

IML Air Science



January 2007

Wind Energy

Service Guide and
Qualifications



- Site Evaluation
- Site Selection
- Measurement Systems
- Engineering Evaluation
- Economic Evaluation

IML Air Science has the resources and experience to perform complete wind energy feasibility studies.

- Preliminary site selection
- Meteorological monitoring
- Meteorology analysis and reporting
- Wind resource assessment
- Evaluation of wind power generation potential
- Evaluation of project economics

For more information, contact:

Ronn Smith, (307) 674-7506 or rsmith@imlinc.com

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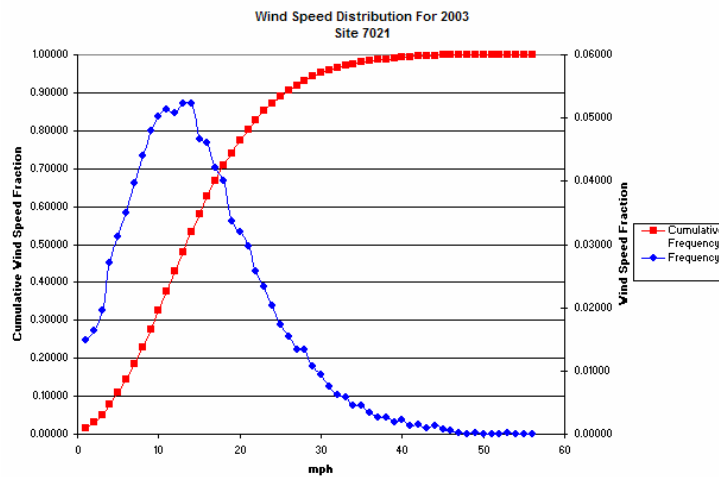
Site Evaluation

Meteorological data collected at the project site are the basis of any site evaluation. IML utilizes custom data processing software to produce useful reports including:

- Summary statistics for wind speed, direction, temperature and barometric pressure
- Wind roses
- Diurnal graphs
- Wind speed distribution or frequency diagrams



These reports characterize the site in a manner that allows for the assessment of power generation potential.



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Site Selection

Preliminary Site Selection

IML's Meteorologists are experienced in assessing local climatic and topographic effects to identify measurement sites with significant potential. Proper placement of measurement systems is critical for accurate assessment of generation potential. Initial site evaluation results in the development of a meteorological monitoring plan for the project area.

Turbine Placement



Some projects include collection of data that can be used to site turbines to maximize the generation potential. This process has the potential to maximize the economic return of the project.

Measurement Systems

IML Air Science designs each meteorological monitoring system to meet the demands of the specific application. IML utilizes OEM agreements with a large number of sensor, hardware, and data acquisition system manufacturers to assure cost effective solutions to monitoring needs.

Tower Systems

IML provides turnkey monitoring solutions:

- Meteorological monitoring systems; single and multiple measurement heights
- Air density measurements (temperature and pressure)
- Installation, operation and maintenance
- Data processing and reporting

Systems are designed for the specific application and components are selected to meet the performance and reliability demands of the project.

Measurement systems can be installed on dedicated or existing towers.



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IML has designed, installed, and operated hundreds of meteorological monitoring systems throughout the Western United States.

Acoustic Profiling

Acoustic profiling using SODAR instrumentation offers several advantages over tower-based measurements. These include:

- Wind profiles across the entire turbine blade
- Profile measurements from 15 to 200+ meters
- Reduced installation requirements (physical, electrical, and permitting)



The relative portability of some SODAR units make micro-siting of turbines possible. Used in combination with one or more fixed measurement systems, a mobile SODAR can be used to locate the most advantageous wind resource in three dimensions.

Engineering Evaluation

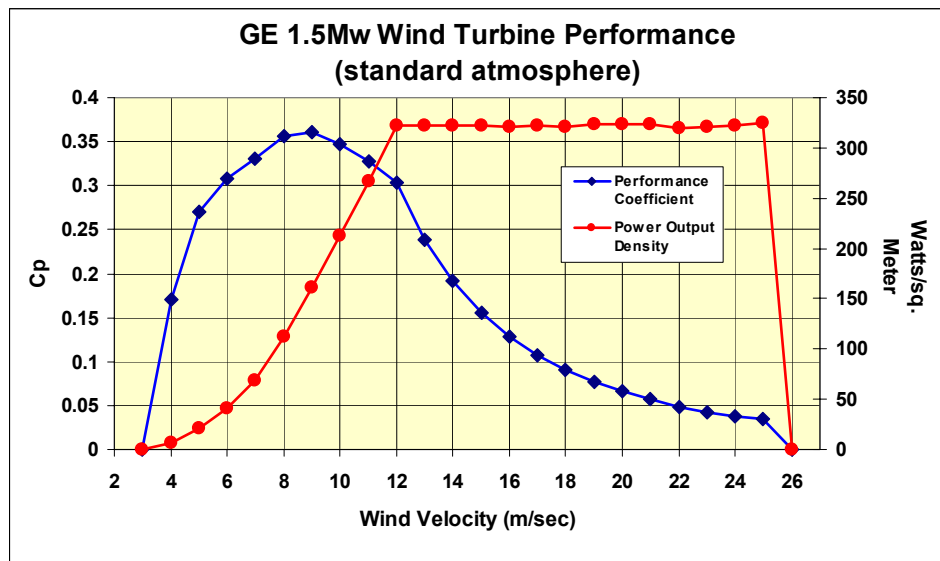
Wind Resource Assessment

This portion of a feasibility study uses measured data to calculate wind energy density and wind shear; critical parameters in characterizing available wind power.

Evaluation of Power Generation Potential

This portion of the feasibility process matches the wind resource with available generation equipment. The evaluation includes:

- Wind turbine comparisons
- 2D numerical modeling of turbine performance
- Load duration curves
- Capacity factor estimation



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Economic Evaluation

An economic evaluation of a wind resource builds on the results of monitoring and the engineering evaluation to provide a basis for economic feasibility determination. Evaluations include:

- Capital and operating cost estimates
- Sales price and production tax credit projections
- Net present value
- Internal rate of return
- Payback period
- Return on investment



Company History

Inter-Mountain Labs (IML) has been providing meteorology monitoring, analysis, and reporting services since its inception in 1979. IML expanded its meteorology services to include wind energy evaluations in the mid-1990's. Since then, the company has provided systems and support services to dozens of wind energy projects throughout the Western U.S.

Key Personnel

Ronn Smith, Air Science Manager rsmith@imlinc.com

B.S. Engineering Physics, Colorado School of Mines

M.B.A. Operations Research, University of Wyoming

Ronn manages wind energy engineering and economic evaluation projects. He is a licensed mechanical engineer with extensive experience in the design, analysis and simulation of energy conversion systems. Ronn is a member of the Western Governors' Association Clean and Diversified Energy Working Group, Wind Energy Task Force.

Shane Hansen, Meteorologist shansen@imlinc.com

B.S. & M.S. Atmospheric Science, South Dakota Tech

Shane leads IML's site evaluation projects. He has experience with dozen of wind energy projects. His extensive educational training is an ideal complement for this experience.

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Kevin Chartier, Vice Presidentkchartier@imlinc.com

B.S. Electrical Engineering, Wichita State University

M.S. Atmospheric Science, University of Wyoming

Kevin's 20 years of environmental and meteorological monitoring experience is useful in his role of providing strategic planning for IML Air Science. He has served as Project Manager for several wind energy projects.

Ernie Scott, Instrumentation Engineerescotte@imlinc.com

B.S. Electrical Engineering, University of Wyoming

M.S. Electrical Engineering, University of Wyoming

Ernie lends system design expertise to wind energy projects. He is the Principal Investigator in IML's infrasonic avalanche identification project. Ernie has 10 years of practical environmental monitoring experience.

Tim Mendenhall, Instrument Techtmendenhall@imlinc.com

A.S. Electronic Technology, Miles Community College

Tim provides technical support to measurement projects. His data communications expertise is central to IML's offerings of extensive remote monitoring options. Tim has several years of experience with SODAR instrumentation, software, and data interpretation.

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