

The Economic Benefits of Wind Farm Development In Vermont

Executive Summary

Vermont could produce 10% of its electric energy from half a dozen wind farms in the state, with a total of about one hundred and fifty 1.5 MW wind turbines. Development would take place over a ten-year period.

The power would be clean, safe, renewable and less expensive than fuel-burning generation over a 20-year period.

The development and construction of the wind farms would require a capital expenditure of 342 million dollars of which 152 million dollars (in current dollars) would be spent in Vermont on goods and services.

The development phase, about four years, would create 140 jobs. The construction phase, about six years, would create about 300 jobs. Operations thereafter would create 40 high-paying jobs.

The wind farms would pay annually:

- 2.7 million dollars to land owners
- 2.2 million dollars in property taxes
- 0.7 million dollars in state taxes

Finally, the wind farms would be located primarily in mountainous and thinly populated areas, where economic development is most needed.

THE ECONOMIC BENEFITS OF WINDFARM DEVELOPMENT IN VERMONT

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By

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I. Introduction

As Vermont's electric load grows and existing sources of supply need to be replaced, electricity generated from the wind in Vermont is one of the best choices for ratepayers and the state economy.

All agree that wind power is the cleanest source of power; is available locally; and is infinitely renewable. The good news is that modern wind turbines of 1.5 MW capacity, as are being installed worldwide, can be sited in Vermont to produce electricity at about 5.6¢ / kWh over a 20 year period. This is the least expensive form of new generation, which is why it's the fastest growing type of electric generation in the U.S and worldwide.

To realize this economy of production, the wind turbines must be located together in groups called "windfarms." Based on the terrain and measured wind velocity, it is expected that a windfarm would have ten to forty turbines, but not necessarily in a straight line.

This study analyzes the economic benefits of meeting 10% of Vermont's electric needs from windfarms developed over a ten-year period. It is assumed that the most likely alternative is to purchase electricity produced from natural gas-fired facilities in southern New England. That scenario has significant price uncertainty and adverse environmental impacts, and none of the expected economic benefits of in-state windfarms.

Indeed, the Vermont Department of Public Service (DPS) has indicated that it is in Vermont's best interests to increase the amount of electricity obtained from in-state renewable resources such as wind (see "Fueling Vermont's Future", DPS, 1998).

"There are many advantages to wind energy use, including no air emissions, few environmental impacts compared with traditional fuels, availability of efficient new technologies, modularity of wind projects, [nearly competitive generation costs which] remain relatively fixed over time, absence of external costs, and positive contributions to local economies." (DPS, 1998, V.2, p.4-27)
Fortunately, Vermont has significant wind resources.

II. Windfarms: Costs and Financial Assumptions

As shown in Table 1, six windfarms could produce 10% of Vermont's electricity with a total of 152 turbines - about 23 per windfarm, plus another 14 turbines at ski areas and special locations.

Table 1

Base Data								
2001 Total VT Load (MWH)	Wind Percent (Vermont MWH)	Wind Annual Sales (MWH)	Wind Annual Production (MWH)*	Turbine Annual Plant Factor	Wind Total Installed (MW)	Wind Total 1.5 MW Turbines	Wind Turbines Per WindFarm	Other Wind Turbines
5,580,000	10%	558,000	600,000	30%	228	152	23	14

* Includes 7% T&D losses

Of the six windfarms required, three locations are already being actively evaluated: Searsburg (expansion), Mount Equinox in Manchester, and East Haven in the Northeast Kingdom. These three projects could probably handle half of the needed turbines. Other sites are being tentatively explored, and some Vermont ski areas are very interested in installing turbines at their locations.

The cost of an installed modern turbine at a windfarm (including roadways, power lines and development costs) should average about \$1,500/KW, or about \$2.25 million per turbine. Thus, the aggregate cost would be about \$342 million in 2002 dollars (see Table 2). We assume five years for development and permitting and seven years for installation (overlapping in years four and five).

As with all investments of this kind, expenditures made in Vermont have significant direct and indirect economic benefits. In this case, the largest single expense is for the turbines, which are manufactured out of state. However, the professional services required for development of the projects and much of the necessary electrical and mechanical equipment can all be purchased in Vermont. In addition, most of the labor needed to construct access roadways, prepare the sites, install the turbines, and connect to the transmission system will be local.

Financing: Ideally, local lenders and VEDA could fund the projects. This would help recycle local deposits, offer investment opportunities for institutional investors (e.g., state retirement funds), and keep a portion of the project revenue in Vermont.

Table 2

Estimated project costs in current dollars (millions)		
	Vermont	Out of state
Development	29	3
Electrical & mechanical equipment	19	6
Construction / installation	86	12
Turbines	0	169
Construction financing (interest)	18	0
Totals	\$152	\$190

In order to assess the "multiplier effects" of these expenditures, we allocated in-state project costs to several industry categories (see Table 3). Expenditures were inflated annually at 2.5%, which is the average of the CPI-U over the last ten years.

Table 3

Annual in-state expenditures by category (millions)										
	Development					Construction / Installation				
Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Category										
Engineering services	2.6	2.7	2.7	2.8	2.9					
Consulting services (permitting)	2.0	2.1	2.1	2.2	2.2	0.2	0.2	0.2	0.2	0.2
Legal services	0.9	0.9	0.9	0.9	1.0	0.1	0.1	0.1	0.1	0.1
Financial services	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Accounting services	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Construction / installation				11.7	12.0	12.3	12.6	12.9	13.3	13.6
Equipment purchased in-state				2.8	2.8	2.9	3.0	\$3.1	3.1	3.2
Total annual in-state expenditures	\$5.8	\$6.0	\$6.1	\$20.8	\$21.3	\$15.9	\$16.3	\$16.7	\$17.1	\$17.5

Some column totals are off due to rounding

III. Economic and Fiscal Benefits

A. JOB CREATION: Using the schedule of expenditures shown above, we applied U.S. Commerce Department multipliers for Vermont¹ to the relevant industries to determine the expected changes in job creation and earnings.

The magnitude of the projects will have very a positive impact on the labor market. The development phase will create about 140 full-time equivalent jobs and the construction phase will produce about 300 jobs per year of development (see Table 4).

Table 4

Annual job creation and earnings from scheduled expenditures (Direct, indirect and induced)										
	Development					Construction / Installation				
Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total annual jobs created	139	142	146	274	281	288	295	303	310	318
Total earnings (millions in 2002 dollars)	\$4.2	\$4.3	\$4.4	\$14.1	\$14.5	\$10.1	\$10.3	\$10.6	\$10.8	\$11.1

The new jobs will be distributed throughout the economy. Some will be direct hires working on the projects; others will result from linkages in the economy (e.g., suppliers of goods and services);

and, the rest from the induced effects of spending by workers and their families. The development phase will feature business services. The second phase will support primarily construction and retail. Both phases will generate additional jobs from the indirect and induced economic activity.

Table 5

Distribution of jobs by industry Year 1 of Development Phase	
Industry	# of jobs
Business services	87
Wholesale & Retail trade	11
Eating / Drinking & Lodging	10
Finance, Insurance & Real estate	7
All other	23

Table 6

Distribution of jobs by industry Construction / Installation (Year 6 - following development)	
Industry	# of jobs
Construction	133
Wholesale & Retail trade	94
Business services	35
All other	95

B. REVENUES AND PAYMENTS

Table 7 shows the annual benefits from each source of revenue provided by the windfarms and individual turbines. Together, these payments are expected to total almost \$5.6 million in year one.

Table 7

Direct Payments by Windfarms*	
Source of funds	Revenue
Lease payments to land owners	\$2,700,000
Property taxes and PILOT	2,200,000
Vermont business taxes	500,000
Vermont personal income taxes	107,000
Vermont sales & excise taxes	83,000
Total	\$5,590,000

* Based on annual sales of 600,000 MW at 5.6¢ / kWh = \$33.6

1. Lease Fees: A principal benefit of windfarms is the payment of lease fees to property owners for the turbine sites, roadways and power line easements. We assume that lease payments will equal 8% of gross revenues, so the windfarms will pay landowners approximately \$2.7 million per year.

Generally speaking, the land required for cost-effective turbine operations lies above 2,500 feet. Some of this land is in private hands, some state, some federal, and some with protective easements. Lease fees for the use of state, federal and conserved lands could provide funding for land maintenance, stewardship, and improved public access.

2. Property Taxes and PILOT: The windfarms would also pay for increased property taxes on private lands and would make payments in lieu of taxes (PILOT) for the use of public lands. At this point, we cannot identify which towns would host the turbines so we can't reliably estimate property taxes. An alternative approach is to calculate the rate as a percentage of gross revenues. If we assume a rate of 6.5% of gross revenues, the windfarms would pay about \$2.2 million per year, to be divided between the towns and the state depending on the location of the turbines and the ownership of the land.

3. Business Tax: The owners and lessors of the windfarms would also pay business income taxes. Assuming an after tax profit of 9%, the windfarms would generate aggregate annual state tax payments of approximately \$500,000/year.

4. Income Tax: The estimated earnings from the new jobs will be almost \$4.2 million in year one (see Table 3). This new income will produce state income tax revenues of about \$107,000 in year one,ⁱⁱⁱ rising to almost \$245,000 in year six (construction only, following development).

5. Sales Tax: Household expenditures vary, but all families pay sales and excise taxes. Using methodology from the Job Gap Study, we estimate sales tax revenues of \$80,000 in year one.^{iv}

C. OTHER ECONOMIC BENEFITS

1. Operations: Once completed, the windfarms will require labor and materials to administer and operate the system and perform maintenance. These expenditures will generate additional economic benefits as a result of the multiplier effect. For example:

- Staff to operate and maintain the system will include specially trained electricians and mechanics, as well as administrators. **Wind industry practice suggests that the windfarms will require 40 staff and an annual payroll of \$1.9 million, plus 20% for general overhead. Using Commerce Department multipliers, the total annual impact of these wages in Vermont would be \$3.3 million/year.**^v

Note: In current dollars, staff salaries would be approximately \$60,000 for electricians and mechanics and \$35,000 for general office positions.

- **The project would pay \$1.3 million annually for maintenance materials, about half of which would be spent in Vermont (\$670,000). Because of the multiplier effect, these**

expenditures would produce 20 FTE jobs (primarily in retail trade) and over \$400,000 in total earnings.

2. Rural Economic Development: As noted above, annual lease payments made to private landowners would provide substantial new income. For those owners who rely primarily on agriculture or forestry, such lease payments would help diversify their income base and create more stability in local economies.

3. Electric Power Supply Portfolios: "The addition of wind energy to the resource portfolio of a utility diversifies its fuel mix, stabilizing costs and reducing risks. Since there is no 'fuel' for a wind turbine, its costs are essentially fixed at the time of construction. As prices for other generation fuels fluctuate, the cost of wind power remains constant. Further, since there are almost no external costs associated with wind generated electricity, the risk of future environmentally based restrictions on operations (which could be imposed on fossil plants) are all but eliminated."^{vi}

The 5.6¢ / kWh price of wind generation over 20 years would cost less than gas-fired generation if the price of gas increases by 10% per year over the term. In fact, if a utility makes a blended purchase of wind generation from Vermont and gas-fired turbine power from southern New England, it would provide a more reliable and lower cost power supply than either source alone.

4. Tourism: There is anecdotal evidence that windfarms attract tourists.^{vii} In addition, the construction and maintenance of access roadways for the turbines would undoubtedly attract residents and tourists who enjoy outdoor activities such as hiking, camping, birding, and snowmobiling.

We cannot say whether any tourists would come to Vermont specifically because of the turbines or the new access roadways, or simply add them to their itineraries. In any case, such tourists spend money at local businesses. It is impossible at present to reliably estimate the economic benefits of these activities but it is reasonable to assume increased expenditures and tax revenues.

ENDNOTES

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- ⁱ Regional Input-Output Modeling System (RIMS II), U.S. Dept. of Commerce.
- ⁱⁱ Sales of 600,000 MW/year at \$0.056 per kWh in 2003 = \$33.6 million.
- ⁱⁱⁱ The average annual wage for the FTE jobs created in year 1 is \$30,412 (\$4.2 million ÷ 137). According to the state Tax Department, about 60% of tax filers that earn between \$25,000 and \$60,000 file joint returns and 40% file single returns. Using this ratio, we calculated the net state taxes with a program created for the Joint Fiscal Office (JFO - see "Basic Needs Budgets, 2002" at <http://www.leg.state.vt.us/jfo/topics.htm>). For joint returns, we assumed 2 children; that both adults work and have total income of \$60,000. We split the resulting net state tax.
- Note: The JFO tax program does not yet contain changes in federal and state tax law enacted since 2000.
- ^{iv} We used the "Methodology for Sales Tax Calculation" from Phase 7 of the Job Gap Study, which found that families spend approximately 1.9% of gross income on sales and excise taxes.
- "Using the Consumer Expenditure Survey (CES), we calculated the percentage of disposable income spent on various categories by a family of four with two wage earners and average annual expenditures of \$52,032. We then multiplied the category percentages times the total after tax amount...to estimate the aggregate amount spent in each category. We then determined which categories (or portions thereof) were subject to Vermont sales and excise taxes and the tax rate for each. By multiplying the tax rate times the applicable amount of...expenditures, we arrived at the estimated tax revenue for each category" and totaled them (Vermont Job Gap Study, Phase 7, p.28).
- Note: The Bureau of Labor Statistics publishes the CES, which provides detailed information on the spending habits of families, based on surveys and interviews with over 30,000 families nationally.
- ^v We assumed the payroll of \$1.9 million would be split evenly among electricians, mechanics and administrative staff and used current RIMS II multipliers.
- ^{vi} "Fueling Vermont's Future: Comprehensive Energy Plan & Greenhouse Gas Action Plan", Dept. of Public Service, July 1998, Volume 2, p. 4-28.

vii The Mount Snow-Haystack Regional Chamber of Commerce reported that of those who made inquiries, about 10% asked for information about the turbines in Searsburg (Sept. 20, 2002 telephone conversation). In addition, Green Mountain Power organizes periodic tours of the Searsburg facility and interest has been steady (Sept. 23, 2002 telephone conversation with Dottie Schnure). The director of V.A.S.T. indicated that such access roadways would certainly be of interest to their membership.