



The Utility Wind Interest Group (UWIG)

*A Positive Force
For Responsible Wind Energy Development*

Introduction and Overview



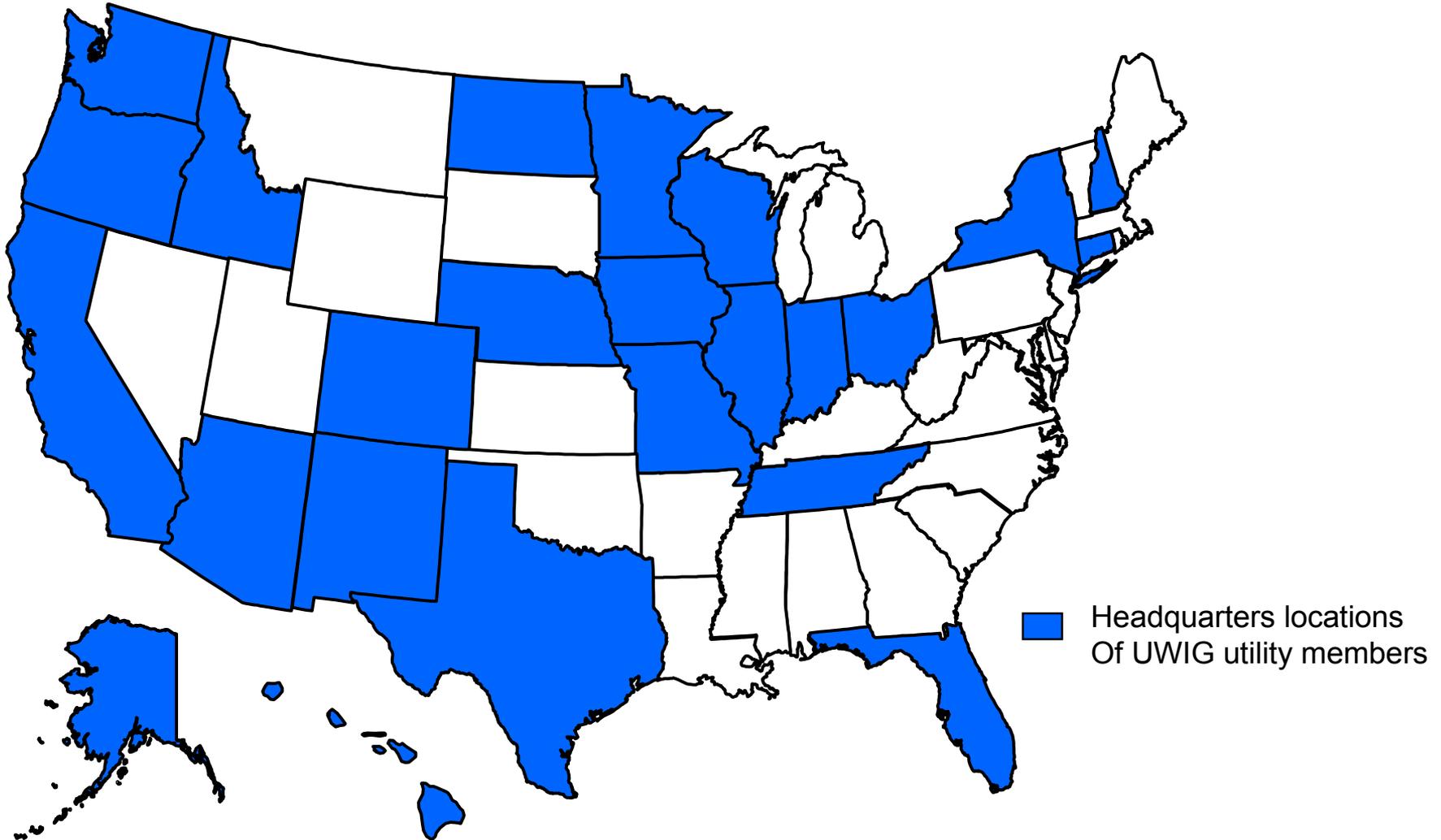
UWIG – A Short History

- ◆ Established by 6 utilities in 1989 with support from EPRI and DOE/NREL
- ◆ Includes Associate Members from wind development community
- ◆ Non-profit corporation governed by board of directors from utility and ISO/RTO members
- ◆ Ex officio members include APPA, NRECA, EEI, and EPRI
- ◆ Currently has 60 members
- ◆ Focus on technical issues

UWIG Mission and Evolution

- ◆ The mission of the Utility Wind Interest Group (UWIG) is to accelerate the appropriate integration of wind power into the electric system through the coordinated efforts and actions of its members in collaboration with wind industry stakeholders, including federal agencies, trade associations, and industry research organizations.
- ◆ Evolving from role of
 - Self-education and sharing experience to
 - Addressing research topics and providing knowledge

The UWIG Membership



A New Cash Crop

1979: 40 cents/kWh

**2000:
4 - 6 cents/kWh**

- Increased Turbine Size
- R&D Advances
- Manufacturing Improvements



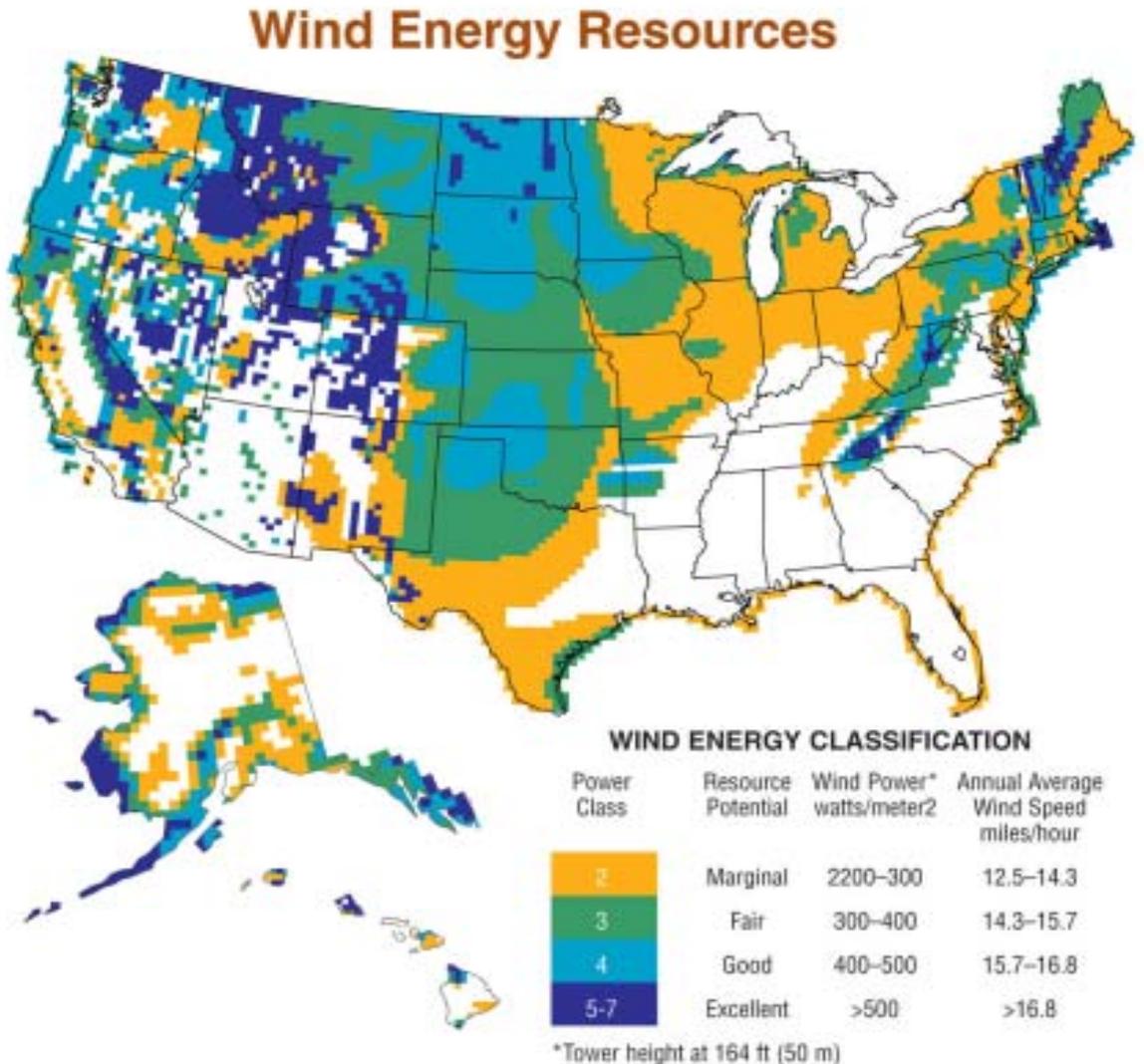
NSP 107 MW Lake Benton wind farm
4 cents/kWh (unsubsidized)

**2004:
3 - 5 cents/kWh**

Source: NREL

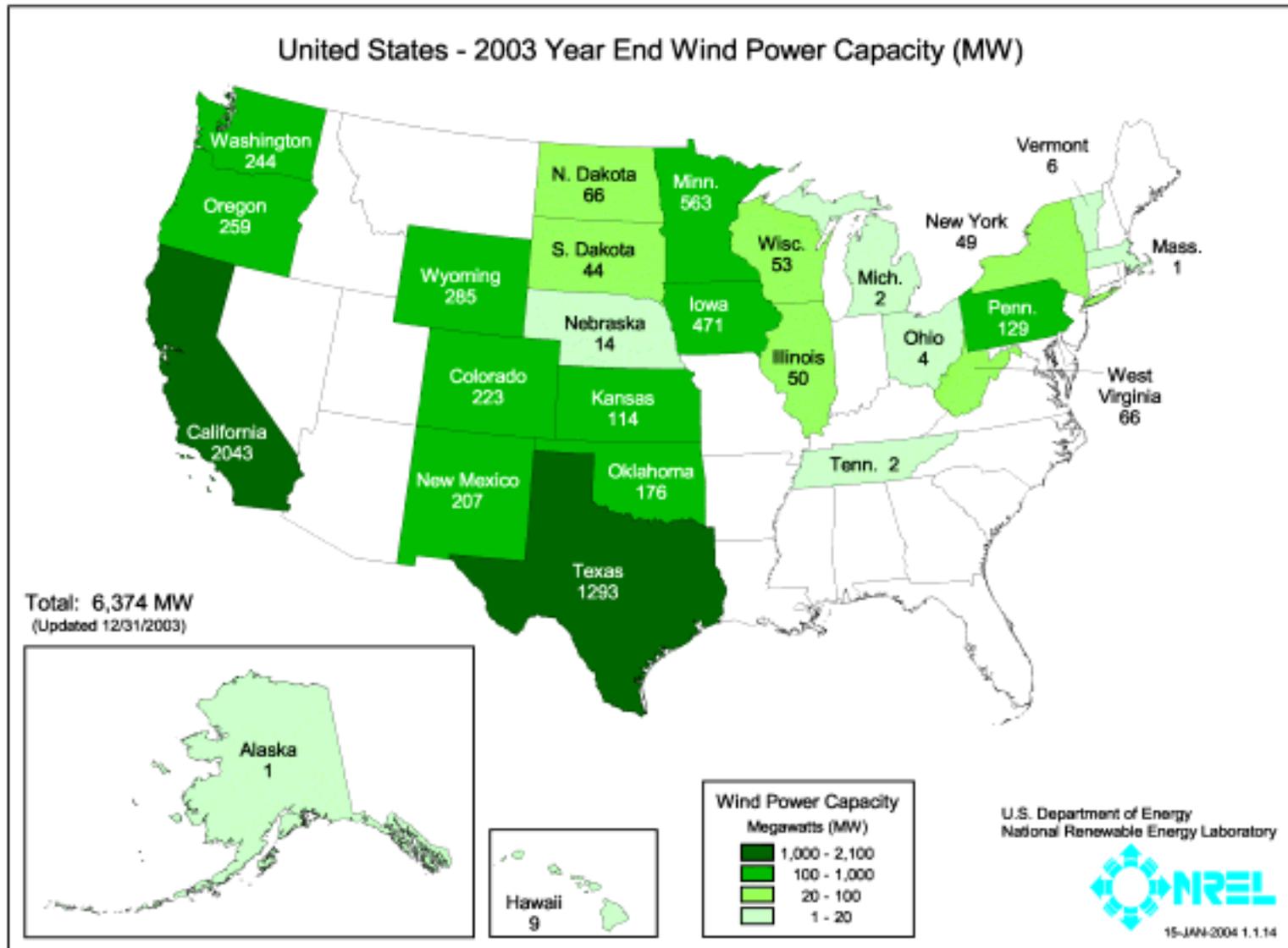
An All American Resource

Rank	State
1	North Dakota
2	Texas
3	Kansas
4	South Dakota
5	Montana
6	Nebraska
7	Wyoming
8	Oklahoma
9	Minnesota
10	Iowa
11	Colorado
12	New Mexico
13	Idaho
14	Michigan
15	New York
16	Illinois
17	California



Source: AWEA

Wind Capacity by State



Perceived Market Barriers

- ◆ Siting
 - Avian
 - Noise
 - Aesthetics
- ◆ Transmission constraints
- ◆ Energy cost
- ◆ Financing
- ◆ Variable output
 - Large system impacts (transmission level)
 - Small system impacts (distribution level)



UWIG R&D Survey

- ◆ Periodic survey of member R&D needs conducted
- ◆ Members asked to identify top concerns related to adding increased wind capacity
- ◆ Top two priorities identified by members are:
 - Operating impact cost of large wind plants
 - Impact of distributed wind on distribution feeders
- ◆ UWIG initiated funded research projects to address these concerns

UWIG Operating Impacts Work

- ◆ Large funded research project to investigate operating cost impacts of 280 MW wind capacity on Xcel-North system of >8,000 MW (3.5%)
- ◆ Investigated regulation, load following, and unit commitment time frames
- ◆ Found ancillary service costs of \$1.85/MWh
- ◆ Stimulated significant industry interest and follow-on work by other utilities

Operating Impacts Results

- ◆ Comparison of study results shows costs are low at low levels of penetration and rise with increasing levels of penetration (~\$5/MWh @ 20%)
- ◆ Costs are driven by uncertainty in wind plant output
- ◆ Variations in wind and load are important in determining true cost
- ◆ Debate has shifted from if it can be done to how much does it cost
- ◆ So far, costs appear to be moderate

UWIG Distributed Wind Work

- ◆ Large funded research project to develop software tools and application guides for installation of wind turbines on distribution systems
- ◆ Provide guidance and direction for new efforts through resource materials in the form of measurements database and case study library
- ◆ Driven by recognition that analytical tools for distribution system planning, design, and operation with radial distribution feeders may no longer be valid for feeders interconnected to distributed generators

Voltage Profile Simulator Page

Click on feeder one-line components to set parameter values. Click "Voltage Profile" button to run simulation and obtain results for specified circuit and generator output profiles.

Voltage Profile Simulator - Microsoft Internet Explorer

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Address <http://www.uwig.org/uwigdistwind/Flicker/VoltageProfile>

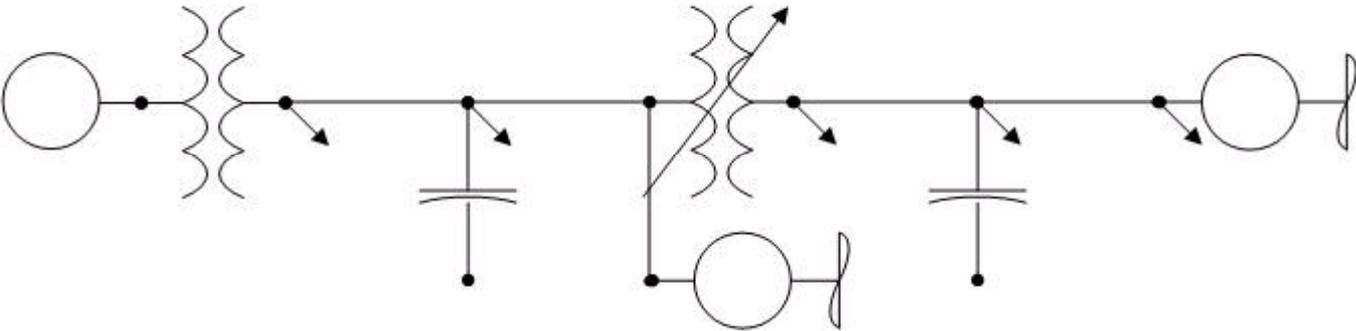
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Distributed

Utility Wind Interest Group

Voltage Profile Simulator

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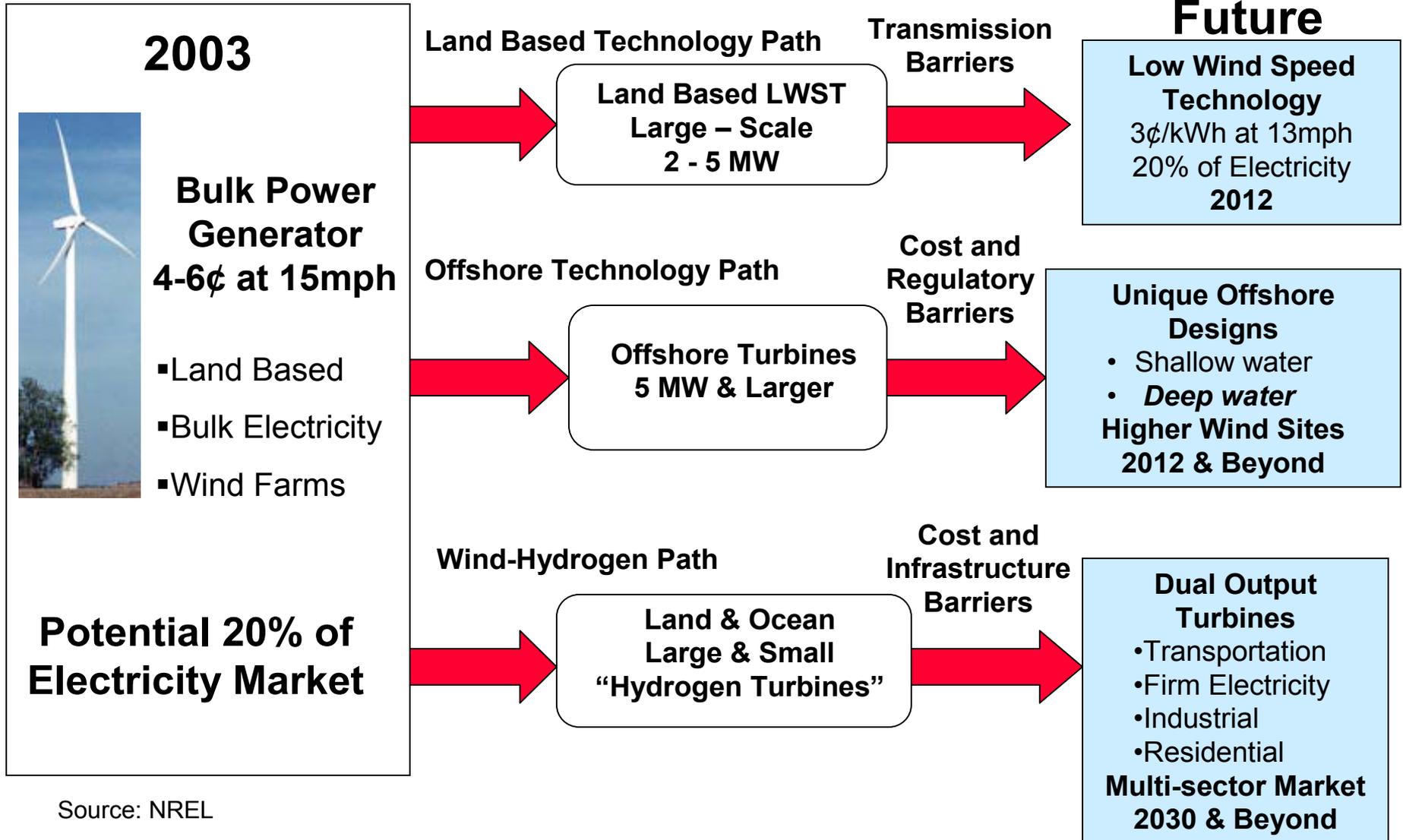


Time Step Size sec Number of Steps

B Max A Max A Min B Min

<http://www.uwig.org/uwigdistwind/LWIGDistWindHome.htm> Internet

Wind Development – A Future Vision



Evolution of the User Groups

- ◆ Recognition of the need for UWIG to take more proactive role in addressing the ongoing technical challenges related to wind generation for the utility industry
- ◆ Outgrowth of the favorable response to the leadership provided through UWIG funded research projects
- ◆ Response to need for analysis and dissemination of information targeted to utility audience

Distributed Wind Application

User Group Scope

- ◆ Engineering software tools
 - Voltage regulation and flicker
 - Overcurrent protective device coordination
 - Economic screening
- ◆ Application guides for P1547 and flicker
- ◆ Case study library
- ◆ Measurement database
- ◆ Maintain and disseminate information



UWIG Meetings

- ◆ Semi-annual technical workshops
 - Typically held in region with interest in wind energy
 - Blend of national, regional, and local interest
 - Address current technical topics of interest
 - Roundtable discussion for utility/ISO members only
 - Site visits to operating facilities
- ◆ Topical User Group meetings and workshops cosponsored with industry parties (NREL, AWEA)

For More Information

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