

From: Springer, Darren [Darren.Springer@state.vt.us]
Sent: Wednesday, March 04, 2015 7:42 AM
To: Tony Klein; 'Rebecca Ellis'
Subject: Fwd: Public Service Department - Public Records Request
Attachments: VT Heading in the Wrong Direction.docx; ATT00001.htm

See email chain below based on public record request from Energize VT to us on H.40

Sent from my iPhone

Begin forwarded message:

From: "Tauscher, David" <David.Tauscher@state.vt.us>
Date: March 4, 2015 at 7:28:56 AM EST
To: "Hopkins, Asa" <Asa.Hopkins@state.vt.us>, "Springer, Darren" <Darren.Springer@state.vt.us>
Subject: FW: FW: Public Service Department - Public Records Request

Fyi...

From: Willem Post [<mailto:wilpost37@gmail.com>]
Sent: Tuesday, March 03, 2015 8:57 AM
To: Warren Van Wyck; mark@energizevermont.org; Tauscher, David
Subject: Re: FW: Public Service Department - Public Records Request
Mark,

Those are interesting spreadsheets.

I would question some of the assumptions.

Caution: With "unworldly" assumptions, anything can be made to look good ON PAPER.

These are working spreadsheets, not ready for presentation to Legislators, who generally would not be able to make heads of tails out of them, without much more verbal explanation.

Even I would have to sit down with the preparers to follow the logic.

The main thing that makes any economic sense for poor Vermont's fragile, near-zero-growth economy is to:

- Get more hydro energy from Hydro-Quebec at 5 - 7 c/kWh, per Dostis of GMP, and to
- Have a building code that requires all new buildings to be net-zero energy buildings, or even energy-surplus buildings to charge electric vehicles, with proper subsidies to ensure many such buildings each year.

<http://theenergycollective.com/willem-post/332911/high-renewable-energy-costs-damage-vermonts-economy>

<http://theenergycollective.com/willem-post/2146376/renewable-energy-less-effective-energy-efficiency>

<http://theenergycollective.com/willem-post/2162036/comparison-grid-connected-and-grid-houses>

Willem

See attachment regarding hydro energy, buildings, and wood-burning power plants.

On Tue, Mar 3, 2015 at 7:28 AM, Warren Van Wyck

<wvanwyck@leg.state.vt.us> wrote:

Hi Willem,

You've modeled some scenarios.

You would comment on the DPS's analyses attached?

Regards,

-- Warren

----- Forwarded Message -----

Subject:FW: Public Service Department - Public Records Request

Date:Mon, 2 Mar 2015 21:54:40 -0500

From:Mark Whitworth

To:wvanwyck@leg.state.vt.us

Warren,

Here are the files that the Department used to develop its cost-benefit numbers for RESET. Is this the kind of analysis you would expect to see for a program as important and complicated as RESET?

Mark

From: Tauscher, David [<mailto:David.Tauscher@state.vt.us>]

Sent: Monday, March 2, 2015 9:26 AM

To: 'Mark@EnergizeVermont.org'

Subject: FW: Public Service Department - Public Records Request

From: Tauscher, David

Sent: Monday, March 02, 2015 8:38 AM

To: 'mark@energizevermont.org'

Subject: Public Service Department - Public Records Request

Hi Mark,

Attached are the files responsive to your public records request of February 25, 2015.

Regards,

David

David Tauscher, Administrative Services Director

Vermont Public Service Department

112 State St

Montpelier, VT 05620-2601

david.tauscher@state.vt.us

[802-828-4085](tel:802-828-4085)

All,

Below is an article consisting of 14 sections. Each section covers a different topic, but all are related, as they show how Vermont's economy is being led into the wrong direction by a political leadership whose main solutions to problems are more and more government programs, often called "initiatives", that typically are started with a federal subsidies "to get them up and running".

Basically, this violates the historic driving forces of the US economy, which are mostly private sector initiatives ultimately leading to higher standards of living. As a result of unwise policies, Vermont has become one of the poorest states in the US, with an expensive, ponderous government whose actions have become a wet blanket on the low/near-zero-profit private sector that has experienced low/near-zero-growth for about a decade.

VERMONT IS GOING IN THE WRONG DIRECTION

1) Shumlin's Proposed 0.7% Payroll Tax

A few weeks ago, Shumlin's healthcare gurus held an "informational" meeting in Montpelier to explain to the Vermont media the purpose of Shumlin's proposed 0.7% payroll tax. The gurus provided the following numbers, which I copied from a Valley News article.

The Proposed 0.7% Payroll Tax for Medicaid and Other Purposes: The 0.7% payroll tax, to be effective January 1, 2016, is to raise \$82.8 million to bring Medicaid payments from 60% of a provider bill to 80%, the same as Medicare, so providers (doctors, hospitals, etc.) have less reason to ration care, turn away patients, complain about being underpaid, and shift costs to the bills of other patients. In 2012, about \$150 million was cost shifted to commercial insurers; about \$100 million for Medicaid and \$50 million for Medicare. To recover their higher costs, commercial insurers increase the premiums for those not on Medicare and Medicaid.

The federal government would provide \$89 million of matching Medicaid funds. In the first year, the \$82.8 million in new payroll taxes + \$89 million in federal match = \$171.8 million would go into the Healthcare Resources Fund. In subsequent years, it likely would need to be much more.

About \$50 million would be used to pay more to providers of Medicaid services and about \$60 million would be used to pay for expanded Medicaid rolls, a total of \$110 million of increased Medicaid payments for the first year. Plus, about \$55 million would be used to:

- Increase payments to providers who participate in Vermont's Blue Print for Health.
- Increase subsidies for out of pocket costs on the exchange.
- Increase the budget of the Green Mountain Care Board.
- Support Vermont's pursuit of an All-Payer federal waiver.

The 0.7% Payroll Tax Will Increase in Future Years: It is not clear by how much the above 0.7% payroll tax, etc., would reduce the cost shifting of \$150 million of 2012; much greater cost shifting has occurred in 2013 and 2014, and will occur in subsequent years. See below. As cost shifting is a small percentage of total premiums paid by Vermonters not on Medicare and Medicaid, there could be only a minor reduction of their insurance premiums, say 5% or less, or only a minor reduction of their rate of increase, hardly an excuse for a 0.7% payroll tax, for STARTERS.

NOTE: If a family with 2 children has 2 earners, say a teacher and a carpenter, its PAYROLL income may total \$100,000, 0.7% of that would be \$700/year. Vermont has tens of thousands of such families. The 0.7% payroll tax, taken out of pay similar to FICA taxes, is just for starters, as more and more people are being enrolled in Medicaid.

The "Informational Meeting" was a Grand Deception: Gruber, a self-discredited consultant, hired by Shumlin, made the following statement: "Lack of transparency is a huge political advantage, and basically, call it the stupidity of the American voter or whatever. But basically that was really critical to getting the thing (ACA, a.k.a., Obamacare) to pass." A Machiavellian statement, or is it Orwellian?

It appears likely, the "informational" meeting was a Gruberesque attempt at obfuscation and manipulation, because the gurus who conducted the meeting likely knew cost shifting in 2013 and 2014 was much greater than "\$150 million in 2012", and used the Vermont media to deceive Vermonters. Besides the gurus, Shumlin, Campbell, Smith, et al, likely were also in on the content of the deceptive "informational" meeting BEFORE it occurred. Such an important meeting would not take place in a vacuum.

Expansion of Medicaid and CHIP Increased Cost Shifting in 2013 and 2014: The ACA expanded Medicaid eligibility to higher income levels and to children (CHIP). Medicaid (including CHIP) enrolled 184,867 Vermonters by end October 2014, about 57,705 more than the average enrollment of the July – September 2013 period. See URL.

<http://www.medicaid.gov/Medicaid-CHIP-Program-Information/By-State/vermont.html>

NOTE: This was NOT MENTIONED in the "informational" meeting; "\$150 million in 2012" numbers were used instead to deceive Vermonters. How stupid do the "gurus" think we are?

Because those on Medicaid and CHIP are rapidly increasing (due to ACA) and those on Medicare are steadily increasing (due to aging), cost shifting will go through the roof, which will have an even a greater impact on the insurance premiums of those not on Medicare and Medicaid!!!! The cost shifting was at least 50% greater in 2013 and 2014 than the "\$150 million in 2012" paraded before the Vermont media.

These greater numbers were known to all insiders, but apparently not to Vermont's media, which dutifully swallowed the "informational deception", hook, line, and sinker. See page 17 of "Fiscal Year 2014, Summary of Vermont Hospital Budgets, Final Budgets", as APPROVED by the Green Mountain Care Board. http://gmcbboard.vermont.gov/sites/gmcbboard/files/B14ReviewFindings_final.pdf

It is now completely clear to all Legislators, et al., the 0.7% payroll tax is just for STARTERS. It is nowhere near enough to cover cost shifting of 2013, 2014 and beyond, and to cover other costs mentioned in the Gruberesque "informational" meeting. The 0.7% payroll tax in 2016, likely would increase to 1.5% in 2017, and 2.0% in 2018, etc.,!!

NOTE: Instead of a payroll tax, it would be more rational to have increased taxes on tobacco, alcohol and soft drinks, as these harm health and increase medical expenses. However, Campbell, senate majority leader, is against such taxes, as it would harm some businesses in counties bordering New Hampshire!!

2) Closing a "Tax Loophole" to Reduce Recurring Budget Deficits

The 0.7% payroll tax is not the full picture. IN ADDITION to the above 0.7% payroll tax, Shumlin also proposed to eliminate a “tax loophole” by ending the deductibility of state and local taxes from VERMONT taxable income to balance the budget. The closing of the “loophole” would be aimed directly at increasing the income taxes of higher income households.

Currently, your FEDERAL taxable income is the base for calculating state income taxes. If Shumlin’s deceptively called “loophole closing” becomes law, this base would be INCREASED due to not deducting your state income taxes, and your local real estate/school taxes, if you itemize, as do about 1/3 of Vermont income tax return filers.

This means the base on which your state income tax is calculated would be much higher and you would have to pay much more state income taxes. For many households that pay \$6000 as state income taxes, plus \$6000 as local real estate/school taxes, the state income TAX INCREASE would be at least \$1,000, or more!!

“The closed loophole is expected to raise \$15.5 million per year/89,000 itemizers = \$175 per year per itemizer”, says Jim Reardon, Commissioner of the Department of Finance and Management”. The \$15.5 million would not go very far to close RECURRING budget deficits of about \$100 million.

Jim Reardon’s deceptive “\$175 per year per itemizer” is true, but does not represent the real picture for tens of thousands of filers, including almost all legislators. It appears, the ability to effectively engage in deception is a job qualification, if working for Shumlin.

Has anyone EVER thought about REDUCING government spending to UNBURDEN already-struggling households, with DECLINING real incomes, trying to make do in a near-zero-growth Vermont economy?

Has anyone EVER thought about UNBURDENING the low/near-zero profit private sector so it can grow and be profitable again and create well-paying jobs?

Has anyone EVER heard of LEVEL FUNDING, or of REDUCING state government spending to reduce recurring deficits?

Has anyone EVER thought Vermont, with its large, ponderous, expensive government, is on the wrong track?

Is there is a congenital defect that causes the Governor, Legislators, et al., to break out in hives, if they were to consider such measures?

3) The Netherlands is Number One in Healthcare

The Netherlands used to have a single-payer, universal healthcare system, but it was junked because it became too unworkable and expensive. I lived there for 18 years.

For the life of me, I do not understand Vermont’s misguided fixation of moving to single-payer, as the Netherlands moved AWAY from single-payer, and AS A RESULT became ranked No. 1 in Europe, per various studies.

The Netherlands got single-payer after the Germans invaded in 1940. Germany had had it since 1880. The practical Dutch moved away from it about 10 years ago, because it had become an expensive, unmanageable, bureaucratic nightmare.

The Dutch have established a European model to copy. See Page 3. In the Netherlands, financing agencies and healthcare amateurs, such as politicians and bureaucrats, seem farther removed from operative healthcare decisions than in almost any other European country. See Page 5.

People have monthly amounts taken out of their paycheck, which are forwarded to insurance companies, or they can choose to send monthly checks, the way you make a car, mortgage, or rent payment.

<http://www.healthpowerhouse.com/files/Report-EHCI-2012.pdf>

In the Netherlands, everyone HAS to buy one of several government-approved health insurance plans. PRIVATE insurance companies COMPETE to offer government-approved health plans. Employers have no involvement in and do not contribute to these plans.

The government designs the plans with provider input, monitors compliance to standard outcomes, with bonuses for exceeding standards, and penalties, including loss of contract, for underperforming standards.

For a basic plan the cost is about 720 euro per person, with a 365-euro deductible, and small co-payments.

Costs are controlled: MRI 250 euro; Basic lab test 10 euro. Lab tests are performed by computers tied to chemical analyzers, as they are in the US, except the US providers charge through the nose.

A study was performed of seven healthcare systems. The ranking was as follows:

- 1 Netherlands
- 2 UK
- 3 Australia
- 4 Germany,
- 5 New Zealand
- 6 Canada
- 7 US

The reports of two studies, performed by experts, rank the Netherlands as No. 1, a REAL leader. Vermont would do well to learn from the Netherlands. It likely would not be a good approach to emulate Canada’s “universal” healthcare system, as some uninformed people have proposed, because they saw the word “universal”.

<http://www.bbc.co.uk/news/10375877>

http://en.wikipedia.org/wiki/Healthcare_in_the_Netherlands

4) Shumlin’s Fantasy Goal of 90% of ALL Vermont Energy from RE by 2050

Vermont’s Comprehensive energy Plan, CEP, has fantasy goal of 90% of ALL energy from RE by 2050. It would require:

- About 90% of all cars, SUVs, minivans and 1/4-ton pick-ups to be all electric or hybrids using electricity and 100% bio-fuels. No more 90% gasoline/10% ethanol mix, or diesel, etc., at the pump. That implies the US will be producing about 10 million/yr of such vehicles by 2050.

- Major EE upgrades of almost all residential and other buildings to enable heating and cooling with electric heat pumps and bio-fuels, such as wood, wood pellets, etc. No more fuel oil, propane, gas, coal, etc., for building heating and cooling.

- Vermont's annual ELECTRICAL consumption to increase by about a factor of 3, from about 5,600 GWh to 16,800 GWh, about 90% of it from RE. Additional EE efforts may reduce the 16,800 GWh by a percentage.

By the end of 2013, Vermont had achieved $4.86\% \times 5,600 \text{ GWh} = 272 \text{ GWh}$ of NEW, IN-STATE, RE projects by investing about \$538 million over 3.5 years, or $538/3.5 = \$154 \text{ million/yr}$.

Vermont would have only $16,800 \times 90\% - 272 = 14,848 \text{ GWh}$ to go, at a capital cost of about $14848/272 \times 538 = \$29.4 \text{ billion}$, or \$816 million per year for 36 years, to achieve the CEP fantasy goal of 90% of ALL energy from RE by 2050, if the RE were from NEW, Vermont-generated wind on ridgelines and solar on meadows. Vermont's environment would be grossly spoiled forever.

Fortunately, RESET would allow utilities to buy RE from out-of-state sources, such as from Hydro-Quebec, which has over 5,000 MW of underused hydro capacity, and would be eager to sell more energy to Vermont.

If a large quantity of the RE would be bought from out-of-state, such as hydro energy from Hydro-Quebec, the \$816 million/yr would be significantly less, PLUS the cost of buying that hydro energy would be significantly less, about 5 -7 c/kWh, per Dostis of GMP. See Section 7.

NOTE: There are other Vermont-generated RE sources, such as biomass, but they are expected to be minor.

5) Expensive, Underperforming SPEED Program is a Burden on the Vermont Economy

Here is how the SPEED program, 2.2 MW or less, has performed these past 4.5 years.

Vermont has been replacing the near-CO2-free, low-cost (4 - 5c/kWh) energy of Vermont Yankee with expensive, variable, grid-disturbing SPEED energy. By any definition the SPEED program has been, and still is, an economic headwind.

SPEED energy is getting more and more expensive. See below table. But Vermont wants to be an RE leader, just like Germany. However, Germany is a very rich, industrial powerhouse and Vermont is mostly very poor.

Increased energy efficiency would be a much wiser choice for Vermont, as it would actually REDUCE the energy bills of already-struggling households and low/near-zero-profit businesses. Unfortunately, Vermont's political leadership, lubricated by campaign contributions to perform "constituent service", is in RE subsidy-chasing mode.

Here are the production results for the heavily subsidized SPEED Program, 2.2 MW or less. Note the RISING cost trend. It is mindless idiocy to be for SPEED, as it ultimately renders uncompetitive Vermont's private sector. Vermont's government sector will protect itself by means of higher taxes.

Year.....	Production.....	Paid to Owners.....	\$/kWh.....	% VT Use
Units.....	kWh.....	\$		
2010.....	5,980,779.....	829,832.88.....	0.1387.....	0.11
2011.....	20,172,973.....	3,329,269.05.....	0.1650.....	0.36
2012.....	29,666,592.....	5,093,237.71.....	0.1717.....	0.53
2013.....	44,820,516.....	8,692,440.70.....	0.1939.....	0.81
2014.....	62,865,075.....	13,190,927.86.....	0.2098.....	1.13; after 4.5 years of RE build-outs!

<http://vermontspeed.com/speed-monthly-production/>
<http://vermontspeed.squarespace.com/project-status/>

Excess payments during the past 5 years, based on New England average On-Peak wholesale prices of about 6.5 c/kWh.

.....	Excess Payments.....	Cent/kWh increase of electric bills
2010.....	\$506,871.....	0.01
2011.....	\$2,239,929.....	0.04
2012.....	\$3,491,242.....	0.06
2013.....	\$6,272,133.....	0.11
2014.....	\$9,796,214.....	0.18; rapidly increasing, as is the budget of Efficiency Vermont!

<http://theenergycollective.com/willem-post/332911/high-renewable-energy-costs-damage-vermonts-economy>

The above "Paid to Owners" column shows the amount paid mostly to the risk-free tax shelters of in-state and out-of-state multi-millionaires, who own the larger PV solar systems. In the future, these "Paid-to-Owner" amounts be INCREASING by at least \$5 million per year, as the table shows, courtesy of the PSB, et al. Those owners get compensated at an average of about 27 c/kWh for existing solar projects. This is coddling the seriously rich, at everyone else's expense, using the lame excuse of "fighting global warming"!

The "Excess Payments" were rolled into the electric rates of already-struggling households and no/near-zero profit businesses. These payments would have increased to about \$62.5 million by 2017 had VT's unrealistic SPEED goals been achieved. The main reason for the rapid increase is due to the PV solar feed-in tariff of an excessively high 25.7 c/kWh. The tariff is set by the PSB, based on a dubious rationale called "avoided cost-based prices", but the On-Peak wholesale price, at which utilities buy some of their energy, hardly ever exceeds 8 c/kWh!

The politically well-connected, multi-millionaires, with lucrative, no-risk, tax shelters, are benefitting the most from tax credits, fast write-offs, production tax credits and overly generous feed-in tariffs, to build solar plants (destroying meadows) and under-performing wind plants (destroying ridge lines) that produce variable, intermittent, grid-disturbing energy at 3-5 times New England wholesale prices; a sure way to further DECREASE the competitiveness of an already near-stagnant Vermont economy. Vermont's government is coddling those wealthy multi-millionaires with RE programs that excessively waste scarce taxpayer money and would do practically nothing to reduce global warming.

6) Out With the SPEED Program, in with H-40, RESET, and New Carbon Tax.

H-40 Hearings: According to some legislators on Klein's House Natural Resources and Energy Committee, House Bill H-40 was largely written by DPS; "it is their bill", one member told me. Klein is holding pro-forma hearings, but practicing selective listening, as usual. He knows what is best, does not need to (but has to) listen to all these people. His marching orders come from the higher-ups.

Smith added to the 11-member Committee 7 new members with almost no experience in energy systems; "I have very little experience in energy systems" I was told by the above member. Klein, plus the 3 holdovers, plus 2 more votes, can send any H-40 bill to the Legislature for a mostly rubberstamp vote. Is Smith "packing" the committee? You bet! Klein, former lobbyist, will deliver a bill for a House vote, just as was done with the bill that set up the ill-fated SPEED program!! Déjà vu.

Renewable Energy Standard and Energy Transformation program, RESET: Because the dysfunctional, expensive, underperforming SPEED program has grossly fallen short of RE production targets, the 5-yr program will be scrapped, and replaced with House bill H-40 that establishes a Renewable Energy Standard and Energy Transformation program, RESET. All states with a Renewable Portfolio Standard call it RPS, but Vermont calls it Renewable Energy Standard, RES!

NOTE: 29 states + Washington DC + 2 territories have an RPS. Several of the states that have an RPS have watered it down, some are thinking of cancelling it. Just Google. The TREND appears to be away from having RPS laws.

Carbon Tax: H-40, a.k.a., RESET, will include incentives, i.e., subsidies to build RE projects. These incentives would cost tens on millions of dollars each year, FOR STARTERS. Hence a NEW carbon tax will be required, and it will be increasing each year.

With an RES, utilities would be forced to buy increasing percentages of their energy as in-state, or out-of-state, renewable energy, which typically costs 2 – 5 times New England wholesale prices. See Section 7. The cost of increasing quantities of such expensive energy rolled into household and business electric rates would act as a headwind on Vermont's economy and render Vermont's low/near-zero-growth economy even less competitive.

The revenue of the carbon tax would be going into the political Clean Energy Development Fund, CEDF, that would pay subsidies mostly to politically, well-connected RE businesses, that are mostly owned by in-state and out-of-state multi-millionaires with lucrative, risk-free tax shelters.

As federal subsidies for RE projects will go from 30% at present to 10% at end 2017, Vermont's households and businesses would have to fork over increasingly larger amounts of money in future years to make up that "shortfall", to make heavily subsidized RE projects viable.

7) Wind and Solar Energy

Wind and Solar energy: People should know by now, in New England, wind energy is zero, or near zero, about 30% of the hours of the year, and solar energy is zero, or near zero, about 65% of the hours of the year. Often both are near zero.

That means ALL other generators need to be kept in good running order, staffed and fueled to provide almost ALL energy during these hours, and lesser quantities of energy, including for balancing the variable solar and wind energy, during other hours!! Two energy systems to do one job!

NEK Grid Adequacy: The current NEK is perfectly adequate to serve the NEK demands, but feeding variable, intermittent wind energy into that grid causes excessive instabilities, as was found with the Lowell project.

It is well known by DPS, PSB, GMP, VEC and Klein's Committee, et al., the NEK would need at least \$300 million of grid upgrades before significant variable, intermittent, grid disturbing, wind energy could be added. Just adding the cancelled, SENECA system would have cost \$86 million in grid upgrades. GMP had to spend a total of about \$20 million to connect the underperforming Lowell system to the grid.

NOTE: Economically viable energy storage systems, other than hydro, have not yet been invented, and would take many billions of dollars and decades to deploy AFTER they are invented.

NOTE: 2014 was a good wind year in New England. Almost all wind turbines did better. In 2014, Lowell generated 179,385,000 kWh. $CF = 179,385,000 \text{ kWh} / (63,000 \text{ kW} \times 8760) = 0.325$.

Lowell is grossly UNDERPERFORMING in a GOOD wind year, because in a NORMAL wind year, with the bigger rotor, the CF was predicted to be 0.3587, i.e., it would be higher in a GOOD wind year, say 0.37.

GMP had to spend \$20 million on grid improvements and synchronous converter to be able to feed that much energy into the NEK grid. SENECA was to be located near Lowell and its grid improvements were estimated at \$86 million. The project was cancelled. According to standard practice, the ISO-NE rule is THE DISTURBER PAYS.

NOTE: PV panels were not designed for snowy climates. The reason they do not have electric heaters to melt snow and ice. If field-mounted, one can rake off the snow with a squeegee, but on roof-mounted systems, no one would be foolish enough to climb on a steep, snow-covered roof.

On average, NEW PV systems have an efficiency of about 82%. See URL. For example, 50 MW dc of solar systems have an annual average output of $50 \text{ MW} \times 0.82 = 41 \text{ MW ac}$, due to various losses designed into the system. ISO-NE measures MW in ac.
http://www.iso-ne.com/committees/comm_wkgrps/othr/distributed_generation_frct/2014_pv_frct/2014_final_solar_forecast.pdf

But, in the real world, solar panels are aging, dusty, partially shaded by trees, all or partially snow-covered, etc., and, as about 80% of the systems are roof-mounted, many roofs are not true-south-facing and the panels are not correctly angled. All these factors reduce the 82% to about 66%, a loss due to real-world factors of about 20%, as confirmed by annual production numbers.

In Germany, the ACTUAL capacity factor of a real-world mix of systems = 0.095, based on annual production numbers, whereas the THEORETICAL CF of NEW systems = 0.115, a loss of about 20%. In Vermont, the numbers are 0.145 and 0.120, respectively, a loss of about 20%.

The German, the national solar production is as low as 2 - 3% of installed capacity, MW, in winter, and at most 65% in summer. Similar numbers apply to Vermont.

8) Increased Hydro Energy From Hydro-Quebec

Hydro energy is steady, not variable, not intermittent, highly reliable, 24/7/365. Hydro-Quebec has multiple hydro plants with multiple turbines. It is rare for an ENTIRE hydro plant to be down. "All eggs in one basket?" Norway gets 95% of its energy from hydro plants and hardly ever has an outage.

If GMP, VEC, et al., were really interested in reducing the electric bills of already-struggling Vermont households and of low/near-zero-profit Vermont businesses, they would get about 75% of their total energy as steady, not variable, not intermittent, hydro energy, at 5 - 7 c/kWh (per Dostis of GMP), from Hydro-Quebec.

It would be much less destructive to Vermont's environment to buy as much hydro energy as possible from H-Q, which has about 5,000 MW of underused hydro capacity due to demand growth planned for at that time, but did not occur. The Canadians are eager to sell as much energy as we need. The environmental damage to build the H-Q hydro plants was done over 30 years ago!!

Any wind and solar energy, in-state or out-of-state, would entail ADDITIONAL damage, mostly on Vermont's ridgelines and meadows. Why be irrational and do more environmental damage in Vermont to build RE systems that produce EXPENSIVE, VARIABLE, INTERMITTENT energy at 2 - 5 times wholesale prices? It is called shooting yourself in the foot.

The additional H-Q hydro energy would require building additional HVDC lines, capacity about 600 MW, within Vermont. HQ would build connecting HVDC lines within Canada. The line would be in parallel with the existing HVDC lines, and could be operated near design capacity to maximize its economic return. The funds to build the HVDC lines would be borrowed by private entities. No Vermont outlays for capital and subsidies would be required.

Vermont's economy would be the major beneficiary by taking as much as possible of the low-cost, near-CO2-free, STEADY hydro energy, with the rest fed into the New England power system. That way all of the low-cost, near-CO2-free, STEADY nuclear energy New England lost by closing down Vermont Yankee would be replaced by the H-Q hydro energy for many decades. A no-brainer?

Buying additional energy from Hydro-Quebec would not require any Vermont outlays of about 1 - 2 billion dollars in subsidies to build out the equivalent wind capacity on ridgelines and solar capacity in meadows, and would not require any ADDITIONAL environmental damage in Vermont. Always remember, one person's subsidy is another person's tax. A no-brainer?

The new HVDC line could deliver = 600 MW x 8760 hr./yr. x CF 0.90 = 4,730,000 MWh/yr. To produce that quantity of energy with wind and solar capacity, assuming 80% from wind (3,784,320 MWh/yr.) and 20% from solar (946,080 MWh/yr.), would require:

Wind cost = 1728 MW x 8760 hr./yr. x CF 0.25 x \$2,800,000/MW = \$4.84 billion; (27) 63 MW Lowell Mountains!!
Solar cost = 771 MW x 8760 hr./yr. x CF 0.14 x \$3,500,000/MW = \$2.70 billion; (350) 2.2 MW field-mounted systems!!
Grid modifications to accommodate wind and solar energy..... = \$1.50 billion
Total..... = \$9.04 billion

The capital cost of the Vermont portion of HVDC lines is estimated at about \$1 billion.

The cost of the unsteady, variable, intermittent, wind energy would be 10 - 15 c/kWh from ridgelines (with subsidies).

The cost of the unsteady, variable, intermittent, solar energy would be 15 - 27 c/kWh from roofs and meadows (with subsidies).

NOTE: New England wholesale prices, at which utilities buy some of their energy, have averaged about 5 c/kWh for the past 5 years.

9) Energy- Efficient Buildings

During hearings on H-40, not a word was said about having zero-energy buildings or energy-surplus buildings. About 95% of Vermont buildings are energy-hog buildings. Adding air source or ground source heat pumps to energy-hog buildings is like putting the horse behind the cart. First one should build the energy-efficient buildings, then it makes sense to add the heat pumps. Energy-efficient buildings, such as Passivhaus buildings, hardly need any heating system, even in Vermont.

As all technologies are fully developed and proven, more energy could be locally generated and locally consumed in energy-efficient buildings, all "under one roof". See below URLs. There would be massive resistance from special interests to go into that direction, as they have grown big by exploiting the fossil fuel-addicted society for at least the past 100 years.

The energy efficiency of buildings did not become an issue until after the 4-fold increase of crude oil prices in 1973. The owners of mostly energy-hog buildings, seeing major increases in their heating and cooling costs, consulted with engineers to make energy surveys of buildings, which, after implementation of the recommendations, usually resulted in at least 50% decreases of energy consumption.

Such efficiency improvements regarding houses did not take place until much later, and then only on a case by case basis, because politicians were, and still are, very slow to upgrade building codes. For them, it is so much easier to cater to special interests, to be for heavily subsidized, highly visible, renewable energy, than for lightly subsidized, invisible, energy efficiency.

Embedded CO2 emissions would be spread out over many years, as is the case at present. Building structure EE measures would be spread out over at least 100 years. Because CO2 emissions are one of the factors affecting global warming and climate change, it would be desirable to have buildings be near the goal of "net-zero-energy and near-zero CO2 emissions".

Here are some examples of annual energy use for heating, cooling and electricity of energy-hog, government buildings. Not much can be done with such buildings other than taking them down to the steel structure and start over.

NY State Office Building Campus/SUNY-Albany Campus; average 186,000 Btu/sq ft/yr. Source: a study I did in the 80s.

Vermont State Government buildings; average 107,000 Btu/sq ft/yr.

<http://www.publicassets.org/PAI-IB0806.pdf>

<http://theenergycollective.com/willem-post/46652/reducing-energy-use-houses>

<http://theenergycollective.com/willem-post/71771/energy-efficiency-first-renewables-later>

<http://theenergycollective.com/willem-post/2146376/renewable-energy-less-effective-energy-efficiency>

<http://theenergycollective.com/willem-post/2162036/comparison-grid-connected-and-grid-houses>

10) Vermont, a Poor State with an Economy in Near-Zero Growth Mode

Vermont's economy has been stuck in low/near-zero growth mode since about 2000, largely because of the wet blanket of unwise, excessive government spending suffocating the shrinking, low/near-zero-profit private sector. In Vermont, the sum of local and state tax burdens, plus government fees, plus quasi-government surcharges (such as for Efficiency Vermont, which was given an 8% budget increase for 2014) has been increasing as a percent of total household incomes, while the real household incomes of 60% of lower income households have been decreasing in a near-zero growth economy for the past 14 years. That is called hollowing-out the middle class.

Vermont 8th Poorest State: Vermont is the 8th poorest state, based on dividing REAL (inflation-adjusted, 2013\$) median household incomes by the COL index. <http://www.census.gov/content/dam/Census/library/publications/2014/demo/p60-249.pdf>

NOTE: Chittenden County has many people, and its economic statistics rank well above all other Vermont counties. If Chittenden County were removed from the Vermont averages, the rest of Vermont would have averages just slightly above Mississippi, i.e., near the BOTTOM of US averages. Vermont is a very poor state with a very expensive government? You bet.

Vermont 6th Most-Socialized State: Vermont's economic growth is stagnating, partially because it is the 6th "most-socialized" state in the US, based on government footprint. Governments do things ponderously and expensively. Some states, more socialized than Vermont, have large FEDERAL government installations, which Vermont does not have. Vermont would rank even higher on the "most-socialized" scale, if that aspect were removed. http://www.thestreet.com/story/12964955/1/the-10-most-socialist-states-in-america.html?pu=Outbrain&utm_source=Outbrain&utm_medium=cpc&utm_campaign=stoutbrain&cm_ven=outbrain

11) Cost of Living Index, Household and Family Incomes

Vermont has a tax, mandated fees, etc., burden that is much higher than the US average, and Vermont has a LOWER real household and family income than the NE average. A household has one or more people; a family has two or more people.

- The COL index covers the total income of the households in the top 20% of households, by income.
- The top 20% of households, by income, take in about 55% of ALL US household income.
- Thus the COL index covers a lot of US household spending and is highly representative, certainly for these households.
- The effect of any taxes (federal, state and local) is NOT taken into account in the COL index.
- If a state is in the upper quarter of per capita tax burden, such as Vermont, then the exclusion of taxes from the COL is significant.
- Vermont's COL index is about 120, the US = 100. Vermont's nominal median household and family incomes would need to be significantly higher to equal US incomes.

Real (inflation-adjusted, 2013\$) median HOUSEHOLD incomes:
.....US.....VT.....VT, COL adjusted
2013.....\$52,250.....\$52,578.....\$43,815
2012.....\$52,117.....\$53,746.....\$44,788
2005.....\$55,178.....\$54,514.....\$45,428

Real (inflation-adjusted, 2013\$) median FAMILY incomes:
.....US.....VT.....VT, COL adjusted
2013.....\$64,030.....\$68,382.....\$56,985
2012.....\$63,435.....\$67,006.....\$55,838
2005.....\$66,621.....\$68,217.....\$56,848
<http://www.deptofnumbers.com/income/us/#household>

Real (inflation-adjusted, 2013\$) US household income DECLINES. Vermont household income declines are similar.

Quintile.....	Peak Year.....	Peak Income.....	2013 Income.....	Decline
1st	2006.....	\$194,296.....	\$185,206.....	- 4.7%
2nd.....	2007.....	\$88,880.....	\$83,519.....	- 6.0%
3rd.....	2000.....	\$57,129.....	\$52,322.....	- 8.4%
4th.....	2000.....	\$34,306.....	\$30,509.....	- 11.1%
5th.....	1999.....	\$13,861.....	\$11,651.....	- 15.9%

<http://www.advisorperspectives.com/dshort/updates/Household-Income-Distribution.php>

12) All-Payer Waiver to Put Medicare and Medicaid Under State Control

Now that Single-Payer has been put on the back burner, because it would adversely affect the already-fragile, near-zero-growth Vermont economy, setting up an ALL-PAYER healthcare system has become the fallback alternative.

Maryland's All-Payer: Maryland, population 5.929 million in 2013, has had such a system since 1977. Its hospitals received about \$1 billion in 2013 in EXTRA Medicare/Medicaid funds, which were used to reduce cost shifting, the alleged under-compensation of providers by Medicare and Medicaid, which providers recoup by charging more to OTHER insured people, which causes their healthcare premiums to be higher than they would be without the cost shifting.

Maryland obtained a federal waiver and got the EXTRA funds written into federal law, which allows Maryland to administer its own Medicare and Medicaid programs using federal funds, instead of the federal government doing the administering.

It took Maryland many years to get providers to adjust their operations, and for the state to monitor their operations to make Maryland's multi-billion dollar, All-Payer program functional. Maryland was lucky to get about \$1 billion in EXTRA Medicare/Medicaid funds to make its All-Payer scheme a "success", i.e., reduce cost shifting. Vermont would not be so lucky with Republicans controlling the Congress.

Vermont's Proposed All-Payer: Under All-Payer, Vermont's in-state network, Green Mountain Care, GMC, would pay in-state and out-of-state providers. GMC would contract with out-of-state providers, as necessary, to meet the needs of Vermonters.

About a third of all Vermont residents on Medicaid and Medicare have care at Dartmouth-Hitchcock Medical Center, DHMC, in New Hampshire. Under All-Payer, would any services obtainable from Vermont providers no longer be allowed from DHMC, except by permission slip from GMC? The services of the Vermont providers would need to show significant savings compared to DHMC.

It would be presumptuous for state bureaucrats and GMC bureaucrats to claim they could produce significant savings by managing \$2.75 billion of Medicare and Medicaid funds more efficiently than the federal government, which has been doing it for at least 40 years!! They could not even manage to set up a website!! It appears the only reason for the existence of All-Payer would be to create the state infrastructure to more easily implement Single-Payer in the future.

Vermont's Extra Medicare/Medicaid Funds under All-Payer: If Vermont obtained the federal waivers and got the EXTRA funds written into federal law, similar to Maryland, then Vermont, population 0.625 million, would get about \$1 billion x 0.625/5.929 = \$118 million/yr of EXTRA Medicare/Medicaid funds. That is not a lot of money!! A significant part of that \$118 million would be spent for the hundred (hundreds?) or so ADDITIONAL state employees and quasi-state, GMC employees, all with state-level, platinum plus benefits, to get all providers to adjust their operations, and to monitor their operations to make Vermont's multi-billion dollar, All-Payer program functional.

It would be very difficult for Vermont (already having recurring budget deficits) to follow Maryland, without the EXTRA Medicare/Medicaid funds. A handful of other states, including New York and New Jersey, tried to implement similar systems in the late 1970s and early 1980s. But unlike Maryland, they did not get the EXTRA funds written into federal law and gave up on the program. "Maryland made a very strategic, savvy move," said McDonough, the Harvard professor. "Had they not locked in those higher reimbursements, there wouldn't be value in the program."

All-Payer, a Backdoor to Single-Payer: Under Single-Payer, there would be no change regarding Medicare; it would continue to be administered by the federal government. At least one third of all Medicare patients have care from DHMC. Under All-Payer, Medicare PLUS Medicaid would be administered by GMC.

Assuming Vermont gets the federal waiver and the EXTRA Medicaid/Medicare funds written into federal law, the All-Payer scheme would be politically easier to implement, because elderly people on Medicare and those on Medicaid are not well organized and more easily manipulated by politicians and bureaucrats, unlike various business organizations (not stupid), which strongly opposed Shumlin's Single-Payer.

The All-Payer waiver would not be trivial, as it would give Vermont almost complete control over Medicare funds for about 140,000 people and Medicaid funds for about 141,000 people in 2017, totaling \$ 2,659.2 in 2013, about \$3.0 billion in 2017, about 50% of Vermont's healthcare spending. See page 12. It would amount to a major back-door move to ultimately implement Single-Payer. Various business organizations would be wise to oppose it now, before the Legislature enacts All-Payer into law.

<http://hcr.vermont.gov/sites/hcr/files/2014/GMCReport2014/GMC%20FINAL%20REPORT%20123014.pdf>

Impact on Elderly, Sick People on Medicare: Currently, people on Medicare have the right to select their primary care physician. Also, they have the right to bypass that physician and go directly to a specialist of their choice. Under All-Payer, it is not clear, if people could still go to a doctor of their choice, or a specialist of their choice (which Medicare allows), without a permission slip of a primary care physician, who might be constrained by state rules and regulations under the All-Payer scheme.

Under All-Payer, people on Medicare and Medicaid living in the Upper Valley would likely not be able to go to the nearby DHMC (about a 0.6 hr round-trip), without a GMC permission slip. Those ELDERLY, SICK people would have to go to the Rutland Regional Medical Center (about a 2.5 hr round-trip, longer with bad weather), or another, equivalent Vermont medical center, which would have a GMC contract to provide services at certain prices.

NOTE: With All-Payer, I might have been dead a long time ago. About 8 years ago, I was "treated" for a heart condition by a local primary care physician without much success, and, finally, on my own, as allowed by Medicare WITHOUT permission slip, I went to a cardiologist at the DHMC, who saw me the same day, immediately had tests performed, which revealed two 90% blockages, immediately requiring 2 stents. After the stents were in place, he said: "You were on the edge of having a massive heart attack". With proper drugs, I have been well ever since, and plan to live many more years.

<http://kaiserhealthnews.org/news/stateline-medicare-enrollment-increases-by-state/>

<http://vtdigger.org/2014/04/03/lawmakers-briefed-marylands-payer-health-care-system/>

<http://www.washingtonpost.com/blogs/wonkblog/wp/2013/05/25/maryland-already-sets-hospitals-prices-now-it-wants-to-cap-their-spending/>

<http://vtdigger.org/2014/10/01/shumlin-team-d-c-seek-federal-waivers-single-payer-health-care/>

https://www.umassmed.edu/uploadedFiles/CWM_CHLE/About/Vermont%20Health%20Care%20Financing%20Plan%202017%20-%20Act%2048%20-%20FINAL%20REPORT.pdf

13) The RES of H-40 Mandates Utilities to Buy Expensive Renewable Energy

Under the RES, utilities would be required to sell 55% of their energy as RE by end 2017, 75% by end 2032. Energy sales from distributed RE projects of 1% at end 2017, 10% at end 2032, are part of the 55% and 75% requirements.

NOTE: The DPS claims, without backup numbers, RE sales were about 2,240,000 MWh in 2014, or 40% of total utility sales.

<http://vtdigger.org/2015/01/28/utilities-want-flexibility-renewable-portfolio-standards/#comment-211965>

PHASE 1; Going from existing 40% RE at end 2014 to 55% RE at end 2017

Based on the H-40 RES mandate to have utility RE sales increase from 40% of total sales at end 2014, to 55% at end 2017, about 75 MW of wind turbine systems (25 MW/yr.) and 534 MW of solar systems (178 MW/yr.) in meadows would be required. Below are the detailed numbers for the increased RE generated and the capital cost to build the systems for the years 2015, 2016, 2017.

H-40 RES MANDATE FOR UTILITY RE SALES

Vermont consumption.....5,600,000 MWh; per ISO-NE

55% RE at end 2017.....3,080,000 MWh; per RES goal

1% Distributed RE at end 2017.....30,800 MWh; mostly solar systems on roofs, etc., per RES goal

Other RE at end 2017.....3,049,200 MWh; mostly from ridgelines and meadows, and other sources, such as Hydro Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

EXISTING UTILITY RE SALES AT END 2014, per DPS

Existing RE.....2,240,000 MWh; 40% of consumption, per above DPS statement

Existing distributed RE.....10,000 MWh; mostly solar systems on roofs, etc.; my assumption

Other RE.....2,230,000 MWh; mostly from ridgelines and meadows, and other sources, such as hydro Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

ADDED UTILITY RE SALES AT END 2017

NEW distributed RE at end 2017.....20,800 MWh; mostly solar systems on roofs, etc.

NEW RE at end 2017.....819,200 MWh; mostly from ridgelines and meadows, and other sources, such as Hydro-Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

If all those RE systems were built in Vermont, and 80% is assumed solar (mostly in meadows, etc., which has met GROWING public opposition) and 20% is assumed wind (mostly on ridgelines which has met SIGNIFICANT public opposition), then the estimated capital cost and number of systems would be:

Wind = $0.20 \times 819,200 \text{ MWh} / (8,760 \text{ hr./yr.} \times \text{CF } 0.27) \times \$2,800,000/\text{MW} = \$0.19 \text{ billion}$
Number of Lowell wind systems = $75 \text{ MW} / 63 \text{ MW} = 1.1$

Solar = $0.80 \times 819,200 \text{ MWh} / (8,760 \text{ hr./yr.} \times \text{CF } 0.14) \times \$4,000,000/\text{MW} = \$2.14 \text{ billion}$
Number of 2.2 MW solar systems = $534 / 2.2 = 243$

H-40 MANDATES DISTRIBUTED RE TO BE 1% UTILITY RE SALES AT END 2017

In 2013, total solar energy from about 44 MW of panels, SPEED and non-SPEED, was about $44 \text{ MW} \times 8,760 \text{ hr./yr.} \times \text{capacity factor } 0.14 = 53,962 \text{ MWh}$. Less than 10,000 MWh was from distributed sources, such as on rooftops, etc.

H-40 mandates distributed RE to go from about 10,000 MWh at end 2014, to 30,800 MWh at end 2017, and increase of 20,800 MWh in 3 years. That is a major acceleration, as it took at least 7 years to get to 10,000 MWh!! **H-40 is SPEED on steroids.**

That would require ADDING, in 3 years, $20,800 \text{ MWh} / (8,760 \times 0.14) = 16,960 \text{ kW}$ of installations, equivalent to (3,392) 5 kW rooftop systems, at a capital cost of $16,960 \text{ kW} \times \$4,000/\text{kW} = \$67.8 \text{ million}$, of which about 30% would be a federal CASH subsidy that is set to expire at end 2017 and revert to 10% at start 2018.

About \$200 million is estimated for grid upgrades. The estimated total capital cost would be at least $\$0.19 \text{ b Wind} + \$2.14 \text{ b Solar} + \$0.10 \text{ b Grid} + 0.07 = \2.50 billion by end 2017, or $2.50 \text{ b} / 3 = \$833 \text{ million PER YEAR}$ for 3 years. **H-40 is SPEED on steroids!**

NOTE: This would require rounding up a few hundred multi-millionaires, and a lot of hearings and paper shuffling by the PSB. Maybe Shumlin could take another trip to China to round up a few hundred EB-5 Chinese multi-millionaires to pitch in about \$810 million dollars PER YEAR, for 3 years!!

NOTE: These high level of capital outlays are part of the DPS plan to try to maximize the overly generous 30% federal subsidies before they expire at end 2017!!!

PHASE 2; Going from 55% RE at end 2017 to 75% RE at end 2032

Based on the H-40 RES mandate to have utility RE sales increase from 55% of total sales at end 2017, to 75% at end 2032, about 62 MW of wind turbine systems (21 MW/yr.) and 477 MW of solar systems (32 MW/yr.) in meadows would be required. Below are the detailed numbers for the increased RE generated and the capital cost to build the systems during the 2017 – 2032 period.

This looks to me a slightly less of a pie-in-the-sky mandate, as the 730,800 MWh of new RE to be generated is spread out over 15 years, or $730,800 / 15 = 48,720 \text{ MWh}$, and the 389,200 MWh of distributed RE also would be spread out over 15 years, or $389,200 / 15 = 29,947 \text{ MWh/yr.}$

H-40 RES GOAL FOR RE UTILITIES SALES AT END 2032

Vermont consumption.....5,600,000 MWh; per ISO-NE

75% RE.....4,200,000 MWh; per RES goal

Distributed RE.....420,000 MWh; mostly solar systems on roofs, etc., per RES goal

Other RE.....3,780,000 MWh; mostly from ridgelines and meadows, and other sources, such as Hydro Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

RE UTILITY SALES AT END 2017

Existing RE.....3,080,000 MWh; 40% of consumption, per above DPS statement

Existing distributed RE.....30,800 MWh; mostly solar systems on roofs, etc.; my assumption

Other RE.....3,049,200 MWh; mostly from ridgelines and meadows, and other sources, such as hydro Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

ADDED RE UTILITY SALES AT END 2032

New distributed RE at end 2017.....389,200 MWh; mostly solar systems on roofs, etc.

New RE at end 2017.....730,800 MWh; mostly from ridgelines and meadows, and other sources, such as Hydro-Quebec, as RE from farm methane, biomass, landfill gas, etc., likely will be minor, based on 4.5 years of existing SPEED projects.

If all those RE systems were built in Vermont, and 80% is assumed solar (mostly in meadows, etc., which has met GROWING public opposition) and 20% is assumed wind (mostly on ridgelines which has met SIGNIFICANT public opposition), then the estimated capital cost and number of systems would be:

Wind = $0.20 \times 730,800 \text{ MWh} / (8,760 \text{ hr./yr.} \times \text{CF } 0.27) \times \$2,800,000/\text{MW} = \$0.17 \text{ billion}$
Number of Lowell wind systems = $62 \text{ MW} / 63 \text{ MW} = 1$

Solar = $0.80 \times 730,800 \text{ MWh} / (8,760 \text{ hr./yr.} \times \text{CF } 0.14) \times \$4,000,000/\text{MW} = \$1.91 \text{ billion}$
Number of 2.2 MW solar systems = $477 / 2.2 = 217$

H-40 MANDATES DISTRIBUTED RE TO BE 10% OF UTILITY RE SALES AT END 2032

H-40 mandates distributed renewable energy to go from 1% of utility RE sales, or 30,800 MWh, at end 2017, to 10%, or 420,000 MWh at end 2032, and increase of 389,200 MWh over 15 years.

That would require ADDING, in 15 years, $389,200 \text{ MWh} / (8,760 \times 0.14) = 317,000 \text{ kW}$ of installations, equivalent to (63,470) 5 kW distributed systems, at a capital cost of $317,000 \text{ kW} \times \$3,500/\text{kW} = \$1.11 \text{ billion}$. It would be a major challenge to properly locate such a large number of systems, unless many systems are greater than 5 kW.

About \$300 million is estimated for grid upgrades. The estimated total capital cost would be at least $\$0.17 \text{ b Wind} + \$1.91 \text{ b Solar} + \$0.30 \text{ b Grid} + 1.11 \text{ b Distr.} = \3.49 billion by end 2032, or $3.49 \text{ b} / 15 = \$233 \text{ million PER YEAR}$ for 15 years. **H-40 is SPEED on steroids!**

H-30 MANDATES ENERGY TRANSFORMATION

H-40 mandates energy transformation, ET, as follows:

% of total utility sales at end of 2014*.....Unknown?
2% of total utility sales at end 2017.....56,000 MWh
12% of total utility sales at end 2032.....672,000 MWh
Increase of ET+616,000 MWh This is not a trivial quantity. It will affect many tens of thousands of households.

* No qualifying ET quantities were provided for existing ET at end 2014!!
+ Over 15 years, or 41,067 MWh/yr

After reading the H-40 text, it was not clear what utilities and ratepayers would be required to do to effect “energy transformation”. Some examples of this “innovation” would have been useful. What would an ET program consist of? Why is the H-40 description of the ET aspect so vague? With such vagueness, legislators would have no idea what they would vote for. Was the vagueness on purpose? Energy transformation does have a nice “feel-good” aura to it.

GENERAL COMMENTS

To make capital outlays at those levels for 15 years, and have all systems in operation, in Vermont, by the end of 2032, and pay for the expensive RE, would be a major additional headwind for Vermont’s fragile economy and environment.

In addition to diverting scarce capital from more useful investments, it would be misused to destroy ridgelines and meadows, and to produce RE at about 3 - 5 times New England wholesale prices, which have averaged about 5 c/kWh for the past 5 years.

A major headwind for Vermont’s weak, low/near-zero-growth, economy, with mostly already-struggling households, whose real incomes have DECLINED since 2000, and with low/near-zero-profit businesses, all trying to make ends meet, while paying more and more, for an ever-growing, ponderous, expensive government sector that acts as a wet blanket on the shrinking, hollowed-out private sector.

Because H-40 abolishes the expensive, dysfunctional SPEED program does not mean the lucrative SPEED feed-in tariffs disappear. Most RE projects could not exist without them.

14) Wood Burning Power Plants in Vermont?

Recent VTDigger comment: "Just a single 25 megawatt (MW) woodchip plant could/would provide some 4% of Vermont’s consumption, 24/7, and would contribute to the Vermont economy in the form of jobs and money in circulation from the wages, taxes — wealth created in the state that stays in the state."

My response:

Expensive Renewable Energy is an Economic Headwind for Vermont’s Economy: Some of the main reasons burning wood is pushed by Vermont’s government are: 1) give work to the logging industry, 2) money is spent in Vermont, 3) create jobs in Vermont, etc. The commentator is right about jobs, wages, taxes, etc., but that is not the real issue.

Subsidized, renewable energy systems, inefficiently producing, variable, intermittent energy at 2 – 5 times wholesale prices are the REAL issue. Vermont needs to have LOW-COST renewable energy to make the ALL sectors of Vermont’s economy more viable, so they can expand, be profitable, create jobs, pay good wages, and pay taxes.

Vermont, one of the poorest states in the U.S., with a fragile economy, cannot afford to turn over a major part of its economy to expensive renewable energy production. With more and more of such subsidized, renewable energy projects, Vermont’s ENTIRE economy would be facing an increasingly stronger headwind for many years.

Wood-burning power plants require cutting trees and burning them, which may have an immediate, adverse global warming impact. However, the forest would require about 100 years to recover from the damage, based on numerous studies. See URLs. Wood-burning aficionados like to claim burning wood is “CO2-neutral”. They purposely forget to add: “over a period of about 100 years.” Global warming is a problem now. Wood-burning power plants are an inappropriate 100-year “solution”!

<http://ces.williams.edu/files/2011/02/Mary-Booth-Wiliams-Talk.pdf>
<http://www.globalchange.umich.edu/globalchange2/current/lectures/deforest/deforest.html>

Wood-Burning Power Plants

Some people advocate for wood-burning, combined heating/power, CHP, plants, with thermal distribution systems to buildings (likely energy-hog buildings), because, they claim, such systems are more efficient, which is true, but the efficiency of just the CHP plants is about 50%, whereas of wood-burning, power-only plants it is about 25%.

Much of the “waste heat” of both type plants is used to process and dry the fuel, usually wood chips, before burning. Any leftover heat could be used for heating buildings connected to a high temperature hot water, HTHW, system. BTW, steam distribution systems are NOT preferred, because they have much higher operating and maintenance costs, etc.

Most existing CHP plants use natural gas, coal, or oil (some recent plants AUGMENT those fuel inputs with biomass, i.e., wood) and much more heat is available for heating buildings. Such CHP plants have efficiencies up to about 75% with traditional boilers, up to about 85% with 60%-efficient, combined-cycle, gas-turbines, CCGTs, as provided by Siemens and GE.

The above 50%, 75%, and 85% efficiencies are greatly reduced, because of heat losses of the distribution systems and of the connected buildings usually being leaky, poorly insulated, i.e., energy-hog buildings.

CHP systems may be attractive to lay people who are not familiar with the numbers, including the capital and operating and maintenance costs, but as energy-efficient building design has greatly advanced these past 40 years, CHP district heating systems is rapidly becoming a bygone technology, that was applicable when energy and other costs were much less.

Yet, DPS, the author of H-40, appears to be on autopilot, as it ignores the possibilities of energy-efficient buildings, and continues to advocate subsidies for the

bygone technology of wood-burning CHP plants with 50% efficiencies!!

It would be far less costly to pay the additional money to design near-zero energy buildings, instead of wasting it on CHP systems of an earlier age. Trying to convince such decision makers to let go of their ingrained, uninformed thinking is quite an uphill battle.

Below are some calculations regarding 25 MW, wood-burning power plants.

Energy Production, Wood Chip Input and Capital Cost

A 25 MW, wood-burning power plant operating at 90% capacity factor (base-loaded mode) will produce 197,100,000 kWh/yr., or about 3.52 percent of Vermont's 5,600,000,000 kWh/yr. consumption.

Plant heat input = production x (3,413 Btu/kWh)/0.25 plant efficiency = 2,691 billion Btu/yr.
<http://www.masonbruce.com/wfe/2008Program/martin.pdf>

Wood chip input = plant heat input/(23,139,667 Btu/cord) = 116,286 cord/yr., or 290,714 ton/yr.

The estimated capital cost = 25,000 kW x \$4,000/kW = \$100,000,000.

See Page 31

<http://www.stlawu.edu/green/sites/stlawu.edu.green/files/reports/INRS%20Final%20Report.pdf>

CO2 Emissions

Usually, it comes as a surprise to lay people when told wood-burning CO2/kWh and particulate/kWh are at least as bad as from coal. Here are some numbers:

1) Harvest, process, transport CO2 emissions = 2.09 gal diesel fuel/green ton x 290,714 green ton/yr. x 22,384 lb. CO2/gal = 13,600,341 lb. CO2/yr., or 6,800 ton CO2/yr.

2) Wood-burning CO2 emissions = 195 lb./1,000,000 Btu x 2,691 billion Btu/yr. = 524,707,794 lb./yr., or 262,354 ton/yr.

Total CO2 emissions = 1) + 2) = 538,308,135 lb. CO2/yr., or 269,154 ton/yr.

Truckloads and Harvested Area

Truckloads = 290,714/(32 ton/truck) = 9,085/yr., or 36/day, based on 250 hauling days.

Harvested area = cords/(0.5 cord/acre) = 232,571 acres, or 363 sq. miles.

Harvested area radius = sq. root of 363/pi = 10.76 miles, if only harvestable forest is in that area. In the real world, the harvested area is 9 to 25 times greater, corresponding to a radius of about 30 to 50 miles!! Beyond 50 miles, the hauling cost would be uneconomical. As a result, Vermont could have only a few ADDITIONAL 25 MW wood-burning plants.

Using No.6 Fuel Oil Instead of Wood Emits 33% Less CO2

Oil-fired power plants have efficiencies of about 35%. Which means the Btu input to the boiler is 25/35 = 71% of the wood-burning power plant.

Combustion CO2 emissions = 173.906 lb. CO2/million Btu x 0.71 x 2,691 billion Btu/yr. = 334,248,475 lb. CO2/yr., or 167,124 ton/yr.
Production CO2 emissions = 12.5244 lb. CO2/million Btu x 0.71 x 2,691 billion Btu/yr. = 24,071,979 lb. CO2/yr., or 12,036 ton CO2/yr.
Transport CO2 emissions = 0.62622 lb. CO2/million Btu x 0.71 x 2,691 billion Btu/yr. = 1,203,599 lb. CO2/yr., or 602 ton CO2/yr.
Total CO2 emissions = 359,524,053 lb. CO2/yr., or 179,762 ton CO2/yr., which is only 67% of the wood CO2 emissions/yr.

NOTES:

1) Cord weight of low-grade, green wood chips = 5,000 lb. = 2.5 ton.
<http://www.biomasscenter.org/pdfs/Wood-Chip-Heating-Guide.pdf>

2) 0.5 cord/acre may be harvested to conform to sustainable forestry practice. One sq. mile = 640 acres.

Better Alternatives Than Renewable Energy Build-outs

Hydro-Energy from Hydro-Quebec: Getting more, low-cost (5 – 7 c/kWh, per Dostis of Green Mountain Power), steady, not variable, not intermittent, near-CO2-free, hydro energy from Hydro-Quebec would be the BEST way to get ALL the sectors of Vermont's economy moving again.

Energy-Efficient Buildings and Vehicles: Building net-zero-energy buildings and encouraging the use of high-mileage light vehicles are much more effective measures to reduce fossil fuel consumption and manmade global warming than wood-burning power plants, and they have near-zero, adverse environmental impact.

<http://theenergycollective.com/willem-post/332911/high-renewable-energy-costs-damage-vermonts-economy>
<http://theenergycollective.com/willem-post/2146376/renewable-energy-less-effective-energy-efficiency>
<http://theenergycollective.com/willem-post/2162036/comparison-grid-connected-and-grid-houses>
<http://theenergycollective.com/willem-post/46652/reducing-energy-use-houses>

15) Increased Wind Energy versus Increased Canadian Hydro Energy

Annette Smith writes: "ISO-NE's 2014 electricity outlook projects based on public policy and economic choices being made now that in the future the grid mix will be 55% natural gas, 40% wind and 5% other." See URLs.

<http://vtdigger.org/2015/02/13/changes-net-metering-energy-projects-proposed/#comments>

What will tomorrow's energy mix look like? See page 16
http://www.iso-ne.com/aboutiso/fin/annl_reports/2000/2014_reo.pdf

Let us look at some numbers to see what it would take to implement the future energy mix mentioned in the ISO-NE report.

New England consumes about 125,000 GWh/yr., of which Vermont's consumption is about 5,600 GWh/yr. With more heat pumps and electric vehicles, those levels of consumption will drastically increase by a factor of 2 or 3, even with increased energy efficiency, according to Blittersdorf, Angwin, et al.

From government records, we know, the New England ANNUAL AVERAGE, ONSHORE, CF is about 0.26 for newer installations; some installations are higher, others lower.

If Wind Energy Were 100% On-shore: Number of ONSHORE 63 MW Lowell Mountain systems required in New England = $(0.4 \times 125,000,000 \text{ MWh}) / (8,760 \text{ hr./yr.} \times 0.26 \times 63 \text{ MW}) = 348$ systems, of which Vermont ridge lines would have $5.6/125 \times 348 = 16$ systems.

Capital cost = $348 \times 63 \times \$2,800,000/\text{MW} = \61 billion, plus about \$15 - \$20 billion in grid upgrades, plus capital cost for changing the mix of the OTHER generators to enable balancing the variable, intermittent energy, AND to provide energy when wind energy is inadequate*, including as low as 1 or 2% of energy on the NE system. The WHOLESale cost of that wind energy would be about 10 - 15 c/kWh.

* Germany, et al., have similarly low wind energy outputs during more or less UNPREDICTABLE periods.

If Wind Energy Were 50% On-shore + 50% Off-shore @ CF = 0.40: Capital cost, 50% energy on-shore, 50% off-shore = $30.5 + \$4,000,000/\text{MW} \times (0.2 \times 125,000,000) / (8,760 \times 0.40) = 30.5 + 28.5 = \59 billion, plus about 15 - 20 billion in grid upgrades, plus capital cost for changing the mix of the OTHER generators to enable balancing the variable, intermittent energy, AND to provide energy when wind energy is inadequate, including as low as 1 or 2% of energy on the NE system. The WHOLESale cost of that wind energy would be about 10 - 15 c/kWh on-shore, and 20 - 25 c/kWh off-shore.

Canadian Hydro Energy is a Much Better Alternative: Getting much more, low-cost, near-CO2-free, STEADY (not variable, not intermittent) hydro energy from Quebec, New Brunswick and Labrador would involve about \$5 - \$8 billion in new HVDC lines, NO significant grid changes, NO significant generator mix changes, plus that energy would be at 5 - 7 c/kWh, per Dostis of GMP, who knows these numbers better than most of us. A MAJOR LONG-TERM plus for the New England economy.

Some Comments on Wind Energy: People should know by now, in New England, wind energy is zero, or near-zero, about 30% of the hours of the year, and solar energy is zero, or near-zero, about 65% of the hours of the year. Often both are at near-zero levels. See URL, click on Renewables.
<http://www.iso-ne.com/isoexpress/>

That means ALL other generators need to be kept in good running order, staffed and fueled to provide almost ALL energy during these hours, and lesser quantities of energy, including for balancing the variable solar and wind energy, during other hours!! Two energy systems to do one job!

The current NEK grid is perfectly adequate to serve the NEK demands, but feeding variable, intermittent wind energy into that grid would cause excessive instabilities, as was found with the Lowell project.

It is well known by DPS, PSB, GMP, VEC and Klein's Committee, et al., the NEK would need at least \$300 million of grid upgrades before significant variable, intermittent, grid disturbing, wind energy could be added. Just adding the cancelled SENECA system would have cost \$86 million in grid upgrades. GMP had to spend a total of about \$20 million to connect the still underperforming Lowell system to the grid.

NOTE: Economically viable energy storage systems, other than hydro, have not yet been invented, and would take many billions of dollars and decades to deploy AFTER they are invented.

