VERMONT SMALL SCALE RENEWABLE ENERGY INCENTIVE PROGRAM; REVIEW AND COMMENTS by Willem Post; dated 6 July, 2010
http://www.coalitionforenergysolutions.org/

INTRODUCTION

The Vermont Department of Public Service issues periodic progress reports regarding the subject program. The latest report summarizes the results for the 6.5-year period of October 2003 (start of) to March 2010.
http://www.rerc-vt.org/incentives/reports.htm

The purpose of this review is to determine:
- the simple paybacks and CO2 abatement of the small scale renewables and compare them to installed small PV solar and small wind systems and to energy efficiency measures.
- the household participation rates.
- the capital requirements to achieve 10% of Vermont's electricity from small scale renewables by 2030.

METHOD OF ANALYSIS

Simple paybacks are used as a quick, first-cut to rank returns on investments for various projects. Operating and maintenance costs, financial and tax aspects, such as government incentives, the cost of capital, tax rates, etc., are ignored. More advanced analyses, such as a multiyear cashflow and internal rate of return analysis on a spreadsheet, would take them into account. Because resources are limited, private companies that require a defined minimum return on various classes of investments usually fund the highest ranked projects first to maximize income.

During the past decades, traditional power sources (coal, oil, gas, nuclear, hydro, etc.) have received various subsidies which have the net effect of reducing the cost of utility power to consumers. Proponents of renewables claim the cost of utility power would likely be 20% to 30% higher without these subsidies and that renewables should be evaluated against a higher rate.

Calculating the higher rate: The US consumes about 4,000,000 GWh/yr (for comparison, ISO-NE about 130,000 GWh/yr, Vermont about 6,000 GWh/yr). If the net effect of the various subsidies to traditional power sources reduces consumer power costs by $120 billion/yr (for comparison, US GDP = $14,500 billion/yr), it would reduce power costs by ($120 billion/yr)/(4,000,000 GWh/yr) = $0.03/kWh. Thus, power that sells at $0.12/kWh with subsidies, for a total consumer electric cost of about $480 billion/yr, would sell at $0.15/kWh without subsidies, for a total consumer electric cost about $600 billion. Therefore, for purposes of this review, the utility power rate and fuel costs has been increased by ($0.15/kWh)/($0.12/kWh) x 100% = 25%, the adjustment factor.
Some proponents of renewables argue for adjustment factors as high as 50%, but, in my opinion, such high factors are not supportable by factual analysis.

Simple payback, for purposes of this analysis = (the dollar value of the annual electricity production by the project/the capital costs) x 100%.
CO2 abatement, for purposes of this analysis = the capital costs/annual CO2 reduction.
Adjusted utility power rate, for purposes of this analysis = $0.12/kWh x 1.25 = $0.15/kWh.

The adjusted utility power rate enables all alternatives to be evaluated on the same bases, i.e., without any subsidies, and ranked based on their adjusted simple paybacks.
The adjusted utility power rate increases the simple paybacks by a little, which does not alter the ranking of renewables and the conclusions of this review.

SUMMARY

Power Source	Installations	Capacity	Capacity Factor	Cost	Adjusted Simple Payback
Small Wind	100	376 kW	0.10	$3,101,785	1.59% per year
Small PV Solar	552	1,876 kW	0.143	$15,349,740	2.26% per year
Small Solar Hot Water	648	60.351 million BTU/day		$7,224,858	13.40% per year - replacing electric 10.48% per year - replacing No. 2 fuel oil 12.81% per year - replacing propane

Note: Examples of an recently installed small wind system and small PV solar system, described below, have similar simple paybacks which were calculated from actual operating data from the system owners.

The small scale installations cost $25,676,383 (excludes subsidies) and are capable of producing 9,099,600 kWh/yr.
If ratepayers had bought this power from the utility, it would have cost about 9,099,600 kWh/yr x $0.12/kWh = $1,091,952/yr.

The table shows the adjusted simple paybacks of the small scale renewables program after 6.5 years of subsidies are dismal. This program diverts increasingly scarce resources from more effective energy efficiency measures and other societal needs. This wasteful, ineffective program should be ended.

If the goal were a modest 10% of power consumption from small scale renewables by 2030, then 10%/0.15% = 67 times the current number of small scale installations and about $1.71 billion (2010$), or an average of $85.5 million/yr would be required for the next 20 years; a significant percentage of that, very likely much more than 50%, would need to be government subsidies to significantly raise household participation rates. Where would Vermont get such funds? Increase taxes? Increase ratepayer charges on their electric bills again, as already happened to subsidize the 50 MW of feed-in-tariff projects many of which owned by lottery-winning millionaires?

The conclusions of the review are:
- most energy efficiency measures have about 5 times the simple payback and 3 times the CO2 abatement of small scale renewables.
- increasingly scarce resources should be spent on energy efficiency before spending it on small scale renewables; there are no resources to do both at the same time.
- the current program be ended and the funds shifted to energy efficiency measures with simple paybacks of 20 to 100 percent per year.

Energy efficiency measures:
- should be done before renewables, because most have simple paybacks of 20 to100 % per year, or 1 to 5 year payback periods, far greater than renewables.
- should be done before renewables because the capacities and capital costs, etc., would need to be much less as a result of the increased energy efficiency.
- would quickly reduce CO2 AND make Vermont more efficient in many areas which will raise living standards, or prevent them from falling further.
- would reduce energy use and CO2 emissions much quicker than renewables. Significant reductions of CO2 emissions from renewables will be years or even decades away.
- would create many more jobs than renewables, especially for the building and automotive sectors. No studies, research, demonstration and pilot plants will be required.
- are NON-POLLUTING AND INVISIBLE; no wind turbines on ridge lines, no solar panels in meadows and on rooftops, no additional transmission systems.
- are by far the cleanest energy activity anyone can engage in; they are quick, cheap and easy, reduce CO2 at the LOWEST cost.
- would quickly put money in people's pockets, which quickly they would spend, which quickly would raise taxes, which quickly would balance budgets.

SMALL WIND

Installations built 100, rated capacity 376 kW, average capacity 3.76 kW, installed cost $3,101,785, average cost $8,249/kW, production 376 kW x 8,760 hrs/yr x Capacity Factor 0.10 = 329,376 kWh/yr, adjusted simple payback = {(329,376 kWh/yr x $0.12/kWh x 1.25)/$3,101,785 } x 100% = 1.59%/yr.
Note: the capacity factor, CF, may be even less than 0.10. See example below.

The report shows the cost of small wind systems was about $8,000/kW in January 2007 and about the same in March 2010.

The costs of small wind systems did NOT decline, as some proponents of small wind systems had been predicting. I am somewhat surprised by the $8,000/kW; it appears too high when compared to a recent wind turbine installation.

Example of a recently installed small residential wind turbine system:
A 10 kW wind turbine, net-metered, all-in owner cost $40,500, or $4,050/kW, for an architect-designed $550,000 LEED Platinum house, Charlotte, VT. Homeowner records show it produced 10 kW x 8,760 x CF 0.0712 = 6,286 kWh during a 12-month period, of which 192 kWh were sold to the utility; note the low CF. The owner could have purchased the 6,286 kWh for about $754, adjusted simple payback = {(6,286 kWh/yr x $0.12/kWh x 1.25)/$40,500} x 100% = 2.33%/yr. See above table.

Efficiency Vermont, a quasi-state entity, financed at $30,000,000/yr by ratepayers, provided a $12,500 grant to help these "poor" people make expensive wind power.
http://www.greenbuildingadvisor.com/homes/energy-comes-sun-wind-and-earth-vermont-leed-platinum-home

SMALL PV SOLAR

Installations built 552, rated capacity 1,847 kW, installed cost $15,349,740, average cost $8,310/kW, production 1,847 kW x 8,760 hrs/yr x CF 0.143 = 2,313,700 kWh/yr, adjusted simple payback = {(2,313,700 kWh/yr x 0.12/kWh x 1.25)/$15,349,740} x 100% = 2.26%/yr. The CF 0.143 is for new panels; output deteriorates about 0.2% per year.
The report shows the cost of small PV solar systems was about $9,000/kW in January 2007 and about $6,000/kW in March 2010.

The cost of PV solar systems declined because:
- of increased mass production in new factories, especially in China.
- Germany, after an investment of about 35 billion Euros from 2000 to 2008 and another 18 billion Euros for 2009 and 2010, a total of 53 billion Euros from 2000 to 2010, decided to significantly reduce its PV solar investments and to accelerate reducing its PV solar FITs; only 1.1% of its power was from PV solar in 2009.

- Spain, much more favorable for solar power than Germany, followed Germany's lead; only 2.8% of its power was from Concentrated solar and PV solar in 2009.
- the Great Recession.

Example of a recently installed small PV solar system:
A 58 kW DC, fixed-tilt, PV solar system located in a meadow, all-in owner cost $450,000, or $7,759/kW, for Farmway, Bradford, VT, supplied by groSolar, White River Junction, VT. Farmway records show it produced 72,050 kWh during the 12 month period March 2009-February 2010.
CF = 72,050 kWh/yr/(58 kW DC x 8,760 hr/yr) = 0.1418; the lower CF may be due to the panels having some dust on them.
Efficiency = 72,050 kWh/yr/(58 kW DC x 4.3 avg peak sun hrs/d x 365 d/yr) = 0.79
Farmway could have purchased the 72,050 kWh for about $8,646, adjusted simple payback = {(72,050 kWh/yr x $0.12/kWh x 1.25)/$450,000} x 100% = 2.40%/yr. See above table.

The Clean Energy Development Fund, CEDF, provided a $226,000 taxpayer/ratepayer funded grant to help this "poor" business owner make expensive power.
http://view2.fatspaniel.net/PV2Web/merge?&view=PV/standard/Simple&eid=222370

Some Remarks about PV Solar in Germany and Spain:

Germany's 10-year experience with renewable energy promotion is often cited as a model to be replicated elsewhere, being based on a combination of far-reaching energy and environmental laws that stretch back nearly two decades. By the end of 2008 this had led to Germany having the second-largest installed wind capacity in the world, behind the United States, and largest installed PV solar capacity in the world, ahead of Spain. Renewables proponents claim Germany's wind and PV solar programs are a success.

However, installed capacity is not the same as production. By the end of 2008 the estimated share of wind power in Germany's electricity production was 6.3%, followed by biomass-based power 3.6% and hydro power 3.1%. By the end of 2009 the share of PV solar was a negligible 1.1%, despite being the most subsidized renewable energy.

Over the 10-year FIT period, the PV solar power subsidies may total 53 billion Euros ($73.2 billion) for systems installed between 2000 and 2010.
Over the 10-year FIT period, the wind power subsidies may total 20.3 billion Euros ($28.1 billion) for wind turbines installed between 2000 and 2010.
Conclusion: Utility size wind provided about 6 times the power of PV solar for less than one third the money spent on PV solar! Go Solar?

Germany, realizing the huge investment in PV solar and the small quantity of expensive, variable, intermittent power from it, decided to significantly reduce its PV solar FITs. Spain, much more favorable for Concentrated and PV solar, production was 2.8% from solar in 2009, nevertheless followed Germany's lead of reducing its FITs.

Germany's wind and PV solar programs are a success for vendors, developers, etc., but from a power production viewpoint, the production results are dismal.
German renewable energy policy, and in particular the FIT scheme, have failed to ensure a viable and cost-effective introduction of renewable energies into the the German energy portfolio.

It appears following the lead of Germany, while good for vendors and developers, may NOT be the renewable energy and jobs creation panacea hoped for. Vermont, a poor state struggling with multi-year projected budget deficits, would be wise not to emulate Germany.

http://www.dw-world.de/dw/article/0,,4110890,00.html
http://www.spiegel.de/international/world/0,1518,605957,00.html
http://www.guardian.co.uk/environment/georgemonbiot/2010/mar/11/solar-power-germany-feed-in-tariff
http://www.rwi-essen.de/pls/portal30/docs/FOLDER/PUBLIKATIONEN/GUTACHTEN/P_RENEWABLE+ENERGY+REPORT+RWI+FORMAT.PDF
http://online.wsj.com/article/SB125193815050081615.html
http://en.wikipedia.org/wiki/Solar_power_in_Germany
http://www.aeeolica.es/userfiles/file/notas-de-prensa/100105-NP-Wind-Energy-has-consolidated-as-the-third-technology-of-the-power-system.pdf

SMALL SOLAR HOT WATER

Installations built 648, rated capacity 60,351,800 Btu/day, installed cost $7,224,858, average cost about $9,000/kW, production 60,351,800 BTU/day x 1d/24 hrs x 0.2931 Watts/(Btu/hr) x 1 kW/1,000 W x 8,760 hrs/yr = 6,456,524 kWh/yr, adjusted simple payback = {(6,456,524 kWh/yr x $0.12/kWh x 1.25)/$7,224,858} x 100% = 13.40%/yr, if replacing an electric water heater.
If replacing No. 2 fuel oil, the adjusted simple payback = {[6,456,524 kWh/yr/(140,000 Btu/gal x eff 0.65 x 1 kWh/3,413 Btu x 1 gal/$2.50)]/$7,224,858} x 100% x 1.25 = 10.48 %/yr.
If replacing propane, the adjusted simple payback = {[6,456,524 kWh/yr/(91,600 Btu/gal x eff 0.65 x 1 kWh/3,413 Btu x 1 gal/$2.00)]/$7,224,858} x 100% x 1.25 = 12.81 %/yr
http://www.human.cornell.edu/che/DEA/outreach/upload/CompareHeatFuels.pdf

The report shows the cost of Solar Hot Water systems was about $12/{100 Btu/day x 1d/24 hrs x 0.2931 Watts/(Btu/hr)} = $12/1.22 W = $9,826/kW in January 2007 and about $8,188/kW in March 2010.

It appears solar hot water heaters have merit and should be more actively promoted AFTER other energy efficiency measures with much higher simple paybacks have been implemented.

Whereas small wind and small PV solar can be net-metered to improve the economics, this is not so with solar hot water systems which may be producing hot water when it is not needed, such as during the middle of the day when children are at school and parents are at work. A separate HW storage tank of sufficient capacity will be required.

HOUSEHOLD PARTICIPATION RATES

There are about 240,000 households in Vermont and about 1,300 small scale renewables installations, for a household participation rate of 0.54%; a dismal result after 6.5 years of subsidies. This was a predictable result given the miniscule simple paybacks WITHOUT subsidies. Because these paybacks are still insufficient WITH subsidies, there has been no mass movement towards small wind, small PV solar systems and small solar hot water systems.

SIMPLE PAYBACK AND CO2 ABATEMENT COSTS

Vermont consumes about 6,000,000,000 kWh/yr and the small scale renewables required a capital cost of $25,676,383 over 6.5 years, or an average of $3.95 million/yr, to produce about 9,099,600 kWh/yr, or 0.15% of Vermont's annual power consumption. If ratepayers had bought this power from the utility, it would have cost 9,099,600 kWh/yr x $0.12/kWh = $1,091,952/yr. Average adjusted simple payback of small scale renewables = {($1,091,952/yr)/$25,676,383} x 100% x 1.25 = 5.3%/yr

The average greenhouse gas emission of all power sources of the ISO-NE grid is about 1.5 lb CO2/kWh.
The CO2 reduction by the small scale installations = 9,099,600 kWh/yr x 1.5 lb CO2/kWh = 13,649,400 lb CO2/yr. The CO2 abatement cost = $25,676,383/(13,649,400 CO2/yr x 1 lb/2,000 lb) = $3,762/ton of CO2/yr.

If the goal were a modest 10% of power consumption from small scale renewables by 2030, then 10%/0.15% = 67 times the current number of small scale installations and about $1.71 billion (2010$), or an average of $85. 5 million/yr would be required for each of the next 20 years; a significant percentage of that, very likely much more than 50%, would need to be government subsidies to significantly raise household participation rates. Where would Vermont get such funds? Increase taxes? Increase ratepayer charges on their electric bills again, as already happened to subsidize the 50 MW of feed-in-tariff projects many of which owned by lottery-winning millionaires?

Example of residential energy efficiency:
Gaye Symington, who owns a 120-yr old poorly-insulated, drafty house in Vermont, spent $12,000 to have a contractor insulate and caulk her house. She reduced her No. 2 fuel consumption from 1,800 gal/yr to 900 gal/yr, for a saving of $2,700/yr, at $3/gal. She wrote about her project in the Valley News. Adjusted simple payback = {($2,700/yr)/$12,000} x 100% x 1.25 = 28.1%/yr. The CO2 abatement cost per ton is $12,000/(900 gal/yr x 22.4 lb CO2/gal x 1 lb/2,000 lb) = $1,190/ton of CO2/yr.

	Adjusted Simple Payback	CO2 Abatement Cost
Vermont Small Scale Renewables Program	5.3% per year	$3,762/ton of CO2 per year
Energy efficiency: Insulate 120-yr old house	28.1% per year	$1,190/ton of CO2 per year

RENEWABLES JOB CREATION

According to VT-DPS reports, about 35% of the capital cost of renewables projects is supplied by Vermont sources, the rest, mostly equipment, is by non-Vermont sources. For example: PV panels from China and inverters from Germany are about 70% of a PV system's materials cost.

According to VT-DPS reports, there is a spike in short-term jobs during the renewables construction stage which flattens to a permanent net gain of only a few long-term full-time jobs during the operation and maintenance stage. In essence jobs are created in one sector (renewables) of the Vermont economy at the expense other sectors.

It appears using scarce ratepayer/taxpayer funds for renewables that are expensive and produce just a little, but expensive power is NOT the jobs creation panacea so much talked about by proponents of renewables.
http://publicservice.vermont.gov/planning/DPS%20White%20Paper%20Feed%20in%20Tariff.pdf

STATE ADMINISTRATION COSTS Of ENERGY PROGRAMS

Not stated in the VT-DPS report are the costs of the state employees and state facilities used to administer the program, and the costs for travel, meetings, office expenses, producing reports, etc.; it could about \$0.5-\$1.0 million/yr, which would wipe out most of the program savings and significantly reduce adjusted simple paybacks.

The CEDF, another energy program, much larger than the small scale renewables program and may require \$1 million/yr or more to administer, received during past years most of its funds from Entergy as part of an agreement and used them as subsidies for renewables projects. Recently, the leadership of the legislature allocated \$21+ plus million of federal stimulus money to the CEDF to ensure money is available as subsidies for the newly enacted 50 MW of feed-in-tariff renewables projects, which also have miniscule simple paybacks and which are mostly owned by lottery-winning millionaires.

Such state-subsidized, economic decision making in favor of expensive renewables that produce just a little, but expensive power and have miniscule simple paybacks are part of a set of bad habits that will lead to lower living standards for all Vermonters, including state workers.

How are we ever going to downsize state government, if proponents of renewables keep thinking up all these programs many of which have similar miniscule simple paybacks? Does anyone do a cost/benefit analysis? It seems program creation has a life of its own regardless of benefits, feeds on itself using ratepayer/taxpayer money. A conundrum
that hopefuly will be dealt with by the voters in the near future.

EXAMPLE OF RENEWABLES IMPACT ON OTHER SOCIETAL NEEDS
Because the \$21-plus million was quickly and quietly hijacked by the leadership of the legislature into the CEDF for subsidizing expensive renewables, scores of organizations all over the state, such as the Thompson Senior Center in Woodstock, which were promised funds for renovations, etc., that would quickly create local jobs, are STILL waiting for those funds. Legislators are aware of this, but called it a tough session and went home to talk with voters, avoid touchy issues and hopefully get reelected.

ENDING THE SMALL SCALE RENEWABLES PROGRAM
About 75% of Vermont's power is from Vermont Yankee, Hydro-Quebec and In-state hydro. It is already CO2-free.
Regarding CO2 abatement, the small scale installations (and large scale as well) are of little benefit to Vermont's CO2 profile. Of much greater benefit to Vermont's CO2 profile would be subsidies for more efficient buildings and vehicles which produce 71% of Vermont's CO2 emissions. See below.

The existance of this program cannot be justified because, after 6.5 years its
- household participation rate is a tiny 0.54%.
- power production is a tiny 0.15% of Vermont's needs.
- CO2 abatement per dollar invested is about 1/3 that of energy efficiency projects.
- adjusted simple payback is about 1/5 that of energy efficiency projects.
- job creation is nearly non-existent or a wash (more jobs for renewables vendors, mostly less jobs for other economic sectors).
- diversion of resouces from other societal needs.

Because of Vermont's budget constrains, further increasing subsidies to achieve a huge increase in small scale installations is fortunately unlikely; wasting \$1.71 billion on expensive small scale renewables that produce just a little, but expensive power and have miniscule simple paybacks is irrational. It would be wiser policy to admit error and quickly end this ineffective program to help balance the budget and fund other societal needs.

ENERGY EFFICIENCY FIRST, THEN RENEWABLES
It is far less costly to use subsidies to increase energy efficiency and abate CO2 than using the same money for expensive renewables that produce just a little, but expensive power. In case of solar and wind that power is intermittent, variable, seasonal. Because insufficient storage capacity exists on the grid and because efficient storage still needs to be developed PV solar and wind power cannot be stored and is not a reliable, dispatchable power source most of the time. Therefore, steady, 24/7/365 power sources are needed to provide power when PV solar and wind power is absent (no wind, too much wind, at night, etc.) or insufficient (cloudy days, too little wind, etc.)

Many of the industrially advanced nations, our competitors, use much less energy per dollar of GDP, more than 50% less in case of Japan, an industrial powerhouse, and Denmark. When energy prices were low that difference did not matter. With rising energy prices, that difference does matter. Currently, it is about \$250 billion/yr in extra energy cost which makes products and services more expensive and the US less competitive. These nations performed much greater energy efficiency efforts after the oil price shock of 1973 than the US. For the US to become more competitive, reduce its trade and budget deficits and borrow less from foreigners (Greenspan: "We are in danger of becoming the next Greece"), it needs to use its SCARCE resources to quickly catch up and lower its energy use at least 30% per dollar of GDP BEFORE going into expensive renewables.

This will have all sorts of benefits: less need for exploration, production, distribution and use of fuels, less pollution, better health, more output from healthier workers, less need for existing dirty power plants, less need for new power plants, less need for unsightly transmission systems, unsightly wind farms, unsightly PV solar panels in meadows and on roof tops, etc., AND the future capacities of any renewables systems and their capital costs would need to be much less. Becoming more energy efficient has a major impact AND it is less costly. Doing energy efficiency before renewables is a no-brainer.
http://green.blogs.nytimes.com/2010/07/06/for-a-premier-lab-a-zero-energy-showcase/?ref=business
http://www.treehugger.com/files/2010/07/energy-efficiency-twice-the-impact-of-renewables-nuclear-clean-coal-combined.php?campaign=th_

Proponents of renewables, afraid politicians might shift their subsidies to energy efficiency, often claim the US should do both at the same time. However, there is no money to do both at the same time. It is best to spend scarce money on energy efficiency where it gets the biggest bang for the buck.

Vermont's CO2 emissions are 71% from buildings and transportation. It is Vermont's buildings and transportation that should become more energy efficient and emit less CO2. Vermont needs "Cash for Caulkers and Insulators" and "Cash for Clunkers". For example: to get a subsidy one must scrap any car that gets less than 20 mpg and replace it with a new one that gets 33 mpg or more; the latter mpg rising as higher mileage cars become available.

Example of energy efficiency:
Recently, I built an R-40 addition to my house. The southwest-facing room has a 6'w x 6'-10"h slider, a 7'w x 5'h bay window and (2) 3'w x 3'-6"h windows.
While the outside temperature rises from 50F (early morning) to 85F (in the afternoon), the inside temperature rises from 67F to 73F and, by opening some windows, it decreases from 73F to 67F, or lower, during the night; its like having built-in air conditioning for free.

The room is so well sealed and insulated (6 inches foam under the 10,000 lb concrete slab R-30, 8 inches in the walls R-40, and 10 inches in the ceiling R-50) that the warm air cannot infiltrate into the walls to warm them up, as happens in almost all houses, AND the heat cannot get through the insulation. During summer days any heat gain by the room is so small that the concrete slab easily absorbs it by warming up a few degrees. During winter days any heat loss will be so small that the concrete slab easily provides it by cooling down a few degrees. During a prolonged cold spell and no sun, a 0.5 kW electric heater will be sufficient to keep the room at 65F when the outside temperature is 0F.

All Vermonters should have such energy efficient housing. It can be done with proper subsidies. It would create jobs, reduce energy use and CO2 emissions far more than installing renewables systems all over the state. It would be NON-POLLUTING and INVISIBLE; no unsightly wind turbines on ridge lines, no unsightly solar panels in meadows and on roof tops and no unsightly additional transmission systems. It would greatly improve Vermont's CO2 profile at a much lower cost than installing renewables.
http://en.wikipedia.org/wiki/File:SolarPowerPlantSerpa.jpg

Energy efficiency measures
- should be done before renewables, because most have simple paybacks of 20 to 100 % per year, or 1 to 5 year payback periods, far greater than renewables.
- should be done before renewables because the capacities and capital costs, etc., would need to be much less as a result of the increased energy efficiency.
- would quickly reduce CO2 AND make Vermont more efficient in many areas which will raise living standards, or prevent them from falling further.
- would reduce energy use and CO2 emissions much quicker than renewables. Significant reductions of CO2 emissions from renewables will be years or even decades away.
- would create 2 to 3 times more jobs than renewables, especially for the building and automotive sectors. No studies, research, demonstration and pilot plants will be required.
- are NON-POLLUTING AND INVISIBLE; no wind turbines on ridge lines, no solar panels in meadows and on rooftops, no additional transmission systems.
- are by far the cleanest energy activity anyone can engage in; they are quick, cheap and easy, reduce CO2 at the LOWEST cost.
- would quickly put money in people's pockets, which quickly they would spend, which quickly would raise taxes, which quickly would balance budgets.

Energy efficiency materials, such as for taping, sealing, caulking, insulation, windows, doors, refrigerators, water heaters, furnaces, fans, air conditioners, etc., used to retrofit buildings and building systems are almost entirely made in the US. They represent about 30% of the cost of an energy efficiency project, the rest is mostly labor. If politicians really want to help create jobs, energy efficiency is a less costly, more effective way forward than expensive renewables that produce just a little, but expensive power.

Most Vermonters are smart and frugal. They prefer to maintain or improve their standard of living by investing in systems that involve little paperwork and have HIGH simple paybacks, such as energy efficiency measures.

CEDF should spend its trove on energy efficiency measures with the HIGHEST simple paybacks to get a REAL bang for the people's bucks. CEDF is well within its charter to promote energy efficiency, instead of promoting ineffective renewables programs with miniscule simple paybacks. Why not hold a competition where people propose their HIGHEST simple payback projects and use the CEDF to quickly implement those projects?