State of Vermont

The Economic Impacts of Vermont Feed in Tariffs

By

Division of Energy Planning

Vermont Department of Public Service
112 State Street, Drawer 20
Montpelier, VT 05620-2601
Phone: 802-828-2811

December 2009

Abstract

The Department of Public Service evaluated the economic consequences of The Vermont Energy Act of 2009 which established mandatory cost based prices for 50 MW of renewable energy technologies. These prices were generally higher, and in many cases significantly higher, than current estimates of prices for market based alternatives. Using a dynamic regional forecasting and policy model the DPS estimated the economic and employment impacts on Vermont households and businesses for the next 25 years.

The analysis found the Feed in Tariff program is expected to increase Vermont capital investment and create jobs during its 26 year life cycle. However, the net gain in employment was found to be far less than conventionally thought with long term winners and losers by sector. Following an initial increase in temporary construction-related jobs long term employment averaged 13 full time jobs per year. This total includes both direct and indirect employment in the energy sector as well as the job and income related effects of increased electricity costs.

This study estimated only the economic and employment impacts from the specific mix of renewable systems chosen to participate in the Feed in Tariff program and the impacts of the specific rates provided to these facilities. As a result, the conclusions of this study do not represent any general conclusions regarding the economic impacts of renewable energy in general, nor does it attempt to include any other benefits or costs that may result from implementation of these generation sources.

The Vermont Department of Public Service

The Department of Public Service is an agency within the executive branch of state government that serves all citizens of Vermont through public advocacy, planning, programs, and other actions that meet the public's need for least cost, environmentally sound, efficient, reliable, secure, sustainable, and safe energy, telecommunications, and regulated utility systems in the state for the short and long term. The Department carries out this charge by:

- Representing the public interest in utility cases before the Public Service Board, federal regulatory agencies, and state and federal courts.
- Providing long range planning for the state's energy and telecommunications needs.
- Promoting energy efficiency.
- Administering federal energy programs.
- Resolving utility customer complaints.
- Informing the public about utility-related matters.
- Making and administering contracts for the purchase of power on behalf of the state.

This Report was prepared by:

George R. Nagle and Dave Lamont, Director
Division of Energy Planning
Vermont Department of Public Service

The Economic Impacts of Vermont Feed in Tariffs

Momentum for renewable energy is being driven in part by policy-induced demand generated by Federal and state government programs. The Federal government has contributed to investments in clean energy with grants, loan guarantees, tax credits and other incentives. Currently 27 states now require renewable portfolio standards (RPS) and an additional five states (including Vermont) have enacted a voluntary renewable purchase programs.

Based on expectations for a cleaner environment and a healthier economy through new investment and job creation, it is not surprising states have offered tax breaks, job training and cash to try to capture new business investment and jobs from the renewable energy industry. What is surprising is the dearth of evidence to quantify and/or confirm the benefits claimed from these investments.

Act 45, a.k.a. the Vermont Energy Act of 2009, passed by the Vermont Legislature, established specific mandatory price setting requirements for 50 MW of renewable energy technologies. The Act further directs the Public Service Board (PSB) to revisit, review, and possibly re-set the mandatory price paid to a (renewable) plant owner by electric ratepayers based, among other factors, "on an economic analysis….". In our view an economic assessment of the forward expectations of the program was very important given that many of the proponents of Act 45 cited the transformative effect that this new "standard offer" program would have on Vermont's economy. Many envisioned an entirely new economic paradigm for the state based on so-called green jobs and new businesses focused in alternative energy.

The Department of Public Service (DPS) had expressed concerns about the standard offer

program citing the experience in Spain and other countries. The Spain experience has been widely reported where the cost of implementing the renewable energy program ultimately cost the economy thousands of jobs and more than $29 billion in fiscal impacts. Further, after an initial spike in employment, the high energy prices and economic losses led to a dramatic halt in the program which led to a crash in the industry, not just in Spain but throughout the global marketplace. While the program envisioned for Vermont was not as extreme as the Spanish program either in terms of rates paid to producers or relative size of the program, it shared some of the same characteristics of long term above market fixed price contracts.

Given the mandate of Act 45, The Department of Public Service had the opportunity to evaluate and weigh the merits of this new energy initiative. The intent of this investigation was to evaluate the economic consequences of both the investments in renewable technology and renewable price setting decisions (called Feed in Tariffs) that will impact Vermont ratepayers for the next 25 years

What we did – was to conduct an economic impact analysis which typically measures changes in local economic growth along with related changes in jobs and incomes that occur from a change in policy, program, or an event. To provide a clear picture of the policy's impact, the analysis starts with a baseline, business as usual forecast, then measures 'differences' in economic activity related to the effects of the new renewable energy program.

Economic impact analysis is relevant because it has the capability to capture changes in the Vermont economy over space and time. This dimension is important because Feed in Tariffs established in Act 45 will, to some extent, change the retail price of electricity, as well as its attributes, for households and businesses for up to 25 years.

How we did it – As with most analyses in energy and economics we relied on models and forecasts of trends in the economy. In this case the DPS used REMI[1], a model developed specifically for the purpose of dynamic regional forecasting and policy analysis. The Vermont REMI model includes 70 detailed inter-industry relationships and 79 consumer expenditure categories that interact and change on a year-by-year basis. This allows for firms and households to adjust their behavior in response to changing prices, production, imports, exports and other changes. REMI also captures economic changes among classes of ratepayers, among industries and sectors competing for electricity resources, and changes in the competitive environment between Vermont and other locations.

The Game Plan – was to separate the renewable energy Feed in Tariff program into three phases, each with its own metrics. First, was to estimate how much new capital investment would occur (this assumes the investments would not have occurred 'but-for' the Feed in Tariffs). We also expect the capital construction phase to be a short term impact ending when construction of all 50 MW of renewable energy facilities is completed. To improve accuracy, the cost of constructing and installing each renewable technology (biomass, hydro, wind, solar PV, landfill gas, and farm methane) was estimated separately.

Second, once these facilities are up and running they must be operated, repaired and maintained. These costs were entered in the model as benefits to the Vermont economy, continuing annually for the term of the Feed in Tariff. Again, these costs were individually weighted by their respective renewable technology.

[1] Regional Economic Models Inc. (REMI), Amherst, MA,. REMI was founded in 1980 for the purpose of developing regional forecasting and policy analysis models REMI is often used to analyze public policy decisions in economic development, the environment, energy, transportation, taxation, and others.

Lastly, we considered the impact that the Feed in Tariff rates, and the resulting changes in electricity costs, is expected to impose on Vermont ratepayers and the economy as a whole.

The renewable bids and capital construction – On October 19, 2009 the Public Service Board opened and received bids for 47.8 MW[2] of installed electrical generating capacity of various types of technology. The distribution of bids and total estimated capital costs by renewable technology appears below:

	MW		**Capital Cost**
Solar PV	14.3	$	65,854,950
Biomass/biogas	13.0	$	74,520,000
Wind	8.1	$	24,210,000
Hydro	7.8	$	32,340,750
Farm Methane	3.1	$	23,265,400
LFG	1.7	$	8,238,780
Total	47.8	$	228,429,880

Before these values were added to the model a few adjustments were needed because it is both unreasonable and illogical to assume the entire $228.4 million investment in power generating equipment originates and stays entirely within Vermont. While some portions of both the labor and materials of each renewable energy project will be supplied in Vermont, each renewable technology requires specialized inputs, machinery, equipment, and services that are unlikely to be locally sourced and must be imported.

Based on information from the NREL (National Renewable Energy Laboratory, US Dept. of Energy) and internal DPS discussions, capital costs for the six renewable technologies were allocated across five industry sectors (primary metals manufacturing, machinery

[2] Subsequent to this analysis additional Standard Offer Bids were received filling the entire 50 MW allotment as prescribed in statute

manufacturing, construction, utility, and finance). We then assumed Vermont would locally source 10% of the machinery, 10% of primary metals, 76% of construction activity, 100% of utility (interconnection), and 50% of financial activities. After weighting each industry component by its respective renewable technology Vermont was assumed to source a total of $75.4 million, or 33% of total installed capital costs.

	VT share	**Weighted Total**	**Or,**	**$ mill**	**Estimated VT Capital Construction**
Construction	76%			$ 51.1	
Hardware: Prim Metals	10%			$ 11.2	
Utility	100%	33%		$ 6.9	$75.4
Hardware: Mach Mfg	10%			$ 4.0	
Finance	50%			$ 2.3	

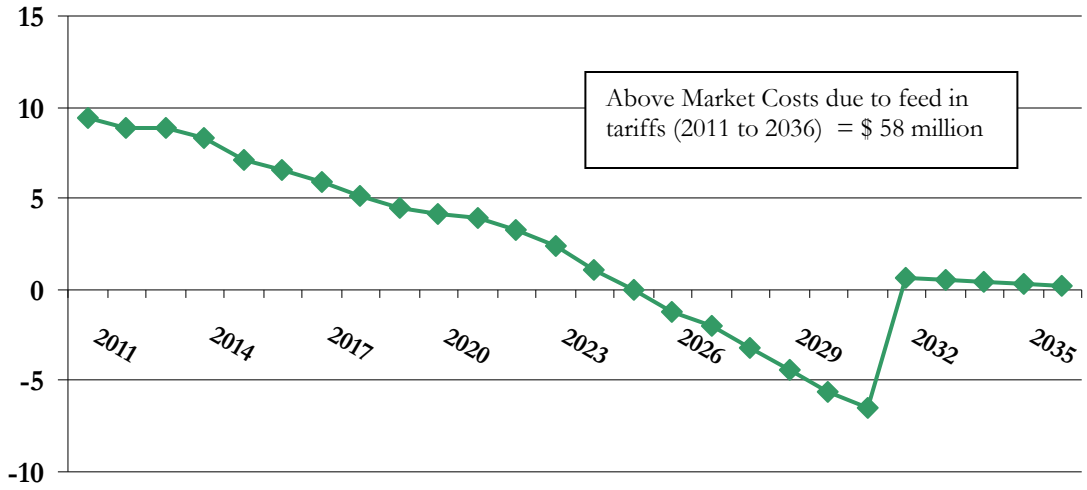
Lastly, for the sake of simplicity we assumed the entire capital investment would be installed in 2010 with generation starting in 2011 and continuing for the life of the Feed in Tariff. Although FIT is expected to promote $228.4 million in renewable capital spending which includes an estimated $75 million from within Vermont, this Report did not address the potential economic loss of diverting investment away from more productive sectors.

O & M – was a bit easier to predict. Annual estimates for operations, repair and maintenance for each of the six technologies were made and entered into the model beginning in 2011 and extending for the life of the power contract.

The Feed in Tariff & above market costs - Since our objective was to measure the differential impact of Feed in Tariffs from a baseline a few adjustments were needed. The renewable Feed in Tariffs ranged from $ 0.12 per KWh for land fill gas to $ 0.30 per KWh for

solar PV. We managed this by calculating a weighted average cost. However, these costs would displace expected 'market costs' of electricity. Using the latest (2009) avoided cost study (AESC) we calculated the difference between the higher Feed in Tariff costs for each year and expected 'avoided costs'. These above market costs are plotted below. Since market 'avoided costs' are expected to rise over time – at some point (after 2024) the fixed price Feed in Tariff actually falls below the market price forecast.

Difference: Above Market Costs (Feed in Tariffs) – Avoided (market) Costs (In millions current $)



Expected Outcomes – First, the impact of $75.4 million in capital investment is expected to provide a temporary boost to employment (especially construction and related trades) and personal incomes across Vermont. The impacts quickly diminish as projects are completed, although there are some minor positive job and income effects in following years from indirect spending resulting from higher incomes in sectors that service and support project build out.

Similarly, expenditures on O & M of approximately $10 million per year begin in 2011 and create additional jobs and incomes throughout the FIT contract period.

Lastly, is the economic impact of the Feed in Tariff which will differ by ratepayer class – residential, commercial and industrial customers. To the extent the FIT represents an 'above market cost'; the FIT will increase the cost of electricity to households and businesses. When the composite price falls below the forecasted market price, the cost of electricity to homes and businesses will decrease relative to what it would have been. It is important to note that the calculation of the above market costs imputes a sale of the renewable attributes of the power purchased under the FIT to load serving entities in other New England states that have Renewable Portfolio Standards[3]. As a result, those purchasing these attributes will be able to claim renewable power in their mix, while Vermont utilities will not[4].

For households, the economic impact is largely through an income effect whereby households reduce expenditures on 'all other' items to pay for a rising electric bill. In an extreme case increased energy bills can lead to a higher cost of living and out-migration of population.

---

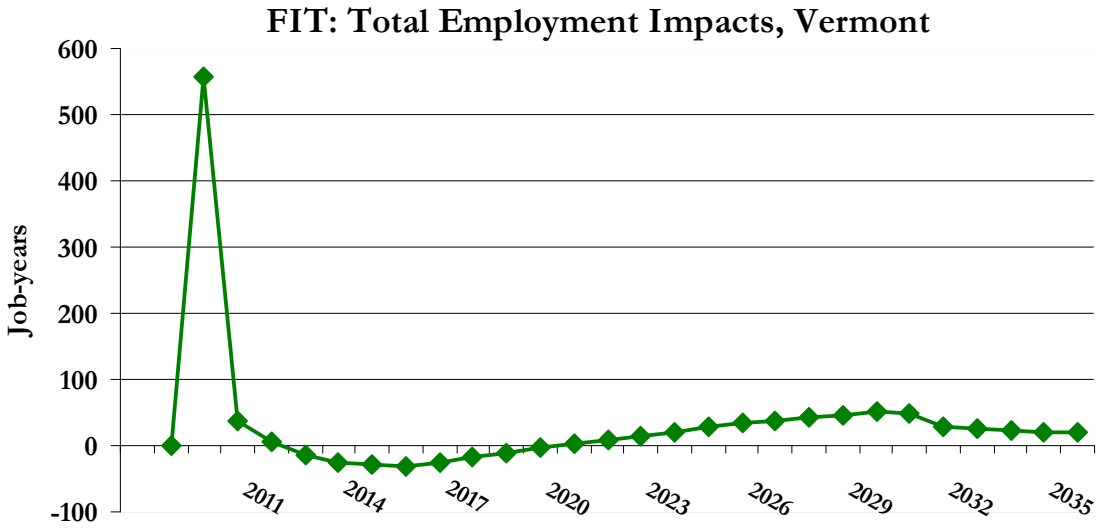
[3] Other New England states have a Renewable Portfolio Standard ("RPS") which imposes an obligation on Load Serving Entities in those states to meet a certain portion of their energy sales requirements with renewable energy. This obligation is satisfied through the purchase of Renewable Energy Certificates ("REC") from eligible renewable projects that produce them. A REC represents the renewable attributes of the power and is sold separately from the physical aspects of the power. The final owner of the REC is able to claim that renewable generation in their portfolio.

[4] The other New England states have their RPS requirements laid out in law. The amount of renewable power RECs they need to buy is thereby fixed into the future. To the extent that other states purchase RECs from Vermont projects to satisfy these requirements, they will not need to purchase RECs from some other project. The net result is that no additional renewable resources are constructed as a result of the Feed in Tariff beyond those already mandated in statute by other New England states.

Similarly, the productive sectors of the Vermont economy, industrial and commercial ratepayers are faced with limited options as well. They will pay higher electric bills which raise their cost of production and leaves them disadvantaged relative to out-of–state competition. Again, in the extreme case they may reduce in-state production and/or relocate to a lower cost location.

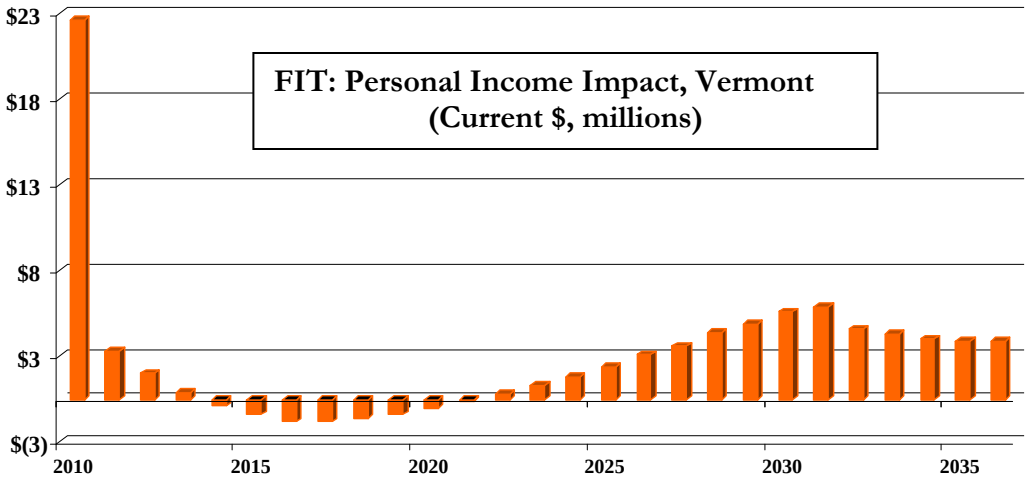
For those years where Feed in Tariffs fall below market costs the opposite effects would occur whereby households and businesses benefit from lower energy bills.

The Results – Although our three economic variables (construction, O & M, above market tariffs) were discussed individually they are interrelated over time and across classes of ratepayers and thus the results shown below reflect the overall economic impacts on the State of Vermont. Perhaps the results are best illustrated by the annual estimate of net job creation from the Feed in Tariff (below).



As expected the spike in employment occurs during construction in 2010 followed by job losses in following years as above market (FIT) costs diminish consumer spending and increase the cost of production. Sometime after 2024 Feed in Tariffs fall below market avoided electric costs which together with O & M spending, results in marginal employment gains.

In total the renewable policy generates 894 job-years of employment (over 26 years). This sounds like a successful economic development program until it's converted into an annual equivalent of 34 long term jobs (894/26 yrs = 34); about equal to the size of one average-sized Vermont manufacturer. The jobs pay wages and create spending which boosts Vermont personal income by about $55 million (net present value, 2010 $) over the 26 year period.



After the first year of construction (2010) the employment outlook changes. In the following years only a handful of repair and maintenance jobs remain along with a few indirect jobs. From 2011 through 2036 we estimate the long term creation of just 13 jobs above and beyond the baseline. The present value of personal income falls to $33.5 million.

	FIT With Construction 2010-36	FIT After Construction 2011-36
Total Employment (Job-yrs)	894	337
or, long term employment (no.)	34	13
Personal Income (2010 $mill) (Net Present Value @ 1.5%)	$54.8	$33.5

Winners & Losers – All Vermont sectors are not treated alike. There were long term differences among industry sectors (see table below – measured in man-years of employment). The overall positive employment gain was driven largely by the annual requirements for repair and maintenance (noted below as 'other services') and the temporary demand for construction workers. Utilities and manufacturing have small, but positive contributions to total Feed in Tariff - related employment.

Sectors with long term gains	Job-yrs	Sectors with long term losses	Job-yrs
Other Services (O+M)	557.3	Real Estate	-44.2
Construction	338.8	Educational Services	-12.5
Utilities	24.3	Prof & Tech Services	-10.3
Health Care	15.3	Finance and Insurance	-8.4
Manufacturing	14.0	Accommodation & Food Services	-6.1
Retail Trade	7.4	Admin & Waste Services	-4.2
Mining	3.6	Wholesale Trade	-2.8
Arts, Entertain & Recreation	2.9	Forestry, Fishing	-2.5
		Information	-1.3
		Management	-0.9
		Transp & Warehouse	-0.3

Other sectors, predominately service sectors suffer long term net job losses. This includes above average wage sectors, such as professional services, finance, and information technology. In essence jobs are created in one sector of the Vermont economy at the expense others.

Other Impacts – The model did not find any measureable long term impact on overall consumption, although there were changes in the composition of consumption – such as increased expenditures on electricity and lower expenditures on all other items.

Unemployment dropped, increased, and dropped again over time, with little long term change from the baseline.

A Personal Consumption Expenditure Price Index, a proxy in the model for the cost-of-living, was driven above the baseline making it somewhat more expensive to live in Vermont. Finally, there was a slight loss in population in the long run, likely caused by higher prices and cost of living.

The Bottom Line - The analysis measured marketplace responses to a policy-induced investment in 50 MW of renewable energy capital construction, spending on O+M, and differential Feed in Tariffs.

The Feed in Tariff program is expected to increase Vermont capital investment and create jobs during its 26 year life cycle. However, the net gain in employment was found to be far less than conventionally thought with long term winners and losers by economic sector. Moreover, the analysis did not consider the potentially detrimental impacts of diverting capital investment away from more productive opportunities.

Above-market energy costs had the deleterious effects of reshuffling consumer spending and increasing the cost of production for Vermont businesses. Increased costs for households and employers reduced the positive employment impacts of renewable energy capital

investment and the annual repair and maintenance activities.

Lessons Learned - Certainly the population most directly affected by the Standard Offer is utility ratepayers who will pay a significant premium for a portion of their electricity for up to 25 years. As a general principle the Department does not support having ratepayers subsidize economic policy in their rates because regulatory discipline dictates that the rates that consumers pay should go solely to what is necessary to source power that lights their homes and businesses. Further, the least cost principals embodied in statute and implemented by the DPS dictate that the power that is purchased on behalf of rate payers is sourced on a least-cost basis[5]. The architects of Act 45 specifically eliminated the least cost standard from the

---

[5] Since the early 1980s, state energy policy has been to procure supply and demand resources on a least cost basis. Least cost has been defined to include consideration of both energy and non-energy costs in evaluating resource choices. Under this evaluation scheme, emitting resources such as fossil fuel based energy sources, are assessed a penalty relative to non-emitting resources such as renewable sources. However, among categories of resources, utilities are under an obligation to procure the least cost mix of those resources to serve their needs. Generally speaking, renewable (and non-renewable) projects are more costly in smaller sizes. The Feed in Tariff, by both restricting entry to smaller size, more costly projects and by requiring purchase of this power by utilities – whether they need it or not – violates those principals. See **§ 202a. State energy policy –** It is the general policy of the state of Vermont:

(1) To assure, to the greatest extent practicable, that Vermont can meet its energy service needs in a manner that is adequate, reliable, secure and sustainable; that assures affordability and encourages the state's economic vitality, the efficient use of energy resources and cost effective demand side management; and that is environmentally sound.

(2) To identify and evaluate on an ongoing basis, resources that will meet Vermont's energy service needs in accordance with the principles of least cost integrated planning; including efficiency, conservation and load management alternatives, wise use of renewable resources and environmentally sound energy supply. (Added 1981, No. 236 (Adj. Sess.), § 4; amended 1983, No. 170 (Adj. Sess.), § 13, eff. April 19, 1984; 1991, No. 259 (Adj. Sess.), § 1.)

standard offer program which opened the door to paying premium rates to higher cost energy providers.

Consumers may benefit and desire that their energy come from renewable power sources, but in the standard offer program the rate structure requires the payment of a price sufficient to support less competitive renewable sources. Wind, biomass, solar and farm methane are all renewable sources of electricity, but they do not all cost the same to produce per kwhr of electricity. Further, the smaller sized resources supported under this program suffer from diseconomies of scale within each renewable type. 50 MW of renewable electricity can be procured for Vermont ratepayers on a long-term basis at a much lower cost if the program dictated that the least cost renewable should be chosen. Put another way Vermont consumers are paying a higher price for a portion of their renewable energy with no discernable benefit.

Unintended Consequences - Finally, the fact that the renewable attributes (RECs) are sold to support mandates for service providers in other states means that they will not have to build similar renewable facilities to support those mandates. One should question whether this program actually increases the penetration of renewables in the New England marketplace.