RENEWABLES ARE *EXPENSIVE* AND PRODUCE LITTLE, BUT *EXPENSIVE* POWER

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http://www.coalitionforenergysolutions.org/

INTRODUCTION

Proponents of renewables often use the following talking points regarding renewables in Vermont:

- Vermont is following the lead of some European nations that successfully jump-stared renewables by paying them stable, long-term feed-in tariffs (FITs) according to their true cost of deployment.

- the 50 MW renewables cap is there to reduce the impact on ratepayers.

- the 50 MW of renewables will add just 0.5%-1.5% to a ratepayer's electric bill.

- the 50 MW cap may be lifted as the capital costs and power production costs of renewables decline so that the stable, long-term FITs will make the finances work for more renewable energy developers.

- the renewables projects will create good, clean jobs and provide energy independence.

- a statewide poll shows Vermonters want more in-state renewable energy and are willing to pay a little more for it.

It is useful to look at some numbers and then make some comments.

RENEWABLES CAPACITIES AND CAPITAL COSTS

The data below are mainly from the Vermont Department of Public Service, VT-DPS, report "The Economic Impacts of Vermont Feed in Tariffs"
http://publicservice.vermont.gov/planning/DPS%20White%20Paper%20F

eed%20in%20Tariff.pdf and from a Vermont feed-in tariff study by David G. Hill, Ph.D., Vermont Energy Investment Corporation which owns Efficiency Vermont. http://www.ases.org/papers/194.pdf

The VT-DPS received 238 applications for a total of 208 MW of renewables on October 2009. VT-DPS held a lottery and reviewed the winning bids. The total qualified bids for all renewables became 47.8 MW, a little below the above 50 MW cap. The total capital cost was estimated at $228.5 million. The breakdown by renewable is as follows:

> Solar; qualified bids 14.3 MW, cost $65.9 million PV Solar, fixed-tilt, FIT = $0.30/kWh (reduced to $0.24/kWh on January 15, 2010) for 25 years, capacity factor, CF, about 0.143. With super-efficient, expensive inverter AND varying the tilt 2x/yr, the CF becomes 0.155; Source VT-DPS.
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> Biomass (mainly wood) and Biogas (from corn? grass?) for 20 years; qualified bids 13 MW, cost $74.5 million Wood plants, FIT = $0.125/kWh, average CF about 0.65
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> Wind; qualified bids 8.1 MW, cost $24.2 million Wind, 15 kW or greater, FIT = $0.125/kWh for 20 years, average CF about 0.20 for a 100 kW wind turbine, lesser CFs for smaller wind turbines; Source VT-DPS Wind, 15 kW or less, FIT = $0.20/kWh for 20 years, average CF about 0.10
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> Hydro; qualified bids 7.8 MW, cost $32.3 million Hydro plants, FIT = $0.125/kWh for 20 years, average CF about 0.50
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> Farm Methane; qualified bids 3.1 MW, cost $23.3 million and Landfill Methane; qualified bids 1.7 MW, cost $8.3 million Farm Methane, FIT = $0.16/kWh for 20 years, average CF about 0.50 and Landfill Methane, FIT = $0.12/kWh for 15 years, average CF about 0.50

RENEWABLES POWER PRODUCTION

> PV Solar: 14.3 MW x 8,760 hrs/yr x CF 0.143 = 17,913,324 kWh/yr; daily variable, intermittent; seasonally variable, intermittent

Biomass/Biogas: 13 MW x 8,760 x CF 0.65 = 74,022,000 kWh/yr; mostly steady, if operated 24/7

Wind: 8.1 MW x 8,760 hrs/yr x CF 0.15 = 10,643,400 kWh/yr; daily variable, intermittent; seasonally variable, intermittent

Hydro: 7.8 MW x 8,760 hrs/yr x CF 0.50 = 34,164,000 kWh/yr; seasonally variable

Methane: 4.8 MW x 8,760 hrs/yr x CF 0.50 = 21,024,000 kWh/yr; mostly steady, if operated 24/7

Total power produced: 157,766,724 kWh/yr, say 158 million kWh/yr of which at least 28.5 million kWh/yr of PV solar and wind is variable, intermittent. Vermont consumes about 6,000 million kWh/yr. Vermont is "investing" $228.5 million to produce 2.6% of its power by renewables.

If 2.6% renewables adds about 1% to ratepayers' bills, then 25% renewables will add about 9.5% If the goal is 25% of renewables by 2030, then about $2.2 billion (2010$) will be required. Note: Efficiency Vermont, a quasi-state entity, 2010 budget about $30 million, staff about 175, already adds about 2%-3% to ratepayers' bills.

The above renewables use mostly mature technologies and future efficiency increases will likely be small. It appears capital cost and power production costs of renewables may NOT decline as much as hoped for.

RENEWABLES JOB CREATION

According to above VT-DPS report, about 35% of the $228.5 million would be supplied by Vermont sources, the rest, mostly equipment by non-Vermont sources. For example: PV panels from China and inverters from Germany are about 70% of a PV system's materials cost. VT-DPS states: "There would be spike of about 550 short-term jobs during the 1-3 year construction stage which would flatten to a permanent net gain of 13 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 renewables job creation may NOT be as much as hoped for.

VERMONT ENERGY FUTURE STATEWIDE DELIBERATIVE POLL

The poll was conducted by Center for Deliberative Opinion Research, University of Texas, for the VT-DPS. The poll was conducted on a random sample of Vermonters in Burlington on the weekend of November 3-4, 2007. The results of the poll were summarized in a 157 page report. http://cdd.stanford.edu/polls/energy/2008/vermont-results.pdf

Proponents of renewables will find in the report much to like. Some will use it for talking points and some as a reason to cast a vote for renewables. One of the major conclusions of the weekend deliberative poll is that the majority of Vermonters want more in-state renewable energy and are willing to pay a little more for it. Such a conclusion can be obtained just about anywhere in the US.

It is well known polls are of questionable value; they are only as good as who is selected to be in the samples (which influences answers) and only as good as the type of questions in the questionnaires (which influences answers) and only as good as the diversity, intent and biases of people guiding the deliberations. It appears a weekend of deliberative polling and filling out of questionnaires may NOT yield guidance for spending billions of dollars for Vermont's Energy Future.

EUROPEAN NATIONS AND RENEWABLES

Example: Germany quickly became a leader in installed capacity for wind and PV solar as a result of extremely generous FITs. 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 (3.6%) and hydro (3.1%). The amount of electricity produced by PV solar was a negligible 0.6% despite being the most subsidized renewable, with a net cost of about $12.4 Billion for 2008. South Germany has a PV solar CF of about 0.12; Vermont's is about 0.143. Germany, realizing the huge investment and the small quantity of expensive, variable, intermittent power from it, decided to significantly reduce its PV solar FITs. Spain, much more favorable for PV solar, nevertheless followed Germany's lead of reducing its PV solar FITs. At the same time, China expanded its PV panel production. As a result of this perfect storm and the Great Recession, there is a glut of PV panels which has reduced their prices. It appears

following the lead of some European nations, while good for vendors and developers, may NOT be the renewable energy panacea hoped for. http://www.rwi-essen.de/pls/portal30/docs/FOLDER/PUBLIKATIONEN/GUTACHTEN/P_RENEWABLE+ENERGY+REPORT+RWI+FORMAT.PDF

FIRST ENERGY EFFICIENCY, THEN RENEWABLES

After the deliberative poll came the Great Recession which has put Vermonters and the State in a multi-year financial bind; it means money needs to be spent more efficiently and that many programs need to be pruned or eliminated. And then people began to realize renewables are expensive and produce just a little, but expensive power. And then people began to realize that all this investment in renewables creates only a few jobs. And then people began to realize that they have been mislead by the rose-colored renewables hype of proponents. And then people began to realize that there may be other ways to invest scarce funds, such as in energy efficiency, that would have a much better return on investment for ALL Vermonters, instead of having FITs "to make the finances work for renewable energy developers", many of whom already are financially very well situated.

Vermont needs measures to increase worker productivity and to make Vermont more efficient in ALL areas, including energy. Subsidies usually SHIFT jobs from one sector to another; there is little NET job gain, as shown by the above VT-DPS study. Job gains usually come from improving worker productivity and becoming more efficient and BROADLY DISTRIBUTING the benefits of those efficiencies.

Some people, including legislators, claim Vermont already spends a lot on energy efficiency and point to the $30 million/yr spent by Efficiency Vermont. However, more than $20 million of the $30 million are expenses for payroll, office, travel, etc., of its 175 person staff. None of that $20 million saves energy.

It would be more effective:

- to use the $30 million/yr as DIRECT incentives to the bottom 90% of households to make their houses ("cash for caulkers") and their

vehicles (“cash for clunkers”) more energy efficient; the lower the household income, the greater the incentives.

- to cancel/reduce/place-on-hold the existing, mostly elitist incentives for expensive renewables, and instead provide major incentives to reduce the heating, cooling and electricity costs of residences and other buildings, to establish an ENFORCED statewide building energy code, and to build more compact communities to reduce the time and energy to travel from residences to workplace buildings.

- to replace old, polluting, inefficient wood and coal stoves and oil furnaces with new, clean-burning, high efficiency ones

- to exchange old gas guzzlers (20 mpg or less) with new high mileage (30 mpg or more) vehicles; the higher the mileage, the greater the incentive. http://www.fueleconomy.gov/feg/FEG2010.pdf

There would be a surge of renewal of tens of thousands of houses providing hundreds of jobs. This renewal would quickly lead to lower fuel bills, lower CO2 emissions, less need for fossil power plants and renewables, AND would quickly put money in the pockets of people which they would quickly spend to stimulate the economy which would quickly raise revenues to help balance Vermont's budget. Just imagine what $228 million would do.

Also note:

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

- Energy efficiency efforts would create many more jobs than renewables, especially for the depressed building and automotive sectors. No studies, research, demonstration and pilot plants will be required.

- Energy efficiency efforts will quickly reduce CO2 AND make Vermont more efficient in many areas which will raise living standards, or prevent them from falling further. Significant reductions of CO2 emissions from renewables and alternatives will be years or even decades away. Regarding global warming, time is of the essence.

- By doing energy efficiency FIRST, the capacities and capital costs of renewables will be much less later; putting the horse before the cart is so much better, as any Vermont FARMER knows.

NUCLEAR AND NATURAL GAS AS BRIDGE FUELS

US total installed electricity generating capacity is about 1,000,000 MW, of which wind is 35,086MW (produced about 70.8 TWh, or 1.8% of all US power in 2009), and nuclear is about 100,000 MW (produced about 20.2% of all power in 2009). For about 25 years utilities have been adding gas-fired combined cycle gas turbine, CCGT, plants and retiring coal and oil fired plants. For the past 5 years they have also built many (heavily subsidized) wind plants. Current power production is from coal 44.4%, natural gas 23.7%, nuclear 20.2%, hydro 6.8%, oil 1% (even less from IMPORTED oil) and Renewables 3.6%, of which Wind about 1.8%, Wood and other Biomass about 1.4%, Geothermal about 0.4%, PV solar about 0.04%. Transportation uses about 28% of US energy consumption and 75% of that is IMPORTED oil.
http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html
http://www.awea.org/reports/Annual_Market_Report_Press_Release_Teaser.pdf

The drilling for oil will become increasingly costly, difficult and hazardous to the environment. The Mexican Gulf fiasco is quickly changing the political landscape regarding deep offshore drilling.
Rational people who proposed nuclear and natural gas as bridge fuels, heretofore not heeded, are finally being listened to.

Nuclear and natural gas will need to be the bridge fuels for the next 30-50 years while competitive renewables are being developed. The world has a plentiful supply of nuclear fuel and the US has at least 100 years of natural

gas reserves. Natural gas can be liquified for air and ocean transport and until electric vehicles become more economical.

Nuclear power is relatively low-cost, CO2-free, steady, 24/7/365 power. Nuclear power is not renewable, but the world, i.e., India and Australia, has enough thorium to operate hundreds of 1,000 MW thorium/uranium-fueled reactors for at least a thousand years.

The most efficient natural gas-fired combined cycle gas turbine, CCGT, are plants by Siemens and GE. When operated a full load they have an electrical efficiency of about 60% (at low loads it is much less) and emit about 0.5 lb CO2/kWh; this compares with an efficiency of about 30% and emissions of 2 lb CO2/kWh from coal and 1.7 lb/kWh from oil.
Many nations, such as Germany, Denmark, Sweden, the Netherlands, Poland, Russia, Japan, etc., use CCGT plants for electricity and district heating and cooling which have a combined electrical/thermal efficiency of up to 85%.

Germany and Sweden have decided to continue using their existing nuclear plants, because their rational people have concluded they cannot achieve CO2 targets with renewables. The UK will make a similar decision. The US decided to continue its existing nuclear plants AND build new plants using loan guarantees as incentives; other nations will follow.