CHITTENDEN COUNTY RPC
Communities Planning Together

CCRPC Long Range Planning Energy Sub -Committee

AGENDA

*=attached to agenda in the meeting packet

DATE: **Tuesday, December 19, 2017**

TIME: **5:00 p.m. to 7:00 pm Meeting may go until 8, if needed**

PLACE: **CCRPC Office, 110 West Canal Street, Suite 202, Winooski, VT.**

Wi-Fi INFO: **Network = CCRPC-Guest; Password = ccrpc$guest**

1. **Welcome + Introductions (5 minutes)**
   Accessed Here

2. **Review November 28, 2017 Minutes (5 Minutes)**

3. **Public Comments* (Discussion) – 60 minutes**
   Please see the attached spreadsheet for the comments CCRPC has received on the draft sections of the ECOS Plan. The comments highlighted in yellow are the comments which need committee input. A draft of the relevant sections of the ECOS Plan is also attached so you can review the proposed amendments which address the public comments. Please consider making a recommendation to the LRPC on including the energy sections as drafted in the 1st public hearing draft of the ECOS Plan.

4. **Renewable Generation Targets* (60 minutes)**
   Please see the attached tables which show each municipality's generation target under a variety of scenarios.

5. **Next Steps** *(5 minutes)*
   Next Meeting 01/16/2018

In accordance with provisions of the Americans with Disabilities Act (ADA) of 1990, the CCRPC will ensure public meeting sites are accessible to all people. Requests for free interpretive or translation services, assistive devices, or other requested accommodations, should be made to Emma Vaughn, CCRPC Title VI Coordinator, at (802) 861-0114 or evaughn@ccrpcvt.org, no later than 3 business days prior to the meeting for which services are requested.

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1	**2018 ECOS Plan Public Comments**										
2	**Category**	**Page #**	**Comment**	**Commentor**	**Municipality**	**Response**	**Date Response Sent & by Whom**	**Proposed ECOS Plan content change (Y, N, N/A)**	**Need LRPC Discussion?**		
4	Energy Plan	N/A	Thanks for updating me on this - I'm very interested, especially in conservation in this area. Let me know if there will be meetings open to the public.	Paula DeMichele	Essex	Thank you for your reply to our Front Porch Forum post in late September regarding Chittenden County's ECOS Plan update, and specifically the energy component. I'm very sorry for the delay in getting back to you! To answer your specific question - yes, there are working meetings where the energy content will be further refined. The Energy sub-committee will be working on this exclusively, while the Long Range Planning Committee will be working on the entire ECOS Plan update, including economic development and transportation. The Energy sub-committee will meet next on Nov. 28th from 5pm to 6:30pm; and their agenda will be posted before the meeting here. The Long Range Planning Committee (LRPC) will meet next on November 9th from 8:30am to 10am; and their agenda will be posted before the meeting here. I don't anticipate much energy content on the LRPC's November agenda, but likely at their December meeting (December 14th at the same time). Melanie Needle is leading this effort and is cc'd here. Please let her know if you have any questions/comments. Also, we will be posting a summary and a draft of the energy plan content next week, and it will be posted here when it is ready.	10/27/17, Regina	N/A			
5	Energy Overview	2	What about natural gas heating? How does that cost compare to the cold climate heat pump cost?	Anonymous		Staff will research data on cost comparisons for each fuel type. http://publicservice.vermont.gov/content/retail-prices-heating-fuels	Not yet responded	**Need to add cost comparison for fuel type**			
6	Energy Overview	2	[Reply to the above comment] Great question! Here's a complimentary one: assuming natural gas heating is "cheaper", how might we find ways to make heat pumps (local and clean energy) the go-to choice?	Anonymous		Heat pumps do provide air conditioning and the energy which powers a heat pump is "greener" than natural gas. However, in VT Gas's territory heat pumps are a tough sell as saving money with a cold climate Heat Pump (CCHP) is highly unlikely, even if the system you purchased displaces 75% of the natural gas your building consumes during a typical year. In fact, current natural gas prices would need to double in order for most CCHP systems to generate enough savings to pay back your initial investment of between $3500 and $5000 in 9 years. Staff will add the issue of CCHP not being competitve with those heating with natural gas as a key issue and emphasize that is a strategy for keeping our energy dollars more local than sending them abroad.	Not yet responded	Yes made the change			
7	Energy Overview	2	Where does this data come from, the DPS fuel price report? http://publicservice.vermont.gov/content/retail-prices-heating-fuels	Wayne Maceyka		Thanks for providing the data reference!	Not yet responded	N/A			
8	Energy Plan	7	Perhaps this should be saved for the Transportation section, but a reference to electric transit buses (as demoed in Burlington) might be in order here.	Anonymous		We will add language which references adoption of electric school buses to policy statement 3.2.2.5.c.v.3	Not yet responded	Yes made the change			
9	Energy Plan	10	Smart Grid without price signals to allow customers to share in the value of shifting their demand to optimal times (such as those with lower demand or when the sun is shining) will not work. Protections need to be in place for those vulnerable populations who can not shift demand, but transparency in the price of energy at certain times is paramount for Smart Grid to work.	Anonymous		Staff will add price signals to this key issue	Not yet responded	Yes made the change			
10	Energy Plan	10	Vermont pioneered the energy efficiency model that has been replicated around the globe. Now, let's put the same Market Transformation mechanism to work for transportation!	Anonymous		I think this commentor is referring to the Carbon Tax. Including a statement on CCRPC's position on the carbon tax is out of the scope of this Plan and seems premature given that the Governor's Climate Action Commission is currently working on specific actions he should move forward with by January 1, 2018.	Not yet responded	change needed			
11	Energy Plan	10	As with Burlington Electric's "Net Zero Burlington" initiative, no one wants to talk about the elephant in the room: natural gas. Can we call out specific steps to get us off the addiction of "cheap" (but costly to the environment) natural gas?	Anonymous		The draft plan already acknowledges that we are challenged with meeting the 90X2050 goal being in VTGAS's territory. I'm not sure there is anything else we can say on this issue.	responded	change needed			

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12	Energy Plan	11	YES! Heat local (biomass or PV-fueled heat-pumps) and fuel your car locally (PV-fueled cars) to keep money in the local economy!!!	Anonymous		Thank you. Perhaps we can connect keep our energy dollars local with cold climate heat pumps as we move towards more in-region renewables. See row 6 for how we are adressing this	responded	Yes made the change in the energy key issue section			
13	Energy Plan	11	Don't pellet stoves produce more greenhouse gases than natural gas heating systems?	Scott Pennington		The combustion of wood releases carbon dioxide into the atmosphere, but through the cycle of growing trees, using the wood, and replanting more trees, the carbon dioxide is recycled from the atmosphere. As long as trees are replanted at the same rate they are harvested and used, they take in approximately the same amount of carbon dioxide as is released during combustion. Therefore, using wood for energy does not contribute to climate change by adding more carbon dioxide to the atmosphere. Heating with wood produces less carbon overall as long as it sustainable harvetsted.	responded	l wood in the discussion of heat in the key issues sec			
14	Energy Plan	11	Add-on question: how do the new EPA wood stove guidelines or newer (80% efficient) pellet stoves and boilers match up with natural gas from an emissions standpoint?	Anonymous		"Yes, whether you use natural gas or propane emits less soot and other air pollution" (retrieved from EPA site) . Natural gas is not a renewable resource.	responded				
15	Energy Plan	14	This sort of growth in heat pump use in the C&I sector may be a surprise to the local electric utility. Does it match their projections? Is it even technically possible?	Anonymous		From Robert Dostis at GMP" The electric utilities subject to Act 56 are offering innovative products and services to meet the statute and deliver innovation. These electric utilities offer a host of services and programs that encourage strategic electrification to reduce fossil fuel use. For example, BED, in addition to being its own efficiency utility is exploring electric buses to replace old diesel busses. GMP is promoting cold climate heat pumps and heat pump water heaters with a finance to own program. GMP also offers Tesla Powerwall batteries, and when coupled with roof top solar, they increase renewable generation and reliability. GMP's offerings, like electric vehicle charging stations, and mobile control devices for heat pumps and water heaters, not only provide convenience to customers they also allow GMP shared access to these appliances to lower costs for all. VEC is providing incentives for electric vehicles and heat pumps. VEC along with all the utilities are working with their commercial customers to customize solutions for strategic electrification. As these services and programs are being deployed and as they demonstrate value they will not doubt be shared and offered by all the electric utilities. Opportunities in general for strategic electrification in C & I sector is big. Heat Pumps are a definite option for warehouses and manufacturing "					
16	Energy Plan	16	This plan with its increased reliance on electricity reminds me of the push for electric heat in the sixties. It was then and is now really short-sighted to promote one fuel source over others. What we need is diversity, not uniformity. What happens if and when the grid goes down? Not only will all the latest gadgets be unusable, but people will be stranded with no alternatives for power. The latest wind storm is a good example of my point. Many are searching for generators powered by oh horrors - fossil fuels.	Leslie Rowley		As we transition to more renewables, grid resilience is valued by both residents and business, especially because Vermont's climate makes us vulnerable to grid outages. When storage is coupled with distributed energy generation it can provide a source of backup power and also offer the potential to minimize loads at peak times, thereby reducing energy costs.	responded	ontent to energy key issue section			
17	Energy Plan	16	For back-up, battery storage (as prices continue to plummet) and yes fossil fuels are going to be the answer. Using fossil fuels for a main heating system or for transportation, however, is going backwards.	Anonymous		I think this coment is saying that fossil fuels should only be reserved for back up generation. Do we need to call this out as a key issue?	Not yet responded				
18	Energy Plan	16	What kind of land was measured for this data, solely just open agricultural land? Does this include available land over previously developed, impervious parking lots? There is huge potential in citing ground mounted solar canopies over existing developed spaces while also preserving their uses for parking. Diversifying use, offering infrastructure to EV charging, and, of course producing energy.	Anonymous		All land free from state and local known constraints was used to measure energy potential. Existing developed areas were not subtracted out from the analysis. The ECOS Plan does include assumptions on energy potential on rooftops and includes a policy statement encouraging solar canopies on parking lots	responded	change needed			

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19	Energy Plan	20	How can we make these ideas into reality?!	Anonymous			Not yet responded	N/A			
20	Energy Plan	30	I've only looked at the EV areas so far— MEGO— and what I see looks like pretty good Rx, but could maybe use more timeline details and specifics. For instance, many, many more level 2&3 chargers in varied locations will be necessary to get people comfortable with buying an EV. For instance, where do people spend time with their cars parked, besides work? Restaurants, department stores, gym/sport facilities, etc. These establishments need to be convinced that sponsoring charging stations will increase their patronage while drivers wait for their cars to charge. I only became comfortable buying an EV when the Bolt came out because I felt I could drive for a day of errands and still get home to Huntington in the winter. Rural drivers will get the most out of EVs if they can be confident of returning home. Really every town and village needs multiple spots to recharge— look at how long it takes as opposed to filling up with gas! Also, a universal standard charging port would be good to encourage, or at least cheap or free adapters so everyone can use the Tesla stations. VHS vs. Beta, again? I hope to be able to look at other sections as time allows, but I am crunched to get projects done before the snow flies...	Knox Cummin		The Plan does specifically reference downtowns as being key locations for public charging. Will add villages, as well to policy 3.2.2.5.c.v	responded				
21	Energy Plan	16	What kind of land was measured for this data, solely just open agricultural land? Does this include available land over previously developed, impervious parking lots? There is huge potential in citing ground mounted solar canopies over existing developed spaces while also preserving their uses for parking. Diversifying use, offering infrastructure to EV charging, and, of course producing energy.	Anonymous		All land free from state and local known constraints was used to measure energy potential. Existing developed areas were not subtracted out from the analysis. The ECOS Plan does include assumptions on energy potential on rooftops and includes a policy statement encouraging solar canopies on parking lots	Not yet responded	N/A			
22	Energy Plan	19	It's good to mention CNG, but given that engines must be altered to run on it, it might not be worth investing in retrofits or new technology that will be outdated within 50-100 years.	Darren Schibler		Compressed natural gas although cleaner than gasoline is not in alignment with reducing fossil fuels in the transportation sector.	Not yet responded	N/A			
23	Energy Plan	20	Has anybody explored policies that replace gas taxes with vehicle taxes? This would solve the infrastructure problem in the short term while incentivizing non-SOV travel long-term; subsidies for high-efficiency or low/no-emissions vehicles could help bridge the financial gap and further the 90/2050 goal.	Darren Schibler		Vtrans has been working on this. Staff will find out the status of this work	Not yet responded				
24	Energy Plan	21	The wording here is somewhat confusing--has driving alone increased by 71%, or decreased to that number?	Darren Schibler		Revised	Not yet responded				
25	Energy Plan	22	Discussion of rail transportation is sorely lacking in this section, especially given the existing rail network in the county, and the potential efficiency and ability for rail to transition to renewable energy sources. Air transportation is already cost-prohibitive (at least from Burlington) and will become unsustainable in the near future.	Darren Schibler		we could include a reference to the MTP's section on rail here	Not yet responded				
26	Energy Plan	3	This land use section does not seem to relate to energy, but could discuss how compact settlement is more energy-efficient because of reduced travel distances, heating efficiency of clustered buildings, etc.	Darren Schibler		we will revise per comment	Not yet responded				
27	Energy Overview	2	What percentage of Chittenden homes and residences have access to natural gas?	Tim Loucks		37,073 or 57% according to the ACS 2016 1-Year estimates	Responded	change needed			
28	Energy Overview	2	What about energy storage strategies as part of this shift to electric?	Tim Loucks		Need to review the State's storage plan.	: has been added to the energy key issues				
29	Energy Overview	2	Why no mention of wood pellet heating since the state is promoting this with incentives for wood pellet boilers?	Tim Loucks		The energy overview was intended to focus on the highlights of the enery sections and wood pellet heating has less of a focus given there are little to no siting/land use implications to them.	Wood pellet heating is part of the pathway for achieving 90X2050 but the state's energy modeling assumes that the current rate of wood heating will remain constant into the future.				

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30	Energy Overview	2	Natural gas is a fossil fuel so using it doesn't help our renewable energy goals. My guess is that the plan highlights oil because there's good reason to switch from oil to heat pump now. Heat from natural gas and heat pumps costs about the same, so you can't yet recover the cost of installing the heat pumps, but for new construction or a failed furnace, a heat pump would be competitive and a lot of the new construction is using heat pumps	Damon		That is correct, though other comments are asking for us to make the case even when heating with natural gas.	Yes this correct. Language on the cost competiveness between natural gas and electricity has been added				
31	Energy Overview	2	Maybe suggest that incentives on the units are contrary to the state goals and they should be removed? Also, a lot of people like the cooling ability that heat pumps have. Last I knew heat pumps in Maine were quite a bit cheaper so our industry still had some learning to do. Catching up to ME's pricing will help.	Damon		I don't understand the first part of his comment.	Not yet responded				
32	Energy Plan	46	Add a Chittenden County .005 gasoline tax/along with an electrical surcharge of $X a year on all, making a tiered charge so that larger users pay more than the lowest users.	Jim Calder		Committee should discuss whether we need a policy statement on disince	Not yet responded				
33	Energy Plan	47	There are many non-profit church buildings, why not work to have solar arrays installed on their roofs, provide the church some of the output energy and the rest going into the grid. This might also be done on our public school buildings, many of which are flat, again providing that school some of the energy while the grid gets the remainder.	Jim Calder		added places of whorhsip to Action 2.4a..6 "vi. Encourage renewable energy generation , reduced reliance on fossil fuels for heating, energy efficiency measures to reduce energy costs for publicly owned buildings and places of worship."	Not yet responded				
34	Energy Plan	48	With many parking lots both public and no-public, we could partner with a solar company to install covered parking with solar panels on top, and then provide charging points and such for the electric/partial electric cars.	Jim Calder		Assisting with deploying EV Infrastructure (paired with solar) at workplaces and key public locations including downtowns, growth centers, and villages.	Not yet responded				
35	Energy Plan	49	Do not forget your church buildings and public school buildings need to move to heat pump heat/a/c systems and again, they do need assistance in adding these to their buildings.	Jim Calder		Encourage renewable energy generation, reduced reliance on fossil fuels for heating, energy efficiency measures to reduce energy costs for publicly owned buildings and places of worship.	Not yet responded				
36	Energy Overview		add rooftop solar to target graphics	LRPC		ok	Not yet responded				
37	Energy Overview		add amount of land area that is in constrained area to circl graphic	LRPC		ok	Not yet responded				

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38	Energy Plan		1. We want to encourage the location of renewable energy generation following these guidelines as relevant. Inability to meet these guidelines does not limit the ability to develop renewable energy development. What does this mean? …We'd like you to meet the following, but it's quite alright if you don't? This does not offer clear guidance. Again, as plan policies, these are already recognized as guidance statements and not enforceable "rules". Would simply state that "the following represent adopted policies for [intended to guide] the siting of renewable energy facilities in Chittenden County. Where state or municipal policies differ, the more stringent will apply… 3.Ultimately, it'll be left for the PUC to decide, but I still fear this language could well render the plan, and all the hard work that went into it, irrelevant with regard to its use/interpretation. It allows the possible exception to become the rule – how do we determine which, if any, guidelines are relevant to a particular project, when an applicant argues they're not? How is "inability" determined—based on financial constraints? Physical constraints? Or, per the PUC's version of the Quechee test, other overriding state interests? How do we distinguish between well and poorly sited projects, without clear and consistent guidance? The PUC and courts have regularly ignored plan language that is not relevant to a particular project, or that is unclear or ambiguous in its interpretation. Here we're handing them both—that it can be argued that the policies aren't relevant to a particular project, and that we're only encouraging, not requiring facilities to be sited accordingly. "Encourage" in this context is especially worrisome, as one of those words that's been highlighted in the past as meaningless in a regulatory context. Again, some rewording to get at your point, without given up the ship, might help. And yes, technologies and circumstances change over time (as is true for all types of development), so plans must be updated and readopted every 8 years to adjust and remain current – and can be amended at any time as needed (admittedly a much tougher call at the regional level). Consider this my input on the current draft, as a not very active member of the committee (again my apologies for having missed so many meetings). I'm definitely not speaking for the town…will seek their input before any board votes. And again, I really appreciate all the great work you and Emily have put into this over the past several months—I just want to make sure it counts, at the other end, to the extent any of us can anticipate what the PUC might do…	Sharon Murray (NOT on behalf of the Town)	Bolton	2. The intent of "We want to encourage the location of renewable energy generation following these guidelines as relevant. Inability to meet these guidelines does not limit the ability to develop renewable energy development" is to balance the need to site more renewable energy generation in our county and respect local/regional land use policies. Also, we realize that technology and policies may change over time so it's difficult to anticipate all the nuances and possibilities of how generation could happen and don't want these suitability policies to be so limiting that they prohibit a good project. In other words, if an applicant proposes a project that does not align with these policies but can help us meet our renewable energy goals and respects the constraints than we would not want to prevent it right out of the gate.	Not yet responded				
39	Energy Plan		How is the ECOS Plan addressing the proposed rule on decibel limits?	Michael Oman	Underhill	Checked in with DPS. Recommendation is that the ECOS Plan addresses the rule in the narrative or policy statements. The energy sub-committee should disuss whether we mention the decibel limits in the wind policy statement. http://puc.vermont.gov/document/temporary-board-rule-5700-sound-levels-wind-generation-facilities		Energy Sub Committee agreed discussing the sound rules is out of the scope of the ECOS Plan			
40	Energy Plan		CEP Goals refer to per capita energy use but all the town and county data is shown in totals	Michael Oman	Underhill	Staff will consider converting all data into per capita to better track progre	Not yet responded				
41	Energy Plan		Is it possible to utilize the wind speed data to show MWh potential in more detail?	Michael Oman	Underhill	Staff will look into this.	Not yet responded				

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63	Energy Plan		Folks, Surprisingly, the Chittenden County Regional Planning Commission's draft Regional Energy Plan (REP) ignores entirely an important source of renewable energy: passive solar energy technology. The county and the state would realize significant benefits by including programs that encourage and facilitate the use of passive solar designs in new construction and retrofits of both residential and commercial buildings. Please accept this email as a formal comment on the REP, along with the attached letter to the editor that appeared in the Burlington Free Press on February 18, 2016. Combined with energy conservation measures, passive solar technologies have resulted in buildings in Vermont whose annual budgets for supplemental energy are much less than half of the average building. A well insulated single family home in Vermont can easily derive more than half of its annual heating budget by incorporating passive solar design elements such as a sunroom, a solar greenhouse, south facing windows with insulating shades, and thermal mass to store the energy. One of the most significant advantages of passive solar technologies is that the issue of siting is non-existent. Large scale wind energy or photovoltaic installations are unfortunately often impacted by controversies, expenses, increased timelines, and legal issues due to siting concerns. With passive solar, the building IS the collector, so there are no siting issues outside of the normal process for building permits and zoning. Vermonters such as Doug Taff and the late Robert Holdridge of Hinesburg (right here in Chittenden County!) designed groundbreaking buildings that were used as examples nationwide of how designing with the sun can provide large energy savings in cost effective ways. The first nationwide conference on solar greenhouses was held at Marlboro College in 1977, where then Representative Jim Jeffords was the keynote speaker. Garden Way Sunrooms in Charlotte became the #2 greenhouse company in the nation in 1984. Beth Sachs and the late Blair Hamilton were pioneers in the area of passive solar retrofits, along with their phenomenal work with the Vermont Energy Investment Corporation that they co-founded in 1986. There are dozens of other examples. If only a portion of the buildings that have been built in Vermont in the last 40 years had utilized principles of passive solar design, the state's energy demand today would be many percentage	Scott Hicks	Underhill	we could add passive solar energy to 4.2.a.9	Not yet responded				
64	Energy Plan		I am writing to offer some additional comment concerning the identification of know or possible local constraints in the ECOS Energy Plan that CCRPC is currently working on. I had previously submitted that steep slopes (30% or greater) be identified as a known local constraint because they are used for reducing allowed density in the town's development regulations. You had previously let me know that the Energy Committee at CCRPC recommended that steep slopes be listed as a potential local constraint because an applicant might be able to obtain a variance. That reasoning is not in keeping with Williston's development regulations as written nor as administered. Chapter 19 of the town's Unified Development Bylaw (attached)detail how density is calculated. This includes the metric used for steep slope. There is no mention of a variance as a possible exception to the calculation method described. In addition, the town is not really open to the notion of granting variances. In my 9+ years working in Williston the DRB has approved a single variance and has rejected all others. We have never entertained a variance request on density calculations	Ken Belliveau	Williston	Energy Sub-Committee agreed that steep slopes will be included as a knov	not yet responded	Y			
65	Energy Plan		Richmond has requested the following constraints, but there is not supporting language for them in the zoning or in the town plan, as the plan is expired and a drafting process is ongoing. The following will be considered by CCRPC staff after the adoption of the Town Plan. (1. Ridges 2. Slopes >_ 30% 3. Trails 4. Conserved Land 5. ANR Primary Conservation Areas 6. Highest Priority Habitat derived from STA Report)		Richmond	Town plan language is unclear because there are dozens of things that might or might not fall under protecting wildlife or forests or habitat. (ex. forest blocks or just any forested area over a certain acreage? Which wildlife? Where's their habitat inventory? Etc. Zoning regulations: The following areas of a lot shall be deemed incapable of supporting any Land Development: b) Slopes equal to or greater than thirty-five percent - 35%	not yet responded				

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66	Energy Overview	2	Agreed, and greater incentives for individual homeowners. If people provide their own power there is little need for large farms. Also, increasing public awareness of the incentives that currently exist and, on all new projects, making the sustainable option the default one, while still allowing the homeowner the freedom to opt out should they wish to put in the extra effort required to do so. "Nudge"	Kalin Thompson		Public awareness of incentives is an ECOS Action **see page XX**					
67	Energy Overview	3	Has floating solar been explored as an option?	Kalin Thompson		???					
68	Energy Overview	2	This would be good, but given the rural distribution of most Vermonters, it would still require some commute to get the station. I wonder if the problem lies in the fact that most people already have cars? How can the state incentivize trading them in for electric cars? Otherwise, even if they do buy electric, people will only be adding to their current fleet of vehicles and this won't be changing the ratio very significantly. One possible option might be in parking. If city and business parking for non-electric vehicles is either super expensive or very awkwardly far away from everything no one will want to drive. And this goes for business employees too: let's suppose I get hired to work at Dealer. The company says, "will you be parking a non-electric car?" I say."Yes." They say, "you understand that a monthly fee will be deducted from your paycheck..." If its more than a few thousand dollars a year, that could tip the scale. OR, the government could give tax incentives to businesses based on what percentage of their workforce commutes sustainably. This might give rise to creative solutions, and possibly even have the added benefit of incentivizing a more local workforce (of course, the housing goals would also need to be met).	Kalin Thompson		Transportation Demand Management (TDM) is using strategies and policies to reduce single occupant vehicles and encourage/incentivize other modes such as walking, biking, ridesharing, vanpooling, transit, and car-sharing. https://www.ccrpcvt.org/our-work/transportation/transportation-demand-management-park-ride/					
69	Energy Plan		Removal of a 1,500 exemption for wind turbines is part of a zoning regulation change that is going town vote in March. Can we use the town plan as the guiding policy which says no development is allowed above 1,500 ft	Andrew Strniste	Underhill	OK					
70	Energy Plan	13	There is a difference (discrepancy?) that I don't understand in the CC wide tables (pdf.13) * Fossil Fuel Energy Used for Transportation in 2015 = 4,971,503 MMBtu * Total Light Duty Transportation Energy Use in 2015 = 7,552,000 MMBtu I don't understand why these two numbers are so different and especially why total light duty energy, which seems to be a subset of total transportation energy, would be ~50% higher	Michael Oman	Underhill	we will check on this					
71	Energy Plan		It would be helpful to number tables for easier reference.Several of the maps included with the plan pdf are unreadable Sometimes energy reduction targets seem to be total (eg pdf.10), and sometimes per capita (eg pdf.19); do targets reflect per capita or total reductions? It would be helpful to number tables for easier reference. Several of the maps included with the plan pdf are unreadable Sometimes energy reduction targets seem to be total (eg pdf.10), and sometimes per capita (eg pdf.19); do targets reflect per capita or total reductions?	Michael Oman	Underhill	working on showing the data in a per capita context					

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72	Energy Plan		It appears that solar constraint layers do not reflect existing structures (eg houses) with or without immediately adjacent property, which may make assessments of land availabvle for large scale solar arrays less than totally reliable. It would be helpful if this information could be made available somehhow since it will significantly affect where large ground based solar arrays may be located. * A suggestion to make make mapping a little easier to use by municipalities: I note the wind composite layer includes considerable information re wind details (ie hub height & avg wind speed in both mps & mph (wndrsccl (wind resource class?) appears to be null) but neither the wind nor solar layer includes the nature of possible constraints directly. This will necessitate bouncing between many constraint layers to determine what is going on. Since these layers delineate only *possible* constraints (not known/definite constraints) it is possible that, under some circumstances a community may wish to circumvent some contstraints to particularly desirable conditions for RE generation (eg located on 3 phase power). Is there any way that the RPC could populate the mapping units with constraint attributes (for at least the State possible constraints). I think this would make the mapped layers much more productive for communities to use. > Also, is there any more information on how to use the wind data (hub height and avg wind speed) to help us refine wind potential at our locations?	Michael Oman	Underhill	will work on making the GIS data more accessible.					
73	Energy Plan		It seems like the goals for (a) a reduction in energy use and (b) the source of renewables should somehow be linked. A town plan should get credit from doing very well with one of these goals while perhaps not meeting the other.	Michael Oman	Underhill	Yes going forward we are working with Efficiency Vermont and others to track progress on all these areas. At the same time we are planning to site more renewables we also need to be reducing our energy consumption by 1/3					
74	Energy Plan		In general, the more information available with respect to the projected effectiveness of conservation measures beyond just targets the more to the point will be local plans, To wit, what specific actions might we be taking in order to realize our targets and how effective might we expect them to be in doing it? To the extent that these measures can be quantitative, it will be helpful.	Michael Oman	Underhill	will work with Underhill on this when we provide TA on their town plan update					
75	Energy Plan		While it is likely true that "cold climate heat pumps are more efficient than oil heating systems", at least at moderately cold temperatures, the source of the electricity makes a huge difference it their effectiveness at reducing GHG and will be dependent on the successful implementation of effective RE program.	Michael Oman	Underhill	Agreed.					
76	Energy Plan		I don't see very much discussion of what role, if any, electricity storage might play in this plan. This could be an important contributor to a variety of important network qualities, RE variability, reliability, and load management, including reducing the need for peak load distribution network for distributed storage. Some approaches such as pumped storage would have important land use implications as well if they are possible at all. Would it make any sense to include electrical storage discussion in the plan both at the industrial level and distributed storage with or without extensive distributed RE generation? I don't know how important this might be in our energy planning, but as we succeed in reducing VMT & gas usage, sources of financal support for infrastructure, etc will diminish dramatically, affecting our ability to implement further change. Is there any thought to exploring/addressing this issue at all	Michael Oman	Underhill	energy storage discussion has been added to the energy section key issues					
77	Energy Plan	16	(tables: Land Available for Wind and Solar Generation, Renewable Electricity Generation Potential, Renewable Energy Generation Target & Possible Scenarios...): I am worried that demanding such a high proportion of potential generation (>~1/3 of potential for both wind & solar (in terms of acreage) for high target) won't leave much room for error or adjustments. Not sure what, if anything can be done about this.	Michael Oman	Underhill	good point. There also a variety of ways a town can meet their target through other technologies and these targets in regional in nature so we need to work regionally to meet the targets.					
78	Energy Plan	17	3.3.3: A personal observation: I don't really like goals of the form "strive for..". Goals by their nature will need to be striven for. In my mind a goal should be something more like: "Locate 80% of new development in areas planned for growth, which amounts to 15% of our land area". We can then strive to achieve it.	Michael Oman	Underhill						

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79	Energy Plan	20	I for one, could use more information on "stretch energy code" & how does it avoid disincentives for infill in growth areas?	Michael Oman	Underhill	Commentor is referring to "Work with local municipalities and the State to encourage all municipalities to participate in the State's stretch energy code to avoid disincentives for infill development in areas planned for growth"					
80	Energy Plan	21	it would be helpful to have at least a passing allusion to the contents of (or hyperlink to) constraint strategies (3.2.3.1.f, 3.2.4.1.e, 3.2.4.2.e.) and setback requirements 30 V.S.A. §248(s) (what are these? mapped? how define suitable lands w/o mapping?); also note "municipal screening requirements adopted in accordance with 30 V.S.A. §248(b)(B)"	Michael Oman	Underhill	ok					
81	Energy Plan		I don't know how extensive the problem is elsewhere, but at least here in Underhill we have encountered some issues with net metering projects, even at currently envisioned low levels, with the rigid territories of different suppliers. Is there anything that can be done to ease this issue or address it in any way?	Michael Oman	Underhill	Staff will work with Underhill on this issue through the update of their town plan.					
82	Energy Plan		Although there is some discussion of 3 phase power in conjunction with regional scale transmission lines, the role of 3 phase service to potential renewable sites has not been addressed, or at least emphasized. RE electrical generation on the scale apparently envisioned in this plan will (as I understand it) requires 3 phase service to far more sites in the rural areas where they can be located than is currently available. It would be helpful to have some discussion of this issue and where and how this service can be extended to facilitate extensive RE generation.	Michael Oman	Underhill	The plan addresses the issue of connecting to existing distribution through the policy statement"Locate energy generation proximate to existing distribution and transmission infrastructure with adequate capacity and near areas with high electric load". Additionally, we reviewed the utilities Integrated Resource Plan and they do no conduct long term planning of distribution lines in a way that discussues where lines will be extended in the future.					
83	Energy Plan		Given how difficult weatherization has proven overall, and given the legitimate question as to whether it's better to replace structures with energy efficient new structures (versus trying to insulate what is often poor construction or very old structures), does it make sense to recalibrate the weatherization date for something other than 60,000 by 2017 / 80,000 by 2020?	Will Dodge	Essex	The weatherization goal is based on State statute so we can't change it.	Melanie 11/28/2017				
84	Energy Plan		Section 3.2.2 Invest in Areas Planned for Growth, Sec. 1(c) (p.100) – should there be a concept of replacing housing to improve energy use and lower emissions?	Will Dodge	Essex	Interesting thought. The County has been achieving and exceeding this goal since 2011. The discussion that was added to the land use section about how concentrated growth in our areas planned for growth empahsizes the point that land use does have a role in helping the region to meet the CEP goals.	Melanie 11/28/2017	Yes, see page 62			
85	Energy Plan		In deciding to promote heat pumps over natural gas, is CCRPC basically taking a position that Vermont Gas's efforts to employ "renewable" (i.e., anaerobic digester-based) natural gas is futile? Would there be a scenario by which CCRPC would consider a switch toward that product as a suitable alternative to cold heat pumps?	Will Dodge	Essex	This is a challenging issue. When we met with Vermont Gas I got the sense that the renewable natural gas industry is still in its infancy and so it is hard to plan for this replacing traditional natural gas or heat pumps.	Melanie 11/28/2017	No change needed			
86	Energy Plan		Is the Energy Star program the only metric by which a Chittenden County home is considered "weatherized"?	Will Dodge	Essex	Yes because of data availability. However we could also reference new homes built to the Vermont Energy Code standards but that is difficult to measure.	Melanie 11/28/2017	Yes, see page 77, first bullet			
87	Energy Plan		Do the sites shown in the chart reflect "constructed" sites or only "permitted" sites? Either way, it would be good to disclose in the source information	Will Dodge	Essex	I believe it is permitted sites and the Department of Public Service is currently working with utilities to vet whether a facility was constructed. I will add this caveat to the table.	Melanie 11/28/2017	Yes. See page 83			
88	Energy Plan		Has CCRPC considered (or would it consider) a "solar ready" requirement for new affordable housing stock (at least as a recommendation)?	Will Dodge	Essex	Let's discuss this with the energy sub-committee.	Melanie 11/28/2017	see page 110 # Vii			
89	Energy Plan	102	6. Section 3.2.4ai Transform Region's Energy System (p.102) * While we've enjoyed the Button Up events we worked on so far this year, it's worth at least evaluating whether this is the best / most effective means of encouraging weatherization. (In other words, build a continual reevaluation mechanism into the "continue partnerships" bullet of subsection ai).	Will Dodge	Essex	Good point.	Melanie 11/28/2017	Yes			
90	Energy Plan	103	Section 3.2.4avii Provide assistance to municipalities * Wondering whether the assistance on enhancing town plans to meet the energy certification requirements of Act 174 should be "where requested", as some towns might decide it's not necessary (and that the suitability policies can be used instead).	Will Dodge	Essex	A town is not required to update their town plan per Act 174. If they choose to and we have funding available, we are able to assist them. I agree that adding "where requested" would help to clarify that this process is optional for towns.	Melanie 11/28/2017	Yes			

	A	B	C	F	G	J	K	L	M	N	O
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91	Energy Plan	104	8. Suitability Policies (p. 104): * Modify romanette (iv) to say "30 meters (98.43 feet)" OK * Modify romanette (v) to read "50 meters (164.04 feet) in Chittenden County's areas planned for growth),"OK	Will Dodge	Essex	OK	Melanie 11/28/2017	Yes			
92	Energy Plan	105-106	Might make sense here (if true) to state something about CCRPC support for the Agency's attempts at procuring electric school buses as part of the VW Settlement: http://dec.vermont.gov/air-quality/vw	Will Dodge	Essex	We have statement about this pg. 106 item 4 third bullet and can add in the specific language you provided.	Melanie 11/28/2017				
93	Energy Plan		May also make sense to mention something about encouraging the use of electric vehicles in tourism promotion (i.e., that VT is an electric-vehicle-friendly place to visit, with an ever-increasing amount of public EV-charging infrastructure).	Will Dodge	Essex	Ok	Melanie 11/28/2017				
94	Energy Plan	138	Last non-bulleted paragraph, second line, change "guidesits" to "guides its"	Will Dodge	Essex	Ok	Melanie 11/28/2017				
95	Energy Plan		Electric efficiency programs have always worked to reduce electrical demand especially during peak periods but the development of the Smart Grid will provide a powerful tool to address this issue. Smart Grid coupled with education, behavior change, and load control technologies can help reduce peak demand and defer substation upgrades which can result in substantial cost saving. "I'm not clear how by "Smart Grid" per say is going to achieve what is spelled out "	Robert Dostis	GMP	added language about price signaling	not yet responded				
96	Energy Plan		See WORD Document regarding an area you might want to emphasize, namely partnering with utilities serving Chittenden County on energy transformation. You mention in the report that you would work with utilities, this I hope provides a bit more rationale for why that's a good strategy. Feel free to use any of the language if it's helpful.	Robert Dostis	GMP	The explanation is very thorough and helpful. Some of the language is included in the Transition to Renewable section of the Plan.	not yet responded				
97	Energy Plan	77	Chapter 2, 2.5.5 Energy, under Efficiency and Conservation, 4th bullet :While efficiency programs targeting electricity and natural gas have been largely successful (add: *in the commercial and residential sectors*), there is an urgent need to fund and develop programs for non-regulated thermal fuels and for the transportation sector (add: *as well as for multi-family rental properties where the tenant pays the utility bills*); Last sentence: To prepare for widespread adoption of electric vehicles, charging infrastructure should be developed (add: including the availability of at-home charging infrastructure.)	Jennifer Green	BED	Ok. Change made	not yet responded				
98	Energy Plan		Chapter 2, under Renewable Energy Generation, 3rd bullet: Second to last sentence, no longer as relevant: "In addition, Burlington's plan to capture 'waste heat' from the McNeil power plant and distribute it to the ONE and heat greenhouses in the Intervale, etc…" could be rewritten to read: Burlington is hoping to advance a district heating system using McNeil's waste heat for distribution to the down town core, among other venues	Jennifer Green	BED	Ok. Change made	not yet responded				
99	Energy Plan	103	Chapter 3, High Priority Strategies, under 4. Energy, page 103: Decrease fossil fuel heating by working with partners such as Efficiency Vermont (add: and the Burlington Electric Department for Burlington residents)	Jennifer Green	BED	Ok. Change made	not yet responded				
100	Energy Plan		Under viii: Use the Energy Acton Network Community Energy Dashboard to educate residents….Add: Institutions (including municipalities, institutions of higher education, businesses and non-profits) can use the Vermont Climate Pledge Coalition Tracker to upload actions that will help the State achieve its 90% renewable energy 2050 goal.	Jennifer Green	BED	Ok. Change made	not yet responded				

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101	Energy Plan		Is it fair to treat GF separately from Essex/Essex Junction for the purposes of energy, considering that we also benefit disproportionately from the jobs and tax base it provides? How is this handled for other metrics and realms of governance (water/wastewater, transportation, etc.?)	Darren Schibler	Essex	Good point about Essex Junction benefitting from the tax base GF provides. I would argue that the municipal tax system is different from a state wide utility. What I mean by this is a larger pool of rate payers is sharing in the cost/impacts/benefits that occur because of GF's consumption. That being said the approach to redistribute GF's consumption regionally attempts to account for the fact that GMP will likely need to site renewable facilities in other towns to meet the 90X2050 goal and also increase the amount that is generated instate, so we are anticipating this in our methodology to distribute the region's target.	Responded via email 11/29/2017		Y		
102	Energy Plan		South Burlington will also not be able to meet its targets—how are they going to handle this? Will there be agreements or a credits market involving towns that have excess supply? Can Essex/EJ participate in that	Darren Schibler	Essex	I think it is too soon to say this as the analysis is not fully completed. South Burlington has a lot of acreage in base solar area and also roof top capacity. If a town can't meet the target, then we do need an approach for dealing with this. Regional and town plans are not set up to be agreements in sharing energy credits, so the important thing to keep in mind is that regionally we are able to meet the target and each town's target is one scenario for how this may play out. For example, the ECOS Plan says that Burlington has done its fair share of generation which doesn't mean that Burlington is going to stop encouraging roof top solar, so I'm confident that doing this upfront planning and analysis region wide we are having the conversations and asking the tough questions to ensure that we will advance the state's energy goals.	Responded via email 11/29/2017		Y		
103	Energy Plan		Burlington seems to have already met its target despite the fact that it has the lion's share of population and energy use. Is this due to the McNeil plant? Can similar large-scale renewables facilities be sited in the towns that have higher energy demands, residential or commercial?	Darren Schibler	Essex	Yes this is due to all of Burlington's generation that is sited within the City and includes McNeil, half of Winooski One, and numerous large solar array projects. Yes large scale renewables can be sited in other towns so long as it is consistent with land use plans and adheres to permitting.	Responded via email 11/29/2017				
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Location in Public Comment Table	**Jim Donovan**	**Catherine McMains**	**Matt Burke**
line 6	Can we show how much of the county is covered by VT Gas?	#6&7 go together as it could be helpful to have cost comparisons of fuel sources perhaps adding a statement about the additional costs in the long run of fossil fuels that are not calculated into fuel cost.	
Line 8	Why just school buses?		
Line 9	I have to confess I'm ignorant as to what price signals are!		
line 16	To me this is a big issue. I think this is a basic policy issue that was never discussed. Sorry I did not realize it. this comment to me is one of the more important ones.	putting an emphasis on research for battery storage capacity	
line 17	I would say no, because the plan seems to be going that way already.		
Line 23		given what a trigger “carbon tax” is, a vehicle tax could be more palatable. There are quite a few states that tax vehicles yearly as personal property taxes	
Line 26	Is there any way to add back up data in the appendix?		
Line 32	Policy or statement on the need for some disincentives in order to shift public behavior would be good.		
Line 33	We should include more than just churches, was the comment indicates.		
Line 38	Once we are all in agreement that the constraints are correct, then I would support Sharon's viewpoint. I don't think we are there yet, so I still favor encourage, despite its flaws.		
Line 41		Not just passive solar considerations but passive house construction techniques as well which do cost more as initial construction, but have the lowest yearly energy costs	
Line 63	Yes, this should be added and if possible included in our projections. I have a passive solar house and hte heat never goes during the day, even on most of the coldest days in the winter when it's cloudy. There is still enough solar energy to heat the house.		
Line 70	Thinking more of the larger issue, disincentives as well as incentives should be part of the plan.		
Line 78	I agree 10% with this.		
Line 79	Adding this would be helpful.		
line 88	I think this would be a good idea.		

Location in Public Comment Table	**Jim Donovan**	**Catherine McMains**	**Matt Burke**
		#12 also in this category	Lines 11, 16 & 17 all relate in some sense. I would welcome a chance to talk through these in our next meeting if possible. At the least I see value in communicating outward regarding our need for new tools to plan the future use of fossil fuels in addition to renewables.

2.5.1 LAND USE

Land Use Pattern Goal: Encourage future growth in the Center, Metro, Enterprise, Suburban, and Village Planning Areas to maintain Vermont's historic settlement pattern and respect working and natural landscapes.

Key Issues/Trends/Insights

[Data from this section drawn from Historic Development and Future Land Use/ Transportation Analysis Report]

- Over the past 60 years development trends, zoning regulations, and consumer preference have shifted growth away from the metropolitan areas around Burlington, to more suburban and rural locales. This shift has resulted in scattered development at low densities that consume large amounts of land, high infrastructure costs, with little opportunity for social interactions, and less ability to walk to services. Since 2011, the region has seen at least 80% of new housing built in the areas planned for growth which are the center, metro, suburban, and village planning areas. This land use pattern reduces energy for transportation and land use by promoting increased opportunities for carpooling, pedestrian/bicycle travel, availability of transit, reduction in vehicle miles traveled, and the need for smaller homes that maximize energy efficiency.
- Overall, Chittenden County is moving in th62e right direction of developing and implementing policies that encourage more growth in these areas. As of 2012, Chittenden County includes 10 Villages, 2 Downtowns, 2 Growth Centers, 2 New Town Centers, and 1 New Neighborhood that are part of the State Designation Program that promotes smart growth principles. Recent studies and surveys indicate that households are choosing to live in areas with shorter commute times, nearby shops and services, and more transit options. This growing demand indicates that the small lot and attached accessible housing stock may be in short supply.
- Forest and agricultural land fragmentation and increased parceling have meant that the number of parcels in rural areas has increased while their size has decreased, diminishing their economic viability, scenic, and the ecological services they provide.
- Future land-based opportunities for farming and forest-based products, recreation and tourism may become more limited as suitable open land becomes less available. This possibility has far reaching consequences for the future of Vermont's local and tourism economies.
- There are over 4,400 designated historic sites in Chittenden County (over 2,500 in Burlington alone) and over 80 designated historic districts (see historic resources map here: http://maps.ccrpcvt.org/ChittendenCountyVT/).
- A sustainable society operates without contributing new contaminants to the environment, but also cleans up old contaminants and returns those lands into productive use. Contamination impairs the environment, poses risks to human health, and discourages productive use or reuse of the property. Of 702 Chittenden County sites with reported contamination, 476 (68%) have completed corrective action (VT DEC Waste Management Identification Database).

Key Indicators

- **% of Acres in Major Land Use Categories, Chittenden County 2008**

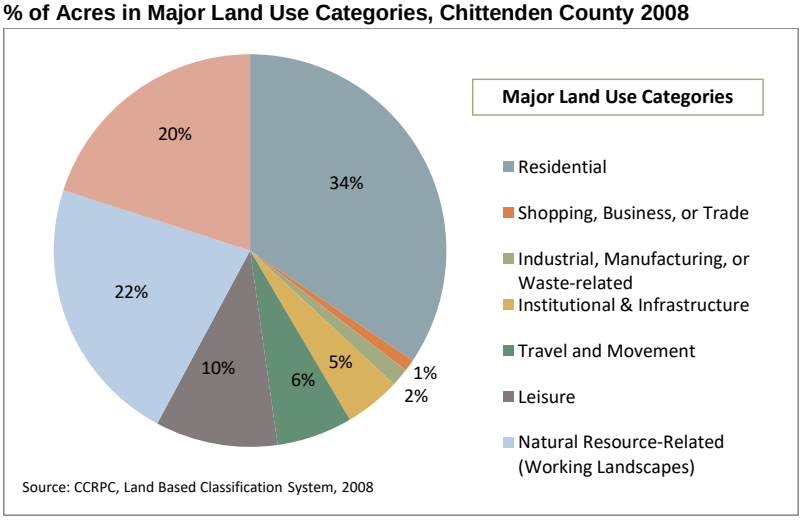

FIGURE 40 – LAND USE CATEGORIES BY PERCENTAGE

- **Percent of New Structures in Areas Planned for Growth: 1950 – 2010**

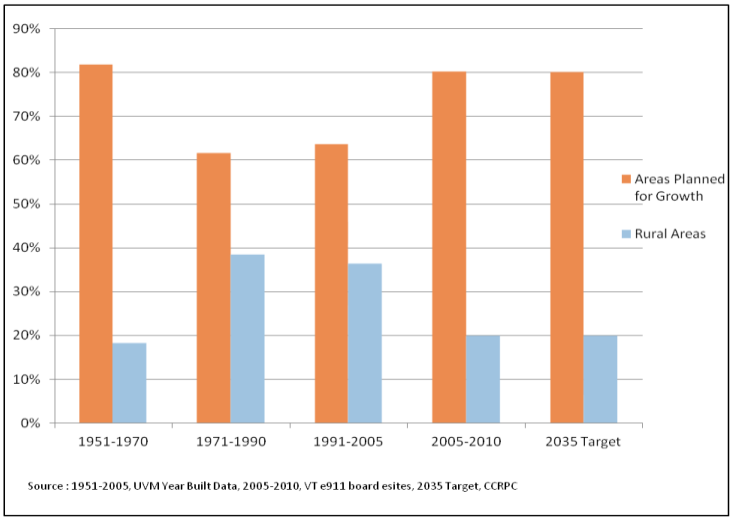

FIGURE 41 - PERCENT OF NEW STRUCTURES IN AREAS PLANNED FOR GROWTH, 1950 - 2010

Note regarding Figure 41: The best available data at the time of this report related to e911 structures. Going forward, CCRPC seeks to regularly track dwelling units and the non-residential square footage in the Areas Planned for Growth to better represent the development that is occurring in the County.

- **75% of private property investment is going into the Areas Planned for Growth and 25% in the Rural Planning Area** (Source: CCRPC from parcel and grand list data).

- **Development Density by Planning Area, 2010**

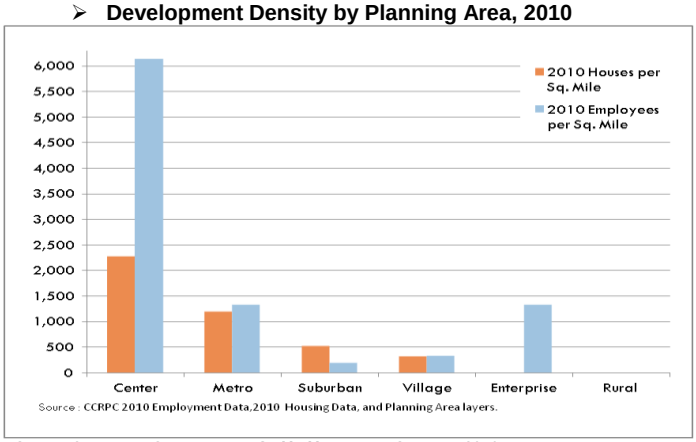

FIGURE 42 – DEVELOPMENT DENSITY BY PLANNING AREA, 2010

2.5.3 TRANSPORTATION

Transportation Goal: Provide accessible, safe, efficient, interconnected, secure, equitable and sustainable mobility choices for our region's businesses, residents and visitors.

Key Issues/Trends/Insights

[Data for this section drawn from Historic Development and Future Land Use/Transportation Analysis Report and MTP Supplemental Documents in Chapter 4]

- Congestion is worsening with potential negative consequences on economic development, the environment and human health.
- The 2008-2009 Scenario Planning Process undertaken by the Chittenden County Metropolitan Planning Organization resulted in a clear surveyed preference for future growth to be concentrated into higher density, mixed use centers – this preference is also demonstrated in the policy direction outlined in municipal plans and ordinances throughout the County. Directing transportation investments to serve mobility and accessibility in compact settlements will result in a more cost effective and efficient transportation system.
- Continued low-density development in rural areas will increase Vehicle Miles Traveled (VMT) and likely increase potentially harmful air pollutants and greenhouse gases.
- Higher fuel prices will lead to an increase in the percentage of household income needed to meet transportation expenses; rural residents are disproportionately impacted by household transportation costs.
- Some population segments – youth, the elderly, low-income and communities of color – lack access to viable public and private transportation options. The lack of safe, reliable, and complete connections within the transportation system and between transport modes reduces access to employment, social, economic, and recreation opportunities; and limits access to basic needs by means other than a personal vehicle.
- More robust investment in transportation options – transit, walking/biking, carsharing and ridesharing – could reduce transportation energy use, congestion, vehicle miles traveled, use of single occupancy vehicles, social exclusion, and could improve public health, and enhance the economic well-being of our residents, businesses and visitors.
- While access to public transit is widely available in the region's more urbanized areas, there are days and times when service is not available; some suburban and most rural populations lack access to transit.
- Roadway condition of over half of the arterial highway mileage in Chittenden County is rated poor or worse. Compounding our poor roadway conditions and inadequate investment, transportation funding in general is overly reliant on the state and federal gas taxes which are decreasing in value as inflation lowers purchasing power and revenues decline due to improving vehicle fuel efficiency, fewer VMT and a shift to electric vehicles.
- Transportation costs exceed our capacity to maintain, operate, and improve our current system. Nor do we have adequate funds needed to grow transit, walking/biking, and Transportation Demand Management (TDM) programs. The prospect of less funding in a time of increasing transportation investment need is a worrisome trend and needs to be addressed.
- The MTP must be fiscally constrained to the funding anticipated for investment in the planning horizon through 2035. The following chart outlines the funds anticipated to be available for the next 25 years. The chart highlights the fact that we will not be able to afford everything that may be needed and that investments will need to be selected which promote future sustainability.

Estimated Transportation Funding for Chittenden County: 2010 - 2035

	COSTS in Millions (2010$)
Estimate of future funds	$1,177
Cost to maintain/preserve the transportation system	$754
Committed projects (TIP and Circ Alternatives)	$113
Total available to address new transportation needs	$310
Estimated cost of anticipated new projects (the sum of all items on the MTP Project List - Transportation Need)	$849
Funding deficit (Transportation Need minus Total Available)	($540)

FIGURE 44 - ESTIMATED TRANSPORTATION FUNDING FOR CHITTENDEN COUNTY 2010 - 2035

- While our rate of driving alone to work increased by 36% between 1980 and 2000 (to 76% of all work trips), in more recent years this trend has shown improvement to 71% of the population driving alone in 2010. We've also seen a nearly 60% increase in transit ridership the past decade. Vehicle Miles of Travel (VMT) per person is also on the decline, down 8% between 2000 and 2010. It is imperative that we maintain these positive recent trends in order to reduce congestion, reduce transportation energy use, decrease greenhouse gas emissions, and more efficiently utilize all of our transportation resources.
- Note: Aviation transportation is planned for by the Burlington International Airport (BIA) according to Federal Aviation Administration procedures. Air to ground transportation planning is coordinated between CCRPC, BIA, and the City of South Burlington and is considered in this Plan.
- The State of Vermont has a goal of obtaining 90% of energy across all sectors from renewable sources by 2050. This includes energy used for transportation. For this to occur state and federal policies will need to support the transition of light duty vehicles will switch entirely from gasoline and diesel to electric, and medium and heavy duty vehicles will switch entirely from diesel to biodiesel or renewable diesel. Although compressed natural gas (CNG) is not a renewable resource, it could serve as a bridge fuel for heavy duty vehicles as an alternative to gasoline. To be widely adopted, electric vehicles need to be appealing to consumers, and charging infrastructure must be affordable and easily accessible, which will require both financial and regulatory incentives and disincentives.

Key Indicators

- **Percent of workers commuting by non-Single Occupant Vehicle (SOV) mode (walk, bike, transit, carpool, telecommute).** Recent data suggests the reversal of a negative trend going back at least 30 years and probably longer.

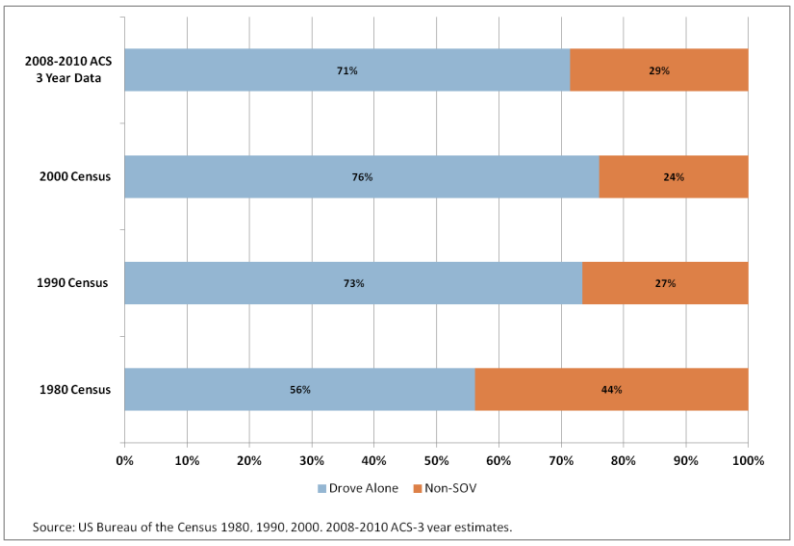

FIGURE 45 – PERCENT OF WORKERS COMMUNTING BY NON-SINGLE OCCUPANT VEHICLE (SOV)

- **VMT Per Capita.** Less driving per person can have positive environmental, transportation, economic, health and social impacts. Our most recent data may portend a positive trend.

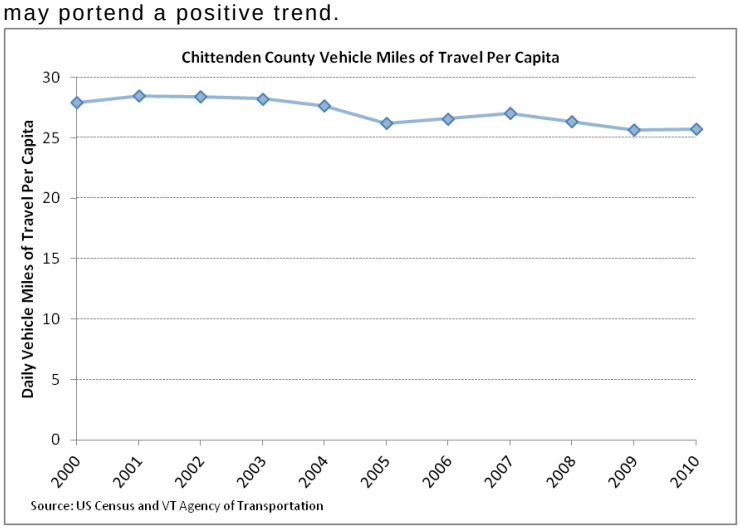

FIGURE 46 - VEHICLE MILES OF TRAVEL PER CAPITA

- **Number of electric vehicles registered.** Increasing the number of electric vehicles is key to reducing the use of fossil fuels for transportation and to reducing transportation energy use. There were 601 electric/plug-in hybrid vehicles registered in Chittenden County in July 2017, or 0.6% of all light duty vehicles.
- **Amount of fossil fuel used by heavy duty vehicles.** Decreasing fossil fuel use in heavy duty vehicles will depend on vehicles being able to run on fuels such as biodiesel. In 2017, heavy duty vehicles used XXXX gallons of fossil fuels.
- **Energy used for transportation.** By 2050, the LEAP model calls for a 79% decrease in energy used for light-duty transportation; a reduction of 5,953,000 MMBtus.

2.5.5 ENERGY

Energy Goal: Transform Chittenden County's energy system to a cleaner more efficient and renewable system that benefits health, economic development, and the local/global climate by working towards the State's Comprehensive Energy Plan goals.

The goals of the 2016 Vermont Comprehensive Energy Plan are to:

- Weatherize 80,000 Vermont homes by 2020
  - Intermediate goal of 60,000 homes by 2017
- Get 90% of Vermont's energy from renewable sources by 2050
  - Intermediate goal of 25% of energy from renewable sources by 2025, including 10% of transportation energy
  - Intermediate goal of 40% of energy from renewable sources by 2035
- Reduce total Vermont energy consumption by more than 1/3 by 2050
  - Intermediate goal of 15% reduction by 2025

Key Issues/Trends/Insights

[Data for this section drawn from: Energy Planning Methodology, Energy Analysis Report and Climate Change Trends and Impacts Report].

Efficiency and Conservation

- Chittenden County has a long history of electrical and natural gas energy efficiency programs, dating back to 1990, which have provided significant energy savings and economic benefits to the state and County. These programs along with improvements in federal standards have led to a reduction in per household and per employee energy consumption of electricity and natural gas. Reduction in energy consumption directly results in a reduction in energy bills. Following the Home Performance with ENERGY STAR® guidelines and building/renovating to the State's Building Energy Code are two programs which asist Vermonters with reducing energy consumption from heating and electricty. See Indicators for data on efficiency gains.
- The State of Vermont's goal to weatherize 80,000 Vermont homes by 2020 and 60,000 homes by 2017 is optimistic. Progress on weatherization has been low despite programs such as the State of Vermont's Heat Saver Loan Program. According to the LEAP analysis Chittenden County would need to weatherize 14% of homes by 2025 and 70% of homes by 2050.
- Electric efficiency programs have always worked to reduce the region's overall load. As demand for electricity increases and renewables continue to become part of our energy supply managing demand is vital to maintaining grid health. ~~electrical demand especially during peak periods but the development of the Smart Grid will provide a powerful tool to address this issue~~. Smart Grid technology coupled with education, behavior change, price signaling, and load control technologies can help reduce peak demand and defer substation upgrades which can result in substantial cost saving.
- While efficiency programs targeting electricity and natural gas have been largely successful in the commercial and residential sectors, there is an urgent need to fund and develop similar programs for non-regulated thermal fuels and for the transporation sector, as well as for multi-family rental properties where the tenant pays the utility bills. The more widespread adoption of electric vehicles should reduce the total energy consumption in the County, due to better efficiency (an EV gets the equivalent of 100 miles/gallon). To prepare for widespread adoption of electric vehicles, charging infrastructure should be developed, including the availability of at-

home charging infrastructure. In addition, policies and pricing structures to encourage off peak charging need to be considered to mitigate grid constraints.

- It is necessary to shift the heating sector away from fossil fuel use. Promoting cold climate heat pumps(powered by a renewable electric grid), in addition to sustainability harvested wood, biogas and geothermal heating systems, will be key to meeting this goal. However, in VT Gas's territory heat pumps are not cost competitive with natural gas as saving money with a cold climate Heat Pump (CCHP) is highly unlikely, even if the system you purchased displaces 75% of the natural gas your building consumes during a typical year. In fact, current natural gas prices would need to double for most CCHP systems to generate enough savings to pay back the initial investment of between $3500 and $5000 in 9 years. Though, investing in CCHP technology does keep energy dollars in the State as opposed to sending them overseas.
- There is a need for focused study to determine solutions for vermiculite removal as it relates to weatherization, in particular low income weatherization. Vermiculite was used as an insulator for decades (1960-1990) and was mined with asbestos. Thus any home with vermiculite is assumed to be contaminated.

Transition to Renewable Energy

- In analyzing Chittenden County's ability to meet the 90% renewable energy by 2050 goal the Long-Range Energy Alternatives (LEAP) model was utilized to understand the type and amount of fuel needed to meet the State's energy goals. It is important to note that Chittenden County's LEAP scenario reflects 85% renewable by 2050. Although the level of renewability is not 90%, the ECOS Plan is deemed to be consistent with the State energy goals because the policy statements within this plan are aligned with the framework for advancing state energy goals and Chittenden County is well suited to move in the right direction. See the methodology report for more information on LEAP.
- The LEAP model shows a significant reduction in natural gas as one scenario to achieve the ambitious 90% renewable energy by 2050 goal in Chittenden County. This scenario will be challenging because of the region's current reliance on natural gas for heating in significant portions of Chittenden County, recent and planned service area expansions, and the relatively low cost of the fuel source. The natural gas infrastructure in Chittenden County also represents a significant investment on the part of utility companies, and much of the County's dense residential and commercial growth is dependent on this fuel. Therefore, fulfillment of this scenario requires aggressive weatherization of the region's building stock, switching to heat pumps and other renewable heating technologies. The shift to renewable energy sources for heating will also require the involvement of private-sector energy developers, regional and state-wide utilities, and individual energy users; as well as changes to state energy policy implementation. Despite challenges related to natural gas, CCRPC will work to the best of our ability to meet the 90x2050 goal via the actions discussed in Strategy 3.2.2.
- A transition to renewable energy will require electrifying the heating and transportation sectors and by generating more electricity from renewable sources to power these sectors. Chittenden County, perhaps more so than other regions of the State, can achieve great benefits from its density and infill development goals. For example, this land use pattern can lay the ground work for a switch to electric vehicles, carpooling, transit ridership, walking/biking and a smaller energy footprint per household. Dense population centers make distributed generation easier, because energy can be produced near significant numbers of customers. Finally, the county's dense land use pattern may allow for innovative energy solutions, such as district heating and microgrids. Switching home heating away from fossil fuels is a key strategy for meeting our energy goals. Cold climate heat pumps, which use heat from the outside air to heat a home, and biomass systems, such as pellet stoves, are home heating alternatives that do not use fossil fuels.

- Chittenden County citizens, businesses, and industries spent about $617 million on energy in 2009 (25% of Vermont's total). Much of this money leaves the County and state immediately. This outflow of energy dollars acts as a drain on the local economy (data need to be updated).
- The price of energy is forecasted to continue increasing in the future, which will result in an additional burden on the County's residents and businesses, unless energy consumption can be reduced.
- Fossil fuel combustion increases the atmospheric concentration of carbon dioxide and other greenhouse gases, which are the causes of global climate change. Climate change will have profound impacts on the environment, public health, infrastructure, and economy of Chittenden County.
- Vermont, and the County, relies heavily on gasoline and diesel for transportation. Gasoline consumption has increased as more residents drive to and from work, and run errands.
- Chittenden County is home to an international airport and a National Guard base, therefore the transportation fuel consumption in the County not only includes gasoline, diesel, and compressed natural gas, but also aviation gasoline and jet fuel. It is important to note fuel use in the aviation sector was removed from CCRPC's LEAP analysis and modeling of future energy use, as this is a sector the region will have little influence over.
- As we transition to more renewables, grid resilience is valued by both residents and business, especially because Vermont's climate makes us vulnerable to grid outages. When storage is coupled with distributed energy generation it can provide a source of backup power and also offer the potential to minimize loads at peak times, thereby reducing energy costs.
- A Vermont statute passed in 2015, Act 56 requires Vermont's Electric Utilities to be 55% renewable by 2017, 75% by 2032, and 90% by 2050. Also as part of Act 56, electric utilities need to work with customers to reduce fossil fuel and decrease carbon emissions from transportation and thermal heating by offering new innovative programs and services to their customers. Shifting from fossil fuels to an ever increasing renewable energy resource will drive down carbon emissions. The electric utilities subject to Act 56 are offering innovative products and services to meet the statute and deliver innovation. These electric utilities offer a host of services and programs that encourage strategic electrification to reduce fossil fuel use.
-

Renewable Energy Generation

- Chittenden County has many non-fossil fuel based, renewable energy production sites owned by utilities, private parties, and municipalities. Reliable, cost effective, and environmentally sustainable energy availability is critical to support the economy and natural resources of Chittenden County.
- Vermont's rural nature offers challenges for the transmission and distribution of energy. It is important to maintain and develop an energy production, transmission, and distribution infrastructure in Chittenden County that is efficient, reliable, cost-effective, and environmentally responsible. Current energy distribution projects include: Extension of 3-phase power in south Hinesburg along VT116 by Green Mountain Power; ~~Extension of natural gas service in Hinesburg up Richmond Road by VT Gas~~; and Extension of natural gas service to St. George village center~~. In addition, Burlington's plan to capture "waste heat" from the McNeil power plant and distribute it to the Old North End of Burlington and heat greenhouses at the Intervale is a thermal energy project with a more efficient distribution of a previously wasted energy source.~~ Burlington is hoping to advance a district heating system using McNeil's waste heat for distribution to the down town core, among other venuesSee the CEDS Project list in Section

4.2.6 for cost estimates, funding sources and proposed timelines for these projects. (This will be updated to reflect the completion of some projects)

- The cost of electricity is related to the distance it travels. When electricity is transmitted over long distances, a significant amount of electricity is lost. Improving line efficiency or encouraging distributed generation (such as locally sited small scale renewable projects) reduces losses and could result in more cost-effective rates.
- Every three years, Vermont Systems Planning Committee (VSPC) launches a process to update and identify constrained areas and reliability needs for the electric transmission grid. Chittenden County has areas identified as needing improvement. An adequate distribution grid that is able to accommodate the planned increase in electricity use and reduces energy loss is necessary to meet the goals of this section.
- CCRPC has undergone a process to look at areas suitable for solar and wind energy generation to determine our ability to meet the 90% renewable by 2050 goal. See the key indicators below for an analysis of existing generation and future generation possibilities.
- In 2016, the Vermont Legislature enacted Act 174 to improve energy planning and give town and regional plans greater weight or "substantial deference" in Public Service Board proceedings. The effects of "substantial deference" have yet to be tested in PSB proceedings.

Key Indicators

- **Current energy consumption in the transportation sector, and 2025, 2035 and 2050 targets for consumption.** The table below shows current energy consumption for transportation and sets targets for future consumption in line with the goals of a greater than 1/3 reduction by 2050 and 90% renewable energy by 2050.

Current Transportation Energy Use

Metric	County Data
Fossil Fuel Burning Cars, 2015	106,936
Fossil Fuel Energy Used for Transportation in 2015 (MMBtu)	4,971,503
Electric Vehicles in 2015 (#)	546
Electricity Used for Transportation in 2015 (MMBtu)	4,347
Sources: VTrans, American Community Survey, Drive Electric Vermont, DMV	

Transportation Energy Use, 2015-2050

	2015	2025	2035	2050
Total Light Duty Transportation Energy Use (MMBtu)	7,552,000	6,061,000	3,744,000	1,599,000
Electricity Used for Transportation (MMBtu)	6,000	81,000	543,000	1,124,000
Electric Vehicles (% of Vehicle Fleet)	0%	6%	41%	89%
Biofuel Blended* Energy Used for Transportation (MMBtu)	7,546,000	5,980,000	3,201,000	475,000
Biofuel Blend* Vehicles (% of Vehicle Fleet)	100%	94%	59%	11%
**This measures biofuels blended with fossil fuels. A common example is gasoline with ethanol mixed in.*				
Sources: VTrans, LEAP Model				

- **Current energy Consumption in the heating sector, and 2025, 2035 and 2050 targets for consumption.** The graph below shows current energy consumption for heating (delivered fuels to be added) and sets targets for future consumption in line with the goals of a greater than 1/3 reduction by 2050 and 90% renewable energy by 2050. According to the ACS 2016 1-Year estimates 37,073 or 57% heat their homes with natural gas.

Current Thermal Energy Use from Natural Gas, 2015

Total Residential Natural Gas Consumption (Mcf)	3,331,770
Percentage of Municipal Natural Gas Consumption	45%
Total Commercial/Industrial Natural Gas Consumption (Mcf)	4,120,470
Percentage of Municipal Natural Gas Consumption	55%
Total Municipal Natural Gas Consumption	7,452,239

Sources: Vermont Gas

Commercial and Industrial Thermal Energy Use, 2015-2050

	2015	2025	2035	2050
Total Commercial and Industrial Thermal Energy Use (MMBtu)	3,574,500	3,219,900	2,776,400	2,112,000
Percent of Commercial and Industrial Establishments Weatherized by Target Year	11%	20%	22%	39%
Energy Saved by Weatherization by Target Year (MMBtu)	86,500	189,006	259,783	629,830
Commercial and Industrial Establishments Using Heat Pumps (%)	1%	22%	35%	39%
Commercial and Industrial Thermal Energy Use by Heat Pumps (MMBtu)	6,590	284,318	562,046	839,773
Commercial and Industrial Establishments Using Wood Heating (%)	7%	9%	10%	11%
Commercial and Industrial Thermal Energy Use Attributable to Wood Heating (MMBtu)	266,300	424,000	583,700	854,500

Sources: LEAP Model, Department of Public Service, Department of Labor

Residential Thermal Energy Use, 2015-2050

	2015	2025	2035	2050
Total Residential Thermal Energy Use (MMBtu)	6,281,000	5,597,000	4,772,000	3,382,000
Percent of Residences Weatherized by Target Year	2%	14%	23%	70%
Energy Saved by Weatherization by Target Year (MMBtu)	41,800	250,800	455,400	1,518,000
Percent of Residences Using Heat Pumps	3%	18%	35%	55%
Residential Thermal Energy Use from Heat Pumps (MMBtu)	62,000	362,000	750,000	1,126,000
Residences Using Wood Heating (%)	14%	14%	14%	13%
Residential Thermal Energy Use from Wood Heating (MMBtu)	982,000	1,029,000	1,035,000	931,000

Sources: LEAP Model, Department of Public Service

- **Current energy consumption in the electric Sector, and 2025, 2035 and 2050 targets for consumption.** The graph below shows current energy consumption for electricity and sets targets for future consumption in line with the goals of a greater than 1/3 reduction by 2050 and 90% renewable energy by 2050.

Current Electrical Energy Use	
Residential Electric Energy Use (kWh)	425,335,425
Commercial and Industrial Electric Energy Use (kWh)	1,483,005,818
Total Electric Energy Use (kWh)	1,908,341,243
Sources: Efficiency Vermont, Burlington Electric Department, 2016	

Electrical Energy Use, 2015-2050

	2015	2025	2035	2050
Total Electric Energy Saved (kWh)	9,000,000	107,000,000	216,000,000	404,000,000
Residences that have increased their Electric Efficiency	3%	31%	58%	98%
Commercial and Industrial Establishments that have Increased Their Electric Efficiency	3%	31%	58%	98%
Sources: LEAP Model and Efficiency Vermont, 2013				

- **Number of home weatherization projects completed.** To meet the State weatherization target, 70% of Chittenden County homes need to be weatherized by 2050 (47,967 homes out of 68,525). As of 2016, 3,690 homes have completed weatherization through the Home Performance with ENERGY STAR® program.

- **Current Renewable Energy Generation in Chittenden County.** The table below shows solar, wind, hydro, and biomass generation in Chittenden County.

Existing Renewable Electricity Generation

	Sites	Power (kW)	Energy (kWh)
Solar	2,785	40,080	49,806,017
Wind	23	10,460	31,136,031
Hydroelectric	6	35,800	164,136,000
Biomass	14	50,578	266,163,840
Other	0	0	0
Total	2,785	136,918	511,241,888*

Source: Community Energy Dashboard, October 2017
**The total existing renewable energy generation varies from the existing renewable energy generation reported in the Energy Overview due to variations in the way the data is counted.*

Commented [MN1]: These reflect permitted sites. Energy Action Network will work with DPS going forward to validate that site were built. -add this as a disclaimer to the new table.

- **Renewable Electricity Generation Potential.** The table below shows renewable energy generation potential for rooftop solar, ground mounted solar, and wind. See Map 5-7 and Map 9 for more details on appropriate locations for renewable energy generation development.

Land Available for Wind and Solar Generation

	Prime (acres)	Base (acres)
Solar	9,600	71,706
Wind	4,555	46,142

Renewable Electricity Generation Potential

	Power (MW)	Energy (MWh)
Rooftop Solar	103	126,328
Ground-Mounted Solar	1,168	1,432,176
Wind		N/A
Hydro	See Hydro Map	
Biomass	See Biomass Map	
Methane	Unknown	Unknown
Other	Unknown/District Heat?	Unknown/District Heat?
Source: CCRPC and the Department of Public Service		

- **Renewable Electricity Generation Targets.** The table below shows renewable energy generation targets for ground mounted solar and wind. These targets are set by CCRPC and are aligned with state energy policy and are intended to set trajectories and pace of change needed toward a path of meeting the goal of obtaining 90% of energy from renewable sources. The target for the region assumes that 50% of renewable energy will be generated in-state. The low and high targets are achievable as the County has 9,600 acres of prime solar and 4,555 acres of prime wind. See Map 5-7 and Map 9 for more details on appropriate locations for renewable energy generation development.

Renewable Energy Generation Target	MWh
State Projected Electricity Demand (2050)	10,000,000
In-State Generation Target (2050)	5,000,000
State Imported Generation (2050)	50%
Low Target for Renewable Energy Generation in Chittenden County -15% of State	
Total Target	756,250
Existing Renewable Energy Generation	500,590
New Generation Needed	255,660
High Target for Renewable Energy Generation un Chittenden County -25% of State	
Total Target	1,265,134
Existing Renewable Energy Generation	500,590
New Generation Needed	764,544

Possible Scenario for Achieving the Targets			
	MWh	MW	Acres Needed
Low Target: New Generation by 2050			
75% of Renewable Energy is Land-based Solar	191,745	156	1,251
25% of Renewable Energy is Wind	63,915	21	521
Total	255,660	177	1,772
High Target: New Generation by 2050			
75% of Renewable Energy is Land-based Solar	573,408	468	3,740
25% of Renewable Energy is Wind	191,136	62	1,559
Total	764,544	530	5,299

Vermont Legal Aid to test and enforce state protected classes (Age, marital status, sexual orientation, gender identity, receipt of public assistance).

4. Energy – Transform the Region's energy system to meet the goals of Vermont's energy and greenhouse gas reduction goals.

a. Reduce energy consumption and decrease greenhouse gas emissions, to support the State's goals:
   - Reduce greenhouse gas emissions 50% from 1990 levels by 2028,
   - Reduce greenhouse gas emissions 75% from 1990 levels by 2050,
   - Reduce per capita energy use across all sectors (electricity, transportation and heating) 15% by 2025,
   - Reduce per capital energy use across all sectors (electricity, transportation and heating) by more than 1/3 by 2050, and
   - Weatherize 25% of all homes by 2020.

   i. Continue and evaluate partnerships with Vermont Gas, Burlington Electric Department, Efficiency Vermont and the State Weatherization Assistance Program to facilitate the weatherization and increased energy efficiency of housing stock and other buildings.
   ii. Decrease fossil fuel heating by working with partners such as Efficiency Vermont and Burlington Electric Department for Burlington residents to educate developers and homeowners on the benefits of technology such as cold climate heat pumps, wood heating and geothermal systems. Examples include district heating (for example, using waste heat from the McNeil Plant to heat buildings in Burlington) and biogas generation (capturing the methane produced by landfills or farms and using it instead of natural gas).
   iii. Work with~~-~~ local municipalities and the State to encourage all municipalities to participate in the State's stretch energy code to avoid disincentives for infill development in areas planned for growth.
   iv. Reduce fossil fuel consumption in the transportation sector, through the Transportation Demand Management and electric vehicle promotion strategies outlined in Part 6c of this section and in the Metropolitan Transportation Plan (MTP) included in this plan.
   v. Collaborate with the State of Vermont and utilities to ensure that state energy policy implementation (i.e. permits for non-renewable fuels) reflect state energy goals and our policies in Section b.
   vi. Encourage renewable energy generation~~-~~, reduced reliance on fossil fuels for heating, energy efficiency measures to reduce energy costs for publicly owned buildings and places of worship.
   vii. Provide assistance to municipalities when requested to enhance town plans to be consistent with Act 174 standards for the purpose of enabling municipalities the ability to gain substantial deference in the Certificate of Public Good Section 248 process. This assistance will include working with municipalities to identify natural, cultural, historic, or scenic resources to be protected from all development types, ~~and,~~ identify preferred locations for renewable energy generation facilities, and suggest zoning changes to ensure development is solar-ready, energy efficient, and built with electric vehicle charging capabilities~~.~~

viii. Use the Energy Action Network (EAN) Community Energy Dashboard to educate residents and municipalities about opportunities to reduce energy use and switch to renewable energy sources. Additionally, institutions (including municipalities, institutions of higher education, businesses and non-profits) can use the Vermont Climate Pledge Coalition Tracker to upload actions that will help the State achieve its 90% renewable energy 2050 goal.

ix. Support a wide variety of renewable energy generation types, including sustainable uses of biomass for heating, passive solar building design, bio-digesters for electricity generation, photovoltaic solar, wind turbines, and optimizing the energy potential for existing hydro-electric dams.

x. Work with the utilities on long-range infrastructure capacity planning.

xi. Support in-place upgrades of existing facilities, including existing renewable energy generation, storage, transmission lines, distribution lines and substations as needed to reliably serve municipalities and the region.

xii. Support changes in federal, state, and local policies to achieve the state of Vermont Comprehensive Energy Plan goals.

b. CCRPC supports the generation of ~~xx,xxx MWh, or more, of~~ new renewable energy in the County to meet the Vermont Comprehensive Energy Plan's goal of using 90% renewable energy by 2050, in a manner that is cost effective and respects the natural environment. Specifically, Chittenden County needs to generate a total of 756,250 Mwh (Megawatt hours) of energy to meet the low target, or a 51% increase -- and 1,265,134 Mwh to meet the high target, or a 153% increase. The low and high ranges represent two pathways toward meeting the State's 90% renewable goal. The following statements are CCRPC's renewable energy generation facility siting policies and will inform CCRPC's preferred sites policy.

Constraint Policies: Ground mounted renewable energy generation is constrained in certain areas due to state and local restrictions on development.

i. Site renewable energy generation to avoid state and local known constraints and to minimize impacts to state and local possible constraints, as defined in strategies 3.2.3.1.f, 3.2.4.1.e, 3.2.4.2.e.

ii. Site ground-mounted solar development in accordance with setback standards as defined in 30 V.S.A. §248(s) and municipal screening requirements adopted in accordance with 30 V.S.A. §248(b)(B).

Suitability Policies: After considering the constraints referenced above and found in section 4.1.1~~X~~, different levels of suitability exist for different scales and types of renewable energy generation depending on location within the County. To determine an appropriate location for a facility, first review the constraints above and then look at the polices below to determine how and where CCRPC encourages renewable energy generation facilities. CCRPC encourages the location of renewable energy generation facilities in accordance with the relevant guidelines below. Inability to meet these guidelines does not preclude the ability to develop renewable energy generation development.

i. Locate energy generation proximate to existing distribution and transmission infrastructure with adequate capacity and near areas with high electric load.

ii. Locate renewable energy generation in areas designated by a municipality in an adopted plan for such use, including specific preferred sites for solar (state preferred sites are mapped on Map 5).
~~ii.~~iii. Locate solar generation (including but not limited to net metering) on previously impacted areas (such as, parking lots, previously developed sites, brownfields, landfills, gravel pits/quarries, or on or near existing structures).
~~iii.~~iv. Locate ground-mounted solar larger than 15 kW AC and wind turbines with a hub height larger than 30 meters (98 ft) outside of state designated village centers, growth centers, downtowns, new town centers, neighborhood development areas, and historic districts on the State or National Register.
~~iv.~~v. Locate ground-mounted solar generation, and small-scale wind (1 or 2 turbines, up to 50 meters (164 ft) in Chittenden County's areas planned for growth, while allowing infill development wherever reasonably practical.
~~v.~~vi. Locate wind generation in areas with high wind potential, such as the prime and base wind potential areas shown on Map ~~X~~7.

4. State/Local Permitting Coordination & Improvement

a. Support changes to the local and state permitting process to make the two more coordinated and effective. Participate in the Agency of Commerce and Community Development's (ACCD) process to improve the State's designation programs designed to encourage development in appropriately planned places and discourage development outside of those areas. This program could be improved with regulatory and/or fiscal incentives. These could include expedited permitting processes for projects in areas that are: a) designated for growth; and, b) where a community has a robust plan, regulations and staff capacity; and reduction of redundancies such as delegation of permitting for certain local and state reviews (such as exemption from Act 250). In conjunction with delegation it may be appropriate to develop more stringent standards and thresholds for development review in rural areas.
b. Collaborate with stakeholders to ensure local and state regulations, bylaws and plans encourage transparency, predictability and timely review of sustainable and environmentally sound development applications.
c. Develop a transportation assessment process that supports existing and planned land use densities and patterns in Center, Metro, Suburban, Village, and Enterprise Planning Areas to allow for more congestion and greater mode choice than allowed by current standards. The CCRPC will collaborate with the Vermont Agency of Transportation (VTrans), the Natural Resources Board, and other state and local stakeholders to develop a process that evaluates the transportation impact from a multi-modal perspective rather than just a traffic flow standpoint.
    - Policies and planning studies that are adopted as part of this ECOS Plan and subsequent amendments will guide CCRPC's position in permit proceedings.

5. Metropolitan Transportation Plan Investments

a. Adequately fund the maintenance and preservation of our existing transportation assets including roads, bridges, rail, transit, walking/biking, park & ride facilities, and transportation demand management (TDM) programs.
b. New transportation system investment should focus on the highest priority transportation projects as detailed in the ECOS/Metropolitan Transportation Plan (MTP) Project List. In

Commented [MN10]: Do we need a policy statement on autonomous vehicles? Suggestion: Adapt and make infrastructure improvements to incorporate autonomous vehicles into the region's transportation system.

3.2.3 IMPROVE THE SAFETY, WATER QUALITY, AND HABITAT OF OUR RIVERS, STREAMS, WETLANDS AND LAKES IN EACH WATERSHED.

While striving toward all of these ECOS strategies, and particularly Strategy #2 – 80% of growth in 15% of our land area, it is essential to do so in such a way that we do not impair our essential water resources (including potable water) and that we prepare ourselves for the impacts of a changing climate.

1. **River Hazard Protection** – Develop and implement adaptation strategies to reduce flooding and fluvial erosion hazards. While supporting planned growth, ensure that growth is evaluated in terms of preparedness for a changing climate. Chittenden County will continue its efforts, along with the municipalities, to avoid development in particularly vulnerable areas such as floodplains, river corridors, wetlands, lakeshore and steep slopes; protect people, buildings and facilities where development already exists in vulnerable areas to reduce future flooding risk; plan for and encourage new development in areas that are less vulnerable to future flood events (see Section 3.2.2); and implement stormwater management techniques to slow, spread and sink floodwater (see the Non-Point Source Pollution section below).
   a. Identify problem locations - Conduct on the ground inventories and map flow and sediment attenuation locations and problematic infrastructure (undersized culverts, eroding roadways, "vulnerable infrastructure" - infrastructure subject to repeat damage and replacement, etc.).
   b. Revise bridge/culvert designs - Revise public works and zoning ordinances with culvert and bridge design specifications that allow for wildlife passage and movement of floodwater and debris during high intensity events. Implement culvert and bridge designs that produce stable structure in river channels (i.e. fluvial geomorphology).
   c. Protect river corridors– Existing bylaws protect the majority of Fluvial Erosion Hazard (FEH) areas with stream setbacks and floodplain regulations. Work with ANR to get the FEH data incorporated into the River Corridor Protection Area maps. Work with municipalities and ANR to improve bylaws to protect the River Corridor Protection Areas or River Corridors not currently protected and enforce these bylaws. Continue protection of river corridors including non-regulatory protection measures such as stream re-buffering, river corridor easements on agricultural lands, river corridor restoration and culvert and bridge adaptation.
   d. Support non-regulatory conservation and/or preservation of vulnerable areas through public and land trust investments, including identification of repetitively damaged structures and provide assistance to elevate, relocate or buy out structures, and identify where flood storage capacity may be restored and conserved.
   e. Participate in the development and implementation of the Lamoille, Winooski and Direct to Lake Tactical Basin Plans. CCRPC will work with the State, municipalities and other partners to address river hazard protection, flood resiliency and water quality through these Plans – including prioritizing projects for funding.
   f. To protect water quality, development should be located ~~so as~~ to avoid state and local known constraints that have been field verified, and to minimize impacts to state and local possible constraints that have been field verified.
      i. State and Local Known Constraints, as protected by municipalities and State agencies, are shown on Map ~~69~~ and include the following: DEC River Corridors,

FEMA Floodways, and Municipal Water Quality Setbacks, Local Known Constraints – see table in Section 4.1.1. ~~TBD, as of (date)~~

ii. State and Local Possible Constraints are shown on Map ~~69~~ and include the following: FEMA Special Flood Hazard Areas and hydric soils, Local Possible Constraints – see table in Section 4.1.1. ~~TBD, as of (date)~~

2. **Non-point Source Pollution** - While we have addressed point sources of pollution, non-point sources are still contributing pollutants to our water bodies.
    a. Assemble data – Work from existing data collected and further identify the locations that are contributing to water quality pollution such as flow, sediment, pathogen and nutrient. Where needed, conduct on-the-ground inventories of water quality and biological assessments (in-stream), wetlands, sub-watersheds, river corridors (buffered or not) and geomorphology. Map the existing and new data on one regional map.
    b. Revise Plans and Bylaws and Ensure Enforcement -- Incorporate the above data into municipal plans; establish specific statements that protect these resources; develop clear standards for how to protect these resources within zoning regulations; and initiate on-going enforcement of the regulations. Encourage low impact development techniques, and shared storm water control programs to maximize land development in areas planned for growth. Incentivize best management practices for agricultural uses; and encourage the Agency of Agriculture to better enforce their required agricultural practices. In addition, EPA's DRAFT Lake Champlain Total Maximum Daily Load (TMDL) for phosphorus, Vermont's Phase 1 TMDL Implementation Plan, and the Vermont Clean Water Act (2015 Act 64) have established a variety of regulatory programs to address phosphorus reduction. CCRPC will work with the municipalities and other partners to implement these programs: Municipal Roads General Permit, Phosphorus reduction integration into the existing MS4 permit, and Developed Lands (3 or more acres of impervious). See Chittenden County's Work Plan and the 2016 All Hazard Mitigation Plan (in development) for more detail on these actions.
    c. Implement Non-regulatory approaches - Identify and implement non-regulatory approaches to nutrient, pathogen and sediment pollution management. Under new MS4 permit requirements, municipalities will be developing flow restoration plans to achieve the total maximum daily load requirements for impaired streams, rivers, and Lake Champlain. These plans may require additional public investment in storm water facilities or investments or actions by individual property owners. Support watershed organizations.
        - ~~FUNDED PROJECT - Connecting the Drops: A Water Story - Winooski Natural Resources Conservation District (WNRCD) aims to continue public awareness of water quality issues with a call to action in the 2013 summer season. The project includes a public art and education display in downtown Burlington where art, public participation, science education, and environmental stewardship will highlight stormwater's impact on Lake health and steps each of us can take to improve it.~~

3. **Wastewater Treatment Plant Upgrades** – The non-point sources have been identified as the largest contributors of phosphorus to Lake Champlain, and therefore Vermont's August 2015 *Draft* Lake Champlain Phosphorus TMDL Phase I Implementation Plan, does not allocate any additional

phosphorus reductions to wastewater treatment plants in the Lake Champlain basin. However, EPA's *Draft* Phosphorus TMDLs for Vermont Segments of Lake Champlain, dated August 14, 2015, does include reductions at some of the County's wastewater treatment plants as identified in Table 9 of that document. These treatment plants are listed in the ECOS Project List (see Section 4.2.6). To provide further context to the treatment plants on this list, here is further information from EPA's Phosphorus TMDL:

> "*The currently permitted WWTF [wastewater treatment facility] contributions in [the Main Lake, Shelburne Bay and Burlington Bay] segments ranges from 16 to 97% of the total segment base load and should be reduced. EPA has made WWTF waste load allocations [WLA] equivalent to setting the phosphorus limit at 0.2 mg/l at design flow for the 17 facilities with flows greater than 0.20 MGD. Those facilities [in Chittenden County] are: Burlington East, Burlington Main, Burlington North, Essex Junction, Hinesburg, Global Foundries, Shelburne #1 and #2, Richmond, South Burlington Airport Parkway, South Burlington Bartletts Bay, and Winooski. [Some] of these facilities have recently made upgrades or have the ability to make process improvements that would enable them to meet permit limits consistent with the new allocations without major construction upgrades. [Within Chittenden County] these include, Essex Junction, South Burlington Airport Parkway, Shelburne #1 and #2, and South Burlington Bartlett Bay….There are two exceptions to this general approach. The 2002 WLAs for Weed Fish Culture Station and Burlington Electric were lower than a limit equivalent to 0.2 mg/l at design flow. The more stringent 2002 allocations have been retained and are already reflected in the permit limits for these facilities.*" EPA's Phosphorus TMDLs for Vermont Segments of Lake Champlain August 14, 2015, page 31.

4. Support and promote the use of more holistic, less chemical dependent and less energy intensive effluent management efforts whenever possible (for example, composting toilets, localized grey water systems, passive grey water and black water septic systems, rain water harvesting and storage, etc.)

MAP 5 - WATER QUALITY & SAFETY

3.2.4 INCREASE INVESTMENT IN AND DECREASE SUBDIVISION OF WORKING LANDS AND SIGNIFICANT HABITATS, AND SUPPORT LOCAL FOOD SYSTEMS.

Commented [RM12]: Need to add Act 171!!

1. **Habitat Preservation** - Protect forests, wetlands and agricultural lands from development, and promote vegetative landscaping in urban areas in order to maintain natural habitats, natural storm water management and carbon sequestration. This will keep people and infrastructure out of harm's way and allow for natural flood attenuation areas.
   a. Inventory - Conduct on the ground surveys and inventories of significant habitats (include wetlands), connectivity corridors, scenic resources and locations of invasive species and map this information. Incorporate this data into municipal and regional plan text and maps and establish specific policies that address and protect these resources.

      - ~~FUNDED PROJECT - Forests, Wildlife & Communities: Science to Action – Town of Richmond with Towns of Bolton, Jericho, Huntington, Vermont Natural Resources Council, Arrowwood Environmental, Vermont Fish & Wildlife Department, VT Forests, Parks & Recreation Department, and CCRPC. This project is a comprehensive four-town natural resource inventory of wildlife habitat, wetlands, uplands, natural communities and working lands; technical assistance in the development of bylaws and non-regulatory conservation tools tailored to our communities' needs to provide permitting predictability, protect, restore and enhance critical habitat, and advance the goals specified in each town's plan; and engagement of property owners and other citizens in all aspects of the project.~~

   b. Municipal Development Review Regulations - Develop clear definitions of the resources to be protected and establish standards to describe how to protect these resources within zoning and subdivision regulations.
   c. Education - Educate engineers, developers, real estate professionals, planners and the public regarding resources and methods for restoration and protection.
   d. Non-regulatory Protection - Support non-regulatory conservation and/or preservation through public and land trust investments. Establish invasive plant removal management plans, implement the plans and include long-term monitoring.
   e. To protect significant habitats, development should be located ~~so as~~ to avoid state and local known constraints that have been field verified, and to minimize impacts to ~~-~~state and local possible constraints that have been field verified.
      - State and Local Known Constraints, as protected by municipalities and State agencies, are shown on Map ~~6~~ 9 and include the following: State - significant natural communities and rare threatened and endangered species, vernal pools (unconfirmed and confirmed), and Class 1 and Class 2 Wetlands, Local Known Constraints: – see table in Section 4.1.1.~~TBD (as of date)~~
      - Possible State and Local Constraints, as protected by municipalities and State agencies, are shown on Map ~~6~~9 and include the following: Protected Lands (state lands in fee simple ownership and privately conserved land), deer wintering areas, the Agency of Natural Resources Vermont

Conservation Design Highest Priority Forest Blocks, Local Possible Constraints: – see table in Section 4.1.1.~~TBD (as of date)~~

2. **Working Lands Implementation** – To preserve the soul of Vermont, as well as move forward into the future with resiliency, Vermont needs to protect the farmland and forestland we have and support existing and new operations (including, but not limited to, un-intensive urban and suburban home gardens and mini-homesteads). Support implementation of the Farm to Plate Strategic Plan and the VT Working Landscape Partnership Action Plan.
    a. Municipal Development Review Regulations - Develop clear definitions of working lands to be protected and establish zoning and subdivision standards to describe how to protect these areas from development so that they may be retained and accessible as "working" lands. Maintain access and scale of working lands to ensure viability after subdivision in the rural landscape (including but not limited to protection of log landings of previously logged forested parcels, zoning techniques such as fixed area ratio zoning to separate lot size from density, conservation zoning and homeowners association bylaws that allow for farming on the open space lots, etc.); while promoting urban agriculture in areas planned for growth. While farming is generally exempt from municipal zoning, some structures such as farm houses, processing facilities, the generation of energy for on-farm use, and on-farm retail and related enterprises may be regulated. The economic viability of farm enterprises can often depend on these facilities so municipal regulation should not impede reasonable farm related improvements.
    b. Infrastructure & Systems – support establishment of food processing industries, value-added product markets, workforce training, etc to help support the viability of these industries.
        - ~~FUNDED PROJECT - New American Food - Association of Africans Living in Vermont, Inc. is leading this revenue-generating, culinary job skills training project. It will prepare unemployed refugee Reach Up (Temporary Assistance for Needy Families) recipients, with limited English proficiency, for jobs in the food preparation and food processing industries through the 120-hour, 10-week FRESH food course. The AALV Employment Counselor places graduates into employment opportunities that result in movement off welfare. In addition, there will be an increase in sales by refugee farmers of organic, locally grown crops.~~
    c. Support non-regulatory conservation and/or preservation through public and land trust investments (including but not limited to municipal land conservation funds).
    d. Work with farmers and the Farm to Plate Initiative to balance this plan's goals of a strong local food system and increased production of renewable energy.
    e. To preserve working lands, development should be located ~~so as~~ to avoid state and local known constraints that have been field-verified, and to minimize impacts to state and local possible constraints that have been field-verified.

        - Possible State or Local Constraints, as protected by municipalities and State agencies, are shown on Map ~~6~~ 9 and include the following: Agricultural soils

and Act 250 agricultural soil mitigation areas, and local constraints listed in Section 4.1.1~~ Local Possible Constraints TBD~~

3. **Earth Resources Extraction -** Mineral extraction and processing facilities, including smaller private extraction operations existing to support agricultural operations, should be planned, constructed, and managed, in conjunction with State and local regulations, to:

a. Not place an excessive or uneconomic burden on local and state highways and bridges – including but not limited to a burden to the function and safety of existing roads and bridges serving the project site, strain from heavy loads on roadbeds and bridges, conflicts with pedestrians or bicyclists and increased heavy traffic in dense residential areas; and

b. Minimize any adverse effects on water quality, fish and wildlife habitats, and adjacent land uses; and

c. Plan for their eventual rehabilitation so that slopes are stable and the surface is revegetated with a variety of native species to support a wide range of biodiversity. To that end, topsoil should not be removed from sites and excavations should stop early enough so that stable slopes can be established on the property; and

d. Extraction sites should be screened to the extent practical if topography and vegetation allow.

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4.1.1 ECOS PLAN POLICIES & MAPS

For the purposes of complying with VT Statute (24 VSA 4348a), the ECOS Plan's goals in Chapter 2 serve as the policy statements, and the maps are located throughout this document and online (more detail about the maps can be found below). These goals were influenced by analysis reports, data, sub-committee expertise and public participation efforts. The strategies and actions described in Chapter 3 will help CCRPC, member municipalities and partners reach the desired goals. CCRPC deliberately chose to make the 2013 ECOS Plan a strategic plan that is intended to provide **general advisory guidance** and intentionally chose to use "should", rather than shall, in the Plan's goal statements.

ECOS Plan Maps

The following ECOS Plan maps can be found within the Plan itself:

- Map 1 - Economic Infrastructure (located in Section 3.2.1)
- Map 2 - Future Land Use (located in Section 3.2.2)
- Map 3 - Utility and Facilities (located in Section 3.2.2)
- Map 4 – Future Transportation Improvements (located in Section 3.2.2)
- Map 5 – State Preferred Sites for Solar Generation
- Map 6 – Solar Generation Potential
- Map 7 – Wind Generation Potential
- Map 8 - Water Quality and Safety (located in Section 3.2.3)
- Map 9 - Natural Systems/Development Constraints (located in Section 3.2.4)
- Map 10 - Opportunity and Race (located in Section 3.2.8)

Don't change these yet, because these will all change in the MTP I'm sure. And we don't need them for tomorrow.

- Map 8 – 2013 Metropolitan Transportation Systems Map (located in Section 4.3.1)
- Map 9 – 2006-2010 High Crash Locations-Intersections (located in Section 4.3.2
- Map 10- 2006-2010 High Crash Location –Segments (located in Section 4.3.2)
- Map 11 – Transportation Corridors (located in Section 4.3.5)

The maps included in the ECOS Plan are limited illustrations of the underlying datasets that reside in CCRPC's Geographic Information System (GIS) and are intended to provide a general overview of future and existing conditions. The accuracy of information presented in the maps is determined by its sources. Errors and omissions may exist. The Chittenden County Regional Planning Commission is not responsible for these. Questions of on-the-ground location can be resolved by site inspections and/or surveys by registered surveyor. These maps are not sufficient for delineation of features on-the-ground. These maps identify the presence of features, and may indicate relationships between features, but are not a replacement for surveyed information or engineering studies. More detail of the mapped data can be accessed through the ECOS Online Map (http://maps.ccrpcvt.org/ChittendenCountyVT/). Map updates will be incorporated into the online map as data is available and time allows. Once a year, a thorough examination of available data will be conducted. The ECOS Online Map contains data which helped to inform the regional analysis and is presented in four categories: Built Environment, Social Community, Economic Infrastructure, and

Natural Systems. The ECOS Online map is a data viewer that allows a user to locate their area of interest and control the display of various layers. A user can see data at the County level as well as at the address level. The ECOS Online Map essentially enables unique creation and printing of individual maps through the Internet.

Map 1- Economic Infrastructure Map

The Economic Infrastructure Map identifies areas within the County that are appropriate for commercial and industrial uses, per municipal zoning regulations. These uses exist throughout the County and include warehouses, manufacturing, office buildings, hotels, retail stores, medical buildings, and auto sales. This map also shows whether the areas zoned for commercial and industrial uses are within the sewer service area.

Map 2 - Future Land Use Map

The future land use map identifies the location and boundaries of the Chittenden County Regional Planning Areas as described below.

Planning Areas

The ECOS Plan uses the Planning Areas concept to identify places that share similar existing features and future planning goals. The Planning Areas reflect current municipal zoning. In addition, the scenario exercise described in Section 3.1 showed public support for growth in line with these Planning Areas. The Planning Areas aim to describe the appropriate type of future growth expected in each Planning Area; however the exact uses and densities allowable are determined by local ordinances. The Planning Areas also aim to illustrate a regional picture of future land use policies in the County necessary to promote a regional conversation about land use in Chittenden County municipalities. The six Planning Areas are depicted on the Future Land Use Plan Map. They are Center, Metro, Suburban, Village, Rural, and Enterprise.

Center Planning Areas are intended to be regional centers or traditional downtowns that serve the County and beyond and contain a mix of jobs, housing, and community facilities. Center Planning Areas also contain the County's highest density and largest-scale developments with residential densities generally ranging from 7 to more than 60 dwelling units per acre. Center Planning Areas may contain a state designated New Town Center, Growth Center, Tax Increment Financing District, or high density Village Center. Development in downtown centers primarily happens through infill development of underutilized vacant land and adaptive reuse of older structures whereas, development in municipal growth centers occurs in targeted areas that will accommodate future anticipated growth. These land uses are locally planned and managed to coexist successfully with neighborhoods and natural areas. Places within Center Planning Areas are served by wastewater facilities, other infrastructure, and offer a variety of transportation options, including non-motorized modes

Metro Planning Areas are areas where local zoning authorizes places to accommodate jobs and housing in a compact development pattern that supports transit service and encourages pedestrian activity and are within the sewer service area. Commercial land uses found in the Metro Planning Area are intended to serve the nearby residential area. Existing densities within Metro Planning Areas are typically higher than those found in the Suburban, Rural, Village, and Enterprise Planning Areas and generally range between 4 and 20 dwelling units per acre. Future development in the metro area should

be encouraged to occur at the higher end of this range to ensure that there are adequate housing and jobs in these areas.

Suburban Planning Areas are areas near a Center Planning Area, Metro Planning Area, Village Planning Area, or Enterprise Planning Area where local zoning authorizes future development to occur at scales, densities, and uses compatible with existing development and with general residential densities greater than 1 and less than 4.5 dwelling units per acre. Many parts of the Suburban Planning Area already have been developed, often in suburban styles of development and are predominantly within the sewer service area. Future development and redevelopment in this Planning Area should be publicly sewered, minimize adverse impacts on natural resources, and protect strategic open space.

Enterprise Planning Areas are areas where local zoning authorizes a future concentration of employment uses that attract workers from the County and multi-county region. Development in these Planning Areas should have adequate wastewater capacity and access to transit or be near these services. Typically, this area encompasses major employers or a cluster of single employers and has current or planned transit service.

Village Planning Areas are areas where local zoning authorizes a variety of future residential and nonresidential development at densities and scales in keeping with the character of a Vermont village, generally between 2 and 12 dwelling units per acre if sewered and between 0.2 and 4 units per acre if not sewered. Village Planning Areas are compact areas of mixed-use activities that maintain the character of a Vermont village. This type of Planning Area is intended to serve its local surroundings as a place where people can live, work, shop and recreate.

Rural Planning Areas are areas where regional and town plans promote the preservation of Vermont's traditional working landscape and natural area features. The Rural Planning Area also provides for low density commercial, industrial, and residential development (generally 1 dwelling unit per acre or less) that is compatible with working lands and natural areas so that these places may continue to highlight the rural character and self-sustaining natural area systems. Development in the rural planning areas is typically outside the sewer service area.

Map 3 – Existing Utilities and Facilities

The Utilities and Facilities Map shows the existing sewer service area, the water supply district, solid waste facilities, natural gas service area, and cellular towers.

Map 4 - Future Transportation Improvements

The Future Transportation Improvements Map gives an overview of the projects that fit within the funding constraints identified in the ECOS project list in Section 4.3.6 of the ECOS Plan. These future improvement projects create a multimodal strategy to address the efficient and long term movement of people and goods, while respecting ECOS goals. For a complete overview of proposed transit investments refer to the 2010 CCTA Transit Development Plan.

Map ~~X~~ 5 – Preferred Sites for ~~Wind and~~ Solar Generation

This map will show the location of legislatively-identified preferred sites:

Preferred sites as defined by the State of Vermont include:

- Rooftops and other structures

- Parking lots
- Previously developed sites
- Brownfields
- Gravel pits
- Quarries
- Superfund sites

Map ~~X~~ 6 and Map ~~X~~ 7 – Solar Generation Potential and Wind Generation Potential

These maps combine GIS analysis of either solar generation potential, or wind generation potential, respectively, with state and local identified *known* and *possible* constraints. The maps and corresponding data are intended to be used to inform energy planning efforts by municipalities and regions, and provided a basis for CCRPC to estimate solar and wind generation potential and municipal and regional ability to meet the generation targets. For more information on the methodology used to determine solar generation potential, please visit http://www.vtenergyatlas-info.com/solar/methodology; and for wind generation potential please visit http://www.vtenergyatlas-info.com/wind/methodology. For more information on the constraints, see the discussion of Map 6.

Areas with state and local identified constraints are removed from the Generation Potential maps completely, leaving:

1. Prime Solar or Wind Areas: areas with generation potential and no local or state constraints, and
2. Base Solar or Wind Areas: areas with generation potential and possible local or state constraints.

The accuracy of information presented in this map is limited due to scale and the accuracy of the original data source. Errors and omissions may exist, including in the analysis of whether a site has generation potential to begin with.

Map ~~5~~ 8 - Water Quality and Safety Map

The Water Quality and Safety Map illustrates the level of impairment for streams and lakes based on the Vermont Department of Environmental Conservation 303d List and the 2012 List of Priority Surface Waters. Additionally, it shows the location of wetlands, fluvial erosion hazard areas, special flood ways, and the 500 year flood hazard area.

Map ~~6~~ 9 - Natural Systems Map

The Natural Systems Map depicts sensitive and protected areas in the County. The resources included on the map are described within two ~~different~~ categories: known constraints, and possible constraints. Development should be located so as to avoid state and local known constraints, and to minimize impacts to state and local possible constraints~~:~~. ~~-~~ Constraints are based on statewide or local policies that are currently adopted or in effect. As with all maps included in the ECOS Plan, the map of constraints is intended to provide a general overview of existing conditions. The accuracy of information presented in the maps is limited due to scale. Errors and omissions may exist. These maps are not sufficient for delineation of features on-the-ground. To determine whether a site has constraints, surveyed information, engineering studies or other site-specific information will likely be necessary.

~~Sensitive areas include ground water source protection zones, deer wintering areas, primary agricultural soils, habitat blocks, core forests, and rare, threatened or endangered natural communities. Sensitive areas are partially protected through the municipal permitting process and Act 250. The map also includes areas that are protected or where development is discouraged. For the purpose of this map, conserved lands, parks, rivers and their buffers, areas over 2,500 ft., special flood hazard Areas, and wetlands make up the protected category.~~

Local Known and Possible Constraints (as of 10/29/2017)

Bolton	Burlington	Charlotte	Colchester
Known Constraints: • Surface Water ~~Buffers~~Setbacks • Wetland Buffers • Slopes 25% or more **Possible Constraints:** • Conservation District • Slopes ~~15% or more~~15% to 25% • Forest District • Town Owned Land • Flood Hazard Overlay II	**Known Constraints:** none identified **Possible Constraints:** • Historic Districts, Historic Neighborhoods (Eligible for Listing) • Mixed Use, Institutional Core Campus and Enterprise Zoning Districts • Designated Downtown and Neighborhood Development Area 5. Official Map Features • View Corridors Burlington Country Club property • City-owned parks and Centennial Woods	**Known Constraints:** none identified **Possible Constraints:** • Shoreland Setback and Buffer Area • Surface Waters, Wetlands, and Buffer areas • Flood Hazard Areas • Special Natural Areas • Wildlife habitat • Historic Districts, Site, and Structures • Slopes greater than 15% • Land in Active Agriculture • Water Supply Protection • Scenic Views 11. • Significant Wildlife Habitat	**Known Constraints:** • Slopes 20% or greater • Wetlands and Surface Water Buffers **Possible Constraints:** • Shoreland Overlay District
Essex	**Hinesburg**	**Jericho**	**Milton**

Known Constraints: • Slopes Higher than 20% **Possible Constraints:** • Scenic Resource Protection Overlay District • Resource Protection District • Slopes 15%-20% • Core Habitat • Habitat Blocks	**Known Constraints:** • Slopes Higher than 25% **Possible Constraints:** • Slopes (15-25%) • Core Habitat • Village Growth • Area • Industrial Zoning District	**Known Constraints:** • Well Protection Area • Overlay District • Natural Areas • Natural Communities • Primary Conservation Areas **Possible Constraints:** • Secondary Conservation Areas • Village Centers	**Known Constraints:** None identified **Possible Constraints**: • Town Forest and Municipal Natural and Rec Areas w/Management Plans • Habitat Blocks 8-10 • Encumbered Open Space

Shelburne	South Burlington	Underhill	Westford
Known Constraints: None identified **Possible Constraints:** • Significant View Areas • Lakeshore Buffer • Archeologically Sensitive Areas (not mapped)	**Known Constraints:** Wetlands and buffer **Possible Constraints:** • Source Protection Area • Zone 1 • Habitat Blocks • Riparian Connectivity • Slopes 20% or greater • SEQ Natural Resource Protection Area	**Known Constraints:** • Above 1,500 ft. Elevation **Possible Constraints:** • Slopes 15% or greater • Mt. Mansfield Scenic Preservation District • Wetlands and associated buffers, Surface Waters and buffers • Above 1,500 ft. Elevation	**Known Constraints:** • Slopes 25% or greater • Deer Wintering Areas • Ledge Outcropping • Flood Hazard Overlay • Water Resources Overlay **Possible Constraints:** None identified

Williston	State	State
Known Constraints: • Water Protection Buffers • Primary Viewshed Areas • Slopes 30% or greater **Possible Constraints:** • Slopes 15% ~~or more~~ 30% • Conservation Areas/Natural Communities	**Known Constraints** • FEMA Floodways • DEC River Corridors • National Wilderness Areas • State-significant Natural Communities and Rare, Threatened, and Endangered Species • Vernal Pools (confirmed and unconfirmed) • Class 1 and 2 wetlands (VSWI and advisory layers)	**Possible Constraints** • Agricultural Soils + Hydric Soils • Act 250 Ag. Soil Mitigation Areas • FEMA Special Flood Hazard Areas • VT Conservation Design Highest Priority Forest Blocks • Protected Lands (State fee lands and private conservation lands) • Deer Wintering Areas

Map ~~7~~ 10 - Opportunity and Race Map

The Opportunity and Race Map combines an opportunity index, developed by the U.S. Department of Housing and Urban Development, with U.S. Census data on race. The purpose of this map is to show levels of opportunity in areas where there are the highest concentrations of racial minorities. HUD has developed a process for analyzing opportunity at the Census Tract level. The opportunity index includes data on poverty rate, school proficiency, homeownership rate, unemployment, and job access. Each tract is ranked relative to the others in the county. Tracts that are low opportunity typically have a higher proportion of rental housing, people receiving public assistance, lower school scores, and more unemployment in comparison to other areas. Opportunity mapping is a way to see where to target investments to address disparities in the County.

Map ~~8~~ 11 - 2013 Metropolitan Transportation Systems Map

The Metropolitan Transportation Systems Map represents the present transportation network. The Metropolitan Transportation System is the multimodal network of highways, arterial and major collector roadways, transit services, rail lines, bicycle paths, sidewalks, Burlington International Airport, and other inter-modal facilities critical to the movement of people and goods in the region.

Map ~~9~~ 12 - 2006-2010 High Crash Locations-Intersections

The High Crash Locations at Intersections Map depicts where the rate of crashes exceeds a threshold known as the critical rate. Locations are ranked by calculating a ratio between the critical rate and actual rate.

Map ~~10~~ 13 - 2006-2010 Crash Locations-Segments

The High Crash Locations of Segments Map depicts where the rate of crashes exceeds a threshold known as the critical rate. Locations are ranked by calculating a ratio between the critical rate and actual rate.

Map ~~11~~ 14 - Transportation Corridors

The Transportation Corridors Map represents the locations of the corridors where projects, programs, and strategies are implemented within Chittenden County's transportation system.

4.1.2 ACT 250, SECTION 248 & SUBSTANTIAL REGIONAL IMPACT

In accordance with 24 VSA § 4345a(17) a regional planning commission shall, as part of its regional plan, define a substantial regional impact, as the term may be used with respect to its region. This definition shall be given due consideration, where relevant, in state regulatory proceedings. Those proceedings are:

1. Act 250 – Certain proposed developments are required to obtain a permit from one of Vermont's nine District Environmental Commissions in order to establish that the proposed development will satisfy 10 criteria defined by Act 250 (10 VSA §6086). One of these 10 criteria is that the proposed development be "in conformance with any duly adopted local or regional plan or capital program."

2. Section 248 – Certain proposed utility facilities are required to obtain a permit from Vermont's Public Service Board to establish that the proposed facility will satisfy criteria defined by Section 248 (30 VSA §248). One of the Section 248 criteria is that the proposed facility will "not unduly

interfere with the orderly development of the region with due consideration having been given to the recommendations of the municipal and regional planning commissions."

3. In addition, the Secretary of the Agency of Natural Resources may not issue a new Solid Waste Management Facility Certification (10 VSA §6605(c)) unless the facility is "in conformance with any municipal or regional plan adopted in accordance with 24 VSA Chapter 117."

In accordance with 24 VSA §4348 (h), in the above three proceedings, in which the provisions of a regional plan or a municipal plan are relevant to the determination of any issue in those proceedings, the provisions of the regional plan shall be given effect to the extent that they are not in conflict with the provisions of a duly adopted municipal plan. To the extent that such a conflict exists, the regional plan shall be given effect it if is demonstrated that the project under consideration in the proceedings would have a "substantial regional impact." **That is, the issue of whether a proposed development has a "substantial regional impact" is important only when there is a conflict between the regional plan and municipal plan.** CCRPC will attempt to reduce the potential for such conflicts through its municipal plan review and approval process.

The following is the required definition of "substantial regional impact," as this term is to be used with respect to Chittenden County:

A proposed development has a substantial regional impact if it is not consistent with the Future Land Use Policy (Strategy 3.2.2) and associated Map 2 of this Regional Plan.

This definition puts the emphasis on the Planning Areas – and stipulates that if a development proposal is not consistent with the Planning Areas, then the Regional Plan will take effect in the State proceedings (as described above) if there is a conflict between the regional plan and the municipal plan. The Planning Areas form the basis for the appropriate areas for growth in the next 20 years as shown in the Future Land Use Plan.

The Planning Areas are consistent with current municipal plans and zoning, so only developments that are NOT consistent with municipal zoning and the planning area definitions would likely prompt the SRI definition. Further, developments that push beyond these defined areas are more likely to have a significant impact on our region, than developments within the defined areas for growth. Upon request by a municipality to make a change to the Planning Areas as a result of a municipal plan, zoning and/or infrastructure service area change, CCRPC will review the request for consistency with the Planning Area definitions prior to any action.

The CCRPC has a role in development review outside of the very limited circumstances in which the substantial regional impact definition will come into play. RPCs "shall appear before district environmental commissions to aid them in making a determination as to the conformance of developments and subdivisions with the criteria of 10 VSA § 6086" (24 VSA § 4345a(13)). Both Act 250 and Section 248 require the permit applicant for a project that is proposed to be located in Chittenden County to submit a copy of the application to CCRPC. CCRPC is a party in any such application for an Act 250 permit and may apply to be a party in any such application for a Section 248 permit.

CCRPC's current policy, ~~has established an interim policy (~~Guidelines and Standards for Reviewing Act 250 and Section 248 Applications, guides~~) for~~ its participation in the permit review procedures of Act 250 and Section 248. Currently under this interim policy:

- CCRPC's Executive Committee considers whether an applicant's proposal is in conformance with the Regional Plan, with specific attention given to the Planning Areas of this Plan (for the

same reasons described above for the SRI definition), and the criteria dealing with traffic and other criteria within CCRPC's expertise.

- Staff initially reviews each Act 250 application (with specific attention given to those applications going to a hearing as the FY13 CCRPC contract with the Agency of Commerce and Community Development requires that the CCRPC review and comment on Act 250 and Section 248 applications if a hearing is held).
- CCRPC staff will discuss potential Act 250 and Section 248 projects with Planning and Zoning staff and members of the Planning Advisory Committee to identify emerging development proposals to assess their conformance with the Regional Plan. The intent is that this proactive, collaborative approach attempts to work out any concerns about Act 250 and Section 248 applications prior to their submission.

The Planning Advisory Committee may recommend to the CCRPC revised procedures for participation in Act 250 and Section 248 proceedings in order to better achieve the goals of this Chittenden County 2013 ECOS Plan. These revisions will be established through formal amendments to the *Guidelines and Standards for Reviewing Act 250 and Section 248 Applications*, and if appropriate, as amendments to this Plan as well. Changes in the review of transportation impacts and CCRPC policies will be coordinated with VTrans and the District Environmental Commission as appropriate to seek consistency in Act 250 reviews.

Subsequent to Plan adoption, the CCRPC anticipates three potential ~~a~~ changes to the *Guidelines and Standards for Reviewing Act 250 and Section 248 Applications* ~~to the measures and thresholds used to evaluate allowable congestion in Planning Areas Designated for Growth~~:

- **Measures and thresholds used to evaluate allowable congestion in Planning Areas Designated for Growth -** Currently, Level of Service (LOS) is the predominant measure used to quantify traffic congestion of the transportation system and often determines whether or not mitigation is required for specific development proposals LOS measures quality of service of a transportation facility from a driver's perspective. Alternatively, LOS will not be used as the predominant measure of congestion when reviewing overall intersection performance in traffic impact studies as part of Act 250 applications. For Planning Areas Designated for Growth (excludes Rural Planning Areas), the CCRPC will use both LOS and volume-to-capacity (*v/c*) measures to evaluate congestion. Rather than focusing on incremental and often inconsequential changes between different levels of service, the *v/c* measure provides information on whether capacity of an intersection is being fully utilized. Applying both LOS and *v/c* measures will more effectively assist in reaching the land use and transportation goals of the region. The CCRPC will work with VTrans and other stakeholders to develop LOS and *v/c* thresholds that will allow for higher levels of congestion within non-Rural CCRPC defined Planning Areas than currently defined in the VTrans LOS Policy.
- **Development Constraints** – Resources have been identified in Strategies 3 & 4, and illustrated on Map ~~6~~ 9 as development constraints. Development should be located to avoid state and local known constraints, and to minimize impacts to state and local possible constraints. Constraints are based on statewide or local policies that are currently adopted or in effect. CCRPC will amend their policy to include a review of these development constraints within their Act 250 and Section 248 development proposal review. Because these constraints are protected at the state and local level already, CCRPC will defer to the relevant municipal or agency review of the constraint unless a review or permit has not been issued by those authorities.
- **Preferred Sites for Solar Generation Facilities** – Net metering projects in Vermont are capped at 150 kW, unless they are located on a preferred site. Vermont's net metering rules

(5.100 Rule Pertaining to Construction and Operation of Net-Metering Systems) allows for net metering projects to be up to 500 kW if they are located on a structure, a parking lot canopy, a previously developed site, a brownfield, a landfill, the disturbed portion of a gravel pit, a specific location designated in a duly adopted town plan, or a specific location identified in a joint letter of support from the municipal legislative body and the municipal and regional planning commission. Upon request, CCRPC will review both the development constraints in Strategies 3 & 4, and the suitability statements in Strategy 2 to determine what sites qualify as a preferred site.

4.1.3 STATEMENT OF COMPATIBILITY AND CONSISTENCY

Pursuant to 24 *VSA* 4302 (f), 4345a (5), 4348a (a), and 4348a (a)(8), CCRPC has reviewed the approved plans of its member municipalities and of its adjoining regional planning commissions and concluded that this *ECOS Plan* is compatible with those plans (that is, this *ECOS Plan*, as implemented, will not significantly reduce the desired effect of the implementation of the other plans).

Chittenden County is bordered to the north by Grand Isle and Franklin Counties, which are served by the Northwest Regional Planning Commission. The ECOS Plan is compatible with the NRPC 2015 Regional Plan. Most bordering areas are designated as Rural in the ECOS Plan and as Agricultural Resource, Rural or Conservation and Forest Resource in the NRPC 2015 Regional Plan. There are two areas near the border with Franklin County that should be monitored in the future. Any development near around Exit 17 on Route 2 in Colchester may have an impact on Grand Isle County. Additionally, there is an area in Milton planned for Enterprise in the ECOS Plan near, but not bordering, an area planed for Conservation in Georgia in Franklin County. Development in the future should be monitored to ensure no adverse effects.

Chittenden County is bordered to the east by Lamoille County (served by the Lamoille County Regional Planning Commission) and Washington County (served by the Central Vermont Regional Planning Commission). The ECOS Plan is compatible with the Lamoille County Regional Plan: 2014-2022. The Lamoille County Regional Planning Commission's Future Land Use Map designates the areas bordering Chittenden County as Rural Residential, Forest Conservation or Agricultural Conservation. This is compatible with the ECOS Plan's designation of adjoining municipalities as Rural Planning Areas. The ECOS Plan is also compatible with the 2015 Amendment to the Central Vermont Regional Plan. The Plan's future land use map designates areas bordering Chittenden County as Resource and Rural areas. This is compatible with the ECOS Plan's designation of adjoining municipalities as Rural Planning Areas.

Chittenden County is bordered to the south by Addison County (served by the Addison County Regional Planning Commission). The ECOS Plan is compatible with the Addison County 2011 Regional Plan. The Addison County 2011 Regional Plan designates areas bordering Chittenden County to the south as Rural and Agricultural or Forestland and Conservation/Floodplain areas, which is generally compatible with the designation of bordering areas in the ECOS Plan as Rural Planning Areas. There are two possible points of conflicts between future land uses. In Hinesburg, a designated Enterprise Zone is Hinesburg borders a Rural and Agricultural area in Starksboro. In Ferrisburgh, a designated Village and Commercial/Industrial area borders a Rural Planning Area in Charlotte. Development in the future should be monitored to ensure no adverse effects.

Beyond the abutting land designations as described above, it is likely that there is housing pressure on the surrounding regions based on a lack of housing within Chittenden County. This is evidenced by a low vacancy rate in Chittenden County, and the number of commuters from outside of the region.

County	Percent of Primary Jobs held by County Residents located in Chittenden County (2013)	Number of Primary Jobs held by County Residents located in Chittenden County (2013)
Grand Isle County	57.50%	2,009
Franklin County	42.30%	9,538
Lamoille County	19.80%	2,279
Washington County	16.20%	4,105
Addison County	26.90%	4,160

Source: http://onthemap.ces.census.gov/

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While some of these commuters may prefer to live outside of Chittenden County for reasons other than the housing expense within the County, continued efforts to increase the housing stock within the areas planned for growth in the County will hopefully minimize this pressure on the surrounding regions.

Due to the amount of commuting traffic from the surrounding regions into Chittenden County, there is a demand for transportation services and infrastructure to get residents to their places of work and home again. All four regional plans include a similar sentiment as this one from the Northwest Regional Plan: "As this demand increases, efforts to combine infrastructure capacity improvements with increased public transportation services should be examined at every possible opportunity." A recent example of this type of improvement, selected by the Circ Alternatives Task Force, is the CCTA Jeffersonville Commuter bus route on Route 15. The Plans are consistent in calling for access management, and concentrated development to maintain these arterial corridors for mobility and preservation of character. Concentrated development of jobs and housing that is affordable in the areas planned for growth is a major tenant of the ECOS Plan and a critical component in addressing some of the cross regional pressures on transportation networks. Particular roadway improvements and corridor plan recommendations identified in the surrounding regional plans are consistent with the ECOS Plan.

Also, hazard mitigation and emergency services are regional issues as responders cross municipal and county boundaries. All four regional plans include a similar sentiment as this one from the Addison County Regional Plan: "To maintain a strong and effective response system that is built on the concept of cooperation and mutual aid."

CCRPC has also reviewed the goals of 24 *VSA* 4302 and concluded that this *ECOS Plan* is consistent with those goals (that is, implementation of this *ECOS Plan* will result in substantial progress toward attainment of the goals established in 24 *VSA* 4302).

Municipal Plan Review & Compatibility

In determining whether the Municipal Plans are compatible with this Regional Plan (upon request by the Municipality and in accordance with VT Statute 24 VSA 4350b), the CCRPC will refer to the Planning Areas depicted on the Future Land Use Map, the goals in Chapter 2 and the strategies in Chapter 3. In conducting these reviews and determining compatibility CCRPC's Planning Advisory Committee will use the *Guidelines and Standards for Confirmation of Municipal Planning Processes and Approval of*

Municipal Plans and when needed seek guidance from community partners with expertise in subject areas outside of CCRPC's realm.

~~Municipalities may also find it useful to consult the ECOS Criteria included in Appendix B. The ECOS Criteria were established to prioritize transportation projects (for the MTP), and the ECOS implementation grants in order to ensure that limited financial resources will go to the projects that will have a high rate of return and move many ECOS goals in the right direction. In addition, the MTP sections of this plan, particularly the corridor improvement sections, may be helpful to the municipalities in planning for future land use and transportation improvements.~~

Decisions for how we create denser mixed use communities are made at the local municipal level of government. Therefore, municipalities are encouraged to apply ECOS strategies in their development decision making process. Specific implementation of the ECOS strategies will vary throughout the County as municipalities consider their own unique needs and relationship to the region as a whole.

Upon receipt of a Certification of Energy Compliance from the Department of Public Service for this energy enhanced ECOS Plan, CCRPC will have the authority to grant Certificates of Energy Compliance to our municipalities as they amend their municipal plans to meet the enhanced energy standards of Act 174. CCRPC will amend the *Guidelines and Standards for Confirmation of Municipal Planning Processes and Approval of Municipal Plans* to add this procedure. Local development constraints are folded into this ECOS Plan based on current adopted municipal policies or ordinances, and we anticipate those may change as local municipalities work on their individual enhanced energy plans. To ensure consistency with the Regional Plan, CCRPC will review those local constraints in light of the energy generation targets before approval of the local Certificate of Energy Compliance.

COUNTY ENERGY DATA AND MAPS: CHITTENDEN COUNTY

MTP Scenario: December 2017

This document incudes all data required for Chittenden County to plan for these goals at a county level. The tables contain data that estimate current energy use and provide targets for future energy use across all sectors (transportation, heating, and electricity). The tables also show the region's targets for renewable energy generation. Please note that these data are a starting point for Chittenden County to consider its energy future. This information should provide the framework for a discussion about changes that will need to occur within Chittenden County to ensure that state energy goals are met.

Estimates of current energy use consist primarily of data available from the American Community Survey (ACS), the Vermont Agency of Transportation (VTrans), the Vermont Department of Labor (DOL), Vermont Gas and the Vermont Department of Public Service (DPS). Where available, real consumption data obtained from utilities are used.

Targets for future energy use are drawn from the Long-range Energy Alternatives Planning (LEAP) analysis for Chittenden County, completed the Vermont Energy Investment Corporation (VEIC). The LEAP model is an accounting framework that shows one possible path for Chittenden County to meet the goals above.

Assumptions used to create the LEAP analysis are slightly different than assumptions used to calculate current regional energy use. Regardless, the targets established here show the direction in which change needs to occur to meet regional and state energy goals. It is also important to remember that the targets established by LEAP represent only one way to achieve Chittenden County's energy goals. Other strategies may also allow the region to meet its goals.

The LEAP model was originally based on statewide averages, but CCRPC worked with VEIC to incorporate county-specific data where possible. CCRPC completes its own modeling of future transportation use for our Metropolitan Transportation Plan and identifies a scenario to advance in our regional Metropolitan Transportation Plan. VEIC produced a LEAP model that is consistent with the MTP scenario. The LEAP model shows us what we would need to do to meet the 90% renewable by 2050 goal if all of the elements of the MTP's transportation scenario were completed.

For more explanation on the data included here, please see the Methodology Document.

Data in these tables are updated versions of data previously included in the ECOS plan text.

TRANSPORTATION ENERGY USE

Current Transportation Energy Use

Metric	County Data
Fossil Fuel Burning Cars, 2015	106,936
Fossil Fuel Energy Used for Transportation in 2015 (MMBtu)	5,165,665
Biofuel Blend Energy Used for Transportation in 2015 (MMBtu) *Primarily ethanol mixed into gasoline*	356,903
Electric Vehicles in 2015 (#)	546
Electricity Used for Transportation in 2015 (MMBtu)	4,347
Sources: VTrans, American Community Survey, Drive Electric Vermont, DMV	

Transportation Energy Use, 2015-2050

	2015	2025	2035	2050
Total Light Duty Transportation Energy Use (MMBtu)	7,561,000	6,299,000	3,990,000	1,739,000
Electricity Used for Transportation (MMBtu)	6,000	84,000	579,000	1,222,000
Electric Vehicles (% of Vehicle Fleet)	0%	6%	41%	89%
Biofuel Blended* Energy Used for Transportation (MMBtu)	7,555,000	6,215,000	3,411,000	517,000
Biofuel Blend* Vehicles (% of Vehicle Fleet)	100%	94%	59%	11%
**This measures biofuels blended with fossil fuels. A common example is gasoline with ethanol mixed in.*				
Sources: VTrans, LEAP Model				

THERMAL ENERGY USE

Current Thermal Energy Use from Natural Gas, 2015

Total Residential Natural Gas Consumption (Mcf)	3,331,770
Percentage of County Natural Gas Consumption	45%
Total Commercial/Industrial Natural Gas Consumption (Mcf)	4,120,470
Percentage of County Natural Gas Consumption	55%
Total County Natural Gas Consumption	7,452,239
Sources: Vermont Gas	

Current Thermal Energy Use from Delivered Fuels, 2015?

Total Residential Fuel Oil Consumption (unit?)	
Total Residential Propane Consumption (unit?)	
Total Residential Wood Consumption (unit?)	
Percentage of County Households Heating with Delivered Fuels?	
Sources: ???	

Commercial and Industrial Thermal Energy Use, 2015-2050

	2015	2025	2035	2050
Total Commercial and Industrial Thermal Energy Use (MMBtu)	3,574,500	3,219,900	2,776,400	2,112,000
Percent of Commercial and Industrial Establishments Weatherized by Target Year	11%	20%	22%	39%
Energy Saved by Weatherization by Target Year (MMBtu)	86,500	189,006	259,783	629,830
Commercial and Industrial Establishments Using Heat Pumps (%)	1%	22%	35%	39%
Commercial and Industrial Thermal Energy Use by Heat Pumps (MMBtu)	6,590	284,318	562,046	839,773

Commercial and Industrial Establishments Using Wood Heating (%)	7%	9%	10%	11%
Commercial and Industrial Thermal Energy Use Attributable to Wood Heating (MMBtu)	266,300	424,000	583,700	854,500
Sources: LEAP Model, Department of Public Service, Department of Labor				

Residential Thermal Energy Use, 2015-2050

	2015	**2025**	**2035**	**2050**
Total Residential Thermal Energy Use (MMBtu)	6,299,000	5,647,000	4,788,000	3,315,000
Percent of Residences Weatherized by Target Year	2%	14%	23%	70%
Energy Saved by Weatherization by Target Year (MMBtu)	22,400	194,400	434,000	1,629,000
Percent of Residences Using Heat Pumps	3%	18%	35%	55%
Residential Thermal Energy Use from Heat Pumps (MMBtu)	63,000	366,000	753,000	1,104,000
Residences Using Wood Heating (%)	14%	14%	14%	13%
Residential Thermal Energy Use from Wood Heating (MMBtu)	986,000	1,037,000	1,038,000	912,000
Sources: LEAP Model, Department of Public Service				

ELECTRIC ENERGY USE

Current Electrical Energy Use

Residential Electric Energy Use (MWh)	425,335
Commercial and Industrial Electric Energy Use (MWh)	1,483,006
Total Electric Energy Use (MWh)	1,908,341

Sources: Efficiency Vermont, Burlington Electric Department, 2016

Electrical Energy Use, 2015-2050

	2015	2025	2035	2050
Total Electricity Use (MWh)	1,908,341	2,062,529	2,216,718	2,448,000
Total Electric Energy Saved (MWh)	9,000	107,000	216,000	404,000
Residences that have increased their Electric Efficiency	3%	31%	58%	98%
Commercial and Industrial Establishments that have Increased Their Electric Efficiency	3%	31%	58%	98%

Sources: LEAP Model and Efficiency Vermont, 2016

ELECTRIC ENERGY GENERATION

Renewable Electricity Generation Targets

Renewable Energy Generation Target	MWh
State Projected Electricity Demand (2050)	10,000,000
In-State Generation Target (2050)	5,000,000
State Imported Generation (2050)	50%
Low Target for Renewable Energy Generation in Chittenden County: 15% of State	
Total Target	756,250
Existing Renewable Energy Generation	501,361
New Generation Needed	254,889
High Target for Renewable Energy Generation in Chittenden County: 25% of State	
Total Target	1,265,134
Existing Renewable Energy Generation	501,361
New Generation Needed	763,773

Existing Renewable Electricity Generation

	Sites	Power (MW)	Energy (MWh)
Solar	2,785	40	49,806
Wind	23	10	31,136
Hydroelectric	6	36	164,136
Biomass	14	51	266,164
Other	0	0	0
Total	2,785	137	511,242

Source: Community Energy Dashboard, October 2017

**The total existing renewable energy generation varies from the existing renewable energy generation reported in the Energy Overview due to variations in the way the data is counted.*

Renewable Electricity Generation Potential

	Power (MW)	Energy (MWh)
Rooftop Solar	103	126,328
Ground-Mounted Solar – Prime	1,082	1,327,516
Ground-Mounted Solar – Base	1,124	1,377,868
Wind – Prime	161	1,935,976
Hydro	See Hydro Map	
Biomass	See Biomass Map	
Methane	Unknown	Unknown
Other	Unknown	Unknown

Source: CCRPC and the Department of Public Service

Land Available for Wind and Solar Generation

	Prime (acres)	Base (acres)
Solar	8,660	67,410
Wind	15,786	151,829

Note: Prime areas are areas of high energy potential and an absence of state/local known and possible constraints. Base areas are areas with high energy potential and a presence of state/local possible constraints.

Scenarios to Meet Generation Targets

To meet the low target, can we…

Produce 75% of the Low Target with Solar?
We have 7x the amount of prime solar or 54x the amount of base solar needed to meet this goal

Produce 25% of the Low Target with Wind?
We have 30x the amount of prime wind or 293x the amount of base wind needed to meet this goal

Producing 100% of the Low Target with Solar?
We have 6x the amount of prime solar or 48x the amount of base solar needed to meet this goal

Commented [EN1]: I thought this might be easier without the actual acreages in it, but feel free to change if you think it doesn't work.

Produce 100% of the Low Target with Wind?
We have 4x the amount of prime wind or 34x the amount of base wind needed to meet this goal

To meet the high target, can we…

Produce 75% of the High Target with Solar?
We have 2x the amount of prime solar or 18x the amount of base solar needed to meet this goal

Produce 25% of the Low Target with Wind?
We have 10x the amount of prime wind or 98x the amount of base wind needed to meet this goal

Produce 100% of the High Target with Solar?
We have 2x the amount of prime solar or 18x the amount of base solar needed to meet this goal

Produce 100% of the High Target with Wind?
We have 1x the amount of prime wind or 11x the amount of base wind needed to meet this goal

Figure 1. Chittenden County Energy Consumption by MTP LEAP Scenario – Excluding Aviation Fuel

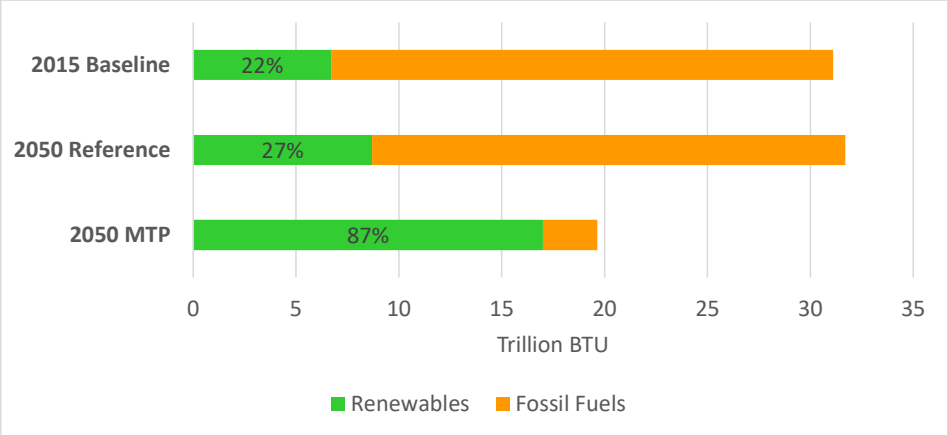


Figure 2. CCRPC 2050 MTP Scenario Energy Use Over Time, by Sector

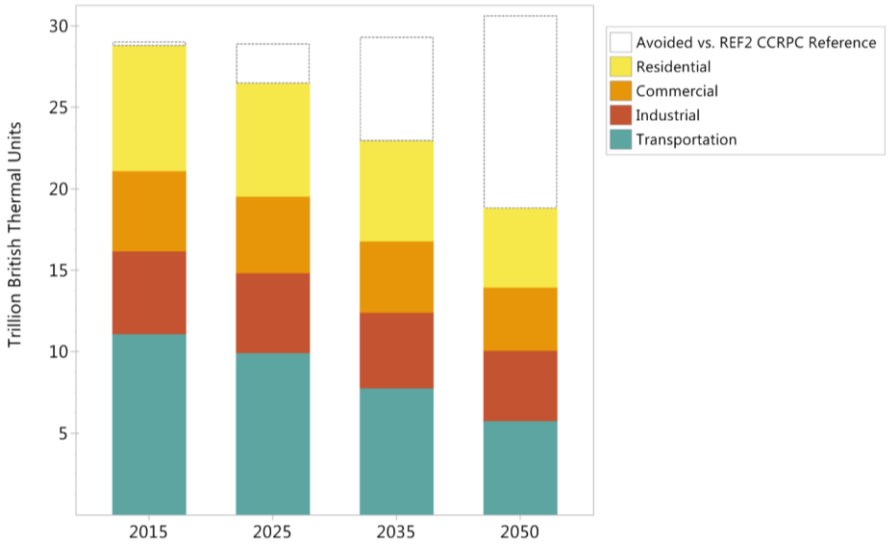
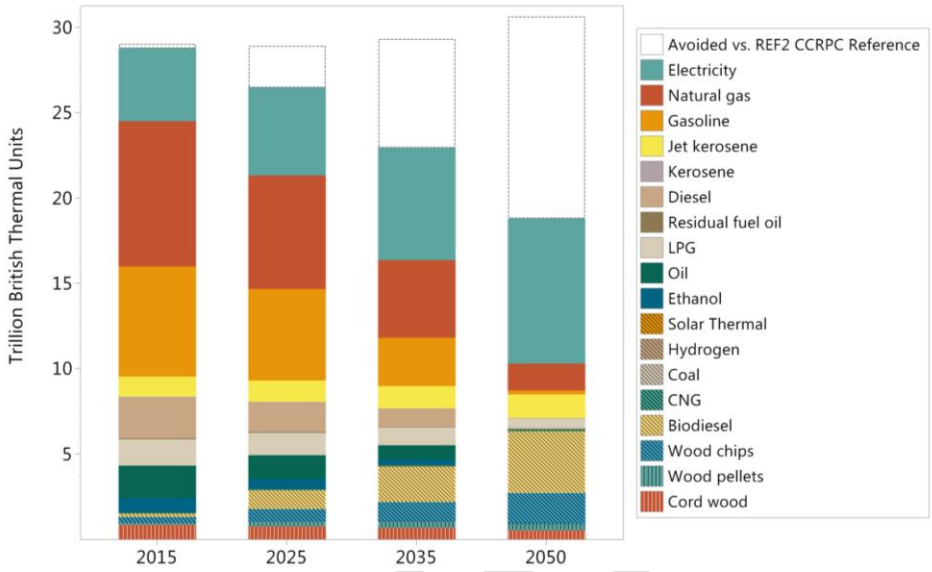


Figure 3. CCRPC 2050 MTP Scenario Energy Use Over Time, by Fuel



Data in these tables are updated versions of data previously included in the ECOS plan text.

Scenario 1: Essex Junction and Essex Town are separate and Global Foundries is split between the two jurisdictions

12/14/2017				Target					Prime Solar Energy Potential				Base Solar Energy Potential					
Town Name	Population Share	Electricity Share	Average of Population and Electricity Use	Total Low Target (MWh)	Total High Target (MWh)	Existing Renewables (MWh)	Low Range Net Remaining (MWh)	High Range Net Remaining (MWh)	Prime Solar Acres	Prime Solar Potential (MW)	Potential Solar Capacity from Prime Solar (MWh)	Can Meet Low Target with Prime Solar Potential ?	Can Meet High Target with Prime Solar Potential?	Base Solar Acres	Base Solar Potential (MW)	Potential Solar Capacity from Base Solar (MWh)	Can Meet Low Target with Prime + Base Solar Potential?	Can Meet High Target with Prime + Base Solar Potential?
Bolton	1%	0%	1%	4,218	7,057	328	3,890	6,729	173	22	26,517	1	1	1,138	19	23,271	1	1
Buels Gore	0%	0%	0%	92	154	6	86	148	9	1	1,393	1	1	91	2	1,861	1	1
Burlington	27%	18%	22%	168,431	281,769	285,442	✓	✓	71					2,045	34	41,796	1	1
Charlotte	2%	1%	2%	12,607	21,090	5,059	7,548	16,031	291	36	44,536	1	1	10,659	178	217,870	1	1
Colchester	11%	7%	9%	67,204	112,427	2,086	65,119	110,341	737	92	112,970	1	1	4,822	80	98,562	1	1
Essex Junction	6%	22%	14%	104,508	174,832	41,282	63,226	133,550	722	90	110,609	1	0	6,721	112	137,383	1	1
Essex Town	7%	22%	14%	106,878	178,797	2,293	104,585	176,503	161	20	24,713	0	0	994	17	20,324	0	0
Hinesburg	3%	1%	2%	14,975	25,051	1,457	13,517	23,594	833	104	127,684	1	1	5,237	87	107,049	1	1
Huntington	1%	0%	1%	5,644	9,442	629	5,016	8,814	409	51	62,751	1	1	1,923	32	39,300	1	1
Jericho	3%	1%	2%	15,869	26,547	1,347	14,523	25,201	575	72	88,219	1	1	3,855	64	78,791	1	1
Milton	7%	4%	5%	39,817	66,610	102,752	✓	✓	945					7,787	130	159,176	1	1
Richmond	3%	1%	2%	13,445	22,491	4,485	8,960	18,006	548	69	84,018	1	1	1,793	30	36,655	1	1
Shelburne	5%	3%	4%	28,443	47,582	4,648	23,795	42,934	436	54	66,835	1	1	4,845	81	99,029	1	1
South Burlington	12%	11%	11%	85,841	143,604	14,627	71,214	128,977	206	26	31,547	0	0	3,114	52	63,653	1	0
St. George	0%	0%	0%	2,368	3,961	312	2,056	3,649	62	8	9,543	1	1	422	7	8,624	1	1
Underhill	2%	1%	1%	9,420	15,759	765	8,656	14,995	795	99	121,934	1	1	4,487	75	91,707	1	1
Westford	1%	0%	1%	6,209	10,387	411	5,798	9,976	792	99	121,478	1	1	3,904	65	79,801	1	1
Williston	6%	6%	6%	44,647	74,691	3,435	41,213	71,256	738	92	113,111	1	1	3,277	55	66,992	1	1
Winooski	5%	2%	3%	25,633	42,882	30,297	✓	12,584	156	20	23,984	1	1	295	5	6,023	1	1
County Total	**100%**	**100%**	**100%**	**756,250**	**1,265,134**	**501,660**	**254,590**	**763,474**	8,660	1082	1,327,516	1	1	67,410	1124	1,377,867	1	1

Scenario 2: Essex Junction + Essex Town Combined, Global Foundries Electricity Consumption remains with Essex and the Junction

12/12/2017				Target					Prime Solar Energy Potential				Base Solar Energy Potential					
Town Name	Population	Electricity Share	Average of Population and Electricity Use	Total Low Target (MWh)	Total High Target (MWh)	Existing Renewables (MWh)	Low Range Net Remaining (MWh)	HighRangeNet Remaining(MWh)	Prime Solar Acres	Prime Solar Potential (MW)	Potential Solar Capacity from Prime Solar (MWh)	Can Meet Low Target with Prime Solar Potential ?	Can Meet High Target with Prime Solar Potential?	Base Solar Acres	Base Solar Acres Potential (MW)	Potential Solar Capacity from Base Solar (MWh)	Can Meet Low Target with Prime + Base Solar Potential?	Can Meet High Target with Prime + Base Solar Potential?
Bolton	1,236	0%	1%	4,218	7,057	328	3,890	6,729	173	22	26,517	1	1	1,138	19	23,271	1	1
Buels Gore	39	0%	0%	92	154	6	86	148	9	1	1,393	1	1	91	2	1,861	1	1
Burlington	42,570	18%	22%	168,431	281,769	285,442	✓	✓	71	9	10,808	1	1	2,045	34	41,796	1	1
Charlotte	3,822	1%	2%	12,607	21,090	5,059	7,548	16,031	291	36	44,536	1	1	10,659	178	217,870	1	1
Colchester	17,293	7%	9%	67,204	112,427	2,086	65,119	110,341	737	92	112,970	1	1	4,822	80	98,562	1	1
Junction + Town	20,419	43%	28%	211,386	353,629	43,576	167,810	310,053	883	110	135,323	0	0	7,716	129	157,707	1	0
Hinesburg	4,472	1%	2%	14,975	25,051	1,457	13,517	23,594	833	104	127,684	1	1	5,237	87	107,049	1	1
Huntington	1,875	0%	1%	5,644	9,442	629	5,016	8,814	409	51	62,751	1	1	1,923	32	39,300	1	1
Jericho	5,043	1%	2%	15,869	26,547	1,347	14,523	25,201	575	72	88,219	1	1	3,855	64	78,791	1	1
Milton	10,610	4%	5%	39,817	66,610	102,752	✓	✓	945	118	144,868	1	1	7,787	130	159,176	1	1
Richmond	4,115	1%	2%	13,445	22,491	4,485	8,960	18,006	548	69	84,018	1	1	1,793	30	36,655	1	1
Shelburne	7,566	3%	4%	28,443	47,582	4,648	23,795	42,934	436	54	66,835	1	1	4,845	81	99,029	1	1
South Burlington	18,536	11%	11%	85,841	143,604	14,627	71,214	128,977	206	26	31,547	0	0	3,114	52	63,653	1	0
St. George	764	0%	0%	2,368	3,961	312	2,056	3,649	62	8	9,543	1	1	422	7	8,624	1	1
Underhill	3,061	1%	1%	9,420	15,759	765	8,656	14,995	795	99	121,934	1	1	4,487	75	91,707	1	1
Westford	2,013	0%	1%	6,209	10,387	411	5,798	9,976	792	99	121,478	1	1	3,904	65	79,801	1	1
Williston*	9,054	6%	6%	44,647	74,691	3,435	41,213	71,256	738	92	113,111	1	1	3,277	55	66,992	1	1
Winooski	7,223	2%	3%	25,633	42,882	30,297	✓	12,584	156	20	23,984	1	1	295	5	6,023	1	1
County Total	**159711**	100%	**100%**	**756,250**	**1,265,134**	**501,661**	**254,589**	**763,473**	8,660	1082	1,327,516	1	1	67,410	1124	1,377,868	1	1

Scenario 3: Essex Junction and Essex Town combined, Global Foundries electricity consumption distributed regionally

12/12/2017				Target					Prime Solar Energy Potential				Base Solar Energy Potential					
Town Name	Population Share	Electricity Share	Average of Population and Electricity Use	Total Low Target (MWh)	Total High Target (MWh)	Existing Renewables (MWh)	Low Range Net Remaining (MWh)	HighRangeNet Remaining(MWh)	Prime Solar Acres	Prime Solar Potential (MW)	Potential Solar Capacity from Prime Solar (MWh)	Can Meet Low Target with Prime Solar Potential ?	Can Meet High Target with Prime Solar Potential?	Base Solar Acres	Base Solar Acres Potential (MW)	Potential Solar Capacity from Base Solar (MWh)	Can Meet Low Target with Prime + Base Solar Potential?	Can Meet High Target with Prime + Base Solar Potential?
Bolton	1%	1%	1%	4,844	8,103	328	4,516	7,775	173	22	26,517	1	1	1,138	19	23,271	1	1
Buels Gore	0%	0%	0%	112	187	6	106	181	9	1	1,393	1	1	91	2	1,861	1	1
Burlington	27%	24%	25%	189,981	317,821	285,442	✓	32,379	71	9	10,808	1	0	2,045	34	41,796	1	1
Charlotte	2%	1%	2%	14,541	24,326	5,059	9,483	19,268	291	36	44,536	1	1	10,659	178	217,870	1	1
Colchester	11%	9%	10%	75,959	127,072	2,086	73,873	124,986	737	92	112,970	1	0	4,822	80	98,562	1	1
Junction + Town	13%	24%	19%	140,873	235,666	43,576	97,297	192,090	883	110	135,323	1	0	7,716	129	157,707	1	1
Hinesburg	3%	2%	2%	17,238	28,838	1,457	15,781	27,381	833	104	127,684	1	1	5,237	87	107,049	1	1
Huntington	1%	1%	1%	6,594	11,030	629	5,965	10,402	409	51	62,751	1	1	1,923	32	39,300	1	1
Jericho	3%	2%	2%	18,422	30,818	1,347	17,075	29,472	575	72	88,219	1	1	3,855	64	78,791	1	1
Milton	7%	5%	6%	45,188	75,595	102,752	✓	✓	945	118	144,868	1	1	7,787	130	159,176	1	1
Richmond	3%	2%	2%	15,528	25,976	4,485	11,043	21,491	548	69	84,018	1	1	1,793	30	36,655	1	1
Shelburne	5%	4%	4%	32,273	53,989	4,648	27,625	49,341	436	54	66,835	1	1	4,845	81	99,029	1	1
South Burlington	12%	14%	13%	95,224	159,301	14,627	80,598	144,674	206	26	31,547	0	0	3,114	52	63,653	1	0
St. George	0%	0%	0%	2,754	4,608	312	2,443	4,296	62	8	9,543	1	1	422	7	8,624	1	1
Underhill	2%	1%	1%	10,970	18,352	765	10,205	17,587	795	99	121,934	1	1	4,487	75	91,707	1	1
Westford	1%	1%	1%	7,228	12,092	411	6,817	11,681	792	99	121,478	1	1	3,904	65	79,801	1	1
Williston*	6%	7%	7%	49,231	82,359	3,435	45,796	78,924	738	92	113,111	1	1	3,277	55	66,992	1	1
Winooski	5%	3%	4%	29,290	48,999	30,297	✓	18,701	156	20	23,984	1	1	295	5	6,023	1	1
County Total	**100%**	**100%**	**100%**	**756,250**	**1,265,134**	**501,661**	**254,589**	**763,473**	8,660	1082	1,327,516	1	1	67,410	1124	1,377,868	1	1

Findings: Burlington can no longer meet the net high target with existing generation under this scenario. However, the City can meet the high target with base + prime solar combined. Essex Town/Junction and Colchester need to rely on both their prime and base solar areas to meet the targets. South Burlington cannot meet the targets with solar alone. This is also the case for South Burlington in scenario 2. See the wind target for potential from wind energy.

Wind Targets by Municipality

12/12/2017				Target					Prime Wind Energy Potential				Base Solar Energy Potential					
Town Name	Population Share	Electricity Share	Average of Population and Electricity Use	Total Low Target (MWh)	Total High Target (MWh)	Existing Renewables (MWh)	Low Range Net Remaining (MWh)	HighRangeNet Remaining(MWh)	Prime Wind Acres	Prime Wind Potential (MW)	Potential Capacity from Wind (MWh)	Can Meet Low Target with Prime Wind Potential ?	Can Meet High Target with Prime Wind Potential?	Base Wind Acres	Base Wind Acres Potential (MW)	Potential Capacity from Base Wind (MWh)	Can Meet Low Target with Prime + Base Wind Potential?	Can Meet High Target with Prime + Base Wind Potential?
Bolton	1%	1%	1%	4,844	8,103	328	4,516	7,775	172	7	21,067	1	1	6,122	245	750,798	1	1
Buels Gore	0%	0%	0%	112	187	6	106	181	148	6	18,137	1	1	4,770	191	584,932	1	1
Burlington	27%	24%	25%	189,981	317,821	285,442	✓	32,379	231	9	28,326	1	0	3,006	120	368,612	1	1
Charlotte	2%	1%	2%	14,541	24,326	5,059	9,483	19,268	658	26	80,745	1	1	29,416	1177	3,607,623	1	1
Colchester	11%	9%	10%	75,959	127,072	2,086	73,873	124,986	707	28	86,701	1	0	3,861	154	473,530	1	1
Junction + Town	13%	24%	19%	140,873	235,666	43,276	97,597	192,390	125	5	15,269	0	0	3,439	138	421,758	1	1
Hinesburg	3%	2%	2%	17,238	28,838	1,457	15,781	27,381	1175	47	144,129	1	1	14,097	564	1,728,844	1	1
Huntington	1%	1%	1%	6,594	11,030	629	5,965	10,402	3255	130	399,242	1	1	12,537	501	1,537,485	1	1
Jericho	3%	2%	2%	18,422	30,818	1,347	17,075	29,472	531	21	65,128	1	1	7,849	314	962,573	1	1
Milton	7%	5%	6%	45,188	75,595	102,752	✓	✓	1279	51	156,844	1	1	13,267	531	1,627,085	1	1
Richmond	3%	2%	2%	15,528	25,976	4,485	11,043	21,491	2705	108	331,744	1	1	3,995	160	490,001	1	1
Shelburne	5%	4%	4%	32,273	53,989	4,648	27,625	49,341	1301	52	159,533	1	1	12,248	490	1,502,123	1	1
South Burlington	12%	14%	13%	95,224	159,301	14,627	80,598	144,674	494	20	60,603	0	0	7,025	281	861,535	1	1
St. George	0%	0%	0%	2,754	4,608	312	2,443	4,296	117	5	14,294	1	1	1,979	79	242,752	1	1
Underhill	2%	1%	1%	10,970	18,352	765	10,205	17,587	419	17	51,409	1	1	15,124	605	1,854,762	1	1
Westford	1%	1%	1%	7,228	12,092	411	6,817	11,681	544	22	66,775	1	1	5,083	203	623,391	1	1
Williston*	6%	7%	7%	49,231	82,359	3,435	45,796	78,924	1865	75	228,690	1	1	7,891	316	967,787	1	1
Winooski	5%	3%	4%	29,290	48,999	30,297	✓	18,701	60	2	7,339	1	0	120	5	14,750	1	1
County Total	**100%**	**100%**	**100%**	**756,250**	**1,265,134**	**501,361**	**254,889**	**763,773**	15,786	631	1,935,976	1	1	151,829	6073	18,620,340	1	1

Findings: The region can meet its wind target and at the same time accommodate local constraints.