REVIEW OF STATES' POLICY INCENTIVES FOR THE DEVELOPMENT OF WIND ENERGY FACILITIES

Prepared for the Oklahoma Wind Power
Assessment Initiative

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Tim Hughes, Principal Investigator
Environmental Verification and Analysis Center
The University of Oklahoma
710 Asp, Suite 8
Norman, OK 73069
(405) 447-8412
E-mail: thughes@ou.edu

Mark Shafer
Oklahoma Climatological Survey
The University of Oklahoma

Dr. Mark Meo
Science and Public Policy Program
The University of Oklahoma

FORWARD

The following document is a summary of state policy options and incentives used for the development of wind energy. It is not an exhaustive list, nor is it meant as recommendations regarding what policies would work best for Oklahoma. Rather, this document is intended as background materials from which interested individuals, policy analysis, or decision makers can begin their investigation of policy options.

In order to determine the appropriate mix of policies that would be capable of sustaining an emerging wind energy market in Oklahoma, it is necessary to examine issues related to economic development and changes in the energy market place. These will be subjects of future reports in the fourth quarter of the project. At that time, a more complete picture will emerge of how these policy options and experiences from other states can affect the development of wind energy in Oklahoma.

The document draws heavily from two sources: the Energy Efficiency and Renewable Energy Network (EREN) and the National Wind Coordinating Committee (NWCC). EREN is within the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE). The mission of EERE is to "develop and deploy efficient and clean energy technologies that meet our nation's energy needs, enhance our environment, and strengthen our national competitiveness." EREN acts as a clearinghouse for information on technologies, resources, and featured web sites.

The NWCC consists of representatives from electric utilities, support organizations, state legislatures and utility commissions, consumer advocacy offices, wind equipment suppliers and developers, green power marketers, environmental organizations, and state and federal agencies. The NWCC's objectives are "to provide a forum for identifying and discussing issues that impact the use of wind power, to catalyze actions addressing key issues, and to build consensus among varied stakeholder groups."

The Oklahoma Wind Power Assessment Initiative consists of a small group of researchers from the University of Oklahoma and Oklahoma State University. Our goals are to highlight the economic and environmental opportunities of wind energy in the state and to build a coalition that will attract investors and developers to wind energy projects within our borders. Toward this end, we seek to broaden this group, and welcome advice and assistance related to this policy document, generation potential assessment, and other aspects of this study. We also invite interested parties to review the material we have collected as background information for this report.

STATE INITIATIVES

The first part of this report chronicles developments within the states related to wind energy. The states profiled below were chosen based upon two criteria. First, those states with significant wind resources were selected. The top 12 states in potential wind energy, all located in the midsection of the United States, account for 90% of the total wind electric potential in the contiguous United States. As Table 1 shows, there is a significant decline in potential wind energy from the twelfth (New Mexico) to the thirteenth (New York) state.

The second criterion was that states with significant operational capacity should be profiled. Many of those with significant capacity (the operational definition used here is more than 1,000 kW total capacity) are within the top-12 states in potential energy. However, California, Wisconsin, Oregon, Vermont, and Hawaii all have significant resources but account for less potential. How these states, with more limited resources, were able to capitalize upon them may be of interest as Oklahoma seeks to develop a local industry in wind energy generation.

Each of these seventeen states are profiled regarding where they rank nationally in wind energy production, their operational assets, their primary energy sources, and incentives offered for renewable energy, and wind energy in particular. Table 1 documents each state's capacity and production facilities. Table 2 shows the fuel sources for each of these states, in millions of kilowatt-hours and as a percentage of the total. The U.S. average is included for reference.

Summaries of renewable energy facilities are through mid-1999. Renewable energy facilities are tracked in the National Renewable Energy Laboratory's (NREL) Renewable Electric Plant Information System (REPiS). Summaries of policy activities were obtained from EREN, and reflect the status of state initiatives in mid-1998.

Table 1. Wind energy potential, number of operational facilities, and annual production (1998) from wind energy sources in each state. Potential is in million megawatt-hours per year and capacity is kilowatts. Source: Energy Efficiency and Renewable Energy Network, U.S. Department of Commerce.

	Potential	Facilities	Production		Potential	Facilities	Production
North Dakota	1,180	22	849	Massachusetts	33	4	360
Texas	1,170	8	189,811	Virginia	17	0	0
Kansas	1,070	77	2,879	Arkansas	13	0	0
Montana	1,040	2	130	New Jersey	13	0	0
South Dakota	1,000	1	10	Arizona	9	3	28
Nebraska	869	2	1,260	North Carolina	8	0	0
Wyoming	774	5	69,810	Ohio	7	0	0
Oklahoma	733	4	200	Connecticut	6	4	55
Minnesota	669	142	274,931	Vermont	6	1	6,050
Iowa	551	42	257,992	West Virginia	6	0	0
Colorado	461	2	21,600	Maryland	5	1	4
New Mexico	436	1	660	New Hampshire	5	13	89
New York	73	2	20	Delaware	4	1	2
California	72	98	1,657,001	Rhode Island	2	1	10
Wisconsin	70	7	20,380	Tennessee	2	0	0
Idaho	68	0	0	Georgia	1	1	25
Michigan	67	6	657	Hawaii	1	6	11,200
Nevada	63	1	10	South Carolina	1	0	0
Illinois	61	4	26	Alabama	0	0	0
Maine	52	7	142	Alaska	0	2	650
Missouri	50	0	0	Florida	0	0	0
Oregon	50	12	24,943	Indiana	0	0	0
Washington	39	0	0	Kentucky	0	0	0
Pennsylvania	38	13	40	Louisiana	0	0	0
Utah	34	1	18	Mississippi	0	0	0

Table 2. Energy use for each of the seventeen states profiled. The first line lists the sources by percentage; the second line is the energy generated in the state in millions of kilowatt-hours. The U.S. aggregate is given in gigawatt-hours. Source: Energy Information Administration, Electric Power Annual: Net Generation from U.S. Electric Utilities by Energy Source, Census Division, and State, 1997 and 1998.

	Nuclear	Coal	Petroleum	Gas	Hydro	Renewable
North Dakota	0	92	*	0	8	0
	0	28176	47	0	2296	0
Texas	13	45	*	41	1	0
	38685	132627	137	230201	1419	0
Kansas	25	68	*	7	0	*
	10411	28024	122	2924	0	0
Montana	0	60	*	*	40	0
	0	16508	14	41	11054	0
South Dakota	0	34	1	2	63	0
	0	3094	27	211	5758	0
Nebraska	29	64	*	1	6	*
	8259	18336	42	400	1683	1
Wyoming	0	97	*	*	3	0
	0	43287	43	27	1342	0
Oklahoma	0	60	*	33	7	0
	0	31027	8	17000	3420	0
Minnesota	26	68	1	1	2	1
	11644	29884	650	652	695	451
Iowa	10	86	1	1	2	*
	3768	31884	110	412	893	19
Colorado	0	93	*	3	4	0
	0	33079	37	964	1392	0
New Mexico	0	88	*	12	*	0
	0	27537	23	3631	236	0
California	30	0	1	23	42	4
	34594	0	121	26385	48684	5141
Wisconsin	18	76	*	2	3	1
	9397	39786	200	1188	1518	441
Oregon	0	7	*	7	85	0
	0	3348	33	3467	39504	0
Vermont	76	0	1	*	19	3
	3358	0	41	1	848	145
Hawaii	0	0	99	0	1	0
	0	0	6287	0	14	0
U.S.	23	54	2	10	10	1
(G kWh)	7176	17047	657	3251	3288	118

1. North Dakota

North Dakota is the nation's leader in potential wind energy, with an estimated 1,180 million megawatt-hours per year, if fully developed. Nearly all portions of the state are suitable for development. REPiS documents 22 wind energy facilities operating in North Dakota with a total installed capacity of 849 kW. The largest is a 200 kW capacity facility at the Sacred Heart Monastery in Richardton. Only three of the facilities are rated at 100 kW capacity or greater. Coal is the primary energy source, accounting for 92% of fuel sources, with hydro supplying 8%.

North Dakota offers tax incentives for the development of wind energy devices. The state provides a 5% deduction on the cost of equipment and installation for a period of three years. Facilities are exempt from property taxes for a period of five years. The state also allows net metering for systems of 100 kW or less capacity, with utilities required to purchase excess generation at their avoided cost.

2. Texas

Texas ranks second nationally in potential wind energy, with an estimated 1,170 million megawatt-hours per year, if fully developed. Northwest Texas and the Panhandle are the prime areas for development, with additional possibilities along the Gulf Coast and far western portions. REPiS documents eight wind facilities operating in Texas with a total installed capacity of 189,811 kW. The largest is a 74,900 kW capacity facility at the Southwest Mesa Wind Farm in McCarney. All eight facilities are rated at 100 kW capacity or greater, with four of the facilities generating 30,000 kW or more. Coal and gas are the dominant energy sources, accounting for 45% and 41%, respectively. Nuclear produces 13% of the state's energy, with an additional 1% coming from hydro.

Texas offers tax incentives, distributed resource policies, and customer choice opportunities. A property tax exemption, with no time limit, exempts renewable energy sources from assessment. For small facilities, 50 kW or less, net metering rules require utilities to pay avoided cost to customers for net excess generation during each billing cycle. Utilities must also supply information about renewable energy options to customers that would otherwise incur line extension charges for new hookups. Several utilities offer green pricing options to customers, with monthly premiums ranging from $5 to $20. The state also requires utilities to disclose fuel sources. In 1999, Texas passed a deregulation bill that includes a 9% renewables portfolio standard by 2008.

3. Kansas

Kansas has an estimated 1,070 million megawatt-hours per year, if fully developed, ranking third nationally. All but the eastern edge of the state is suitable for development. REPiS documents 77 wind energy facilities operating in Kansas with a total installed capacity of 2,879 kW. The largest is a 1,500 kW Western Resources facility. Only three of the facilities have a rated

capacity of 100 kW or greater. Coal accounts for 68% of the fuel sources, with nuclear producing 25% and gas producing 7%.

As of 1998, Kansas offered grants for the development of renewable energy facilities and was home to a voluntary consortium investigating site prospects. The State Energy Program provides $400,000 - $500,000 per year for development of renewable energy sources, with typical awards of $10,000 - $50,000 per project. The grants are funded by petroleum violation escrow funds. In addition to state-sponsored activities, seven electric utilities initiated a cooperative venture, the Kansas Electric Utilities Research Program, in which partners contribute a total of nearly $1 million per year for assessment of renewable energy resources and demonstration projects. The funds are leveraged with federal, state, and other entities to total approximately $8 million (as of 1995).

4. Montana

Montana has an estimated 1,040 million megawatt-hours per year, if fully developed. All parts of the state, except for a few mountain valleys, are suitable for development. REPiS documents two wind energy facilities operating in Montana with a total installed capacity of 130 kW. Each is a privately owned 65 kW facility. Sixty percent of Montana's energy comes from coal, with the remaining 40% generated from hydropower.

As of 1998, Montana offers tax incentives, net metering, fuel source disclosure, easements, and systems benefits charges to support wind energy development. Tax incentives take the form of corporate or personal tax credits of 35% of the investment of $5,000 or more for facilities to manufacture wind energy equipment. Montana also exempts renewable energy equipment from property taxes, up to $20,000 for a residential dwelling or $100,000 for a multi-family or nonresidential structure for a period of ten years. The state's net metering legislation enables excess generation from systems of 50 kW or less to be credited to the customer's next bill, with credits expiring at the end of the calendar year. The state has had a wind easement provision since 1983. Under their deregulation legislation, Montana requires electricity bills to be unbundled, listing distribution and transmission charges, electricity supply charges, transition charges, and universal system benefits charges. Although it does not explicitly require disclosure of fuel mixture, the Montana Public Service Commission may implement rules for such disclosure at their discretion. Montana collects a contribution of 2.4% of each utility's revenues, as universal systems benefits charges, to a fund used to support energy efficiency, renewable energy resources, low-income energy assistance, and renewable energy research and development.

5. South Dakota

South Dakota has an estimated 1,000 million megawatt-hours per year, if fully developed. All regions of the state are suitable for development. REPiS documents only one privately-owned 10 kW capacity energy facility operating in the state as of 1999. The state derives most of its

energy, 63%, from hydropower. The remaining energy sources include coal (34%), gas (2%), and petroleum (1%).

South Dakota offers property tax exemptions of the entire assessed value of residential systems and 50% of the installed cost of commercial systems. The exemption may be claimed for three years after installation, and does not apply to facilities that produce energy for resale.

6. Nebraska

Nebraska has an estimated 869 million megawatt-hours per year, if fully developed. All except the far eastern portions of the state are suitable for development. REPiS documents two wind energy facilities operating in Nebraska with a total installed capacity of 2,160 kW. The largest is a 1,500 kW capacity facility at Springview, owned by the Nebraska Public Power District. The second is a 660 kW capacity facility owned by the Lincoln Electric System. Coal is the primary source of electricity generation in Nebraska, accounting for 64% of the energy generated in 1998. Nuclear (29%), hydropower (6%) and gas (1%) accounted for most of the remaining generation.

Nebraska offers a state loan program that assists development of renewable energy projects. Under the program, the state purchases half of a loan, arranged through a private lender, at 0% interest, effectively reducing the interest rate to half that negotiated with the lender. Nebraska is also developing a renewables energy portfolio. In 1997, Nebraska added wind easements to an existing solar easements statute. In addition to these policies, Nebraska includes wind in its state construction policy, requiring new state construction to examine the use of alternative energy sources, which includes wind power.

7. Wyoming

Wyoming has an estimated 774 million megawatt-hours per year, if fully developed. Most of the state is suitable for development, especially in mountain regions. REPiS documents five wind energy facilities operating in Wyoming with a total installed capacity of 69,810 kW. Existing facilities include a 41,400 kW capacity facility at Arlington, owned by the Pacificorp / Eugene Water and Electric Board, and a 24,750 kW capacity facility, owned by PSC of Colorado. Ninety-seven percent of energy used in Wyoming comes from Coal, with the remaining 3% generated from hydropower.

As of 1998, Wyoming had no incentives for the development of wind energy, although it did offer several incentives for solar energy.

8. Oklahoma

Oklahoma has an estimated 733 million megawatt-hours per year, if fully developed. Most of the western two-thirds of the state and portions of the Ouachita Mountains in Eastern Oklahoma

are suitable for development. REPiS documents four wind energy facilities operating in Oklahoma with a total installed capacity of 200 kW. The largest is a 170 kW capacity facility owned by Drapery Manufacturing. The three remaining facilities are privately owned 10 kW facilities. Most of Oklahoma's energy comes from Coal, accounting for 60% of the energy generated. An additional 33% comes from Gas and 7% from hydropower.

Oklahoma has a net metering regulation, established in 1988 by the Corporation Commission. The regulation applies to facilities of 100 kW capacity of less. It does not require utilities to purchase excess generation, although it prohibits utilities applying surcharges to customers with net metering. In addition, Oklahoma has an equipment certification statute that requires wind turbines and photovoltaic modules to be certified by an accredited organization (the American Wind Energy Association, in the case of wind turbines). The certification was originally required for tax credits, which have since expired.

9. Minnesota

Minnesota has an estimated 669 million megawatt-hours per year, if fully developed. Western and southern Minnesota are suitable for development. REPiS documents 142 wind energy facilities operating in Minnesota with a total installed capacity of 274,930 kW. Seven of these facilities have a capacity of 1,000 kW or greater, including two large wind farms owned by Enron –107,250 kW and 103,500 kW facilities at Lake Benton. Kenetech Wind Power also owns a 25,000 kW facility at Lake Benton. Most of Minnesota's energy comes from coal (68%) and nuclear (26%), with a contribution from hydroelectric power (2%), gas (1%), petroleum (1%), and renewable energy sources (1%). Of the top 20 states in wind energy potential, Minnesota ranks second in renewable energy production.

Minnesota is actively engaged in promoting the development of renewable energy. It offers programs in the forms of tax incentives, production incentives, subsidized loans, net metering, green marketing, easements, and renewable portfolio standards. Minnesota is the only state that offers an accelerated depreciation provision for renewable energy systems, mirroring the federal depreciation schedule. Systems under 2 MW capacity are exempt from property taxes while those greater than 2 MW have reduced rates. Equipment and materials used for the installation of renewable energy systems are exempt from sales taxes.

Minnesota's cash-payments support include production incentives, a 1.5 cent per kWh payment for energy generated from systems less than 2 MW in capacity, with payments extending for ten years. The payments were established in 1997, with an increasing ceiling over time. Presently, payments are extended to all systems on a first-come, first-served basis up to a total statewide capacity of 100 MW. Minnesota also subsidizes interest rates on rural renewable energy projects, effectively cutting interest rates to about 4%. Small, rural systems also benefit from a generous net metering provision, whereby excess generation is purchased by utilities at the average retail rate, rather than the typical, lower avoided cost. The state also provides wind easements.

A renewables portfolio standard was created in 1998 that provides a requirement for the state's largest electricity generator, Northern States Power, to contract out for 225 MW of wind power, with an additional 200 MW by 2003. Minnesota's electric cooperatives also offers green marketing, whereby the cooperatives have agreed to purchase renewable energy at a surcharge (as opposed to green pricing options where the surcharges are voluntary on an individual basis).

10. Iowa

Iowa has an estimated 551 million megawatt-hours per year, if fully developed. Nearly all of the state is suitable for development, except the far eastern and southeastern portions and the southwest corner of the state. REPiS documents 42 wind energy facilities operating in Iowa with a total installed capacity of 257,992 kW. The largest are Enron's 112,500 and 85,000 kW facilities at Storm Lake and FPL Energy's 42,000 kW facility at Clear Lake. Four other facilities are over 1 megawatt capacity. Most of Iowa's energy comes from Coal, accounting for 86% of the energy generated. Ten percent comes from nuclear energy, with a small contribution from hydro, gas, petroleum, and renewable energy. Of the top 20 states in wind power potential, Iowa ranks third in energy production from renewable resources.

Iowa offers many financial incentives for renewable energy. Investors benefit from sales and property tax reductions or exemptions, and may obtain low-interest loans from a state loan program. In addition, Iowa has devoted many resources to research and assessment of alternative energy sources and projects. Like most other states, Iowa has a net metering regulation, which provides compensation to customers based upon the utilities net avoided cost. Iowa was among the first states to implement a renewables set aside (portfolio standard), that requires utilities to purchase 105 MW of generation from renewable and small hydropower sources.

11. Colorado

Colorado has an estimated 461 million megawatt-hours per year, if fully developed. Most areas suitable for development are in mountain passes or to the east side of the Rocky Mountains. REPiS documents only two wind energy facilities operating in Colorado with a total installed capacity of 21,600 kW. These are a 16,500 kW facility and a 5,100 kW facility, both at Ponnequin, owned by PSC of Colorado and Energy Unlimited, respectively. Coal accounts for 93% of the energy generated in Colorado. Hyrdopower accounts for 4% and gas for most of the remaining 3%.

Most of Colorado's incentives are in the form of regulatory or utility-offered programs. Like many states, Colorado has a net metering law, however customers are not compensated for net excess generation. Colorado also requires utilities to provide a cost-benefit analysis of photovoltaic systems as compared to line extension costs; this could be extended to other forms of renewable energy. Under an executive order in 1997, Colorado began examining requirements for state agencies to purchase electricity from renewable resources. Several municipalities offer green pricing programs, where customers pay a premium for energy from

renewable resources. Unlike many other programs that have limited success, Colorado has been relatively effective in getting a commitment from corporate "champions" to purchase at least 15% of their energy from renewable resources.

12. New Mexico

New Mexico has an estimated 436 million megawatt-hours per year, if fully developed. The prime areas for development are in mountain passes, east of the Rocky Mountains, and across west-central and southern New Mexico. REPiS documents only one wind energy facility operating in the state, a 660 kW facility at Clovis owned by Southwestern Public Service Company. Coal accounts for 88% of the energy generated in New Mexico, with gas accounting for nearly all the remaining energy production.

The state's Energy, Minerals and Natural Resources Department has undertaken a wind energy resource assessment for the state. New Mexico offers few incentives for the development of wind energy; most efforts are directed toward research and assessment. Like Colorado, New Mexico requires utilities to provide information on photovoltaic systems to customers whose line extension costs would exceed $25,000. Customers can sign up for a net metering program in which utilities will pay avoided cost for net excess generation, but at a surcharge.

14. California

California has an estimated 72 million megawatt-hours per year, if fully developed, but it is by far the national leader in actual production. Most potential wind production areas lie in a few mountain passes. REPiS documents 98 wind energy facilities operating in California, with a combined capacity of 1,657,001 kW. Nearly all (81 of the 98) have over 1,000 kW capacity, and more than half (51) have a capacity of 10,000 kW or more. The largest are 110,000 and 100,000 kW capacity facilities owned by FPL Energy. An additional six facilities have capacities between 50,000 and 100,000 kW. California has a diversified energy source: 42% of their energy comes from hydropower, 30% from nuclear, 23% from gas, 4% from non-hydro renewable resources, and 1% from petroleum. There are no coal-powered energy generation facilities in California.

California offers a tremendous range of incentives for the development of renewable resources. The state offers several grant programs, ranging from assistance in the development of operational systems to demonstration or research projects to technology export assistance. In addition to direct grants, California offers low interest loans to qualified small businesses for alternative energy and efficiency technologies. The state has a more active net metering program than most other states, but consumers are not compensated for net excess generation. California has also invested in research and outreach programs, which is financed from a $0.0002 / kWh electricity surcharge. Funding for existing and new renewable energy programs is included in a Systems Benefits Charge on utility bills, which is expected to generate $540 million over four years.

In addition to these incentives and resources, California has several customer choice opportunities. Several retail providers offer green marketing, in which energy sources may be certified by the California Energy Commission as being "green". Some generators, such as the Sacramento Municipal Utility District, offer direct green pricing programs, where consumers pay a surcharge for renewable energy. California also requires fuel source disclosure to all customers on at least a quarterly basis.

15. Wisconsin

Wisconsin has an estimated 70 million megawatt-hours per year, if fully developed. Southwestern portions of the state are most favorable for development. REPiS documents seven operational facilities with a total generating capacity of 20,380 kW. Madison Gas and Electric owns two large facilities, with capacities of 11,220 and 7,920 kW. A 1,200 kW capacity facility is privately owned. The remaining four facilities are 10 kW capacity each.

Wisconsin offers property tax exemptions, investment incentives, and production incentives for wind projects. The state's Renewable Energy Assistance Program offers construction grants of 10-20% of a project up to a $75,000 limit. The grants provide half at the time of equipment purchase and the other half upon completion. Wisconsin's Demand Side Management Programs include a production incentive of 0.75 cent per kWh for energy from wind systems. Wisconsin also has net metering regulations, in which consumers are paid the utility's avoided cost for net excess generation, and wind easement provisions. Several utilities offer green pricing options. In addition to incentives, several Wisconsin electric utilities are engaged in a feasibility project on low wind speed turbines.

21. Oregon

Oregon has an estimated 50 million megawatt-hours per year, if fully developed. . The western third and northeastern quarter of Oregon is suitable for the development of wind energy. REPiS documents 12 facilities operating in Oregon, with a combined capacity of 24,943 kW, ranking 6th nationally in wind energy production. Almost all of this capacity, 24,900 kW, is from a single facility owned by FPL Energy. The remaining 11 facilities are all 10 kW or less capacity. Hydroelectric power is the primary energy source in Oregon, meeting 85% of the state's electricity needs. The remaining energy comes from coal (7%) and gas (7%), with a small contribution from petroleum.

Oregon offers investment tax credits, property tax exemptions, and subsidized loans to assist the development of wind power. In addition, the state has net metering regulations and provisions for wind easements, favoring small systems. Several utilities also offer green pricing programs. The investment tax credit is 35% of the investment up to $100,000, and is taken over a five-year period, reducing the probability of the tax credit exceeding the investor's tax liability for the year (and thereby being unable to fully utilize the credit). Net metering customers can roll unused credits over to the next month, but at the end of the year excess credits are cleared and granted to the utility's low-income assistance programs, without compensation to the consumer-generator.

34. Vermont

Vermont ranks in the lower third of states in wind energy potential, with an estimated 6 million megawatt-hours per year, if fully developed. Most of the state is suitable for development, with a favorable location along the ridge of mountains in the western parts of the state. REPiS documents only one wind facility, with a total generating capacity of 6, 050 kW. The facility, located at Searburg, is owned by the Green Mountain Power Corporation. Vermont's energy comes primarily from nuclear fuel, accounting for 76% of the energy consumed in the state. Hydroelectric power accounts for 19% and renewable resources make up 3% of the energy used. The remaining energy comes from petroleum and gas.

Most financial incentives offered by Vermont are aimed at small generation facilities. Vermont allows municipalities the option of exempting property taxes for renewable energy facilities. The state began net metering in 1998 and in addition to the standard credits, the state offers a waiver of the 5% sales tax on net metering equipment. The net metering provisions allow consumers to carry credits forward to the end of the calendar year, at which time the credits expire.

42. Hawaii

Hawaii ranks near the bottom in wind energy potential, with only an estimated 0.5 megawatt-hours per year, if fully developed. However, the mountainous terrain provides some very good locations for wind energy development on nearly every island. REPiS documents six wind facilities with a combined capacity of 11,200 kW. Most of this is in two commercial developments, a 9,250 kW capacity facility owned by Apollo Energy Systems and a 1,555 kW capacity facility owned by Lalamilo Ventures, Inc. Virtually all energy comes from petroleum, with a small contribution from hydroelectric sources.

Hawaii offers personal and corporate investment tax incentives. Individuals or corporations may claim a 20% tax credit of the cost of equipment and assembly of a wind turbine. Unused credits, where the tax credit exceeds the tax liability for the year, can be claimed in subsequent years until fully utilized.

POLICY OPTIONS

The summary of policy options described in this section are drawn largely from a report by the National Wind Coordinating Committee (NWCC; 1999) entitled "Strategies for Supporting Wind Energy: A Review and Analysis of State Policy Options". The NWCC report presents a discussion of 26 different policies and an evaluation of each. The evaluation examines each policy based upon three measures: achieving sustainable energy goals, addressing market barriers, and practical criteria. Each of the measures is further broken down into numerous sub-categories. This section presents a brief summary of each policy, examines the relative merits of each, and provides a qualitative summary of the three NWCC evaluation measures.

The NWCC policies are grouped into seven categories:

- tax incentives
- direct cash payments
- low-cost capital programs
- distributed resource policies
- customer choice opportunities
- general environmental regulations
- other policies

The options are each designed to either decrease the relative cost of constructing and producing wind energy, increase the relative cost of fossil fuel sources to reflect environmental costs, or create markets for renewable energy.

Tax incentives may take several forms: production tax credits, investment tax credits, sales and/or property tax reductions, or accelerated depreciation. These policies are designed to reduce the capital and/or operational costs of wind facilities. A key attribute of tax credits is that they are limited primarily to in-state investors who have sufficiently large tax burdens in order to claim all possible credits. Out-of-state investors and non-profit agencies, which have little or no state tax burden, cannot capitalize upon these incentives. A secondary concern about tax credits is that they may reduce eligibility for the federal production tax credit, partially offsetting the benefits of the tax incentives.

Direct cash payments may be either production or investment incentives. Investment incentives, in the form of grants, help offset large capital requirements for start-up projects while production incentives favor performance of operating systems. These benefits are likely to spur development of new facilities, but without a guaranteed market there will remain reluctance on the part of investors. Direct cash payments, especially investment incentives, will reduce the federal production tax credit.

Low-cost capital programs focus upon securing financial resources necessary for the development of new facilities. These may take the form of government subsidized loans, project loan guarantees, or project aggregation. These are all mechanisms aimed at reducing uncertainty in the investment market, thereby reducing interest rates charged to new development. Subsidies of any sort will likely offset some portion of the federal production tax credit.

The three aforementioned sets of options represent market-push strategies, aimed at development of facilities. They do not address creation of markets for the product.

Distributed resource policies address creation of markets for small wind systems. Policy options include standard contracts, net metering, and line extension policies. Standard contracts guarantee a purchaser for the product. Net metering and line extension policies favor connecting small renewable energy systems to the grid to capitalize upon excess energy not used at the producer's site.

Customer choice opportunities are similarly aimed at stimulating a market for renewable energy. Policies include utility-supplied green pricing options, green marketing, aggregated consumer purchases, and fuel source disclosure requirements. The concept underpinning these policies is that some portion of educated consumers will be willing to pay a premium in order to gain the benefits of an environmentally clean energy source.

General environmental regulations may take the form of either market-push or market-pull policies. Market-push policies raise the price of fossil fuels relative to renewable energy by adding a surcharge for externalities associated with emissions from the fuel source. In so doing, renewable energy sources become more competitive. Externality valuation, environmental dispatch, and emissions taxes all take this form. Market-pull regulations take the form of emissions caps. By limiting the total emissions within an area, it becomes necessary for producers to switch to cleaner energy sources.

The options grouped by the NWCC into the "other policies" category are largely market-pull policies. These create guaranteed markets, principally from large wind facilities. Options include government purchase of renewable energy, renewable portfolio standards, auctioned contracts, and performance-based ratemaking. Site prospecting and easements are designed to remove some of the market barriers to new development.

The following pages address the seven aforementioned categories in more detail. Table 3 at the end of this section summarizes the effectiveness of the various policy options in achieving sustainable energy goals, addressing market barriers and meeting criteria for practicality.

Tax Incentives

Tax reductions are designed to reduce the capital and/or operational costs of developing wind facilities. They may be targeted for either small or large wind projects. By using targeted tax reductions, the per-kWh costs of renewable energy may decrease to levels similar to those of fossil fuels. Tax incentives are only effective to the point at which an investor carries a tax burden; if the investor owes little in state taxes, tax credits will be of little value.

A critical issue in tax incentives is their volatility. In order to act as a significant incentive, an investor must be certain that the credit will be available for some time after an investment is made. A second limiting factor in tax incentives is they do not help with securing capital. Financers tend to view renewable energy projects as risky, and unless there is a certain market for the wind energy, they often shy away from renewable energy projects. Incentives that help secure capital financing, therefore, are more likely to help establish new facilities.

The federal government offers production tax credit for wind power, established in Title XIX of the Energy Policy Act of 1992. The tax credit offers a 10-year, 1.5 cents per kWh reduction of federal taxes for wind energy produced. However, there are limitations upon claiming the credit. Any claim is reduced for any grants, tax-exempt bonds, subsidized financing, or other credits received by the investor for the project. For example, if a state were to offer a 1.0 cent per kWh tax credit, the federal subsidy would be reduced to 0.5 cent per kWh. This reduction affects policy options of tax incentives, direct cash payments, and low-cost capital programs; other policy options apparently would not reduce the federal credit. The federal production tax credit extends only through 2001, but is likely to be renewed.

Production Tax Credits. Production tax credits are performance-based credits, based upon the amount of electricity generated by a qualifying facility. The credit is claimed on state income taxes. By reducing state taxes, after-tax cash flows are increased, which provides an incentive to build renewable power generation facilities. The primary drawback is that the producer must owe significant in-state taxes, or they will only be able to partially claim the total value of the credit. Therefore, state production tax credits offer little incentive to out-of-state investors and non-profit organizations.

Production tax credits are difficult to assess for small off-grid facilities. Administratively, production tax credits would best be applied to facilities connected to the grid, and over a certain size. Otherwise, the state's administrative burden would be large. The NWCC estimates that a one cent per kWh tax credit would reduce actual costs of wind energy approximately 0.6 cent per kWh, because it does not address capital costs before production can begin. Production tax credits may make wind energy costs more competitive with other sources, but they do not guarantee a market for the product.

Investment Tax Credits. Like production tax credits, investment tax credits are a reduction of state income taxes. Instead of measuring the output of wind facilities, the investment tax credit is a reduction of capital costs. The deduction may be single-year or multi-year. Investment tax

credits were used extensively by the federal government during the 1970s and early 1980s, but have since been phased out for wind energy. As of 1998, ten states offered investment tax credits, mostly applied to small wind systems.

The disadvantage to investment tax credits is that it rewards creation of the facilities, regardless of potential energy output. This can be countered by adding some performance-based criteria to the tax credit. This would help to concentrate development in optimal energy-producing locations, and minimize a state's liability in total tax deductions that could be claimed.

Investment tax credits, like other tax incentives, do little to lure out-of-state investors or nonprofit organizations that carry little or no in-state tax burden. Similarly, like other credits, the volatility of financing must be reduced in order to encourage financers to supply needed capital. The NWCC estimates that each 10% reduction of installed cost would result in an approximately 0.4 cent per kWh reduction in actual wind energy costs. Investment tax credits are more likely to favor small wind systems, which often have higher in-state tax burdens and would not benefit substantially from production tax credits.

Sales Tax Reductions. Renewable energy facilities operate at an up-front disadvantage. Fossil fuels equipment is generally exempt from sales taxes, while renewable energy equipment is not. A 4% sales tax on equipment translates to an additional 0.2 cent per kWh increase in wind energy costs (when averaged over the expected lifetime of the facility), according to NWCC estimates.

Sales tax reductions are not likely to affect major investment decisions, although they can be a large factor for smaller systems that have higher proportional capital costs. Like other tax incentives, sales tax reductions do not guarantee a market for the product. Sales taxes offer the advantage of administrative ease, but may pose a challenge in cost containment, especially at local government levels that may rely upon that source of income.

Property Tax Reductions. Property taxes for renewable energy facilities tend to be higher than for comparable fossil-fuel facilities, typically on the order of 1-3% higher (although ranging as high as 10%), according to a 1992 study by the U.S. Advisory Commission on Intergovernmental Relations. The NWCC estimates that a 1% reduction in property taxes would reduce production costs approximately 0.2 cent per kWh. Reductions could come in the form of full exemptions, reduction in rates, or changes in assessment methods.

The major obstacle to property tax reductions is that they may be harmful to local tax sources, and consequently could generate local opposition. Experience in other states suggests that this is a viable policy option, with 13 states (as of 1995) offering some form of property tax reduction or exemption. The major challenge, like sales taxes, is cost containment.

Accelerated Depreciation. States typically follow the federal depreciation of assets schedule, which grants a 5-year life for wind systems. The federal depreciation schedule (Modified

Accelerated Cost Recovery System from the Tax Reform Act of 1986) already provides incentives for wind energy, because non-renewable energy systems typically are set at a 15-20 year life. Therefore, capital costs of renewable energy systems can be deducted over a shorter time span. The NWCC estimates that if states were to provide a 100% first-year depreciation, based upon a 6% state income tax rate, the savings in actual energy costs would be approximately 0.15 cent per kWh. By contrast, the savings from the accelerated federal depreciation schedule is about 0.7 cent per kWh.

Accelerated depreciation is favorable primarily to large, commercial development. Like other tax incentives, accelerated depreciation is an incentive only to those who owe substantial state income taxes.

Direct Cash Payments

Direct cash payments can take two forms: production incentives or investment incentives. Production incentives are performance-based, while investment incentives help raise capital for start-up projects. Direct cash payments have the advantage over tax incentives in that an investor can fully utilize the benefit (i.e., it is not dependent upon the investor's in-state tax burden).

Funding for direct cash payment programs can come from dedicated sources or the general fund. Dedicated sources include a systems benefits charge – a surcharge on electric rates, or earmarked taxes. Like tax incentives, stability of financing is critical to the success of the incentives. Both policies are likely to spur new renewable energy development.

Direct Production Incentives. Direct production incentives are price-support payments of a certain amount per kWh of energy generated from renewable resources. If the production incentives are stable (i.e., guaranteed over a ten-year period), the incentives can be factored into development, offsetting some of the higher capital costs associated with renewable resources. Furthermore, unlike production tax credits, production incentives are not likely to reduce the federal production tax credit, because production incentives are not considered subsidized financing.

Incentives can be offered to the energy generator, retailer, or customer. Options for the energy generator include a fixed-rate incentive, auctioned fixed-rate incentive, or adjustable credit. Each of these options could have attached characteristics, such as bidder qualifications, set-asides for new generation facilities, or categories to encourage targeted production. The fixed-rate incentive is subscription-based, and would likely include a cost cap. The auctioned incentives provide more flexibility, with the market determining the value of the supplemental funds. For example, a fixed-rate incentive may set a flat value of 1.5 cents per kWh, whereas a value of 1.2 cents per kWh may be sufficient to make ventures viable. By using auctioned incentives, the per-kWh payout may be lower, which would either reduce the cost to the state or could include more ventures within the allocated funding. Adjustable credits are also market-based, with the value determined by the difference between a target price and the market price. Like other incentives, the subsidy could be capped using a worst-case scenario, such as lowest market price, or total value of incentives.

There are a few examples of states using direct production incentives. Minnesota offers a fixed-rate incentive of 1.5 cents per kWh for ten years, applying only to systems under two megawatts (small to medium generators). California collects wire charges, which they use to fund auctioned fixed-rate incentives. Bids for 5-year funding are submitted, with bidders having to meet milestones in order to remain eligible. The average winning bid is 1.2 cents per kWh, below Minnesota's fixed-rate incentive. Furthermore, because contracts are based upon a 5-year period, investors can collect funding during development, based upon expected energy returns in later years. The federal government also offers a fixed-rate incentive of 1.5 cents per kWh for nonprofit organizations, which do not qualify for the federal 1.5 cents per kWh production tax credit. The Federal Renewable Energy Production Incentive (REPI), however, suffers from uncertainty in annual funding which increases investor's risk.

The difficulties associated with direct production incentives are (1) determining an appropriate value of the subsidy, either fixed-rate or projected bid prices, and (2) political barriers in creating a funding source. The production incentives are also most attractive to large facilities. The NWCC estimates that an incentive rate of 1.0 cent per kWh over ten years would reduce actual operational costs approximately 0.95 cent per kWh over the life of the incentive.

Direct Investment Incentives (Grants). Direct Investment Incentives are grants given for development of wind energy facilities. Grants reduce the capital required for start-up facilities, thereby making projects more attractive to private investors. By reducing capital costs, the average price per kWh decreases, making the resources competitive with fossil fuel sources. Grants could be considered a cost-share, which reduces investor tax burdens.

Investment Incentives may be either up-front to reduce capital costs, or spread over several years, perhaps contingent upon certain performance measures. The advantages of longer-term financing are that it lessens costs associated with failed ventures (as opposed to up-front payment of the entire grant) and that performance measures can be added. For example, a grant could assist with up-front development costs, but if the site fails to produce the anticipated energy returns, the later portion of the grant would be reduced. This encourages development in prime locations.

Like production incentives, investment incentives can be distributed on several bases. Competitive auctions provide some measure of market assessment of viability, especially if certain requirements, such as obtaining other financing, are required of bidders. A first-come basis has the advantage of administrative simplicity. A more complex multi-attribute analysis allows the agency to evaluate applications and determine viability. The NWCC estimates that a 10% capital grant would reduce the cost of wind energy by approximately 0.35 cent per kWh. A 10% cost-share would reduce the cost by approximately 0.55 cent per kWh, due to avoided taxes.

Investment incentives are most likely to favor small developers, who have more difficulty obtaining financing. This same group of investors also is least likely to gain from production incentives, thereby complementing the large-turbine industry with smaller distributed systems. The drawback to investment incentives is that it will likely reduce federal production tax credits.

Low-Cost Capital Programs

This group of policy options relates to reducing the risk associated with loans. Partially because of a lack of knowledge about technological advances in wind energy, which have substantially reduced the per-kWh costs over the last two decades, the finance markets tend to view wind energy projects as high-risk. Reflecting this risk, loans tend to be 1-2 percentage points higher than gas-fired projects. Government subsidized loans, project loan guarantees, and project aggregation all act to either reduce the lender's risk or to pool risk, similar to insurance plans.

Like both tax incentives and direct cash payments, the funding sources must be stable. This set of policies primarily reduces market barriers, making it easy for developers to obtain financing for wind energy facilities. The loans do not guarantee a market for renewable energy, and generally require more oversight than for either tax incentives or direct cash payments. Funds required for either policy option could come from a dedicated cash pool, perhaps financed by wire charges, or through general taxing authority. Either option likely would result in reduction of federal production tax credits.

***Government Subsidized Loans*.** Government loans can be either direct or arranged through private banks. Examples of direct loans include economic development bonds, government and utility loans, community development programs, and "green bonds." Subsidized loans would carry lower interest rates than could be obtained from the private sector. Within the private sector, lenders prefer long-term contracts for energy delivery, but in a restructured, competitive market there is likely to be a shift toward shorter-term contracts. Because markets are already uncertain about the cost and reliability of wind energy, most lenders will favor fossil-fuel based sources, which they perceive to be safer investments.

Government subsidized loans are offered in eleven states, but primarily are available only for small systems. It is uncertain if this policy option could be used effectively for large ventures, which typically can secure long-term contracts and therefore secure commercial loans at favorable rates. Presently, the U.S. Department of Agriculture Rural Utility Service is investigating the possibility of providing low-interest loans to rural electric cooperatives.

On a typical 12-year mortgage-style debt, a subsidized 5% loan rate (the market presently is about 9.5 percent) would reduce production costs about 0.6 cent per kWh, according to NWCC estimates. If the loan were extended to 20 years, the cost reduction would be approximately 1.2 cents per kWh.

***Project Loan Guarantees*.** Rather than having the government provide the loan, guarantees could be given and allow the market to make the loans. This has the effect of reducing risk in the market, while still encouraging the market to play an important role in evaluating the viability of the projects for funding consideration. By providing loan guarantees, the private market should become more receptive to proposals. This would be especially helpful for smaller ventures that lack the ability to secure large energy purchase contracts.

The federal government has had extensive experience with loan guarantees. Notable successes include home purchases and U.S. corporate investment in foreign markets. The federal government offered loan guarantees for experimental energy sources in the 1980s, with mixed results. It is not certain how well loan guarantees would perform in the states.

Market lending rates would not be as low as for government subsidized loans, but would drop substantially from present values. The NWCC estimates that a 12-year mortgage-style loan would drop from a rate of 9.5% to 6%, reducing energy production costs approximately 0.5 cent per kWh (approximately 1.0 cent per kWh for a 20-year loan). If the guarantor does not have a high credit rating, an 8% loan would be more typical, with a resulting reduced cost of about 0.2 cent per kWh for a 12-year loan.

***Project Aggregation*.** Renewable energy development projects are often small, and of little interest to commercial lenders. Aggregating several projects increases the payoff to prospective lenders, especially by reducing transaction costs associated with financing each project individually. Aggregation also diversifies project risks, such that one small project failing will be compensated by other successes. If the projects are geographically separated, it also may reduce intermittence problems. Aggregation also increases the ease of obtaining large power-sales contracts, which is critical for lenders to provide financial capital.

Aggregation services can be provided by a private company, nonprofit organization, or government entity (for example a Renewable Power Market Authority). Aggregation has happened in other market sectors, such as student loan debt and mortgages, but is relatively new to the energy sector. Because of this, it is difficult to determine the financial impact upon cost reduction for renewable energy sources, however it can be expected to reduce start-up capital costs.

A significant challenge is in design of an aggregated project, especially in apportioning compensation and financing among individual projects with different risk characteristics. By definition, the risk to some will increase while the risk to others will decrease. Less risky projects should not end up paying increased rates or the pool will become limited to only risky ventures.

Distributed Resource Policies

Distributed resource policies are aimed primarily at removing market barriers for small wind energy systems. Small systems are mostly used to offset retail energy purchases, but some are large enough to produce energy that can be contributed to the grid system. These policies will not guarantee markets, and therefore do little in terms of achieving sustainable energy goals, but are relatively simple to implement. Costs may be borne by those generating the power, or shared among utility customers, with little cost to the state.

A limiting factor in generation from small wind facilities is the ability to connect to the electric grid. Predefined, standardized interconnection requirements would help those who do invest in small systems to provide excess energy generated back to the grid. The incentives for development are mostly in avoiding higher retail purchase rates, so even a small marginal return would be an inducement to connect small distributed systems into the grid, provided the costs of connection do not outweigh the anticipated returns from excess generation.

Standard Contracts for Small Projects. Standard contracts are guaranteed long-term power purchase contracts. Whereas most large power suppliers use a bid system (auctioned contracts), small producers cannot afford the costs associated with bid preparation. By promoting standard contracts, any producer who meets eligibility criteria can obtain access to long-term contracts without having to go through an extensive self-marketing process. Being able to obtain long-term contracts improves financing opportunities by reducing risk because a lender will be assured that there is a market for the power produced from the facility.

Determining rates for the power purchases is a difficult challenge. Rates must be based upon long-term market projections; however some incremental cost to reflect social values (such as avoided environmental costs) could be added. In order to generate an appreciable market, the NWCC estimates that wind energy rates would need to be in the neighborhood of 7 cents per kWh for large systems and 15 cents per kWh for small systems, currently well above market rates. Therefore, standard contracts are not likely to promote sustainable energy development.

Spurred by the Public Utilities Regulatory Policies Act (PURPA), standard contracts were developed in many states during the 1980s. PURPA required states to set power purchase rates for Qualifying Facilities equal to the avoided cost of power supply. These avoided costs have tended to be much lower than the actual cost of generation from wind power. Therefore, standard contracts offer little incentive for investment in new wind facilities.

Net Metering. Net metering uses a bi-directional meter. When energy is consumed from the grid, the meter runs forward; when excess energy is produced by the distributed system, the meter runs backwards. At the end of a billing cycle, the customer is billed only for the net energy consumed during the period. If excess energy was generated, utilities may purchase excess energy at “avoided cost” (e.g., wholesale rates), dependent upon state law. Net metering is not practical for large-scale generation, because it is not possible to limit energy generation to the times in which it is demand. If excess energy is generated at a time when it is not needed, it

is lost (as a perishable good), but the producer would still get credit for generating the unused energy.

Net metering is common, with at least 25 states having net metering laws. Almost all laws restrict the size of generators, to avoid the problems of excess generation at a time of low demand. Most of these laws will need to be rewritten in the context of utility deregulation. Most laws were established based upon the premise of vertical monopolies, a single source controlling the electricity grid. Options to revise existing laws include allowing carryover from one billing period to the next, such that utilities are never required to purchase excess capacity from the generators. Although this does not resolve the problem of excess generation, it greatly simplifies billing and accountability / regulatory concerns.

Line Extension Policies. Costs of extending transmission and distribution lines can be substantial. Estimates place the average cost at about $10 per foot. Most states require a free-footage allowance of 300 feet, sometimes more for high-energy users. Costs of these allowances are factored into the overall business costs for the franchise, such that residential homeowners will not have to pay substantial up-front fees for electric utility access.

Line extension policies are actually detrimental to development of on-site alternative energy. In effect, they create a subsidy that promotes grid connection rather than stand-alone systems. For example, the 300-foot allowance would actually cost about $3,000, a charge which the homeowner never sees. If the homeowner had to pay that cost, there would be an incentive to evaluate alternative non-grid sources, including small wind turbines or solar cells.

Idaho Power Company and Southern California Edison offer remote photovoltaic systems, billed on fixed monthly facilities charge rather than metered. These units avoid the high installation costs for lines in remote locations. Similar offers could include small wind turbines, however the variability of wind may require line connection for many applications in order to assure a steady supply of power.

Customer Choice Opportunities

Customer choice opportunities are predicated upon the assumption that some percentage of customers are willing to pay additional costs for products that provide environmental, health, or other public benefits. Mechanisms for payment include a premium rate for green power, voluntary contributions on customer bills, choice of power supplier, aggregated groups purchases, and investment funds with a below-market rate of return (where the difference is used to pay the cost differential between green energy and fossil fuel rates).

Surveys estimate that a significant proportion of customers state a willingness to pay a 5-15% premium for "green energy". Of these, less than 10% actually sign up, creating a free rider problem. Part of the problem lies in survey methodology. Respondents will be inclined to favor environmental factors, but when the choice comes down to an actual financial obligation, many drop out.

Utility-Supplied Green Pricing Options. Green pricing options are where utilities offer customers a choice to purchase energy from renewable sources, often at a premium ranging from $2.50 to $10.00 per month extra. As of mid-1998, about 40 utilities offered some form of green pricing programs, with mixed results. Green pricing programs require extensive marketing and significant transaction costs. Given the low customer enrollment, typically about 1-2% of residential customers, most utilities do not view this market as significant enough to warrant the investment. Enrollment could perhaps be boosted by advertising the price stability of renewable energy, especially given recent drastic increases in the cost of natural gas and petroleum.

Green pricing requires some form of oversight to assure the validity of claims and prevent cost shifting under mandates. For example, if a utility is required to purchase a certain percentage of renewable energy, it may be dedicated to a small group of users who pay a higher premium, rather than spreading the increased costs across all customers. Green pricing provides only a marginal incentive to developers, because there is no guarantee that the actual demand for renewable energy sources will increase.

Green Marketing. Green marketing involves contracts between the energy generators and retailers, not the individual customers. Green marketing retailers purchase renewable energy on the open market, with an amount determined by their customer base. Retailers may charge premiums ranging from 0.5 to 3.5 cents per kWh. States may offer a subsidy to lower the premium surcharges; for example California offers a 1.5 cents per kWh subsidy from the state's wire charges.

The difficulties with green marketing are similar to those faced by utility-supplied green pricing. Disclosure and certification are required to assure the validity of "green" claims. Green marketing does not necessarily increase green market share, because customers inclined toward paying premiums for green energy sources may choose these retailers over green pricing options offered by their current utility companies. Effectively this creates market shifting rather than market enhancement.

Retailers have been slow to offer green marketing, primarily because of market uncertainty and low expectations. Market penetration is difficult due to a lack of customer awareness. Suppliers are not likely to invest in new renewable energy sources because of lack of guarantees of long-term energy production contracts. Low expectations come from the experience of utility-supplied green pricing, where typically fewer than 2% of residential customers have enrolled in programs, where they are available.

***Aggregated Consumer Purchases*.** Aggregating individual purchases into larger blocks overcomes some of the uncertainty associated with green pricing programs. Aggregation may be groups like local governments contracting for community access, local municipalities, or other consortiums. There are few examples of aggregation at this time, with most being at a city or county government level. Using the market to determine supply and purchase price limits state government involvement to only creating mechanisms for aggregation.

Large groups offer benefits to individual customers through improved bargaining power, which could lower surcharge rates. From the retailers and generators point-of-view, aggregated power purchases provides an ability to issue longer-term power purchasing agreements. Aggregating into large groups also reduces the free rider problem and fosters a sense of community ownership of renewable energy (such as "green cities").

While creating a market is easier than other individual supply-side measures, the extent to which it will spur new renewable energy development is uncertain. Most likely, this policy option would favor large generating facilities. There would be some reduction of institutional barriers, especially in reducing transaction costs, finding buyers, and negotiating purchase agreements.

***Fuel Source Disclosure Requirements*.** Awareness is a necessary component in creating a demand for renewable energy. Disclosure provides information to each consumer regarding the sources of power and related pollution production. In providing this information, it is assumed that some individuals will opt for more environmentally friendly energy sources. Disclosure may be related to the makeup of fuel sources, the emissions produced from those sources, or price variability and associated risks with each source. Disclosure would be the responsibility of the retail power suppliers, who may include the information on regular bills, quarterly or annual reports to customers, or on marketing materials. Reporting should be done in a standardized format, perhaps on a national basis for comparison between various out-of-state providers. By educating customers, they can shop more effectively among competing providers based upon price, stability, pollution abatement, and other factors.

Certification underpins the success of disclosure. Certification need not be a function of a government agency; it could be provided by various organizations via a seal of approval. Certification protects against misleading claims by competitors since in a free market other retailers will challenge misleading claims. In order to track fuel source purchases, a market of production credits could be created. Companies would purchase these credits, which would then determine the percentage of energy obtained from renewable energy sources.

General Environmental Regulations

Environmental regulations are intended to mitigate against production of harmful side effects from fossil fuels and to reflect the costs associated with externalities. Regulations typically take the form of monitoring and fines, although new market-based structures have become popular in recent years. Fees assessed to pollution-causing fuel sources internalize the costs of production, thereby more accurately representing the true societal costs of the source. By raising the cost of fossil fuels, renewable energy sources become more viable.

Regulation may focus upon externality costs or emissions reductions. Externality costs, either through externality valuation, environmental dispatch, or emissions taxes, increase the costs of fossil fuel sources through a marginal add-on tax or assessment. Emissions caps limit the total amount of emissions within an area, and impose fines for non-compliance. Within the concept of emissions caps, a market of tradable credits has emerged, allowing cleaner sources to gain financial capital by selling excess credits on the market to those which exceed their allotted emissions.

***Externality Valuation*.** Externalities can be valued in some way such that societal costs are included during the process of integrated resource planning. These externalities are sometimes referred to as "adders" – an addition to the bid cost representing a monetary estimate of environmental costs. Integrated resource planning is a regulated process, whereby power producers within a state determine the optimal configuration of energy sources. Although integrated resource planning is a commonly used process, it is not likely to continue in a deregulated market since the adders would put in-state companies at a competitive disadvantage relative to out-of-state suppliers.

The most significant barrier to adders is that the value is often below the incremental costs of switching from fossil fuels to renewable energy. A GAO report (1994) noted that 25 states considered externalities in resource planning, but the adders had no effect on the acquisition of renewable resources. Adders are often below the actual environmental costs due to political factors in achieving a consensus, as well as technical factors in the assumptions used in determining appropriate values.

Environmental adders do not reflect other positive attributes of renewable energy, such as price stability, economic development, and fuel security. If the price of fossil fuels, with the adders, were comparable to the actual costs of renewable energy sources, these additional attributes may influence decisions to invest in renewable energy.

***Environmental Dispatch*.** Environmental dispatch begins with externality valuation, in which the environmental costs of the fuel source are added to the fuel price. Rather than utilizing an integrated resource planning process (which requires regulation), environmental dispatch ranks each fuel source with the lowest-cost fuels being dispatched from the power pool first. Because wind energy has low marginal costs, this process would favor wind energy systems. The process

does require regulation, but through the Federal Energy Regulatory Commission (FERC), rather than on a state-by-state basis.

Environmental dispatch suffers from many of the same limitations as externality valuation. It is difficult to determine the appropriate adder values, thereby keeping fossil fuel costs low. Many suppliers will opt to pay the higher relative rates rather than investing in equipment for cleaner burning fossil fuels or alternative energy sources. Dispatch is limited to those who draw from a common power pool; there is no way to enforce this mechanism on bilateral contracts between a generator and a retailer. Furthermore, participants can reduce bid prices on fossil fuels in order to keep them below the cost of alternative energy sources, in effect offsetting the adders. For environmental dispatch to be effective in promoting renewable energy sources, there must be a significant amount of renewable energy within the power pool; otherwise the competition is primarily among fossil-fuel resources.

***Emissions Taxes*.** Emissions taxes are a more straightforward way to account for the environmental costs of fossil fuels. Instead of regulating selection of fuel sources, emissions taxes simply increase costs at the source. The 1990 Clean Air Act authorized states to impose emissions taxes. The goal of emissions taxes is to increase the marginal cost of environmental damage to a point greater than the marginal cost of pollution abatement. Funds from the taxes are placed into an environmental trust fund, which can provide a source of funding for other renewable energy incentives and pollution-abatement equipment.

Like the other forms of environmental regulations, determining the optimal tax level is difficult. There is some experience with environmental taxes – superfund, waste disposal taxes, chlorofluorocarbon consumption taxes, and taxes in support of recycling. It is unlikely that emissions taxes will reach the intended effect of raising fossil fuel marginal costs substantially, however. Emissions taxes on carbon may be effective in raising the cost of coal-produced energy substantially, but most producers would likely opt for alternatives such as natural gas, which is cleaner, has less capital costs for development of facilities, and is available on-demand when compared to wind energy.

***Emissions Caps*.** Emissions caps were created under Title IV of the 1990 Clean Air Act, which established a cap for sulfur dioxide (to reduce the incidence of acid rain). Each region is allocated a certain amount of total emissions, with the cap value typically decreasing over time. Each energy producer bids on credits, which are needed for each unit of emissions produced. Excess units may be sold to other producers on the open market or retained for future need. Initial trading was successful, and the EPA has since expanded emissions caps and tradable credits to other sources, including hydrocarbons, nitrogen oxides, particulate matter, sulfur oxides, and carbon monoxide.

It is not necessary for a governmental agency to determine the appropriate value of environmental costs; the price of the credits is determined by supply-and-demand, thereby setting the marginal cost of emissions reduction measures. In having to purchase credits for the emissions, the price of fossil fuels is effectively increased relative to the costs of renewable

energy sources. Credits are often traded internally within firms among various generation facilities or firms invest in pollution-control equipment in order to minimize the cost of acquiring credits. Several states have trading programs already in place, including California, Massachusetts, Illinois, and Texas.

Other Policies

Most of the policies described in this section are designed to address creating markets for renewable energy. Whereas other policies act to stimulate production, decrease relative costs, or reflect environmental costs of fossil fuels, none act specifically to guarantee a market. By guaranteeing markets, the uncertainty associated with renewable energy is reduced, making it a more attractive investment for both producers and investors.

***Government Purchases*.** Government is one of the largest consumers of energy in the marketplace. Government purchases involve setting some percentage of energy that must be obtained from renewable sources. This can be accomplished via legislative action or executive order. Purchases could be made through green marketing programs, direct contracts with renewable energy generators, or developing on-site facilities.

The NWCC notes that government purchase of renewable energy is among the most certain ways to guarantee a market. This provides long-term contracts, which promotes the stability of income streams to producers, lowers the risk of capital investment, and lowers interest rates charged to developers. Furthermore, the knowledge that there is a definite customer for the energy produced from renewable sources reduces market barriers by drawing attention to the resource.

***Site Prospecting, Review and Permitting*.** Preparing areas for development in advance of specific requests helps to overcome institutional resistance to wind facilities. Site prospecting includes performing resource assessments, transmission studies, bird population studies, cultural and religious site reviews, zoning, and defining wind rights. Review and permitting relates to streamlining permitting procedures, including setting reasonable time frames for public comment and issuing permits, setting clear decision criteria, coordinating the process within a single state agency, and expediting judicial review. By having the state undertake these efforts, the capital costs of siting wind facilities are reduced.

Once areas of the state suitable for development are identified, state authorities can work with local communities to determine level of interest, economic development potential, and educate local landowners about the benefits and risks of wind energy. Because many people are not familiar with wind as an energy source, there may be extensive local opposition to erecting large towers necessary for large wind facilities.

Several states and organizations have undertaken assessments, including Montana, Minnesota, California, the Northwest Power Planning Council, and the Union of Concerned Scientists ("Powering the Midwest"). Many of these efforts have been funded by the U.S. Department of Energy's Utility Wind Resource Assessment Program. Kansas and Minnesota go further than the assessment stage, offering limited exemptions from regulations governing other power generating facilities.

Easements. The National Wind Coordinating Committee did not discuss Easements as a policy option in their report, but many states have wind and/or solar easements in their laws. Easements are designed to assure an individual landowner that a site will remain compatible for energy production in perpetuity. One source of uncertainty, especially for small renewable generating facilities, is nearby development obstructing the source of energy, either reducing wind speeds or blocking solar radiation. By assuring that these sources will remain unaltered, uncertainty is reduced, which promotes the development of small renewable energy facilities.

Renewables Portfolio Standard. Renewables Portfolio Standards are a relatively common feature in state utility deregulation bills. Portfolio standards mandate that retail suppliers will include some fixed percentage of their energy from renewable resources. These suppliers may or may not include municipal and cooperative utilities.

The mechanism by which government agencies can track purchase of renewable resources is tradable credits. The credits, as with emissions caps, are granted to a producer for each unit of renewable energy supplied to the power pool. Retailers purchase credits to meet their set portfolio standards. In order to minimize the burden on the private sector, credits could be capped at some level, with a dedicated source of funds used to compensate for the difference between the market value of the credit and the actual cost of energy production. Care must be taken to set the cap at a high enough level that it would rarely be exceeded, in order to keep the state's financial burden low. Retailers that fall short of the portfolio standard would be charged for each credit shortage, at a rate greater than the market price. This encourages compliance without much oversight. Because renewable resources are limited, the percentage may start low and increase gradually over time to some target.

Renewables portfolio standards guarantee a market and provide stability. Although there is some initial difficulty in establishing the portfolio standards, they work well in the marketplace once established.

Auctioned Contracts. Auctioned Contracts are requests-for-proposals (RFPs) to suppliers for energy from qualifying sources. Winning bids are selected based upon price and other factors, such as an ability to produce energy at certain times of the day or year. The winning producers deliver power to a power pool, which the agency issuing the contracts can then sell at market rates to retailers. Auctioned contracts may be limited to renewable resources (set-asides) or may be open to other sources; however renewable sources do not compete well without exclusive RFPs because other sources do not reflect costs associated with externalities.

A dedicated funding source is required to compensate for the difference between the prevailing market price for energy and the winning bid price, which will likely be higher than the sale price. Wire charges, bonds, or earmarked taxes can supply needed funds. A significant drawback to auctioned contracts is the complexity of the bidding process and selection of bid criteria. If structured properly, though, auctioned contracts guarantee a market, reduce market barriers, and are compatible with market competition.

***Performance-Based Ratemaking*.** States have typically employed a cost-return on investment form of ratemaking for regulated utilities. Cost-return is not compatible with a deregulated market, however some forms of ratemaking may still be compatible. Options for performance-based ratemaking include targeted incentive regulation, price caps, and revenue caps. Targeted incentive regulation ties utility profits to specific performance or activities, which may include incentives for purchase of diversified energy resources. Price caps set a ceiling on utility prices, with retailers keeping revenues below the price caps. Revenue caps set a total or per-customer benchmark level, not necessarily tied to the per-kWh energy production level.

Any of these types of performance-based ratemaking could be tied to incentives and penalties, including emissions performance indices and renewable energy incentives. Those meeting targets would be rewarded while those failing to meet targets would pay penalties. The advantages of price caps or revenue caps is that each provides incentives for efficiency, whereas targeted incentive regulation generally includes provisions for a pass-through on fuel price increases. Performance-based ratemaking is the principal form of regulation in the U.S. telecommunications industry.

Several states offer renewable energy incentives. Montana provides a rate-of-return incentive and Wisconsin offers financial support for installing facilities. Diversity targets and penalties for non-compliance would help promote sustainable energy goals.

Table 3. Rankings of policy options by the National Wind Coordinating Committee (1999).

Policy Option	Sustainable Energy[1]	Market Barriers[2]	Practical Criteria[3]
Tax Incentives			
Production Tax Credits	◆		◆◆◆
Investment Tax Credits	◆		◆◆
Sales Tax Reductions	◆		◆◆
Property Tax Reductions	◆		◆◆
Accelerated Depreciation			◆◆◆
Direct Cash Payments			
Direct Production Incentives	◆◆		◆◆
Direct Investment Incentives (Grants)	◆◆		◆◆
Low-Cost Capital Programs			
Government Subsidized Loans	◆	◆◆	◆◆
Project Loan Guarantees	◆	◆◆	◆◆
Project Aggregation		◆◆	◆◆
Distributed Resource Policies			
Standard Contracts for Small Projects	◆	◆◆	◆◆
Net Metering	◆	◆◆	◆◆
Line Extension Policies	◆	◆	◆◆
Customer Choice Opportunities			
Utility-Supplied Green Pricing Options		◆	◆◆
Green Marketing	◆	◆	◆◆
Aggregated Consumer Purchases	◆	◆◆	◆◆
Fuel Source Disclosure Requirements	◆	◆	◆◆
General Environmental Regulations			
Externality Valuation	◆		◆◆
Environmental Dispatch			◆
Emissions Taxes	◆		◆◆
Emissions Caps	◆		◆◆
Other Policies			
Government Purchases	◆◆	◆◆	◆◆◆
Site Prospecting, Review		◆◆	◆◆
Renewable Portfolio Standard	◆◆◆	◆◆	◆◆
Auctioned Contracts	◆◆	◆◆	◆◆
Performance-Based Ratemaking	◆◆	◆	◆

◆ = policy option ranks low for (1) achieving sustainable energy goals; (2) addressing market barriers; or (3) meeting criteria for practicality

◆◆ = policy option ranks medium for the above

◆◆◆ = policy option ranks high for the above

CONCLUDING COMMENTS

No single policy or set of policies is likely to be sufficient to stimulate wind energy development. Market-push and market-pull policies, working in conjunction, can likely create sufficient incentives for investors to enter the market. For example, government purchases, auctioned contracts, production incentives and/or renewable portfolio standards create a demand for renewable energy. Given the demand, investors will be more interested in entering the market. Incentives that reduce the cost of development, such as loan guarantees, investment incentives, or investment tax credits, may be sufficient to initiate capital funding for new development.

As Oklahoma considers the effects of utility deregulation, it is important to consider the development of a wind energy industry within the context of other fuel sources. Incentives designed to lower capital or production costs and create markets may not be sufficient to overcome momentum behind more traditional forms of energy production. Integrating markets within the context of emissions caps and diversified portfolios will work toward the benefit of both sources of power production. For example, wind and natural gas – two prime energy sources in Oklahoma – can work in tandem, with natural gas facilities supplying more power at times when the wind is not sufficient to generate much electricity, and less when wind is at optimal capacity. In this way, wind can help producers hedge against the rising cost of gas, while earning them green credits - and someday, in all likelihood, carbon emission credits - for trade on the open market.

Each of the policy options described in the NWCC report addresses different aspects of creating a wind energy industry in the state. Those grouped as 'other policies' tend to favor development of markets, while low-cost capital programs, distributed resource policies, and customer choice opportunities help lower market barriers. Nearly all policy options fare well in regards to practical criteria.

Tax incentives are worthwhile for stimulating some level of development, but they alone will be ineffective. Despite reducing the relative cost of production, if market barriers are not reduced there will be few investors willing to take the risks associated with a new venture. Direct cash payments are more effective than tax incentives, although they also suffer from market barriers. Low-cost capital programs reduce investors risk, which when coupled with other incentives may be sufficient to spur investment.

Distributed resource policies are especially good for promoting small wind generation facilities, but do little for investment in large-scale facilities. The advantages of small facilities include self-sufficiency for some customers, reduced demand for fossil fuel based energy, and reduced price volatility. They are not, however, sufficient to generate enough energy to export to critical markets in other states.

Customer choice opportunities help to raise awareness of the environmental impacts of fossil fuels, thereby lowering market barriers to wind energy. However, they do little in attracting investors, because the number of subscribers willing to pay premiums for "green energy" is likely to remain small.

Environmental regulations do little in spurring development of renewable energy, because the costs or taxes added to fossil fuels are often not sufficient to raise fossil fuel costs above renewable energy costs. This is not to advocate abandonment of environmental regulations, though, because there are tremendous benefits to reducing pollution from background emissions sources.

The key to success seems to be in coupling policies that create markets for the product, such as government purchases or renewables portfolio standards, with more traditional tax incentives, grants, production incentives, or subsidized loans. Many of the states most aggressively developing large wind energy facilities include renewables portfolio standards, including Texas, Nebraska, Minnesota, and Iowa (See Table 4). By creating a guaranteed market, investor risk is reduced, which contributes immensely to removing barriers to entry into the market.

States rely upon different mechanisms to spur interest in renewable energy. Most states offer some form of net metering for small wind energy systems. For large projects, however, tax incentives seem to be the favored mechanism, with ten of the seventeen states profiled here offering some form of tax credits or reductions. Government subsidized loans are common in several of the states with large capacity; California, Minnesota, and Iowa – the top 3 states in production – all offer subsidized loans.

Customer choice opportunities are popular among the states because they are fairly easy to implement and require little government regulation. Many utilities now offer green pricing options in order to secure a niche market, but the low subscriber rates limit the effectiveness of green pricing as a significant policy option. Green marketing is a more effective approach, drawing renewable energy sources into a diversified energy pool. California and Minnesota both use green marketing effectively to stimulate demand for renewable energy.

The policy reviews from the EREN report did not mention environmental regulations: thus no states have environmental regulations checked in Table 4. This is probably a result of categorization that we hope to remedy in a revised edition of this report. Emissions caps tend to fall under federal guidelines, so it may be that states do not have specific policies related to environmental regulation, leaving it to agencies such as the EPA and U.S. Department of Energy, which as federal programs would not be listed under state summaries from EREN.

The greatest challenge is to maximize incentives without either creating a tremendous cost for the state or offsetting federal subsidies. One method to determine the appropriate incentives is to set a target cost reduction, and then select policies that will meet that target. For example, an investment tax credit may contribute 0.4 cent per kWh reduction, a capital grant could reduce about 0.35 cent per kWh, and project loan guarantees could save 0.5 cent per kWh through more favorable market interest rates. This produces a total reduction of about 1.25 cents per kWh, assuming no offset of the federal production tax credit. Coupled with a pre-defined market through market-pull strategies, this may be sufficient to spur development of new generation facilities.

Table 4. Policy options offered in selected states.

Policy Option	North Dakota	Texas	Kansas	Montana	South Dakota	Nebraksa	Wyoming	Oklahoma	Minnesota	Iowa	Colorado	New Mexico	California	Oregon	Wisconsin	Hawaii	Vermont
Tax Incentives																	
Production Tax Credits																	
Investment Tax Credits	✔			✔										✔		✔	
Sales Tax Reductions									✔	✔							✔
Property Tax Reductions	✔	✔		✔	✔				✔	✔				✔	✔		✔
Accelerated Depreciation									✔								
Direct Cash Payments																	
Direct Production Incentives									✔						✔		
Direct Investment Incentives (Grants)			✔										✔		✔		
Low-Cost Capital Programs																	
Government Subsidized Loans						✔			✔	✔			✔	✔			
Project Loan Guarantees																	
Project Aggregation																	
Distributed Resource Policies																	
Standard Contracts for Small Projects																	
Net Metering	✔	✔		✔				✔	✔	✔	✔	✔	✔	✔	✔		✔
Line Extension Policies		✔									✔	✔					
Customer Choice Opportunities																	
Utility-Supplied Green Pricing Options		✔									✔		✔	✔	✔		
Green Marketing									✔				✔				
Aggregated Consumer Purchases																	
Fuel Source Disclosure Requirements		✔		✔									✔				
General Environmental Regulations																	
Externality Valuation																	
Environmental Dispatch																	
Emissions Taxes																	
Emissions Caps																	
Other Policies																	
Government Purchases											✔						
Site Prospecting, Review			✔							✔			✔				
Easements				✔		✔			✔					✔	✔		
Renewable Portfolio Standard		✔				✔			✔	✔							
Auctioned Contracts																	
Performance-Based Ratemaking																	

REFERENCES

Rader, Nancy A. and Ryan H. Wiser, 1999. Strategies for Supporting Wind Energy: A Review and Analysis of State Policy Options. Denver, CO: National Conference of State Legislators.

The National Wind Coordinating Committee (NWCC) offers several publications as background to policy issues related to the development of wind energy. Many of their publications, including "Strategies for Supporting Wind Energy: A Review and Analysis of State Policy Options", are available from their website: http://www.nationalwind.org/default.htm.

The Energy Efficiency and Renewable Energy Network (EREN), a part of the U.S. Department of Energy, provides information regarding activities and technologies related to the development of wind energy. EREN's homepage is: http://www.eren.doe.gov/. For more information on wind energy in particular, visit: http://www.eren.doe.gov/RE/wind.html.

Summaries of state activities were obtained via EREN's state summaries pages, located at: http://www.eren.doe.gov/state_energy/states.cfm.