THE OKLAHOMA WIND RUSH:
A Collaborative Approach to Sustainable Energy Development

by

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Abstract

In the three-year period from 2003 through 2005, Oklahoma expanded its capacity to generate electric power from the wind from essentially nothing to almost 475 MW, placing it among the top five states in national wind power production. This explosive growth in renewable energy production was the result of an informal alliance among academic researchers, state government agencies, and developers who wanted to expand their market opportunities in the state. In this paper, the emergence of Oklahoma's wind industry is explored in the context of a collaborative effort that brought key parties together in a way that facilitated the political and institutional support for an industry that has long been perceived to be at odds with the state's historic reliance on fossil energy resources (i.e. petroleum and natural gas).

While Oklahoma is well endowed in renewable resources, it lacks a coherent public planning process, and relies primarily on a developer-driven approach to economic development. In order to motivate public and political support for a new industry, academic researchers first decided to document graphically the extent of the state's wind resource in order to provide interested parties with a clear visual image of its development potential. Following a successful conference that brought several hundred land owners together to hear about economic development opportunities, a public and private sector stakeholder group was formed to lobby the state legislature and generate greater public understanding about the promise of wind. With the enactment of a state production tax credit in 2002 (and a federal PTC), developers selected two of the most promising sites to build wind farms and secured long-term contracts with state utilities.

The continuing success of wind power development in the state is the result of a strategic approach that first wove together aspects of John Kingdon's policy, politics, and problem streams and creating a *window of opportunity* for taking concerted action. Continuing interest and public support have been sustained with statewide conferences, newsletters, an information-rich website, public workshops, and related outreach activities. This paper describes the key parties involved in the wind power collaboration, and how their independent and collective actions have advanced the development of a new industry in the state.

Introduction

The neoclassical economic argument for the substitution of one energy technology for another frequently evokes the causal relationship between fuel prices, declining costs, and alternative technology selection by rational decision makers. Which is to say that under perfectly competitive market conditions, fuel price pressures and the cost of energy technologies alone can be expected to engender the development of more efficient (and possibly cleaner) energy systems to meet societal needs. This perspective is somewhat reassuring to anxious energy observers who often fret that wide-scale dependence on fossil energy could lead to future social disruptions should substitute technologies or fuels fail to materialize in a timely manner if prices were to escalate rapidly. However, in response to the absence of a perfectly competitive market in energy supply and related

technologies, the federal government has traditionally invested public dollars into research programs to research, develop, and demonstrate the next generation of energy systems that might supercede and supplant the existing portfolio of technologies as fuels change or prices rise. For a variety of reasons, including such concerns as terrorism, monopolistic price-rigging, and even increasing atmospheric carbon concentrations, the federal government's response has been driven by the perceived failure of energy markets to accommodate unanticipated and significant environmental and geopolitical issues through price signals alone.

Nevertheless, the additional portfolio of choices provided by public investment in energy research and development cannot be relied upon by itself to serve as a smooth bridge that connects past reliance with future opportunities. An important aspect of moving the notion of sustainable development into public prominence is to improve our understanding of the ways that new energy technologies can be brought into greater use by the public when circumstances warrant. To this end, institutional and social inertia, which can pose serious obstacles to the adoption of nontraditional energy systems, will have to be addressed in a positive and thoughtful manner. While infant industry incentives, such as tax breaks and protected set asides, may be vital to the wider deployment of innovative technologies, appropriate policy changes and innovations are also central to their overall success in market penetration.

Oklahoma's recent success with wind power development provides a useful case for exploring the role of policy innovation in the deployment of a new energy technology. Oklahoma, rated as the nation's eighth windiest state by the U.S. Department of Energy, has recently won recognition as a leading locale for utility scale wind farm development with over 475 megawatts of installed capacity (Opalka 2005). In this paper, I argue that Oklahoma's notable record in attracting wind power development has resulted primarily from the active collaboration of state government, nongovernmental advocates, and academic researchers who have combined their respective skills and talents to foster a receptive political and economic foundation that facilitated the wind industry's entrance and emergence in the state. Moreover, I argue that success was piloted with a rough model of policy change that notes the importance of a critical *window of opportunity* in which energy policy, politics, and problem streams can be woven together in a productive manner (see John Kingdon, 1984). The respective roles of the collaborative partners in applying the Kingdon (1984) framework with wind power are described below with specific attention to the key factors that led them to their desired goals.

Policy Setting

The history of Oklahoma is well marked by the boom and bust cycles of oil and gas production. Both resources have been key to state economic development as well as serving as important export commodities for national consumption. While petroleum is not currently as important to the state's economy that it once was, natural gas production continues to occupy a leading role in the state's energy mix. Due to the slow growth of the state's population, however, conventional fuels such as natural gas and coal (and some hydropower) have been the primary energy resources for the state's electric

utilities. Consequently, with slow demand growth for electric power and comparatively low fuel prices, nontraditional technologies, such as wind turbines, have been historically unable to attract serious consideration from investors and political leaders. While international recognition in small wind turbine development has been won by Bergey Windpower, a Norman, OK company, the state's sole incentive for alternative power generation stemmed from enactment of the Public Utilities Regulatory Policies Act of 1978, which obligates electric utilities to purchase power from qualified alternative power providers at the utilities' avoided cost.

In the wake of the OPEC oil embargo in the mid 1970s, expanded federal research and development on wind turbines substantively improved the attractiveness of the technology in economic and performance terms. With advances in turbine engineering and improved economies of operation and scale, wind turbine costs had declined steadily to the point where wind power had become almost competitive with conventional electric power production. When former Texas Governor George W. Bush deregulated the state's electric utilities in the late 1990s, a 3% Renewable Portfolio Standard (RPS) was included in the 1999 law that mandated that a specified amount of power (2,880 MW by 2009) be generated by renewable energy sources. With rapidity, wind farms soon began to sprout in the windiest regions of West Texas. Wind power developers were benefited by a federal production tax credit that further enabled them to reduce their production costs.

While Texas soon began to chase California as the leading wind power state, Oklahoma's political leadership remained indifferent. Even with its head start in wind, however, Texas sought political approval to develop an environmental monitoring network that would be comparable to Oklahoma's highly regarded Mesonet (Mesocale Meteorological Network) which is comprised of 114 ten-meter instrumented towers with at least one in each of the state's 77 counties. The Mesonet, which was developed initially in 1994 as a joint effort between the University of Oklahoma and Oklahoma State University, was funded by oil overcharge monies returned to the state by the federal government. Each Mesonet station is instrumented with a RM Young propeller vane (model 5103) at 10 meters, and reports wind speed and direction every quarter hour. While originally developed with the aim of providing real-time information on agricultural and meteorological conditions, the designers of the Mesonet appear to have overlooked wind power assessment as a possible application.

In the early summer of 2000, the author and Tim Hughes approached the Oklahoma Department of Commerce, which serves as the state's energy agency, and proposed that a wind power map be created with Mesonet data that would inform state leaders and interested land owners about the potential economic benefit that wind power development could accrue. The investigators argued that wind power development in Texas would likely expand northward into Oklahoma, but that even with future investments, the state and public would remain largely uninformed of the potential value of the state's wind resource. The point was made that despite the recent publication of a national wind atlas, the level of detail and accuracy of the state's wind regions was too vague and uncertain for investors to count on (see Figure 1 below). Consequently in July,

the Department of Commerce funded the proposed Oklahoma Wind Power Assessment Initiative (OWPAI, subsequently shortened to OWPI) using State Energy Program funds from the U.S. Department of Energy. Consistent with the collaborative character of the Mesonet, OWPAI was undertaken as a joint venture between OU and OSU.

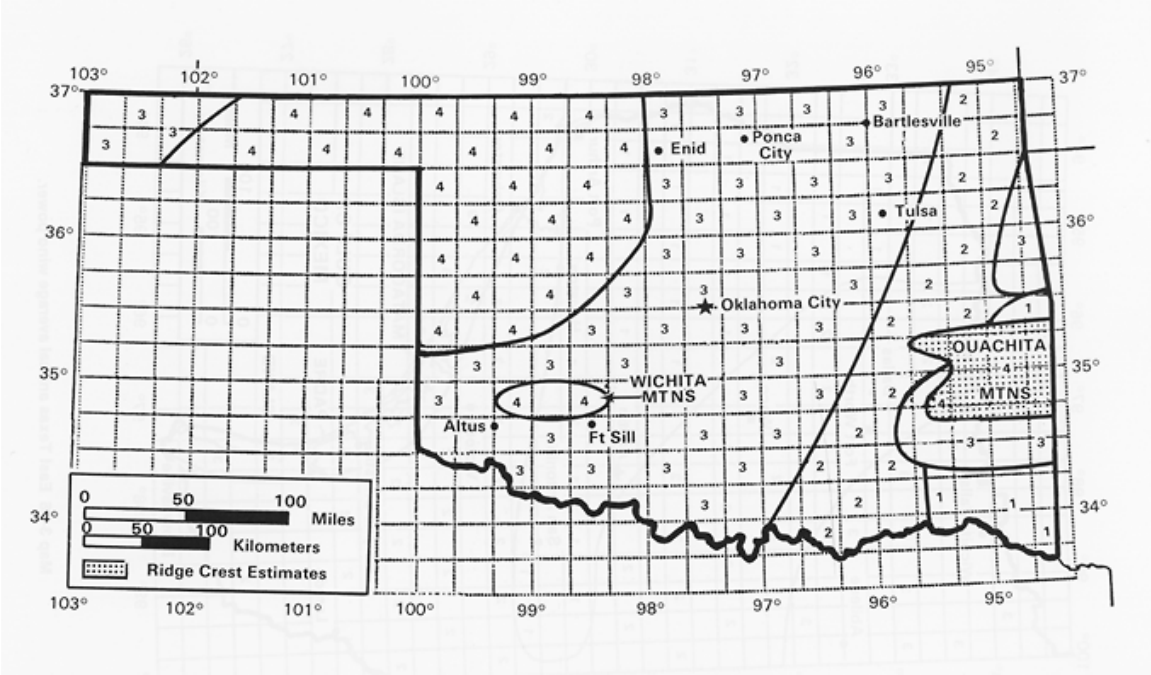

Figure 1. U.S. Department of Energy, Pacific Northwest National Laboratory estimation of wind resources in Oklahoma, 1987. Resolution: approximately 33 km. Resource potentials increase from 1 to 4. i.e. Class 1 areas are poor; Class 4 areas are good.

Shortly after the start of the project, the U.S. DOE Denver office notified the investigators that they would be expected to sponsor and plan a wind power workshop as part of the DOE's Wind Powering America (WPA) program goal for building support for achieving greater national wind capacity through public outreach and education. With the assistance of state officials in Kansas, who had organized a well-received workshop the previous year, the OWPAI investigators scheduled a one-day workshop for the Spring of 2001. Participation and support for the workshop were provided by Oklahoma's Departments of Commerce and Agriculture, OU and OSU, as well as several other parties (such as Western Farmers Electric Cooperative and private developers) that were becoming curious about the potential benefits of wind power development. As part of the campaign to inform the public about the potential benefits of wind power, the OWPAI investigators with the help of WPA personnel began a series of meetings to brief legislative leaders about the research effort and what state policy initiatives might be undertaken to help advance the entry of the wind industry into the state. When the first wind power conference was held in Oklahoma City in 2001, the potential appeal to landowners of receiving several thousand dollars per year in royalty payments from developers for the use of their property led to a rather large attendance of over 400 people. Speakers and sessions at the workshop included federal, state, and local officials as well as wind industry developers who were fairly vocal in stating their interest in

developing wind power projects in Oklahoma. Interest in wind was catalyzed after one speaker from Texas struck a nerve with the audience when he commented that while the Oklahoma *Sooners* may have beaten the Texas *Longhorns* on the gridiron, the State of Texas was way ahead of Oklahoma in wind power development.

An important event at the conference was the presentation and discussion of the initial mapping results the investigators assembled from Mesonet wind data. Figure 2 below illustrates the high degree of geographic detail and accuracy that the data base afforded, and helped to spark interest among workshop attendees for further governmental action. As part of the project, the investigators posted their work products, including several wind maps on an easily accessible Internet website (http://www.seic.okstate.edu/owpi) that enables any landowner or interested party to quickly determine whether wind development is a feasible option. A map server was subsequently added which enables viewers to inspect windy regions along with highway and road networks, electric power transmission lines, and major cities. A more detailed discussion of the map development process can be found in Hughes et al. (2002).

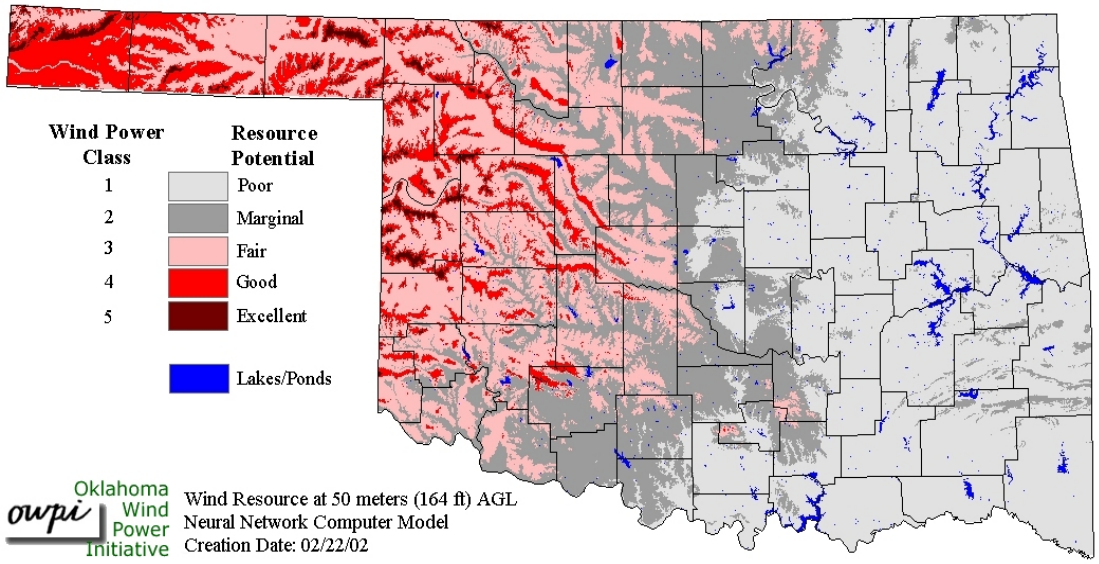

Figure 2. Final version of wind resource map presented at the 2001 workshop. Map can be accessed at http://www.seic.okstate.edu/owpi

At a communal breakfast the day after the workshop, individuals interested in motivating policy actions that advanced wind power development agreed to form the Oklahoma Renewable Energy Council (OREC). OREC's function is to bring together representatives from various sectors of energy generation, retail, and consumption for monthly meetings. It also provides a mechanism for briefing legislators and study panels on renewable energy. Although it began with wind as its initial focus, OREC has expanded to include representatives of other renewable energy sources, such as biomass and solar energy.

With the effective lobbying and educational help of OREC members and WPA personnel, legislative actions taken after the wind power conference proved fruitful. By June 2001, former Oklahoma Governor Frank Keating signed a bill that provides a zero-emission facilities production tax credit of $.005 per kWh between January 1, 2004 and January 1, 2007; and $.0025 per kWh after January 1, 2007 but prior to January 1, 2012. Electric power produced before January 1, 2004 was eligible for a credit of $.0075 per kWh. The state PTC applies only to facilities with a capacity of 50 MW or greater. The law was enacted on January 1, 2002 and became effective on January 1, 2003.

Industry Responds

The first wind farms in Oklahoma began construction in summer and fall of 2003. The first announcement was made by Zilkha Renewables (now Horizon Wind) for a site known as Blue Canyon situated just northwest of Lawton in southwest Oklahoma. The initial Blue Canyon project has a capacity of 74.25 MW, which is purchased by Western Farmers Electric Cooperative. The next two developments are located a few miles north of Woodward (in northwest OK) and include 51 MW developed by the Oklahoma Municipal Power Authority for its own use and 51 MW developed by Florida Power and Light (FPL) for purchase by Oklahoma Gas & Electric (OG&E). The OG&E wind power purchase is one of the largest in the country and provides its customers special renewable energy contracts (see http://www.oge.com/es/wp for details about the program). Wind farm growth continued the following year with an announcement by FPL for a large (106.5 MW) wind farm that straddles Interstate Highway 40 in Weatherford. Before it was completed, Public Service Company announced that it was expanding its Weatherford facility by an additional 40.5 MW. In addition, Public Service Company announced that it was purchasing 151.2 MW from an expansion at Blue Canyon. The total wind power capacity underway in just three years adds up to 474.45 MW, which is a remarkable achievement when one considers that there was essentially no capacity in the state in 2000, and no particular plans for advancing wind power development. Details for Oklahoma's wind power facilities can be reviewed at http://www.awea.org/projects/oklahoma.html.

A variety of factors contributed to the state's rapid wind power development. First, while cost reductions for wind power made it the most "market ready" of the renewable technologies, continued increases in the price of natural gas made wind power increasingly attractive to utilities. Analyses such as the one undertaken by the Colorado Public Utility Commission that compared wind with coal and natural gas-fired electric turbines indicated that wind was competitive on economic grounds, and likely to remain so in the future. In addition, public hearings in Oklahoma that included discussion of interactive polling exercises conducted in Texas revealed that, when given a choice and complete information about the environmental impacts of alternative fuels, utility customers would overwhelmingly favor renewable energy sources rather than coal or natural gas. These findings may have influenced OG&E to change its position toward wind. Further, developers also indicated at public hearings that the state PTC in tandem with the federal PTC were attractive enough to invite capital investment. However,

despite repeated attempts by OREC to foster political support for an RPS, Oklahoma political leaders and industry lobbyists have failed to support it (so far).

With the recent success of the wind industry in the state, the Oklahoma Department of Commerce has expanded its technical staff in renewable energy resources, and has begun to pursue other renewable energy development opportunities, including ethanol and biodiesel production. For its part, the OWPI team has continued to refine its map resources and has implemented a state-wide education and public outreach program to foster greater state support for emerging energy technologies and related subjects.

Discussion

It was suggested above that Oklahoma's success with wind power development followed a pattern of policy change closely associated with Kingdon's (1984) model. Some more discussion about the contributing themes and the way they contributed to the formulation of a renewable energy policy follows.

The Problem Stream. Oklahoma's storied past with petroleum exploration and production is not likely to recur. Despite the fact that almost half of the state's petroleum reserves still remain below ground, continued movement by the industry to offshore deposits has left the state waiting for more attractive economic and policy incentives to alter its declining production trend. With growing concern about natural gas abundance and price, the state has become more attentive to alternative low–cost fuels, particularly if they are of local origin. In addition, growing national concerns about global climate change and carbon pollution, the fear of recurrent terrorist attacks, and international competition for finite fuel resources have focused attention on the economic development potential of novel technology applications to the state's heterogeneous renewable resource base. With the recent loss of more established manufacturing jobs, Oklahoma is more receptive to the opportunities embedded within a national and regional transition to cleaner fuels and technologies. Should the resource endowment in the Great Plains serve as a basis for future economic development and prosperity, Oklahoma would not wish to have overlooked any opportunities to build upon it.

The Policy Stream. Without subsidy, renewable energy has long been considered too costly for serious business people to invest in. In the years following the first OPEC oil embargo, renewable energy has endured repeated policy defeats at the hands of conventional fuel lobbies that have been quick to point out to legislatures that higher-priced energy serves customers (i.e. voters) and shareholders badly. Nevertheless, continued improvement in technology has lowered costs, particularly with respect to wind, and the occurrence of utility deregulation in Texas with an obligation to produce renewable energy made the policy choices more appealing to Oklahomans. As an infant industry in Oklahoma, wind was not perceived as a serious rival to conventional fuels. More to the point, wind was understood to be a complement to the fossil fuel industry, and it also had the potential to provide local economic development benefits.

The Politics Stream. In a state such as Oklahoma, which is largely developer-driven (and which takes pride in its energy economy), private investment in wind is viewed positively if public incentives are not too great. While the political leadership in support of wind power was limited to a small number of influential individuals, the needed incentives sought to promote the industry were also relatively small. With the steady shift of electric utilities from a longstanding adversarial position against wind power to one more openly supportive, the emergence of OG&E, OMPA, Public Service, and WFEC as leading power purchasers signaled the arrival of wind in Oklahoma as a permanent resource. With the wind industry now firmly established in several cities, other renewable energy industries are likely to become more attractive to local and state political leaders.

The Window of Opportunity. The historic cultural rivalry between Texas and Oklahoma served admirably as a backdrop to introduce wind to the state. With the help of very detailed and publicly accessible visual maps that illustrate the most promising sites for future development, Oklahomans (primarily land owners) helped create a policy window through which political action could transpire. With less of a motive born of environmental quality concerns, and one more oriented toward personal economic gain, wind power readily received widespread public and private sector endorsement. The entrepreneurial agents who helped pilot this policy shift were primarily academics from the state's two flagship institutions, an arrangement that furthered the notion that wind policy could benefit the entire state, and not just a few. In sum, the collaboration that evolved among the federal (U.S. DOE), state (ODOC), non-governmental organizations (OREC), and academe (OU, OSU) to apply an existing technology (the Mesonet) to a new economic development opportunity worked very well in this case.

An advantageous aspect of Oklahoma's experience with wind power stems from its compatibility with a national trend toward a more environmentally-sensitive and domestically-oriented energy policy. Should the nation adopt an RPS requirement of 20% for electric utilities as a legal obligation (as it almost did in last year's energy legislation), windy states such as Oklahoma, which have campaigned to attract wind power developers, are likely to benefit early on. In addition, a federal mandate to cap carbon dioxide emissions from fossil energy use will favor the wider adoption of low-carbon and zero emission technologies such as wind power. While surplus electric power export from the state is constrained by the existing power grid, efforts are now underway to rebuild the power transmission system so that wind-rich states can provide more energy beyond their borders. By expanding its industrial energy portfolio, the state is helping itself to prepare for an uncertain, but rewarding, sustainable energy future.

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