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Wind Powering America

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wable Energy Laboratory

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WIND POWERING AMERICA

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INTRODUCTION

At the June 1999 Windpower Conference, the Secretary of Energy launched the Office of Energy Efficiency and Renewable Energy's Wind Powering America (WPA) initiative. The goals of the initiative are to meet 5 % of the nation's energy needs with wind energy by 2020 (i.e., 80,000 megawatts installed), to double the number of states that have more than 20 megawatts (MW) of wind capacity to 16 by 2005 and triple it to 24 by 2010, and to increase wind's contribution to Federal electricity use to 5% by 2010. To achieve the Federal government's goal, DOE would take the leadership position and work with its Federal partners. Subsequently, the Secretary accelerated the DOE 5% commitment to 2005. Achieving the 80,000 MW goal would result in approximately $60 billion investment and $1.5 billion of economic development in our rural areas (where the wind resources are the greatest). The purpose of this paper is to provide an update on DOE's strategy for achieving its goals and the activities it has undertaken since the initiative was announced.

APPROACH

The Wind Powering America (WPA) initiative was conceived as a nationwide public-private partnership. As a first step, DOE established a national strategy team to conduct a series of stakeholder meetings to gain input from a cross section of public and private wind interests, including utilities, developers, suppliers, advocacy groups, regulators, policy officials, industry and users associations, consultants, and state and federal agencies. Based on these inputs, the strategy team selected four themes on which to focus the WPA efforts: federal wind power; state activities; rural economic development; and utility partnerships. Each of these themes required an action plan and the development of specific agency, state, utility, and regional partners. The primary guiding principal was to focus on regions, agencies, and activities that were considered “at the margin” for short-term development by the wind energy community; i.e., those that were vital but would not otherwise be an important short-term commercial target. A second principal was that it was important for WPA to “stay out of the way” of existing and emerging strong commercial markets. Third, the implementation mechanism would take advantage of existing infrastructure and resources to comprise a team from DOE Headquarters, the DOE regional offices, and the National Renewable Energy Laboratory (NREL) with selected support from numerous national and regional public and private specialists.

Federal Activities

The U.S. government is the largest energy user in the world, with an annual consumption of 54,900,000 MWh (equivalent to 18,000 MW of installed wind capacity at .35 capacity factor). While DOE is the chief funding agency of wind R&D, it also manages 53 major facilities across the country with an annual consumption of 4,600,000 MWh. DOE was and remains in a position to show national leadership for all agencies that are required to comply with existing executive orders and other guidance concerning federal sector renewable energy purchases (EO13123 requires federal agencies to purchase renewable energy).

Purchases of renewable energy products would likely feature wind energy, as it remains the lowest cost bulk non-hydro renewable energy power available to potential federal sector facilities. WPA focused on addressing barriers to wind energy purchases. First, federal procurement regulations were examined to determine if and how they would allow the purchase of a premium renewable energy product. Second, discussions and briefings were held with federal agency managers to determine interest in meeting and/or surpassing the intent of existing power purchase directives. WPA launched a pilot effort aimed at addressing these two issues in partnership with the Denver Federal Executive Board (DFEB) in Denver, Colorado, by aggregating the federal load in the area and using the savings to purchase wind generated power. Over 130 federal agencies were contacted by a team of DOE, General Services Administration, and the National Renewable Energy Laboratory (NREL) to present the concept and discuss wind product offerings, their costs, administration, and benefits. Thirty-one of these agencies agreed to make a 3-year commitment to purchase a wind equivalent of 3% of the total Denver area federal load, or approximately 10MW of wind generated power. This effort was announced on Earth Day 2000. Subsequently, WPA developed a workbook (and is supplying technical assistance) for use in replicating the federal load aggregation pilot in other regions of the country in cities with large federal loads.

Representatives from Federal agencies signing up to purchase wind power in Denver, Colorado, gather round the 7.9-meter (26-foot) wind turbine blade displayed at the Earth Day 2000 Wind Power Commitment ceremonies.

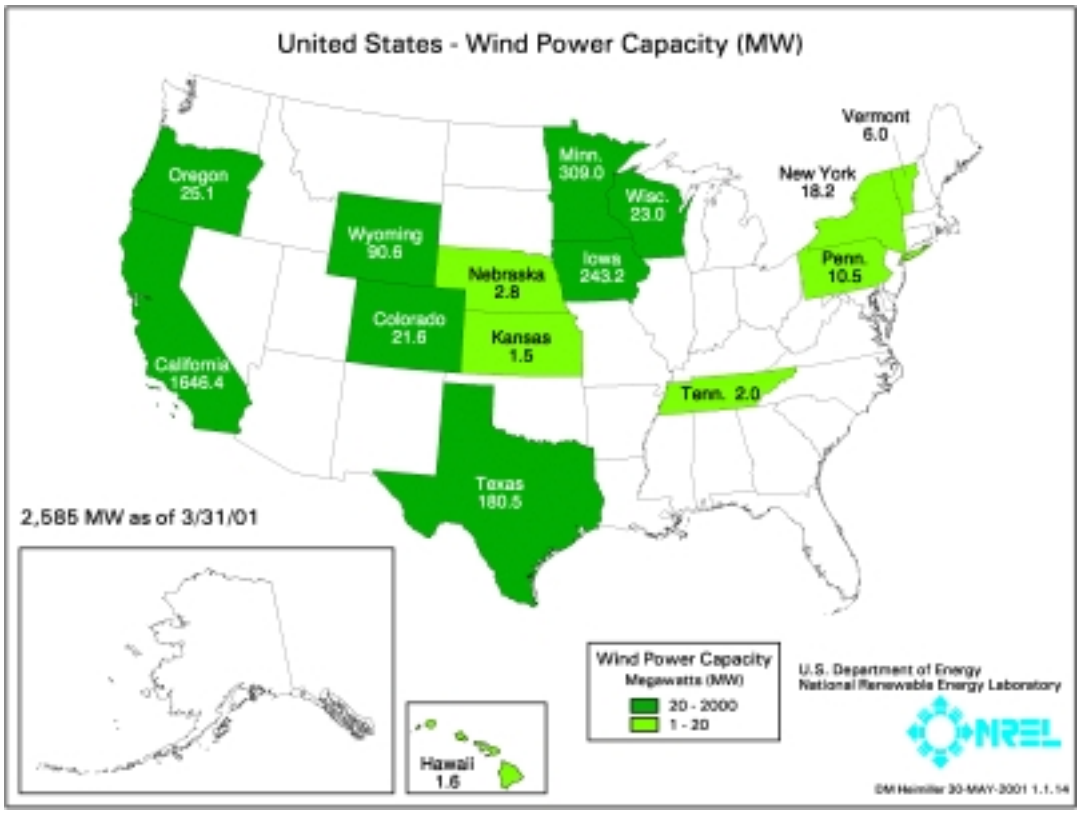
Federal facilities located in states where wind, or "green" power products, are not available may be able to purchase renewable energy credits or "green tags." In a green tag transaction, the customer continues to purchase energy from its existing utility or power marketer and purchases green tags from a different supplier. The two key benefits of green tags to federal agencies are availability and low cost. The purchase of the environmental benefit of a renewable electron vs. receipt of actual power eliminates need for and thus the associated cost of transmission and distribution, as well as the administrative cost of multiple procurements for a multi-location agency. Also, since EO13123 allows for the use of energy efficiency savings to offset RE premiums, at the national level EE savings can be applied to national "green tagging." WPA has been working with the Federal Energy Management Program (FEMP), the primary purchasing agent for power for federal facilities, federal power administrations, and associated affiliates that offer renewable energy credits (e.g., Bonneville Environmental Foundation, BEF) to communicate this option top federal agencies and within DOE headquarters.

The key partner for WPA in moving federal sector renewable purchases forward is DOE's FEMP. For years FEMP has assisted federal agencies and their facility managers in evaluation and contracting related to energy efficiency measures. More recently FEMP has teamed with DOE Headquarters, the Regional Offices, and NREL to help facility managers evaluate their renewable energy options, both for on-site generation and as part of their utility purchase, especially in restructured markets. Additionally, FEMP manages the Renewables Working Group of federal agency facility managers involved in purchases of renewable energy. To date the focus of FEMP's emphasis has been on solar energy products. Based on

existing relationships and expertise, WPA has partnered with FEMP to communicate wind as an opportunity for renewable power purchase for agencies and facility managers. In response to recent emphasis on federal sector conservation as a key element of the new energy plan, WPA will work diligently with FEMP to develop necessary mechanisms and outreach efforts to ensure part of those savings are invested in renewable energy purchases.

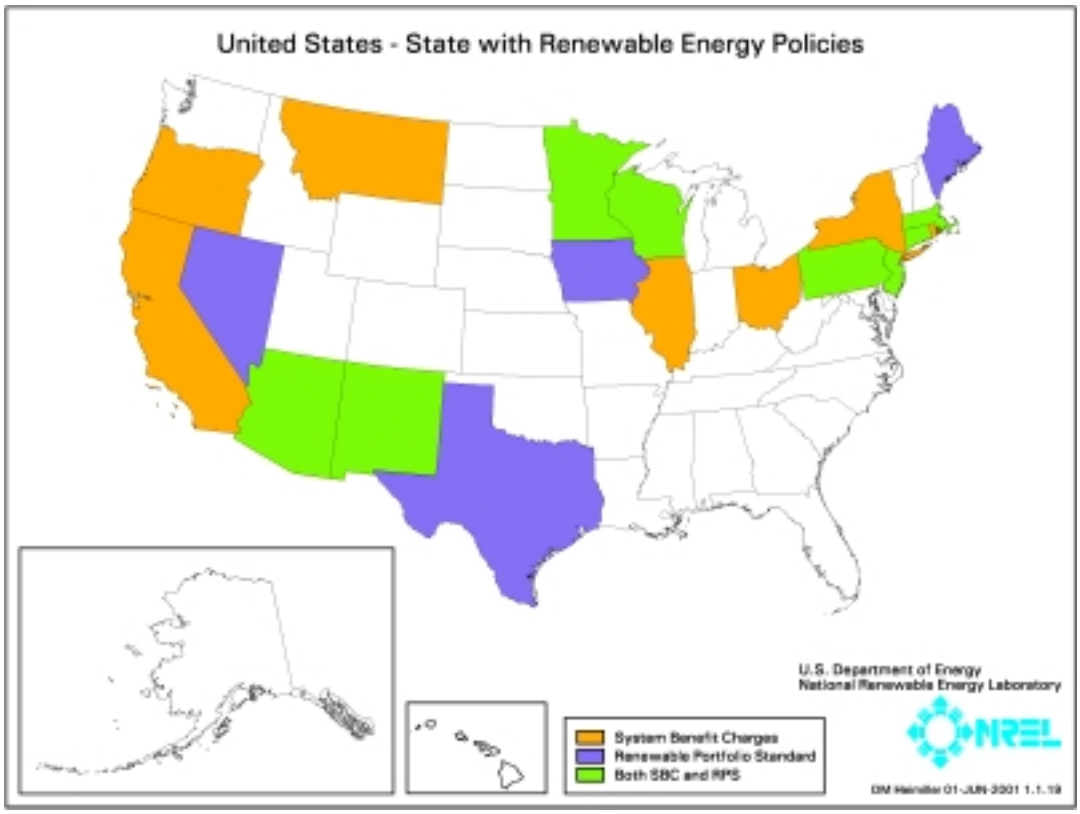
Perhaps the area of greatest potential for wind energy purchases is the Department of Defense (DOD), which uses 28,900,000 MWh/year— 53% of the federal electricity budget and more than any other user in the world. Federal directives notwithstanding, few DOD facilities have expressed an interest in purchasing renewable power, mainly because of the associated price premium. However, the volatility of conventional fuel prices in recent months has piqued the interest of a number of the facility managers in California and nearby and deregulated states. WPA is working with facility managers and the services' energy staff to evaluate the "stable" (and sometimes lower cost) wind option.

State Activities



In June 1999, there were 8 states with 20 or more MW of installed wind capacity. One of WPA's key goals was to increase this number to 16 by 2005 and to 24 by 2010. By the end of 2001, we expect the number of states with more than 20 MW installed capacity to increase to 13. It is our belief that once a state reaches 20 MW of installed capacity, there is enough internal momentum, including press coverage, local awareness, and political sensitivity, that outreach and awareness efforts to expand the resource will occur without WPA assistance. As a corollary, WPA will focus its efforts in states that have significant wind resources but limited (less than 20 MW) wind development.

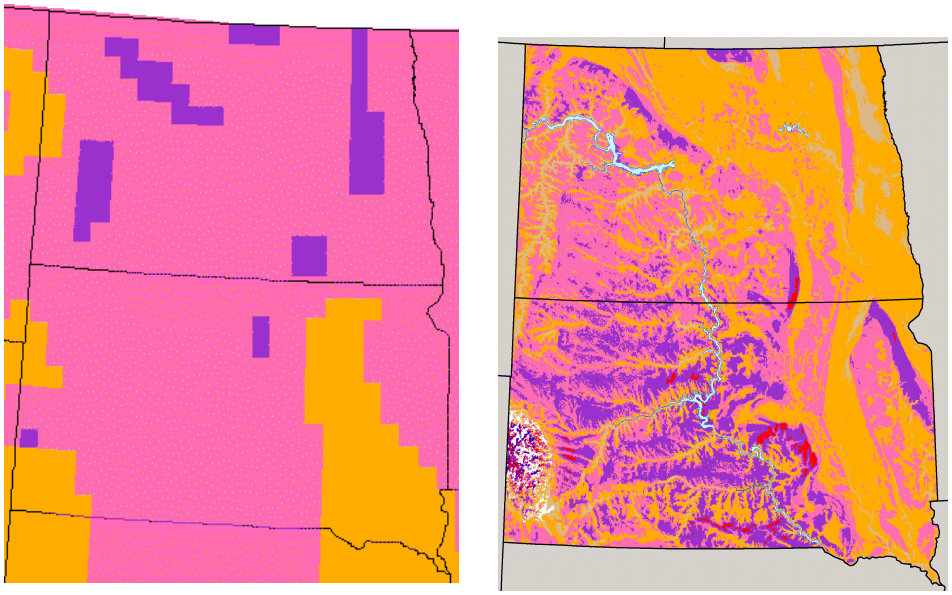
The main driver affecting utility-scale wind installation to date in the United States has been state legislative and regulatory policies. Currently 15 states have adopted System Benefit Charges (SBC) and 12 states have instituted Renewable Portfolio Standards (RPS). Additionally, a number of states are studying these options for future adoption. The rules and guidelines in each state differ in the details. WPA provides support for technical analysis and consultation with interested state policy makers during the consideration and the implementation of the policy. These funds offer a unique opportunity for RE, and wind, being the lowest cost renewable, in particular.



The initial focus of WPA regional/state activities was in the upper Great Plains, where the wind resource is enormous, but the record for wind development is mixed. State wind workshops were designed to communicate the current state of the wind technology, economics, state wind resources, economic development impacts, policy options/issues, and barriers to wind development. The audience for this information is broad, including policy makers, state energy officials, landowners, utilities, advocacy groups, and economic development interests. Because of the success of a state workshop pilot in Great Falls, North Dakota, similar workshops have been held in South Dakota, Nebraska, Kansas, West Virginia, Puerto Rico, Washington, Oklahoma, and Tennessee. Similar events are scheduled this year in New York, Utah, Nevada, Massachusetts, Montana, Idaho, Illinois, and New Mexico. Targeted, half-day workshops have been held in Wisconsin, New Mexico, Idaho, Montana, and Massachusetts. The key to the success of these workshops is working with the state and local stakeholders to plan an agenda that includes key state issues and national and local speakers to ensure a broad and robust attendance. Often, WPA collaborates with other national organizations, like the National Wind Coordinating Committee (NWCC), to leverage key regional wind or energy meetings. The key outcome of these meetings is the formulation of a state wind working group and a set of priority activities needed to move wind development forward in that particular state.

Knowledge of the wind resource is the first and often most important step toward wind development. Not only is this true for individual landowners and developers, it is especially true for state, county and local-level policy makers. Statewide wind maps have often been the vehicles used to expose elected and appointed officials to the significant economic benefits from wind development. While there is a U.S. Wind Resource Atlas that was published in 1987, modern methodologies and newly available meteorological databases combined with GIS software have enabled analysts to develop higher detail regional wind maps. The new technology and processes have also given analysts the capability to overlay resources maps with transmission grids, roads, county boundaries, federal/state/Native American lands, and geographical features. This new capability enables more realistic and robust evaluation of wind development opportunities for landowners, policy makers, and potential developers. By the end of 2001, these higher resolution state maps will be available for 23 states. WPA has sponsored a cost-sharing arrangement to develop of most of these maps.

Comparison of Digital Wind Map from 1987 U.S. Wind Atlas
and New (2000) High-Resolution (1-km^2) Wind Map
North Dakota



1987

2000

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed[a] at 50 m m/s	Wind Speed[a] at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0

One of the special "opportunities at the margin" that has significant potential for wind development being pursued by WPA is the SEP or the Supplemental Environmental Projects associated with federal and state air (and other media) quality violations. Every year over $100 million in fines for air quality (and other) violations are levied to individual site and multisite violators. As an alternative to paying the full fine, a SEP allows the violator to fund a project that has positive environmental effects. Energy efficiency

investments are one of the current approved Environmental Protection Agency (EPA) SEP options. Recently, the Colorado Department of Health (CODOH) worked with NREL to develop a pilot SEP for Colorado violators to purchase wind energy from Xcel Energy's local Windsource program. CODOH negotiated a settlement with a Colorado firm to purchase $300,000 of Windsource rather than paying the full fine. NREL's WPA and SLAP have teamed with DOE's Denver Regional Office, DOE's General Accounting Office, and the EPA to communicate this opportunity to state environmental officials and provide technical assistance in formulating wind options that make sense for each interested state.

While most of the WPA efforts to date have focused on utility-scale wind development, there is an important opportunity for homeowners, ranchers, farmers, and some institutions to install small wind (100kW or less) systems and applications. Some states have seen the value of small wind systems to their constituencies and have developed incentives, including net metering, buy-downs, and tax credits. WPA has developed a small wind guidebook to help the users evaluate the opportunity for small wind applications and has worked with state energy officials to customize the guide for state-specific wind resources, incentives, and contact information. A small wind calculator is the process of being customized for the WPA Website. Additionally, a request for proposals (RFP) is currently in the process to help develop innovative ownership and applications for small (and utility-scale) wind systems.

DOE has always maintained a strong tie to the state energy offices and WPA has continued to build on these relationships. Each of the six DOE Regional Offices plays a key role in developing and implementing WPA activities through a regional office WPA contact. Working through existing and new partnerships, the regional offices undertake a wide variety of state-specific activities as shown in Table 1.

KEY ACTIVITIES	AK	AZ	CA	HI	ID	NV	OR	WA	SRO	MT	NE	ND	SD	WY	OK	KS	UT	NM	CO	LA	TX	DRO	IL	IN	IA	MO	MN	MI	OH	WI	CRO
Federal Aggregation				●											●		●	●	*				●			●					
Workshops/Working groups					●			●		●	*	*	*		*	*	●	*					●								
Earth Day / Marketing							●	●		*	*	*	*		*	●	●	*	*					*							
Regional Website									●						●	●	●					●									*
WPA Stakeholder Meeting																						●									●
State Wind Maps					●					●								●					●								
Anemometer Loan Program					●		●			*		*	*				*														
Wind SEP Replication									*	*							●		*												●
Small Wind Pilot									*	●	●																				●
Native American Outreach	●	●	●				●	●		●					●		●	●													*
Public Power Outreach			●				●	●														●									*

KEY ACTIVITIES	AL	FL	KT	MS	NC	SC	PR	TN	GA	VI	ARO	CT	ME	MA	NH	NY	RI	VT	BRO	PA	NJ	MD	DE	DC	VA	WV	PRO
Federal Aggregation		●												●								●			●		
Workshops/Working groups					●			●						●						*					●	●	
Earth Day / Marketing														●						*	●						
Regional Website											●								●								
WPA Stakeholder Meeting											●																*
State Wind Maps					●		●	●	●			●		●			●										●
Anemometer Loan Program			●							●				●											*		
Wind SEP Replication											●								●								
Small Wind Pilot											●		●	●													
Native American Outreach					●								●			●											
Public Power outreach											●								●								*

- **Planned Activities**

* **Completed Activities**

(Updated 06/01/01)

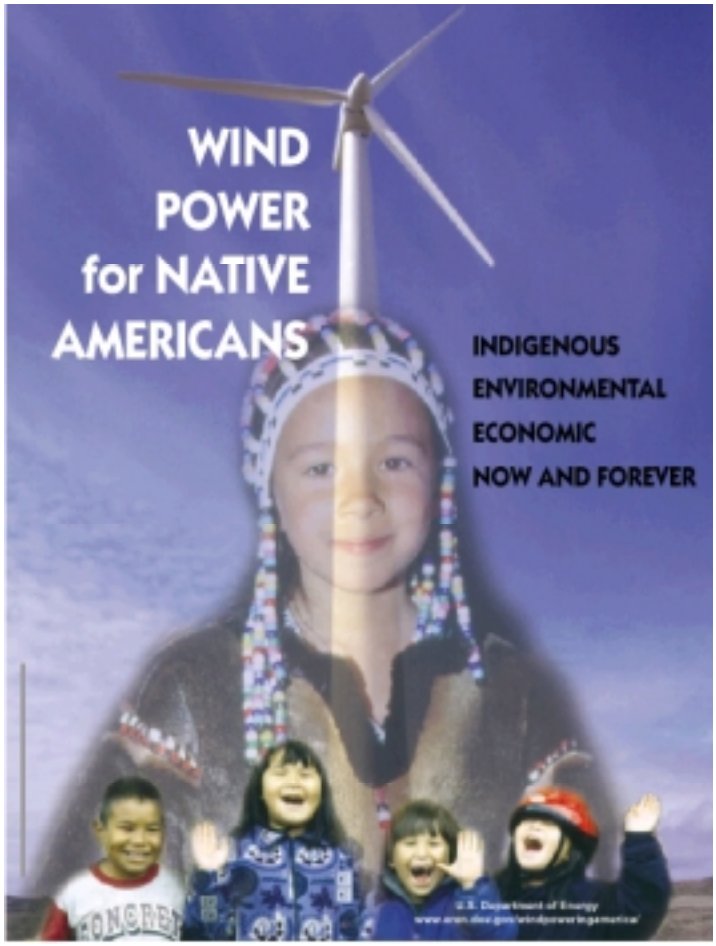
Rural Economic Development

WPA's guiding principals also recognize that wind energy offers the greatest opportunity for rural economic development. This has been confirmed qualitatively by the remarkable landowner attendance to the wind workshops throughout rural America. Currently, the traditional development approach features siting wind projects on private land. These projects generate an annual payment to the landowner of about $2700–$4000/MW of installed capacity. Additionally, local and state taxes and payments in lieu of taxes from wind development provide significant revenue and infrastructure investment for rural communities. Employment benefits also exist during construction with a modest opportunity for relatively high paying jobs in operations and maintenance following initial construction.

Because wind development is a new opportunity for rural landowners, WPA is supporting efforts to communicate the opportunity to rural communities. By sponsoring landowner/town meetings and statewide workshops, documenting frequently asked questions, and providing a landowner-oriented Website (Windustry.com) and the small wind guide, WPA is attempting to help the rural landowners understand their options.

WPA is also working with the NWCC's economic development working group to develop a methodology that will quantify the economic benefits of wind development in a uniform and thorough manner. Additionally, a series of case studies are planned to quantify the benefits that have accrued from significant wind development in a number of states. WPA plans to include a user-friendly economic development spreadsheet (based on the NWCC methodology) on its Website for interested county and state officials.

A special opportunity for economic development also exists for Native Americans. There are more than 700 American Indian tribes and Native Alaskan villages and corporations located on 96 million acres in the United States. Many of these tribes and villages have excellent wind resources that could be commercially developed to meet their electricity needs or for electricity export. Changing national utility policy, a keen interest in economic development, environmental concerns, and availability of low-cost financing have kindled a strong interest in tribal wind development opportunities. However, several key issues need to be addressed, including lack of wind resource data, tribal utility policies, sovereignty, perceived developer risk, limited loads, investment capital, technical expertise, and especially transmission to markets.



To move forward, WPA developed a focused effort to support examination and development of NA wind resources. As a first step, WPA initiated an anemometers loan project (through a cooperative program with WAPA). Currently 16 tribes in 8 states have chosen to participate and an additional 7 are in the application process. To support the resource assessment program, we provide technical assistance on siting, installation, and data analysis. WPA has also conducted 7 regional NA wind workshops thus far and has plans for four more this year. WPA will also support the formation of an interactive NA wind interest working group (NAWIG) to exchange experiences, concerns, and information on wind development. To date WPA has funded an analysis of the tribes wind development opportunities in the Dakotas that led to discussions of an intertribal wind development approach for sale of renewable power and its derivative products to federal agencies. For the second year, we sponsored (16) NA participants in the annual Wind Energy Applications Training Symposium (WEATS). We have also developed a special section of our Website to address NA-specific issues, case studies, and events.

An important impact of the energy crisis in the Northwest is the energy future of irrigators. Water resources are the lowest in a century, and energy rates are increasing and variable. Some states are scheduled for deregulation, and the irrigators (and the related agricultural industry) are very concerned about the potential impacts on their energy and economic future. WPA, in cooperation with Montana's SBC fund and ranchers, developed and initiated a pilot project to evaluate the use of small wind systems for meeting irrigation loads (50-80 kW), which are heaviest during the summer months. The pilots take advantage of state net metering provisions that allow the irrigators to cut their power bills and sell surplus power back to the utility. The Montana SBC will buy down the first cost of the refurbished California turbines and WPA will instrument and analyze the results and communicate the opportunity to other irrigator groups. An innovative ownership and operation and maintenance arrangement has been developed by an entrepreneurial group in Montana to implement the pilot. WPA has funded an analysis of the opportunity and is currently developing a user-friendly interface that will accompany the spreadsheet on the WPA Website. It is our intention to replicate the experience in a number of western and Midwestern states.

Utility Partnerships

The utility grid is the backbone of the U.S. electric system and will continue to be so for the foreseeable future. It is important for WPA to work with utilities and utility groups to accomplish its goals. Probably the most significant barriers to meeting WPA's 80 GW goal by 2020 are regional transmission constraints and operational policies, especially in the Great Plains and the Northwest. WPA is cooperating with NWCC's transmission working group in identifying issues and funding analysis of selected constrained grid nodes, as well as supporting regional capacity analyses. Several wind system opportunities will be studied this year, including the benefits/issues with wind-hydro hybrid operation of the PMA's and the value of short-term wind system operational curtailment to grid availability.

Most of the major wind development in the United States, thus far, has been associated with IOU's. More recently the Federal Power Administrations/Authorities (PMA's) have announced plans for wind development. WPA will continue to work with the PMA's on analysis, development options, and the green tag opportunity. Additionally, WPA will focus its public power utility efforts on the rural electric cooperative and municipal utility sectors. This sector has seen several innovative utilities introduce wind-generated power for sale to their customers in small increments. These preliminary efforts have shown that there is a genuine interest and market in rural America for wind power. While several municipally owned utilities have installed wind capacity, only one rural cooperative owns a wind system. WPA has funded an analysis that shows that USDA/RUS financing provides the public power sector with very competitive wind energy costs, even for modest sized projects. WPA is working with the National Rural Electric Cooperative Association (NRECA) and regional electric cooperative groups to communicate this opportunity to the public power community. A recent joint wind workshop (co-

sponsored by WPA, Utility Wind Interest Group [UWIG], Northwest Public Power Association [NWPPA], and BPA) communicated this opportunity to more than 100 representatives of the Northwest rural electric coop community. This workshop will be replicated in other regions of the United States. A user-friendly version of the coop wind economic analysis spreadsheet will be included on the public power section of the WPA Website. A plan has been developed for coop focused wind outreach materials. WPA is collaborating with UWIG, NRECA, and the American Public Power Association in its outreach and analysis efforts.

Future Opportunities/Conclusions

WPA will continue to support its four major themes through its DOE-NREL team and its many national, regional, and state agencies and institutional partners. It will continue to focus on the activities (and their replication) with agencies and states "at the margin." WPA is committed to working with FEMP to apply energy savings to RE purchases for federal customers, including the aggregation and renewable energy credit concepts. WPA will continue to provide technical assistance to states that are considering or are in the early stages of implementing RE policies that might include wind. We will help sponsor and participate in-state and regional wind workshops and support state wind working groups. We will continue to build relationships with Native Americans, the public power sector, and landowners so that they understand and can pursue the economic development benefits of "home grown" wind energy. We will continue to foster the development of higher resolution wind maps in support of a new U.S. wind atlas. We will work with environmental and energy officials in replicating the Colorado SEP pilot and with irrigators and rancher organizations in replicating the Montana irrigation pilot. As the pilots become commercial and self-sustaining, and as the states attain the 20MW goal, they will be replaced on the WPA agenda with new opportunities. We anticipate a new round of innovative projects from the in-process RFV RFP; supporting, evaluating and replicating them will be an important effort over the next few years. We will continue to support the application of small wind systems to reduce home and ranch/farm utility bills. We will enhance the WPA Website with information and tools to help the various sectors evaluate and pursue wind energy. We will continue to undertake these activities in a manner that leverages our limited resources, utilizes existing relationships and activities. We will also continue to do so in a manner that does not duplicate efforts, and first and foremost, presents wind development as an option for economic development throughout the country.

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