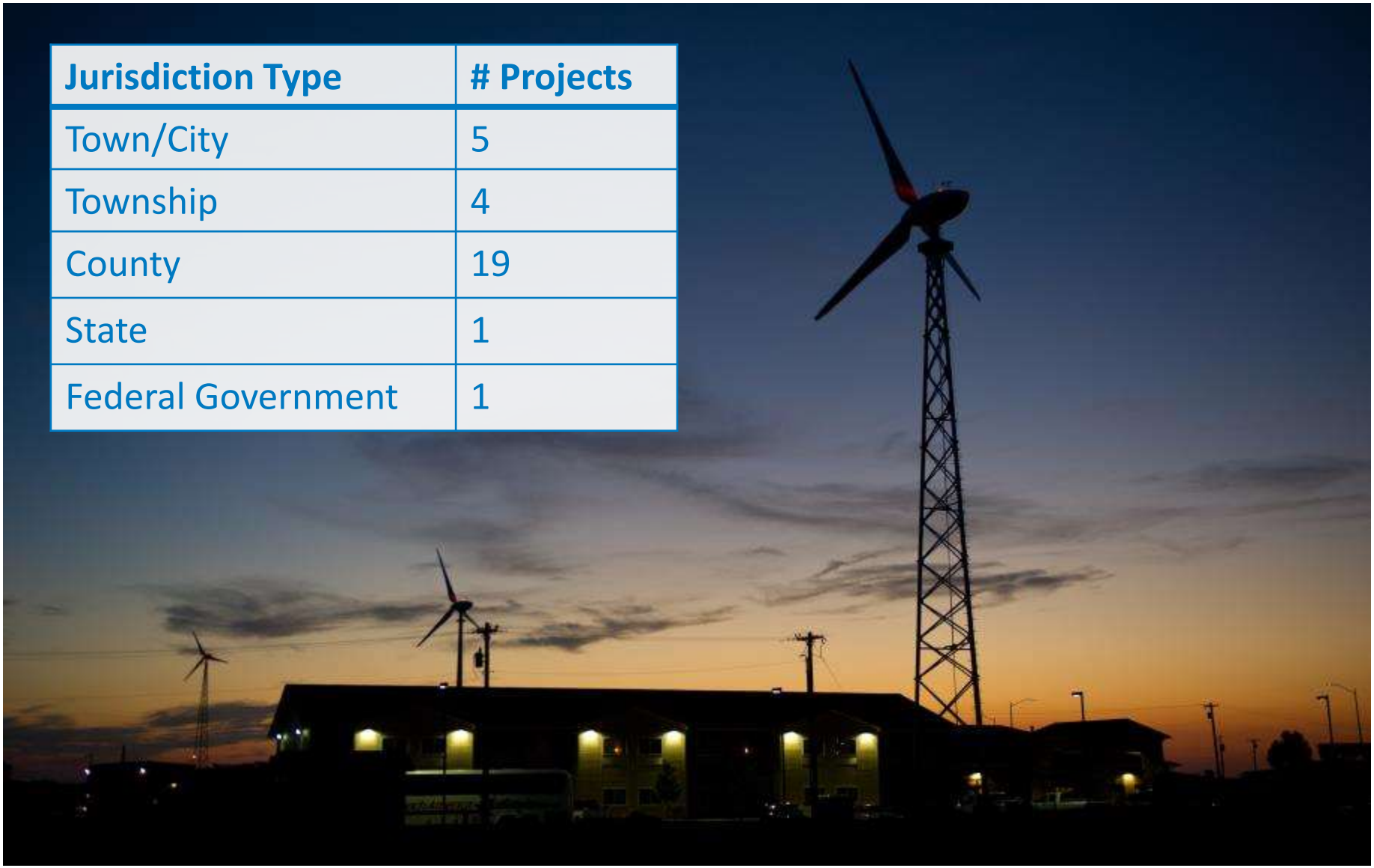
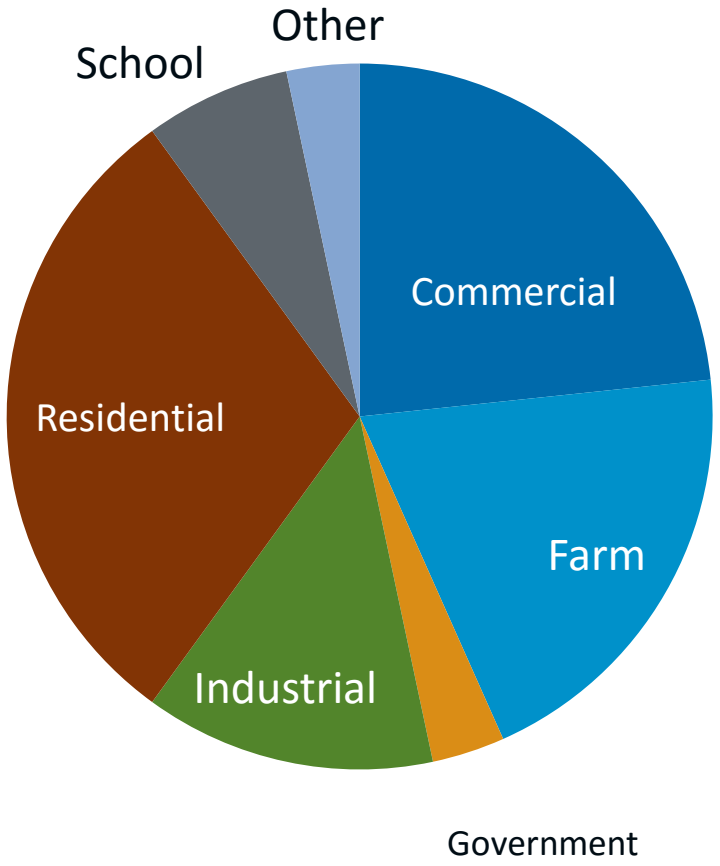


Photo by Dennis Schroeder, NREL 21764

Alpha Data Set: Project Demographics – Customer Category

Customer Category	# of Projects
Commercial	7
Farm	6
Government	1
Industrial	4
Residential	9
School	2
Other	1

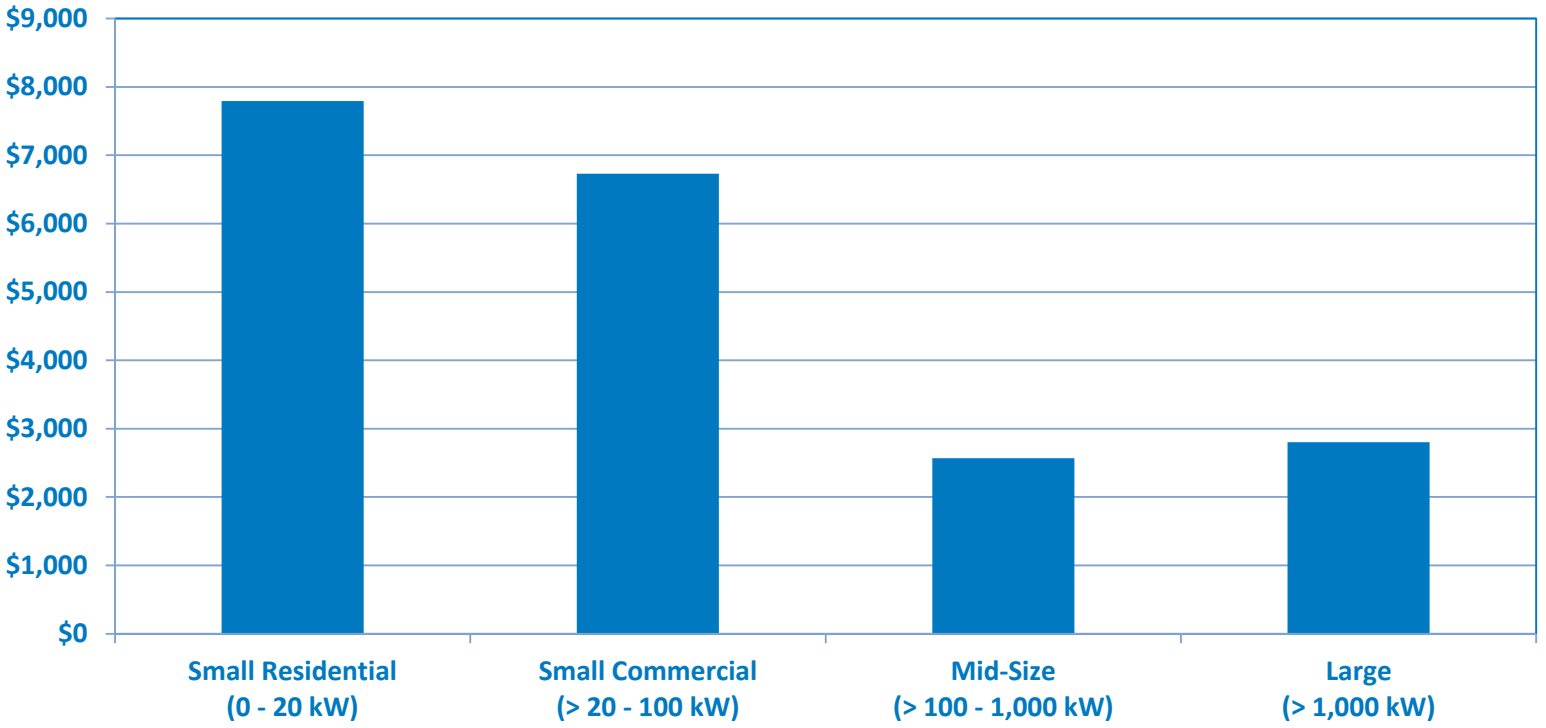


Alpha Data Set Summary: Caveats

- Alpha data set as presented is **preliminary**
- Data QC is ongoing
- Current data set is small
  - Much scatter in the data
  - Not enough data points to look at effects of location, jurisdiction type, interconnecting utility type, etc.
- Need a larger data set to establish a baseline.

Photo from Roger Dixon, NREL 35679

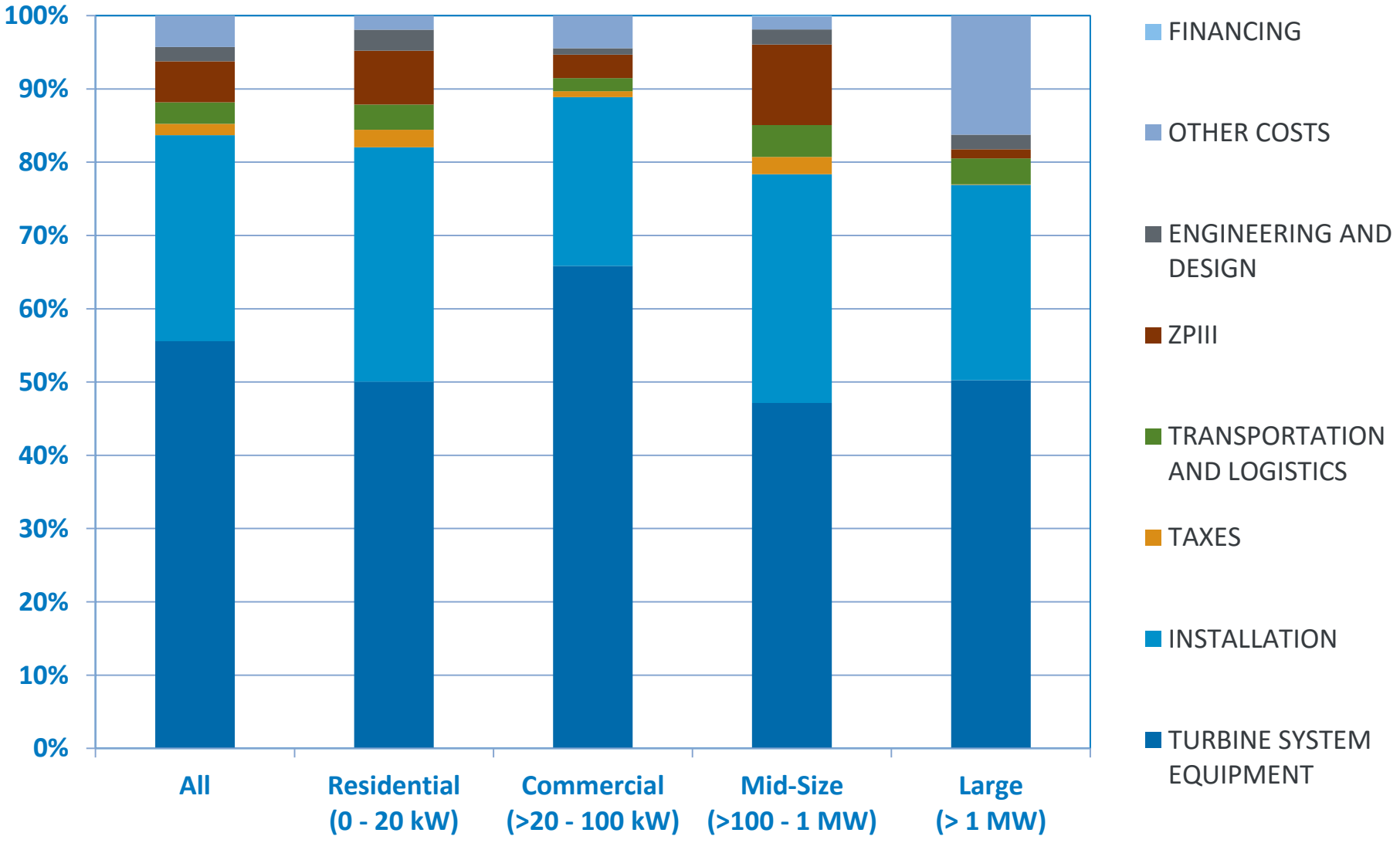
Alpha Data Summary: Installed Capital Cost ($/kW)



Turbine Rated Power	Installed Capital Cost ($/kW)
Small Residential (0 - 20 kW)	$7,793
Commercial (> 20 - 100 kW)	$6,730
Mid-Size (> 100 - 1,000 kW)	*$2,569
Large (> 1,000)	$2,802

* This bin includes remanufactured turbines.

Alpha Data Set Summary: Installed Cost Breakdown



Alpha Data Set Summary: Regulatory (ZPIII)

Number of projects with entries in the following categories:

Taxonomy Category	All	Small Residential	Small Commercial	Mid-Size	Large
ZPIII (Overall)	30	13	11	3	3
Zoning	21	7	9	3	2
Permit (Building/Structural)	28	12	10	3	3
Permit (Electrical)	21	10	9	2	0
Permit (FAA)	17	3	8	3	3
Permit (Environmental)	7	0	5	2	0
Permit (Erosion/Sediment Control)	4	1	1	1	1
Other Permit	3	2	0	1	0
Utility Interconnection	22	6	10	3	3
Incentives Paperwork Processing	15	9	4	2	0

Next Steps, Future Work

Short Term

- Finalize alpha data set
- Incorporate feedback
- Refine taxonomy.

Long Term (Funding Dependent)

- Gather additional project cost information
- Examine cost-reduction opportunities and develop strategies to pursue
- Examine deployment barriers and develop strategies to address
- Publish DW soft costs technical paper, including soft cost metrics and industry benchmarks.

Photo from Roy Rakobitsch, NREL 26792

Discussion: Comments / Questions / Feedback

We want your feedback!!!!

- What is your business model?
- What do you see as the most promising cost-reduction opportunities?
- What do you see as the most significant barrier(s) to DW deployment?

Please see the handout with a full list of questions.

Thank you!

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Comments / Questions / Feedback

All Questions
These will be on a hardcopy handout

- What is your business model?
- Are there jurisdictions you avoid? Why?
- What is the best way to highlight ZPIII challenges? (Cost? Labor hours? Calendar time? Other?)
- Are there particular questions we should try to answer with the data at hand?
- Any suggested improvements to the taxonomy?
- What do you see as the most promising cost-reduction opportunities?
- Are there significant cost reduction opportunities in installation labor?
- What do you see as the most significant barrier(s) to DW deployment? (We're tracking zoning as a big one.)
- Do you have project cost data to share?
- Any other thoughts/ideas?