



---

**BEAVER  
WOOD  
ENERGY**

---

## **TABLE OF CONTENTS**

- **Economic Impacts of the Beaver Wood Energy Integrated Facilities  
- A Summary**
- **Regional Economic Impact Analysis for a Biomass Fired Power  
Generation and Wood Pellet Manufacturing Facility in Fair Haven,  
Vermont - Proposed by Beaver Wood Energy Fair Haven, LLC**
- **Regional Economic Impact Analysis for a Biomass Fired Power  
Generation and Wood Pellet Manufacturing Facility in Pownal,  
Vermont - Proposed by Beaver Wood Energy Pownal, LLC**
- **Electricity Prices and the Regional Economic Impact of a Biomass  
Fired Power Generation and Wood Pellet Manufacturing Facility -  
Proposed by Beaver Wood Energy Fair Haven, LLC**
- **Electricity Prices and the Regional Economic Impact of a Biomass  
Fired Power Generation and Wood Pellet Manufacturing Facility -  
Proposed by Beaver Wood Energy Pownal, LLC**
- **The Economic Impacts of Major Renewable Energy Projects: A  
Comparative Study**

# ECONOMIC IMPACTS OF THE BEAVER WOOD ENERGY INTEGRATED FACILITIES

## A SUMMARY

Beaver Wood Energy LLC (“BWE”) has commissioned several studies by Northern Economic Consulting, Inc. (“NEC”) to determine the economic impacts of the development, construction and operation of their integrated wood biomass fired electric generation and wood pellet manufacturing facilities in Fair Haven and Pownal, Vermont (each an “Integrated Facility”, and together, the “Integrated Facilities”). Each Integrated Facility will produce 29.5 MW (net) of base load electricity and 110,000 TPY of wood pellets from forest residues and sustainable forest management activities (removal of diseased, misshapen, overgrown and low value trees), respectively. These ‘combined heat and power’ systems (waste heat from the generating facility will produce 50% of the pellet feedstock drying requirements) will afford higher overall efficiencies for the Integrated Facilities, while utilizing the latest in emissions control technology.

The NEC studies were commissioned for presentation to the Vermont Public Service Board in the 248 permitting process for each Integrated Facility. The studies analyzed the impacts of these Integrated Facilities on direct and indirect job creation, wages, equipment and construction supplies purchases and tax revenue in Vermont. The economic impacts reported by NEC in Vermont *do not* take into consideration the significant economic impacts of the Integrated Facilities in adjacent states of New York and Massachusetts (the Pownal Integrated Facility is directly adjacent to both New York and Massachusetts and the Fair Haven Integrated Facility is directly adjacent to New York).

The Vermont regional economic impact analyses performed by NEC for the Integrated Facilities<sup>1</sup> concluded, in the aggregate ----

- Job Creation
  - For the 26 month construction period beginning in 2011, **1,500<sup>2</sup> people** will be employed in Rutland and Bennington Counties and **2,010 people** (including those in Rutland and Bennington Counties) will be employed in all of Vermont
  - For each year of the Integrated Facilities operations beginning in 2013, **90 people** will be employed directly by the Integrated Facilities, **320 people** will be employed indirectly by third parties in Rutland and Bennington Counties and **370 people** (including those in Rutland and Bennington Counties) will be employed indirectly by third parties in all of Vermont
- A significant portion of the aggregate cost of the Integrated Facilities - **\$500 million** - will be spent in Rutland and Bennington Counties, as well as the rest of Vermont, to develop and construct the Integrated Facilities
- For each year of Integrated Facilities' operations beginning in 2013 -
  - **\$6.8 million** in wages will be paid to people employed by the Integrated Facilities
  - **\$19 million** in wages will be paid to people employed by third parties in all of Vermont
  - **\$36.4 million** will be spent to purchase and transport forest products for the Integrated Facilities
  - **\$4.8 million** in additional state tax revenue will be created
  - **\$1 million** in additional property tax revenue will be generated in Fair Haven and **\$0.5 million** in Pownal

In sum, (x) a total of **2,010 people** will be employed throughout Vermont during construction of the Integrated Facilities; (y) a total of **460 people** will be employed throughout Vermont *each year* from 2013 through 2034 and (z) a total of **\$68.5 million**

---

<sup>1</sup> "The Regional Economic Impact Analysis for a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Fair Haven, Vermont Proposed by Beaver Wood Energy Fair Haven LLC" and "The Regional Economic Impact Analysis for a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Pownal, Vermont Proposed by Beaver Wood Energy Pownal LLC", dated September 7 and 8, 2010, respectively, prepared by Northern Economic Consulting, Inc. of Westford, Vermont and attached hereto.

<sup>2</sup> All numbers from the NEC studies are reasonable approximations based on information from primary and reliable secondary sources, as well as calculations derived from the foregoing.

*(\$62 million* in annual spend in Vermont, plus taxes of *\$6 million*) will be required to operate the Integrated Facilities, or *\$1.37 billion* in the aggregate over 20 years.

NEC followed the positive gross results of the regional economic impact analyses for the Integrated Facilities with a review of the net results of these analyses after taking into consideration any increased costs of electricity in Vermont due to the addition of electricity charges from the wood biomass-fired electric generating portion of the Integrated Facilities.<sup>3</sup> NEC concluded that, notwithstanding a less than 2% rise in Vermont retail electricity prices due to the addition of electricity generated by the Integrated Facilities, both the overall and individual economic benefits of the Vermont regional impact analyses, noted above, remain largely intact over the expected useful lives of the Integrated Facilities.

Finally, BWE asked NEC to compare the economic impacts of the Integrated Facilities with the economic impacts of wind and solar projects in Vermont and New Hampshire.<sup>4</sup> The following conclusions reflect the fact that once wind and solar projects are completed, on-going operational costs remain modest, given the independent operating characteristics of such facilities. NEC concluded that (x) no wind or solar project reviewed would provide the job or wage creation during construction or operations that even a single BWE Integrated Facility would provide; (y) no wind or solar project reviewed would provide the local or state tax revenue that even a single BWE Integrated Facility would provide and (z) no wind or solar project reviewed would provide the third party revenues during operations that even a single BWE Integrated Facility would provide.<sup>5</sup> As further evidence of the economic advantage of the BWE Integrated Facilities, NEC provided a cost/benefit analysis. This analysis took into consideration the increase in the cost of power to Vermont ratepayers caused by the Integrated Facilities and the overall economic benefits created by the Integrated Facilities for the State of Vermont. The analysis concluded that aggregating

---

<sup>3</sup> "Electricity Prices and the Regional Economic Impacts of a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Fair Haven, Vermont Proposed by Beaver Wood Energy Fair Haven LLC" and "Electricity Prices and the Regional Economic Impacts of a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Pownal, Vermont Proposed by Beaver Wood Energy Pownal LLC", each dated November 30, 2010, prepared by NEC and attached hereto.

<sup>4</sup> "The Economic Impacts of Major Renewable Energy Projects: A Comparative Study", dated December 15, 2010, prepared by NEC and attached hereto.

<sup>5</sup> See the Wind and Solar Summary Tables provided in the comparative study noted above.

the costs and benefits of the Integrated Facilities produced an effective net cost of power to Vermont of \$60 MWh!<sup>6</sup>

In summary, the BWE Integrated Facilities will generate base load power and produce wood pellets using a regionally indigenous renewable feedstock, while at the same time creating significant increases in jobs, wages and taxes and offering an economic boon to the State of Vermont that no other renewable or fossil- fuel facility could expect to achieve.

---

<sup>6</sup> See the NEC Cost/Benefit Analysis to the State of Vermont prepared by NEC as part of the comparative study in *footnote 4* above.

**Regional Economic Impact Analysis  
for a  
Biomass Fired Power Generation and Wood Pellet  
Manufacturing Facility  
in Fair Haven, Vermont  
Proposed by  
Beaver Wood Energy Fair Haven, LLC**

Prepared by  
Richard W. Heaps  
September 7, 2010

## **Executive Summary**

Beaver Wood Energy Fair Haven LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Fair Haven, Vermont. The total construction cost of the project is estimated to be \$250 million at 2009 prices. The Integrated Facility will directly employ 45 people with an annual payroll of \$3.4 million plus have an annual spending of \$9.9 million with third-party contractors. In addition, the Integrated Facility will annually purchase about \$18.2 million in forest products from local loggers.

The purpose of this analysis is to estimate the economic impacts of the proposed Beaver Wood Integrated Facility on the state of Vermont for presentation to the Vermont Public Service Board as part of the application for a Section 248 Certificate of Public Good.

The integrated energy generation and wood pellet manufacturing facility will bring significant economic benefits to the host town, the neighboring region, and the state of Vermont. The construction of the Integrated Facility in 2012 through 2013 will lead to the creation of about 730 jobs in Rutland County and a total of about 1,050 jobs in all of Vermont. Operation of the Integrated Facility will lead to the creation of nearly 200 jobs in Rutland County and a total of more than 230 jobs in all of Vermont from 2014 forward. Payrolls across the state will increase by over \$11 million annually with operation of the Beaver Wood facility.

Tax revenues to the State of Vermont from the operation of the Integrated Facility are estimated to increase by an annual total of more than \$2.5 million.

The project will clearly have positive fiscal impacts on the host town of Fair Haven, paying over \$1 million more in annual municipal property taxes than demanding in municipal services.

Finally, the Beaver Wood Integrated Facility for Fair Haven will make a positive contribution to Vermont’s efforts to meet future base-load electricity demand, insulate the state from foreign sources of energy, diversify its power generation sources, and maintain a clean renewable energy generation portfolio.

## Table of Contents

<b>I.</b>	<b>Introduction</b> .....	Page 1
<b>II.</b>	<b>Detailed Integrated Facility Description</b> .....	Page 2
<b>III.</b>	<b>The Regional Economy and Demographics</b> .....	Page 3
<b>IV.</b>	<b>Economic Impacts in Vermont</b> .....	Page 6
<b>V.</b>	<b>Vermont Energy Market Considerations</b> .....	Page 15
<b>VI.</b>	<b>Tourism and Property Valuation Impacts</b> .....	Page 16
<b>VII.</b>	<b>Summary and Findings</b> .....	Page 19

## **I. Introduction**

Beaver Wood Energy Fair Haven LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (“the Integrated Facility”) in the Town of Fair Haven, Vermont. The Integrated Facility will be located on a parcel of land north of Route 4 at the Poultney River (on the border with New York state).

Beaver Wood Energy will be submitting an application for a Section 248 Certificate of Public Good from the Vermont Public Service Board. The application requires an economic benefit analysis of the Integrated Facility. This report presents the results of such an analysis. In section II we describe the Integrated Facility in detail. In section III we provide a brief economic and demographic description of the region in order to put this Integrated Facility’s impact into perspective. In section IV we present our estimate of the impact of the Beaver Wood Integrated Facility on economic activity in the county and state during both its construction and operating phases. In section V we discuss the importance of this Integrated Facility in meeting Vermont’s energy needs and renewable energy goals. Section VI discusses the impact of the Integrated Facility on tourism and property values. We summarize our findings in section VII.

---

## II. Detailed Integrated Facility Description

Beaver Wood Energy Fair Haven LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (“the Integrated Facility”) in the Town of Fair Haven, Vermont. The Integrated Facility will be located on a parcel of land north of Route 4 at the Poultney River (on the border with New York state).

The power plant will be fueled by waste wood chips from the surrounding forest lands within approximately a 50 mile radius of the plant. The wood feedstock will include chips from low-valued trees and wood waste residues from the logging of high valued trees. It will have a net output of 29.5 MW of base load power. The Integrated Facility is designed to be operated 24 hours per day. It is expected that the power will be contracted for by Vermont utilities under long term power purchase agreements. The wood pellet production facility will have a capacity of approximately 110,000 tons per year and utilize waste heat from the power plant. Pellets will be sold in the local market to businesses, schools, government offices, etc., typically under multi-year sales agreements. The Integrated Facility is currently in the permitting stage of its development. The Integrated Facility is expected to begin commercial operation by 2014.

Based on current information provided by Beaver Wood Energy, the Integrated Facility will cost a total of \$250 million to construct and bring to operation. The building, site work, engineering, and other construction will cost approximately \$123 million. This will have a significant impact on local employment. Beaver Wood estimates that \$93 million will be expended to procure machinery and equipment for the Integrated Facility. The remaining costs are for financing, reserves, etc. Construction will take approximately 26 months.

The major economic impact of this Integrated Facility on the local and regional economy will come during its operation. The combined generation plant and pellet manufacturing facility will have an employment of 45 and an annual payroll of \$3.4 million. The operation will contract with outside firms to supply maintenance, repairs, and distribution services at an annual expenditure of \$9.9 million. In addition, the facility will contract with local suppliers for forest-product inputs totaling approximately \$18.2 million per year. (All figures are in 2009 dollars.)

Therefore a key impact of this Integrated Facility during its operation is the employment and wages it creates and maintains in Rutland County and the rest of Vermont as well as the production of electricity that diversifies Vermont’s electricity generation in a renewable manner.

### III. The Regional Economy and Demographics

The Beaver Wood Energy Integrated Facility will be built on land in Rutland County in the Town of Fair Haven. In order to put the economic impact of the Integrated Facility into perspective, we briefly present some key summary statistics on the demographics and economics of the county and town.

Rutland County is the second largest of the fourteen counties in the state of Vermont in terms of population. It is home to ten percent of the state’s population. Rutland County’s population declined by 409 people, a 0.6% decline, from 2000 to 2009. The population of the Town of Fair Haven also declined during the period 2000 to 2009, falling by 21 people, for a decline of 0.7%. During this period, the population of Vermont grew very slowly, increasing by only 1.9% in nine years. Nearly all of southern Vermont has lost population in the last decade. All population data are from the U.S. Census.

<b>Regional Population Growth</b>			
Area	July 1, 2000 Population	July 1, 2009 Population	Growth Rate
Town of Fair Haven	2,931	2,910	-0.7%
Rutland County	63,423	63,014	-0.6%
State of Vermont	609,903	621,760	1.9%

Rutland County is home to 9% of the state’s employment. From 2000 to 2009, Rutland County lost 1,354 jobs or 4.7% of its total jobs just nine years earlier. The Town of Fair Haven lost 9.5% of its jobs during this period. During this period payroll employment in the state of Vermont fell just 1.4%, a loss of 4,098 jobs. All employment data are from the Vermont Department of Labor.

<b>Regional Employment Growth</b>			
Area	2000 Employment	2009 Employment	Growth Rate
Town of Fair Haven	983	890	-9.5%
Rutland County	28,930	27,576	-4.7%
State of Vermont	296,468	292,370	-1.4%

Rutland County’s industrial structure is very similar to that of the state as a whole. Employment at goods-producing firms (mostly construction and manufacturing companies) made up 21% to 22% of total private employment in the county and state. Employment at service-producing firms (trade, professional services, health care, tourism, etc) accounted for the remainder of the private employment. Rutland County had a slightly higher concentration of private sector jobs in health care and social assistance than did the state (21% to 19%) as well as a higher concentration of leisure and hospitality jobs (16% to 13%).

Public sector jobs only accounted for 17% of the total jobs in Rutland County, nearly the same as the 18% for the state. Rutland County has a disproportionate small share of federal and state government jobs compared to the state.

<b>Regional Employment Structure 2009</b>				
Area	Private Sector Jobs (% of total)	Goods-producing industries	Service-producing industries	Public Sector Jobs (% of total)
Rutland County	83%	21%	79%	17%
State of Vermont	82%	20%	80%	18%

Finally, according to the Vermont Tax Department median family income in 2008 was \$45,038 in the Town of Fair Haven, 16% below the median of \$53,166 in all of Rutland County and 22% below the statewide median.

Over the last eight years, median family income grew fairly consistently in the town, county and state, increasing at an annual rate of 3.3% in all of Vermont and 3.4% in Fair Haven and Rutland County.

<b>Regional Median Family Income Growth</b>			
Area	2000 Income	2008 Income	Annual Growth Rate
Town of Fair Haven	\$35,541	\$45,038	3.4%
Rutland County	\$41,967	\$53,166	3.4%
State of Vermont	\$46,113	\$58,069	3.3%

In sum, Fair Haven and Rutland County are slow growing regions, even more slow growing than the state of Vermont as a whole. Both the town and county have seen their populations decrease slightly and the trend is for that to continue. Like the state (and nation), Fair Haven and Rutland County employers have lost jobs in the last decade. But the town and county have lost jobs at a much higher rate than the state. This is particularly difficult for the town and region to absorb as median family income in both is significantly below that for the state as a whole.

A project such as the Beaver Wood Integrated Facility, which will boost the local economy and create much needed jobs, is sorely needed in the region.

---

## **IV. Economic Impacts in Vermont**

### **A. Economic Model Inputs**

We estimate the impact of the proposed Beaver Wood Energy Integrated Facility planned for the Town of Fair Haven by use of a regional economic model maintained by Regional Dynamics Inc. (REDYN). The REDYN model is a dynamic, multi-regional, endogenous, input-output economic and demographic model based on the North American Industrial Classification System (NAICS). The model estimates a range of economic impacts of concern to this analysis: employment, wages, tax revenues, etc. It also estimates demographic impacts.

The inputs to this model were developed with data supplied by Beaver Wood Energy and in consultation with REDYN staff. The model inputs we used in this analysis included the construction costs plus expected operational expenditures. The inputs into the REDYN model (in 2009 dollars) are given below. Because of the location of the Fair Haven plant near the New York border, Beaver Wood estimates 55% to 60% of the planned purchases of forest product inputs for the power generation and pellet manufacturing will be with Vermont firms.

The inputs are listed in a table on the following page.

<b>Inputs to REDYN Model (2009 dollars)</b>		
<u>Item</u>	<u>Cost</u>	<u>Date</u>
<b>Construction</b>	\$123,000,000	2012 - 2013
<b>Operation</b>		
Power Generation		
Employment	22 FT jobs	begin 2014
Payroll	\$1,768,200	"
Maint., repair, etc.	\$3,571,200	"
Biomass fuel	\$10,500,000	"
Pellet Manufacturing		
Employment	23 FT jobs	begin 2014
Payroll	\$1,626,600	"
Maint., repair, etc	\$576,000	"
Distribution	\$5,760,000	"
Wood inputs	\$7,735,000	"

Based on these inputs, we estimated with the REDYN model the indirect economic impacts for the region and the state as well as the demographic impacts.

For purposes of this analysis we used a REDYN model with the following three regions: Rutland County, the rest of Vermont, and the rest of the U.S. Also, because the REDYN model operates on an annual basis, we assume all permitting occurs in 2010 and 2011, all construction in 2012 and 2013, and operations begin on January 1, 2014.

**B. Economic Model Outputs**

We show the major economic and demographic impacts that are of interest to this analysis from the proposed Fair Haven Beaver Wood Energy Integrated Facility in the table below. During the construction phase employment will increase by about 730 in Rutland County and about 1,050 throughout the entire state of Vermont, (this includes the 730 jobs in Rutland County). Then in 2014 and the following years, the operation of Integrated Facility will generate nearly 200 jobs in Rutland County (including the 45 at the Integrated Facility site) and a total of more than 230 jobs statewide (including the 200 in Rutland County).

<b>Economic Impacts of the Beaver Wood Energy- Fair Haven, VT Integrated Facility (Changes from the Baseline)</b>						
Variable	Region	2012	2013	2014	2015	2016
Employment	Rutland County	738	723	203	200	197
	All Vermont	1,063	1,042	241	238	232
Wages (\$million)	Rutland County	\$31.5	\$31.3	\$9.2	\$9.3	\$9.3
	(In 2010 dollars) All Vermont	\$46.4	\$46.3	\$11.1	\$11.2	\$11.3
State Taxes (\$million)						
(In 2010 dollars)	All Vermont	\$3.8	\$3.7	\$2.5	\$2.6	\$2.7
Population	Rutland County	72	140	157	106	57
"	All Vermont	107	209	228	148	71

Wage gains follow the employment pattern. During the construction years, wages paid in the state rise by about \$46 million. With the operation of Integrated Facility beginning in 2014 the wage gain in the state totals over \$11 million. Wages then grow with general wage inflation.

The Integrated Facility will generate new tax revenues from its construction and operation in Rutland County and from the economic activity elsewhere in the state. The REDYN model estimates that tax payments to the state will increase over \$3.7 million during the construction years. This includes sales taxes, income taxes, corporate income taxes, and other state taxes. Then, with the operation of the plant, new tax payments to the state will equal more than \$2.5 million per year (as the plant also begins to pay state education property taxes).

Finally, with the ongoing operation of the Integrated Facility, population will rise by 56 people in the Rutland County and 70 in total throughout the state.

### **C. Reasonableness of Estimates**

We examine the reasonableness of our estimates in two ways. First, we examine the reasonableness of the inputs we used in the REDYN model. Second, we compare the reasonableness of the outputs from the model with that from another, widely-used economic model.

First, the Burlington Electric Department has been generating electricity from the McNeil Generating Station since 1984. The plant is a 50 MW facility that operates at about 60% of capacity.<sup>1</sup> It has an annual payroll of about \$2.5 million with an employment of approximately 40 people.<sup>2</sup> It purchases about \$11.5 million per year in biomass fuel. The proposed Fair Haven generation plant (without the pellet manufacturing operation) is rated at 29.5 MW, will directly employ 23 people plus contractors, will operate at 92% of capacity, and use \$10.5 million of biomass fuel.

With a plant about 60% of the rated size of the Burlington electric plant, the Beaver Wood plant calls for just about 60% (22 versus 40) of the employment and 70% (\$1.8 million versus \$2.5 million) of the payroll. The ratios of production capacity, employment, and wages between the

---

<sup>1</sup> Burlington Electric Commission, *Performance Measures Report*, March 2009.

<sup>2</sup> See the Annual Report at [www.dfd.com](http://www.dfd.com).

McNeil plant and the proposed Fair Haven plant demonstrate the reasonableness of the inputs used in the REDYN model.<sup>3</sup>

We also compared the estimated total statewide employment from the REDYN model to the employment suggested by the multipliers produced by the U.S. Bureau of Economic Analysis' RIMS II model. As discussed using the REDYN model, the 45 jobs and contractor payments at the proposed Fair Haven combined facility are estimated to lead to about 230 jobs in all of the state of Vermont during its operation. The RIMS II model estimates these 45 jobs plus contractor payments would lead to the creation of 298 jobs in the state.<sup>4</sup>

The estimate from the RIMS II model supports the estimate presented in this report from the REDYN model.

---

<sup>3</sup> Ryegate Associates operates a 20 MW wood-fired electricity generating plant in Ryegate, Vermont. The plant states that it has an employment of 21 people, which is also consistent with the plans for the Beaver Wood facility in Fair Haven.

<sup>4</sup> The RIMS II jobs multiplier for electrical generation plants is 3.0743, for wood products manufacturing is 2.0774, and for the logging industry is 2.0291. These multipliers suggest a total of 298 jobs would be created in Vermont from the proposed plant(22 jobs times 3.0743 plus 23 jobs times 2.0774 plus 90 jobs times 2.0291).

## **D. Fiscal Impact on the Host Town of Fair Haven**

The proposed Beaver Wood biomass facility will be sited in the Town of Fair Haven. The town will be impacted positively by any tax revenues generated by the Integrated Facility and negatively by any demands for town services from the Integrated Facility or any new employees attracted to the town as residents by the Integrated Facility.

We estimate that Rutland County will see a population increase of 56 people in 2015 because of this Integrated Facility. A few of these new residents will choose to live in the Town of Fair Haven. U.S. Census data on commuting patterns show that 29% of the employees of Fair Haven town businesses live in Fair Haven. Therefore, we assume that Fair Haven will see sixteen new residents from this Integrated Facility (56 times 29%). And we expect they will live in seven new households based on the average household size for the region (nine divided by 2.39 average household size in Rutland County).

Note that the population impacts are all small. The 2009 population of Fair Haven is estimated by the Census Bureau to be 2,910. If sixteen new residents were added to the total, the increase would be less than one percent (only 0.5%). And we note that Fair Haven's population has declined during this decade (by 21 people). The potential for these new residents to cause a fiscal problem, rather than being a fiscal benefit, is small.

In the following section, we examine in detail the fiscal impact on the Town of Fair Haven from the proposed Integrated Facility.

## **A. Impact on the Demand for Municipal Services in the Town of Fair Haven**

The budgeted expenditures for Town of Fair Haven's municipal general fund in FY11 is \$2,065,775, of which \$1,587,700 will be raised through property taxes. We estimate the current municipal costs per employee and per household by use of a per capita expenditure method commonly used in conducting an impact analysis.<sup>5</sup> The method divides municipal expenditures into residential and nonresidential based on grand list data. The following table shows the calculations for the municipal cost per new employee (excluding highway costs) and per new residence in the Town of Fair Haven.

---

<sup>5</sup> *Development Impact Assessment Handbook*, Robert W. Burchell, David Listokin, William R. Dolphin, Lawrence Q. Newton and Susan J. Foxley, Urban Institute, 1994, page. 129.

<b>Town of Fair Haven Municipal Impact Parameter Calculation</b>		
1. Municipal budgeted expenditures (FY11)		\$2,065,775
2. Total Taxable Parcels		1,157
	Residential parcels	930
	Percent of total	80.4%
	Nonresidential parcels	227
	Percent of total	19.6%
2. Total Assessed Value		\$180,441,400
	Residential parcels	\$140,565,800
	Percent of total	77.9%
	Nonresidential parcels	\$39,875,600
	Percent of total	22.1%
3. Expenditure parameters		
	Residential	
	Share residential	79.1%
	Estimated residential expenditure	\$1,634,869
	Cost per residence	\$1,413
	Non-residential	
	Share nonresidential	20.9%
	Estimated nonresidential expenditure	\$430,906
	Total employees at Town of Fair Haven businesses (2009)	890
	Cost per employee	\$484

The cost of municipal services per new residence and new employee is calculated in the table to be \$1,413 and \$484, respectively. The cost is based on the average share of the parcel total and assessed value represented by residences and employment.

Next, we calculate the total cost, total tax revenue and net benefit from both the Integrated Facility itself and the new residences. Our calculations are shown below.

<b>Town of Fair Haven Municipal Impact Analysis Expenditure and Revenues</b>		
Beaver Wood Facility		
	Assessment <sup>6</sup>	\$127,300,000
	Town Tax rate	\$0.8791
	Taxes	\$1,119,094
	Cost from the 45 employees	\$21,780
	Net benefit from Integrated Facility	\$1,097,314
New residences		
	Assessment of 7 new residences	\$1,143,996
	Town Tax Rate	\$0.8791
	Taxes	\$10,057
	Cost from 7 residences	\$9,891
	Net benefit from new residences	\$166
	<b>Total net benefit =</b>	<b>\$1,097,480</b>

First, we consider the fiscal impact on the municipal budget from the Beaver Wood Energy Integrated Facility itself. We estimate the assessed value of the Integrated Facility would be \$127.3 million for FY11. Municipal property taxes on the Integrated Facility would be \$1,119,094 based on the FY11 municipal tax rate of \$0.8791 per \$100 of listed value. Using the per employee municipal expenditure parameter developed above, the cost of new municipal services supplied to Integrated Facility would be \$21,780. Therefore, the net impact on the municipal budget from the Integrated Facility itself will equal a net benefit of \$1,097,314 in FY11. (This is a huge net benefit to the small town of Fair Haven, amounting to about 70% of property tax receipts at the current tax rate.)

---

<sup>6</sup> Industrial properties in the Town of Fair Haven are listed at 103.51% of fair market value according to the Certified Final Computation Sheet for Fair Haven prepared in December 2009. Therefore, based on its construction cost of \$123 million the Integrated Facility will be listed at \$127.3 million.

Next, we assume the seven new households that move into residences in Fair Haven because of the Beaver Wood Integrated Facility will live in homes of average listed value, which equaled \$163,428.<sup>7</sup> The total assessed housing value of the four new households would be \$1,143,996. This will generate \$10,057 in new municipal tax revenue. The cost from the seven residences would be \$9,891 based on the spending parameters determined above. Therefore, the town will see a net fiscal benefit from the four new residences of \$166.

Finally, the combined net benefit to the Fair Haven municipal budget from the proposed Beaver Wood Integrated Facility and the seven new households is estimated to be \$1,097,480. If the town chose to keep spending constant (except for the estimated increase for the plant and the four new households), the municipal tax rate could fall from \$0.8791 to \$0.5240 saving the average-valued home in Fair Haven \$580 per year in taxes.

Therefore, the proposed Beaver Wood Integrated Facility will have a very significant positive impact on the municipal budget of the Town of Fair Haven.

---

<sup>7</sup> Based on the December 2009 *Final Computation Sheet* from PVR

---

## V. Vermont Energy Market Considerations

The Vermont economy needs to have reliable and competitively priced electricity in order to promote economic growth and the well-being of its citizens. In addition, Vermonters have expressed their desire to use renewable energy sources to the extent possible. Several salient characteristics of the state's provision of electricity are:

- The demand for electricity in Vermont grew steadily from 1989 until the current recession. According to the ISO New England 2009 Regional System Plan, Vermont's demand for electricity will grow at an annual rate of 0.5% from 2009 to 2010.
- Vermont's source of electric power has been highly concentrated from two producers: Entergy Yankee (nuclear) and Hydro-Quebec (hydroelectric). According to the Vermont Department of Public Service, in 2003 the former supplied 36% of the state's power and the latter 28%. Both produce power without emitting greenhouse gases.
- Entergy Yankee's license to operate ends in March 2012. The question of renewing this license is before the state's legislature and regulatory board. A long-term power contract with Hydro-Quebec was just signed in August 2010.

The future supply of electrical power to Vermont is still uncertain. In any outcome, securing a more diverse portfolio of power is a prudent action. One of the major priorities of the 2005 Vermont Electric Plan prepared by the Vermont Department of Public Service is to "ensure that Vermont's overall energy portfolio is sufficiently diverse..."

Part of the answer to the future of electrical generation in Vermont will include biomass generated power. This would help replace some of the possibly reduced electrical power from Yankee (or meet the future growth in demand for electrical power), aid in the goal of diversifying power sources, and keep the Vermont power generation portfolio "clean." The Beaver Wood Energy Integrated Facility is an important part of Vermont's long term electrical energy production.

---

## **VI. Tourism and Property Valuation Impacts**

Two frequently raised concerns about new electricity generation (and other) facilities in regulatory hearings in Vermont are the potential impacts they could have on the local tourism industry and local property valuations. We provide a brief review of these two concerns as they might affect the Fair Haven Integrated Facility below.

### **A. Potential Tourism Impacts**

The potential of this Integrated Facility to negatively impact the local tourism industry is very limited for three reasons (assuming it actually would have a significant, negative impact on some tourists).

- First, the Beaver Wood Energy Fair Haven is far from the historic downtown of Fair Haven. The Integrated Facility will be located on a parcel of land north of Route 4 at the New York state line (on the Poultney River). The parcel will be bordered by New York state to the west, the Castleton River to the north and the 4-lane Route 4 to the east and south. The parcel is located in a very rural area generally bordered by farm and forested lands. It is about two miles by road to the historic district of Fair Haven. The nearest structure is across the four lane divided highway.
- Second, the potential to negatively impact the local tourism industry is very limited by the small size of the tourism industry in Fair Haven. U.S. Census reports show only four lodging establishments and four food service businesses in the town. We identified the four lodging establishments as having a total of only 15 rooms in all. The food service establishments are limited as well with sales in 2009 reported to the Vermont Tax Department of just \$3.5 million (this includes food sales at the lodges as well).
- Third, only a portion of the tourists visiting Fair Haven would see the facility on the way to the town. Tourists traveling Route 22A to the north or south won't encounter the Integrated Facility. Tourists traveling to the west on Route 4 won't see the facility until they have nearly exited Vermont.

Therefore, we conclude there will be no measurable impact from the proposed Beaver Wood Energy Integrated Facility on the local tourism economy.

## **B. Potential Property Valuation Impacts**

Another concern sometimes raised with biomass generating plants is the potential negative impact of the Integrated Facility on local property values. Often a claim is made that the plants will be negatively perceived, thus the demand for local properties will fall, and hence, local property valuations will fall.

Again, the Beaver Wood Energy Fair Haven Integrated Facility will be located on a parcel of land far outside of the concentrated residential neighborhoods of Fair Haven. The parcel is located in a very rural area generally bordered by farm and forested lands.

A small number of rigorous, unbiased studies of the impact of power plants on local property values have been completed over the years. Most have been done on large power plants in suburban/urban areas. The most recent study we found, which builds on previous research, was completed in 2008 by Lucas W. Davis of the University of Michigan.<sup>8</sup> His study looked at the impact of large power plants (greater than 100MW) on property values within two miles of the plant. He found housing property values near smaller (less than 325 MW), as opposed to larger, power plants fell on the order of just 1.2%. Given that the Beaver Wood plant is rated at just 29.5 MW, this suggests the impact on nearby housing values is likely less than 1%.<sup>9</sup>

In addition, there is a great deal of academic literature on the impact of a variety of potentially undesirable land uses including high tension power lines, landfills, roads, airports, etc. Our review of this literature shows that when a Integrated Facility is well-designed (that is, takes reasonable efforts to minimize the negative impacts) the adverse impacts on property values are small (generally less than 5%) and very localized (usually felt only within 500 feet of the land use). This suggests the impact of the Beaver Wood Integrated Facility on local property values will be limited to the few residential properties located very near to the Integrated Facility. There are few such residences.

Finally, we note that Vermont has actual experience with the Burlington Electric Department's McNeil Generating Station. This plant is located within 500 feet of a number of properties which have a direct sight view of the plant. According to the city assessor (Tom Vickery), the

---

<sup>8</sup> Lucas W. Davis, "The Effect of Power Plants on Local Housing Values and Rents..." *Review of Economics and Statistics*, forthcoming.

<sup>9</sup> We note that the average \$163,000 home near the plant would see a drop in value of less than \$1,630 at the 1% level. We previously showed that the proposed plant could result in a municipal tax decrease of \$580 per year. This would more than compensate a homeowner in just three years for the loss in property value.

city has seen no evidence to suggest property values should be lowered for those residences within close proximity of the generating plant. No requests have been sent to the assessor's office requesting such a reduction.

We conclude there will be essentially no negative impact from the proposed Beaver Wood Energy Integrated Facility on neighboring property values.

---

## **VII. Summary and Findings**

The proposed Beaver Wood Energy Integrated Facility consists of a 29.5 MW power plant and an integrated wood pellet manufacturing plant. The construction of the facility is estimated at \$250 million in 2009 prices. The combined facilities will have a payroll of \$3.4 million for 45 employees plus an annual spending of \$9.9 million for contractors. The facilities will be purchasing \$18.2 million in forest products from loggers living within a 50 mile radius of the plant.

The construction of the Integrated Facility in Fair Haven will lead to the creation of about 1,050 jobs in Vermont. Operation of the facility will create more than 230 new jobs in Vermont with a payroll of over \$11 million statewide from 2013 forward. State tax revenues will increase by more than \$2.5 million with the ongoing operation of the plant.

The Integrated Facility will have a very positive fiscal impact on the host town of Fair Haven, easily paying much more in local property taxes than demanding in municipal services.

The Integrated Facility will make a positive contribution to the state's efforts to meet future electricity demand, diversify its power generation sources, and maintain a clean energy generation portfolio.

**Regional Economic Impact Analysis  
for a  
Biomass Fired Power Generation and Wood Pellet  
Manufacturing Facility  
in Pownal, Vermont  
Proposed by  
Beaver Wood Energy Pownal, LLC**

Prepared by  
Richard W. Heaps  
September 8, 2010

---

## **Executive Summary**

Beaver Wood Energy Pownal LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Pownal, Vermont. The total construction cost of the project is estimated to be \$250 million at 2009 prices. The Integrated Facility will directly employ 45 people with an annual payroll of \$3.4 million plus have an annual spending of \$9.9 million with third-party contractors. In addition, the Integrated Facility will annually purchase about \$18.2 million in forest products from local loggers.

The purpose of this analysis is to estimate the economic impacts of the proposed Beaver Wood Integrated Facility on the state of Vermont for presentation to the Vermont Public Service Board as part of the application for a Section 248 Certificate of Public Good.

The integrated energy generation and wood pellet manufacturing facility will bring significant economic benefits to the host town, the neighboring region, and the state of Vermont. The construction of the Integrated Facility in 2012 through 2013 will lead to the creation of more than 770 jobs in Bennington County and a total of about 960 jobs in all of Vermont. Operation of the Integrated Facility will lead to the creation of over 120 jobs in Bennington County and a total of more than 140 jobs in all of Vermont from 2014 forward. Payrolls across the state will increase by over \$8 million annually with operation of the Beaver Wood facility.

Tax revenues to the State of Vermont from the operation of the Integrated Facility are estimated to increase by an annual total of approximately \$2.3 million.

The Integrated Facility will clearly have positive fiscal impacts on the host town of Pownal, paying over \$500,000 more in annual municipal property taxes than demanding in municipal services.

Finally, the Beaver Wood Integrated Facility for Pownal will make a positive contribution to Vermont’s efforts to meet future base-load electricity demand, insulate the state from foreign sources of energy, diversify its power generation sources, and maintain a clean renewable energy generation portfolio.

---

## Table of Contents

<b>I.</b>	<b>Introduction</b> .....	<b>Page 1</b>
<b>II.</b>	<b>Detailed Integrated Facility Description</b> .....	<b>Page 2</b>
<b>III.</b>	<b>The Regional Economy and Demographics</b> .....	<b>Page 3</b>
<b>IV.</b>	<b>Economic Impacts in Vermont</b> .....	<b>Page 6</b>
<b>V.</b>	<b>Vermont Energy Market Considerations</b> .....	<b>Page 15</b>
<b>VI.</b>	<b>Tourism and Property Valuation Impacts</b> .....	<b>Page 16</b>
<b>VII.</b>	<b>Summary and Findings</b> .....	<b>Page 19</b>

---

## **I. Introduction**

Beaver Wood Energy Pownal LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility in the Town of Pownal, Vermont. The Integrated Facility will be located on the west side of Route 7 on a parcel of land which previously housed the Green Mountain Race track.

Beaver Wood Energy will be submitting an application for a Section 248 Certificate of Public Good from the Vermont Public Service Board. The application requires an economic benefit analysis of the Integrated Facility. This report presents the results of such an analysis. In section II we describe the Integrated Facility in detail. In section III we provide a brief economic and demographic description of the region in order to put this Integrated Facility's impact into perspective. In section IV we present our estimate of the impact of the Beaver Wood Integrated Facility on economic activity in the county and state during both its construction and operating phases. In section V we discuss the importance of this Integrated Facility in meeting Vermont's energy needs and renewable energy goals. Section VI discusses the impact of the Integrated Facility on tourism and property values. We summarize our findings in section VII.

---

## II. Detailed Integrated Facility Description

Beaver Wood Energy Pownal LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility in the Town of Pownal, Vermont. The Integrated Facility will be located on the west side of Route 7 on a parcel of land which previously housed the Green Mountain Race track.

The power plant will be fueled by waste wood chips from the surrounding forest lands within approximately a 50 mile radius of the plant. The wood feedstock will include chips from low-valued trees and wood waste residues from the logging of high valued trees. It will have a net output of 29.5 MW of base load power. The Integrated Facility is designed to be operated 24 hours per day. It is expected that the power will be contracted for by Vermont utilities under long term power purchase agreements. The wood pellet production facility will have a capacity of approximately 110,000 tons per year and utilize waste heat from the power plant. Pellets will be sold in the local market to businesses, schools, government offices, etc., typically under multi-year sales agreements. The Integrated Facility is currently in the permitting stage of its development. The Integrated Facility is expected begin commercial operation by 2014.

Based on current information provided by Beaver Wood Energy, the Integrated Facility will cost a total of \$250 million to construct and bring to operation. The building, site work, engineering, and other construction will cost approximately \$123 million. This will have a significant impact on local employment. Beaver Wood estimates that \$93 million will be expended to procure machinery and equipment for the Integrated Facility. The remaining costs are for financing, reserves, etc. Construction will take approximately 26 months.

The major economic impact of this Integrated Facility on the local and regional economy will come during its operation. The combined generation plant and pellet manufacturing facility will have an employment of 45 and an annual payroll of \$3.4 million. The operation will contract with outside firms to supply maintenance, repairs, and distribution services at an annual expenditure of \$9.9 million. In addition, the facility will contract with local suppliers for forest-product inputs totaling approximately \$18.2 million per year. (All figures are in 2009 dollars.)

Therefore a key impact of this Integrated Facility during its operation is the employment and wages it creates and maintains in Bennington County and the rest of Vermont as well as the production of electricity that diversifies Vermont's electricity generation in a renewable manner.

### III. The Regional Economy and Demographics

The Beaver Wood Energy Integrated Facility will be built on land in Bennington County in the Town of Pownal. In order to put the economic impact of the Integrated Facility into perspective, we briefly present some key summary statistics on the demographics and economics of the county and town.

Bennington County is the eighth smallest of the fourteen counties in the state of Vermont in terms of population. It is home to six percent of the state's population. Bennington County's population declined by 565 people, a decline of 1.5%, from 2000 to 2009. The population of the Town of Pownal also declined during the period 2000 to 2009, falling by 86 people, for a decline of 2.4%. During this period, the population of Vermont grew very slowly, increasing by only 1.9% in nine years. Nearly all of southern Vermont has lost population in the last decade. All population data are from the U.S. Census.

<b>Regional Population Growth</b>			
Area	July 1, 2000 Population	July 1, 2009 Population	Growth Rate
Town of Pownal	3,551	3,465	-2.4%
Bennington County	36,976	36,411	-1.5%
State of Vermont	609,903	621,760	1.9%

Bennington County is also home to 6% of the state's employment. From 2000 to 2009, Bennington County lost 2,149 jobs or 11.2% of its total jobs just nine years earlier. The Town of Pownal lost 19.5% of its jobs during this period. During this period payroll employment in the state of Vermont fell just 1.4%, a loss of 4,098 jobs. All employment data are from the Vermont Department of Labor.

<b>Regional Employment Growth</b>			
Area	2000 Employment	2009 Employment	Growth Rate
Town of Pownal	241	194	-19.5%
Bennington County	19,112	16,963	-11.2%
State of Vermont	296,468	292,370	-1.4%

Bennington County’s industrial structure is generally similar to that of the state as a whole. Employment at goods-producing firms (mostly construction and manufacturing companies) made up 20% to 22% of total private employment in the county and state. Employment at service-producing firms (trade, professional services, health care, tourism, etc) accounted for the remainder of the private employment. Bennington County had a slightly higher concentration of private sector jobs in manufacturing than did the state (17% to 13%) as well as a higher concentration of retail jobs (20% to 16%).

Public sector jobs only accounted for 13% of the total jobs in Bennington County versus 18% for the state. Bennington County has a disproportionate small share of federal and state government jobs compared to the state.

<b>Regional Employment Structure 2009</b>				
Area	Private Sector Jobs (% of total)	Goods-producing industries	Service-producing industries	Public Sector Jobs (% of total)
Bennington County	87%	22%	78%	13%
State of Vermont	82%	20%	80%	18%

Finally, according to the Vermont Tax Department median family income in 2008 was \$47,583 or 9% below the level of \$52,192 for Bennington County. This was also 18% below the statewide median of \$58,069.

Over the last eight years, median family income grew fairly consistently in the town, county and state, increasing at an annual rate of 3.0% in Pownal and 3.3% in all of Vermont.

<b>Regional Median Family Income Growth</b>			
Area	2000 Income	2008 Income	Annual Growth Rate
Town of Pownal	\$38,733	\$47,583	3.0%
Bennington County	\$42,139	\$52,192	3.1%
State of Vermont	\$46,113	\$58,069	3.3%

In sum, Pownal and Bennington County are slow growing regions, even more slow growing than the state of Vermont as a whole. Both the town and county have seen their populations decrease slightly and the trend is for that to continue. Like the state (and nation), Pownal and Bennington County employers have lost jobs in the last decade. But the town and county have lost jobs at a much higher rate than the state. This is particularly difficult for the town and region to absorb as median family income in both is significantly below that for the state as a whole.

A project such as the Beaver Wood Integrated Facility, which will boost the local economy and create much needed jobs, is sorely needed in the region.

---

## **IV. Economic Impacts in Vermont**

### **A. Economic Model Inputs**

We estimate the impact of the proposed Beaver Wood Energy Integrated Facility planned for the Town of Pownal by use of a regional economic model maintained by Regional Dynamics Inc. (REDYN). The REDYN model is a dynamic, multi-regional, endogenous, input-output economic and demographic model based on the North American Industrial Classification System (NAICS). The model estimates a range of economic impacts of concern to this analysis: employment, wages, tax revenues, etc. It also estimates demographic impacts.

The inputs to this model were developed with data supplied by Beaver Wood Energy and in consultation with REDYN staff. The model inputs we used in this analysis included the construction costs plus expected operational expenditures. The inputs into the REDYN model (in 2009 dollars) are given below. Because of the location of the Pownal plant near the New York border, Beaver Wood estimates only 30% of the planned purchases of forest product inputs for the power generation and pellet manufacturing will be with Vermont firms.

The inputs are listed in a table on the following page.

<b>Inputs to REDYN Model (2009 dollars)</b>		
<u>Item</u>	<u>Cost</u>	<u>Date</u>
<b>Construction</b>	\$123,000,000	2012 - 2013
<b>Operation</b>		
Power Generation		
Employment	22 FT jobs	begin 2014
Payroll	\$1,768,200	"
Maint., repair, etc.	\$3,571,200	"
Biomass fuel	\$10,500,000	"
Pellet Manufacturing		
Employment	23 FT jobs	begin 2014
Payroll	\$1,626,600	"
Maint., repair, etc	\$576,000	"
Distribution	\$5,760,000	"
Wood inputs	\$7,735,000	"

Based on these inputs, we estimated with the REDYN model the indirect economic impacts for the region and the state as well as the demographic impacts.

For purposes of this analysis we used a REDYN model with the following three regions: Bennington County, the rest of Vermont, and the rest of the U.S. Also, because the REDYN model operates on an annual basis, we assume all permitting occurs in 2010 and 2011, all construction in 2012 and 2013, and operations begin on January 1, 2014.

**B. Economic Model Outputs**

We show the major economic and demographic impacts that are of interest to this analysis from the proposed Pownal Beaver Wood Energy Integrated Facility in the table below.

During the construction phase employment will increase by more than 770 in Bennington County and about 960 throughout the entire state of Vermont, (this includes the 770 jobs in Bennington County). Then in 2014 and the following years, the operation of the Integrated Facility will generate over 120 jobs in Bennington County (including the 45 at the Integrated Facility site) and a total of more than 140 jobs statewide (including the 120 in Bennington County).

<b>Economic Impacts of the Beaver Wood Energy- Pownal, VT Integrated Facility (Changes from the Baseline)</b>						
Variable	Region	2012	2013	2014	2015	2016
Employment	Bennington Cty	786	770	123	122	121
	All Vermont	976	957	144	143	142
Wages (\$million)	Bennington Cty	\$27.3	\$27.2	\$7.1	\$7.2	\$7.2
	(In 2010 dollars) All Vermont	\$36.1	\$36.0	\$8.1	\$8.2	\$8.3
State Taxes (\$million)						
	(In 2010 dollars) All Vermont	\$2.7	\$2.7	\$2.3	\$2.3	\$2.4
Population	Bennington Cty	48	94	104	68	34
"	All Vermont	70	137	148	94	43

Wage gains follow the employment pattern. During the construction years, wages paid in the state rise by \$36 million. With the operation of the Integrated Facility beginning in 2014 the wage gain in the state totals over \$8 million. Wages then grow with general wage inflation.

The Integrated Facility will generate new tax revenues from its construction and operation in Bennington County and from the economic activity elsewhere in the state. The REDYN model estimates that tax payments to the state will increase about \$2.7 million during the construction years. This includes sales taxes, income taxes, corporate income taxes, and other state taxes. Then, with the operation of the plant, new tax revenues will equal \$2.3 million per year (as the plant also begins to pay state education property taxes).

Finally, with the ongoing operation of the Integrated Facility, population will rise by 34 people in the Bennington County and 43 in total throughout the state.

### **C. Reasonableness of Estimates**

We examine the reasonableness of our estimates in two ways. First, we examine the reasonableness of the inputs we used in the REDYN model. Second, we compare the reasonableness of the outputs from the model with that from another, widely-used economic model.

First, the Burlington Electric Department has been generating electricity from the McNeil Generating Station since 1984. The plant is a 50 MW facility that operates at about 60% of capacity.<sup>1</sup> It has an annual payroll of about \$2.5 million with an employment of approximately 40 people.<sup>2</sup> It purchases about \$11.5 million per year in biomass fuel. The proposed Pownal generation plant (without the pellet manufacturing operation) is rated at 29.5 MW, will directly employ 23 people plus contractors, will operate at 92% of capacity, and use \$10.5 million of biomass fuel.

With a plant about 60% of the rated size of the Burlington electric plant, the Beaver Wood plant calls for just about 60% (22 versus 40) of the employment and 70% (\$1.8 million versus \$2.5 million) of the payroll. The ratios of production capacity, employment, and wages between the

---

<sup>1</sup> Burlington Electric Commission, *Performance Measures Report*, March 2009.

<sup>2</sup> See the Annual Report at [www.dfd.com](http://www.dfd.com).

McNeil plant and the proposed Pownal plant demonstrate the reasonableness of the inputs used in the REDYN model.<sup>3</sup>

We also compared the estimated total statewide employment from the REDYN model to the employment suggested by the multipliers produced by the U.S. Bureau of Economic Analysis' RIMS II model. As discussed using the REDYN model, the 45 jobs and contractor payments at the proposed Pownal combined facility are estimated to lead to about 140 jobs in all of the state of Vermont during its operation. The RIMS II model estimates these 45 jobs plus contractor payments would lead to the creation of 298 jobs in the state.<sup>4</sup> The difference is accounted for by the location of the plant in Pownal, at the extreme southwest corner of Vermont. Much of the gain in jobs that would be captured by the state if the plant was located in the center of the state occur instead in Massachusetts and New York.

The estimate from the RIMS II model supports the estimate presented in this report from the REDYN model.

---

<sup>3</sup> Ryegate Associates operates a 20 MW wood-fired electricity generating plant in Ryegate, Vermont. The plant states that it has an employment of 21 people, which is also consistent with the plans for the Beaver Wood facility in Pownal.

<sup>4</sup> The RIMS II jobs multiplier for electrical generation plants is 3.0743, for wood products manufacturing is 2.0774, and for the logging industry is 2.0291. These multipliers suggest a total of 298 jobs would be created in Vermont from the proposed plant(22 jobs times 3.0743 plus 23 jobs times 2.0774 plus 90 jobs times 2.0291).

## **D. Fiscal Impact on the Host Town of Pownal**

The proposed Beaver Wood biomass facility will be sited in the Town of Pownal. The town will be impacted positively by any tax revenues generated by the Integrated Facility and negatively by any demands for town services from the Integrated Facility or any new employees attracted to the town as residents by the Integrated Facility.

We estimate that Bennington County will see a population increase of 34 people because of this Integrated Facility. A few of these new residents will choose to live in the Town of Pownal. U.S. Census data on commuting patterns show that 53% of the employees of Pownal town businesses live in Pownal. Therefore, we assume that Pownal will see eighteen new residents from this Integrated Facility (34 times 53%).<sup>5</sup> And we expect they will live in eight new households based on the average household size for the region (eighteen divided by 2.41 average household size in Bennington County).

Note that the population impacts are all small. The 2009 population of Pownal is estimated by the Census Bureau to be 3,465. If eighteen residents were added to the total, the increase would be less than one percent (only 0.5%). And we note that Pownal's population has declined during this decade (by 86 people). The potential for these new residents to cause a fiscal problem, rather than being a fiscal benefit, is small.

In the following section, we examine in detail the fiscal impact on the Town of Pownal from the proposed Integrated Facility.

## **A. Impact on the Demand for Municipal Services in the Town of Pownal**

The budgeted expenditures for Town of Pownal's municipal general and road fund in FY11 is \$1,789,690, of which \$1,319,105 will be raised through property taxes. We estimate the current municipal costs per employee and per household by use of a per capita expenditure method commonly used in conducting an impact analysis.<sup>6</sup> The method divides municipal expenditures into residential and nonresidential based on grand list data. The following table shows the calculations for the municipal cost per new employee (excluding highway costs) and per new residence in the Town of Pownal.

---

<sup>5</sup> This is an overstatement of the actual number of residents that will likely choose to live in Pownal. As the analysis shows, the conclusion is not sensitive to the number chosen.

<sup>6</sup> *Development Impact Assessment Handbook*, Robert W. Burchell, David Listokin, William R. Dolphin, Lawrence Q. Newton and Susan J. Foxley, Urban Institute, 1994, page. 129.

<b>Town of Pownal Municipal Impact Parameter Calculation</b>		
1. Municipal budgeted expenditures (FY11)		\$1,789,690
2. Total Taxable Parcels		1,711
	Residential parcels	1,437
	Percent of total	84.0%
	Nonresidential parcels	274
	Percent of total	16.0%
2. Total Assessed Value		\$205,045,000
	Residential parcels	\$179,322,600
	Percent of total	87.5%
	Nonresidential parcels	\$25,722,400
	Percent of total	12.5%
3. Expenditure parameters		
	Residential	
	Share residential	85.7%
	Estimated residential expenditure	\$1,534,133
	Cost per residence	\$897
	Non-residential	
	Share nonresidential	14.3%
	Estimated nonresidential expenditure	\$255,557
	Total employees at Town of Pownal businesses (2009)	241
	Cost per employee	\$1,060

The cost of municipal services per new residence and new employee is calculated in the table to be \$897 and \$1,060, respectively. The cost is based on the average share of the parcel total and assessed value represented by residences and employment.

Next, we calculate the total cost, total tax revenue and net benefit from both the Integrated Facility itself and the new residences. Our calculations are shown below.

<b>Town of Pownal Municipal Impact Analysis Expenditure and Revenues</b>		
Beaver Wood Facility		
	Assessment <sup>7</sup>	\$98,100,000
	Town Tax rate	\$0.5842
	Taxes	\$573,100
	Cost from the 45 employees	\$47,700
	Net benefit from Integrated Facility	\$525,400
New residences		
	Assessment of 8 new residences	\$1,289,392
	Town Tax Rate	\$0.5842
	Taxes	\$7,533
	Cost from 8 residences	\$7,176
	Net benefit from new residences	\$357
	<b>Total net benefit =</b>	<b>\$525,757</b>

First, we consider the fiscal impact on the municipal budget from the Integrated Facility itself. We estimate the assessed value of the Integrated Facility would be \$98.1 million for FY11. Municipal property taxes on the Integrated Facility would be \$573,100 based on the FY11 municipal tax rate of \$0.5842 per \$100 of listed value. Using the per employee municipal expenditure parameter developed above, the cost of new municipal services supplied to the Beaver Wood Integrated Facility (using 45 employees) would be \$47,700. Therefore, the net impact on the municipal budget from the Integrated Facility itself will equal a net benefit of \$525,400 in FY11. (This is a significant net benefit to the small Town of Pownal, amounting to about 45% of property tax receipts at the current tax rate.)

---

<sup>7</sup> Industrial properties in the Town of Pownal are listed at 79.72% of fair market value according to the Certified Final Computation Sheet for Pownal prepared in December 2009. Therefore, based on its construction cost of \$123 million the Integrated Facility will be listed at \$98.1 million.

Next, we assume the four new households that move into residences in Pownal because of the Beaver Wood Integrated Facility will live in homes of average listed value, which equaled \$161,174.<sup>8</sup> The total assessed housing value of the eight new households would be \$653,712. This will generate \$7,533 in new municipal tax revenue. The cost from the eight residences would be \$7,176 based on the spending parameters determined above. Therefore, the town will see a net fiscal benefit from the four new residences of \$357.

Finally, the combined net benefit to the Pownal municipal budget from the proposed Beaver Wood facility and the eight new households is estimated to be \$525,757. If the town chose to keep spending constant (except for the estimated increase for the plant and the four new households), the municipal tax rate could fall from \$0.5842 to \$0.4106 saving the average-valued home in Pownal \$280 per year in taxes.

Therefore, the proposed Beaver Wood facility will have a very significant positive impact on the municipal budget of the Town of Pownal.

---

<sup>8</sup> Based on the December 2009 *Final Computation Sheet* from PVR

---

## V. Vermont Energy Market Considerations

The Vermont economy needs to have reliable and competitively priced electricity in order to promote economic growth and the well-being of its citizens. In addition, Vermonters have expressed their desire to use renewable energy sources to the extent possible. Several salient characteristics of the state's provision of electricity are:

- The demand for electricity in Vermont grew steadily from 1989 until the current recession. According to the ISO New England 2009 Regional System Plan, Vermont's demand for electricity will grow at an annual rate of 0.5% from 2009 to 2010.
- Vermont's source of electric power has been highly concentrated from two producers: Entergy Yankee (nuclear) and Hydro-Quebec (hydroelectric). According to the Vermont Department of Public Service, in 2003 the former supplied 36% of the state's power and the latter 28%. Both produce power without emitting greenhouse gases.
- Entergy Yankee's license to operate ends in March 2012. The question of renewing this license is before the state's legislature and regulatory board. A long-term power contract with Hydro-Quebec was just signed in August 2010.

The future supply of electrical power to Vermont is still uncertain. In any outcome, securing a more diverse portfolio of power is a prudent action. One of the major priorities of the 2005 Vermont Electric Plan prepared by the Vermont Department of Public Service is to "ensure that Vermont's overall energy portfolio is sufficiently diverse..."

Part of the answer to the future of electrical generation in Vermont will include biomass generated power. This would help replace some of the possibly reduced electrical power from Yankee (or meet the future growth in demand for electrical power), aid in the goal of diversifying power sources, and keep the Vermont power generation portfolio "clean." The Beaver Wood Energy Integrated Facility is an important part of Vermont's long term electrical energy production.

---

## **VI. Tourism and Property Valuation Impacts**

Two frequently raised concerns about new electricity generation (and other) facilities in regulatory hearings in Vermont are the potential impacts they could have on the local tourism industry and local property valuations. We provide a brief review of these two concerns as they might affect the Pownal Integrated Facility below.

### **A. Potential Tourism Impacts**

The potential of this Integrated Facility to negatively impact the local tourism industry is very limited for three reasons (assuming it actually would have a significant, negative impact on some tourists).

- First, the Beaver Wood Energy Pownal will be located on a 45 acre parcel within the 144-acre site of the former Green Mountain Race Track, west of Route 7 just south of the center of Pownal. The extensive grounds will allow the facility to be hidden from tourists traveling Route 7, except for the estimated 180 to 230 foot high stack. Even the largest structure of the Integrated Facility is smaller than the enclosed grandstand building currently on the property.
- Second, the potential to negatively impact the local tourism industry is very limited by the small size of the tourism industry in Pownal. U.S. Census reports show only one lodging establishment and three food service businesses in the town.

Therefore, we conclude there will be no measurable impact from the proposed Beaver Wood Energy Integrated Facility on the local tourism economy.

## **B. Potential Property Valuation Impacts**

Another concern sometimes raised with biomass generating plants is the potential negative impact of the Integrated Facility on local property values. Often a claim is made that the plants will be negatively perceived, thus the demand for local properties will fall, and hence, local property valuations will fall.

Again the Beaver Wood Energy Pownal Integrated Facility will be located on a 45-acre parcel within the 144-acre parcel that used to house the former Green Mountain Race Track. Most of the facility will be hidden from direct site except for the water-vapor stack. For the few properties located nearby to the north, wood storage silos will be constructed on that side of the property to reduce any noise headed in that direction.

A small number of rigorous, unbiased studies of the impact of power plants on local property values have been completed over the years. Most have been done on large power plants in suburban/urban areas. The most recent study we found, which builds on previous research, was completed in 2008 by Lucas W. Davis of the University of Michigan.<sup>9</sup> His study looked at the impact of large power plants (greater than 100MW) on property values within two miles of the plant. He found housing property values near smaller (less than 325 MW) , as opposed to larger, power plants fell on the order of just 1.2%. Given that the Beaver Wood plant is rated at just 29.5 MW, this suggests the impact on nearby housing values is likely less than 1%.<sup>10</sup>

In addition, there is a great deal of academic literature on the impact of a variety of potentially undesirable land uses including high tension power lines, landfills, roads, airports, etc. Our review of this literature shows that when a Integrated Facility is well-designed (that is, takes reasonable efforts to minimize the negative impacts) the adverse impacts on property values are small (generally less than 5%) and very localized (usually felt only within 500 feet of the land use. This suggests the impact of the Beaver Wood Integrated Facility on local property values will be limited to the few residential properties located very near to the Integrated Facility. There are few such residences.

---

<sup>9</sup> Lucas W. Davis, "The Effect of Power Plants on Local Housing Values and Rents..." *Review of Economics and Statistics*, forthcoming.

<sup>10</sup> We note that the average \$161,000 home near the plant would see a drop in value of less than \$1,610 at the 1% level. We previously showed that the proposed plant could result in a municipal tax decrease of \$280 per year. This would compensate a homeowner in just six years for the loss in property value.

Finally, we note that Vermont has actual experience with the Burlington Electric Department's McNeil Generating Station. This plant is located within 500 feet of a number of properties which have a direct sight view of the plant. According to the city assessor (Tom Vickery), the city has seen no evidence to suggest property values should be lowered for those residences within close proximity of the generating plant. No requests have been sent to the assessor's office requesting such a reduction.

We conclude there will be essentially no negative impact from the proposed Beaver Wood Energy Integrated Facility on neighboring property values.

## **VII. Summary and Findings**

The proposed Beaver Wood Energy Integrated Facility consists of a 29.5 MW power plant and an integrated wood pellet manufacturing plant. The construction of the facility is estimated at \$250 million in 2009 prices. The combined facilities will have a payroll of \$3.4 million for 45 employees plus an annual spending of \$9.9 million for contractors. The facilities will be purchasing \$18.2 million in forest products from loggers living within a 50 mile radius of the plant.

The construction of the Integrated Facility in Pownal will lead to the creation of about 960 jobs in Vermont. Operation of the facility will create over 140 new jobs with a payroll of over \$8 million statewide from 2013 forward. State tax revenues will increase by over \$2.3 million with the ongoing operation of the plant.

The Integrated Facility will have a very positive fiscal impact on the host town of Pownal, easily paying much more in local property taxes than demanding in municipal services.

The Integrated Facility will make a positive contribution to the state's efforts to meet future electricity demand, diversify its power generation sources, and maintain a clean energy generation portfolio.

**Electricity Prices  
and the  
Regional Economic Impacts  
of a  
Biomass Fired Power Generation and Wood Pellet  
Manufacturing Facility  
in Fair Haven, Vermont  
Proposed by  
Beaver Wood Energy Fair Haven, LLC**

Prepared by  
Richard W. Heaps  
November 30, 2010

## Executive Summary

Beaver Wood Energy Fair Haven LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Fair Haven, Vermont. The economic impacts of this project have been analyzed in an earlier report prepared by Northern Economic Consulting. That report focused on the economic impacts from the project’s employment, payroll, and spending. This report takes the analysis one step further by also examining the economic impacts from the change in retail electricity prices in Vermont brought about by the proposed facility in Fair Haven over the period 2012 through 2033.

The estimated economic impacts of the Fair Haven Integrated Facility on the Vermont economy—noted in the following bullet points—are positive and substantial, even after considering the electricity price increase.

- Vermont will see the creation of about 1,060 new jobs during the Fair Haven Integrated Facility’s construction in 2012 and 2013. In the first year of the Integrated Facility’s operation net job creation will equal approximately 220. The job increase will decrease slowly from there by about four jobs per year. Twenty years later (in 2033) the job increase in Vermont will total 131.
- Vermont will see an increase in payrolls at the state’s employers of about \$46 million during the Integrated Facility’s construction in 2012 and 2013. In the first year of the Fair Haven Integrated Facility’s operation Vermont will see a net increase in payrolls of approximately \$8.9 million. The payroll gain will decrease slowly over time in step with the job change discussed above to \$7.4 million twenty years later. (All figures are in constant 2010 dollars.) In present value terms, from 2012 to 2033, payrolls in Vermont will increase by \$220 million from the Beaver Wood Energy Fair Haven Integrated Facility.
- Vermont will see a net increase in state tax receipts of about \$3.8 million during the construction of the Integrated Facility in 2012 and 2013. In the first year of its operation, Vermont will see a net increase in state tax receipts of \$2.3 million which will rise slowly to \$2.6 million after twenty years of operation. (All figures are in constant 2010 dollars.) In present value terms, from 2012 to 2033, state tax revenues in Vermont will increase by \$45 million from the Fair Haven Integrated Facility.

This research found that the foregoing results hold for a wide range of reasonable assumptions about the future electricity supply and electricity prices in Vermont.

## Table of Contents

<b>I.</b>	<b>Introduction and Methodology</b> .....	Page 1
<b>II.</b>	<b>Economic Impacts - Baseline Case</b> .....	Page 2
<b>III.</b>	<b>The Potential Electricity Price Increase</b> .....	Page 5
<b>IV.</b>	<b>Results</b> .....	Page 10
<b>V.</b>	<b>Sensitivity Analysis</b> .....	Page 13

---

## I. Introduction and Methodology

Beaver Wood Energy Fair Haven LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Fair Haven, Vermont. The economic impacts of this project has been analyzed in an earlier report prepared by Northern Economic Consulting.<sup>1</sup> That report focused on the impacts from the project’s employment, payroll, and spending. This report takes that analysis one step further by also considering the economic impacts from the change in retail electricity prices brought about by purchasing power from the proposed facility in Fair Haven.

The Fair Haven Integrated Facility will be supplying just over 34 MW of gross base load power to Vermont electric utilities. This is a small, but important, addition to the state’s electricity supply. In recent years, Vermont residences, commercial businesses, and industrial enterprises have used just under 6 million megawatt hours of electricity. The Fair Haven wood-fueled power plant would add approximately 4.6% to the current supply. The price of this power will cause a slight increase in the overall cost of electricity to utilities and their consumers. That increase in the price of electricity, standing alone, would have a modestly negative impact on the Vermont economy. However it must be considered in context of the positive impacts on the Vermont economy from jobs, payroll, and spending of the Fair Haven Integrated Facility.

We estimate the economic impacts during the construction and the first 20 years of the operation (2012 to 2033) of the Fair Haven Integrated Facility by use of a dynamic input-output model. This technique is well-established by analysts in and out of Vermont.<sup>2</sup>

---

<sup>1</sup> “Regional Economic Impact Analysis for a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Fair Haven, Vermont Proposed by Beaver Wood Energy Fair Haven LLC” prepared by Richard Heaps of Northern Economic Consulting, September 7, 2010.

<sup>2</sup> For example, see the report “The Economic Impacts of Vermont Feed in Tariffs” by the Division of Energy Planning, Vermont Department of Public Service, December 2009, which used the REMI model. Also see the report “An Assessment of Energy Needs in Westchester County: The Economic Impact of Rising Energy Prices and Shortages in Supplies” by Dr. Howard Axelrod, Energy Strategies, Inc., January 31, 2008, which used the REDYN model.

---

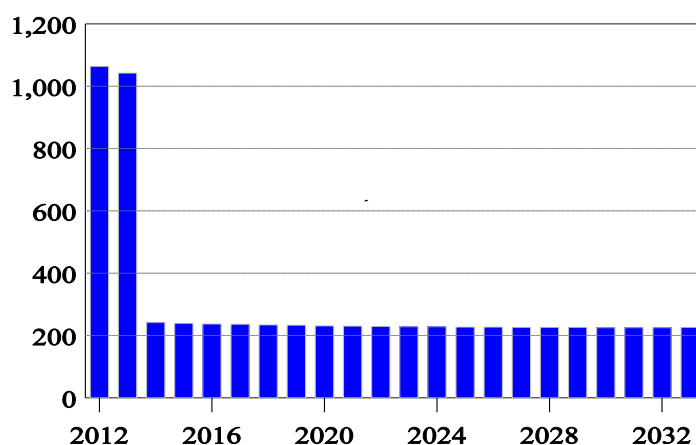
## II. Economic Impacts - Baseline Case

The economic impacts of the Fair Haven Integrated Facility was first analyzed by Northern Economic Consulting, Inc. in our September 7, 2010 report. In that report, we estimated the economic impacts over the period 2012 to 2017. That period was long enough to give the reader a clear insight into the project's ongoing impacts on jobs, wages, and tax revenues in the state of Vermont.

In this report, we are also concerned with the economic impacts from an electricity price increase over a longer term — one which runs through the first 20 years of the power plant's operation (2014 to 2033). Therefore, we begin the analysis by extending our original economic impact analysis over the period 2012 to 2033. We summarize these impacts graphically by looking at the job, payroll and state revenue impacts during that period.

As shown below, the Fair Haven Integrated Facility in Fair Haven will lead to the creation of about 1,060 new jobs in Vermont each year during its construction in 2012 and 2013. Then, with the operation of the Fair Haven Integrated Facility, the employment increase in Vermont will begin at 240 in 2014. The employment gain decreases slowly over the following years to 226 in 2033.<sup>3</sup>

### Baseline Employment

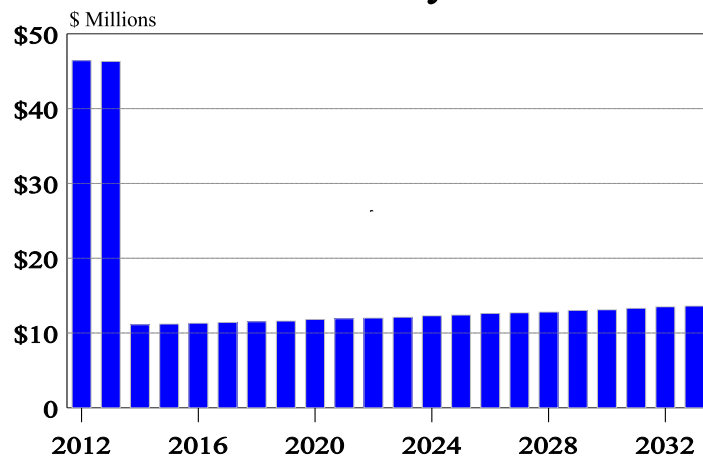


---

<sup>3</sup> The REDYN model shows the decrease is largely in the logging industry as productivity increases reduce the need for labor.

Total payroll increases in the state of Vermont follow a similar pattern. The Fair Haven Integrated Facility will lead to a payroll increase statewide during its construction in 2012 and 2013 of about \$46 million per year. Then, with the operation of the Fair Haven Integrated Facility, the annual payroll increase in Vermont will initially total over \$11 million, then rise to more than \$13 million twenty years later in 2033. All these prices are stated in constant 2010 dollars.

### Baseline Payrolls

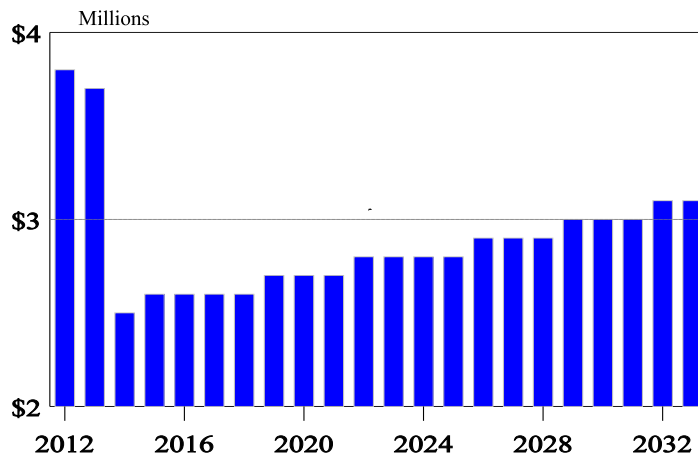


In present value terms, from 2012 to 2033 payrolls in Vermont will increase by \$276 million from the Fair Haven Integrated Facility’s construction and first 20 years of operation .<sup>4</sup>

<sup>4</sup> Because payrolls are expressed in constant 2010 dollars, we use an inflation-adjusted discount rate of 2%.

Finally, state tax revenues will increase substantially from the Fair Haven Integrated Facility. Tax revenues rise to approximately \$3.8 million per year during the construction of the facility. Then, with operations beginning in 2014, state tax revenues total \$2.5 million and rise slowly to \$3.1 million at the end of twenty years. All figures are in constant 2010 dollars. State taxes include personal income taxes, sales taxes, corporate income taxes, statewide education property taxes, and other items.

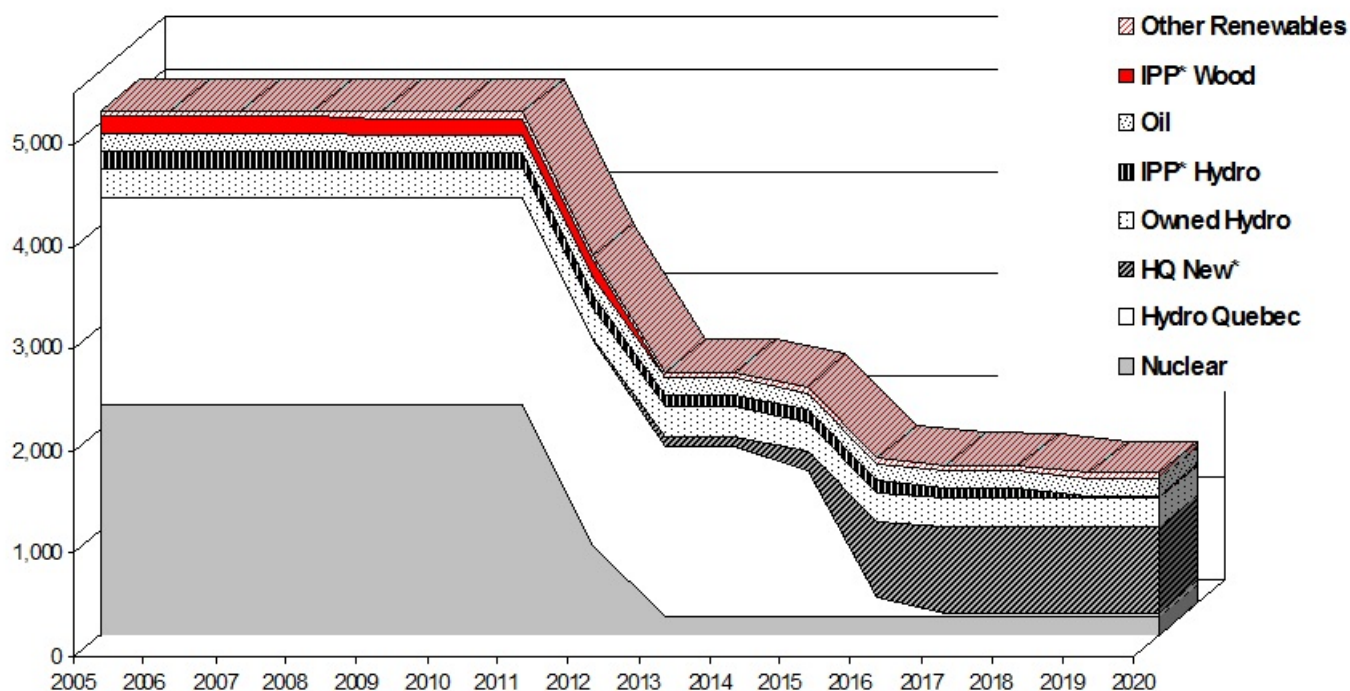
### Baseline State Taxes



### III. The Potential Electricity Price Increase

In order to estimate the impact of higher electricity prices on the Vermont economy with the REDYN model, we need to determine the likely percentage increase in retail electricity prices that may occur. The potential electricity price increase from the Fair Haven Integrated Facility is estimated based on the expected supply of electrical power and prices in Vermont in 2014 when the facility comes online. This necessarily involves forecasting. One difficulty in doing so is that the supply of power from most of Vermont’s electricity suppliers for 2014 is unknown. As shown in the graph below, only about half of Vermont’s electricity supply for 2014 is committed and only about one-quarter is committed after 2017. This includes the state’s current largest supplier, Vermont Yankee.

**Committed Resources in GWH (As of September 2010)**



\* HQ New\* reflects the terms of a new 26 year purchase power agreement between HQ and Vermont utilities for 218 to 225 MW starting in November 2012 and extending through 2038.

Source: Vermont Department of Public Service.

Even if Vermont Yankee continues in operation it is unknown if it will supply the same quantity of power it has in the past.<sup>5</sup>

The potential electricity price increase estimated here uses very conservative assumptions so as not to underestimate the potential price impact from Beaver Wood Energy's project and, hence, lead to an overstatement of the beneficial economic impacts of the Fair Haven Integrated Facility. In addition, the potential price impact is estimated as a range and not a single point. We consider the economic impacts from this potential price range at the end of this analysis.

In 2009, electricity was supplied in Vermont from the sources listed below (Vermont DPS). This has been fairly constant in the last decade.<sup>6</sup>

<b>Vermont Electric Supply (MWh) in 2009</b>		
	MWh	Percent
Nuclear	2,240,961	38%
Hydro Quebec	1,747,603	30%
Hydro renewables	782,426	13%
Market purchases	622,548	11%
Other renewables	412,391	7%
Oil	44,440	1%
Gas	10,000	0%
Total =	5,860,369	100%

---

<sup>5</sup>. In 2009 VY supplied just over 2.2 GWh to Vermont. That implies 255 MW per hour. VY's last offer was to supply 115 MW.

<sup>6</sup> In 2003 VY and HQ were supplying 36% and 28% of Vermont's power, respectively.

In 2014, we estimate the wholesale price of electricity in Vermont without the Fair Haven Integrated Facility several ways, with our preferred estimate shown in the table below.<sup>7</sup> The blended wholesale price to Vermont is \$69.877.

<b>Vermont Electric Supply (MWh) in 2014</b>				
<b>Source</b>	<b>MWh</b>	<b>Percent</b>	<b>Price per MWh</b>	<b>Weighted Price</b>
Nuclear	1,500,000	25%	\$61	\$15.250
Hydro Quebec	1,314,000	22%	\$60	\$13.140
Hydro renewables - In state	441,729	7%	\$35	\$2.577
- IPP	233,663	4%	\$120	\$4.673
- NYPA	107,034	2%	\$15	\$0.268
Market purchases	1,936,743	32%	\$78	\$25.178
Other renewables	412,391	7%	\$120	\$8.248
Oil	44,440	1%	\$60	\$0.444
Gas	10,000	0%	\$60	\$0.100
<b>Total</b>	<b>6,000,000</b>	<b>100%</b>		<b>\$69.877</b>

<sup>7</sup> The major assumptions are: (A) VY continues in operation and sells 1.5 GWh to Vermont utilities at 6.1¢. This is a substantially higher volume than the current offer from VY at about 1 GWh. By choosing a high volume from a low cost producer, we are overestimating the price impact of the Fair Haven Integrated Facility. (B) HQ sells 225 MW for 16 hours per day based on the just signed contract. (C) In state renewables remain basically unchanged from today. As of this date a minimal amount of new supply is likely to be operating in 2014 from the Feed In Tariff program. And the volume of supply (i.e. the actual capacity factor) from various wind projects in the state remains to be seen. (D) Market purchases are the default supplier to yield a total supply of 6.0 GWh to the state. Market purchases are assumed to occur at \$78/MWh. That's a 20% increase in the current price of \$65/MWh based on forecasted prices by Synapse Energy Economics, Inc. Again, this is a conservative estimate as market purchases are shown as a low cost source of power (other than VY and HQ which are discussed above). A relaxation of any of these assumptions, reduces the price impact of the Fair Haven Integrated Facility.

If the Fair Haven Integrated Facility is added to the mix as a producer of 34 MW of base load power at \$100 per MWh, the blended price to Vermont electricity users is \$70.882, a 1.4% increase in wholesale prices (from \$69.877 calculated on the previous page).<sup>8</sup>

<b>Vermont Electric Supply (MWh) in 2014 with BWE</b>				
<b>Source</b>	<b>MWh</b>	<b>Percent</b>	<b>Price per MWh</b>	<b>Weighted Price</b>
Nuclear	1,500,000	25%	\$61	\$15.250
Hydro Quebec	1,314,000	22%	\$60	\$13.140
Hydro renewables - In state	441,729	7%	\$35	\$2.577
- IPP	233,663	4%	\$120	\$4.673
- NYPA	107,034	2%	\$15	\$0.268
Market purchases	1,662,743	28%	\$78	\$21.616
Other renewables	412,391	7%	\$120	\$8.248
Oil	44,440	1%	\$60	\$0.444
Gas	10,000	0%	\$60	\$0.100
BWE - Fair Haven <sup>9</sup>	274,000	5%	\$100	\$4.567
Total =	6,000,000	100%		\$70.882

<sup>8</sup> This \$100 per MWh is the price of electricity only for the Pownal Integrated Facility. This is the reference price of \$125 per MWh less and assumed Renewable Energy Credit value of \$20 per MWh and less an assumed value for capacity and ancillaries of \$5 per MWh.

<sup>9</sup> The capacity factor of the Fair Haven Integrated Facility is 92%. The total annual capacity of 274,000 MWh is calculated from 8,760 hours times 34 MW times 0.92.

We estimate this wholesale price increase will lead to a rise in retail prices to Vermont residents and commercial interests of half of the 1.4% calculated above, or 0.7% (seven-tenths of a percent). This is based on:

- an analysis of the relationship between the Vermont retail price of electricity in 2008 as reported by the U.S. Energy Information Administration and the blended wholesale price for 2008 as calculated above. The retail price was 2.1 times the wholesale price.
- an analysis of the ratio between retail sales and wholesale production (and purchases) costs of CVPS from 2007 to 2009 and VEC for 2008 to 2009. The CVPS ratio was 1.9 to 2.0 and the VEC ratio was 1.7 to 1.8. Insufficient information was available for GMP.

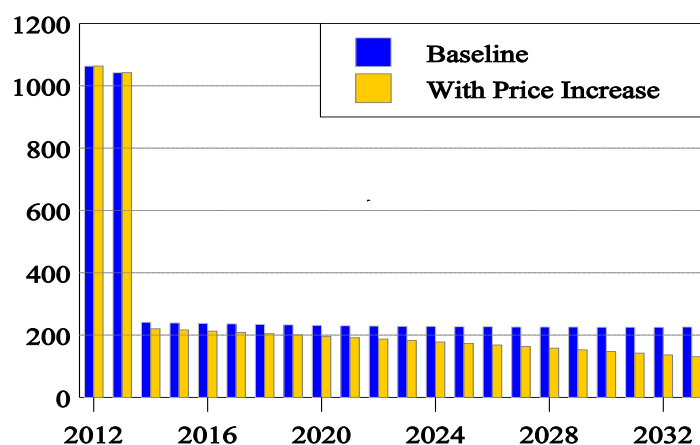
See Section VI of this report for a discussion of a reasonable range of price impact calculations under differing assumptions and the resulting economic impacts using different assumptions.

## IV. Economic Impacts with Price Increase

The economic impacts of the Fair Haven Integrated Facility were estimated with the same parameters for employment, payrolls, etc. as in section II but now with a seven-tenths of a percent rise in retail electricity prices to all Vermont consumers of electricity. We summarize the resulting impacts graphically by looking at the job, payroll and state tax revenue impacts with and without the price increase.

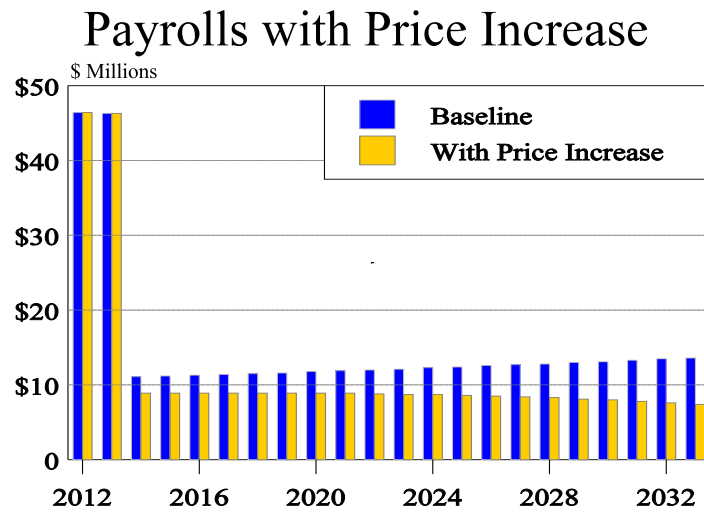
There is no change in our estimates of jobs for the construction years as no electricity price increase from the Fair Haven Integrated Facility would have occurred. Then, with the operation of the Fair Haven Integrated Facility and the rise in electricity prices, the employment gain in Vermont will begin at 220 in 2014 and decrease slowly to 131 in 2033 as shown in the orange bars in the graph below. This is a decrease of about four jobs per year as shown in the orange bars in the graph.

### Employment With Price Increase



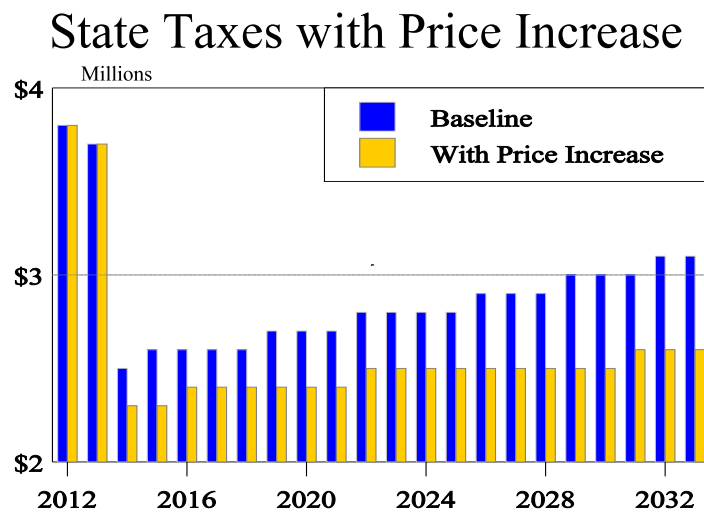
As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, a significant employment impact remains during the first 20 years of operation of the Fair Haven Integrated Facility.

During the construction years there is no change in electricity prices and, hence, no change in payrolls from that estimated earlier. With the operation of the Fair Haven Integrated Facility and the rise in electricity prices, the payroll gain in Vermont will begin at \$8.9 million in 2014 and decrease very slowly to \$7.4 over the following years as shown by the orange bars in the graph below. Again, payrolls are expressed in constant 2010 dollars but would be positive in nominal terms.



As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, the payroll impact is still significant during the first 20 years of operation of the Fair Haven Integrated Facility. In present value terms, from 2012 to 2033, payrolls in Vermont will increase by \$220 million from the Beaver Wood Energy Fair Haven Integrated Facility's construction and first 20 years of operation even considering the accompanying electricity price increase.

Without a price increase in electricity in Vermont during the construction years, there is no change in state tax revenues. With the operation of the Fair Haven Integrated Facility and the rise in electricity prices, the state tax revenue gain in Vermont will begin at \$2.3 million in 2014 and rise very slowly to \$2.6 over the following years as shown in the orange bars in the graph below. Again, taxes are expressed in constant 2010 dollars.



As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, the tax revenue impact is still significant during the first 20 years of operation of the Fair Haven Integrated Facility. In present value terms, from 2012 to 2033, state tax revenues in Vermont will increase by \$45 million from the Fair Haven Integrated Facility's construction and first 20 years of operation even considering the accompanying electricity price increase.

---

## V. Sensitivity Analysis

The key input into our analysis in this report is the percentage increase in retail electricity prices stemming from power purchases from the Fair Haven Integrated Facility. We calculated that retail prices would increase by seven-tenths of one percent across the state of Vermont. As explained in section III, this is a conservative estimate of the price increase, designed to err on the side of overstating the price increase rather than understating it.

We examined the sensitivity of the economic impact estimates obtained from the REDYN model by modifying the key price assumption. A reasonable range of differing future price assumptions suggests the price increase from the Fair Haven Integrated Facility could range plus or minus three-tenths of a percent off of our calculation of a seven-tenths of a percent increase. We ran the REDYN model with both a lower (0.4%) and higher (1.0%) increase in retail electricity prices.<sup>10</sup> The impacts on jobs, payrolls, and taxes were:

- employment changed little across the state. For example, our best estimate (with a 0.7% price increase) showed an employment gain of 183 jobs in 2023 from the Fair Haven project. The electricity price increase range of +/- 0.3% resulted in an employment gain of 162 to 204 in 2023. Similarly, our best estimate showed an employment gain of 131 in 2033 and the +/- 0.3% range resulted in an estimated employment gain of 82 to 180. Under all scenarios considered, the Beaver Wood Fair Haven Integrated Facility clearly would create a substantial number of jobs throughout Vermont.
- estimated payrolls were always a significant positive impact for Vermont. In 2023 the range of increased payrolls was estimated to be from \$7.8 million to \$9.6 million. In 2033 the range was from \$4.8 million to \$10.0 million. The gain in payrolls is always very significant for Vermont throughout the range of potential price increases.

---

<sup>10</sup> We calculated the blended wholesale price change with the Fair Haven Integrated Facility under a variety of assumptions. Those presented in the body of this report show a 1.4% wholesale price change with the plant. The key assumptions which determine the price impact of the Fair Haven plant is the cost of market power and the cost of the power from the Fair Haven plant.

If we assume the market power price rises only 2.5% per year to just \$72 in 2014, the wholesale price impact of the Fair Haven facility is 1.9% and the retail change is just under 1.0%. If we assume the market price rises to \$89 (an annual increase of 9% likely associated with a strong world economic recovery from current conditions), the Fair Haven facility causes a wholesale electricity price increase of 0.8% with a retail price increase of 0.4%.

This set the boundaries for the price changes in the sensitivity analysis.

- state tax revenues also were always a significant positive impact for Vermont. In 2023 the range of increased state tax revenues was estimated to be from \$2.3 million to \$2.7 million. In 2033 the range was from \$2.3 million to \$2.9 million.
- In sum, the estimates produced in this analysis show that for a reasonable range of assumptions about the electricity price impact of the Fair Haven Integrated Facility, the project clearly has a very significant positive economic impact on the state of Vermont in terms of jobs, payrolls, and state tax revenues.

**Electricity Prices  
and the  
Regional Economic Impacts  
of a  
Biomass Fired Power Generation and Wood Pellet  
Manufacturing Facility  
in Pownal, Vermont  
Proposed by  
Beaver Wood Energy Pownal, LLC**

Prepared by  
Richard W. Heaps  
November 30, 2010

## Executive Summary

Beaver Wood Energy Pownal LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Pownal, Vermont. The economic impacts of this project have been analyzed in an earlier report prepared by Northern Economic Consulting. That report focused on the economic impacts from the project’s employment, payroll, and spending. This report takes the analysis one step further by also examining the economic impacts from the change in retail electricity prices in Vermont brought about by the proposed facility in Pownal over the period 2012 through 2033.

The estimated economic impacts of the Pownal Integrated Facility on the Vermont economy—noted in the following bullet points—are positive and substantial, even after considering the electricity price increase.

- Vermont will see the creation of about 970 new jobs during the Pownal Integrated Facility’s construction in 2012 and 2013. In the first year of the Integrated Facility’s operation net job creation will equal 116. The job gain will decrease from there by about four jobs per year. Twenty years later (in 2033) the job increase in Vermont will total 40.
- Vermont will see an increase in payrolls at the state’s employers of about \$36 million during the Integrated Facility’s construction in 2012 and 2013. In the first year of the Pownal Integrated Facility’s operation Vermont will see a net increase in payrolls of approximately \$5.5 million. The payroll gain will decrease slowly over time in step with the job change discussed above to \$3.4 million twenty years later. (All figures are in constant 2010 dollars.) In present value terms, from 2012 to 2033, payrolls in Vermont will increase by \$145 million from the Beaver Wood Energy Pownal Integrated Facility.
- Vermont will see an increase in state tax receipts of about \$2.7 million during the Integrated Facility’s construction in 2012 and 2013. In the first year of the Pownal Integrated Facility’s operation, Vermont will see a net increase in state tax revenues of \$2.0 million which will rise slowly to \$2.2 million after twenty years of operation. (All figures are in constant 2010 dollars.) In present value terms, from 2012 to 2033, state tax revenues in Vermont will increase by \$38 million from the Pownal Integrated Facility.

This research found that the foregoing results hold for a wide range of reasonable assumptions about the future electricity supply and electricity prices in Vermont.

## Table of Contents

<b>I.</b>	<b>Introduction and Methodology</b> .....	Page 1
<b>II.</b>	<b>Economic Impacts - Baseline Case</b> .....	Page 2
<b>III.</b>	<b>The Potential Electricity Price Increase</b> .....	Page 5
<b>IV.</b>	<b>Results</b> .....	Page 10
<b>V.</b>	<b>Sensitivity Analysis</b> .....	Page 13

---

## I. Introduction and Methodology

Beaver Wood Energy Pownal LLC proposes to construct an integrated wood biomass-fired electric generation plant and wood pellet manufacturing facility (the “Integrated Facility”) in the Town of Pownal, Vermont. The economic impacts of this project has been analyzed in an earlier report prepared by Northern Economic Consulting.<sup>1</sup> That report focused on the impacts from the project’s employment, payroll, and spending. This report takes that analysis one step further by also considering the economic impacts from the change in retail electricity prices brought about by purchasing power from the proposed facility in Pownal.

The Pownal Integrated Facility will be supplying just over 34 MW of gross base load power to Vermont electric utilities. This is a small, but important, addition to the state’s electricity supply. In recent years, Vermont residences, commercial businesses, and industrial enterprises have used just under 6 million megawatt hours of electricity. The Pownal wood-fueled power plant would add approximately 4.6% to the current supply. The price of this power will cause a slight increase in the overall cost of electricity to utilities and their consumers. That increase in the price of electricity, standing alone, would have a modestly negative impact on the Vermont economy. However it must be considered in context of the positive impacts on the Vermont economy from jobs, payroll, and spending of the Pownal Integrated Facility.

We estimate the economic impacts during the construction and the first 20 years of the operation (2012 to 2033) of the Pownal Integrated Facility by use of a dynamic input-output model. This technique is well-established by analysts in and out of Vermont.<sup>2</sup>

---

<sup>1</sup> “Regional Economic Impact Analysis for a Biomass Fired Power Generation and Wood Pellet Manufacturing Facility in Pownal, Vermont Proposed by Beaver Wood Energy Pownal LLC” prepared by Richard Heaps of Northern Economic Consulting, September 8, 2010.

<sup>2</sup> For example, see the report “The Economic Impacts of Vermont Feed in Tariffs” by the Division of Energy Planning, Vermont Department of Public Service, December 2009, which used the REMI model. Also see the report “An Assessment of Energy Needs in Westchester County: The Economic Impact of Rising Energy Prices and Shortages in Supplies” by Dr. Howard Axelrod, Energy Strategies, Inc., January 31, 2008, which used the REDYN model.

---

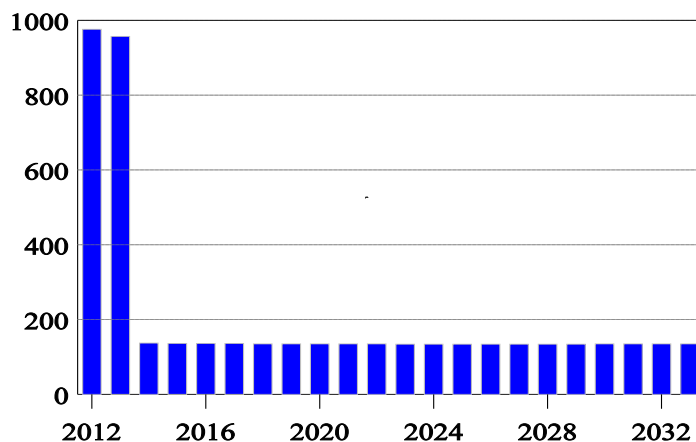
## II. Economic Impacts - Baseline Case

The economic impacts of the Pownal Integrated Facility was first analyzed by Northern Economic Consulting, Inc. in our September 8, 2010 report. In that report, we estimated the economic impacts over the period 2012 to 2017. That period was long enough to give the reader a clear insight into the project's ongoing impacts on jobs, wages, and tax revenues in the state of Vermont.

In this report, we are also concerned with the economic impacts from an electricity price increase over a longer term — one which runs through the first 20 years of the power plant's operation (2014 to 2033). Therefore, we begin the analysis by extending our original economic impact analysis over the period 2012 to 2033. We summarize these impacts graphically by looking at the job, payroll and state revenue impacts during that period.

As shown below, the Integrated Facility in Pownal will lead to the creation of about 970 new jobs in Vermont each year during its construction in 2012 and 2013. Then, with the operation of the Pownal Integrated Facility, the employment increase in Vermont will begin at about 140 in 2014. The employment gain decreases slightly over the following years to 135 in 2033.<sup>3</sup>

### Baseline Employment

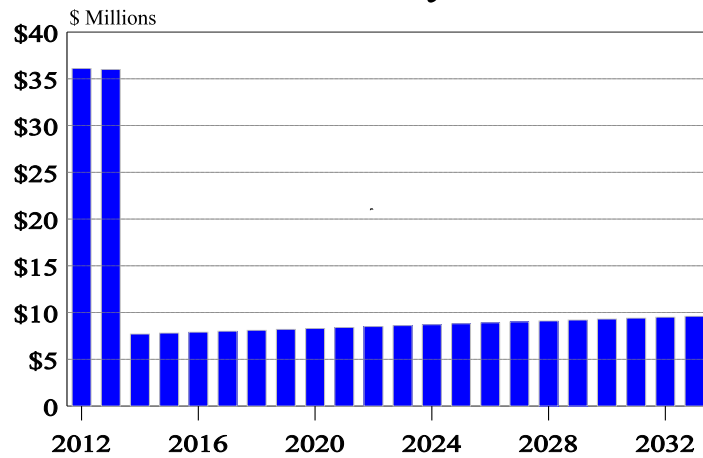


---

<sup>3</sup> The REDYN model shows the decrease is largely in the logging industry as productivity increases reduce the need for labor.

Total payroll increases in the state of Vermont follow a similar pattern. The Pownal Integrated Facility will lead to a payroll increase statewide during its construction in 2012 and 2013 of about \$36 million per year. Then, with the operation of the Pownal Integrated Facility, the annual payroll increase in Vermont will initially total \$7.8 million, then rise to \$9.6 million twenty years later in 2033. All these prices are stated in constant 2010 dollars.

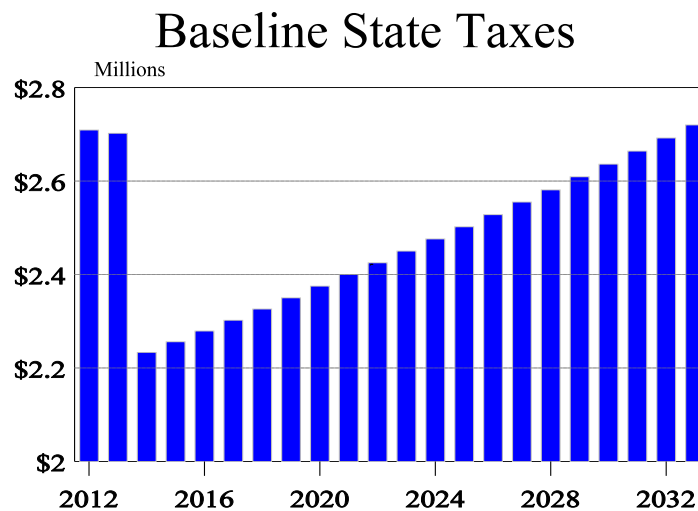
### Baseline Payrolls



In present value terms, from 2012 to 2033 payrolls in Vermont will increase by \$201 million from the Pownal Integrated Facility’s construction and first 20 years of operation .<sup>4</sup>

<sup>4</sup> Because payrolls are expressed in constant 2010 dollars, we use an inflation-adjusted discount rate of 2%.

Finally, state tax revenues will increase substantially from the Pownal Integrated Facility. Tax revenues rise to approximately \$2.7 million per year during the construction of the facility. Then, with operations beginning in 2014, state tax revenues total \$2.2 million and rise slowly to \$2.7 million at the end of twenty years. All figures are in constant 2010 dollars. State taxes include personal income taxes, sales taxes, corporate income taxes, statewide education property taxes, and other items.

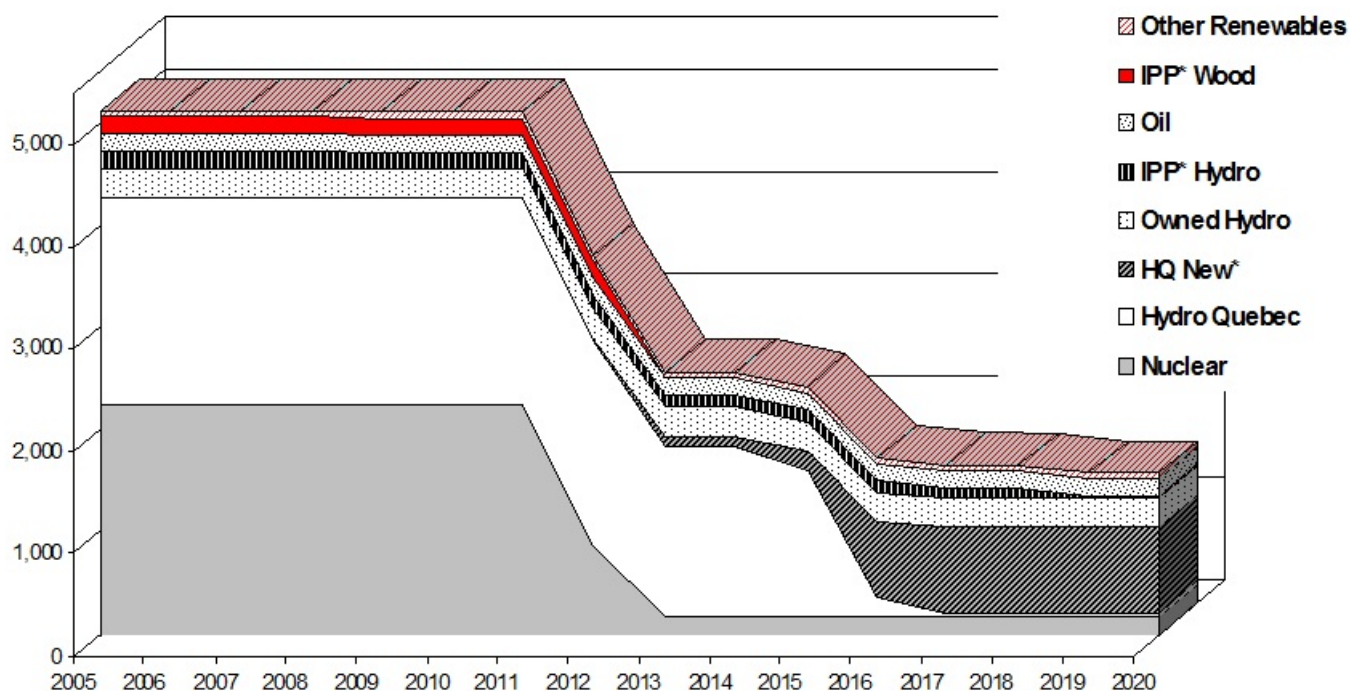


Note: A reader who compares the economic impacts of the Pownal Integrated Facility to the Fair Haven Integrated Facility will not that the impacts are smaller with Pownal than Fair Haven. That is largely due to the fact that the facility in Pownal is located on the border of Vermont with Massachusetts and New York. Some of the positive economic impacts from the Pownal plant spill over into the neighboring two states (whereas less of the positive economic of the Fair Haven Integrated Facility spills into New York). Since the subject of this report is the economic impacts on the state of Vermont alone, those impacts on neighboring states are not included. However, should that restriction be lifted, the economic impacts of the Pownal and Fair Haven Integrated Facilities would be close to identical.

### III. The Potential Electricity Price Increase

In order to estimate the impact of higher electricity prices on the Vermont economy with the REDYN model, we need to determine the likely percentage increase in retail electricity prices that may occur. The potential electricity price increase from the Pownal Integrated Facility is estimated based on the expected supply of electrical power and prices in Vermont in 2014 when the facility comes online. This necessarily involves forecasting. One difficulty in doing so is that the supply of power from most of Vermont’s electricity suppliers for 2014 is unknown. As shown in the graph below, only about half of Vermont’s electricity supply for 2014 is committed and only about one-quarter is committed after 2017. This includes the state’s current largest supplier, Vermont Yankee.

**Committed Resources in GWH (As of September 2010)**



\* HQ New\* reflects the terms of a new 26 year purchase power agreement between HQ and Vermont utilities for 218 to 225 MW starting in November 2012 and extending through 2038.

Source: Vermont Department of Public Service.

Even if Vermont Yankee continues in operation it is unknown if it will supply the same quantity of power it has in the past.<sup>5</sup>

The potential electricity price increase estimated here uses very conservative assumptions so as not to underestimate the potential price impact from Beaver Wood Energy's project and, hence, lead to an overstatement of the beneficial economic impacts of the Pownal Integrated Facility. In addition, the potential price impact is estimated as a range and not a single point. We consider the economic impacts from this potential price range at the end of this analysis.

In 2009, electricity was supplied in Vermont from the sources listed below (Vermont DPS). This has been fairly constant in the last decade.<sup>6</sup>

<b>Vermont Electric Supply (MWh) in 2009</b>		
	MWh	Percent
Nuclear	2,240,961	38%
Hydro Quebec	1,747,603	30%
Hydro renewables	782,426	13%
Market purchases	622,548	11%
Other renewables	412,391	7%
Oil	44,440	1%
Gas	10,000	0%
Total =	5,860,369	100%

---

<sup>5</sup>. In 2009 VY supplied just over 2.2 GWh to Vermont. That implies 255 MW per hour. VY's last offer was to supply 115 MW.

<sup>6</sup> In 2003 VY and HQ were supplying 36% and 28% of Vermont's power, respectively.

In 2014, we estimate the wholesale price of electricity in Vermont without the Pownal Integrated Facility several ways, with our preferred estimate shown in the table below.<sup>7</sup> The blended wholesale price to Vermont is \$69.877.

<b>Vermont Electric Supply (MWh) in 2014</b>				
<b>Source</b>	<b>MWh</b>	<b>Percent</b>	<b>Price per MWh</b>	<b>Weighted Price</b>
Nuclear	1,500,000	25%	\$61	\$15.250
Hydro Quebec	1,314,000	22%	\$60	\$13.140
Hydro renewables - In state	441,729	7%	\$35	\$2.577
- IPP	233,663	4%	\$120	\$4.673
- NYPA	107,034	2%	\$15	\$0.268
Market purchases	1,936,743	32%	\$78	\$25.178
Other renewables	412,391	7%	\$120	\$8.248
Oil	44,440	1%	\$60	\$0.444
Gas	10,000	0%	\$60	\$0.100
<b>Total</b>	<b>6,000,000</b>	<b>100%</b>		<b>\$69.877</b>

<sup>7</sup> The major assumptions are: (A) VY continues in operation and sells 1.5 GWh to Vermont utilities at 6.1¢. This is a substantially higher volume than the current offer from VY at about 1 GWh. By choosing a high volume from a low cost producer, we are overestimating the price impact of the Pownal Integrated Facility. (B) HQ sells 225 MW for 16 hours per day based on the just signed contract. (C) In state renewables remain basically unchanged from today. As of this date a minimal amount of new supply is likely to be operating in 2014 from the Feed In Tariff program. And the volume of supply (i.e. the actual capacity factor) from various wind projects in the state remains to be seen. (D) Market purchases are the default supplier to yield a total supply of 6.0 GWh to the state. Market purchases are assumed to occur at \$78/MWh. That's a 20% increase in the current price of \$65/MWh based on forecasted prices by Synapse Energy Economics, Inc. Again, this is a conservative estimate as market purchases are shown as a low cost source of power (other than VY and HQ which are discussed above). A relaxation of any of these assumptions, reduces the price impact of the Pownal Integrated Facility.

If the Pownal Integrated Facility is added to the mix as a producer of 34 MW of base load power at \$100 per MWh, the blended price to Vermont electricity users is \$70.882, a 1.4% increase in wholesale prices (from \$69.877 calculated on the previous page).<sup>8</sup>

<b>Vermont Electric Supply (MWh) in 2014 with BWE</b>				
<b>Source</b>	<b>MWh</b>	<b>Percent</b>	<b>Price per MWh</b>	<b>Weighted Price</b>
Nuclear	1,500,000	25%	\$61	\$15.250
Hydro Quebec	1,314,000	22%	\$60	\$13.140
Hydro renewables - In state	441,729	7%	\$35	\$2.577
- IPP	233,663	4%	\$120	\$4.673
- NYPA	107,034	2%	\$15	\$0.268
Market purchases	1,662,743	28%	\$78	\$21.616
Other renewables	412,391	7%	\$120	\$8.248
Oil	44,440	1%	\$60	\$0.444
Gas	10,000	0%	\$60	\$0.100
BWE - Pownal <sup>9</sup>	274,000	5%	\$100	\$4.567
Total =	6,000,000	100%		\$70.882

<sup>8</sup> This \$100 per MWh is the price of electricity only for the Pownal Integrated Facility. This is the reference price of \$125 per MWh less and assumed Renewable Energy Credit value of \$20 per MWh and less an assumed value for capacity and ancillaries of \$5 per MWh.

<sup>9</sup> The capacity factor of the Pownal Integrated Facility is 92%. The total annual capacity of 274,000 MWh is calculated from 8,760 hours times 34 MW times 0.92.

We estimate this wholesale price increase will lead to a rise in retail prices to Vermont residents and commercial interests of half of the 1.4% calculated above, or 0.7% (seven-tenths of a percent). This is based on:

- an analysis of the relationship between the Vermont retail price of electricity in 2008 as reported by the U.S. Energy Information Administration and the blended wholesale price for 2008 as calculated above. The retail price was 2.1 times the wholesale price.
- an analysis of the ratio between retail sales and wholesale production (and purchases) costs of CVPS from 2007 to 2009 and VEC for 2008 to 2009. The CVPS ratio was 1.9 to 2.0 and the VEC ratio was 1.7 to 1.8. Insufficient information was available for GMP.

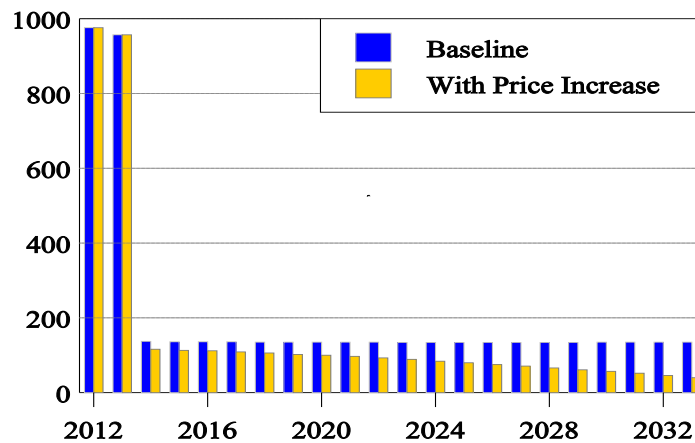
See Section VI of this report for a discussion of a reasonable range of price impact calculations under differing assumptions and the resulting economic impacts using different assumptions.

## IV. Economic Impacts with Price Increase

The economic impacts of the Pownal Integrated Facility were estimated with the same parameters for employment, payrolls, etc. as in section II but now with a seven-tenths of a percent rise in retail electricity prices to all Vermont consumers of electricity. We summarize the resulting impacts graphically by looking at the job, payroll and state tax revenue impacts with and without the price increase.

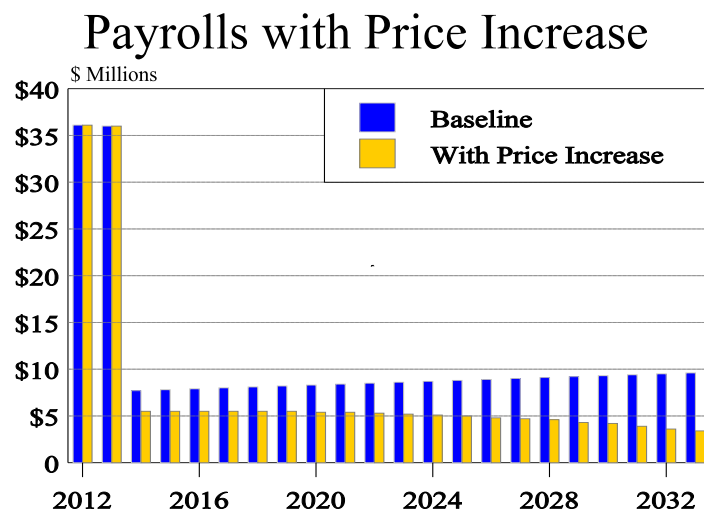
There is no change in our estimates of jobs for the construction years as no electricity price increase from the Pownal Integrated Facility would have occurred. Then, with the operation of the Pownal Integrated Facility and the rise in electricity prices, the employment gain in Vermont will begin at 116 in 2014 and decrease to 40 in 2033 as shown in the orange bars in the graph below. This is a decrease of about four jobs per year as shown in the orange bars in the graph.

### Employment With Price Increase



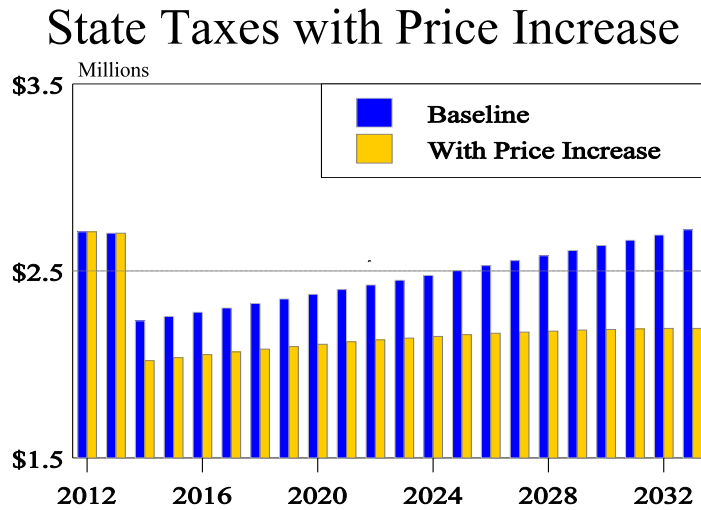
As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, a significant employment impact remains during the first 20 years of operation of the Pownal Integrated Facility.

During the construction years there is no change in electricity prices and, hence, no change in payrolls from that estimated earlier. With the operation of the Pownal Integrated Facility and the rise in electricity prices, the payroll gain in Vermont will begin at \$5.5 million in 2014 and decrease very slowly to \$3.4 over the following years as shown by the orange bars in the graph below. Again, payrolls are expressed in constant 2010 dollars but would be positive in nominal terms.



As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, the payroll impact is still significant during the first 20 years of operation of the Pownal Integrated Facility. In present value terms, from 2012 to 2033, payrolls in Vermont will increase by \$145 million from the Beaver Wood Energy Pownal Integrated Facility's construction and first 20 years of operation even considering the accompanying electricity price increase.

Without a price increase in electricity in Vermont during the construction years, there is no change in state tax revenues. With the operation of the Pownal Integrated Facility and the rise in electricity prices, the state tax revenue gain in Vermont will begin at \$2.0 million in 2014 and rise very slowly to \$2.2 over the following years as shown in the orange bars in the graph below. Again, taxes are expressed in constant 2010 dollars.



As the graph shows, even considering the slightly higher electricity prices likely accompanying this project, the tax revenue impact is still significant during the first 20 years of operation of the Pownal Integrated Facility. In present value terms, from 2012 to 2033, state tax revenues in Vermont will increase by \$38 million from the Pownal Integrated Facility's construction and first 20 years of operation even considering the accompanying electricity price increase.

---

## V. Sensitivity Analysis

The key input into our analysis in this report is the percentage increase in retail electricity prices stemming from power purchases from the Pownal Integrated Facility. We calculated that retail prices would increase by seven-tenths of one percent across the state of Vermont. As explained in section III, this is a conservative estimate of the price increase, designed to err on the side of overstating the price increase rather than understating it.

We examined the sensitivity of the economic impact estimates obtained from the REDYN model by modifying the key price assumption. A reasonable range of differing future price assumptions suggests the price increase from the Pownal Integrated Facility could range plus or minus three-tenths of a percent off of our calculation of a seven-tenths of a percent increase. We ran the REDYN model with both a lower (0.4%) and higher (1.0%) increase in retail electricity prices.<sup>10</sup> The impacts on jobs, payrolls, and taxes were:

- employment changed little across the state. For example, our best estimate (with a 0.7% price increase) showed an employment gain of 89 jobs in 2023 from the Pownal project. The electricity price increase range of +/- 0.3% resulted in an employment gain of 68 to 110 in 2023. Similarly, our best estimate showed an employment gain of 40 in 2033 and the +/- 0.3% range resulted in an estimated employment gain of -9 to 89. Under almost all scenarios considered with the exception of an extreme outlier, the Beaver Wood Pownal Integrated Facility would always create jobs throughout Vermont.
- estimated payrolls were always a significant positive impact for Vermont. In 2023 the range of increased payrolls was estimated to be from \$4.1 million to \$6.2 million. In 2033 the range was from \$0.8 million to \$6.0 million. The gain in payrolls is always very significant for Vermont throughout the range of potential price increases.

---

<sup>10</sup> We calculated the blended wholesale price change with the Pownal Integrated Facility under a variety of assumptions. Those presented in the body of this report show a 1.4% wholesale price change with the plant. The key assumptions which determine the price impact of the Pownal plant is the cost of market power and the cost of the power from the Pownal plant.

If we assume the market power price rises only 2.5% per year to just \$72 in 2014, the wholesale price impact of the Pownal facility is 1.9% and the retail change is just under 1.0%. If we assume the market price rises to \$89 (an annual increase of 9% likely associated with a strong world economic recovery from current conditions), the Pownal facility causes a wholesale electricity price increase of 0.8% with a retail price increase of 0.4%.

This set the boundaries for the price changes in the sensitivity analysis.

- state tax revenues also were always a significant positive impact for Vermont. In 2023 the range of increased state tax revenues was estimated to be from \$1.9 million to \$2.3 million. In 2033 the range was from \$1.9 million to \$2.5 million.
- In sum, the estimates produced in this analysis show that for a reasonable range of assumptions about the electricity price impact of the Pownal Integrated Facility, the project clearly has a very significant positive economic impact on the state of Vermont in terms of jobs, payrolls, and state tax revenues.

**The Economic Impacts  
of  
Major Renewable Energy Projects:  
A Comparative Study**

Prepared by  
Richard W. Heaps  
January 4, 2011

---

## **I. Introduction**

Several renewable electricity generation projects have been proposed in Vermont and neighboring New Hampshire. Public authorities in both states have required some degree of analysis of the economic impacts of these projects. This report reviews the economic impacts from the major wind and solar projects in our region and compares them to the economic impacts from the proposed Beaver Wood Energy Fair Haven Integrated Facility.

In general, the cost of constructing and operating wind and solar electricity generation facilities is very different from biomass facilities. The cost to the wind and solar projects is mostly up-front construction and equipment costs with small operating costs following. Biomass facilities have proportionately smaller construction costs (though still substantial) but relatively higher ongoing operating costs associated with fuel purchases and handling. The consequence is wind and solar projects have very limited ongoing economic impacts (in terms of jobs, wages, etc.) while biomass projects continue to generate significant employment and payrolls for their operation. We will demonstrate this in the following manner.

First, we collected publicly available economic impact reports prepared for wind projects in Vermont and New Hampshire and submitted to local public authorities. We summarize the economic impacts discussed in these reports and compare them to the impacts we found for the Fair Haven Integrated Facility. In addition, we have prepared a cost-benefit analysis of the wind projects that published sufficient information along and the Fair Haven Integrated Facility.

Second, we collected publicly available economic impact reports from solar projects in Vermont and New Hampshire. We also summarize the economic impacts discussed in these reports and compare them to the impacts we found for the Fair Haven Integrated Facility.

Third, we review an excellent study prepared by the Vermont Department of Public Service on the economic impact of a range of small renewable projects proposed for Vermont. This study is important because it included in its analysis the impacts from the price of the power produced by these renewable projects. We then compare these impacts to those we found for the Fair Haven Integrated Facility.

The point of this comparison is not to denigrate the economic impacts from any source of renewable energy but solely to compare the impacts.

---

## **II. Economic Impacts of Wind Turbine Projects**

The most common type of renewable energy project in our region that has a significant generation capacity have been wind turbine projects. We review six of these projects below, which is sufficient to show the pattern of economic impacts from wind turbine facilities.

### **A. Deerfield Wind Project in Readsboro and Searsburg, VT**

Deerfield Wind LLC (DWL) proposed a wind project to be located in the Towns of Readsboro and Searsburg, Vermont. DWL presented an economic analysis to the Vermont Public Service Board in June 2008.<sup>1</sup>

The project was described as 15 wind turbines with a total nameplate electric generation capacity of approximately 30 MW. The report stated the average net output of the facility is expected to be about 95,600 MWh per year. This implies a net capacity factor of 36%.<sup>2</sup>

The cost of construction of the plant was estimated at more than \$85 million. During the construction of the plant employment in Vermont was estimated at 256 jobs with a payroll of \$9.1 million. (This, and all subsequent figures cited, include jobs at the project itself plus those created through the multiplier effect.) With the operation of the plant, the net employment gain in Vermont was estimated at only 9 with a payroll of just \$388,000 in the first year. Payroll then increased slowly over time with general wage inflation.

Total state and local tax revenue generated during construction was estimated at \$1.2 million. Then during the first year of operation of the plant this equaled \$0.8 million (and increased with general inflation thereafter).

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output (which was the norm for nearly all studies referenced in this report.)

---

<sup>1</sup> "Regional Economic Impact Analysis for the Deerfield Wind Project" prepared by Kavet, Rockler & Associates in June 2008 (available online).

<sup>2</sup> The net capacity factor is the ratio of the actual (or expected) output of a power plant over a period of time and its output if it had operated at full nameplate capacity the entire time. In the case of the Deerfield Wind project the expected output was stated to be 95,600. The nameplate capacity is 30 MW times 365 days time 24 hours (262,800). The ratio 95,600/262,800 equals 0.36 or 36%.

## **B. Georgia Mountain Community Wind Project in Georgia, VT**

Georgia Community Wind LLC (GCWL) proposed a wind project to be located in the Towns of Georgia and Milton, Vermont. GCWL presented an economic analysis to the Vermont Public Service Board in June 2008.<sup>3</sup>

The project was described as up to 5 wind turbines with a total nameplate electric generation capacity of 8.25 MW. The report presented no information to calculate a net capacity factor.

The cost of construction of the plant was estimated at more than \$24 million. During the two years of construction of the plant the total employment in Vermont was estimated at 62 jobs with a payroll of \$4.1 million.<sup>4</sup> With the operation of the plant, the net employment gain in Vermont was only two with a payroll of just \$72,000 in the first year. Payroll increased slowly over time with general wage inflation.

Total state tax revenue generated during construction was estimated at \$130,000. (This included only state taxes, not local taxes, and excluded state property taxes. Then during the first year of operation of the plant this equaled \$43,000 (and increased with general inflation thereafter).

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output.

---

<sup>3</sup> "Regional Economic Impact Analysis for the Georgia Community Wind Project" prepared by Northern Economic Consulting in March 2009 (available online).

<sup>4</sup> Construction is estimated to take two years with 27 jobs the first year and 35 jobs the second. Payroll was \$2.0 million the first year and \$2.1 million the second.

### **C. Kingdom Community Wind Project in Lowell, VT**

Green Mountain Power Corporation (GMP) proposed a wind project to be located in the Town of Lowell, Vermont. GMP presented an economic analysis to the Vermont Public Service Board in May 2010.<sup>5</sup>

The project was described as 20 to 21 wind turbines with a total nameplate electric generation capacity between of 50 and 63 MW. The report did not state the average net output of the facility (other than it could power 20,000 Vermont homes), but other reports by the same firm (see Sheffield below) suggest it to be about 150,000 MWh per year. This implies a net capacity factor of 30%.

The cost of construction of the plant was estimated at more than \$150 million. During the construction of the plant employment in Vermont was estimated at 728 jobs with a payroll of \$30.8 million. With the operation of the plant, the net employment gain in Vermont was 30 with a payroll of \$1.6 million in the first year. Payroll increased slowly over time with general wage inflation.

Total state and local tax revenue generated during construction was estimated at \$2.1 million. Then during the first year of operation of the plant this equaled \$1.1 million (and increased with general inflation thereafter).

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output.

### **D. The Sheffield Wind Farm in Sheffield and Sutton, VT**

UPC Vermont Wind, LLC (UPC) proposed a wind project to be located in the Towns of Sheffield and Sutton, Vermont. UPC presented an economic analysis to the Vermont Public Service Board in February, 2006.<sup>6</sup>

---

<sup>5</sup> "Regional Economic Impact Analysis for the Kingdom Community Wind Project" prepared by Kavet, Rockler & Associates in May 2010 (available online).

<sup>6</sup> "Economic Analysis Associated with the Sheffield Wind Farm" prepared by Kavet, Rockler & Associates in February 2006 (available online).

The project was described as 26 wind turbines with a total nameplate electric generation capacity between of 52 MW. The report stated the average net output of the facility to be about 147,600 MWh per year. This implies a net capacity factor of 32%.

The cost of construction of the plant was estimated at more than \$90 million. During the construction of the plant the average annual employment in Vermont was estimated at 83 jobs. With the operation of the plant, the net employment gain in Vermont was 24. No payroll estimates were presented in the report.

Total state and local tax revenue generated during construction was estimated at \$1.0 million. Then during the first year of operation of the plant this equaled \$1.4 million (and increased with general inflation thereafter).

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output.

## **E. Granite Reliable Wind Power in Coos County, NH**

Granite Reliable Power, LLC (GRPL) proposed a wind project to be located in Coos County in the northern tip of New Hampshire. GRPL presented an economic analysis to the New Hampshire Site Evaluation Committee in February 2009.<sup>7</sup>

The project was described as 33 wind turbines with a total nameplate electric generation capacity of 99 MW. The report did not state the average net output of the facility needed to calculate an implied net capacity factor.

The cost of construction of the plant was estimated at more than \$250 million. During the construction of the plant employment in northern New Hampshire, Vermont and Maine was estimated at 550 jobs. With the operation of the plant, the net employment gain in the region was estimated at 72. Payroll data given in the report were not clear enough to present here.

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output.

---

<sup>7</sup> "Economic Impact of Granite Reliable Wind Power Project in Coos County, New Hampshire," prepared by Ross Gittell and Matt Magnusson, University of New Hampshire, February 2009 (available online).

## **F. Groton Wind Project in Groton, New Hampshire**

Groton Wind LLC(GWL) proposed a wind project to be located in the Town of Groton, Vermont. GWL presented an economic analysis to the New Hampshire Site Evaluation Committee in January 2010.<sup>8</sup>

The project was described as 24 wind turbines with a total nameplate electric generation capacity of 48 MW. The report stated the average net output of the facility be about 144,000 to 158,000 MWh per year. This implies a net capacity factor of 36%.

The cost of construction of the plant was estimated at more than \$140 million. During the construction of the plant employment in Grafton County and the five surrounding counties) was estimated at 229 jobs. With the operation of the plant, the net employment gain in the region was 20. Payroll data given in the report were not clear enough to present here.

Finally, we note that this study did not consider any economic impacts associated with expected higher or lower electricity prices for the plant's output.

---

<sup>8</sup> "Economic Impact of the Proposed Groton Wind 50 MW Wind Power Project in Groton, New Hampshire," prepared by Ross Gittell and Matt Magnusson, University of New Hampshire, January 2010 (available online).

### G. Summary: Economic Impact of Wind Projects Versus the Fair Haven and Pownal Integrated Facilities

Below, we summarize the description and economic impacts of the six wind projects listed above based on the analyses they have publicly released.

<b>Economic Impacts of Six Wind Power Projects versus the Fair Haven and Pownal Integrated Facilities</b>								
Project	Construction Cost (\$ million)	Turbines	Nameplate Capacity MW	Net Capacity Factor	Annual Output (MWh)	Total Construction Jobs	On-site Operating Jobs/yr	Total Operating Jobs/yr
Deerfield Wind	\$85	15	30	36%	95,600	256	2.5	9
Georgia MT.	\$24	5	8.25	not stated	not stated	62	1	2
Kingdom Comm.	\$150	20-21	50-63	30%	166,000 est.	728	5.5	30
Sheffield Wind	\$90	26	52	32%	147,600	83	6	24
Granite Reliable	\$250	33	99	36%	300,000	550	6	72
Groton Wind	\$140	24	48	36%	151,000	229	6	20
Fair Haven Integrated Facility	\$250	----	34	92%	274,000	2,105	45	240
Pownal Integrated Facility	\$250	----	34	92%	274,000	1,933	45	140

The six wind projects range from a small Georgia Mountain project to a large Granite Reliable project. All projects have a net capacity factor of 30% to 36%, showing that they will not serve as base load power. However, the Fair Haven and Pownal Integrated Facilities provide base load power. For example, during a typical year, Fair Haven and Pownal each will produce 274,000 MWh of power as compared to 150,000 MWh for Kingdom Wind. Granite Reliable has the potential to produce more power in a year than Fair Haven or Pownal alone (300,000 MWh), but it will do so intermittently.

As shown in the table, each project was estimated to initially generate a burst of construction jobs followed by a much smaller number of ongoing jobs during the operating phase. The various job definitions used in the table are given below.

- **Total construction jobs:** The total jobs created during construction are the sum of all jobs created in the years of construction of the facility. For example, if a project created

25 construction jobs in the first year and 30 construction jobs in the second year, that is listed as a total of 55 construction jobs in the table above. This figure includes not only the jobs at the construction site but also the jobs created elsewhere in Vermont through the construction spending and the multiplier process.

- **On-site operating jobs per year:** This is the total number of jobs directly on the site of the facility during each year of its operation.
- **Total operating jobs per year:** This is the total number of jobs created each year during the operation of the project. It includes the jobs on-site plus those created elsewhere in the region through the plant's spending and the multiplier process.

The Fair Haven and Pownal Integrated Facilities differ most greatly from the wind projects in terms of job creation during both the construction and operating phases. During construction, wind power facilities create far fewer jobs than the biomass facility because a much higher percentage of the construction cost of a wind turbine project is for expensive equipment purchased from out of the region. (This holds even assuming half the Fair Haven or Pownal job creation is from the wood pellet operation.) Then during operations, the Fair Haven and Pownal Integrated Facilities also create many more jobs than wind facilities as the biomass plants need more employees to operate. In addition, many other jobs are simultaneously created in local forestry to supply the fuel to the Fair Haven and Pownal Integrated Facilities.

## H. The Price of Electricity from Wind Turbines

We were unable to find any public statements as to the price Vermont utilities would be paying for the electricity generated by the above wind projects. We suspect the price is substantially above the average price currently paid for electricity. We base this on the following information.

1. The U.S. Energy Information Administration estimated the average national levelized costs for generating technologies.<sup>9</sup> Levelized costs represent the present value of the total cost of building and operating a generating plant over its financial life, converted to equal annual payments and amortized over expected annual generation from an assumed duty cycle. No state or federal incentives are included. The levelized costs (2008\$/MWh) for wind turbine facilities entering service in 2016 is \$149.3 per MWh.

---

<sup>9</sup> See <http://www.eia.doe.gov/oiaf/index.html>

2. The Vermont SPEED Standard offer for a wind power plant with a capacity greater than 15 kW is a price equal to the average residential rate per kWh charged by all of the state's retail electricity providers weighted in accordance with each provider's share of the state's electrical load.<sup>10</sup> According to the U.S. EIA in 2010 the average residential rate in Vermont was 15.36¢ per kWh.

3. Massachusetts state utility regulators just this month approved a 15-year power purchase contract between Cape Wind and the utility National Grid.<sup>11</sup> Cape Wind is a 130 turbine wind project planned for Nantucket Sound. The starting price is 18.7 cents per kWh and increases 3.5% per year for the life of the contract.

Based on this information, we expect that the price of power from wind turbine plants is higher than the likely price of power from the proposed Fair Haven Integrated Facility.

Nonetheless, we have highlighted the overall net economic benefit of the Fair Haven Integrated Facility by calculating the net wholesale price of power across the four projects as presented in the table below. For this purpose, we assumed the wholesale price of electricity from every project was \$100 per MWh. Note that the net wholesale price of power for the Fair Haven Integrated Facility is calculated to be \$60 MWh of output compared with higher net wholesale power prices for the three wind projects analyzed.

---

<sup>10</sup> H.446,

<sup>11</sup> Associated press report November 23, 2010.

**COST/BENEFIT ANALYSIS TO THE STATE OF VERMONT\***

<b>Beaver Wood Energy Fair Haven Integrated Facility</b>	<b>Kingdom Community Wind Project</b>	<b>Deerfield Wind Project</b>	<b>Sheffield Wind Farm</b>
<b>(1) Annual Cost of Power (first year of operation)</b>	<b>(1) Annual Cost of Power (first year of operation)</b>	<b>(1) Annual Cost of Power (first year of operation)</b>	<b>(1) Annual Cost of Power (first year of operation)</b>
\$100 Wholesale electricity price per MWh (less RECs, Capacity and Ancillaries)	\$100 Wholesale electricity price per MWh (less RECs, Capacity and Ancillaries)	\$100 Wholesale electricity price per MWh (less RECs, Capacity and Ancillaries)	\$100 Wholesale electricity price per MWh (less RECs, Capacity and Ancillaries)
274,013 Annual MWh (92% capacity)	165,564 Annual MWh (30% capacity)	95,600 Annual MWh (36% capacity)	147,600 Annual MWh (32% capacity)
\$27.0 Total cost to Vermont utilities - assuming all power is sold to VT utilities (in millions)	\$17.0 Total cost to Vermont utilities - assuming all power is sold to VT utilities (in millions)	\$10.0 Total cost to Vermont utilities - assuming all power is sold to VT utilities (in millions)	\$15.0 Total cost to Vermont utilities - assuming all power is sold to VT utilities (in millions)
<b>(2) Annual Economic Benefit</b>	<b>(2) Annual Economic Benefit</b>	<b>(2) Annual Economic Benefit</b>	<b>(2) Annual Economic Benefit</b>
220 Jobs	30 Jobs	9 Jobs	24 Jobs
\$8.9 Payroll generated in Vermont (in millions)	\$1.6 Payroll generated in Vermont (in millions)	\$0.4 Payroll generated in Vermont (in millions)	\$1.5 Payroll generated in Vermont (estimated) (in millions)
\$1.6 State education tax revenue (in millions)	\$1.2 State and municipal tax revenue (in millions)	\$0.8 State and municipal tax revenue (in millions)	\$1.4 State and municipal tax revenue (in millions)
<b>(1)-(2) Annual Net Cost to State of Vermont</b>	<b>(1)-(2) Annual Net Cost to State of Vermont</b>	<b>(1)-(2) Annual Net Cost to State of Vermont</b>	<b>(1)-(2) Annual Net Cost to State of Vermont</b>
\$27.0 Electricity cost	\$17.0 Electricity cost	\$10.0 Electricity cost	\$15.0 Electricity cost
\$8.9 less payroll benefit	\$1.6 less payroll benefit	\$0.4 less payroll benefit	\$1.5 less payroll benefit
<u>\$1.6</u> less state education tax benefit	<u>\$1.2</u> less state and municipal tax benefit	<u>\$0.8</u> less state and municipal tax benefit	<u>\$1.4</u> less state and municipal tax benefit
\$16.5 Net cost (in millions)	\$14.3 Net cost (in millions)	\$8.8 Net cost (in millions)	\$12.1 Net cost (in millions)
\$60 Net wholesale electricity price per MWh	\$86 Net wholesale electricity price per MWh	\$92 Net wholesale electricity price per MWh	\$82 Net wholesale electricity price per MWh

\* Information was provided by Beaver Wood Energy Fair Haven LLC for the Fair Haven Integrated Facility. Various project and public sources were availed for wind project information. To the extent certain facts were not known to NEC, other than by anecdote, good faith estimates have been made. While NEC has concluded that wind power prices are likely higher than that for biomass power, the base price for each has been equalized to evidence the overall economic benefits to the State of Vermont of power produced by the Fair Haven Integrated Facility [which holds true for the Pownal Integrated Facility as well].

---

### **III. Economic Impacts of Solar Energy Projects**

Several solar energy products have been proposed for Vermont and our neighboring states. We review the publicly available reports of their economic impact below.

#### **A. Green Mountain Power Project in Berlin, VT**

Green Mountain Power (GMP) requested a Certificate of Public Good for a proposed solar project to be constructed in the Town of Berlin, Vermont.<sup>12</sup> The project consists of a fixed, ground-mounted array of solar panels, made up of 952 modules. The anticipated output is 200,000 watts (0.2 MW). GMP estimated it had a capacity factor of just 13.7%. The array will cover one acre of land.

The project is estimated to cost \$1.3 million to construct. GMP estimates the construction will take approximately 228 person-days to complete which is equivalent to less than one full time construction job for the construction year. No ongoing jobs to operate the plan were claimed by GMP.

GMP estimates the project will operate for \$0.17 per kWh, less than the \$0.30 per kWh of the current SPEED Solar Standard Offer.

#### **B. Chittenden County Solar Project LLC in S. Burlington, VT**

Chittenden County Solar Project, LLC (CCSP) requested a Certificate of Public Good for a proposed solar project to be constructed in the City of South Burlington, Vermont.<sup>13</sup> The project consists of more than 9,000 individual polycrystalline solar photovoltaic panels of 240 watts each and approximately 383 trackers. The expected net energy output of the project is 3,000,000 kWh per year. With a nameplate capacity of 2.2MW this implies a capacity factor of less than 15%. The array will cover twenty-two acres of land.

---

<sup>12</sup> "Prefiled Testimony of John Castonguay on Behalf of Green Mountain Power Corporation" submitted to the Vermont Public Service Board and dated January 8, 2010.

<sup>13</sup> Certificate of Public Good issued to Chittenden County Solar Project LLC dated September 9, 2015.

The project is estimated to cost \$12 million to construct and have operating costs of \$140,000 per year plus pay property taxes of \$60,000 per year.

CCSP signed a contract to sell this power at the \$0.30 per kWh of the current SPEED Solar Standard Offer.

### **C. Addison Solar Farm LLC in Ferrisburgh, VT**

Addison Solar Farm LLC (ASF) requested a Certificate of Public Good for a proposed solar project to be constructed in the Town of Ferrisburgh, Vermont.<sup>14</sup> The project consists of approximately 5,200 individual 200-watt solar panels (or alternately 3,872 270-watt solar panels). The nameplate capacity is 1.04 MW. The expected net energy output of the project is 1,200 MWh per year.

The project is estimated to cost \$1.3 million to construct. ASF estimates the construction will cost \$5 to \$6 million, with operating costs of \$50,000 to \$75,000 per year. The project will create, including the multiplier effect, about 5-6 full-time equivalent jobs in Vermont during construction. ASF states that the operation of the solar plant is totally automatic and requires no on-site personnel.

ASF will sell this power at the \$0.30 per kWh of the current SPEED Solar Standard Offer.

---

<sup>14</sup> "Prefiled Testimony of Ernest A. Pomerleau and Leigh W. Sneddon" submitted to the Vermont Public Service Board and dated February 9, 2010.

### D. Summary: Economic Impact of Solar Projects Versus the Fair Haven and Pownal Integrated Facilities

Below, we summarize the description and economic impacts of the three solar projects listed above based on the analyses they have publicly released.

<b>Economic Impacts of Three Solar Power Projects versus the Fair Haven and Pownal Integrated Facilities</b>							
Project	Construction Cost (\$ million)	Nameplate Capacity MW	Net Capacity Factor	Annual Output (MWh)	Total Construction Jobs	On-site Operating Jobs/yr	Total Operating Jobs/yr
Green Mountain Power	\$1.3	2.0	13.7%	2,400	less than 1	not stated	not stated
Chittenden County Solar Project	\$12.0	2.2	less than 15.0%	3,000	not stated	not stated	not stated
Addison Solar Farm	\$5 to \$6	1.04	13.2%	1,200	5 to 6	0	not stated
Fair Haven Integrated Facility	\$250	34.0	92%	274,000	2,105	45	240
Pownal Integrated Facility	\$250	34.0	92%	274,000	1,933	45	140

The solar projects proposed for Vermont in recent years have all been small projects not only in terms of nameplate capacity but also in terms of capacity factors. Vermont’s climate is not ideal for solar projects.<sup>15</sup> These projects do not provide base load power but intermittent power.

These small solar projects have a limited and brief employment impact during their construction phase. In addition, their subsequent operation calls for little day-to-day intervention, leading to very limited employment impacts during their operation.

---

<sup>15</sup> One of the largest, if not still the largest, solar projects in the world in Sarnia, Ontario near the southern shore of Lake Huron. The climatic conditions have to be even more limited than Vermont’s. Yet the project is huge by solar standards, with a 80 MW nameplate capacity. The project is owned by Enbridge, Inc. and the power is sold to the Ontario Power Authority. The Toronto Star reports that the power is sold at 42 cents per kWh under an Ontario government program.

---

## IV. Economic Impacts of Several Small Renewable Projects

Last year, the Vermont legislature passed a pilot feed-in tariff (FIT) program to encourage the rapid development of renewable energy technologies in the state. Vermont was the first state in the U.S. to enact an extensive system of feed-in tariffs, though it follows other initiatives across the U.S. and Europe and closely resembles one in Ontario. In a nutshell, the FIT requires the Public Service Board (PSB) to seek bids from small, renewable electrical energy generators for up to 50 MW of power. Each facility must produce no more than 2.2MW.

The key part of the legislation is the price guarantee to these energy producers. Under the FIT program they are guaranteed an initial price of between 12¢ per kWh for methane plants to 30¢ per kWh for solar projects. The PSB is required to adjust these prices, up or down, every two years over a 10 to 25 year period so that the price covers production costs plus a rate of return equal to the highest rate of return earned by the state's electric utilities. Costs of the program will be borne by the electricity ratepayers as Vermont utilities will be required to purchase the power.

Last year, the Vermont Department of Public Service (DPS) prepared a report on the economic impacts of the Vermont feed-in tariff program.<sup>16</sup> The DPS analysis measured the change in jobs and personal income in Vermont that would have occurred if the various projects which bid to be part of the feed-in tariff program were actually constructed and operated. The analysis assumed that the market cost of electricity would rise over time and the projects under the feed in tariff program would eventually produce below market rate power. The projects, estimated at a total cost of \$228 million, included:

Solar PV	14.3 MW
Biomass/biogas	13.0 MW
Wind	8.1 MW
Hydro	7.8 MW
Farm Methane	3.1 MW
LFG	1.7 MW

The DPS analysis found that these projects would result in a spurt of job creation during their construction phase, adding nearly 600 jobs to the state's economy. Then with the operation of the facilities and their above market rate electricity, the state's employers would actually show a net reduction in jobs through the first ten years of operation of the new facilities, followed by net

---

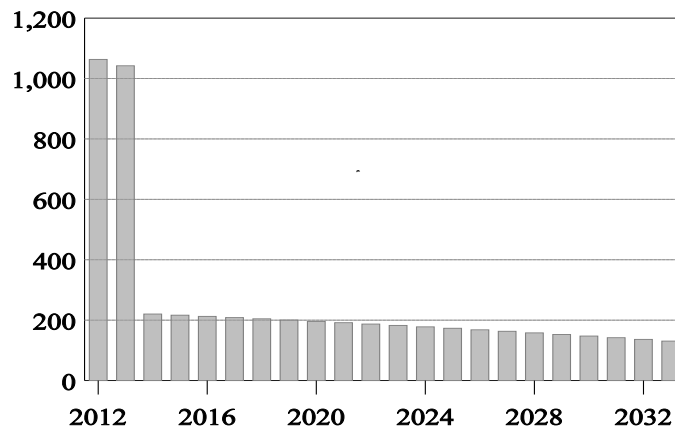
<sup>16</sup> "The Economic Impacts of Vermont Feed in Tariffs" by the Division of Energy Planning, Vermont Department of Public Service, December 2009 (available online).

job gains through the remaining life of the projects. On average over the entire period of the program, these new facilities lead to the average annual creation of 34 jobs

In comparison, we prepared an estimate of the economic impact of the Fair Haven Integrated Facility over time including the likely impacts from any higher electricity prices. (Please note that this has not been done before. All the previous analyses of power facilities reviewed early in this report ignored any price impact.)

In our report, we showed that the Fair Haven Integrated Facility resulted in the net creation of jobs during the entire period under analysis. During the construction year, more than 1,000 jobs are created. Then, with the operation of the Fair Haven Integrated Facility and the rise in electricity prices, the employment gain in Vermont will begin at 220 in 2014 and decrease slowly to 131 in 2033. At no time is there a negative net job (or any other economic impact) from the Fair Haven Integrated Facility as the DPS report found for the feed in tariff projects.

### Employment With Price Increase Fair Haven Integrated Facility



As the graph shows, even considering that electricity prices from the Fair Haven Integrated Facility will increase the average electricity rates in Vermont by a bit less than 1%, a significant positive employment impact remains extant during each of the first 20 years of operation of the Fair Haven Facility.