Total Energy Study:
Public and Stakeholder Engagement Appendix

Contents

Legislative Report:

Public Comment Summary

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1 Introduction

The purpose of this Appendix is to provide a synopsis of comments on the Total Energy Study (TES) solicited and received from energy stakeholders and the public between June 21st and December 2nd, 2013. Commenters responded to various requests from the Public Service Department (PSD):

1. Energy stakeholders submitted written responses to the PSD's Request for Information regarding the Total Energy Study Framing Report.

2. Energy stakeholders participated in eleven focus groups during the summer of 2013. Some submitted written comments as a follow up to the discussions.

   One hundred and thirty two representatives participated from 79 organizations of varieties of businesses and their associations, local and national energy businesses and consulting firms, energy utilities, environmental and citizens advocacy groups, academics, financial institutions, philanthropists, transportation authorities, law firms, town energy committees, planners and other local, state, and federal governmental agencies. Refer to Appendix B for a list of participants.

3. The public and energy stakeholders attended a TES Public Meeting and Webinar on November 14th at the State House and on-line.

4. The public and energy stakeholders submitted written comments from November 14 through December 2nd.

All who provided input are invested in Vermont's future. All statements below were summarized from the summer focus group discussions, the public meeting, and written comment. No comments have been validated. Comments suggesting that a particular action should or should not be taken, should not be interpreted as evidence that the action has or has not already been taken.

This appendix is organized in the following fashion.

- Section 2 Energy Goals and Principles includes comments related to Vermont energy and greenhouse gas goals and methods used to measure energy demand, energy consumption, the renewables component, and greenhouse gas emissions. Section 2 includes comments related to the overarching statutory goals of Vermont's energy policies. Section also includes comments regarding how the public, the private sector, or the Legislature might drive or react to State energy policy.
- Section 3 End Use Demand Technologies & Services and Section 4 Energy Supply Technologies & Services include comments related to technology and service requirements, existing markets, and resources.
- Section 5 Energy Policy Development includes comments regarding priorities, pacing, evaluation criteria and other principles which energy policy analysis and development should consider

during the design of new policies. Section 5 also summarizes comments related to the five primary policy sets described in the Total Energy Study Legislative Report.

2 Energy Goals and Principles

2.1 Energy Goals and Their Measurement

The Legislature required that the TES analyze how to reach the currently defined State energy and greenhouse gas goals. Therefore, few commenters expressed an opinion for or against the current goals as set by the legislature. Many commenters did point out that in order to achieve these energy goals, massive change is needed and that we are entering a new energy frontier. One commenter stated that operating our society at current levels is incompatible with substantial greenhouse gas (GHG) reductions. A few commenters advocated for setting all energy goals such that their achievement directly supports meeting the GHG goals. A particular concern was expressed that if total energy consumption grows, Vermont might reach our renewable goals but not our GHG goals. One commenter advocated for moving beyond our goals to 100% renewables with near-zero GHG emissions as soon as possible.

Many commenters discussed data representations of Vermont's energy portfolio (e.g. pie charts of total energy by resource type) often calling for more clarity in how certain activities are measured and presented, such as the buying and selling of Renewable Energy Credits (RECs), reduction in demand, electricity feedstock resources , and energy losses (heat, transmission). Several commenters appreciated the PSD's more recent visual presentations of total energy supply which differentiate RECs that are sold. Several commenters requested that natural gas purchased through regional electric markets be quantified and shown in Vermont's representations of total energy consumption.

Renewable Energy Goals: Most commenters agreed that Vermont policy should prioritize reducing reliance on fossil fuels. Most commenters agreed that to reach Vermont's renewable energy goals, energy efficiency and conservation are critical primary strategies.

Measuring the Renewable Energy Component of Total Energy: Several commenters requested clarity on how energy savings from efficiency and conservation will be accounted for in the measurement and projection of declining energy usage. More specifically, will these savings be treated as demand reductions against total energy consumption or reductions in supply? Several commenters recommend the former.

One commenter stated that U.S. Energy Information Administration (EIA) data projections used in PSD planning are based primarily on expected demand, which is shown to increase through 2050. This person believes that EIA demand projections are overstated and recommends following biophysical economics methods to account for physical and economic constraints which are likely to lead to an inevitable fall off in consumption around 2030.

One commenter stressed that when measuring the renewable component of the energy mix, we should include the investment of fossil fuels needed to manufacture and install new technologies like electric

vehicles (EV) and photovoltaics (PV). This person contends that relevant GHG measurement and policies should account for the embodied energy in all goods and services produced and consumed in Vermont.

Measuring the renewable resource component of Vermont's total energy supply requires that renewable and non-renewable resources are converted into common units. The standard practice is to convert power outputs from renewables to a British Thermal Unit (BTU) equivalent. One commenter recommends that kilowatt-hours be used as the common measure, given that a majority of Vermont's energy will most likely be derived from electricity in the future.

One commenter highlighted the issue that combustible fuels suffer a loss of heat that renewables such as wind, hydro, and solar do not. Therefore, the use of BTU equivalents will tend to overestimate heat loss from the renewable component of our energy mix. One commenter recommended that "source energy" measurement be more transparent and accurately show the "energy intensity" of Vermont's economy, methodologies for which the EIA has published research. This commenter urges that all efforts should be made to prevent waste in energy generation from being counted in the renewable energy component of our energy mix.

GHG Goals: Many commenters support exploring new and systematic approaches to address Vermont's energy goals. Most are deeply concerned about the impacts of global carbon emissions.

GHG measurement: Several commenters wanted Vermonters to understand that many GHGs will persist in the atmosphere for thousands of years. The timing of emissions reductions is important in meeting GHG goals due to multi-decade lag effects and positive feedback loops. The emissions rate must be less than the global absorption rate to slow or prevent climate change. If all GHG emissions stopped today, climate change would still cause substantial problems. To make better decisions in directing and pacing policy and technology pathways, GHG measures should be presented in terms of a carbon budget and account of compounding atmospheric effects. Many commenters supported the use of lifecycle analysis when measuring GHG emission, though all are aware of the accounting complexities and wide variability in measurement techniques. One commenter cited particular technologies: hydro dams are responsible for GHGs emitted in the decomposition of flooded biomass; intermittent renewable sources require more spinning reserves which emit GHGs; earthworks for new generation and transmission infrastructure clears carbon-storing vegetation; crop-based biofuels may require additional nitrogen fertilization; increased bioenergy production may reduce carbon sequestration benefits from existing land uses. One commenter requested that lifecycle analysis for bioenergy sources include all nonrenewable energy inputs used in their manufacture. Commenters were in general agreement that further dialogue is needed within Vermont regarding the right GHG measurement methodologies and that the terms "clean" and "renewable" should be applied with care.

Several commenters noted that planning documents need to include explicit discussion of research on natural gas GHG measurement. Some measures put lifecycle shale gas emissions near that of coal when accounting for shale gas infrastructure development and operation, including pipeline extension, well pads, access roads, large volumes of water, and release of fracking fluids that may not be recovered or rendered harmless.

There was frequent discussion among commenters about the on-going controversy over how to measure GHG emitted from bioenergy. Some experts consider bioenergy old carbon and thus carbon emitting. Other experts count bioenergy as new carbon and thus carbon neutral. A few voiced concerns over if and how lifecycle accounting would be applied. Will biogenic emissions be counted at-the–stack, when burned, or via lifecycle accounting? Will GHGs from cut firewood be counted? Well informed policy design on the accounting methods can shape reduction in net emissions.

2.2 Projecting the Future: Total Energy Study Modeling

One commenter clarified that the TES will not be a package of strategies but is part of an ongoing process to provide policy directions aiming to optimize benefits for customers, energy systems providers, and the general society. One commenter compared the process to piecing together a daunting puzzle, making a design out of much data, many pieces, and many ideas. One commenter would like to see more evidence that the State is following a systems approach when planning for change related to energy systems, global climate, economic, and social systems, including more information on the connections among policies proposed.

The TES modeling exercise involves comparing a baseline scenario to alternative scenarios comprised of different combinations of policies and technologies. Commenters agreed that TES modeling must distinguish baseline efficiency and conservation savings from new efforts. For instance, CAFE standards should be treated as baseline measures while the impacts from any new state policies to encourage efficient vehicle ownership should be counted as additional savings above the baseline. Several commenters expect that projecting the baseline current policies forward will show how dramatically far Vermont is from meeting its energy goals.

One commenter recommended that each TES Model run prioritize efficiency and conservation programs first and then apply renewable resources. The model should track and measure the impact of new, above baseline policies without counting demand reduction towards Vermont's renewable energy goal. However, another commenter noted that the model needs to dynamically compare the cost effectiveness of efficiency and renewables simultaneously. As renewable technology costs decline they are becoming more cost competitive than efficiency under particular conditions.

2.3 Statutory Goals

2.3.1 "adequate, reliable, secure and sustainable"

Refer to Section 4 Energy Supply Technologies & Services

2.3.2 "assures affordability" and "least cost planning"

Several discussions and written comments noted that forward looking energy planning publications and presentations need to include specific information on costs to residential and commercial/industrial consumers. There needs to be more discussion about consumer choice; consumers need the freedom to state their preferences for energy resources and technologies. One commenter stressed that consumers need opportunities to weigh in regarding their willingness to pay for carbon reduction programs and more renewables.

2.3.2.1 Least Cost Planning

One commenter noted that all energy planning documents listing Vermont's key energy statutes in their introduction should include 30 V.S.A. §202a(2) which requires least cost integrated planning by law.

Several commenters rallied for updating the least cost planning framework historically applied to the electric supply sector, to integrate both the supply and demand sides of the transportation and building energy sectors. Scenario analysis using least cost rules should be indifferent to the scale of projects within any sector; scale will be determined by the energy demand consumers. One commenter suggested another advantage of least cost planning is that an assessment of capital availability can be captured when levelizing the costs of ownership across technologies.

Commenters agreed that efficiency is most often the least cost solution.

Commenters discussed the lack of outcomes in the 2013 legislative session to advance energy policy. Cheap natural gas conflicts with long term efficiency and renewable goals. Some commenters said new legislation was stalled because citizens and legislators are not motivated given that new energy investments have large up-front costs and little if any immediate payback.

New wind energy development was commonly identified as the cheapest new renewable technology. One commenter stressed that consideration of transmission, integration, and environmental costs show wind to be less competitive, especially as costs fall for PV, hydro dam upgrades, and combined heat and power (CHP).

The integration of renewables requires new grid operations technologies and could require increased reliance on fast ramping, higher emitting natural gas plants, energy storage, and in the worst case, temporary curtailment of renewable generators. Several commenters raised questions about how these costs are accounted for when comparing technologies.

One commenter underscored the need to optimize the deployment of renewable generators and energy storage capacity. Energy storage costs are high in terms of capital and operation. Energy planners need data and models to assess the future optimum mixture of renewables that will minimize the need for energy storage and thus minimize total system costs. Data at the right resolution and frequency should be collected from wind, solar, and hydro resources at key locations across Vermont. New legislation and regulation might be needed to make this data available from operators.

Cost Benefit Analyses: Many commenters requested that cost effectiveness analyses and screening tools include total environmental and societal costs (including health impacts) of projects on a lifecycle basis or that the specific costs and benefits be considered under separate criterion. One commenter stressed that until there is consistency in the accounting of full costs and benefits, including insurance, subsidies, tax breaks, etc. across technologies and energy sectors, rational decisions cannot be made by consumers and politicians. While advancing these methods is beyond the TES, a forum for discussion should be defined.

Some commenters highlighted that cost benefit screening tools need to consider particular renewable technologies which become more cost effective as markets deliver lower prices due to economies of scale. For instance, in certain buildings solar can be more cost effective than efficiency measures.

Some commenters voiced the opinion that there are economic benefits to simultaneously developing efficiency and renewable markets in Vermont. Screening tools that give competitive advantage to low cost efficiency measures need to be strategically adjusted in tune with new policies that give greater weight to renewable technologies, especially as the relative installation and operating costs change. Screening tools should be designed to recommend efficiency and/or renewables for a building based on owner specified monthly or annual operating (and financing) expenses.

Energy Return: A few commenters suggested that all energy technologies and projects be evaluated in terms of energy return on energy invested (EROEI) and energy payback time.

2.3.2.2 Price Signals and Markets

Commenters discussed the impact of price signals. In order to adjust markets and influence consumers, energy price signals need to be large and consistent. One commenter contended that the magnitude of energy pricing adjustments needed to impact behavior would have to be effected at the federal level to be feasible. One commenter mentioned that without other dials to turn (e.g. funding), price signals need to be as high as European style energy taxes. Commenters discussed the need to avoid the "P-scream," which happens when prices become too high and create backlash among consumers.

Commenters generally supported using transparent market mechanisms to influence energy systems. The true costs of energy production and consumption should be internalized, however lower income residents need to be protected via vouchers or subsidies. Some commenters stated that price signals are effective public relations campaigns and the right price signals will shift the culture toward lower energy consumption.

Other commenters noted that consumers often do not respond to price signals, new technologies, and markets as expected. Commenters said policies and programs need to be designed with careful consideration of human behavior. Consumer behavior needs to be studied. For instance, significant gasoline price increases and volatility have not lowered Vermont's average Vehicle Miles Traveled (VMT) proportionally. One commenter noted that if gas prices incorporated the true costs of production and externalities, electric vehicle purchases and operation costs would be more competitive.

Commenters recommended tiered rates such that higher prices above standard thresholds are set to reward conservation and protect low-income households. Some commenters noted that tiered pricing for certain resources, such as gas or heating oil, has less potential to incentivize immediate behavior change, but would encourage behavior change for conservation or investment in less energy intensive technologies if phased in and maintained. One commenter recommended tiered pricing be applied to total energy use.

One commenter countered the concern stated by others to always protect the most "vulnerable" from policies that institute pricing mechanisms which are set to influence behavior. This person noted that at

some point the government will not have the resources to provide on-going subsidies that encourage unsustainable behavior, for instance when gas moves to $6 per gallon.

2.3.3 "encourages the state's economic vitality"

Many commenters noted that the impact of energy policy on economic development is not discussed or analyzed with enough frequency or depth.

Commenters noted that Vermont's ability to attract and retain businesses and employees must be cultivated. Many commenters emphasized that price and rate competitiveness must be preserved. There is concern that Vermont's relatively high electricity costs put us at a regional and national disadvantage, although we remain competitive due to other factors, in particular quality of life. As energy transformation unfolds, these costs and existing competitive advantages need to be carefully balanced. One commenter stated that Vermont's energy goals, e.g. "90% by 2050", need push-back from PSD. Striving to reach the goals could raise energy prices sufficiently and cause harm to Vermont's economic development. Analysis is needed not just to study "how to reach the goals", but also to understand "how to mitigate the economic impacts of reaching the goals".

Many commenters held the view that prioritizing the development of in-state renewable energy resources will maximize local economic benefits by creating jobs and keeping dollars in-state.

Some commenters emphasized that the internalization of externalities would be most successfully implemented on a regional, national, or international basis.

Commenters stated that Vermont should be wary of locking-in technology that would make the state less flexible to adopt emerging technologies.

Several commenters noted that transportation and land use policies supporting Smart Growth principles and well designed local/regional transportation systems are beneficial for local economies. One commenter stressed that planners need to be better at concretely demonstrating the economic benefits of funds spent to implement Smart Growth principles.

2.3.4 "efficient use of energy resources and cost effective demand side management"

Refer to Section End Use Demand Technologies & Services

2.3.5 "environmentally sound"

One commenter stated that energy planning needs to broadly assess the cumulative effects of environmental impact; project-by-project assessment does not capture the full picture. For example, transmission build out to reach an array of distributed and remote generators can cause habitat fragmentation.

One commenter warned Vermonters to avoid environmental imperialism and prioritize using resources locally for our energy supply.

One commenter was against siting biomass district heat plants in the vicinity of homes due to concerns over air quality health impacts.

2.4 The Actors and Their Motivation for Action

Many commenters stated that to implement Vermont's energy goals, a sense of urgency is warranted by the Governor, citizens, and Legislature. Commenters stressed the need for significant immediate action sustained over decades; Vermont should not wait for easier conditions, lower technology costs, or broader public support. One commenter said that the need for massive change in our energy systems and the effort to get there needs to be communicated in a positive way rather than from a place of fear and scarcity.

One commenter was concerned that small municipal utilities do not have the capacity to manage the evolving complexity and transformation of energy systems. Their capacity needs to be addressed in planning and perhaps through new policies that help small utilities pool resources, following the VPPSA model.

2.4.1 The Public

Commenters emphasized that a sustained effort of public outreach and education is critical. Consumers need simple, credible messages. Myths need to be dispelled. Some commenters stated that consumers need to be empowered to make different choices about their energy consumption. Education on energy systems and climate change in schools is important.

Commenters stated that service providers need to speak a common language using standard definitions. Social-norming will permit neighbors to share comparable information. One commenter suggested that consumers might be more energy aware if they received one bill rather than multiple bills for energy costs.

Several commenters noted that consumers are sensitive to how they use energy (it's a lifestyle issue) especially with regards to how they heat or cool their living spaces and their reliance on cars. A human touch is needed when providing services to consumers. Service providers need to take the hassle out of mysterious projects and effort.

One commenter noted that Vermonters need to understand the complex trade-offs in all choices regarding our energy future, and be open to the benefits of home-grown energy sources which could include increased security and an improved quality of life.

Several commenters stressed that the public would experience a psychological shift to become more engaged as energy resources are localized, similar to the trends that have swept Germany. The "keep it local" buzz is effective.

2.4.2 The Private Sector

One commenter representing Vermont businesses noted that the private sector should "innovate and creatively partner" with the state government. Numerous comments took as their starting point that private businesses, such as energy providers, will be critical actors in any energy transition.

2.4.3 The Political Landscape for Action

Commenters felt it is important that the TES analysis be non-partisan. One commenter stressed that until least cost planning and cost benefit analyses assess the full costs of our energy choices consistently across technologies, state and local politicians will not be given the "lift" required to promote clean energy policies.

Several commenters suggested that energy stakeholder groups need to work together and avoid neutralizing each other in their approaches to influence legislative action. One commenter said politicians are motivated by cost issues, thus the most compelling message is that the right energy policies will result in lower costs; also that the Governor and leaders in the legislature need to stand behind Vermont's energy goals, heed expert recommendations from studies, and lead from their platforms. One commenter suggested that politicians need to sell the benefits of energy independence and job creation. Commenters noted that policies with broad benefits are worth the effort to move through a potentially difficult political process. A few commenters expressed the need to take back the term "tax". Good tax policy is an effective mechanism to shift behavior.

One commenter contended that the magnitude of energy market shifts required to motivate adequate behavior change must be enacted through proactive political action. However, it might take a crisis to spur such action, at which point the markets will have already dramatically adjusted.

3 End Use Demand Technologies & Services

3.1 Overarching Energy Efficiency & Conservation

Commenters agreed that lowering energy demand is critical. The cheapest energy is that which is never used. Demand side management should be applied across all energy sectors. One commenter suggested that the largest energy users in the Vermont should receive specific attention to help them reduce their consumption.

Behavior Change: A number of commenters discussed behavior change as an important opportunity for demand reduction. One commenter mentioned Vermont's work to develop a Genuine Progress Indicator as a forum to broaden discussion regarding how energy choices align with quality of life. Planners also need data on how different technologies impact behavior; for example wood stoves favor zoned heating, solar hot water users schedule usage on sunny days, and low operating costs for electric vehicles might encourage higher vehicle-miles-traveled.

One commenter recommended that the State review all options for implementing energy efficiency programs, noting the Vermont Energy Investment Corporation's track record, but remaining open to new administrative structures.

Rebound effects: Many commenters are concerned that reduced costs from increased efficiency and fuel or mode switching might cause consumers to use more energy. For instance, one commenter predicted that higher miles per gallon (MPG) cars or EVs that are cheaper to operate will encourage

more driving. To prevent this rebound, a few commenters stressed that efforts to increase efficiency need to be coordinated with increases in energy prices.

3.1.1 Building and Industrial Energy Efficiency

Most commenters support continued investment in weatherization as a critical pathway; this is a mature technology. Policies, standards, education for consumers, and certification for building trades are needed to prevent sub-standard new construction and renovation. Other New England states are doing a better job than Vermont.

One commenter emphasized that there is lot of efficiency left to capture but in residences of people who need public assistance. All the major efficiency work in the commercial and industrial sectors is complete.

Commenters noted that State funds for all current building efficiency incentives are collected from electric sector charges. There is a need to align Efficiency Vermont's (EVT) electric and thermal goals with higher level goals in Vermont's 2011 Comprehensive Energy Plan (CEP). There is a lack of clarity from the PSD on how to adjust EVT goals.

Several commenters emphasized that larger commercial and industrial entities have the expertise and capacity to strategically design and carry out progressive projects to lower their energy demand. These entities want to self direct their efficiency investments. Several commenters mentioned that the Energy Service Company model is not evolving because companies don't want to commit to long term contracts. One commenter mentioned that energy efficiency spending requirements need to be visible to corporate headquarters (which may be located outside of Vermont).

Building Energy Codes, Net Zero Buildings: Building to Net Zero standards does not cost much more than building to current efficiency standards. Commenters noted that in order to analyze the potential of Net Zero building technology, data collection is key. Data needed includes time series data of new construction per year, the state of current building stock, estimates of energy usage per square foot. One commenter asked whether Net Zero should be defined based on energy usage or carbon emissions. One commenter suggests that a better term for the standard should be Net Neutral, signifying the inclusion of building owner investments in renewable generation.

There is a need to identify buildings that are patched together and therefore extremely expensive to retrofit. A decision needs to be made as to whether those buildings will be exempt from new standards or eligible for more lenient standards.

Most commenters noted that the enforcement of building energy codes is critical. One commenter noted that code enforcement is effectively voluntary now but that incremental change is in the works. The issue is very local. Neighbors are known to encourage each other to cut corners to reduce up-front capital costs. Education about savings and other benefits is widely needed.

Several commenters noted that standards need to specify appropriate building sizes based on the structure's function. One commenter suggested that generation on-site be required for a building or

complex of buildings that exceed specified energy consumption standards set for their building function, e.g. for residential, and commercial categories.

Some commenters want buildings to meet a minimum efficiency standard at the time of sale. Other commenters warn that restrictive policies like mandatory efficiency upgrades before sales will be insurmountable in terms of administration and will hamper the real estate market, especially when the market is strained.

Building Efficiency Labeling/Scoring: Many commenters support implementation of building efficiency labels or scores, similar to the Environment Protection Agency's MPG rating for cars. Vermont can start with a voluntary effort. One commenter suggested that the efficiency label be required at the time of sale. Some commenters want scores to include locational efficiency measures which evaluate a building user's transportation energy requirements (e.g. food, schools, medical, and recreation).

Scores need to reflect the cost effectiveness of both efficiency measures and the use of renewable energy supply for heating and electricity. A baseline standard for building efficiency is needed. Vermont needs to formulate policies on sharing building score data; a body of knowledge is needed to direct programs, but privacy must be protected.

Building Trade Training: The pace of technology development is out-running contractor knowledge. More young people need to be recruited and educated.

Consumer Service: Commenters emphasized that consumers need guidance and hand-holding to implement the right solutions. Along with building efficiency certification and licensure for tradespeople, a system of referrals (clearinghouse) is needed to encourage consumers to hire contractors who are trained and up-to-date on the most current technologies. Trades people need to refer each other. Realtors have expertise in both guiding and hand-holding consumers.

3.1.2 Transportation Efficiency and Mode Switching

Commenters requested information on the percent of single occupancy vehicle travel that makes up the total energy use in the transportation sector and what portion is commercial in nature.

Several commenters noted that work place transportation demand management is the surest means to influencing how most people travel. Vermont needs effective regional associations of employers and transportation providers.

Transit services to key regional and metropolitan areas need to be improved. Several commenters noted that public transportation has attracted ridership with wireless internet. Employers are recognizing telecommuting in transit.

Transit Buses & Shuttles: One commenter stated that good design for transit services includes scheduled stops every 15 minutes at each point. Another stated that we need to shift to community oriented transportation (e.g. small shuttles loops, route shifts upon request). One commenter recommended that Vermont coordinate bus routes statewide so that schedules and stops allow for convenient transfers.

Rail: One commenter recommended reestablishing overnight service to New York City. Vermont could collaborate with Amtrak to survey potential riders and plan the best schedules to improve ridership. Another commenter stated that Amtrak is not the answer and believes there is tremendous opportunity to reduce VMT and build the economy with a state-owned commuter train between Bennington and Burlington. One commenter supports the transfer of non-perishable freight by rail instead of trucks.

Smaller Electric Vehicles: One commenter asked that planners include in discussions and modeling the potential to replace car use with smaller vehicles including electrically powered neighborhood vehicles, bicycles, and scooters. Smaller vehicles are effective for commuting.

Some commenters recommended that a transportation data group be convened to devise measures and goals for keeping VMT flat. Information is needed at a more granular level of resolution. We need to understand the impact of Smart Growth on VMT and how to build barriers against reliance on single occupancy vehicle trips.

The discussion of transportation demand reduction continues into the next section on Land Use Practices.

3.1.3 Lowering Energy Demand with Land Use Practices

One commenter described that the "Quintessential Vermont" is a mix of forest, farms, homes, quaint small towns, and more-affluent recreation/tourist destinations. Many commenters pointed out that current preferences for choosing residences in rural areas add to the challenge of meeting Vermont's energy goals. Several commenters noted that affordable housing needs to tie in with access to jobs and transportation. One commenter mentioned that Vermont's aging population requires special consideration for town and transportation designs.

Commenters acknowledged there are good land use policies in place but they are not being consistently executed by local governments. Another commenter questioned whether local and regional planners are supporting Smart Growth principles; there is a lack of funding. One commenter noted that many towns lack zoning altogether or have zoning laws that encourage dispersed development.

Several commenters noted that community development efforts are needed to encourage people to live in mixed-use community centers. As we approach 2050 businesses should be increasingly located near existing urban cores. One commenter expressed a vision for walkable and bikeable town centers that would include locker rooms and showers for employees and safe sidewalks and bike route systems. Commenters suggested creating more car-free areas. One commenter noted that parking requirements for buildings are often inflated and this encourages reliance on car travel.

One commenter was concerned that Smart Growth policies will receive back lash from the public, many of whom prefer living in suburbs or exurbs. Another commenter noted that people are leaving Vermont to live in dense mixed-use communities. Another commenter noted that because of a lack of growth pressures in Vermont, Smart Growth policies are not receiving attention in the political arena.

3.2 Load Shifting and Demand Response

Commenters agreed that after optimizing investments in energy efficiency, energy systems need to shift from managing loads to optimizing demand response.

Smart Grid: Commenters noted that smart grid technology allows both grid operators and building owners to reduce thermal and electrical energy consumption, permits distributed generation and renewables to be safely connected to the grid, and can reduce investment in new utility infrastructure (by shifting loads to off peak). The costs of smart grid upgrades are covered by these savings.

One commenter noted that Vermont is a national leader in deploying Smart Grid technology with 90% of Vermont electric customers having smart meters.

3.3 Fuel Switching

Commenters actively discussed the electrification of the building energy and transportation sectors. Also, bioenergy technologies provide opportunities for switching off fossil fuels.

Some feel that the electrification pathway is in synch with Vermont's least cost energy planning directives. One commenter believes that technology advances will offer opportunities to electrify many segments of energy use. Of particular note is the potential total energy savings from switching from petroleum fuels to electricity via air-to-air heat pumps and electric vehicles. One commenter suggested that Vermont can learn from electrification programs being successfully implemented in other states such as California, and abroad, such as Israel.

One commenter emphasized that renewably generated electricity will not be able to replace all energy derived from fossil fuels. Also, some biofuels have lower energy density than petroleum fuels.

Several commenters stated that industrial entities have limits in their ability to replace fossil fuels with renewable resources for processes requiring very high temperatures; electrical supply cannot generate such high temperatures cost effectively. They mentioned that CHP could work. One commenter noted that for lower temperature processes, there is potential for fuel cell technology where the source energy originates from natural gas, or propane and perhaps hydrogen for sites beyond natural gas pipelines.

3.3.1 Transportation

Electric Vehicles: Many commenters support policy directions that promote the electrification of transportation through the deployment of light-duty EVs and electric vehicle charging equipment (EVCE). One commenter noted that EVs are three times more efficient than conventional vehicles. EVs are entering the market more quickly than hybrids were at a comparable stage of market development. One commenter noted the limited lifetime of current EV batteries.

One commenter noted the Drive Electric Vermont website as the state resource about electric vehicles. At least one guide about EVCE siting and installation is available for local governments from the Chittenden County Regional Planning Commission.

One commenter stated that the expense of buying an EV makes the technology beyond reach for moderate and low income people. A few commenters mentioned that three year EV leasing programs are becoming competitive with those for conventional cars.

One commenter stated that electrifying transportation could save Vermonters almost $1 billion a year in annual energy costs and could result in lower utility rates. One commenter is concerned that the global economic system will not have the capital resources (due to rising raw material and manufacturing costs) to manufacturer EVs in the quantities required.

Other Fuels: One commenter pointed out that because diesel accounts for only 18% and gasoline accounts for the bulk of Vermont's transportation fuel use, the primary challenge for meeting Vermont's transportation energy goals, is to move away from gasoline-powered vehicles.

Several commenters support aggressive policy to replace some uses of gas or diesel with biofuels produced locally, especially for on-farm use.

Several commenters were cautious about investing in EV infrastructure, mentioning that fuel cell technology may still have potential and natural gas vehicles are already on the market. One commenter stressed that fuel cells are not an energy source but are energy carriers that will require renewable resources to generate hydrogen in order to stay on target with renewable energy goals. One commenter stated that fuel cell technology is not likely to reach a favorable EROEI when efficient production, hydrogen storage, and transportation are all accounted for.

Another commenter suggested that Vermont incentivize the purchase of flexible fuel vehicles.

Heavy Duty Vehicles: One commenter suggested that fueling stations offering biofuels and natural gas for heavy duty transportation (freight, transit busses) should be exempt from carbon pricing.

3.3.2 Building and Industrial Energy

Water Heating: One commenter noted that converting hot water heating is one of the more cost effective efforts available in building efficiency and suggested an analysis be done comparing solar hot water heating to air-to-air heat pumps powered by PVs.

Space Heating: Many commenters agreed that policies encouraging fuel switching or equipment upgrades should be prioritized and linked to building retrofits.

Several commenters promoted policy development for aggressive adoption of bioenergy technologies for space heating, including district heating for town centers and building complexes, pellet boilers for small residential and commercial buildings, as well as advanced woodstoves for rural residences. The solid biomass technology and markets are mature. Cold climate Europe has adopted these heating technologies. Several commenters suggested homes switch from fuel oil or gas to wood pellets.

Several commenters emphasized that fuel dealers should be key partners in related programs.

One commenter noted that heat pumps cost effectively harness renewable sources of electricity. And efforts should be made to alter Act 250 mechanisms which have discouraged electric heat.

Several commenters support aggressive adoption of air-to-air heat pumps; this technology is proven, cost effective, and can be cost competitive with natural gas. One commenter noted that heat pumps are applicable in commercial settings for water heating, and clothes drying.

One commenter was particularly against air-to-air heat pumps. Space heat loads have a significant impact on peak and could require load shifting from on-site energy storage. In order to keep space heating prices affordable, buildings would require near-zero energy construction or retrofits. In the past, consumers have viewed electric heat as uncomfortable.

A number of commenters requested more discussion of geothermal or ground-source heat pumps in energy planning discussions and related documents. One commenter detailed the costs and benefits of geothermal technologies for Vermont buildings.

Passive Solar Design: Several commenters suggested that passive solar design is a proven technology and should always be included in discussions and analyses of building efficiency policies. One noted that passive solar design can be a significant contribution to space heating and the design has the best return on investment over heating fuels.

4 Energy Supply Technologies & Services

Commenters requested that Vermont carefully analyze the economic benefits and other tradeoffs of developing in-state resources versus purchasing out-of-state resources on the market or via long term contracts. Commenters noted that due to Vermont's size and environmental policies, we should continue to plan for out-of-state resources. Long term contracting mechanisms and standards (size, environmental impact, emissions, etc.) can help Vermont meets its goals.

One commenter recommends that Vermont prioritize in-state resource investments in order to ensure the greatest economic benefits and long term control over our energy resources.

One commenter stated that long-distance energy distribution systems, including transportation infrastructure, produce energy losses, overloads, accidents, and vulnerability. One commenter supported local distributed electric generation and biofuels production and stated that these local resources could supply much of Vermont's residential demand. Several commenters looking long range added that competition for energy resources could become extreme in the future and cause energy exporters like Hydro Quebec and wind farms in our neighboring states to limit export supply. Vermont may not have the economic leverage to compete for well priced long term contacts, especially with metropolitan areas. Several commenters stated that renewables alone will not make up for declines in conventional energy resources.

Some commenters asked how TES is viewing utility business models. One commenter stated that the current Energy Efficiency Utility (EEU) model is a patch on a utility system that is no longer meeting our needs.

4.1 Electric Supply and the Grid

Several commenters noted that if the regional grid can supply lower cost and cleaner power as compared to in-state resources, Vermont should take advantage of it. One commenter predicted that if the rest of New England enacts similar renewable energy goals, electric prices will climb higher faster. Another commenter stated that because Vermont is small and nimble, we will be able to advance toward our renewable goals more quickly. One commenter added that ISO New England (ISO-NE) treats efficiency as a demand resource; it is accounted for and paid in the market as a generation source.

Distributed Generation: Several commenters noted that with distributed small-scale generation, the framework for utility regulation needs to adjust to new relationships between the utility, suppliers, and customers. Some commenters stated that distributed generation systems will be increasingly called to replace the role of centralized systems, including ancillary services. One commenter surmised that when energy users have a more intimate role with producing energy they are more prone to conservation. Local and at-home generation fits Vermont's do-it-yourself traditions. Another commenter believes that distributed generation will filter into the landscape over a long time, a hundred years.

One commenter noted that distributed resources minimize environmental harm and reduce transmissions costs/losses. However, other commenters posed that distributed resources will lead to more landscape and habitat fragmentation.

Several commenters stated that commercial and industrial entities will increasingly integrate rooftop PV and energy storage technologies.

Large Scale Generation: Commenters noted concern regarding the build out of large scale renewables in advance of grid improvements which are needed to pair demand response with improved energy storage to manage intermittency. Several commenters noted it is important that renewable resources are tracked and associated with the original generating unit.

Energy Siting: Several commenters acknowledged the work of the Energy Generation Siting Policy Commission. One commenter noted that grid interconnection was overlooked in the report.

Transmission and Distribution: One commenter requested that planning efforts specifically address the need to modernize the grid in-state and under the ISO-NE. Commenters noted that distributed in-state generation is already causing constraints requiring grid upgrades, but these upgrades will be less costly than those needed if all of Vermont's power was imported. A number of commenters stated that commercial and industrial entities who own equipment which is sensitive to power dynamics are concerned that the reaction of distributed PV to voltage disruption could trip off a cascading effect across the grid.

Energy Storage: Some commenters proposed that Vermont encourage construction of energy storage in strategic areas. One commenter speculated that significant investments in energy storage will be needed in the next ten years. One commenter questioned how energy storage development will interact with the Sustainably Priced Energy Enterprise Development (SPEED) and net metering programs. Some

commenters requested that future documents include more specifics about Vermont's plans and the costs to invest in energy storage technologies.

Several commenters noted that the potential of EVs as a dynamic energy storage facility is promising but is not likely to be widely available for some time. One commenter suggested that planning for vehicles powering the grid should always include designs for using vehicles as local backup energy storage, e.g. buildings, micro-grids.

Electrification: The impact on load from heat pumps and electric vehicles was frequently discussed. Several commenters estimate that the increased electric load, peak demand, and related transmission and distribution upgrades for these uses is a concern and thus electrification should not be a major policy option. One commenter noted that increased load from electrification is a distribution system issue, not a transmission issue. One commenter predicted that growing constraints in natural gas supplies will impede Vermont's progress toward electrification.

In dispute, other commenters stated that the increased load from electrifying the transportation sector can be offset by electric demand reductions resulting from continued electric efficiency work. Several commenters referred to study findings that show Vermont could electrify a large portion (up to 50%) of its cars without adding new electric supply. One commenter noted that without the right rate structures, EV charging can cause new peak loads (e.g. evenings when commuters arrive home). Time of Use utility rates, as well as special EV rates, can help manage load from charging EVs. One commenter noted that EVs charge from the grid and generate energy efficiency systems charges like any other electric appliance.

There has been some concern regarding if/how EVCE owners can collect fees for charging EVs at public EVCEs without falling under electric utility regulations. Several commenters pointed out that EVCE owners can avoid fees based solely on electric usage and instead set fees based on the duration of use or by session.

Wind: Many commenters recognize wind as a viable and important technology pathway for Vermont. One noted wind has a favorable EROEI. Several commenters stressed that siting wind turbines in-state requires careful deliberation. Several commenters identified existing alternative or potential out-of-state wind resources which Vermont should consider. Working with New England Governors to procure off-shore wind could advance wind development. The potential of off-shore wind needs more attention in analyses, given that Vermont's access to those resources could require transmission investment.

One commenter contends that Vermont's preoccupation with wind development is severely hampering Vermont's efforts to move ahead on other renewable resources. Wind power is not a viable in-state resource – all sizes of wind turbines are causing problems for neighbors and communities are divided. The wind industry has overestimated the availability of good wind sites, wind capacity and grid constraints will make development and operations more expensive, and turbines cause tremendous environmental damage. Another commenter noted that Vermont should consider landscape impacts in other states as well as in-state.

One commenter requests that opposition around aesthetic and environment impacts of wind siting be considered in light of how other types of energy generators and commercial uses of energy impact Vermont's ridgelines, such as ski resorts and logging. Vermont should focus on the larger benefits of protecting the whole of Vermont's habitats from GHG climate change impact. Also noted is the comment that many people find views of wind turbines in the landscape acceptable and that the majority of Vermonters support wind development as a direction for State energy policy.

Solar: Many commenters state that installing residential and commercial rooftop PV and PV covering Vermont's built landscape (e.g. parking lots) should be a policy priority. One commenter requests that key policies discourage large solar fields on agricultural lands until opportunities on the built landscape are maximized.

Hydro Power: A number of commenters said existing dam sites should be developed across the state; these sites should be considered low-hanging fruit. Several commenters support more development ecologically responsible run-of-river hydro and requested that these projects be identified as a distributed renewable technology. One commenter suggested that any hydro system with a good EROEI and minimal environmental impacts be considered for Vermont's electric portfolio, whether in-state or out-of-state. One commenter identified specific alternative out-of-state low impact and run-of-river hydropower operations which Vermont should consider. One commenter suggested that we consider energy from TransCanada as local energy.

Nuclear Power: One commenter noted that the TES Framing Report did not mention nuclear power as an option although the study is meant to leave everything on the table.

One commenter recommended that Vermont ramp up to install 100 mega watt (MW) Liquid Fluoride Thorium Reactors (LFTRs) paired with Vermont Electric Power Company (VELCO) substations. With LFTRs and renewables, town centers could become energy net zero and power EVs.

4.2 BioEnergy Supply

Commenters agree that Vermont needs to develop its limited bioenergy resources with great caution so as not to adversely impact Vermont's landscape, food prices, or other value added uses of these resources. Most commenters agreed that Vermont's forest and farms need to be managed for sustainability. Bioenergy resources should be used as efficiently as possible.

Many commenters support that bioenergy resources are best utilized for space heating. One commenter stated that even though biomass does not yield fast carbon benefits, it can replace fossil fuels at 100% in many applications, and thus there is a strong policy justification for using biomass resources, at scale, for space heating.

Experts stated that Vermont has potential to produce energy crops from carefully selected grass species in specific pockets of Vermont as a primary crop or incorporated more widely to optimize farming practices for food production and land use. Examples of such practices include planting energy crops on marginal soils, along buffers, or as beneficial rotational crops. The cost effectiveness and EROEI of energy crop farming needs to be analyzed based on yield (tons per acre) and should include

transportation costs. One commenter stated that switchgrass is not viable when evaluated for EROEI. More research is needed about current energy crop varieties and those not yet grown in Vermont. There is a need to establish best practices for cost effective bioenergy production while maintaining and improving food crops production, and land use planning to identify sites that are best suited for energy crops, food crops, or both.

Some commenters explained that Vermont needs to carefully monitor bioenergy resources across the region. For instance, how is the new 75 MW Berlin NH biomass electric plant impacting wood prices and supply for Vermont residential customers and businesses?

Experts noted a number of Vermont based research publications and projects that provide a wealth of knowledge in the field of bioenergy production, with specific topics including costs of production, grass fuel, on-farm biodiesel, algae, soybeans, canola, and sunflowers for biodiesel, oil and meal extraction.

Solid Biomass: Commenters noted that the limited woody biomass supply from Vermont forests should be used to optimize Vermont economic interests through value-added wood products as well as for affordable energy production; these uses must be carefully balanced. All commenters stated that sustainable harvesting is critical. Some commenters consider that biomass use for heating and certain CHP applications, and replace fossil fuels, will reduce carbon emissions and have favorable EROEIs. Most commenters support that biomass resources should not be used to produce liquid fuels or purely for electric power because these energy conversions are extremely inefficient and wasteful.

One commenter stated that our forests should be managed by professional foresters who prescribe thinning and harvesting of mature trees about every 20 years, followed by grazing (domesticated or wild animals). Due to climate change, increasing drought, fire danger, and invasive species require updated forest management protocols in Vermont.

Combined Heat and Power: One commenter recommended that CHP plants be incentivized for year-round heat capture; those that utilize heat only seasonally would receive partial incentives. One commenter was against large plants located near residences due to concerns over air quality impacts on the health of neighbors.

Methane Digesters: One commenter noted that digesters should be supported as a key technology for Vermont sized dairy farms. Burning bio-methane for energy has a number of environmental benefits.

Liquid Biofuels: Commenters discussed a vision for producing more liquid biofuels in-state and whether we should think more aggressively than the 25x25 Alliance recommendations. Commenters stated that farmers need technical assistance and access to technology to make “good” biodiesel on farm. To diversify Vermont should explore commercializing algae biodiesel production so as not to rely on soy biodiesel. And farmers should investigate farm cooperatives for production. Another commenter said Vermont should encourage research and development but not pay for it. One commenter noted that good marketing is needed. For instance, Vermont could run a campaign that promotes biofuels as a local Vermont grown energy resource and emphasizes that trucking costs are reduced. Another commenter

noted the challenge is completion with commodity crops from elsewhere are produced at a much larger scale. This commenter questioned whether growing biodiesel is good use for Vermont agricultural lands.

Commenters noted the chicken and egg problem. Until there is more demand for biofuels in Vermont's market, more proximate production facilities will not attract investors. One commenter mentioned that a nearby facility is producing 100,000 gallons per month now and there is a plan to build a 7-million gallons per year plant. Also, demand will be limited until vehicle and equipment manufacturers accept higher blends under their warranties. Some manufacturers are now allowing up to a 5% blend.

One commenter stated that a national heating fuel goal is to have B100 replace fossil heating oil by 2040.

Experts support further research studying which varieties of grass species are cost effective and beneficial for the Vermont agricultural economy. One commenter recommended that policy mechanisms should be analyzed to encourage farmers to grow biofuels to power their farm equipment. One commenter supported continued research for cost effective liquid biofuels production and distribution to supply space heating.

One commenter noted that planning discussions should explore the potential of producing Renewable Natural Gas from landfills, wastewater treatment facilities, and farms.

4.3 Natural Gas Supply

Commenters were concerned that cheap natural gas is causing people to ignore efficiency. Several commenters noted that natural gas may be riskier than expected with pipeline congestion and volatile prices showing up as consequences of growing popularity.

A number of commenters are not comfortable with declarations that natural gas is a valuable bridge fuel. A common concern is that infrastructure investment would "lock-in" this technology beyond its optimum timeframe as a bridge to renewable technologies. Several commenters stated that natural gas will not be a bridge solution for any longer than 15-30 years. One commenter cited known supply challenges with existing reserves and concluded that production will peak in a few years. Several commenters noted there is increasing competition for natural gas supplies across New England and in foreign markets. Prices are likely to rise due to this demand. One commenter noted that pipeline constraints have caused some price spikes in the electric market. Another commenter considers that pipeline expansion investments will be difficult to recoup. Several commenters stressed that before Vermont adopt policies establishing natural gas as a bridge to transition from higher carbon fossil fuels to renewable fuels, we need independent research analyzing natural gas pipeline infrastructure costs, long term natural gas price stability/volatility, and lifecycle emissions and costs of shale gas, and ethical considerations given Vermont's ban on fracking.

4.4 Fossil Fuels Supply in General

A few commenters noted that fossil fuels dominate because of their superior power and energy density, historically high EROEI, and scale. Several commenters noted that certain industrial processes will

continue to require fossil fuels, especially when high temperatures are critical. One commenter noted that because businesses make expensive long term investments in equipment, they are not as flexible to purchase new technologies in the near term. There is a multi-trillion dollar infrastructure supporting their continued use. Useful fossil fuels will be burned. However, a number of commenters predict that petroleum prices will escalate and will drive the move away from fossil fuel use.

A number of commenters stated that the ten percent of resources that will remain nonrenewable should be reserved for critical purposes that cannot be met through conservation, efficiency, or renewables. One commenter recommended that Vermont not waste petroleum on materials that have organic substitutes, such as cellulose insulation, organic fertilizers. Petroleum consumption should be conserved for critical applications such as lubrication and pharmaceuticals.

One commenter stressed that shale from hydraulic fracturing needs more regulation on chemicals, pressures allowed, well monitoring, and sanctions. Wyoming and Colorado and Environmental Defense Funds are good models for regulation.

5 Energy Policy Development

Many commenters favor a systems approach to developing and analyzing policies. A systems approach will drive change in the overall structure in which energy consumption decisions are made. Cross sector policies are imperative in order to meet our energy goals efficiently. One commenter stated that while reviewing alternative policy options, energy planners should be aware how different suppliers and consumers in different economic sectors require different approaches and how federal and other New England states initiatives impact VT's efforts.

Several commenters visualized effective long term policy as carrots (funding, financing), sticks (regulation, fees), and tambourines (education). One commenter identified four types of policies that could lead to reduced energy consumption and therefore lower GHGs: 1) increase energy costs, 2) decrease the derived utility of an energy resource, 3) decrease access to energy resources, and 4) enforcement of lower consumption by an external agent. One commenter asked State energy planners to consider how to apply currently successful energy policy and programs more broadly within or across energy sectors by adapting, adjusting, supplementing, or altering priorities.

One commenter stated that individuals and organizations may be unable to achieve energy goals without public policies and programs that remove barriers and support individual action. The efforts of committed individuals and organizations are impeded by limited funding resources and uncertainly regarding which actions are most effective. One commenter stated that policy mechanisms and impacts need to be translated into tangible descriptions and metrics which average people can understand and implement in their everyday lives. Some commenters recommended that the best means to communicate energy policies and their impacts with the public is to present data in terms of average household expenditures.

Some requested that all energy policies be intelligently designed and coordinated to achieve Vermont's GHG goals. One commenter warned that policies not get hung up on targets and measuring exact emissions each year.

5.1 Energy Policy Priorities and Pacing the Change

Commenters discussed the long range of the CEP & TES planning periods. We have thirty-seven years to 2050. Looking back as far, who would have predicted the rapid deployment of the internet, ultra small computers, and wireless communications? One commenter said technology will improve many times over during the course of the 2050 timeframe and these advances will be big steps forward environmentally, sustainably, and economically. Thus in setting policies to evoke change, policies need to be flexible and responsive to technology improvement and cost reductions. One commenter noted that we should expect the process will not be smooth and that there will be many policy changes.

Many commenters emphasized that the public and communities need to understand a vision for good energy policy along with the cost of inaction. The benefits of action need to be well articulated. The public needs to be given and understand the value associated with alternative pathways in terms of economic impacts, GHG, and non-energy benefits. Consumers and communities need to be educated to understand the relative costs of energy choices and thus how their energy consumption is measured.

A number of commenters noted that the key to gauging successful policies is to systematically track progress toward meeting energy goals. This effort requires policies that establish prescriptive methods for measuring total energy consumption, renewable energy resources, and GHGs. Several commenters emphasized that the original energy sources need to be identified for accurate accounting of renewables, especially for out-of-state resources.

Commenters offered that significant change in policy directions can be phased in, stepping up targets and charges through 2050. However, many commenters stressed that GHG reductions need to be realized as soon as possible to reach our goals. Several commenters emphasized that a sense of urgency is required. Some commenters suggested that prices be adjusted to include societal costs on less desirable technologies in addition to focusing policies on incentivizing desirable technologies. One commenter contends that energy costs will rise faster than income, thus investment in energy development will be less expensive now relative to the future.

Several commenters mentioned federal policy as the biggest barrier to supporting community scale investment and a change in the current political climate is not likely. State vision is needed on this front. Commenters requested a deeper understanding of what will give capital markets support in order to attract private investors to fund a new energy system. Investors need confidence in contract structures. Many commenters supported passage of a Renewable Portfolio Standard. Also they supported rate design to drive down demand for electricity. Most commenters supported near-term investment in residential building energy efficiency as critical. Several commenters emphasized that Vermont also give more near term priority and specification to strategies that promote switching to efficient thermal renewable energy, such as heat pumps, biomass, and solar. Another commenter noted that conversion of hot water heating to renewables is a low hanging fruit.

Many discussions and written comments noted the work of the Thermal Efficiency Taskforce (TETF) and expressed disappointment with the lack of outcomes during the 2013 legislative session with regards to legislative action on the TETF recommendations.

Many commenters stated that Vermont's transportation sector needs more momentum in the formation of energy policy and should be given more immediate priority. Several commenters emphasized that consumption and emissions from the transportation sector should be tackled aggressively. One commenter noted that transportation consumes 34% of the Vermont's total energy use and contributes 59% of our total GHG emissions (EIA).

Many commenters view that long term Vermont's energy will be primarily sourced from electricity. The movement of people will be met through compact communities and electric vehicles. Building heating needs will be met through weatherization, heat pumps, biomass, and solar hot water. Electric needs will be met through efficiency, conservation powered by renewable generators.

Many commenters requested more emphasis on fuel switching to biodiesel for use in vehicles and to heat buildings.

One commenter stressed that PSD policy development and publications should balance analyses of community-based decentralized generation, micro-grids, and other distributed energy infrastructure, more equally with analyses of large-scale generation. The most promising policies provide models and incentives to communities to build community-based energy rather than policies that divide community and give utilities, developers, and large investors an advantage. Local energy control will encourage more personal responsibility.

Some commenters suggested that in order to advance Smart Growth and transportation demand management (TDM) policies, planners and policy makers should tie in the needs of Vermont's aging population for community level transportation and denser communities with accessible services.

Several commenters emphasized that Vermont will need to respond to national energy market changes rather than be the driver. Other constraints on the pace of change are funding, technology advancement, and time for infrastructure build-out; however inelastic cultural norms may be the biggest constraints. One commenter stated that reductions in energy consumption might only come as a result of economic systems not being able to supply affordable energy. The charge of public policy is to smooth the transition to an energy system that is affordable.

Commenters consider that Vermont's collaboration with regional and national partners is important on many fronts. One commenter noted that Vermont is no bigger than a mid-sized city and cannot take on major changes that require cooperation of whole industries.

A few commenters are convinced that fossil fuels will have a sustained allure in terms of energy density, convenience, and the might of existing infrastructure. Also higher consumer efficiencies make abundant

marginal fuels more tolerable. Therefore fossil fuels will be burned globally as long as they are economically available. Even with extremely aggressive conservation, significant climate change can only be delayed 10-15 years. Thus, policy should focus on climate adaptation as the key outcome.

Commenters discussed the need for the State to develop a vision and lay the ground work for moving energy policy, regardless of federal politics. Federal funding for energy development is plausible. It is possible that fossil fuel subsidies will be reduced in the next two to three years. One commenter stated that federal action is not likely to address progressive energy goals or tax reform in the near future. Small tax tweaks are possible.

Some commenters suggested that the State's role is not to pick "winners and losers" but is to support a framework for technology-neutral market mechanisms to operate. The State should make sure there is access to capital, measure, and judge externalities, and make sure good information is available to empower smart decisions by consumers. One commenter added that to the extent that tax policy is used to drive energy markets and consumption, the State should not let such policies outpace technology or the ability to capitalize advances in technology.

5.2 Policy Evaluation Criteria

Several commenters requested a clearer definition of the ultimate goals in Vermont's energy decisions, because some directions seem to be in conflict. For instance, a priority is to keep dollars in-state by favoring in-state energy resources, yet the State and utilities are committing to and sometimes expanding long term contracts with Hydro Quebec.

Most commenters expressed value for locally produced generation. They asked whether the term "local energy" implies local within a town, region, watershed, or other designations. Several commenters requested clear definitions for the terms "distributed generation" and "community-owned".

Given that currently the majority of Vermont energy arrives from out-of-state, all commenters agreed that Vermont policy and technology pathways need to be analyzed in the light of long term views regarding regional energy demand, and regional and national market trends, as well as opportunities to influence policy directions beyond Vermont.

One commenter emphasized that in order to address GHG in the near term, policies chosen need to be designed for quick implementation.

Several commenters stated that the TES evaluation of policy and technology options must provide a reasonable assessment of economic benefits.

Several commenters suggested that Vermonters should use the same evaluation criteria to consider in-state and out-of-state resources, such as wind and hydro.

One commenter emphasized that the results of cost benefit analyses should be regarded with priority when evaluating policies and technologies. This practice will attract the participation of businesses and industries. Most commenters requested that all aspects of equity be considered in policy development

and cost benefit evaluation, with special attention toward protecting low income people from increased costs, disincentives, or regulations dictating particular actions.

Several commenters emphasized that policies need to be simple to understand and implement. Costs to administer policies should be evaluated. One commenter suggested that transaction costs for regulators and regulated entities should be reasonable. This person noted that large overhead costs for managing complex administrative functions favor implementation solely by large organizations.

Several commenters emphasized that policies should allow flexibility in how commercial and industrial entities plan, finance, and implement energy investments. They warn against narrow or prescriptive State policies that would incentivize smaller impact projects over larger projects with broader or longer term benefits.

One commenter stated that maintaining Vermont's small rural communities and prioritizing community benefits, and community sized development are the most important criteria when evaluating long term energy policy. One commenter noted that community resilience is highly valued. We should avoid a top down approach to implement Vermont's energy goals.

All commenters agreed in principal that policies which are flexible to changes in markets and technologies are preferred. One commenter suggested that diversifying risks with an eye on total energy costs over the long term is the most important evaluation criteria.

A number of commenters recommended adding a criterion to rate policies by their expediency to be passed in legislation and to be implemented with legislative action, as well as their potential to be overturned. Also policies should be identified as revenue generating, requiring public funds or payments, or revenue neutral.

5.3 Priorities for Climate Adaption and Mitigation

One commenter stated that taking steps to address the environmental and human welfare crisis posed by climate change is a moral obligation.

A couple of commenters described flaws in the prevailing logic that fossil fuels will be largely replaced with increased renewable resources and energy efficiency. One presented this explanation. Because renewables have a lower EROEI than fossil fuels and their increased use will results in lower utility for the cost and this will result in lower consumption and pressure on society. As lower EROEIs and shortfalls occur in liquid fuel production, addressing societal needs will be prioritized over climate change. Worldwide energy and economic pressures dominate policy choices, thus the burning of ever more expensive fuels from marginal sites will continue to be deemed important. Attempting to appropriately address energy transformation to reduce GHGs would be political suicide. A solution through technology innovation is false but is likely to win because it appeases economic and environmental interests. The only solutions are mitigation and the reservation of valuable resources in the economy to preserve essential goods and services.

One commenter calculated that Vermont's reduction in fossil fuel use will simply make more fossil fuel available elsewhere. Vermont is but a speck contributing less than 0.03% of world GHG. If Vermont stopped all GHG emissions today the world would only be 4 days better off come 2050.

5.4 Funding & Financing Principles

Commenters agreed with the TES Framing report's emphasis that in order to meet Vermont's energy goals, stable long-term polices need to be backed by adequate funding. One commenter noted that the TES economic analysis needs to bring forward how affordable alternative pathways are in terms of sustained investment in infrastructure and institutional capacity. Commenters agreed that where appropriate, Vermont should invest in programs that permit broad deployment of chosen technologies, such that declining costs result from economies of scale, creating a feed-back loop that quickens deployment of new technologies. Several commenters support incentives and financing programs that are prescriptive and performance based.

One commenter stated that because we have delayed so long to adequately fund the energy transformation needed to address climate change, now the initial investment will be large (and unattractive). However, if we invest appropriately now, the long term benefits will be enormous.

One commenter stated that as technology advances, investments cannot be recapitalized; only a small number of people and a smaller number of businesses will be able to continually upgrade. Taxes cannot provide the revenues needed to capitalize technology investments in order to reach our energy goals. Attempts to rely on taxes to reach energy goals will likely be overturned in legislation later.

Many commenters discussed the need to collect more and better energy efficiency and renewable energy project data. The treatment of energy savings needs to be standardized. Without better information those making financing decisions, such as commercial/industrial executives and bankers, cannot accurately project energy savings and risks, or perform rigorous comparisons across projects. With the data these decision makers would be more secure regarding the benefits of proposed energy projects. Several said a statewide database is needed of state loan project performance. One commenter stated a concern that due to the size of Vermont's market, we will not have enough data.

Several commenters requested more flexibility with constructs in place for commercial and industrial entities related to their Energy Efficiency Charge (EEC) and EEU programs. Several suggested that EEC opt-out provisions be more widely available. Some said a portion of their EEC could continue to feed the EEUs, but that the remaining should be solely in their control given their internal expertise to finance. One commenter noted that Massachusetts had allowed op-outs from their EEC but that over time companies realized they were saving more by paying into the fund and participating in the program.

Several commenters noted that larger commercial and industrial entities have access to capital. They are primed to use internal financing for cost saving energy investments, especially those with a two and a half year payback. Also, these entities prefer to carry out larger projects which blend investments with short and long term payback. One commenter explained that because large investments in equipment and production facilities are long term (e.g. 40 years) they are not as flexible to adopt technology

innovations as they appear in the market. Several commenters noted that businesses are having to simultaneous address many competing costs, including health care.

Some commenters had concerns with governmental agencies offering financing. The State's role is to make markets work and to ensure there is access to capital.

Several commenters held that there is plenty of private funding available. Creative public-private partnerships, such as the Vermont Business Energy Conservation Loan Program, are great avenues for advancing energy policy in both commercial and residential applications. One commenter noted that Vermont can set models which other states and nations can emulate. These partnerships invite the private sector to champion programs and could be a key organizational structure for achieving energy goals.

Commenters discussed the need for rate and regulatory certainty in order to build transaction size and volume and to attract sufficient capital. Then capital markets can be leveraged with support from State sponsored incentive programs. Several commenters believe that financial incentives are effective in motivating behavior change. One recommended that all policy sets for the residential sector include incentive and interest-rate buy-down programs and stressed that these programs need to have predictable incentive levels over the long term; transitions in the programs rattle consumer confidence, delay projects, and are disruptive to vendor businesses and banks. Some commenters recommended a State funded loan loss reserve account. One commenter suggested propping up leasing programs.

Some commenters expressed a preference for the socialization of investments in energy distribution infrastructure, including energy storage. One commenter conveyed a strong position that the private sector, rather than government, should be called upon to build out a public EVCE network when the market is ready. One commenter noted that EVCE installations are now eligible under the Property Assessed Clean Energy (PACE) financing program.

Commenters noted that regardless of financing availability, consumers are not borrowing. Available financing is not necessarily the primary barrier. The majority of the public is not yet aware of, does not fully understand, or is not sold on the benefits of new energy technologies. One commenter observed that customers who are financing energy upgrades are interested to invest and install in both efficiency and renewable technologies at one time.

Commenters noted that consumers are wary of up-front capital costs. Consumers understand monthly payments. When people buy a car they don't think about the term or details, rather they ask "Is it a payment I can handle?" Lease and on-bill financing programs show immediate savings on monthly statements. One commenter suggested creating a one-time bond issue with a cafeteria plan to raise significant funds for deep incentives.

Some commenters discussed crowd sourcing and cooperatives as attractive avenues for community ownership or small jointly owned and scaled projects.

Commenters mentioned that the market has no solution for people with low credit ratings. Credit guarantees and similar mechanisms are not a clean solution.

Some commenters mentioned that public serving institutions can't use tax credits and thus must depend on tax equity financing.

Many commenters consider that monetized RECs are effective incentives for supporting local energy development.

Several commenters noted that the electric sector is funding electric and thermal efficiency programs, while the thermal sector is not contributing. One commenter offered specific values for funds spent to save energy by efficiency programs – over $76 million is spent by energy efficiency utilities, $27 million is spent on transportation demand management, and over $9 million is spent on thermal efficiency programs (from the Regional Electric Greenhouse Gas Initiative and the Weatherization Assistance Program).

5.5 Primary Policy Sets

5.5.1 Nearly-Revenue-Neutral Carbon Tax Shift

Carbon pricing was actively discussed as a promising foundational mechanism that has leverage across the economy and deserves serious consideration as a primary strategy. One commenter noted that carbon pricing through taxation will lead to decreased consumption, resource sharing, purchase of more efficient technologies, and perhaps a change in living patterns if it is implemented long-term. Some transportation stakeholders agreed that a carbon price would change behavior leading to the adoption of Smart Growth principles.

Commenters understood that Carbon Tax Shift policies involve charging a carbon price for wholesale purchase of petroleum fuels. The policy would be mandatory and implemented for the long term. Although there is complexity in determining where in the value chain to apply the carbon price and how to price carbon relative to different energy resources, a carbon price is somewhat invisible (easy to administer) at the level of the energy consumer and producer. One commenter requested clarification regarding whether a carbon price would be charged solely on carbon dioxide (CO2) emissions or whether other more potent GHG emissions, such as methane and sulfur hexafluoride (SF6), would also be included.

Keeping in mind Vermont's conservative tax policy, a Nearly-Revenue-Neutral Carbon Tax Shift was generally regarded as having merit because revenues would directly lessen economically harmful taxes like income and/or sales tax. One commenter noted that voter education would be critical in order to explain that the Carbon Tax Shift would reduce taxes overall.

Some commenters suggested that carbon pricing would motivate all sectors of society to invest in efficiency and renewables, including consumers, energy producers & sellers, the finance sector, and government. Many commenters noted that with recent history in mind (gasoline price increases), a price on carbon would need to be large in order to shift consumer behavior. One commenter suggested that

to inspire shifts in vehicle purchases and VMT, a $100 per ton tax which equates to about $1 per gallon of gasoline, would be reasonable. This commenter noted that Vermonters are already paying for GHG impacts through expenses for disaster recovery and climate adaption, and that these responses are not organized, systematic, or equitable; carbon pricing offers a long term systematic approach.

Some commenters representing the broad business sector were wary of an outcome that a Carbon Tax Shift would result in even higher energy costs and would put businesses' ability to manage costs at risk. One commenter was particularly concerned about the impact on the few VT corporations that use large quantities of fossil fuels. How would a Carbon Tax Shift reduce their GHGs? Would the tax motivate them to leave VT?

Some commenters discussed a carbon price range of $80-$100 per ton as potentially effective. One commenter requested background on how a carbon price would be derived. Commenters asked how the State would determine which taxes would be reduced from carbon revenues and what the impact of those reductions would be. Some commenters thought that reducing the gas tax would cancel the desired effects. One commenter suggests that the gas tax not be lessened with carbon revenues because that would certainly stall Carbon Tax Shift policy.

Several noted that a Carbon Tax Shift would only be possible if implemented at the federal level. Many commenters considered the discussion of a Carbon Tax Shift to be moot because it is politically infeasible.

A Cap and Trade mechanism was not favored by commenters due to the challenges of tracking emissions and trade at a retail level. One commenter noted that a Carbon Tax Shift would have a more immediate impact on behavior.

5.5.2 Total Renewable Energy and Efficiency Standard (TREES)

Note: In previous documents and discussions this policy set was named the Clean (Total) Energy Standard.

Commenters were intrigued in discussions of a TREES policy but the program design was not clear. Several commenters noted that a well designed TREES policy would be more effective than combinations of sector-specific policies. Some felt that TREES would be more politically feasible in legislation than a Carbon Tax Shift.

Several commenters thought that policies based on renewable targets could be extremely complex to administer across all energy sectors, however if the policies are not applied across all sectors entities would design operations around policy loopholes. Which entities would be regulated and how would enforcement work? Some commenters recommended that TREES should impose responsibility on energy suppliers. Such policies should offer flexible approaches to those suppliers through credit trading and targeted outcomes can be achieved quickly and efficiently.

One commenter noted that tracking renewable targets is especially difficult for unregulated fuels. This commenter requested a concrete illustration of how TREES would evaluate efficiency and renewable contributions to insure a level playing field for these technologies, yet with an "efficiency first" priority. Managing offset credits is notoriously difficult.

One commenter suggested that this policy start with low targets across sectors and ratchet up the targets in a predictable fashion. Current electric sector targets which are relatively high should not be lessened. This commenter warned that TREES should be equitable for residential users or their energy dealers; that is that the required level of investment or credit offsets purchased need to be consistent with their level of responsibility for GHGs. One commenter emphasized that it should be apparent as to how these policies and any uses of any revenues generated result in lower GHGs.

One commenter expressed that incremental expansion seems appropriate. The State should consider that because transportation comprises the greatest proportion of Vermont's energy consumption, this sector should not be left for last. Dealing with the non-regulated fuels is more difficult, but it is also more important.

One commenter considered the challenges of administering annual accounting of the baseline energy demand upon which TREES fees and incentives are set. Rather than accumulating and computing the past years efficiency and renewable energy investments and resulting savings, an administratively daunting task, the recommendation (mimicking RPS alternative compliance payments) was to set in-lieu fees per energy user for the year forward. Fees would be set based on energy savings from a prescribed level of efficiency or renewable investment. Each user would choose to pay the fee or prove that they made appropriate investments. All fees collected that year would fund other users who wish to make such investments. The commenter noted that this process would operate in a fashion similar to a Carbon Tax Shift.

5.5.3 Renewable Targets with Carbon Revenue

One commenter suggested this hybrid of the Nearly-Revenue-Neutral Carbon Tax Shift and the Total Renewable Energy and Efficiency Standard (TREES) policy sets may be more politically feasible.

A good number of commenters agreed with transferring a portion of carbon revenues to fund energy programs. They said that Vermont needs to support alternatives to paying higher energy prices that make the impacts of higher prices more equitable, especially for low income people. Even if the carbon price signal is low or does not impact markets as expected, funneling a portion of revenues from a Carbon Tax Shift to efficiency programs would compound the impact to lower Vermont's total energy consumption.

Several commenters were concerned with the challenges of administering any policies that require particular actions or payments based on renewable targets that are, especially those that are cross sector. Read more regarding these issues under the TREES comments above.

Several commenters noted that Vermont's electric supply contributes a small portion of our total GHG emissions and policy mechanisms to incent renewables are in place, thus the electric sector does not need as much attention in the development of new policies. One commenter recommended that renewable targets should be set to drive fuel switching in the transportation and heating sectors.

Another commenter asked whether Vermont has enough big GHG emitters to raise enough revenues from a carbon tax under this policy structure.

5.5.4 Market and Business Model Innovation Policies

Most commenters noted that energy policy needs to allow long term flexibility to support the adoption of innovation in new and existing technologies.

One commenter mentioned that 15 years ago a primary energy innovation was the development of the efficiency utility model but today the innovative models to be tested will integrate efficiency and renewable energy programs either within a utility structure or a market structure which seeks sustainability and energy neutrality, rather than energy efficiency alone. Commenters considered if and how new business models for energy utilities can develop. Rule changes are needed to allow the models to evolve. Can utilities be the voice for total energy, efficiency, technology choices, and financing?

One commenter wondered if the public would be attracted to invest in energy development through umbrella cooperatives. Such structures could generalize the utility model and reduce NIMBY resistance. Cooperatives could be run by local governments. Commenters discussed the German energy transformation which has been successful in attracting public investment. Although the German model results in higher energy prices, these are offset by direct income received by individuals who have invested.

One commenter recommended creating funding programs that incentivize and reward the collective efforts of organizational members, while also providing technical assistance and low cost financing options to members.

One commenter stated that the best market lever is to feebate everything and use feebate excesses to lower other taxes. The administration of such policies should be transparent. There should be an intention to leave something for younger generations. These examples were offered:

- Tax carbon, rebate carbon free
- Tax feedlots, rebate grass-fed
- Tax distances transported
- Tax gas guzzlers, fund "lottobates" to divvy up the annual kitty for EV purchases with earlier buyers getting bigger rewards

Many commenters held that the CEP goal of 25% of vehicles powered by renewables by 2030 will be achieved primarily through electrification. This goal requires a bold and innovative approach. Several commenters emphasized that least cost integrative planning should be applied across the transportation

sector. One commenter stressed that the providing adequate electric supply for EVs is not the issue; rather the issue is to design regulatory structures to allow efficient use of electricity.

One commenter proposed that EV related policies and vehicle-to-grid policies be integrated with renewable electric policies and opportunities to experiment be explored. One commenter suggested incentivizing EV purchases by creating battery share agreements.

Several commenters recommended that sector-specific regulations impacting EEUs be loosened to allow effective cross sector programming aimed at reducing overall energy consumption. One commenter suggested that funding for studies be moved to support Public Purpose Energy Service Companies.

Another commenter recommended that the TES modeling effort closely analyze the seamless integration of EEU funds and efficiency programs for electric sector savings now administered under the Demand Resource Plan and for thermal sector savings now administered under the Heating and Process Fuels Plan. All current and new EEU entities such as EVT, the Burlington Electric Department, and Vermont Gas Systems would operate under this integrated framework. EEUs should not be constrained by a sector-specific resource approach and should be allowed to support programs that increase total energy efficiency across sectors for greater societal benefits. Currently under these constraints, EVT is finding it cannot assist customers to maximize their total energy savings. The impact of these constraints is contrary to State energy goals.

That commenter expanded the issue of constrained services, describing that the deployment of Smart Grid technology now opens additional untapped potential to work with customers and utilities on time of use rate design and choosing appliances and usage behaviors that are most efficient, including those that run on or generate renewable resources.

In addition, this commenter recommended that efficiency utilities work directly with the PSD, VELCO, and distribution utilities (electric, gas) to maximize the benefits of distributed resources in-state and regional transmission and distribution planning and to manage peak load.

5.5.5 Energy Sector-Specific Policies

A number of commenters suggest that the promise of implementing policies specific to each energy sector should be evaluated in terms of how well they complement larger policies and trends. One commenter suggested that there be an equal balance between incentives for renewables as for energy efficiency. One commenter recommended that sector-specific policies should be implemented in combination with carbon pricing. A concern is that sector-specific policies should be equitable for all end users.

Building Efficiency: One commenter suggested that the State reinitiate deeper energy reviews of Act 250 applications for commercial development. Another commenter suggested the State, utilities, and commercial entities put renewed attention toward developing utility and company contracts to require investments efficiency or renewable generation. Several commenters requested that commercial and

industrial entities be permitted to utilize electric resistance heat as a backup, in particular when very cold weather causes heat pumps to become less efficient or fail.

Commenters requested policies that support financing and funding for more efficient multi-family housing. Make these buildings simpler to construct. Favor smaller projects (e.g. 15-20 units). Larger projects (e.g. 80 units) often involve complicated partnerships. Requirements for supporting urban density need to be higher. For low income housing, there needs to be a willingness to spend public funds. One commenter recommended that the Home Performance with Energy Star program incentive levels be propped up and consistent for a long time in order to increase participation numbers again.

Small Scale Renewable Incentive Program (SSREIP): One commenter requested long term funding for SSREI in order to maintain consistent incentive levels with no delays in approval; SSREIP has had three transitions in the past year and these have resulted in disruptions for both customers and vendors.

Net Metering: One commenter emphasized that many businesses in the renewable electric supply chain are reliant on Vermont's net metering program. One commenter asked what the limitations are on total net metered capacity in terms of grid management for small municipal utilities. One commenter would like homeowners with renewable generators to be allowed to sell excess electricity to utilities. One commenter recommends the State subsidize solar that is net metered and is used to charge EVs.

SPEED and Standard Offer: Some commenters warned that Vermont should carefully consider the scale and cost-effectiveness of resources eligible for the Standard Offer. In other states with aggressive Standard Offer programs, certain benefits such as deferred upgrades have not always resulted and sometimes greater investment is needed to handle intermittent generation from distributed renewables. Other commenters wish that the SPEED program be expanded further as a key to increasing renewable installations in-state. One commenter recommended that SPEED be customized to meet geographic needs and opportunities.

Many commenters were deeply concerned and disagree with the double counting of RECs under the SPEED program. One commenter asserted that RECs are already discounted due to the uncertainty of Vermont's REC system in light of new limits placed by other states.

Several commenters disagree with the structure of current subsidies which give greater reward to developers, leaving little voice and benefit to local communities and creating opposition to projects based on aesthetics.

One commenter noted that in 2016 the Business Energy Investment Tax Credit is set to expire and federal action is uncertain.

Permitting: One commenter supports a "thoughtful but progressive" permitting process but is concerned that the current process is too drawn out. Vermont's attainment of long term renewable goals is at risk unless the permitting process is streamlined.

Agricultural Sector and Methane Digesters: One commenter suggested that GHG goals should cover Vermont's agricultural sector in addition to the traditional energy sectors (residential, commercial & industrial, and transport) because methane makes up notable percentage of Vermont's GHGs. Also agricultural programs at both the state and federal levels are underfunded or understaffed. This commenter recommended that Vermont provide more funding or a tax credit for installing methane digesters which have proven effective on farms to generate electricity and heat.

Electrification: One commenter stressed the need to develop new institutional coordination across energy sectors between electric grid planning and operation organizations and those preparing for the roll out of thermal and transportation electrification technologies. A shared vision among these organizations will help ensure effective policies and infrastructure investments. Adequate coordination can drive and respond to the new technology adoption, prevent impediments to adoption and avoid risks to the electric grid (e.g. reliability, security). One commenter recommended that the State appoint an "Electrification Officer" to coordinate across State agencies and key players in the private sector, as has done in the telecommunications and health care industries and in Oregon for electrification.

One commenter recommended subsidies for heat pump and EV purchases but requiring product "green tags" to insure they are powered by clean electricity. One commenter recommended tax incentives for ground-source heat pumps similar to other states.

One commenter noted that efforts to optimize non-residential charging infrastructure should follow sitting criteria that compliments other State goals such as Smart Growth and economic development. Another commenter suggested that building energy codes include requirements for multi-family dwellings and public building owners to add a minimum number of EVCEs. One commenter suggested socializing the demand charge on Level 3 EVCEs; this would permit new business models.

Fuel Cells: One commenter suggested that Vermont adopt incentives for fuel cell technologies modeled after those in New York and New Jersey.

Biofuels: Ideas offered from commenters include incentivizing farmers to grow and use local biofuels, tax incentives or cost saving mechanisms for companies investing in biofuels production or mixing equipment, increased support for in-state blending facilities, mandating the State vehicle fleet and buildings use biofuels, tax credits or discounts for bioheat and vehicle uses of biodiesel, developing a regional biofuels network to provide technical assistance for converting vehicles, voluntary or mandated targets for fuel companies to produce or sell specified blends of biofuels.

Fossil Fuels: One commenter recommended that Vermont should produce fossil fuels locally where possible, encouraging renewables and well regulated oil and gas drilling.

Transportation: Many commenters do not support the institution of special fee structures and incentives that would further diminish transportation infrastructure funding which is already at risk (due to vehicle efficiency standards) in favor of fuel switching. One commenter stressed a need to reconcile the fundamental conflict between current infrastructure funding mechanisms and current VTrans policy goals to reduce transportation energy consumption (through mode and fuel switching).

Several commenters stated that alternative fuel vehicles should be treated equitably along with conventional vehicles. Several commenters recommended tax credits, lower insurance premiums, and other financial incentives for purchases of EVs and other alternative fuel vehicles. One commenter recommended a near-term Cash for Clunkers program to exchange sports utility vehicles for EVs. One commenter recommended rebate programs for fuel efficient vehicles, noting France's as a model. Another commenter was concerned that policies that disincentivize larger conventional personal vehicles could work against the many people in Vermont who need vans or pick-up trucks for work (more efficient technologies are not yet available for those vehicle types).

Many commenters felt that EV adoption needs to be paced and placed to match expanded renewable electric capacity. A few commenters supported subsidies paring EVs with PV installations, especially for residential customers. One commenter suggested funding prototypes to test vehicle-to-grid technology.

Another commenter views that setting electrification as a primary strategy at this time falsely assumes Vermonters will adopt EVs and that other vehicle technologies will not surpass the potential of EVs. Several emphasized that the overall cost to Vermont economy of converting to an electric fleet is a significant obstacle.

One commenter suggested that similar to the electric sector's geotargeting initiatives, transportation stakeholders should identify and focus funding on existing and emerging (e.g. the Jay Peak area) TDM hot spots across the state. Local plans should be revised to capture TDM incentives for employers and communities. One commenter recommended public-private partnerships to assist businesses of 50+ employees with operating shuttles between park and rides and businesses.

One commenter suggested that employers report data on employee commuting GHG emissions. Tax credits could be offered to performing employers and would incentivize travel by transit, carpooling, or telecommuting. One commenter mentioned a goal of reaching 50% of commute trips done by walking or biking.

Other policies mentioned include programs support eco-driving and carsharing. One commenter recommended incentives to buy back second cars in order to encourage alternate modes of transportation as well as car/vanpooling and carsharing.

Land Use Policy: Several commenters noted that Smart Growth as a key policy to support both economic development and the environment by fostering infill development, multi-modal transportation, and cut vehicle trips. What policies with "real teeth" will support Smart Growth principles to become integral in planning and zoning at the local level?

Commenters discussed some critical needs. Local planners need technical assistance for planning and design including visualization tools to better convey how desirable a denser and mixed use built environment can be. Future densities could mimic densities that existed in the early 1900's. Several commenters suggested that town center densities reach 8 units per acre. These designs need to integrate all infrastructure services including transportation, water, sewer, flood management, etc. Funding for sewer systems is critical to allow denser communities. Building height regulations need to

be readdressed. One commenter stated that good community design allows for a 20 minute walking zone and frequent transit stops every 15 minutes.

One commenter suggested incentivizing developers to build in dense areas. Vermont should allow for growth in our existing hamlets; suburbs need to be repurposed. Industrial sites could also be considered as growth zones, if they are served by critical infrastructure or strategically placed in other ways.

One commenter suggested diverting health care funds to promote walking and biking. Some commenter suggested that parking requirements be set based on a maximum rather than a minimum, especially for employers. Funds saved can be invested in enhanced transit services.

One commenter suggested that Smart Growth policy should explore measures of location efficiency. One commenter recommended raising property taxes a fraction of a percentage for residences located far from centralized communities. Another mentioned that high gas prices will be the biggest driver. While transit, carpooling, and telecommuting are good, these modes can work against Smart Growth policy. Another commenter raised the issue that affordable EVs will likely create barriers for support of Smart Growth principles.

5.5.6 New England Regional Energy Policy Focus

Commenters generally agreed that regional collaboration is essential on many fronts. One commenter stated that all policies listed in the TES Framing Report would require some degree of regional coordination to be effective. Energy planners should consider the opportunities for collaboration and resource sharing. Vermont is small and nimble to drive innovation, this is an opportunity other states do not have. Also other New England states are more constrained by their heavy reliance on natural gas.

Regardless, commenters stressed that Vermont should learn from work in process by other states. Regional collaboration can support new policies in each state separately as well as coordinated efforts. One commenter noted that non-governmental organizations with chapters in New England states and a mission to lessen climate change impacts are able partners to drive policy in other states. Another commenter asked if other states are in fact interested in energy policy collaboration what current efforts are underway.

One commenter mentioned that Vermonters are already doing a lot compared to other areas of New England, especially relative to major cities where over consumption is common. There is concern that Vermont's interests could be overshadowed by the metropolitan areas. Another commenter noted that Vermont's accomplishments could be offset if our efforts drive Vermont jobs and emitting activity to neighboring states, with the additional potential that products are transported back in-state, causing additional emissions.

Many comments believe carbon pricing and clean energy standard policies will not work without an RPS and regional collaboration. One commenter noted that Vermont cannot price externalities in cost-benefit screening tools without similar action across New England.

Many commenters support passing an RPS. One suggested promoting high EROEI technologies and energy sources through the RPS. One commenter noted that an RPS will drive up energy prices but the short term impacts have longer term benefits. One commenter suggested that if Vermont adopts an RPS, REC sales could be fully dedicated to investment in renewable energy programs, including the Clean Energy Development Fund.

Certain energy resources outside Vermont dwarf our in-state resources. Thus Vermont needs to be part of multi-state partnerships planning large scale siting and transmission requirements, with careful consideration of environmental consequences.

Transmission: Several commenters noted that regardless of Vermont's accomplishments on energy goals, trends of increasing demand in other ISO-NE states will result in Vermont paying for expensive transmission reliability upgrades. Vermont needs to actively advocate for transforming federal and state systems and regulations that discourage non-transmission alternatives (such as efficiency, renewables, and energy storage). Vermont also needs to advocate for equitable treatment in transmission financing. One commenter identified other ISO-NE grid management practices which are counter to Vermont's energy goals, including day-ahead spot market purchases of natural gas can result in curtailment of large renewables, load forecasters are not allocating resources to adequately project load growth and reliability issues related to potential thermal and transportation electrification. A full review of grid management policies is needed in light of distributed and renewable generation, net metering, and electrification of other energy sectors.

Several commenters stressed the need for regional biomass harvesting, procurement, and biomass carbon accounting standards to ensure fair trade and stewardship. Trends in solid biomass trade in the region need to be carefully monitored.

Transportation: One commenter suggested that Vermont join with other states to lobby Congress and automakers to expand fuel efficiency standards to include larger vehicles. Vermonters drive heavier vehicles, such as pick-up trucks, vans, and four-wheel drive vehicles, to handle large loads and rural conditions.

One commenter recommended that Vermont incentivize transportation fuel switching by setting a market value on compliance with a set level renewable fuel production or consumption, by utilizing and expanding the federal Renewable Identification Number system. One commenter was skeptical of the potential for a low carbon fuel standard (LCFS) to be a successful policy in New England. There are few sources of liquid fuel in New England and it is not clear how a LCFS would help promote the adoption of EVs.

Several commenters support institution of a VMT tax to encourage modes of transport other than single occupancy vehicles. One suggested the VMT tax could be imposed through odometer readings at the annual vehicle inspection. One noted that a VMT tax will be the best way to affect behavior, but a gas tax is more feasible politically. One commenter noted that a VMT tax is good in concept, however it would penalize people who have long commutes or have family circumstances that require long trips

(e.g. for medical services). Some commenters stressed that reliance on a VMT tax for revenues would be out of synch with the implementation of Smart Growth principles which work to reduce VMTs.

Legislative Report:

Energy Stakeholders Participating in Focus Groups

The following stakeholders participated in the Public Service Department's Total Energy Study (TES) focus groups during the summer of 2013. The people and organizations below have diverse opinions. Their participation in no way implies their support or disagreement with the TES Legislative Report.

- Adam Sherman – Biomass Energy Resource Ctr.
- Al Teague – Rock-Tenn Missisquoi Mill
- Amanda Beraldi – Green Mountain Power
- Amy Milne-Allen – Vt. Chapter, Appraisal Institute
- Andi Colnes – Energy Action Network
- Andy Boutin – Pellergy
- Andy Shapiro – Energy Balance
- Ann Ingerson – The Wilderness Society
- Annette Smith – Vermonters for a Clean Environment
- Arthur Berndt – Maverick Lloyd Foundation
- Avram Patt
- Barry Bernstein – Better World Engineering
- Ben Walsh – Vt. Public Interest Research Group
- Betsy Ide – Green Mountain Power
- Bob Hedden – Hedden Company
- Brian Dunkiel – Dunkiel Saunders
- Brian Shupe – Vt. Natural Resources Council
- Bryan Mornaghi – Northern Power Systems
- Charles McKenna – Sierra Club
- Chris Granda – Granda Associates
- Cullen Meves – Windham Regional Commission
- Darryl Mays – Go Juice
- Dave Snedeker – Northeastern Vt. Development Association
- David Blittersdorf – All Earth Renewables
- David Hallquist – Vermont Electric Coop
- David Mullett – Vt. Public Power Supply Authority
- Doug Smith – Green Mountain Power
- Elizabeth Courtney – Vt. Natural Resources Council
- Ellen Kahler – Vt. Sustainable Jobs Fund
- Emily Levin – Vt. Energy Investment Corp.
- Frank Blake – Price Chopper
- Gabrielle Stevins – Renewable Energy Vermont
- Gaye Symington – High Meadows Fund
- Gus Seelig – Vt. Housing Conservation Board
- Guy Page – Vt. Energy Partnership
- Hantz Presume – Vt. Electric Power Company
- James Moore – Sun Common
- James Sullivan – Bennington Regional Planning Commission
- Jamison Ervin – Waterbury LEAP
- Janet Doyle – IBM
- Jason Van Driesche – Local Motion
- Jeff Forward – Richmond Climate Action Committee
- Jeff Wolfe – groSolar
- Jim Hand – Hand Motors
- Jo Bradley – Vt. Economic Development Authority
- Johanna Miller – Vt. Natural Resources Council
- John Hulbert – PBM Nutritionals
- Jon Erickson – UVM Gund Institute
- Jonathan Dancing – Building Performance Professionals Assoc. of Vermont
- Josh Castonguay – Green Mountain Power
- Julie Campoli
- Karen Glitman – Vt. Energy Investment Corp.
- Karen Horn – Vt. League of Cities and Towns

- Kate McCarthy – Vt. Natural Resources Council
- Ken Gagnon – Gagnon Lumber, Inc.
- Ken Nolan – Burlington Electric Dept.
- Kevin Jones – Vt. Law School
- Leigh Seddon – Energy Action Network
- Lisa Ventriss – Vt. Business Roundtable
- Luddy Biddle – NeighborWorks of Western Vermont
- Lukas Snelling – Energize Vermont
- Luke Shullenberger – Green Lantern
- Mary Powell – Green Mountain Power
- Matt Cota – Vt. Fuel Dealers Association
- Maureen Hebert – Vt. Technical College
- Meredith Birkett – Chittenden Co. Transportation Authority
- Michael Dworkin - Vt. Law School
- Michael Zahner – Vt. Chamber of Commerce
- Michelle Boomhower – Chittenden Co. Regional Planning Comm.
- Michelle McCutcheon-Schour – UVM Transportation Research Ctr.
- Mike Raker – Agricultural Energy Consultants
- Nils Behn – Aegis Wind
- Owen Bradley – Vt. Gas Systems
- Patricia Richards – Washington Electric Co-op
- Paul Cameron – Brattleboro Climate Protection
- Paul Costello – Vt. Council on Rural Development
- Paul Hutchins – Rock of Ages
- Paul Zabriskie – Central Vt. Community Action Council
- Peter Adamczyk – Vt. Energy Investment Corp.
- Peter Gregory – Two Rivers-Ottaqueechee Regional Planning Commission
- Peter van der Hoof – Casella Waste Systems
- Phillip Mosenthal – Optimal Energy
- Richard Faesy – Energy Futures Group
- Riley Allen– Regulatory Assistance Project
- Robert Chamberlin – RSG, Inc.
- Sam Swanson – Pace Energy & Climate Ctr.
- Sandra Levine – Conservation Law Foundation
- Sarah Carpenter – Vt. Housing Finance Authority
- Sarah Galbraith – Vt. Sustainable Jobs Fund
- Sarah Hoffmann - New England Conference of Public Utilities Commissioners
- Scott Harrington – Vt. Gas Systems
- Scudder Parker – Vt. Energy Investment Corp.
- Steven Letendre – Green Mountain College
- Stu Slote – Navigant Consulting
- Tim Maker – Community Biomass Systems
- Tom Buckley – Burlington Electric Department
- Tom Evslin – NG Advantage
- Wayne Nelson
- William Driscoll – Associated Industries of Vermont

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State and Federal Government

- Alex DePillis – Agency of Agriculture
- Beth Pearce – Vermont State Treasurer
- Billy Coster – Agency of Natural Resources
- Brian Woods – Dept. of Environmental Conservation
- Dale Azaria – Agency of Commerce and Community Development
- Dick Valentinetti – Dept. of Environmental Conservation
- Dylan Giambatista – Office of the Treasurer
- Elaine O'Grady – Dept. of Environmental Conservation
- Gina Campoli – Agency of Transportation
- Harmony Wilder – Dept. of Buildings and General Services
- Jacob Smith – Office of Senator Sanders
- Jeff Merrell – Dept. of Environmental Conservation
- Jon Kaplan – Agency of Transportation
- Ken Jones – Agency of Commerce and Community Development
- Margaret Cheney – Vermont Legislature
- Michael Snyder – Dept. of Forest Parks & Recreation
- Paul Frederick – Dept. of Forests Parks & Recreation
- Ron Shems – Vt. Natural Resources Board

Public Service Department Staff

- Christopher Recchia, Commissioner
- Darren Springer, Deputy Commissioner
- Asa Hopkins, Director of Energy Policy and Planning
- Kelly Launder, Assistant Director, Planning and Energy Resources Director
- TJ Poor
- Karin McNeill
- Edward Delhagen
- John Woodward

Public Comments in Response to the Legislative Report

1 Introduction

This document provides a synopsis of comments on the Total Energy Study (TES) Legislative Report solicited and received from energy stakeholders and the public between December 15th and January 23rd, 2014. The total number of comments received was 436, including 41 emails originally authored and 395 form emails.

The narrative below is a synthesis of all the comments. Sections 1-7 relate to assumptions and policy and technology selection for the TES modeling, while Section 8 relates the State process for carrying out the TES.

2 Measuring Energy Goals, Costs, and Benefits

Policies aimed at greenhouse gas (GHG) reduction should be advanced. Vermont's needs to understand and model lifecycle emissions; this will inform the best energy choices, policy approaches, and investments. Note that 10 V.S.A. §578(a) goals are to reduce GHGs from "outside the boundaries of the state that are caused by the use of energy in Vermont." GHG calculations for fuels extracted from shale fracking and tar sands should account for emissions from extraction processes. Fugitive methane is not accounted for in burner-tip treatment and methane is so potent a GHG. This must be studied prior to further development of policies and strategies that include natural gas (NG) use.

For bioenergy, Vermont should rely on EPA GHG methods in order to avoid participation in this debate.

Vermont's GHG progress is inconsequential relative to other states.

One commenter requested that the cradle to grave GHG emissions of energy equipment (renewables specifically) be accounted for. Another noted that conventional GHG accounting measures are influenced by the status quo investment in fossil fuel powered global economic systems and are even at work in venues such as the IPCC.

Eliminate counting Vermont SPEED renewable energy credit (REC) sales as renewable resources.

The TES model cost/benefit analysis need to compare energy technologies using a true Levelized Cost of Energy done on a societal cost basis over the lifetime of the asset (typically 25 years minimum). Because current programs, do not customers are given incentives for more efficient oil burners but not receive incentives for switching to renewable heating systems.

The cost/benefit analysis should assign the right value to biological systems and natural resources such as Vermont's wild lands, forest lands, water resources, agricultural soils, and recreation areas in order to effectively compare technology pathways. Also social capital and health externalities should be internalized.

Cost benefit analyses should account for the substantial non-energy benefits of efficiency and renewable projects. Also, conservation can improve well-being by lowering expenses and debt, increasing leisure time, physical activity, health, and community interaction…

Modeling needs to account for indirect costs and test an electric load/rate "death spiral", such as synchronous condensers needed to reduce wind curtailment, local subtransmission upgrades, greater use of spinning reserves from NG generators, costs to alleviate impacts of shifting summer peak due to solar penetration (storage, control technologies), cost increases to other customers when entities reduce electric load by switching to trucked CNG or LPG or due to expansion in net metering (increased electric load from heat pumps could mitigate this), the cost to train more master electricians.

3 Statutory Goals

Scenarios should include ample funding for energy efficiency and renewable energy projects in affordable rental housing units. Low income housing services seek to mitigate the impacts of higher energy prices by building and retrofitting housing to meet energy efficiency standards and locating housing near jobs and services.

One commenter stated we can't offset costs for those who cannot afford higher energy costs if that requires doubling costs for others.

4 End Use Demand Technologies and Services

Vermont should invest more in efficiency and conservation. Incorporate the TETF recommendations. Retrofit programs should be fully funded.

Americans need to use 1/10th our energy consumption to get back to 350ppm. The TES Legislative Report page 30 states there is likely a need to reduce Vermont's total energy use through conservation and efficiency by factor of 2 by 2050. One commenter stated that goals to increase energy productivity and the need to potentially reduce energy demand by a factor of 2 or more by 2050 may be in conflict.

Another commenter stated that that level of conservation will cripple Vermont's economy and prefers to see emphasis on increasing renewable supply and GHG free sources, rather than on decreasing aggregate demand. Don't make reducing energy use (inc. vehicles-miles-traveled, VMT) an end in itself. Avoid simple terminology "use less energy" in favor of phrasing such as "dramatic increase in the energy productivity of the state's economy" and "increasing the productivity of energy use".

Do not support do-it-yourself weatherization programs; for beneficial returns, weatherization must be done by experts.

In the industrial sector, in-house engineers have more expertise than EVT regarding efficiency measures in their businesses.

Encourage converting street lights to LEDs.

Encourage passive solar and passivhaus building standards in five years.

Electric vehicles (EV) are not practical for Vermont (cold weather) and are too expensive. Vermont should not count on EV penetration soon enough to meet GHG goals. Don't build large wind in anticipation of broad EV adoption.

Subsidize heat pumps. Legislators are skeptical regarding carbon savings with heat pumps. One commenter stated that heat pumps may be good for new construction but not for existing homes because they are too expensive, not compatible with steam and forced-hot-water systems, and are not recommended for hot water heating where temps fall below 40 degrees.

5 Energy Supply Technologies and Services

Supply modeling needs to assess and inventory the renewable economic and technical potential of each technology (generators, storage, power controllers) and their integration mapped on to the Vermont landscape and include the complexities of mixing electric resources stationed in faraway places (Midwest or off-shore wind). Energy return on energy investment (EROEI) analysis must be the basis for assessing the potential of each technology and geographic placement. Supply modeling will inform which locations and jurisdictions should be incented to produce an optimal share of Vermont's energy supply.

Vermont should build out in-state renewable generation/production with large and small-scale installations. Highlight reduced energy losses due to replacing combusted fuels with renewable electric resources. Don't load build to make electric technologies cost effective e.g. solar.

The electric grid should be upgraded to be more resilient to storms. Build locally powered power islands for each neighborhood/community. Each island would be detachable and linked so communities can back each other up. This will reduce the need for high-tension lines. Using smart meters and connections, during emergencies customers could reduce demand choosing priority equipment to power.

Canadian imports could be lower cost than in-state resources.

As suggested on pg 33, the priority for the use of combustible fuels should not be - heat-led combined heat and power (CHP); heating only; transportation; electricity led-CHP; and electricity only". The electrification of heat and vehicles will result in substantial GHG reductions even if the electric source is primarily from NG plants. Also, flex-fuel electric generation and demand response will be essential to balance the grid. Therefore, heating only and transportation applications should have a lower priority.

Biomass and biofuels resources are limited, must be sustainably harvested, and have health implications.

- Abandon biomass use for electricity only or for low efficiency CHP applications.
- CHP has limited potential in Vermont based on the amount of manufacturing. For CHP projects, we need to model the CHP technology's potential for efficiency contribution of distributed generation, carrying winter loads, and the displacement of grid power, while letting efficiency control the supply choice. Vermont needs to address regulatory and permitting barriers.
- A cap on biomass will be set not based on requirement for sustainable harvesting but on the low energy content of this heavy fuel, with consequent large transportation costs, and the debated concerns regarding public health and carbon neutrality.
- Biomass plants do not reduce GHGs. Based on EPA, data coal plants have lower GHG emissions. E.g. The Springfield Vermont biomass plant has allowable CO2 emissions (2,668lb CO2/MWh) 2 ½ times greater than the proposed EPA standard for fossil fuels (1,000lb CO2/MWh).
- Prime agricultural soils need to be protected for growing food.

- Used of forest resources for energy needs, to be balanced with the sequestration value of those resources.

GHG goals and Vermont agricultural policies are in conflict. State approved practices and technologies promote conventional dairy farming, petroleum based fertilizers, and fallow fields. Larger farms receiving methane digester subsidies, put savings into new capacity, thus adding to the feedback loop favoring the paradigm of continually expanding conventional dairy farms. Instead, small organic farming practices and technologies should be favored.

A number of commenters requested that NG not be considered in Vermont's energy future. The TES report mentions policies and technologies that include NG uses – HDV, industrial processes, electric generation. The driver of NG use is price; the driver of Vermont energy policy is climate change. NG should be approached with skepticism so the right questions remain open.

Do not approve NG pipelines (extensions). Any NG use should include offsets and mitigation to reduce overall use going forward. Begin charging NG a GHG fee. Vermont should reveal the secondary environmental and health impacts from fracking. NG price volatility impacts should not be undervalued. Renewable sources offer price stability and are becoming lower in long term costs. Expanding NG infrastructure locks Vermont in and pipelines will be hard to later abandon. Treating NG as a bridge fuel is false –

> Energy prices will not remain comparatively cheap; EROEI is falling; global demand is growing; lifecycle GHG regulations will change price dynamics; NGs methane emissions are high and expert consensus rates methane's 20 yr global warming impact at 80 times that of CO2.

A number of commenters requested that nuclear not be considered in Vermont's energy future. A couple of commenters requested that the newest generation of nuclear technologies be explored as well as the developing Low Energy Nuclear Reactions (LENR) technology.

6 TES Scenario Selection and Pacing

Some respondents believe Vermont should stand out as a leader with aggressive policies. Vermont's uniqueness does allow us to be out front, but Vermont needs to be wary of risks/reward. Some respondents are concerned that exploring innovative overarching policies could have many unintended consequence. Don't be "out there alone". Pathways need more analysis before this risk/reward context can be likewise flushed out.

With a high pace of technology innovation, Vermont should be flexible to adjust pathways to meet goals. The pace of transition will be set by the end-of life turnover of older technologies; there will be no buy-back program for old technologies. Leaders should be wary of those who hold on to or push technologies as motivated by self-interests.

PSD should test combinations of the policy sets identified in the TES Legislative Report. At least on one of the TES scenarios should analyze a carbon tax. At least one TES scenario should analyze carbon pricing

mechanisms. Some suggested Vermont should not institute a carbon tax or other pricing mechanisms unless there is a national movement, or a regional movement. Some are concerned with how the regulation would be perceived by Vermont's broader business community.

Carbon tax/pricing should not be the sole policy used to meet energy goals. There are market barriers other than price. There is a great deal of literature on barriers to end use efficiency and transportation alternatives. One barrier to respond to is the mismatch between the long time horizons and lower discount rates at play in decision making for large supply-side infrastructure versus short time horizons and higher discount rates for consumers when they make energy demand choices.

Due to the cumulative effect of GHGs, PSD should analyze how of different pacing in scenarios impacts GHG reductions.

The primary importance of Vermont's energy planning is the fight against global warming, however it will be the changing economics of energy services favoring renewables that will motivate behavior; thus policy should be simplified to focus on facilitating the shift to renewables.

Eliminate policies with voluntary targets and credit sales for renewables. These policies have no penalty for missing GHG goals and do not provide appropriate incentives. Mandates are needed. For example, Vermont SPEED creates only an illusion of moving toward goals. Utilities selling RECS must be required to buy RECS to meet renewable energy obligations.

Sector specific policy work can begin now. Most agreed that some sector specific policies are best directed in Vermont while others require regional collaboration. Many commenters stated that sector specific policies need an overarching policy, otherwise there is too much complexity and several commenters had concerns about costs. Also, energy sectors have been separated in energy bills, through regulation, policy, technology, and markets. Going forward, conservation, efficiency, and renewables must be integrated across energy sectors. A few commenters stated that sector specific policies working in tandem with regional efforts can work without overarching policies.

While regional collaboration is desired on certain policy fronts, Vermont should not let regional consensus be a defining feature of our energy pla. Do not let working regionally impede Vermont's ability to move forward toward meeting our energy goals.

Scenarios should address all market failures including irrational (other than cost based) consumer behaviors. Therefore, public outreach and education programs should be included. (See Section 8.)

Scenario construction should solve and/or output the impact on transportation infrastructure funding.

7 Legislative Primary Policy Sets

This section highlights specific issues raised about each of the primary policy sets and includes specific policy sets and goals proposed by respondents.

7.1 Nearly-Revenue-Neutral Carbon Tax Shift

A carefully crafted carbon tax could be the most effective policy mentioned in TES. It should be flexible to new information. A carbon tax must be imposed throughout the energy markets and priced high enough to value the damage done by the emissions. This needs to be enacted as soon as possible. One commenter noted that complementary programs to the carbon tax listed in the Legislative Report are very complex.

Use the term fee rather than tax. Use a "fee and dividend" model and don't just reduce other taxes. Dividends are most effective in motivating ordinary citizens [this is especially true for lower income people].

Carefully analyze the level of carbon tax needed to reduce carbon use. Price carbon based on the appropriate value to reach GHG goals and not based on needed energy program revenues. If there is a revenue short fall to fund energy programs, offset other taxes to meet specific revenues and compensate energy programs. Focus offsets on taxes that disproportionally impact low income people and have broad consumer impacts, e.g. sales tax.

The cost per ton of GHG reduced will be greater through this policy than the other policies, unless some revenues go to low cost GHG reduction measures that face market barriers other than price. It has been shown that carbon pricing on power resources is 7-9 times greater than cost per ton GHG for efficiency investments. This issue needs further analysis for the thermal and transportation sectors where similar results are expected.[1]

7.2 Total Renewable Energy and Efficiency Standard (TREES)

Any scenario testing TREES policies should include policies that address other non-pricing barriers to a least cost solution. Such a scenario needs to capture all the cost-effective efficiency resources, spur transmission access to low cost out-of-state renewables, support flexible generation and demand response technologies to optimize the grid, and address social and other barriers to reducing VMT. TREES does not address how the policy would result in lower fossil fuel consumption/GHG emissions.

The TREES credit structure could borrow the credit paradigm used for energy efficiency - set deemed credits for simpler measures, develop credit algorithms for somewhat more complex measures, and design custom credit protocols for truly complex measures. This credit structure would be refined over time as evaluation results shed light. Continue to pay clean generation credits at generation and efficiency credits over the life of savings; efficiency credits should be set via evaluation-based assumptions.

Efficiency is the least-cost solution but faces more market barriers than renewables development which is more expensive. Therefore to meet TREES obligations, it is not appropriate to set limits on the amount

[1] This issue arose in the recent GHG calculation done for the CEDF FY13 portfolio.

of efficiency added in order to insure a minimal amount of renewable energy is supported; rather there should be limits on renewables to ensure enough low cost efficiency is captured.

An important disadvantage of TREES is the creation of a single market clearing price for clean energy. There will be a wide range of costs for building efficiency, fuel switching, transportation efficiency and renewable generation measures. With TREES, as described, the most expensive measure would set the annual clearing price and consumers would then pay more for certain resources than if acquired through direct obligations. This has been an issue for standard offer efficiency programs in the US and white certificate programs in Europe.

Avoid the situation where both TREES credits and SPEED credits are at play in markets.

The application of TREES to the transportation sector needs in-depth analysis and consulting expertise. How would one gain credit for a transit service or for lower energy land use design [location efficiency has other social and cost benefits beyond transportation – water systems, communication systems].

One commenter was concerned about "double counting" evident in the description on page 23 of the Report "If energy efficiency measures are awarded lifetime credits, it could mean that the overall obligation could rise above 100% (e.g. achieved through 30% lifetime efficiency – saving 2% annually for 15 years – and 75% renewable supply)". The goal is 90% renewables not 75%.

Renewable Energy Vermont does not favor commodity trading of RECs because the REC markets lead to price fluctuations and uncertainty for businesses. Rather, REV members favor Feed-in-Tariffs.

7.3 Renewable Targets with Carbon Revenue

Why was this hybrid approach proposed for renewables without one for efficiency? Efficiency is more important. Europe came close to its binding GHG and renewable energy goals, but fell short in efficiency due to the lack of binding goals. One commenter noted that program described to be funded with carbon revenues are too complicated, appear ineffective, and damaging.

A benefit of this policy is greater flexibility for energy providers than is evident with a carbon tax or TREES.

7.4 Energy Sector-Specific Policies

Also refer to Sections 4 and 5.

In the list of sector policies include aggressive building energy efficiency codes with net zero requirements for new construction by 2030, mandatory labeling and disclosure for buildings at time of sale/rent/lease and mandatory minimum efficiency levels for buildings. Evolve these building energy policies to promote distributed renewables and transportation efficiency via requirements for renewable-ready buildings, and energy rating credits for renewables and location efficiency.

As to whether fuel dealers are sophisticated enough to respond to and support thermal efficiency regulations, Energy Futures Group estimates 15% of dealers are or have committed to becoming retrofit service providers and these are generally the larger firms.

Ideas for transportation policies:

- Add a VMT property tax based on miles away from compact communities or transit hubs.
- Lower the maximum speed limit to 55 mph. Meanwhile, enforce current limits with increased police patrols.
- Increase the gas tax and fund public transit, including rebates for those without access to transit.
- Include sector policies to address transportation electrification.
- Transition to NGVs until they can be replace by EVs; ask businesses to turnover fleets in exchange for not raising diesel tax.

Land use policies to drive growth to downtowns in compact communities and restrict growth to other areas are essential to reduce transportation GHGs and create more mobility options close to home and work. The modeling needs to explore diversification in Vermont's transportation system and alternatives to SOVs.

7.5 New England Regional Energy Policy Focus

Include collaboration with Canadian provinces. Regional collaboration is necessary to leverage markets and promote regional procurement.

Policies that absolutely rely on simultaneous action regionally to be successful are a concern. With this Regional Focus policy front, how would Vermont insure we meet our state energy goals. How can we insulate Vermont from regional collaboration on policies that could result in Vermont interests being overwhelmed by larger states like MA and CT?

Work regionally to modify the electric capacity market to place great value on flexible resources for grid control; this is needed with increasing penetration of non-dispatchable renewables (e.g. demand response, quick/frequent ramping).

Regional standards are needed for biomass harvesting and procurement, and pellet production

A VMT fee would have to be implemented at the federal level.

7.6 Specific Policy Sets or Goals Recommended by Respondents

Akin to feed-in-tariffs[2] the TES could test policies which assign prices designed to reach specific CEP objectives, e.g. GHG reductions through specific means, increased building efficiency, fuel switching, decreasing VMT. Let the market determine how many of these "goods" are purchased. Reset the prices to refine the market action as progress is made or not made. This policy differs from carbon tax by giving positive incentives to encourage goals are met. Incentives are more effective than penalties. Feed-in-tariffs can be designed to meet certain objectives where a carbon tax cannot. Difficulties with this approach include funding and the challenge of setting prices per objective.

A legislative mandate is needed to drive and track conservation in order to reduce fossil fuel consumption. For example, before a renewable installation goes on-line, a commensurate unit of fossil fuel consumption must be eliminated. Vermont will not reduce fossil fuels by adding renewables and increasing efficiency. Efficiency does not necessarily reduce overall consumption. Several TES sections describe that efficiency promotes more spending and economic growth. The economic multiplier effect could nullify or reduce gains from adding renewable resources; this should be considered a market failure. Spending and growth increase consumption, therefore, only conservation reduces consumption.

Legislate a VMT fee with added factors for vehicle weight and possibly number of axles; this needs detailed study. A nonlinear formula makes sense for projecting road wear from vehicle weight and number of axles. To measure VMT, record odometers at the time of annual inspection.

A sector specific achievable immediate path forward is:

- Reduce transportation footprint: decrease VMT, increase ride-sharing, invest in transit, encourage efficient vehicles, switch to EVs only where they are powered with photovoltaics (PV)
- Weatherize homes
- Replace oil and propane with wood and grass pellet heating
- Encourage solar hot water
- Continue to encourage low-impact small distributed electric generation; raise net metering cap; Encourage PV especially with dropping prices

Two central policies can drive the change: 1) a GHG fee for damages to finance the program, and 2) a renewable energy production plan to support in-state production where models show the best geographic and political potential:

> 1-Renewable energy funding via a CO2e GHG fee for damages based on the federal Social Cost of Carbon and third-party derived lifecycle accounting would fund administration, low-income rebates, and investment capital for build-out of renewables. Low carbon renewable energy from out-of-state will not be charge fees but will not be eligible for investment capital or fee rebates.

[2] "For insight on how this might apply to resource objectives other than renewables, see the following paper on the concept of a feed-in-tariff for efficiency: Neme, Chris and Richard Cowart, "Energy Efficiency Feed-in-Tariffs: Key Design and Policy Considerations", 2013 ECEEE Summer Study Proceedings, pp. 305-315."

2-A comprehensive renewable energy production plan will place responsibility on the entire Vermont community on a pro rata basis. This supports local control and benefits. Capital is given for investment and fees are charged if the a "fair share" of investment is not carried out. Communities and Vermont as a whole could be an exporter of energy services. The highest capital support and fees would be in early years encouraging rapid build-out and taper off as fossil fuel use declines. Accounting and regulation for energy production should be separated from grid services. Electric utilities should be responsible only for grid services such as T&D, should be treated equally with other renewable energy production project owners. Vermont should adopt CA's model for interconnection standards.

Vermont could export excess renewable energy; go above 90% to 150-300% renewables. The way we account for and treat out-of-state resources in policy requires serious analysis and debate. Planning for a "100% energy island" within Vermont enhances the benefits of localization. This will eliminate the potential future where Vermont will have to outbid other locales in competition for energy resources.

TES modeling should look at the rate at which sustainably harvested Vermont forests can serve home heating coordinated with efficiency measures, and then assess how remaining heating demand can be served by electricity.

8 Comments Pertaining to the TES Process

Public-private partnerships can be hampered by constraints in how public or quasi-public organizations deliver assistance or funding. The Public Service Department (PSD) and other top level regulatory agencies should develop administrative processes from the top down to maximize flexibility within state agencies and partners.

Vermont needs an energy czar at the cabinet level and a regulatory body that can facilitate the renewable energy plan, its implementation, and accelerate approvals across state agencies, the PSB, and other regulatory panels.

Addressing climate change is a moral necessity. Leaders need to educate the public. Vermont can sustain its energy needs and prosper with locally owned and controlled distributed renewable energy. Other benefits are sustainable local food and agriculture, sustainable jobs, sustainable land utilization. Vermont's landscape must show visible signs of energy infrastructure and production. We need a radical campaign to explain this need. Need to confront the status quo that resists this change. We need strong convictions, will, and diverse champions to overcome resistance to change.

We need to move the public discourse to efficiency initiatives in thermal and transportation and away from the over focus on renewable electric generation issues. Cease framing non-SOV travel modes as alternative.

We need qualitative modeling to promote benefits to be accrued equitably to Vermonters so they understand the renewable energy vision and its promise. This vision needs to be told from many

perspectives, large and small, every day. Energy costs and impacts need to be carefully explained to the public; the public has been given conflicting information. The legislature should mandate an education/outreach campaign to inform all Vermonters of the need for energy conservation with materials and method for tracking individual progress in lowering consumption. State educational curricula should include courses on energy conservation.

Vermont should study and legislate for product labeling which would note the energy impact/savings of products.

PSD should track which sectors and technologies result in increased use of fossil fuels. One commenter suggested retiring the term clean energy (eliminate NG and nuclear in the portfolio) and use the term renewable. Renewable energy includes critical components – efficiency, demand-side management, storage, and energy carriers – electricity, hydrogen, methanol, ammoniac, dimethyl ether and biofuels as long as carriers use renewable energy as the primary energy source.

PSD needs to include in each policy/strategy discussion which includes NG as an energy resource, an obvious articulation that the study of NG lifecycle emissions was not undertaken, but that such a study has potentially signification information.

TES modeling could initiate a decades-long effort to model demand and supply/production. Assumptions and methods should be explicitly described. Independent entities should be allowed to use the model and test their own assumptions. One entity should coordinate consistency in data inputs which are take from peer reviewed and official independent bodies, excluding studies funded by pro fossil fuel, anti-wind, or anti-biomass money.