A Role for Remote Sensing in Community-Scale Wind Projects

Kathleen E. Moore
Integrated Environmental Data, LLC

Loren Pruskowski
Sustainable Energy Developments, Inc.

About IEDat

- Consulting in the wind industry since 2001
- Analyzed remote sensing data (sodar or lidar) with tower data for more than 220 locations

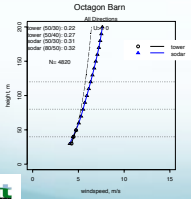
iedat integrated environmental data *information for wise decisions*

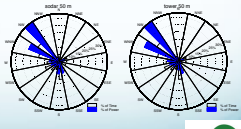
Review of Available remote sensing technology

- Sodar – uses sound. several models available. Power draw varies, but is less than lidar.
- Lidar—uses light. Two models available for profiling, plus at least two for scanning. More expensive than sodar, but may be able to use at some sites where sodar cannot be used.

What do you get?

- Wind profiles (speed and direction) throughout rotor plane; shear parameters
- Separate horizontal and vertical velocities (flow inclination)
- turbulence





Can remote sensing be used as a stand-alone method?

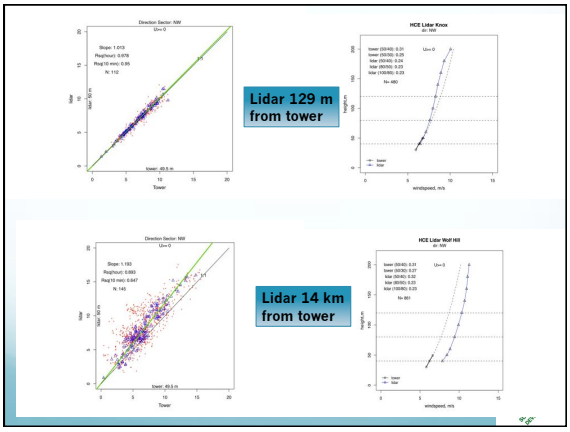
- Availability

  sodar: very dry air, very high wind speeds, rain, snow

  lidar: very clear air, rain, snow

  anemometers: icing, sensor issues

Impacts of differential availability: bias, annualizing, MCP, uncertainty



Costs

- Predevelopment costs (especially wind resource assessment) don't necessarily scale with size of project
- RS costs: $4K to $5K per month.

  Length of campaign: 2 months to a year.

Ways to use RS

- Shear information above tower top; reduce uncertainty in shear & hub height speed
- Use shorter towers?
- Advance the time scale of resource assessment
- Assess the value of additional tower & turbine sites
- Use as a stand-alone resource assessment tool. How much data is needed? How can you get a representative picture of the resource?

Possible "Community Wind" Scenarios

	Net Metered, 600 kW	Net Metered, 1.5 Mw	Wholesale 5 MW
Stand-alone R.S.			
Sodar/lidar, then tower			
Tower alone			

Uncertainty

	Weibull A: 7.5 k: 2.5			
Rated capacity	A=0.6 MW	B=1.0 MW	C=1.5 MW	D=2.5 MW
L-T U (hh)	6.67	6.67	6.67	6.67
Energy Sens. (Gwh/m/s)	0.36	0.40	0.97	1.61
P50, GWh/yr	1.62	1.87	3.86	6.52
P90	1.50	1.73	3.52	5.96
P50-P90 value (retail, wholesale)	$8K, $12K	$9K, $14K	$23K, $35K	$38K, $58K

Protocol

- Data quality screening
- Data validation
- Recommended practices can be found at: www.iedat.com/sodar.html (a parallel document for lidar is being developed through the IEA)

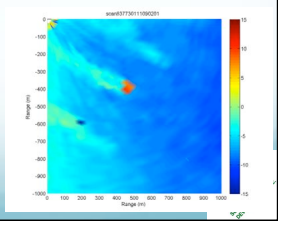
Other Factors

- Retail (net metered) vs wholesale with RECs
- Some markets don't examine the details of the financials (e.g. not-for-profits vs. for-profits)

Further roles for remote sensing

- Scanning for prospecting
- Performance monitoring
- Short-term forecasting
- Scanning lidar output:

(courtesy Peter Clive, Sgurr Energy)



Conclusions

- Remote sensing with sodar or lidar has several potential roles to play in support of community wind
- The cost-effectiveness of remote sensing depends on the project type, the other available resource assessment methodologies and their actual uncertainties
- Close attention to recommended practices is needed to assure quality results

Thank You!

- Integrated Environmental Data, LLC

  Kathleen E. Moore, President

  moore@iedat.com