

ENERGY PLANNING & ACT 174

Overview of
Municipal
Standards for
Determination of
Energy
Compliance

ENERGY PLANNING AND ACT 174

■ **What we will be discussing:**

- Overview of Energy Planning and Section 248
- Review of Municipal Energy Planning Standards
- Approaches and Support for Developing Municipal Plans

■ **Not the focus of this discussion:**

- State policy and plans and the assumptions that underlie them
- The BCRC draft Regional Energy Plan was presented at two recent public meetings. While noted as a potentially important resource document for municipalities, we will not go into it in great detail today.

OVERVIEW

Why and
how are
we here?

WHY PLAN?

- Environmental Reasons
- Economic Reasons
- Long-term Energy Security Reasons



HISTORY OF ENERGY PLANNING IN VT

- 2011 Comprehensive Energy Plan
- Pathways to Meeting State Goals: Total Energy Study - which informed the....
- 2016 Comprehensive Energy Plan
- New Regional Plans intended to provide information for the next CEP as well as support for municipal planning

VERMONT STATE ENERGY GOALS

- Some statutory, some from the State Comprehensive Energy Plan. A few examples:
 - 25% of all energy consumed in the state through in-state renewables by 2025
 - Reduce greenhouse gas emissions resulting from energy use in Vermont by 50% (of 1990 levels) by 2028 and 75% by 2050
 - Weatherize 60,000 Vermont housing units by 2017 and 80,000 by 2025
 - **90% of Vermont's total energy needs from renewable sources by 2050.**

CONNECTING ENERGY AND PLANNING

- Energy Generation Siting Policy Commission (2013)
- Solar Siting Task Force (2015)
- Act 174 (2016): Recognizes that energy is a fundamental consideration when planning for:



Transportation

Housing



FIGURE 2.6: MAP OF LAND USE IN BCR REGION

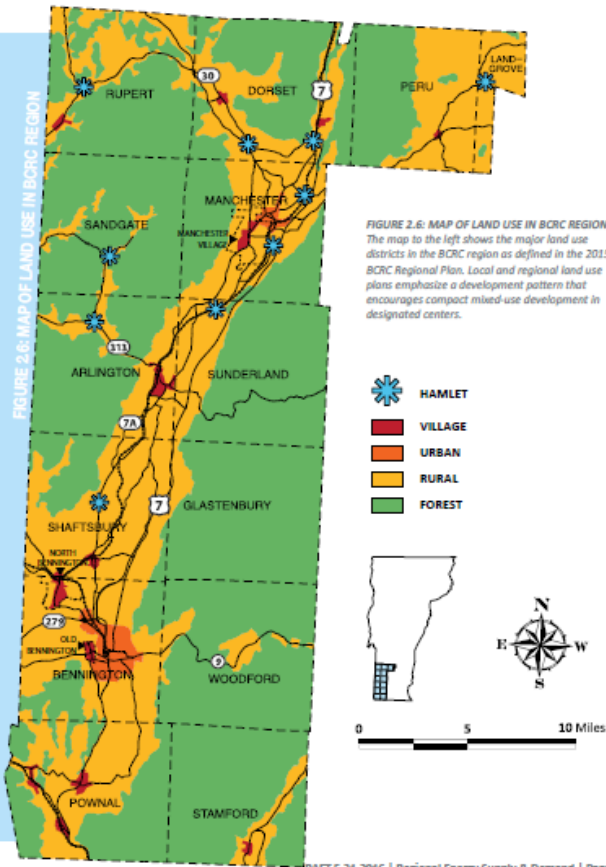


FIGURE 2.6: MAP OF LAND USE IN BCR REGION
The map to the left shows the major land use districts in the BCR region as defined in the 2015 BCR Regional Plan. Local and regional land use plans emphasize a development pattern that encourages compact mixed-use development in designated centers.

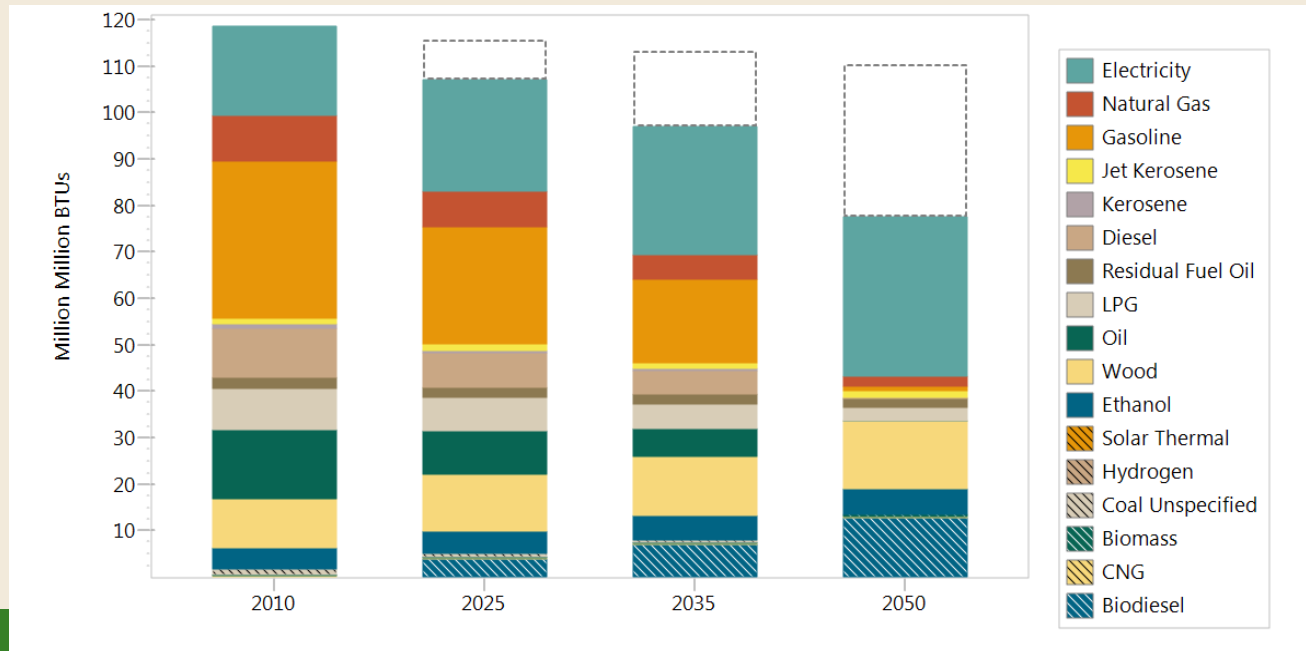
Land Use

Economic Development

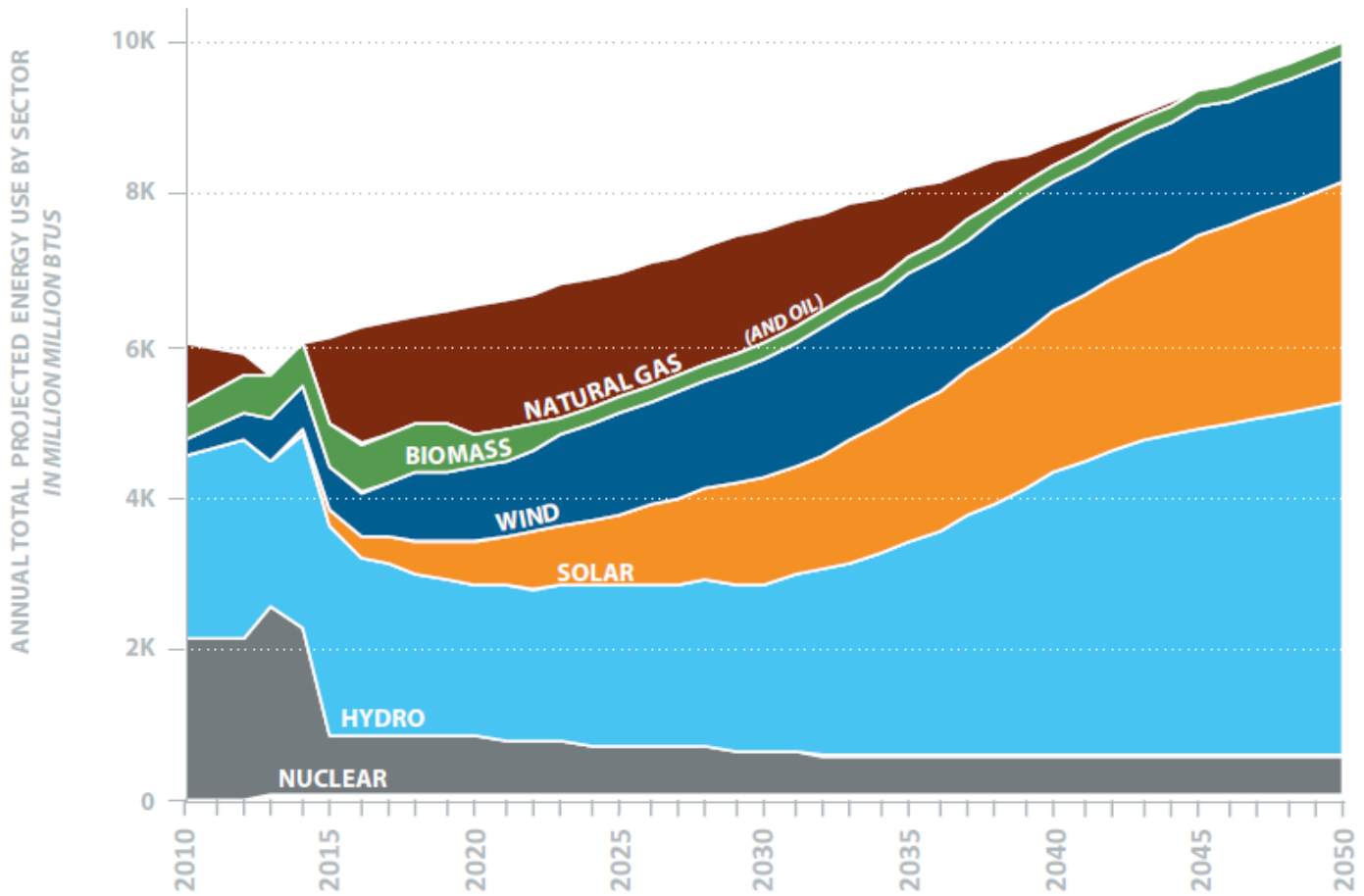




- Regional Planning Pilot Projects - Statewide
 - Evaluate current energy use
 - Set regional targets for:
 - Energy conservation and alternative energy use



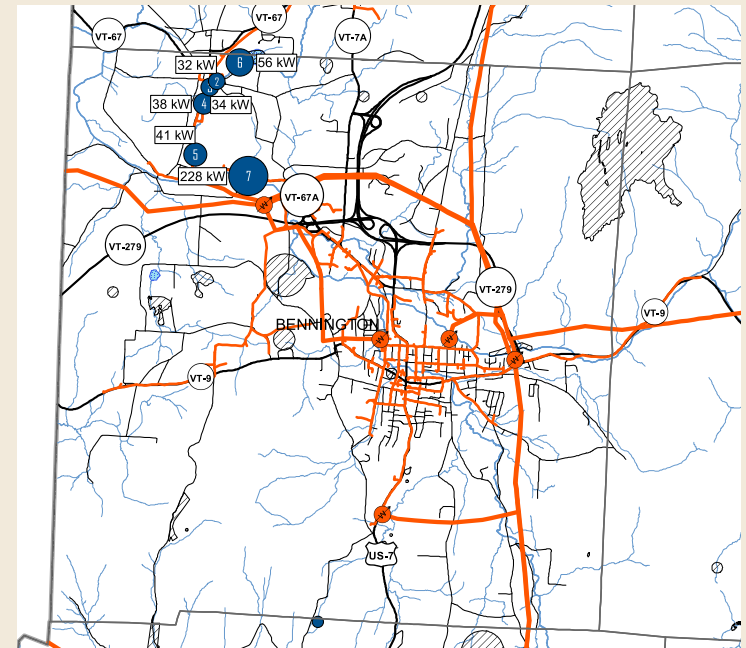
- Energy generation



- Develop specific strategies for:

- Conservation and efficiency in heating and cooling buildings
- Reduced reliance on gas and diesel vehicles and more efficient land use and transportation systems
- Electricity conservation and local distributed generation

- And, as part of the strategies related to electricity, Identify energy resources and areas with the potential for renewable energy development



ANY
QUESTIONS
?

OVERVIEW

Questions?

ACT 174

Enhanced
Energy
Planning

ACT 174 - SUMMARY

- Act 174 establishes a set of **optional** municipal and regional energy planning standards.
- Standards developed by DPS in November 2016
- Communities that meet the standards will receive a “Determination of Energy Compliance” (a separate process and approval from the “plan approval” that we have been doing for many years) and
 - “Substantial deference” under Section 248

SUBSTANTIAL DEFERENCE

Due Consideration

Statute calls for “due consideration.” Does not define what “due consideration is” or assign whether the PSB or the Courts are the ultimate arbiter.

The SCOV indicated that the PSB only has to give “due consideration to the recommendations of the municipal and regional planning commissions in deciding [if] the project will not unduly interfere with the orderly development of the region.”

Substantial Deference

Defined in Statute:

“that a land conservation measure or specific policy shall be applied in accordance with its terms unless there is a clear and convincing demonstration that other factors affecting the general good of the State outweigh the application of the measure or policy.”

STANDARD OF REVIEW

- Statutory Planning Goal: To make efficient use of energy, provide for the development of renewable energy resources, and reduce emissions of greenhouse gases.
 - (A) General strategies for achieving these goals include increasing the energy efficiency of new and existing buildings; identifying areas suitable for renewable energy generation; encouraging the use and development of renewable or lower emission energy sources for electricity, heat, and transportation; and reducing transportation energy demand and single occupancy vehicle use.
 - (B) Specific strategies and recommendations for achieving these goals are identified in the State energy plans prepared under 30 V.S.A. §§ 202 and 202b.
- All sections of plan will be considered and policies must be consistent throughout the plan
- Determination Standards for energy compliance

BASIC REQUIREMENTS

- Locally adopted and regionally approved plan
- Energy Plan as defined in 24 V.S.A. §4348a(a)(3): can be an expansion of the existing section or a new energy plan formally incorporated by reference
- Key Components
 - Analysis and Targets
 - Pathways (Implementation Actions)
 - Siting Considerations and Mapping



ACT 174 SUMMARY

Questions?

ANALYSIS AND TARGET STANDARDS

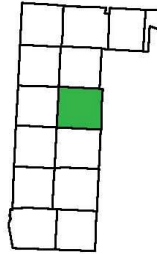
ANALYSIS AND TARGETS

- Plan must contain an analysis of the following across all energy sectors (electric, thermal, transportation):
 - Resources
 - Needs
 - Scarcities
 - Costs
 - Problems
- DPS guidance available at their website (and through BCRC)
- BCRC will have town-level estimates of current energy use and future projections across all sectors by May

Sunderland

Population ¹

Total Population (2014): **934**
 Population Density: **21 people per sq. mile**



Households ¹

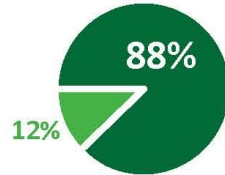
Total Households (2014): **405**

OWNERS

Total HHs Owned: **357**
 Avg. Owner HH Size: **2.3**

RENTERS

Total HHs Rented: **48**
 Avg. Renter HH Size: **2.4**



Businesses

Total businesses in Sunderland (2014): **29**
 Total employees working in Sunderland (2014): **111**
 Total employed residents in Sunderland (2014): **519**
 Average employment wage in Sunderland (2014): **\$41,406**

Residential Transportation Fuel Use ⁵

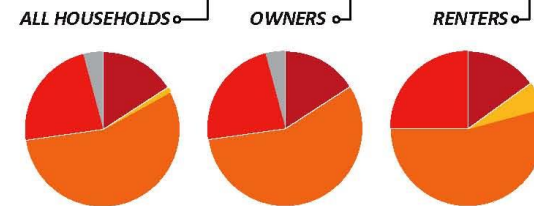
Number of vehicles (2014): **775**
 Mean vehicles per household: **1.9**
 Estimated miles traveled: **12.1 Million Miles**
 Estimated gallons of fuels used: **0.5 Million Gallons**
 Estimated total cost: **\$1.8 Million**
 Percent of resident employees driving alone to work: **71%**
 Average commute time: **18 Minutes**



Space Heating For Households ¹

Median Year Built for Housing Units: **1978**
 Percent of Housing Built Since 2000: **15%**
 Percent of Housing Built Before 1960: **31%**
 Median Annual Household Income: **\$53,869**
 Total Energy Use: **43 Billion BTUs**
 Total Cost: **\$774,000 ⁴**
 Mean Cost per Household: **\$1,800**

Fuel Type: Space Heating	Number of Households	Avg. Use (Annual)	Percent of Use (All HHs)	Percent of Use: Owner	Percent of Use: Renter	Percent of Cost (All HHs)
Tank/LP/etc. Gas	63 HHs	73K Gal	16%	16%	15%	29%
Electricity	3 HHs	63 MWh	1%	0%	6%	1%
Fuel Oil	228 HHs	174K Gal	56%	57%	54%	48%
Wood	95 HHs	606 Tons	23%	23%	25%	21%
Other	16 HHs	-	4%	4%	0%	-



Space Heating for Businesses ²

Mean Estimated Building Space for Businesses: **10,833 sq. ft**
 Total Energy Use: **19 Billion BTUs**
 Estimated Total Annual Cost: **\$421,000**
 Average Annual Cost per Business: **\$14,516**

ANALYSIS AND TARGETS

- Establish targets:
 - Thermal and electric conservation and efficiency
 - Use of renewable energy for transportation, heating, and electricity.
 - Electric generation
- Evaluate needs/changes to occur over time:
 - Conversion of heating sources
 - Transportation system and land use planning
 - Electric-sector conservation and efficiency



DON'T PANIC

RPC CAN PROVIDE DATA

Communities can opt to collect and analyze data themselves, or they can utilize data provided by their RPC.

Those that use the RPC data will be presumed to have met the standards in this section.

METHODOLOGY

- Data and targets should be aligned with state energy policy.
 - If not, must explain how the plan otherwise achieves the intent of the state goal or policy
- Resources
 - BCRC Plan and Data
 - DPS Guidance
 - EAN Community Energy Dashboard

ESTIMATING USE: TRANSPORTATION

■ Example: Shaftsbury

- 2,930 household vehicles (ACS) * 14,000 average miles per vehicle (DPS Guidance) = 41 million miles/year
- 41 million miles/year / 25 MPG (DPS Guidance) = 1.64 million gallons
- 1.64 million gallons * \$2.25/gallon = \$3.7 million in gasoline expenditures per year
- Gas v. Ethanol (DPS = 10%)
 - 1.64 million gallons * .1 = 164,080 gallons of ethanol
- # Electric Vehicles
- Diesel Fuel Estimates

ESTIMATING USE: SINGLE FAMILY HOME HEATING

Home Heating Estimates Methodology

This section outlines the data gathering and analysis process that the BCRC used to generate both regionwide and town estimates for home heating fuel source and costs.

*This analysis does not include non-residential building data

- 1 Retrieve Fuel Type Data from US Census Bureau American Factfinder website. To locate specific sets of data, use the 'Guided Search' feature of the [American Factfinder](#) data portal. Arlington town data, taken from ACS 2013 five year estimates:

Total:	1,109 HHS
Owner Occupied:	779 HHS
Utility gas	0
Bottled, tank, or LP gas	56
Electricity	0
Fuel oil, kerosene, etc.	521
Coal or coke	4
Wood	181
Solar Energy	0
Other fuel	17
No fuel used	0
Renter Occupied:	330 HHS
Utility gas	0
Bottled, tank, or LP gas	47
Electricity	7
Fuel oil, kerosene, etc.	254
Coal or coke	0
Wood	22
Solar energy	0
Other fuel	0
No fuel used	0

- 2 Retrieve Household Size Data from American Factfinder and generate approximate square footage by household type.
*National square feet per person medians taken from the [American Housing Survey for the United States: 2011](#), published in 2013 by the US Census Bureau. Arlington example:

	Avg. ppl per HH	Ntnl. median square ft per person	Total HHS	Total estimated square ft
Owner	2.24	800	779	= 1,395,968
Renter	1.99	500	330	= 328,350

- 3 Calculate Sq. Footage Heated by Fuel Type to estimate the amount of space being heated by each fuel.
BCRC combined 'solar energy' and 'other fuel' categories for this analysis.
Arlington example for fuel oil in owner- and renter-occupied HH:

Owner Occupied	Total 779 HHS	Percentage of housing	Multiply by SqFt/HH: 1,395,968	Approx. SqFt of Owner-occupied housing heated by fuel type:
Fuel oil, kerosene, etc.	521	(521 / 779) ~67%		= 933,632
Wood	181	(181 / 779) ~23%	= 324,352	

ESTIMATING USE: SINGLE FAMILY HOME HEATING

Home Heating Estimates Methodology

4 Calculate Energy Required for Heating with an assumed heating rate of 60,000 BTUs per sq.ft. of housing in VT.

Assumed heating rate is a cautious estimate assuming generally low residential energy efficiency, and is based on a combination of federal and online sources. Other regions may use a lower (more efficient) rate closer to 50,000 BTUs.

Arlington example:

Type of Fuel (Owner Occupied)	Total Sq. Feet of Housing		Approx. BTUs of Energy used Annually for Heating
Fuel oil, kerosene, etc.	933,632	Multiply by BTUs/SqFt: 60,000	= 56,017,920,000
Wood	324,352		= 19,461,120,000

5

Calculate Quantities of Fuel Consumed with assumed rates of energy per unit of each fuel type.

Fuel efficiencies based on several federal and additional sources.

Approximate efficiencies used in BCRC calculations:

1 Gallon Propane	=	91,000 BTUs
1 kWh Electricity	=	3,414 BTUs
1 Gallon Heating Oil	=	140,000 BTUs
1 Pound Coal	=	11,560 BTUs
1 Pound Wood Pellets	=	8,750 BTUs

Arlington example:

Fuel Oil Heating Demand for Owner Occupied Homes	56,017,920,000 BTUs/year	Divided by: 140,000 BTUs/gallon	= 400,128 Gallons Fuel Oil per Year
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6

Calculate Cost of Fuel Consumed with assumed prices for each fuel types.

Prices for fuel inputs fluctuate often, so prices used here are estimates that can be adjusted over time.

Estimated prices used in BCRC calculations:

Propane	=	\$3.45/Gallon
Electricity	=	\$0.1471/kWh
Heating Oil	=	\$2.75/Gallon
Coal	=	\$0.16/Pound
Wood Pellets	=	\$0.16875/Pound

Arlington example:

Fuel Oil Consumed in Owner Occupied Homes	400,128 Gallons/Year	Multiplied by: \$2.75/Gallon	= \$1,100,352.00 per Year
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7

Calculations Done!

Time to compile final calculations and display them as tables and graphs in the corresponding sections of your plan.

Electricity Demand:

Utility Data

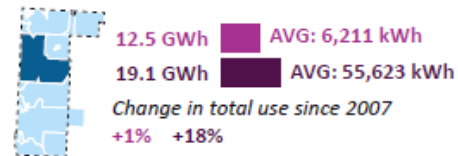
2016 Bennington Regional Energy Plan

FIGURE 2.8: BENNINGTON REGION ELECTRICITY USE BY ZIP, 2014

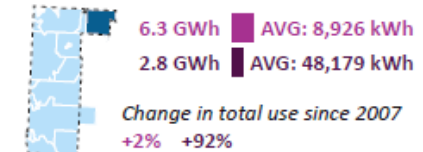
The data from Figure 2.7 on the previous page is broken down below by zip code area for the year 2014. The town of Bennington and its surrounding areas, where the majority of people and businesses in the region are located, are by far the largest consumers of electricity in the region.

RESIDENTIAL
COMMERCIAL & INDUSTRIAL

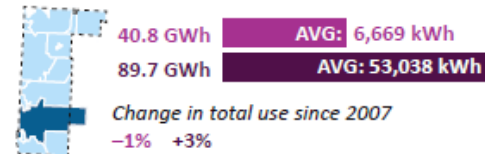
ARLINGTON | ZIP 05251 + 05252



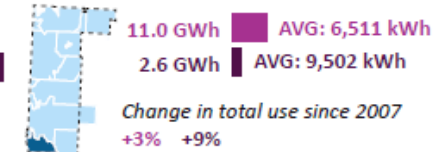
PERU | ZIP 05152



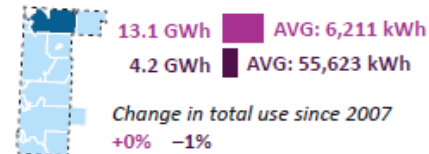
BENNINGTON | ZIP 05201



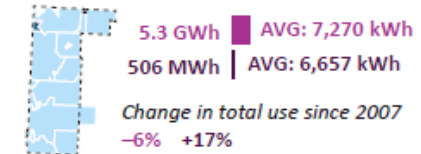
POWNALE | ZIP 05260 + 05261



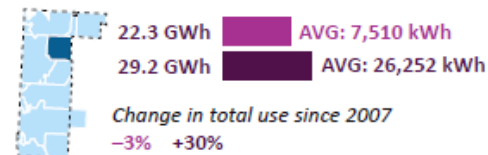
DORSET | ZIP 05251 + 05253



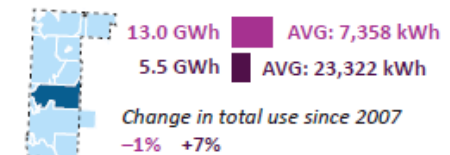
RUPERT | ZIP 05776



MANCHESTER | ZIP 05254 + 05255



SHAFTSBURY | ZIP 05262

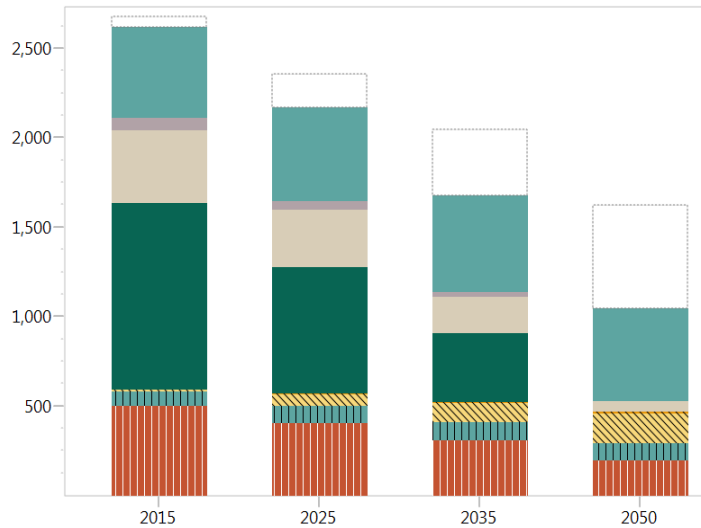


NORTH BENNINGTON | ZIP 05257

STAMFORD | ZIP 05352

PROJECTING FUTURE FUEL USE

Regional Residential Energy Demand by Fuel Type 2015 - 2050



Town Example: **Shaftsbury Home Heating**
1,548 Households* - 10.5% of Region Total

	2015	2025	2035	2050
Biodistillates	9	55	128	386
Cord Wood	353	350	363	452
Electric Resistance	67	71	53	25
Heat Pump	10	59	151	343
Kerosene	50	42	33	-
LPG	282	274	234	132
Natural Gas	-	-	-	-
Oil	730	613	449	-
Wood pellets	54	86	120	213



ANALYSIS AND TARGET STANDARDS

Questions?

IMPLEMENTATION ACTIONS

Pathways
to Targets

POLICY AND IMPLEMENTATION

- Enhanced Energy Plans must:
 - Include “pathways” and recommended actions to achieve energy targets
 - Statements of policy
 - Conservation and Efficiency
 - Transportation
 - Land Use
 - Development and Siting of Renewables
- Some actions may not be applicable or relevant
 - Provide reasonable justification

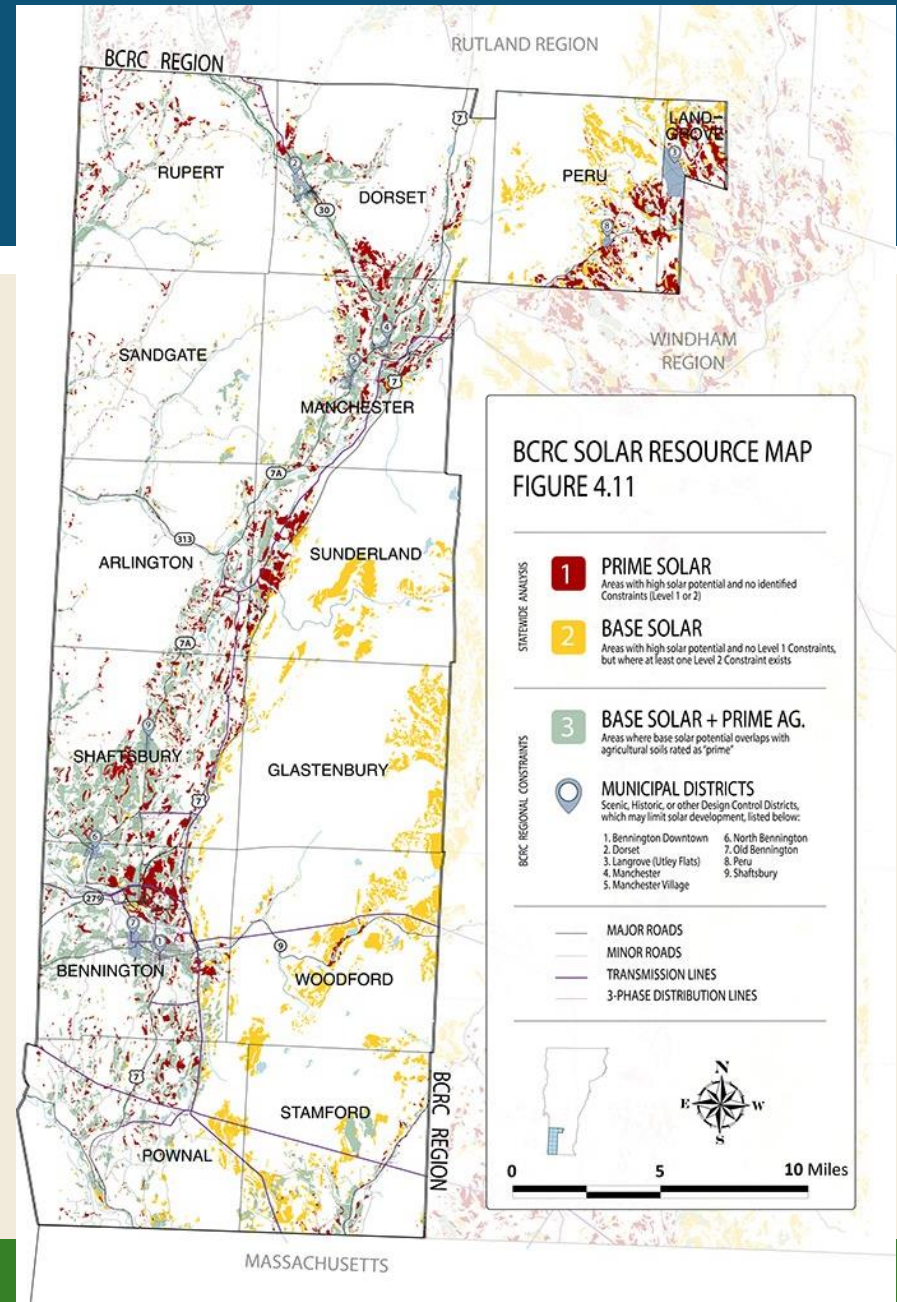
THERMAL STRATEGIES

- Fuel Dealers  Energy Service Providers
- Building Weatherization Programs
- Biomass District Heating Systems (and CHP)
- Heat Pumps (primarily air source for existing buildings)
- Replace Oil and LPG/NG Residential Furnaces with Cordwood and Wood Pellet Fueled Systems
- Education/Incentives for Owners of Residential Rental Properties
- Enforcement of Building Energy Standards for All New Construction (Municipal Level)
- Geothermal Systems for New Construction



MAPPING

- Mapping is required
 - Use regional plan maps “as is” or add local details
 - Municipalities may choose to undertake their own mapping



MAP POTENTIAL AREAS

- Identify potential areas for renewable energy development:



Solar

Topography of land analyzed based on slope and direction (azimuth) conducted in GIS for ground-mounted solar.



Hydro

Existing dams analyzed for potential capacity based on Community Hydro report. No new dams considered.



Wind

Digitally modeled wind speed (based on topography) analyzed at 3 hub heights.



Biomass (wood)

Land coverage used to determine amount of harvestable wood.

MAP POTENTIAL CONSTRAINTS

Known Constraints

Conditions which would likely make development unfeasible.

Possible Constraints

Conditions which could impact development, but which would not necessarily prevent it.

MAP POTENTIAL AREAS



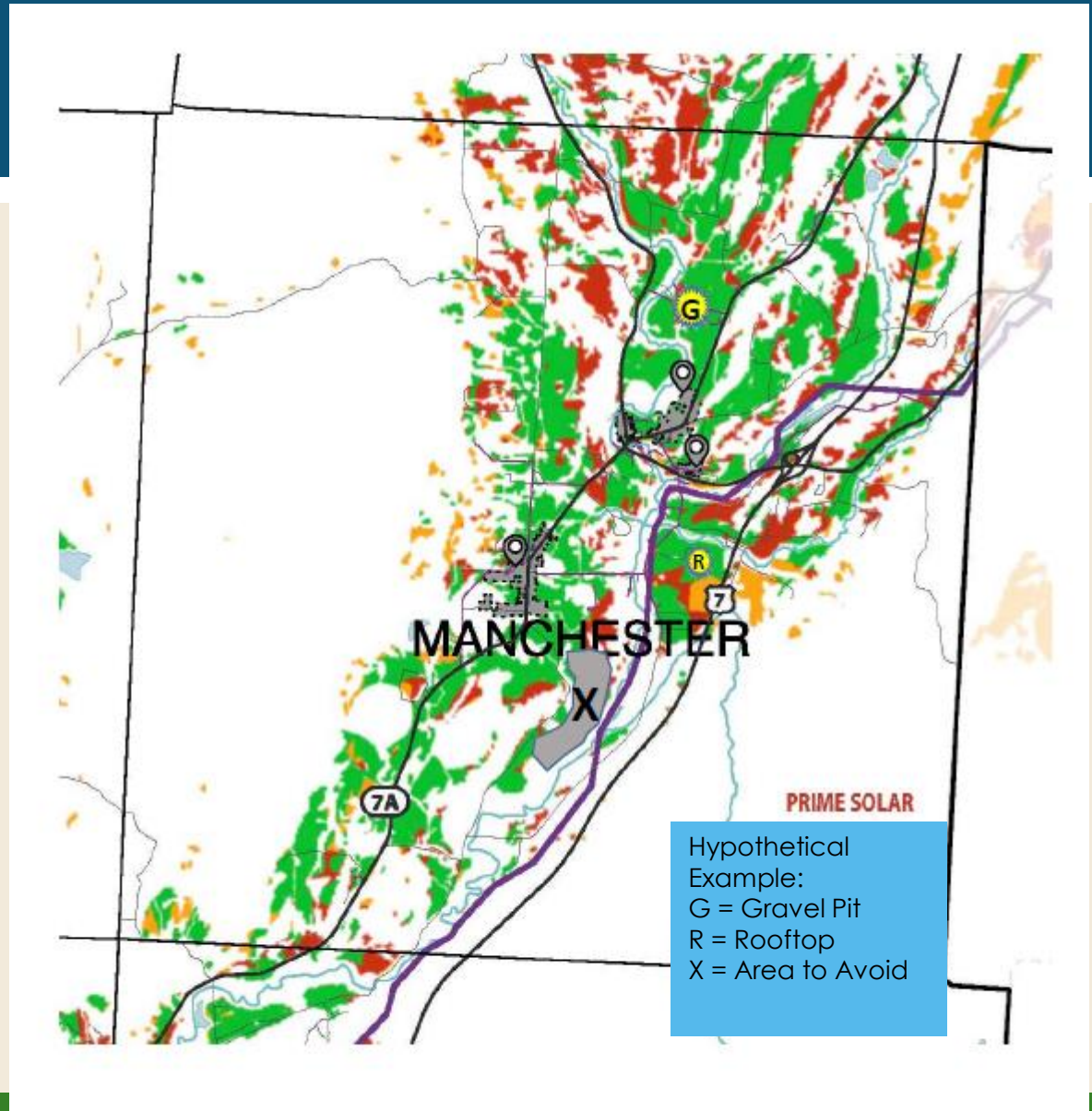
This example shows solar potential.

LOCAL MAPPING DECISIONS

- Preferred locations:
 - Locally preferred locations
 - Statewide preferred locations
 - Have policies about specific sizes or type of generator
- Unsuitable Areas:
 - Areas (or criteria) where Town does not want a generator or a specific size/type of generator.
 - **Must have similar policies for other types of land development.**
 - Any regional or local constraints identified:
 - Supported through data or studies
 - Consistent with the remainder of the plan (and regional plan),
 - No arbitrary prohibition or interference

Individual towns can use the regional map to refine maps at the local level by adding areas preferred for solar development and important local resources that should be avoided.

This local analysis and mapping will be important in Section 248 proceedings.





MAPPING

Questions?

NEXT STEPS

- Regional Energy Plans (BCRC Plan – potential adoption in February, 2017)
- Municipal Determination of Energy Compliance directly from DPS.
 - Submit to: PSD.PlanningStandards@vermont.gov
- BCRC will provide map and analysis of data by the end of April, 2017.
- Direct Municipal assistance

ADDITIONAL RESOURCES

- Department of Public Service
 - <http://publicservice.vermont.gov/>
 - PSD.PlanningStandards@vermont.gov
- BCRC
 - www.bcrcvt.org
 - 802-442-0713 / jsullivan@bcrcvt.org
- EAN Community Energy Dashboard
 - <http://www.vtenergydashboard.org/>
- Vermont League of Cities and Towns
 - www.vlct.org

COMMENTS & QUESTIONS

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Thank You