

MEETING SUMMARIES

ADVANCING RENEWABLES IN THE MIDWEST

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Given the rising costs of fossil fuels, and their role in polluting the environment, including the atmosphere, there is an increasing body of interdisciplinary research devoted to examining the resources of the midwestern United States to determine whether energy alternatives, such as wind or solar energy, are economically and naturally feasible for use in this region (information available online at www.dnr.mo.gov/energy/renewables/wind-energy.htm). This necessarily must include the study of long-term trends in climate as well as the intraseasonal and interannual variability of relevant atmospheric quantities. Also, a better understanding of the climatological frequency and structure of the low-level jet (from about 950 to 850 hPa) is crucial to any discussion of the future of wind energy in this part of the country. Such research is currently underway at the University of Missouri.

The University of Missouri, Columbia, was the host of the First Conference on Advancing Renewables in the Midwest. Regional meetings such

FIRST CONFERENCE ON ADVANCING RENEWABLES IN THE MIDWEST

WHAT: Public, private, and academic sectors from across the Midwest gathered for the first time to discuss alternative energy resources and their feasibility for use in the region.

WHEN: 29 March 2006

WHERE: Columbia, Missouri

as this one, which bring together operational, private, and research sectors to discuss technological and environmental issues in order to find common interests, have been occurring more frequently during the past few years [e.g., the conference on Weather Analysis and Forecasting Issues in the Central United States (Lupo and Market 2003), and the Northeast Regional Workshop (Auciello 2002)].

Those in attendance and speakers at this meeting were from all interested sectors, which included government agencies (e.g., the Missouri Department of Natural Resources and the Missouri Department of Conservation), the private sector, and the academic community. The Joint Chapter of the University of Missouri, Columbia American Meteorological Society (AMS) and National Weather Association (NWA) cosponsored the meeting. More than 210 people attended.

ARE ALTERNATIVES FEASIBLE FOR USE IN THE MIDWEST? Stanley R. Bull from the National Renewable Energy Laboratory (NREL) in Golden, Colorado, discussed the economic, technological, and climatological challenges of

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developing alternative energy in the midwestern United States. After defining renewable energy and outlining the current technology for exploiting these resources, he discussed the climatological factors that make renewable energy feasible here. While the desert Southwest is certainly the most favorable place in the United States for exploiting the use of solar energy, most places in America have enough available sunlight to make this energy source feasible. He showed that locations in the world with less sunlight than our region (e.g., Germany) have been able to use solar energy effectively. The use of wind energy is currently more prevalent in the Upper Midwest and Great Plains States. Most towers in use are approximately 50 m high, however, taller towers (70 m or more) will allow for the more widespread use of wind energy in the Southern Plains and Midwest. Bull discussed the use of biomass energy, ethanol, and other alternatives, as well as the economic factors relating to their production and usage. These included a discussion of tax incentives and advantages for the small-scale producer. Economically, the use of alternatives is becoming more competitive with traditional sources of energy, but the growth of alternatives has been uneven and is influenced substantially by governmental policies.

UNDERSTANDING MISSOURI'S WIND RESOURCES. Richard Anderson, with the Missouri Department of Natural Resources, covered the basics of wind energy in Missouri, including a discussion of the spatial distribution of wind resources as we currently understand them. While wind energy production is proportional to the wind speed cubed, it varies greatly in this part of the country by both season and region. He also discussed the logistics and economics of harvesting wind energy by small producers (home and farm systems) and utility-scale production. This included a discussion of factors for deciding what kind of equipment will be most economical to install and what equipment will produce the greatest economic return. Thomas Carnahan of the Wind Capital Group, which developed Missouri's first utility-scale wind farm, spoke about the Bluegrass Ridge Wind Farm, which was constructed in southwest Gentry County, Missouri, in 2006, and is scheduled to come online in 2007. The project was built with an initial investment of approximately \$70,000,000. He described the fiscal and operational challenges involved in assembling a commercial-scale wind energy project within the current statutory landscape, including financial inducements, incentives, and impediments to a

large-scale wind project. These include inconsistent governmental policies and regulations.

BIOMASS AND INTERCONNECTION OF SMALL RENEWABLE ENERGY SYSTEMS.

Other invited speakers focused on the use and economics of alternatives such as biodiesel fuel and ethanol. This was the subject of a talk by Jenna Higgins, Director of Communications for the National Biodiesel Board, who discussed the current use of biodiesel and the potential environmental and economic benefits of increasing its use, especially in automobiles and trucks. This included information about price comparisons to gasoline, a comparison of greenhouse gas emissions, as well as an increase in vehicle performance. She also discussed where biodiesel is manufactured, where there are plans to develop more, and where it is now commercially available. David Siedel of BioDiverse Energies, Inc., also discussed the use of biomass, in particular, the extraction of acetylene fuel for use in automobile and other small engines. The suggested use of acetylene is not new, but the costs and benefits are becoming competitive with fossil fuels. Bill Brooks from Brooks Engineering Solar Technologies discussed the technical aspects of interconnecting small-scale home and farm renewable energy systems with the utility grid and net metering as a simplified method of billing for the utility. Later that afternoon he held a more in-depth workshop addressing the standards, codes, and testing requirements that have been established for utility-interconnected equipment and systems to ensure safe and reliable operations. In this workshop, he pointed out that there is an economic benefit to becoming a small-scale producer of solar energy, or other alternative energies, and selling that energy back to the utility.

BUILDING TO TAKE ADVANTAGE OF RENEWABLE ENERGY.

Art Boyt, with the Missouri Alternative and Renewable Energy Technology (MARET) Center, Crowder College, discussed the use of technology to achieve "net zero" energy buildings. Such buildings produce as much energy as they consume, or are self-sufficient. The MARET Center has achieved worldwide recognition for its innovative alternative energy program, under the direction of Boyt. He and students at Crowder College designed and built the first solar-powered vehicle to successfully complete a coast-to-coast journey across the United States in 1984. Since then, the college has continued to distinguish itself in world and national solar energy competitions, most recently

the Solar Decathlon in Washington, D.C., where the solar house entry from Crowder was selected as the “people’s choice,” and placed sixth overall in the competition. Boyt discussed the scientific and economic impact of technology used to produce positive energy buildings, from their ability to produce energy that can be shared with power grids for distribution to the ability of such technology to keep jobs and resources within the Midwest.

CONCLUSIONS. During the past few years, regional workshops have become part of a growing trend, indicating increasing cooperation among the private, government, and academic sectors to discuss the common problems facing society and to provide a greater level of service to the public. The First Conference on Advancing Renewables in the Midwest provided an outlet for the interdisciplinary discussion of the pertinent issues relating to the exploitation of alternative sources of energy, including the climatological factors relative to harvesting renewables in the Midwest. Information about this conference, as well as the presentations themselves, can be found on the conference Web site (at <http://weather.missouri.edu/webs/>), hosted by the University of Missouri, Columbia. Given the success of the first meeting, a second meeting has been planned for 28 March 2007.

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REFERENCES

- Auciello, E. P., 2002: Third Northeast Regional Operational Workshop. *Bull. Amer. Meteor. Soc.*, **83**, 1039–1041 .
- Lupo, A. R., and P. S. Market, 2003: First Conference of Weather Analysis and Forecasting Issues in the Central United States. *Bull. Amer. Meteor. Soc.*, **84**, 1245–1247.