Sustainable Development Law & Policy

Volume 3
Issue 2 *Summer/Fall 2003*

Article 4

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Recommended Citation

Newman, Dave. "Empowering the Wind: Overcoming Obstacles to Wind Energy Development in the United States." Sustainable Development Law and Policy, Summer/Fall 2003, 5-20.

FEATURE ARTICLE

EMPOWERING THE WIND: OVERCOMING OBSTACLES TO WIND ENERGY DEVELOPMENT IN THE UNITED STATES

By Dave Newman *

INTRODUCTION

Imagine a world in which power plants and automobiles produce zero pollution, where climate change becomes a manageable problem instead of a growing threat, where farmers and ranchers harvest energy crops alongside agricultural ones, and the Great Plains displaces the Middle East as the main source of energy in the United States. With a combination of policies, incentives, and market transformation, this dream could become a reality within many of our lifetimes.

Wind energy is poised to serve as the foundation of this new clean and sustainable energy economy. Energy derived from wind produces no pollution, very little environmental impact, and has become cost competitive with other commercial energy sources. Since 1995, wind energy has grown at about 30% throughout the world, faster than any other energy source.[1] Although this growth is encouraging, wind still only accounts for a tiny fraction of world energy supplies and many obstacles continue to block broader adoption of wind technologies.[2]

Tapping into this unlimited resource would also serve to stabilize U.S. energy supply and reduce dependence on foreign sources of energy. The continuous flow of wind power could serve as a hedge against the volatility of natural gas, oil and other world energy supplies. In addition, mining clean sources of domestic energy would reduce our dependence on countries that harbor or finance terrorist activities.

Abundant and cheap wind energy could also be used to electrolyze water to create hydrogen. This would serve as a clean and dependable source of fuel for clean-burning fuel cell engines that are expected to begin displacing internal combustion engines over the next two decades. As these new technologies develop, the United States ("U.S.") could utilize its vast wind resources to lead the world to a cleaner energy future.

This paper analyzes the development of the wind industry in the United States and the policies and programs that have been used to spur its growth. Section One discusses the economic and environmental benefits of wind energy today and tracks its recent growth within the U.S. and around the world. Section Two identifies and explains many of the obstacles to growth, including price distortions, discriminatory transmission policies, infrastructure limitations, and local opposition. Section Three includes a discussion of the federal and state incentives in place today and analyzes their impact on wind energy development throughout the country. Section Four provides case studies of several states that have led the way in promoting and developing their wind energy resources. Finally, Section Five presents policy recommendations to maximize wind energy growth in the future.

I. ENVIRONMENTAL AND ECONOMIC BENEFITS TO WIND

A combination of energy efficiency programs and large-scale renewable energy development would significantly reduce a number of environmental and public health problems while spurring substantial economic growth. Improving energy efficiency is widely accepted as the cheapest, fastest, and most environmentally benign way to meet energy demand. Unfortunately, U.S. utilities have moved away from energy efficiency over the past decade, cutting efficiency programs by 45% from 1993 through 1998.[3] The U.S. could produce the same amount of goods and services using 30% less energy by using energy as efficiently as the European Union.[4]

A. Environmental Dividends

Increasing the global share of wind and other renewables in the overall energy supply would significantly reduce the public health and environmental costs of fossil fuel and nuclear energy. Coal-burning power plants cause severe public health problems ranging from summer smog alerts to asthma, respiratory disease, and even death.[5] Reliance on coal also creates enormous environmental impacts including acid rain and the pollution resulting from mining.[6] Nuclear power presents a unique set of concerns, including waste disposal, radioactive exposure, and security.[7]

Wind energy produces no greenhouse gasses or other pollutants and could help the U.S. and other large polluters begin mitigating the potentially disastrous effects of climate change.[8] Unless significant steps are taken to reduce greenhouse gasses, the United States could expect to lose up to 14,000 square miles of coastal land by the end of this century due to rising sea levels.[9] The Bush Administration's most recent report to the United Nations Framework Convention on Climate Change anticipates the following impacts associated with human induced climate change: temperature rises of 5–9°F, ecosystem shifting, widespread water shortages, loss of forest services, excacerbated water and air pollution, and more volatile and disruptive storms.[10]

Wind is a clean, renewable, and domestic source of energy that could supply the entire U.S. with electricity.[11] If the U.S. replaced about 8600 Megawatts ("MW") of fossil fuel power with wind and other non-polluting energy sources over the next 10 years (about double U.S. installed capacity at the end of 2001), U.S. greenhouse gas emissions could be stabilized at current levels.[12] The seven windiest states in the country have the potential to produce nearly 100 times that installed capacity.[13] And when these goals are combined with improved energy efficiency and a cleaner burning automobile fleet, it is entirely possible to see how the U.S. could reduce its greenhouse gas emissions to well below what would have been required under the Kyoto Protocol.

B. Wind Energy Makes Economic Sense

In addition to its environmental benefits, wind energy has increasingly become a wise economic investment. Technology breakthroughs combined with beneficial government incentives has driven down costs from $0.35/kWh in 1980 to about $0.04/kWh today.[14] The Department of Energy ("DOE") and the Electric Power Research Institute projects that continued technological advances will drive the price down to $0.03/kWh by 2004 in high wind areas and between $0.03-$0.04/kWh at more moderate wind sites by 2007-2015.[15]

Several other factors account for the drop in the cost of utility-scale wind power. Improved wind mapping and turbine siting has enabled wind developers to take advantage of better wind conditions, which drives down costs exponentially. Relatively minor increases in average wind speed can dramatically boost output and lower costs. For example, a large power plant in an area that has an average of 7.15 mps wind produces energy at about double the cost of a wind farm with an average of 9.32 mps wind.[16]

Inexpensive computing technology has also contributed to reducing the cost of wind power over the past two decades. Such advanced technology has enabled designers to use extremely sophisticated models to improve machine designs, reduced and streamlined manufacturing costs while improving quality, and allowed operators the ability to remotely monitor and control turbines and more efficiently conduct routine preventative maintenance.[17]

In addition to wind speed, the size of the wind farm also affects the cost of the power generated. In general, a facility with more installed generating capacity will produce power more cheaply than a smaller facility. This results from the larger facility's ability to spread the cost of transmission, interconnection to the grid, and other fixed costs over a larger number of power producing turbines. The American Wind Energy Association estimates that a 51MW wind facility can generate electricity $0.023/kWh cheaper than a 3MW facility.[18] In most cases, that price differential is the difference between a particular project's commercial viability.

Another factor affecting the cost of electricity from wind is project financing. A wind power project's initial construction costs can be up to 40% cheaper when built and financed internally by a public utility as compared with a privately owned and financed independent power producer.[19] This results in part from more restrictive financing terms for privately owned and financed projects. Such restrictions are not imposed when a utility is financing its own project.

Wind energy also makes economic sense for the communities in which it is harnessed. Farmers and ranchers, whose land might generate $120 worth of grain or $20 worth of beef per acre, can make $2,000 or more by leasing their land to wind developers.[20] In addition, wind turbines can co-exist with farming, ranching and other rural land-uses, using only about 5% of the landmass on which they are installed.[21] As farmers and ranchers find it increasingly difficult to stay afloat, wind energy could become a clean cash crop that could help to revive sagging rural economies throughout the country. A recent study estimated that the 240 MW of wind power installed in Iowa from 1998-99 created 200 short-term construction jobs, 40 new permanent jobs, $2 million in new local tax revenue, and $640,000 annually in lease payments to landowners.[22]

C. Recent Growth

The modern wind energy industry has matured significantly over the last decade. The industry had total sales of $5.2 billion in 2001 and is expected to nearly double within the next 5 years.[23] Since 1990, worldwide wind energy has grown from just under 2000 MW installed capacity to nearly 30,000 MW, enough power to meet the demand of approximately 35 million people at typical consumption rates in economically developed countries.[24]

Given the beneficial environmental and economic attributes of wind, it is not surprising that it has become the fastest growing energy source in the world today. In the mid-1990's Europe surpassed the U.S. as the global leader in wind energy production. Today, nearly three-quarters of the world's wind power is generated in the European Union ("E.U.").[25] After a lull in new wind generating capacity throughout the mid-1990's in the U.S., capacity expanded by more than 66% in 2001 to a total of 4260 MW.[26] Despite this huge jump in capacity, wind energy still only produces 0.3% of the nation's electricity supply.[27]

A large reason why the U.S. is falling behind the E.U. in new wind energy development is their divergent policies on global warming. Despite being the world's top emitter of greenhouse gasses, the Bush Administration has withdrawn the United States from the Kyoto Protocol on Climate Change. Ignoring the fact that the U.S. has some of the most abundant untapped wind and solar resources in the world, current U.S. climate change policy instead follows a voluntary approach that does not strive for overall greenhouse gas reductions. In fact, the U.S. DOE currently projects a 17% increase in U.S. emissions by 2012, an average increase of 26.63 million metric tones per year.[28]

In sharp contrast to the U.S., the E.U. and its member nations have ratified the Kyoto Protocol, with a commitment to reduce its greenhouse gas emissions by 8% below 1990 levels by 2008-12.[29] The European Climate Change Program has been created to coordinate the actions of its member nations and to establish an emissions trading system.[30] On September 27, 2001, the E.U. issued a renewable energy directive demonstrating its commitment to increasing its reliance on renewables as a way to combat climate change and to promote "the security and diversification of energy supply, environmental protection and social and economic cohesion."[31]

The U.S. has abundant sources of wind that, if harnessed, could more than supply the nation's energy needs. However, the windiest states in the country currently take little advantage of their vast wind resources. The windiest 7 states have nearly 68% of nation's wind potential but only produce 23% of the nation's wind power today.[32] In contrast, the top 7 producing states have only 24% of the nation's wind energy potential but currently produce almost 80% of the nation's wind energy.[33]

II. OBSTACLES TO GROWTH

Modern wind energy development has been inconsistent in the U.S. over the past thirty years. Following the energy crises of the 1970's, the state of California single-handedly put large-scale wind power on the map. Favorable regulations and relatively high long-term electricity prices helped to sustain wind energy growth in California until the early 1990's.

In the 1990's, wind energy began to boom throughout the world due to technological improvements and lower costs. At the same time, development stalled in the U.S. because of the expiration of favorable long-term contracts and a plentiful supply of cheap fossil fuels. Ironically, the promising, clean technology that was pioneered in the U.S. was becoming big business overseas while the U.S. sat on the sidelines. By the end of the 1990's, a number of factors led to a revival in U.S. wind energy development. These included renewable energy provisions attached to electric deregulation legislation in many states, the effect of state and federal incentives, and a growing awareness of and concern over global warming.

Although wind energy has grown cost competitive with other more traditional sources of power over the past decade, several obstacles impede progress towards wind becoming a major component of the nation's energy portfolio. These obstacles include price distortion, discriminatory transmission policies, infrastructure limitations, and local opposition.

Removing these barriers would unleash powerful market forces and spur significant job creation, sustainable economic growth, dramatic reductions of smog, soot, and greenhouse gas emissions, and increased U.S. energy independence. Fortunately, the collective experiences of several of the nation's leading wind-producing states as well as the innovative policies of the European Union and some its member countries provide a blueprint for creating effective policies that create opportunities for growth.

A. Price Distortion: External Costs and Market-Skewing Subsidies

Even at near-competitive prices, the cost of wind energy remains artificially high because it does not reflect many of its beneficial environmental attributes. Every MW of power produced by wind reduces the environmental and societal cost of pollution from fossil or nuclear power plants. If these external costs were adequately reflected in the price of energy, the cost of wind energy would appear significantly cheaper than it does at currently calculated prices.

According to Lester Brown, director of the Earth Policy Institute, "the key to sustaining economic growth is telling the ecological truth."[34] Unfortunately, unbalanced subsidies combined with current accounting methods that externalize environmental and public health costs prevent energy markets from accurately reflecting the ecological truth in the cost of energy.[35] The disproportionate allocation of government support for non-renewable energy artificially lowers the market price of energy generated from these sources. This distorts the relative cost of energy from different sources and limits or expands the ability for certain technologies to develop commercially.

A study done by the Renewable Energy Policy Project found that fission-related nuclear power received subsidies amounting to $15.30/kWh during the first 15 years (1947-61) of federal support, whereas wind received only $0.46/kWh over the course of its first 15 years (1975-89).[36] These unbalanced subsidies have allowed a comparatively uneconomical nuclear energy source to defy market influences by artificially concealing its true cost. In 2002, fossil fuels received approximately ten times and nuclear power more than two and a half times the total amount of tax breaks and subsidies as renewable energy.[37] Notwithstanding the federal government's relative lack of support for wind energy, the technology and the markets have managed to develop to the point where wind is nearly economically competitive despite these market distortions.

Source: See Note 75

In addition to unbalanced subsidies, the external environmental and public health costs of polluting non-renewables are also not currently reflected in consumer prices. Examples of such externalities include: health care costs from increased respiratory disease, loss of productivity stemming from absenteeism at work and school, the loss of forest services do to acid rain and other pollutants, water pollution from fuel extraction, and the impact on fisheries from mercury and other airborne pollutants. If these costs were incorporated into the market price of energy, the cost of wind and other clean renewables would remain level while the cost of coal, oil and other polluting fuels would increase substantially.

B. Discriminatory Transmission Policies & Infrastructure Limitations

This section discusses how transmission issues impede progress towards more wind power development by considering the following: how certain transmission policies discriminate against wind power; how system inefficiencies limit the availability of transmission services; and the impact of limited transmission infrastructure near some of the nation's windiest sites.

1. Discriminatory Scheduling and Interconnection Policies

Perhaps the greatest impediment to the development of wind resources in the U.S. today is an outdated transmission interconnection policy that discriminates against intermittent power producers like wind and solar. This, in part, is the result of a regulatory framework that was created by and for monopoly-controlled utilities with traditional fossil and nuclear power plants in mind. Although deregulation has brought with it a promise of true competition and customer choice, progress has been slow towards realizing that goal.

a. Scheduling Penalties

The most difficult transmission obstacle for wind producers are scheduling penalties that charge generators whenever they deviate from pre-set delivery schedules. In 1996, the Federal Energy Regulatory Commission ("FERC") issued an Order requiring that utilities under their jurisdiction open their transmission lines to a wider range of wholesale customers.[38] The Order established rules for open access that favored traditional large fossil fuel and nuclear plants at the expense of wind, solar, and other intermittent resources. In order to ensure system stability, reliability, and predictability the Order established rules that severely penalize scheduling deviations regardless of whether the result of intentional manipulation or due to the intermittence of the energy resource.[39]

The American Wind Energy Association and others propose a variety of solutions that promote non-discriminatory scheduling policies while simultaneously ensuring overall system stability. These include real-time balancing markets, the elimination of scheduling penalties, and allowing electricity generators to schedule as close to real time as possible.[40] Real-time balancing markets charge or credit wholesalers for deviations based on the value of the energy at the time of the deviation. This allows for market based efficiencies to influence wholesalers' behavior and eliminates unfair and arbitrary penalties for those, like wind producers, who cannot control precisely when they will be generating power.[41]

b. Interconnection Fees & Agreements

Interconnection fees that are based on peak output as opposed to overall transmission usage severely limit wind power's access to the grid. Although such a fee structure makes sense in allocating charges to an energy producer that is sending a steady and constant flow of electricity at or close to peak capacity over the grid, it unfairly penalizes wind energy producers that rarely achieve peak output. These fees put wind at a competitive disadvantage with more traditional, polluting sources of power because they are forced to recover the cost of these fees over fewer kWh's than their competition.[42]

Complex interconnection agreements often stand in the way of small-scale (less than 2 MW) power producers from developing their projects. Unless utilities are required to simplify the process of connecting to the grid with simpler, standardized contracts, they have little incentive to accommodate these small producers. Some states, like Minnesota, have successfully pressured utilities to adopt such standard interconnection agreements, which enable more small wind producers to come on line.[43]

c. Embedded Costs

Another concern for wind power producers relying on the grid is the way in which the embedded costs required for construction and operation of the existing transmission infrastructure are distributed amongst users. In some parts of the country, transmission owners charge these embedded costs to generators based upon the distance between the generating facility and the nearest "load center."[44] Because wind generation often occurs in remote locations far from where the energy will ultimately be consumed, wind generators are disproportionately penalized by such cost allocations.

d. "Pancaking" (Duplicative) Fees

A fourth problem for wind energy is the current structure in use throughout most of the country whereby the access fees charged by transmission operators "pancake" on top of each other. This requires generators that are geographically distant from their customers to pay the cumulative fees charged by any transmission owner whose lines they are using instead of paying one fee relative to their overall use of the grid.[45]

2. Availability of Limited Transmission Capacity for Wind

Another transmission obstacle to wind power is that existing transmission capacity is limited due to system inefficiencies and a lack of transmission infrastructure in many of the country's windiest locations. In some states, limited interstate transmission capacity has not only dissuaded investments in wind power but has also led to strong industry opposition to adoption of state-wide incentives and programs to study and encourage wind energy development. For example, energy interests in South Dakota, an electricity exporting state with tremendous wind resources, have blocked efforts to increase wind energy development because they fear that it would compete with existing electricity exports generated mainly from coal.[46] As a result, the windiest state in the country currently produces only 3 MW of wind power.[47]

Thermal, voltage, and system operating constraints stemming from outdated technology create inefficiencies that severely limit the amount of power that can safely be transmitted over the grid.[48] As wind generators and other power producers compete for an increasingly limited amount of transmission capacity, alleviation of these constraints will allow more power to flow over the grid and reduce the need for new transmission construction. Upgrading the transmission infrastructure to increase capacity is also cheaper than building new power lines.[49] Other improvements and upgrades such as replacing mechanical switching systems with fiber optics and integrated computer systems would allow system operators the ability to move more power more quickly without sacrificing quality or safety.[50] Such improvements could lead to an increase in productivity and efficiency of the energy system by at least 30%.[51]

3. Stringing Wires – Expanding the Grid

A common concern regarding transmission obstacles to new wind development is the need to string wires out to remote locations with the best wind resource availability. There are two major issues related to this concern: the environmental and social impact of new power lines and identifying who should be responsible for installing and managing these interstate regional routes.

The impacts of new power lines and transmission facilities, however, must be balanced against the impacts of existing polluting and fuel-intensive power plants. The environmental and public health costs of building new transmission infrastructure out to clean renewable energy sources is a tiny price to pay in relation to the benefits of reduced air and water pollution, decreased respiratory illness, and lower greenhouse gas emissions. The emphasis must not only be on increasing the overall amount of wind and other renewable energy that is generated, but also on dramatically increasing energy efficiency so that renewables become an increasing percentage of overall energy use.

C. Local Opposition

Despite economic and environmental benefits of wind power, some wind projects face local grassroots opposition to development. This opposition usually stems from environmental concerns such as wind turbines' impact on migratory bird flyways or fisheries (in the case of offshore turbines) and visual and noise disturbance.

Cape Cod has recently become a hotbed of local opposition to a proposed wind farm in Nantucket Sound. The $500 million project would be the largest wind facility in the country: consisting of 170 turbines approximately 5 miles off shore that would stretch over 25 square miles and produce a peak output of 420 MW (enough to power over half of the Cape).[52] The Alliance to Protect Nantucket Sound is organizing opposition to the project claiming that it will create a "permanent industrial facility in a pristine natural environment."[53] To assuage public concerns and minimize environmental impacts, wind energy projects must be subject to public participation.

Indeed, utility scale wind farms can have serious environmental impact if they are sited improperly. A common concern is the impact wind facilities have on birds. Although avian deaths continue to occur due to collisions and electrocution, the numbers are very small relative to avian mortality resulting from other human structures like vehicles and plate glass.[54] Even these deaths can be minimized, however, with careful siting of turbines, proper study of birds sight and flight patterns, and reducing the number of wind measurement towers.[55] It also should be kept in mind that the environmental impacts of wind facilities are extremely small when compared with those of fossil fuel and other traditional polluting plants, in addition to the impact caused extracting and transporting fuel and waste.

III. OPPORTUNITIES FOR GROWTH

Many of the obstacles discussed in the preceding section can be addressed by implementing and strengthening policies and incentives supporting wind energy. For example, mandates that require utilities to develop wind energy projects force those utilities to become strong advocates for ensuring that their regional transmission policy is favorable to wind. And once transmission policy is reformed, an increasing number of wind projects would become commercially viable independent of government mandates.

Myriad policy tools have been used throughout the country in an effort to spur this type of growth, although not often in an integrated and comprehensive fashion. While some states such as Minnesota, Texas and California have taken an active approach to encouraging renewables, others have done little. In addition, effective federal policies such as the Production Tax Credit have been enacted only for short periods, allowed to expire, and then reenacted for another short term. This inconsistent approach has created boom and bust cycles of investment rather than encouraging a stable and long-term investment environment that would best benefit the growth of these nascent renewable energy industries.

Support and incentives from federal programs are uniformly available throughout the country. However, state and local policies and incentives for wind are by no means uniform. In fact, much of the disparity in wind production between particular states can be attributed to the degree to which state incentives and programs actively promote the technology. Creating an appropriate, efficient, and effective governance structure is an essential step towards widespread and pervasive renewable energy development. Policymakers must choose wisely among a broad array of options by harmonizing the policies of different governmental entities and across competing energy industry sectors. These range from market based mechanisms such as ecological tax reform to regulatory approaches such as stricter pollution controls. Absent a more integrated and comprehensive approach, the enactment of disjointed and uncoordinated renewable energy policies runs the risk of redundancy, impotence, and a lack of popular support. The following is a discussion of a variety of renewable energy policies that have been used within the United States and Europe. The list is not exhaustive.

A. Governmental Support for Market Stimulation & Commercialization

1. Research Development & Demonstration (RD&D)

The U.S. DOE's Wind Energy Program provides support for research and development of wind energy technologies and serves as a clearinghouse of important information for industry and government decision-makers, public interest organizations, and the general public. The program is run through the National Renewable Energy Laboratory's National Wind Technology Center in Golden, Colorado and the Sandia National Laboratories in Albuquerque, New Mexico. The Program is divided into three research areas: Applied Research, Turbine Research, and Cooperative Research and Testing.[56]

The Applied Research division focuses on developing technological breakthroughs in turbine engineering and manufacturing. To accomplish this, they analyzes wind dynamics, aerodynamic and structural design, and work to develop more sophisticated control systems and components.[57]

The Turbine Research division develops public-private partnerships to research, design, build, test and refine commercial wind energy systems. Private partners are invited to participate based on a competitive solicitation process and, once chosen, share in part of the cost of the project.[58]

The Cooperative Research division works to educate and involve the public to help foster broader market acceptance of wind energy. The division also works to help the electric industry integrate wind into the energy supply.[59]

In total, the Wind Energy Program received $40 million in FY2001 to carry out its work.[60] By contrast, federal R&D funding for coal was $170 million in FY2001.[61]

2. Public Benefits Funds/System Benefits Charges

Public Benefits Funds ("PBF") are typically used to ensure continual financial support for state renewable energy programs, energy efficiency programs, and low-income energy assistance. The funds are supported by small charges that are regularly assessed on electricity consumption in the state. Fifteen states currently have some sort of PBF in place and all but one (Maine) require mandatory charges.[62]

Massachusetts established a Public Benefits Fund that will direct $150 million over five years to renewable energy programs.[63] The fund's resources are currently being focused on development of green buildings, distributed renewable power, and a green power development program.[64] The fund also provides grant money for projects developing renewable power technologies and for the purchase of green power.[65]

Oregon's Public Benefits Fund assesses a 3% surcharge on all electricity users inthe state.[66] This raises $60 million per year, 13% of which has been earmarked for renewable energy programs.[67]

California leads the nation with its $540 million renewable energy trust fund.[68] Of that amount, $240 million will be spent on the development and maintenance of existing renewable projects and $161 million on new projects.[69] As of the fall of 2001, funding made available under the program has supported the development of over 900MW of new wind generating capacity in the state.[70]

3. Government Green Power Purchases/ Aggregation

One of the most effective ways government entities can support growth in renewable energy markets is through Green Power Purchases whereby they commit to purchase large quantities of renewable energy over an extended period of time. By directing its purchases in this way, governments can dramatically increase demand for renewables, thereby helping to create economies of scale that reduce price and increase reliability. Directed government purchasing has been one of the most effective ways of establishing viable commercial markets for recycled paper and other materials.

The U.S. government is the largest single energy user in the country, spending over $4 billion annually on electricity.[71] Several federal pilot projects have begun where certain government agencies have agreed to purchase renewable energy. States and municipalities throughout the country have also agreed to such purchases. The city of Santa Monica, California became the first city in the country to switch over to 100% renewables in June 1999.[72] The agreement calls for approximately 5MW of green power for which the city will pay a 5% premium.[73] The energy is provided by The Geysers – the world's largest geothermal resource.[74]

B. Financial Policy

1. Production Tax Credits

Originally passed into law as part of the Energy Policy Act of 1992, the Renewable Energy Production Tax Credit ("PTC") allows wind energy producers a $0.015/kWh credit for ten years after a qualified facility enters service.[75] Adjusted for inflation, the credit is worth $0.018/kWh today. The availability of the PTC has served as an essential tool in enabling wind energy producers to secure financing for projects that otherwise may not have been available to them. Because the credit depends on production instead of a facility's rated capacity, it creates incentives for increased efficiency in design and operating productivity.

Although originally set to expire at the end of 2001, in March of 2002, Congress extended the credit for two years until the end of 2003.[76] Legislation currently pending would further extend the credit to the end of 2006.[77] The DOE's Energy Information Administration predicts that the availability of the extended tax credit would result in a 17.24% increase in the non-hydroelectric renewable share of the total U.S. electricity market by 2020.[78]

The PTC has been one of the most important market drivers for wind energy over the past decade, enabling wind to compete economically with more traditional forms of subsidized energy like gas, coal, and nuclear. However, uncertainty surrounding the availability of the credit over the long-term has undermined some of its beneficial effect. Wind developers and their financial backers continually struggle to plan projects beyond the current deadline of the credit because they are unsure if the political environment will support yet another extension.

2. Production Incentives

Similar to the PTC, the Renewable Energy Production Incentive ("REPI") provides direct financial support for wind energy development. REPI is available to government-owned wind production facilities as well as not-for-profit electric cooperatives. Instead of a tax credit, however, qualified facilities are eligible for annual incentive payments of $0.018/kWh (inflation adjusted) for the first ten years of operation and payments are subject to the availability of annually appropriated funds. The program has paid out $2,440,907 to wind energy producers from 1995 through 2001 for over 150 million kWh generated.[79]

In addition to the federal production incentive (REPI), 13 states also currently provide some form of renewable energy production incentive.[80] Minnesota's "Wind Energy Generation Incentive" establishes a production payment of $0.015/kWh for facilities under 2MW.[81] The payment was implemented to help developers of small wind farms who may not have a large enough tax liability to take advantage of the federal tax credit. Qualifying renewable energy facilities in the state may receive the payment in addition to the $0.018/kWh credit available at the federal level.[82]

3. Electricity Feed Laws

Electricity Feed Laws ("EFL") mandate fixed payments by utilities for renewable energy generated by independent power producers. Germany, Denmark, and Spain have relied on such laws over the past decade to spur the development of well over half of the world's wind energy generating capacity within those countries.[83]

Enacted in 1990, Germany's EFL specified rates that were calculated as a percentage of average electricity prices and were set differently depending on the source of the power.[84] By requiring utilities to purchase renewable energy from independent power producers at commercially attractive rates, the economic climate for renewable investments in Germany stabilized and became predictable, thereby ushering in an era of serious investment opportunities. As a result, Germany experienced a 5000-fold increase in wind energy capacity since 1990.[85]

In 1997, Spain enacted energy legislation setting a goal of doubling the nation's renewable energy supply to 12% by 2010.[86] The law requires utilities to acquire all renewable energy from approved projects and mandates premium payments for renewable energy.[87] For example, electricity produced from wind or hydro power will receive a premium of approximately $0.03/kWh until 2007.

4. Ecological Tax Reform / Carbon Tax

More comprehensive than production tax credits, feed laws, or subsidies, Ecological Tax Reform ("ETR") increases taxes on polluting energy sources while simultaneously reducing the tax burden on employment, thus reducing demand for polluting sources of energy and stimulating job creation. In 1999, Germany embarked on three-stage tax reform policy as a way of promoting employment and sustainable economic growth while also protecting natural resources. The policy's rationale is to shift the tax burden from employment to energy in order to spur efficiency, innovation, job creation.[88] The first stage imposed a new tax on electricity, fuels, heating oil, and natural gas.[89] Although the new tax policy does not distinguish between electricity from renewable sources and that from polluting sources, the expected revenue generated from the tax on renewable power will be diverted back into a green energy fund dedicated to promoting renewable energy investments.[90]

Although the goals and overall policy of ETR in Germany are consistent with internalizing external environmental costs, the polluter pays principle, and sustainable development generally, some have argued that it does not go far enough and fails to harmonize with other inconsistent policy objectives being furthered in Germany. For example, the tax reform does not eliminate or even reduce subsidies currently being provided to the German coal industry due to pressure from coal miners in the Ruhr region.[91] In addition, lower environmental tax rates have been built into the ETR for companies in the manufacturing, agricultural, and forestry sectors in order to limit the short-term economic burden on economic growth.[92]

Despite these inefficiencies, the German Institute for Economic Research has concluded that the German ETR will result in a 2-3% reduction in CO2 emissions in the medium term and create 250,000 new jobs by 2010.[93] Despite the employment benefits of the ETR, economists fear that the short term increase in energy prices imposed by the increase in taxes could create a drag on gross domestic product and economic expansion.[94] In response to this concern, some economists have advocated diverting a portion of the revenue generated by the tax into increased R & D for domestic industries.[95] One such study found that using 15% of new revenues for such purposes could ameliorate the negative drag on GDP without significantly reducing the benefits to employment growth and the reduction in CO2 emissions.[96]

5. Tax Deductions / Exemptions

States employ a variety of tax-based incentives to promote renewable energy investments. Over half provide some type of corporate income tax deduction, 28 states allow for property tax breaks for property with installed renewables, and 18 states cut or eliminate sales tax on renewable energy equipment.[97]

Some states, like Massachusetts, allow a sales tax exemption on the sale of renewable equipment that will be used for residential purposes.[98] Others, like Minnesota, exempt sales tax for any purchaser of renewable equipment, commercial or residential.[99] States also differ in what type of equipment they will exempt from sales tax. Iowa, for example, allows for the total cost of the wind energy equipment as well as any materials used to manufacture that equipment.[100]

A range of corporate tax credits and deductions are available that allow a corporation to deduct up to 35% of the cost of renewable energy equipment and/or the cost of installation of such equipment. Some states limit these incentives to facilities with installed generating capacity above or below a certain rated power threshold.[101]

C. Market Obligations / Renewable Portfolio Standards (RPS)

Renewable Portfolio Standards require that energy generators produce a specified portion of their electricity from renewable resources. Utilities can choose to generate the power themselves, purchase it from another producer, or secure the equivalent quantity through Renewable Energy Credits ("RECs"). Over time, the percentage of energy that must come from renewable sources increases as a percentage of the state's energy portfolio.

REC's represent a specified unit of renewable electricity that has been consumed in the state, regardless of who actually produces the power. The credits enable utilities in areas without good wind resources to meet their renewable requirement by purchasing credits from power producers in windy areas. This encourages the most promising renewable resources to be developed by ensuring that there is a market for their energy product.

This is a hybrid approach that relies on both state mandates and market mechanisms to achieve its goal of increasing the percentage of renewables used in the state. Many of the ideas behind the trading system stem from the existing Clean Air Act permit system that has successfully reduced sulfur dioxide across the country. For an RPS to effectively increase the use of renewables, however, the definition of "renewable energy" included in the standard must be limited to resources that are truly renewable like wind, solar, and geothermal. By choosing what types of renewables will satisfy the RPS mandate, states can dictate their energy portfolios while relying on market forces to determine how the standards will be met. At the end of a specified period (usually every year), utilities and other electricity retailers must have a certain amount of REC's or must be forced to pay a penalty.

Fifteen states have adopted portfolio standards as a way of ensuring that renewables comprise an increasing portion of electricity consumed within the state.[102] For example, Massachusetts created an RPS in its 1997 deregulation legislation that mandates 4.5% renewables by 2009 and then increases 1% per year thereafter.[103] Under the program, generators may purchase renewable energy credits from a corporation set up by the state's Renewable Energy Trust.[104] For 2003, a 1MW credit will cost $50 (or $0.05/kWh) which is expected to be more than the incremental cost of installing new renewable power sources.[105] This provides an incentive for utilities to support new renewable energy projects instead of simply purchasing more expensive credits in order to meet their obligations under the RPS.

Texas established its RPS and credit program through a rule issued by the state's Public Utilities Commission in December of 1999.[106] The program requires 2000MW of new renewable energy by 2009 and allocates each retailer a share based upon its share of the state's retail market.[107] Since the RPS was announced, Texas has added over 915MW of wind generating capacity, with immediate plans for at least 220 more.[108]

In addition to statewide programs, momentum is building for the creation of a national RPS. Such a program would promote renewable energy evenly throughout the country, thereby encouraging the most efficient means of generating power. In addition, a national program would help to spur a regionally based approach to overcoming many of the transmission limitations impeding growth in wind energy development in the windiest locations like the Dakotas and Great Plains states. According to a report by the Union of Concerned Scientists, a National RPS requiring 20% renewables by 2020 would create $80 billion in new capital investments, generate $5 billion in new local tax revenues, and create $1.2 billion in lease payments to farmers, ranchers and other rural landowners for wind energy.[109]

D. Green Power Marketing

1. Green Power Pricing

Green power pricing strives to increase renewable energy development by allowing consumers to pay a premium in exchange for an environmentally preferable energy product. Although 40 million American homes had been given this choice as of October 2001, only 350,000 have chosen to buy it. Consumer demand for green power amongst non-residential customers is even lower.[110]

Some states have required that energy providers give their customers a green power option. As of October 2001, electric utilities in Minnesota are required to provide a green power option and may charge a premium amount no more than the difference between the cost of the renewable energy and the same amount of nonrenewable energy.[111]

Some have theorized that the market share of green power pricing will increase over time in much the same way that bottled water and organic foods have. The expectation is based on the idea that choosing an electricity provider is still foreign to many, but as consumers become more familiar with the concept and more knowledgeable of their options, more people will choose the green power option.[112]

The comparison between premium priced green power and organic food is incongruous, however, because the former depends on a minority of dedicated people to pay the added cost for benefits that are distributed broadly throughout society. By contrast, people choose to pay extra for organic food because they personally can reap the benefits. Green power, however, does not work this way. In many cases, the environmental benefits of the renewable facility being supported by increased rates may not be directly noticeable to that consumer.

Broad social benefits that are felt by all should not rely on the good will and foresight of a few exceptionally motivated individuals. The costs associated with such benefits should be as equally distributed as the benefits themselves.

In theory, green power pricing allows market forces to dictate which energy resources are utilized. Unfortunately, there are many practical problems that often prevent this theory from being realized. Relative costs and benefits of wind versus more polluting energy sources are not accurately reflected in the market price. When consumers are given a choice between $0.03/kWh for coal power or $0.045/kWh for wind, these prices do not account for health care costs for respiratory disease stemming from the coal plant's emissions or the value of coastal land swallowed up by rising sea levels. If these costs were internalized into the price of power for the consumer, there would be no need to market wind as an environmentally preferable choice, because it would simply be a cheaper option.

Despite these practical problems, in some cases green pricing programs have provided a hedge against the volatility of natural gas and other nonrenewable energy sources. For example, the city of Austin, Texas established a Green Choice Program in 2000 that offered consumers the option to pay a $0.0285/kWh power charge replacing the current $0.0268/kWh fossil charge to purchase their power from a newly installed 59 turbine 40MW wind farm. The higher green power charge was guaranteed to remain at that level for 10 years even if the cost of fossil energy rose above that. Within 10 months, the program was fully subscribed with 3075 participants. The addition of this wind power will raise the percentage of renewable power in the city of Austin from 0.5% to 2.5%.[113]

2. Green Energy Certificates

Green Energy Certificates ("GECs") represent the beneficial environmental attributes of power that is generated from a renewable energy source. Instead of paying a premium for green power, people who purchase green tags are paying for the environmental benefits of renewable energy investments occurring regionally or even across the country. GEC programs allow consumers to pay to help make up the increased cost of renewables in another state, region, or even country. They can help overcome some of the physical barriers to large-scale renewable generation in many locations, alleviate regional transmission limitations, and compensate for discriminatory market forces.

However, with these potential benefits, there are also many potential problems associated with GEC's. Much of this stems from the fact that the certificates do not actually represent a physical commodity like a fixed amount of wind energy. Instead, they represent the *beneficial attributes* associated with the energy generation. In other words, the external environmental benefits of producing energy from clean, renewables are captured within the certificate. Creating markets for these certificates allows these benefits to be internalized by the marketplace. However, the abstract nature of the certificates and what they represent can create confusion amongst consumers and invite fraud amongst green marketers.[114]

In order to protect consumers against fraud, it is imperative to establish central registries that track issuances of renewable energy certificates. Some states, such as Texas, have already done so as part of their Renewable Portfolio Standard tracking system. In addition to tracking, sellers of REC's must be required to fully disclose what it is they are selling to ensure that consumers are not misled. This can be accomplished through labeling and mandatory disclosure requirements.[115]

PG&E's National Energy Group developed PureWind to market the environmental attributes of wind facilities in New York and California. [116] PG&E's Madison, New York wind facility is located over a 120 acre privately owned farm and came on line at the end of 2000. The facility produces approximately 24,000 mWh annually, which flows directly into the New York Independent System Operator grid and is consumed throughout the state.[117]

Consumers may purchase PureWind Certificates for $40 per MWH. Compared with polluting, non-renewable sources of energy, each PureWind certificate represents a savings of 5 lbs. sulfur dioxide, (SO_2), 2 lbs. nitrogen oxide, (NOx), and 1000 lbs. carbon dioxide (CO_2) emissions.[118] 3. Environmental Generation Disclosure

Environmental disclosure requirements force energy providers to disclose pertinent information to their customers regarding price, fuel mix, emissions data and other environmental costs by fuel type. As retail competition and consumer choice increases across the country mandatory disclosure requirements provide essential information to consumers. More than 20 states have enacted some sort of mandatory disclosure rule.[119] The type of programs that have been adopted and the information that is required to be disclosed varies quite a bit from state to state.

For example, since 1998 electric retailers in Massachusetts are required to provide customers with a standard disclosure label every quarter. The label must include information on price, fuel mix, emissions, and labor characteristics of generating facilities. The emissions data must be presented in a format that compares to the regional average for SOx, NO2, and CO2. In addition, all advertisements must include a notice that such information is available upon request.[120]

E. Reforming the Transmission System

1. FERC's Solution: Regional Transmission Organizations

The Federal Energy Regulatory Commission ("FERC") is responsible for regulating the transmission and wholesale sale of electricity in interstate commerce. In 1999, FERC began to establish a new policy that would "eliminate any residual discrimination in transmission services that can occur when the operation of the transmission service remains in the control of a vertically integrated utility."[121]

The new policy seeks to establish Regional Transmission Organizations ("RTOs") that would manage the transmission infrastructure as an entity independent of interested utilities and other wholesale electricity providers. In principle, RTO's are intended to encourage wholesale competition by removing transmission barriers for many wholesalers including intermittent power producers like wind. According to FERC, RTO's must have the following characteristics to be approved as such: independence from market participants; appropriate scope and characteristics; operational authority over transmission facilities within its region; and exclusive power to maintain short-term reliability. [122] In order to achieve this role, RTO's would be responsible for the following: designing and administering its own tariff; managing congestion; taking primary responsibility for planning and expanding transmission infrastructure; and participating in inter-regional coordination and reliability practices.[123]

Although many of the goals behind the RTO structure are sound in principal, FERC's plan still presents many potential problems. These include the voluntary nature of its membership, allowing for-profit transmission companies to serve as RTO's, the standardization of interconnection between RTO's throughout the country, and ensuring that consumer and environmental concerns are adequately represented in RTO decisions. FERC's "voluntary" approach may not effectively achieve these goals. The FERC Order defining the new policy ("Order 2000") simply required that all public utilities dealing in interstate commerce submit a plan describing how it would support the establishment of an RTO in its region. Once an RTO has been established and is approved by FERC, individual transmission owners and operators within the region retain the option of not joining the RTO.

Many of these problems are apparent in the December 2001 FERC Order approving the first RTO in the country in the Midwest. The new Midwest RTO is comprised of members with vested interests in the energy industry. Members pay an initial $15,000 fee to join along with $1,000 annual dues. Members elect a board of directors that is responsible for maintaining system reliability, ensuring open access to competing wholesalers, and planning and development of the transmission infrastructure. Although under the guise of an independent organization, the ability of local special interests to determine who sits on the board severely limits the ability of broader consumer, environmental, and other public interests to affect the decisionmaking process.[124]

FERC may also be organizationally unfit to implement and administer the transition to the transmission infrastructure as envisioned by its Order 2000. The GAO recently released a stinging appraisal of FERC's capacity to carry out its mission: "Absent an effective regulatory and oversight approach, FERC lacks assurance that today's energy markets are producing interstate wholesale electricity rates that are just and reasonable."[125] One of FERC's biggest weaknesses is its inability to issue meaningful civil penalties for non-compliance. In addition, FERC has no authority over many parts of the country that do not fall under its jurisdiction – either because they do not deal in interstate commerce like the Electricity Reliability Council of Texas ("ERCOT"), or because they are part of some independent federal entity like the Tennessee Valley Authority.

2. A Public Power Grid

Concerned about the efficacy of FERC's voluntary RTO policy, some have called for the development of a truly public power grid, owned and managed by electricity consumers. Public Citizen, a public interest watchdog group, advocates for a non-profit, consumer-owned transmission systems that would provide non-discriminatory open access to all energy generators.[126] The plan proposes developing non-profit transmission companies that would buy out current owners. Unlike RTO's, the board of directors would be comprised of consumer advocates, environmentalists, and other community stakeholders who would be charged with managing the transmission system in a way that minimizes cost and environmental impact.

3. Progress Towards Reform

Despite these institutional and regulatory shortcomings, however, progress is still being made in certain parts of the country to remove unfair interconnection policies. Several independent service operators ("ISOs") have begun addressing the discriminatory scheduling policies that inhibit wind facilities from efficiently (if at all) connecting to the grid. For example, on March 27, 2002 FERC strongly endorsed the California Independent Service Operator (Cal-ISO) scheduling tariff amendment.[127] Under the new rule, scheduling deviations from intermittent energy producers will be netted monthly and deviation penalties will be waived.[128] In addition, Cal-ISO will conduct near real-time forecasts of potential wind energy generation (paid for by a small fee on the wind generators) that will be used by wind generators to set their generation schedules.[129]

Other ISO's around the country have also begun to adopt fairer scheduling policies. NY-ISO completely exempts all intermittent energy generators from scheduling penalties, ERCOT currently allows a 50% deviation from schedules for wind generators, and PJM-ISO (PA, NJ, and MD) has adopted the FERC Order 2000 proposal allowing all deviations to be settled at real-time prices without penalties.[130]

F. Distributed Energy Incentives

The vast majority of all U.S. wind-generating capacity is currently located on centralized wind farms that connect one or more utility-scale turbine to the grid.[131] Despite this, significant amounts of wind energy could be generated from smaller distributed sources to be used for on-site consumption with excess energy fed back into the grid.

Distributed energy generation has many advantages over a centralized grid. Power loss along long-distance transmission lines is eliminated when power is produced where it is used. Distributing the energy-generating infrastructure also reduces opportunities for terrorists to disrupt the nation's power system by targeting centralized power plants. In addition, the aesthetic and environmental impacts of transmission lines, substations, and large-scale energy facilities are lessened as dependence on the grid decreases. Clean distributed generation can also reduce peak loads on the transmission infrastructure, thereby improving the system's overall reliability.

Many barriers stand in the way of increasing distributed generation capacity across the country. Kurt Yeager, president and chief executive officer of the industry-funded Electric Power Research Institute summarized many of these obstacles as follows:

One of the big problems with increasing "distributed generation" – is that you still need to interconnect with the utilities. Yet the utilities view you as competition. So it's hard to get interconnection agreements. They come up with ridiculous standby charges that make it uneconomic. We need to think of utilities like the automobile industry: It takes a law to make something happen. We didn't get seat belts, pollution control, or better mileage without laws.[132]

1. Net Metering

Net metering allows consumers who generate their own renewable electricity on site to feed excess energy back into the utility at times of excess capacity. This energy is credited to their account by the utility and is used to offset power sold to them at times when their demand outstrips their generation capacity. Most states require utilities to offer a net metering option to all their customers (commercial, industrial, and residential), although the amount of distributed generating capacity that is allowed to be connected is usually capped at no more than 10-50 KW. Most net metering policies require that any excess energy credits that have accrued at the end of the year are granted back to the utility and not carried over for the next year.[133]

2. Wind Easements and Access Laws

Wind easements and access laws allow those with available wind resources on their land to protect that resource from being obstructed or limited by projects or construction on neighboring parcels of land. Nebraska and Montana allow property owners to create wind easements that are conveyed with the transfer of real property ownership. In Wisconsin and Oregon, landowners may apply for special permits that prevent others from obstructing wind resources available on their land.[134]

IV. CASE STUDIES: STATE SNAPSHOTS

A. Texas: The Lone Star State Leading the Nation

Texas is fast becoming the nation's leader in wind energy development, installing over 915 MW in 2001 (21.5% of the nation's total installed wind generation to date.)[135] Texas has a combination of factors working in its favor. First, Texas has great wind potential and many wide-open spaces. Texas ranks 2nd in the nation behind North Dakota as the windiest state, estimated to have the potential to produce 1,190 billion kWh's from wind energy alone.[136] To put this in perspective, total electricity consumption throughout the country was 3,706 billion kWh's in 1999.[137]

Second, the Texas legislature passed one of the most far-reaching RPS in the country in 1999, mandating 400MW of new renewables by 2003 and 2000MW by 2009.[138] The generation requirement mandates that electricity generators either produce a percentage of the state mandate themselves or purchase renewable energy credits to meet their requirement. The size of the RPS targets has been credited with providing long-term security to investors to finance large projects, thus creating economies of scale that have allowed many of these new facilities to deliver power at rates as cheap as $0.03/kWh.[139]

The law creating the state RPS was the result of years of coordinated and sophisticated efforts by a coalition of consumer, environmental, public health and religious groups.[140] The first step towards victory came with the results of a series of intensive polls taken by the state's utilities. The results shocked many in industry and government: 83% said that air pollution was a serious or very serious problem; 76% said that they were willing to pay $5 or more per month for non-polluting, renewable energy; and 67% said that they wanted the Legislature to require power producers to reduce pollution.[141]

The coalition followed this demonstration of public support with a focused media campaign. They regularly released reports highlighting the problems associated with polluting energy and met with the editorial boards of the state's newspapers. The groups also worked to educate and organize the grassroots and hired top-named lobbyists to take their case to the highest levels of state policymaking.

The third factor contributing to the explosion in wind development in Texas in 2001 was the fact that the 10-year, $0.018/kWh federal production tax credit for wind was set to expire at the end of the year. Unsure whether the tax credit would be extended, many developers rushed to bring facilities on-line. (The credit was extended in early 2002 for 2 years).

The fourth factor favoring wind energy in Texas is the fact that its transmission infrastructure is entirely within state regulatory jurisdiction. Unlike most of the rest of the country that is interconnected interstate and therefore under the regulatory authority of FERC, Texas oversees its own transmission system – the Electric Reliability Council of Texas ("ERCOT"). This has many short-term advantages allowing the state to synchronize transmission access regulations with its other mandates supporting renewable energy. For example, the state mandated non-discriminatory open-access prices and policies for wholesale generators as part of its electricity restructuring legislation in 1999. They replaced the old access fee which was calculated by the distance between the generator and consumer with a "postage stamp" policy that charges a flat fee to any generator accessing the transmission infrastructure.[142]

In addition to fairer access fees for wholesale generators in the state, ERCOT also adopted rules that allow unplanned transmission access at a flat-rate of $0.15/MWH.[143] This removes the concern over scheduling penalties that has inhibited wind power in other parts of the country. The final transmission policy favoring wind energy in Texas is the fact that the cost of new transmission construction is paid for by all users of the grid, not the particular generators who will rely on the infrastructure expansions.

The combination of great resource potential, a clear RPS mandate and credit trading program, the availability of a favorable production tax credit, and the adoption of non-discriminatory transmission prices and policies have enabled Texas to lead the nation in wind energy. By the end 2001, Texas had already installed 915 MW of new wind power, more than doubling the goal of 400 MW by the beginning of 2003 mandated under the state RPS.[144]

This new wind development has mainly occurred in West Texas, across the state from most of the state's load centers. Although enough available transmission capacity has been "mined" to enable these projects to come on line, the existing transmission capacity has nearly reached its potential. In response, ERCOT is developing plans to expand the transmission system. Unfortunately, the timeframe for bringing new wind facilities on-line is much shorter (12-18months) than the time it will take to plan and construct the transmission lines capable of delivering this power to market.[145]

B. Oregon & Washington: Shaping the Wind with Water

Wind power development has also progressed in the Northwest. In April 2002, the largest wind farm in the Northwest, the Stateline Project, began generating enough power for more than 21,000 homes.[146] That same month, the world's largest wind turbine manufacturer, Vestas, announced plans to construct its largest manufacturing plant in Portland, OR.[147] Despite signs of progress, however, many obstacles continue to impede wind power development in the Northwest.

From early 2000 to mid-2001, skyrocketing wholesale energy prices and severe energy shortages in California and the Northwest made wind energy a comparatively cheaper option, thus overshadowing many of these obstacles. In an effort to stabilize wholesale supply and prices the Bonneville Power Administration (BPA) issued a request for proposals for at least 1000MW of new wind power. The response to the RFP was tremendous, with 25 proposals totaling over 2600 MW.[148] Unfortunately, as wholesale energy prices began to drop, so did BPA's interest in many of these new wind projects. From the original seven projects selected in July 2001 totaling 830 MW, three have been withdrawn by the developers. Although BPA still plans to go forward with remaining 4 projects (430MW), it is doing so on a relaxed timeframe.[149]

As recent events illustrate, the growth of wind energy in the Northwest is extremely dependant on the policies and initiative of the BPA. BPA owns and or controls about 75% of the high-voltage transmission grid in the Pacific Northwest, providing service throughout Oregon, Washington, Idaho, Western Montana, and small portions of several other states.[150] Federal subsidies have enabled the BPA to deliver power to its customers at some of the cheapest rates in the country. Without a proactive commitment by the BPA to wind power that will not vacillate with short-term energy prices, wind energy growth could be extremely difficult in the region. Importantly, none of the states that serve as BPA's primary service territory have mandated Renewable Portfolio Standards that require utilities to deliver a percentage of renewable power. As a result, Northwest utilities and the BPA are under much less pressure to expedite the process of removing the obstacles that inhibit widespread wind power development.

Nonetheless, BPA and others in the region continue to advance a process that addresses and removes many of the barriers. Their two greatest concerns are the total cost and power system impacts of additional wind resources.[151]

BPA's Generation Imbalance Service Rate has, like many other transmission policies throughout the country, severely limited wind's potential. The existing rules impose a penalty on power generators if delivery deviates more than 1.5% or 2MW (whichever is greater) from the schedule. The penalty, $100/MWh is the difference between commercial viability for many wind operations. Under pressure from renewable energy advocates, BPA recently decided to exempt wind producers from the imbalance penalty. In place of the penalty, wind generators will only have to reimburse BPA for its costs in balancing the intermittency of wind power within the power grid.[152] BPA explained that the exemption for wind was necessary because "wind generation resources are not able to accurately predict their generation output to avoid application of the penalty rate…so they are not able to respond to the rate as an incentive to accurately schedule generation output."[153]

In addition to efforts by BPA, the state of Oregon has also implemented policies to encourage renewable energy. As part of its electric restructuring law, Oregon established a 3% public benefits charge on customers of the state's two largest utilities. The fund is being managed by the Energy Trust of Oregon and will go towards promoting energy efficiency and renewable projects. The newly formed Trust has set ambitious goals of reducing energy use by 300MW by 2012 and increasing the percentage of renewable energy to 15% by that date.[154]

C. Minnesota: Encouraging Small and Large Scale Wind Projects

Minnesota is the 9th windiest state in the country and currently ranks 4th in installed wind capacity with 320MW.[155] Most of the growth can be attributed to a 1997 compromise with the owners of the Prairie Island nuclear facility requiring them to invest in renewables in exchange for allowances to store more nuclear waste on site. The mandate required 425MW of wind by 2002 and an additional 400MW by 2013.[156] XCEL energy, the current owner of Prairie Island, has already installed or contracted out more than enough wind power to meet the 2002 deadline.[157]

In 2001, the state enacted a Renewable Energy Objective ("REO") and a mandatory green pricing program.[158] The REO is like a voluntary RPS that sets a goal of producing 10% of the state's energy from renewables by 2015. To meet the objective, MN would have to install roughly 3400MW of new renewables by that date.[159]

The REO is non-binding and only requires that utilities make a "good-faith" effort to meet the goal.[160] Despite efforts by a coalition of environmental and consumer activists to adopt a mandatory RPS, utilities and other opponents defeated the proposal. The opponents instead pushed for green pricing programs that rely on consumer preference in order to drive new renewable development in the state. Unfortunately, this is likely to have a much more limited impact than a RPS would have.

Minnesota has been as active as any state in the country at promoting small-scale (less than 2MW) wind project development. It is currently the only state to have a Renewable Production Incentive that pays eligible developers $0.015/kWh. This is on top of the Federal Production Tax Credit that may also be available for such projects. Qualifying facilities include small businesses, tribal councils, non-profit corporations, or private projects that are owned and operated by the landowner.[161]

In addition to the production payment, small facilities also benefit from a standardized interconnection agreement and tariff. Unlike many other small wind developers throughout the country, developers in Minnesota do not have to negotiate unique agreements with utilities each time they want to connect to the grid. Instead, upon request, they are presented with a boilerplate agreement that they or their lawyers can easily review before signing. The agreement is simple and the interconnection fees are reasonably calculated.

D. California: Returning to its Roots

California gave birth to the modern wind energy industry in the early 1980's in response to the energy crisis of the prior decade. A combination of high long-term energy prices, generous fiscal incentives, and other aggressive state policies and programs helped to create an atmosphere that was ripe for adoption of the technology.

In addition to fiscal incentives for renewables, California also aggressively pursued increased renewable development in other ways. Under pressure from environmental groups and then Governor Jerry Brown, the state's Public Utilities Commission pressured the three largest utilities to implement recent changes in federal law requiring monopoly utilities to purchase power from independently owned renewable energy plants.[162] The purchases were made through long-term contracts based on anticipated avoided costs of power, which were projected to be higher than they actually turned out to be.[163]

The California Public Utilities Commission also helped to develop standard power purchase contracts ("standard offer contracts"). These standard contracts simplified the process of connecting to the grid and ensured reasonable charges for interconnection.[164]

This combination of policies, programs and incentives led to an average growth of over 64% in wind energy production in California from 1983 to 1994.[165] Unfortunately, this impressive growth skidded to a sudden halt in the mid-1990's due to the expiration of favorable long-term contracts. Energy prices for natural gas and petroleum had fallen and were at levels unanticipated when many of the contracts were originally signed. As a result, the utilities' avoided costs also fell, meaning that long-term contracts being offered to independent wind energy producers were significantly lower than a decade earlier.

In 1996, California passed sweeping electricity deregulation legislation that promised competitive markets, cheaper rates, and consumer choice. Unfortunately, none of these promises were fulfilled. Instead, the stage was set for unprecedented wholesale price manipulation that led to skyrocketing wholesale energy prices that ultimately bankrupted one of the State's largest utilities. The ensuing energy crisis and the State's concern over meeting energy demand led Governor Davis to sign extremely expensive long-term energy contracts. Efforts are underway to re-negotiate these contracts with the State claiming that they should be invalidated because they were under duress when they signed them.

Despite these serious obstacles to renewable energy facing the state, the state has implemented several far-reaching programs to promote the technology. Whether these programs are enough to overcome the obstacles is unclear.

Along with the 1996 deregulation, the State created several programs supporting renewable energy and other programs. The Public Interest Energy Research Program (PIER) annually awards up to $62 million for a variety of programs related to bringing environmentally safe and affordable energy technologies to the marketplace.[166]

The second program was the creation of the largest Public Benefits Fund in the country. The funds are collected from a fee on energy users throughout the state and are allocated to several different accounts. The New and Existing Renewable Resource Accounts provide qualifying projects with a production payment of up to $0.015 kWh.[167] For residential and small business customers, the state has established a Buy-Down program that will pay $4,500 per kW or 50% of the project (whichever is less) for wind turbines under 10 kW.[168]

The State's Renewables Program also allocated funds to help develop green markets, although these programs have been suspended since September 2001, when the state suspended customer choice in response to the problems related to its flawed deregulation process.

Perhaps most significantly, on September 12, 2002, California adopted the most ambitious renewable portfolio standard in the country, requiring the state's utilities to produce at least 20% of their electricity from renewables by 2017.[169] Based upon the effectiveness of RPS policies in other states and California's pioneering experience with wind energy, the future of wind energy development in the state looks bright.

V. RECOMMENDATIONS

A. Leveling the Playing Field

1. Long-Term Initiatives

If the environmental costs of energy were reflected in the price rather than externalized, then wind energy would become a more economical option. The best way to accomplish this is by the elimination of disproportionately allocated subsidies and by shifting the tax burden to internalize environmental costs on the polluter. Phase out all energy subsidies over an extended period of time. This would allow companies and markets to slowly transition to reliance on the cheapest energy sources.

The most economically sound way to help promote more environmentally benign energy sources like wind is through comprehensive tax shifting. This would involve shifting the tax burden on society away from things that are beneficial, such as work and capital investment, and onto things that are detrimental, such as pollution and other unsustainable practices. This rewards those things that we want to encourage and penalizes those things that we want to discourage.

One way to accomplish this within the energy sector is to implement a carbon tax. The tax would add cost to every unit (BTU) of carbon consumed. Because wind and other non-polluting energy sources, consume no carbon, they would escape the tax altogether.

2. Short-Term Proposals

Comprehensive tax shifting and the elimination of all energy subsidies is not a realistic short-term goal due to the enormous political opposition garnered by these proposals. Fortunately, there are many short-term proposals that can realistically be pursued. They include:

- Extending the Renewable Energy Production Tax Credit indefinitely.
- Shifting energy subsidies away from fossil fuels and nuclear power towards renewables and energy efficiency.
- Creating a national RPS and national REC trading system modeled on successful state programs.
- Creating state RPS and REC programs in all 50 states. This would encourage renewable energy development more evenly throughout the country.
- Mandating federal, state, and local government purchases of renewable energy.
- Extending and harmonizing state tax credits and exemptions.

B. Helping Wind Get Grid Connected

The new "open-access" era must begin living up to its name. Despite FERC proclamations in support of non-discriminatory access to the grid for wind and other renewable energy, many policies continue to restrict fair access.

1. Reforming or Replacing FERC

Reforming or replacing FERC's oversight of the interstate transmission system is central to the process of eliminating many of these obstacles. Such reforms should include the following:

- Authorizing FERC to issue meaningful penalties for non-compliance with its Orders.
- Consolidating the regulatory authority over transmission policy within the Bonneville Power Administration, the Tennessee Valley Authority, and those transmission organizations currently under FERC's jurisdiction.
- Mandating uniform transmission policy throughout the country regarding connecting wind energy to the grid.
- Requiring that consumer and environmental concerns are fairly represented within the decision-making bodies of Regional Transmission Organizations and Independent Service Operators.

2. Adopting Non-Discriminatory Scheduling Policies

In addition to reforming or replacing FERC, the following policies should be adopted by the country's various Transmission Operators:

- Eliminating scheduling penalties for intermittent energy generators.
- Allowing real-time balancing markets that settle payments or charges related to scheduling deviations based on real-time prices at the time of the deviation.
- Implementing a system for conducting and disseminating wind forecasting information to reduce scheduling deviations.
- Promoting geographical aggregation of wind facilities to help create a more reliable wholesale power product.

3. Adopting Equitable Interconnection Fees

- Basing the interconnection fee on monthly or annual average usage rather than on a facilities nameplate (peak) capacity.
- Standardizing and simplifying interconnection agreements and fees for small wind producers.
- Financing maintenance (embedded costs) and expansion of the transmission grid by fees paid by electricity consumers rather than by charges to energy generators.
- Adopting a "postage stamp" fee that charges a fixed interconnection fee regardless of how many transmission systems are used to deliver power to the end user.

4. Increasing Transmission Capacity Available for Wind

- Upgrading the transmission infrastructure to reduce thermal and voltage operating constraints.
- Replacing antiquated mechanical switches with a new integrated fiber-optic network.
- Ensuring that wind projects are fairly represented in decisions to expand the transmission infrastructure.

CONCLUSION

Electricity consumption has grown by 23.5% over the last decade in the U.S. with a continual over-reliance on fossil fuel and nuclear energy sources.[170] Our understanding of the causes and effects of climate change and other environmental consequences has also grown. Wind energy and other renewables, along with increased conservation and efficiency programs, could enable us to respond to these growing problems while also providing energy security for future generations.

Although quite possible, transitioning to a clean, renewable energy economy will not be easy. To date, a combination of innovative policymaking and entrepreneurial creativity has enabled wind energy to begin competing with traditional sources of energy in the commercial marketplace. Yet there remains an enormous untapped potential for wind energy in the U.S., one that will remain largely untapped without the introduction of more aggressive and consistent policies throughout the country.

(Endnotes)

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[7] Momentum is building to allow the shipment of nuclear waste through 44 states to a storage facility under Yucca Mountain, Nevada. This would require over 105,000 truckloads of radioactive waste across the country over

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