Beneficial Electrification in Vermont – The Policy Framework

VT Department of Public Service

Goals in Statute

- Meet energy needs in a reliable, secure, sustainable, and affordable manner. (30 V.S.A. § 202a)
- Renewable policies that promote economic benefit, efficient use of resources, stable prices, market development, air and water quality, grid stability, climate change mitigation, and diversity of resources. (30 V.S.A. § 8001)
- 25% renewable by 2025. (10 V.S.A. § 580(a))
- 50% GHG emission reduction by 2028, and 75% (if practicable) by 2050. (10 V.S.A. § 578(a))
- Building efficiency – weatherize 25% of housing stock by 2025. (10 VSA. § 581)

Requirements in Statute

- Renewable Energy Standard (RES)
  - Requires Vermont utilities to acquire specified amounts of renewable energy and to achieve fossil-fuel savings from energy transformation projects. (30 V.S.A. § 8004 and 8005)

- Standard Offer Program
  - Provides for long-term contracts for resources that are 2.2 MW or less (up to 127.5 MW). (30 V.S.A. § 8005a)
  - 93 MW under contract to date
  - PUC opened an investigation into the effectiveness of the program in 2017, including issues such as: review criteria; system costs/benefits; storage; wheeling; exemptions; etc.

Vermont Comprehensive Energy Plan

§ 202b. State Comprehensive Energy Plan

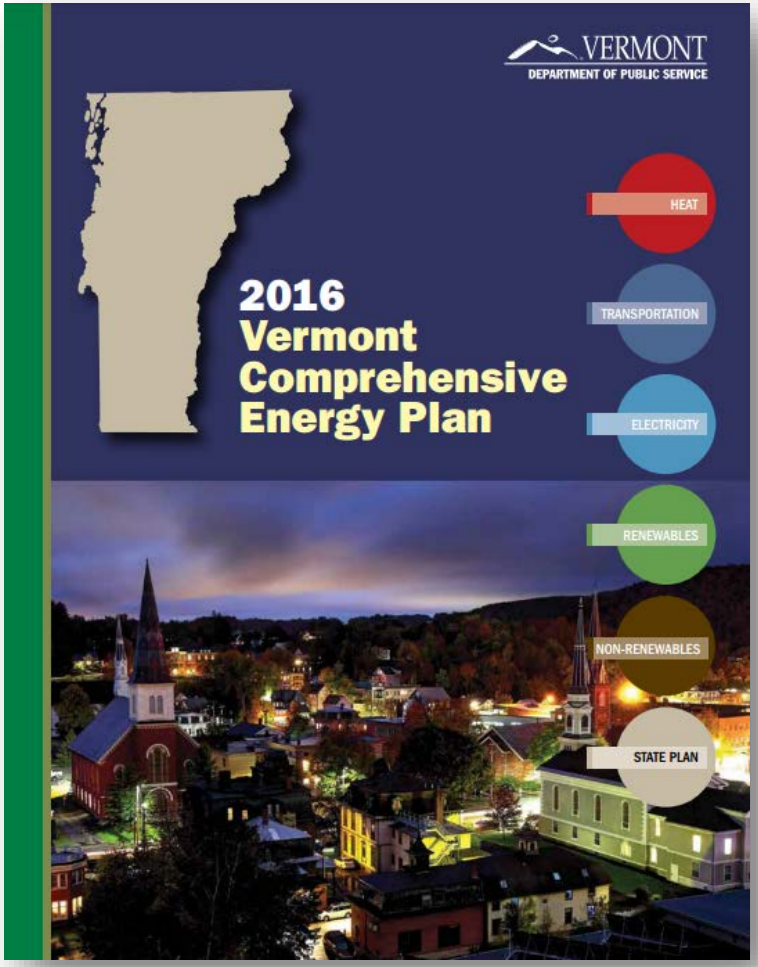
(a) The Department of Public Service, in conjunction with other State agencies designated by the Governor, shall prepare a State Comprehensive Energy Plan covering at least a 20-year period. The Plan shall seek to implement the State energy policy set forth in section 202a of this title and shall be consistent with the relevant goals of 24 V.S.A. § 4302. The Plan shall include:

(1) a comprehensive analysis and projections regarding the use, cost, supply, and environmental effects of all forms of energy resources used within Vermont;

(2) recommendations for State implementation actions, regulation, legislation, and other public and private action to carry out the Comprehensive Energy Plan, including recommendations for State agency energy plans under 3 V.S.A. § 2291 and transportation planning under Title 19; and

(3) recommendations for regional and municipal energy planning and standards for issuing a determination of energy compliance pursuant to 24 V.S.A. § 4352.

CEP Goals



- Reduce total energy consumption per capita by 15% by 2025 (1/3 by 2050)
- Meet 25% of the remaining energy need from renewable sources by 2025 (40% by 2035, 90% by 2050)
- Meet three end-use sector goals for 2025:
  - 10% renewable transportation
  - 30% renewable buildings
  - 67% renewable electric power

Heat Goals

- Goal: 30% renewable heat in buildings by 2025
  - Status: 22-24% in 2015*
- Progress and funding opportunities
  - Weatherization
  - Finance tools, e.g. Heat Saver Loan
  - Heat from electricity and renewables
  - RES Tier 3

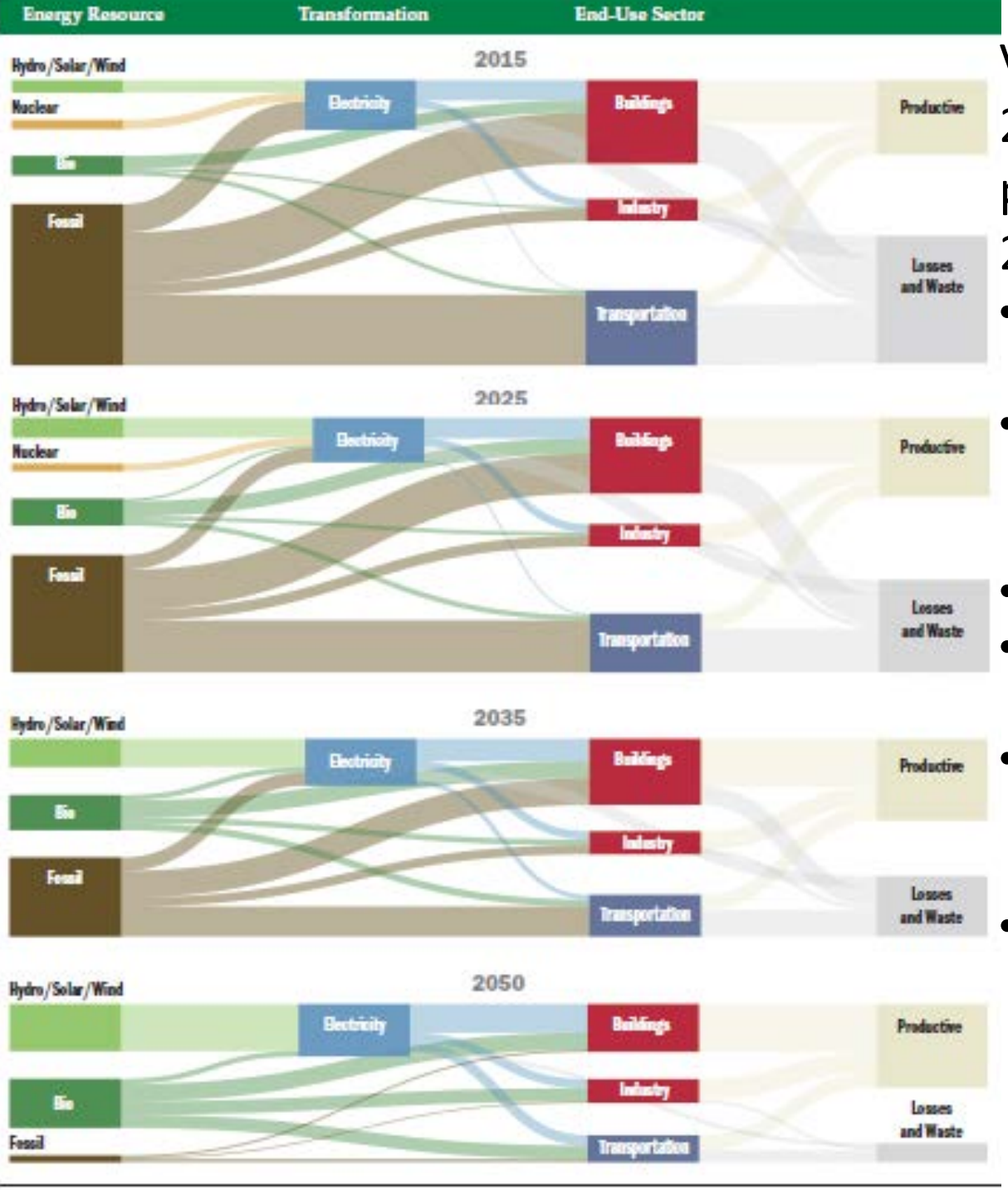
*Predominantly wood heat

Transportation Goals

- Goal: 10% renewable by 2025
  - Status: 5.5% renewable as of 2015
- Progress and funding opportunities
  - Transit & electric vehicles
  - Charging infrastructure (e.g., ACCD EVSE grants)
  - PUC EV docket
  - Rate design

Electricity Goals

- Goal: 67% renewable by 2025
  - Status: 63% renewable in 2017
- Progress and funding opportunities
  - Renewable Energy Standard, Net Metering, Standard Offer
  - Utility pilots & investments (e.g., Tesla Powerwalls, BYOD)
  - Managing high penetrations of renewables and other distributed energy resources
  - Rate design & distribution system planning



Vermont energy flows in 2015, with an illustrative path forward to 2025, 2035, and 2050

- Productive energy increases
- Total energy use declines as waste and losses are reduced
- Fossil fuel use falls
- Electric end-use energy increases significantly
- Primary energy used to generate electricity grows only slightly
- Key strategies
  - Efficiency & conservation
  - Fuel switching
  - Renewable generation

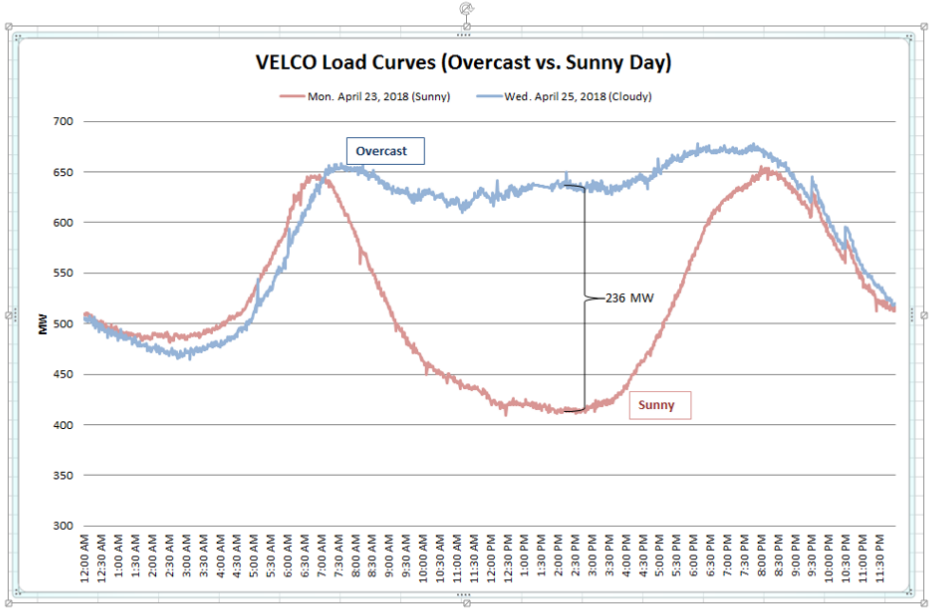
Renewable Energy Standard (2017 to 2032)

1. Total renewable energy (55% growing to 75%)
   - Capture low-value RECs not claimed elsewhere in New England
   - High renewable % for use in electrification
2. Distributed generation (1% to 10%, carve-out of Tier 1)
   - Drive new "Vermont-scale" distributed generation on our grid
   - Depending on generation mix, corresponds to about 25-30 MW of new generation smaller than 5 MW per year
   - Expect Standard Offer to make up 10 MW of this through 2022
   - The rest will be some mix of net metering and utility-owned or PPA projects
3. Energy transformation (2% to 12%, not a carve-out)
   - Measured on fossil-fuel-reduction basis
   - Address challenges in building heat and transportation through weatherization and electrification (heat pumps, EVs)
   - Helps to meet climate goals
   - Reduces overall RES costs by increasing kWh sales over which to spread fixed system costs
   - Encourage utilities to expand business models, build partnerships

Considerations with Increasing Load From Electrification

- Cannot add electric vehicles and heat pumps without regard to system impacts
  - Increased distribution and transmission peak loads add costs
  - Electric system costs matter for success of electrification of transportation and heating sectors
- Statute requires PUC to “ensure that, if an energy transformation project will increase the use of electric energy, the project incorporates best practices for demand management”
- Need to consider existing daily and seasonal demand patterns
  - Daily fluctuations of load can be considerable
  - Moving to system that is differentiated by winter vs. rest of year
  - Daily and even seasonal storage will be key
  - Potential (possibly imperative) to sync with high PV generation

April 2018 Load Comparison



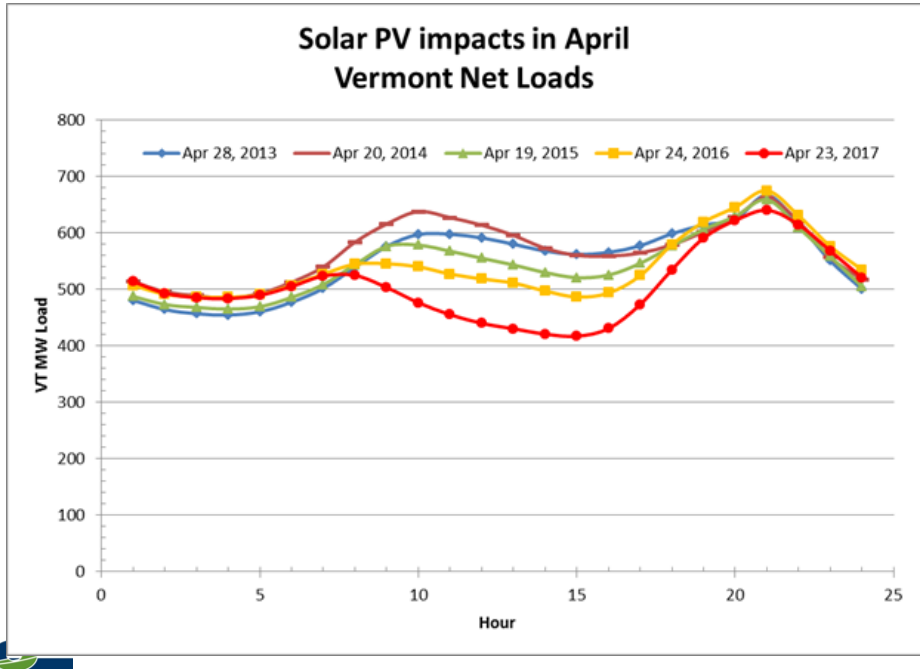
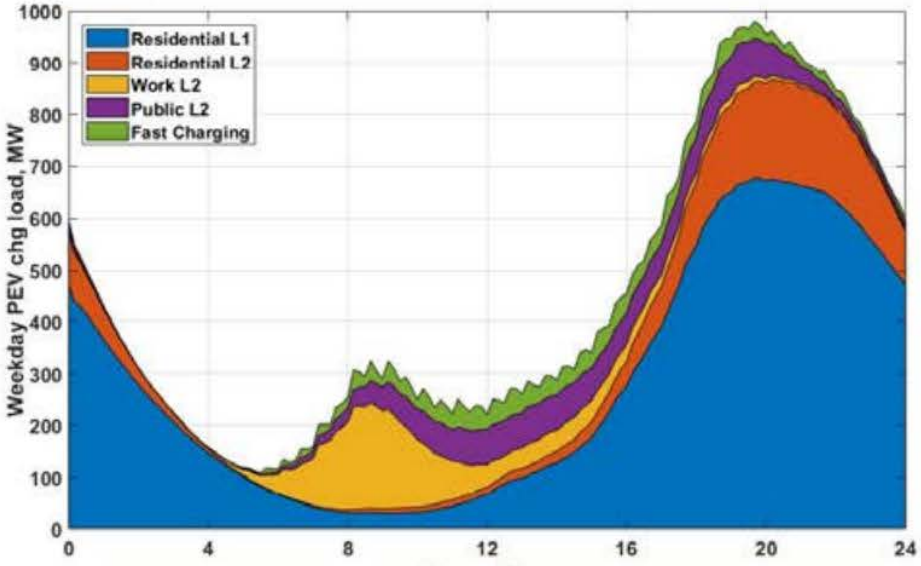
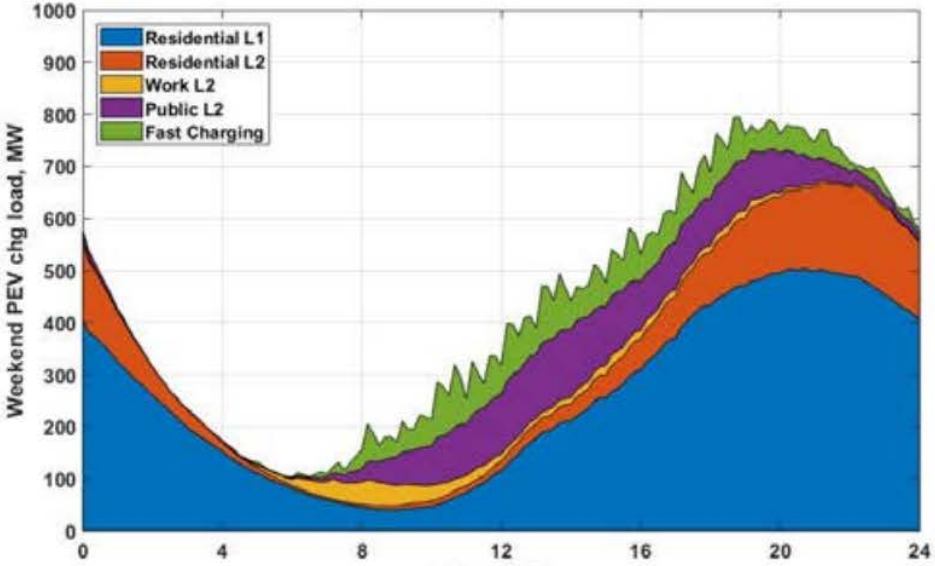


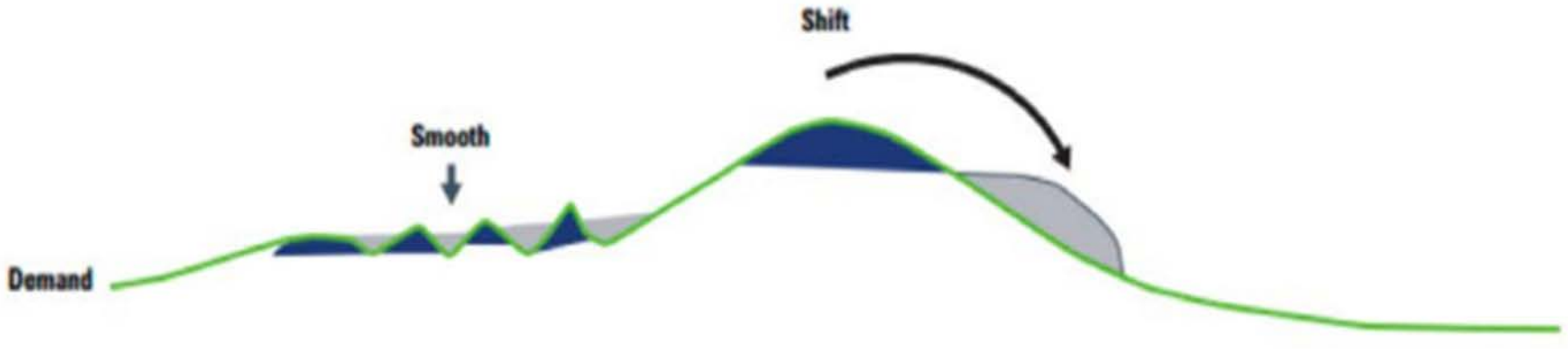
Figure ES.2: PEV Charging Load Profiles in 2025





Potential Benefits to Flexible Load

- Flexible Load = some ability to control load
  - e.g., Electric Vehicles and Cold Climate Heat Pumps
  - Includes direct control and rate design
- EVs – plug in anytime but charge occurs based on signals from utility
- CCHP – heating (or cooling) occurs based on utility signal
  - Requires well-insulated home – weatherization should be addressed alongside incentives for Tier 3 heating projects
- Customer convenience/acceptance is an issue



2019 Tier 3 Incentives

Program/Incentive By Utility	CCHP	HP H2O Heater	Wood Heating	Electric Vehicle	EV Charging	Wx	Other
BED	$750 incentive for single head units; $1,000 for multi-head			$1,200 EV incentive; $600 PHEV incentive	$1,000 for level 2 workplace chargers		$200 rebate for electric bikes; $100 for electric residential lawnmowers
GMP	LI $100 bill credit; provide Sensibo control	LI $100 bill credit		LI $600 rebate for purchase	LI $100 bill credit for installation, free res. chargers		Provide Nest thermostats, install along with hot water heater controls
Stowe	$575 rebate			$850 rebate for EV purchase; $450 rebate for PHEV purchase; LI additional $250			
VEC	$300 bill credit	$150 bill credit	$150 bill credit for pellet stoves	$500 EV incentive for purchase & $100/yr for lease; $250 for PHEV & $50 for lease	$500 for public chargers, Level 2	Considering collaboration w/ WAP	$500 Zero Energy Modular Home bill credit; $1,000 electric forklift incentive; $50 bill credit Water heater control program
VPPSA	$300 incentive; $400 High Per. Home	$300 incentive		$800 (lease or purchase); Plug-in $400 (lease or purchase); LI additional $200	Potential custom incentive for public charging installations	Considering collaboration w/ WAP	
WEC	$250 incentive (High Performance Home only)	$250 incentive	$1,000 boiler; $500 furnace; $250 stoves	LI $1900 rebate for purchase		$600; LI with WAP	

"LI" = Low Income

NOTE: This list may not be all-inclusive

For more information go to:

publicservice.vermont.gov

energyplan.vt.gov

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VERMONT
PUBLIC SERVICE DEPARTMENT

EXTRA SLIDES

What the CEP does

Provides **over 300** specific recommendations

Example:

"Build on prior activities to evaluate finance tools currently available that have potential to accelerate renewable energy and energy efficiency deployment (e.g., Heat Saver Loan, PACE, VEDA commercial loans, CEDF incentives, on-bill programs, etc.) and expand the use of those tools as appropriate."

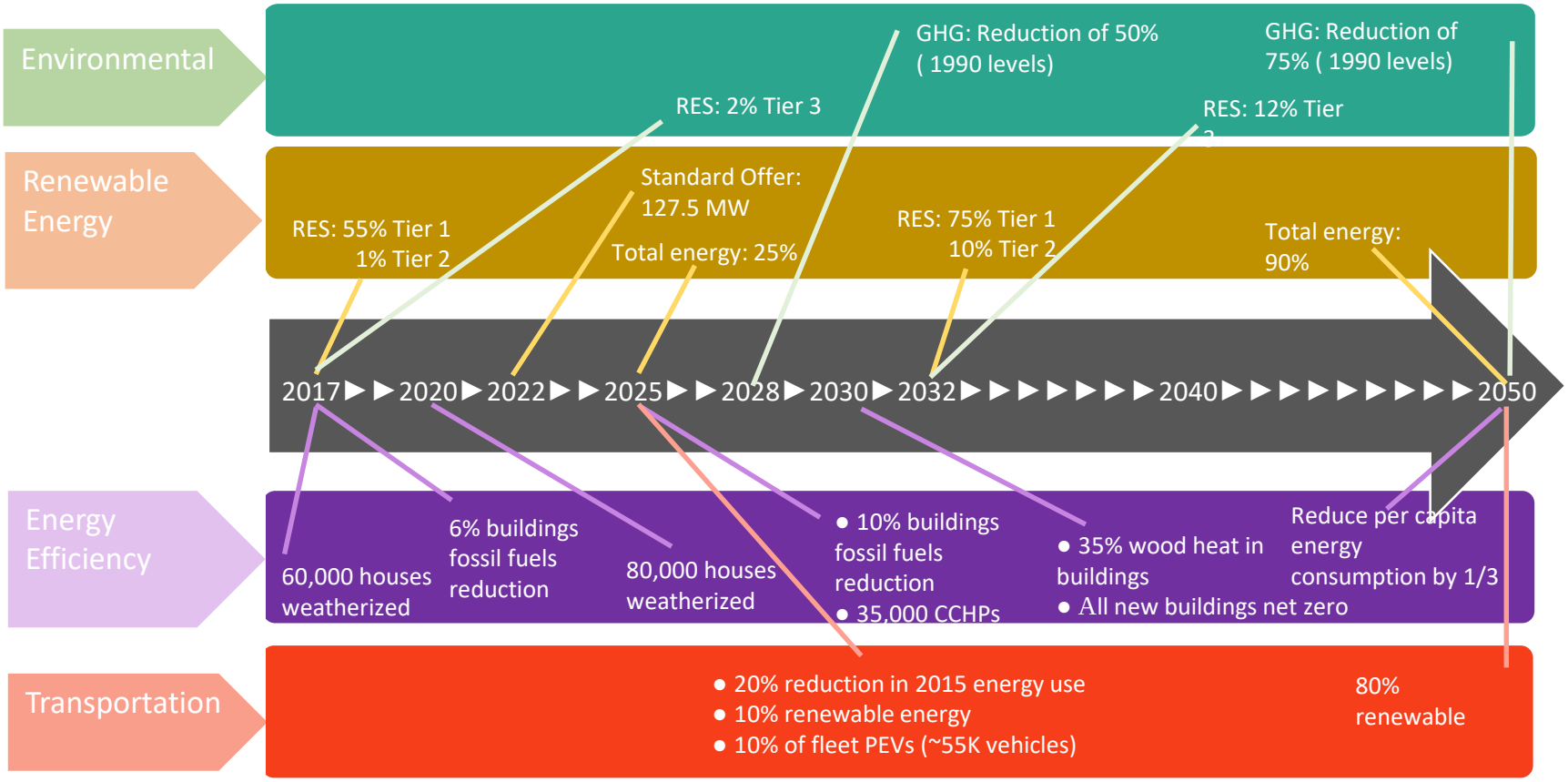
Example:

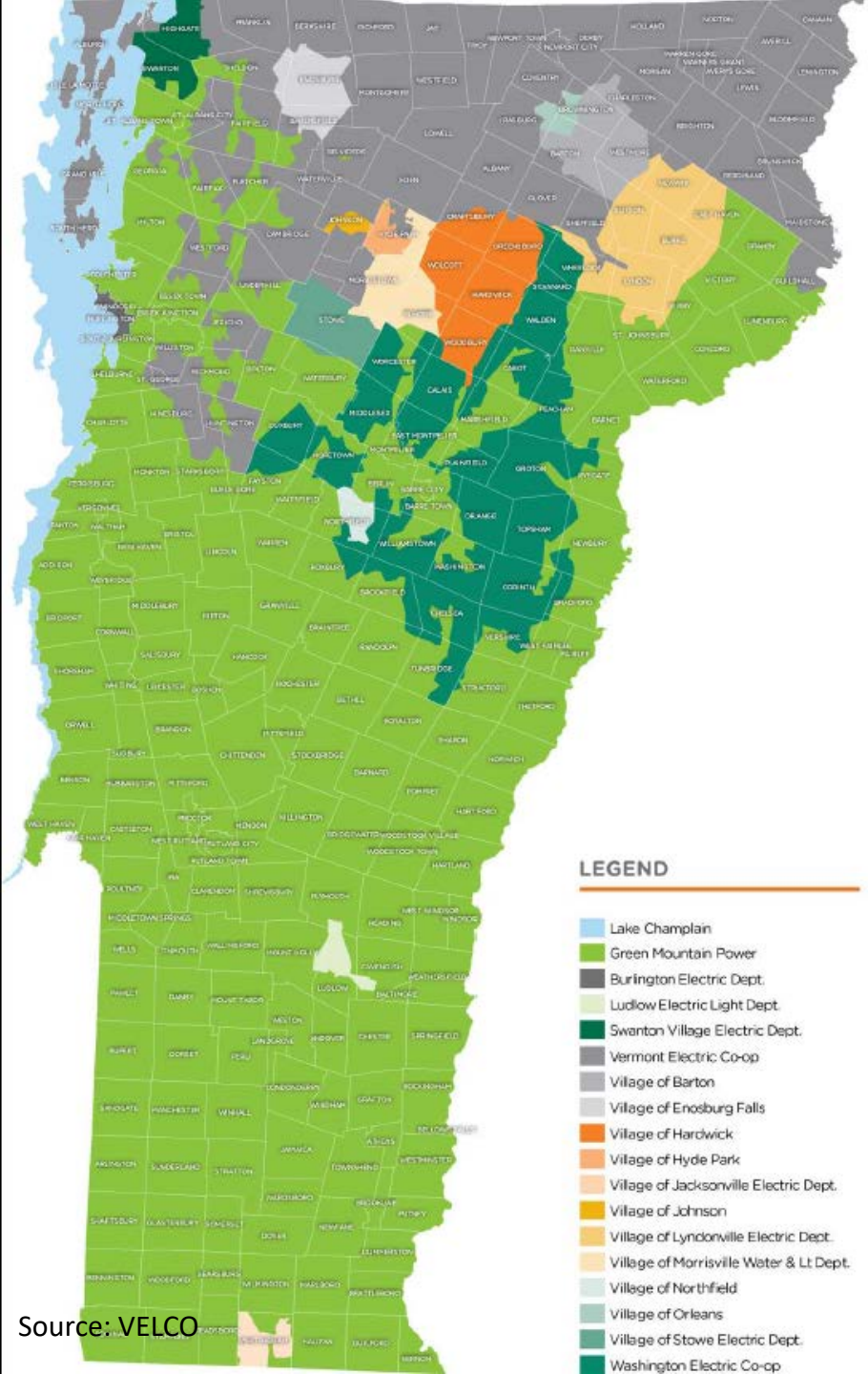
"Additional thermal efficiency funding should consider how to best provide services to lower-income households that do not meet eligibility requirements for Weatherization Assistance Program services. Investigate potential opportunities, such as "do-it-yourself" programs, no-interest loans, and needs-based tiered incentives for those who are unable to afford efficiency measures."

What the CEP Does NOT do

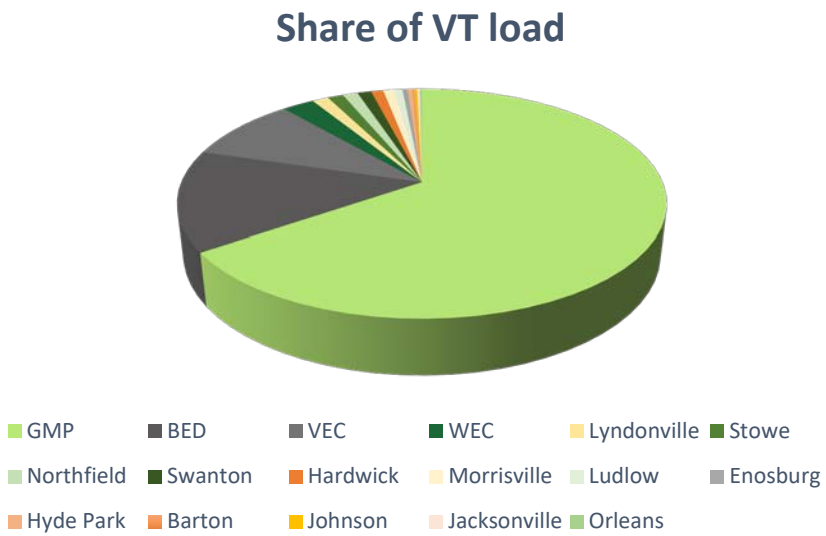
- Does not address particular projects
- Does not presume to know every choice we will make along the way
- Is not a climate change plan
  - non-energy related GHG emissions not included
  - Adaptation and resiliency planning not included

Energy Planning Policy Drivers





Source: VELCO



Vermont Electric Utilities

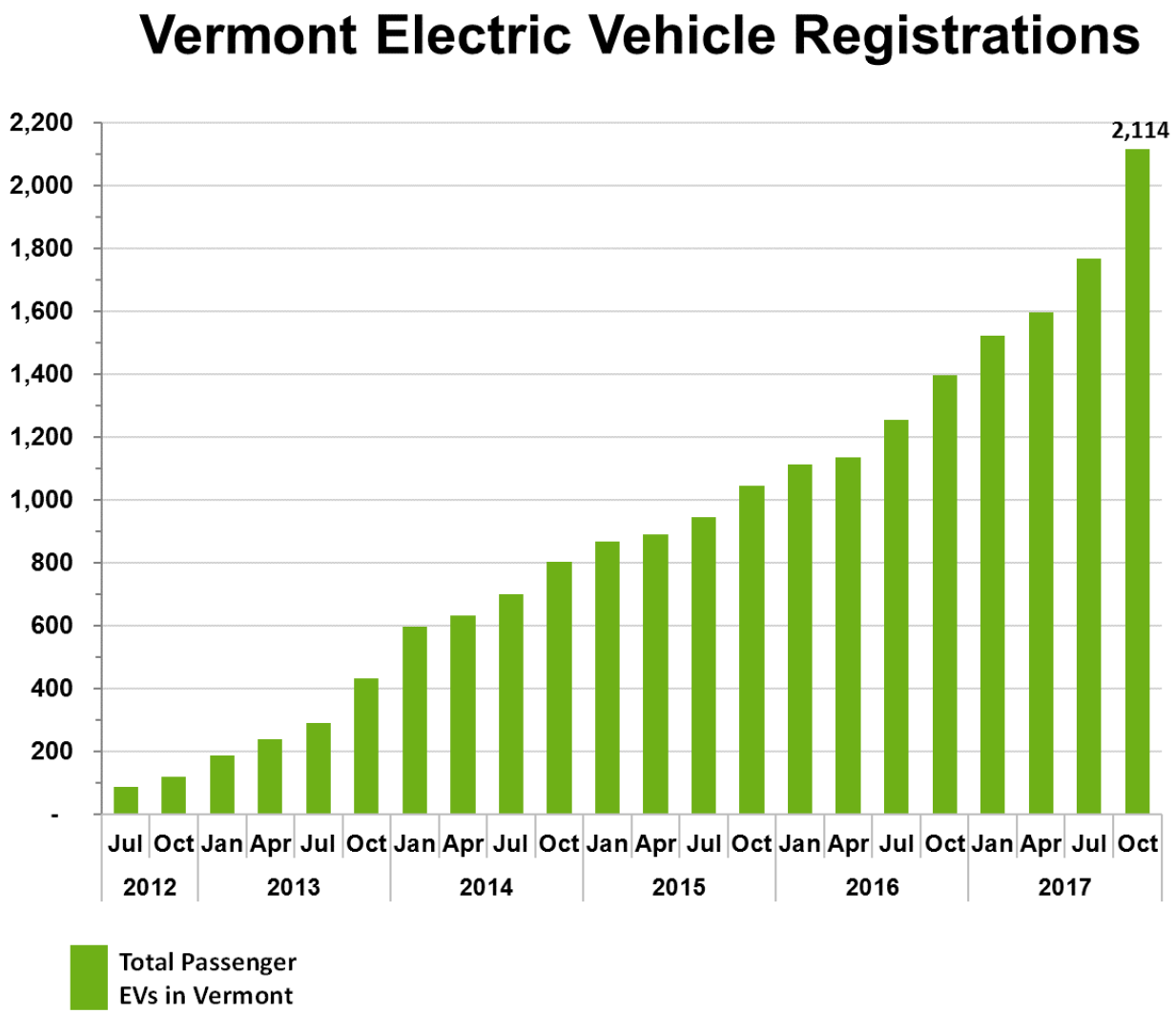
- 1 IOU (serving ¾ of VT load or 260,000 customers)
- 2 Coops
- 14 Municipals
- 1 transmission utility (VELCO)

Vermont Renewable Deployment

- 300 MW Solar PV
- 150 MW Wind
- 200 MW In-State Hydro
- 70 MW Biomass
- 8 MW Landfill Gas
- 5 MW Methane Digesters

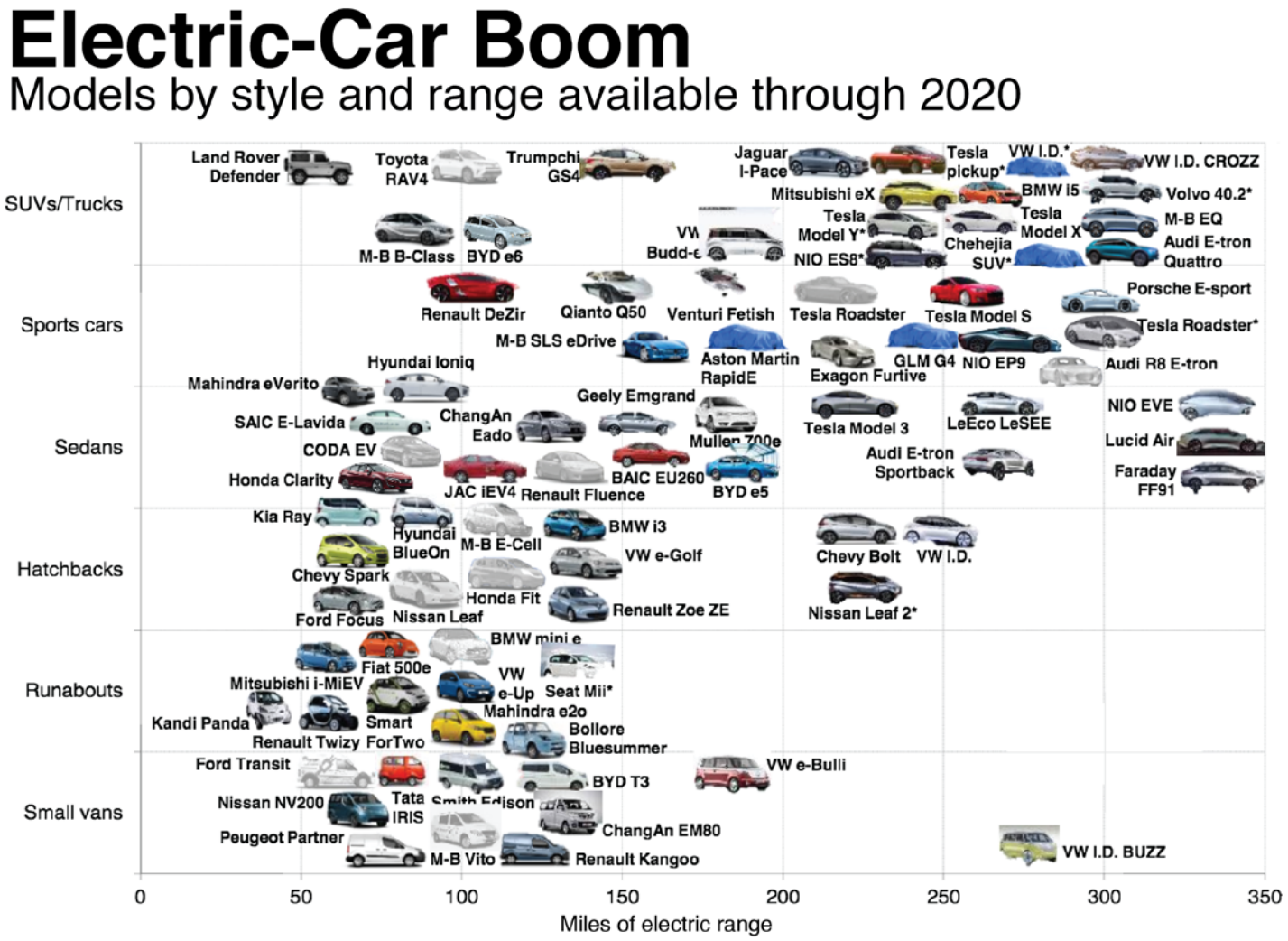
1000 MW Peak

Increasing Trend of EV Registrations



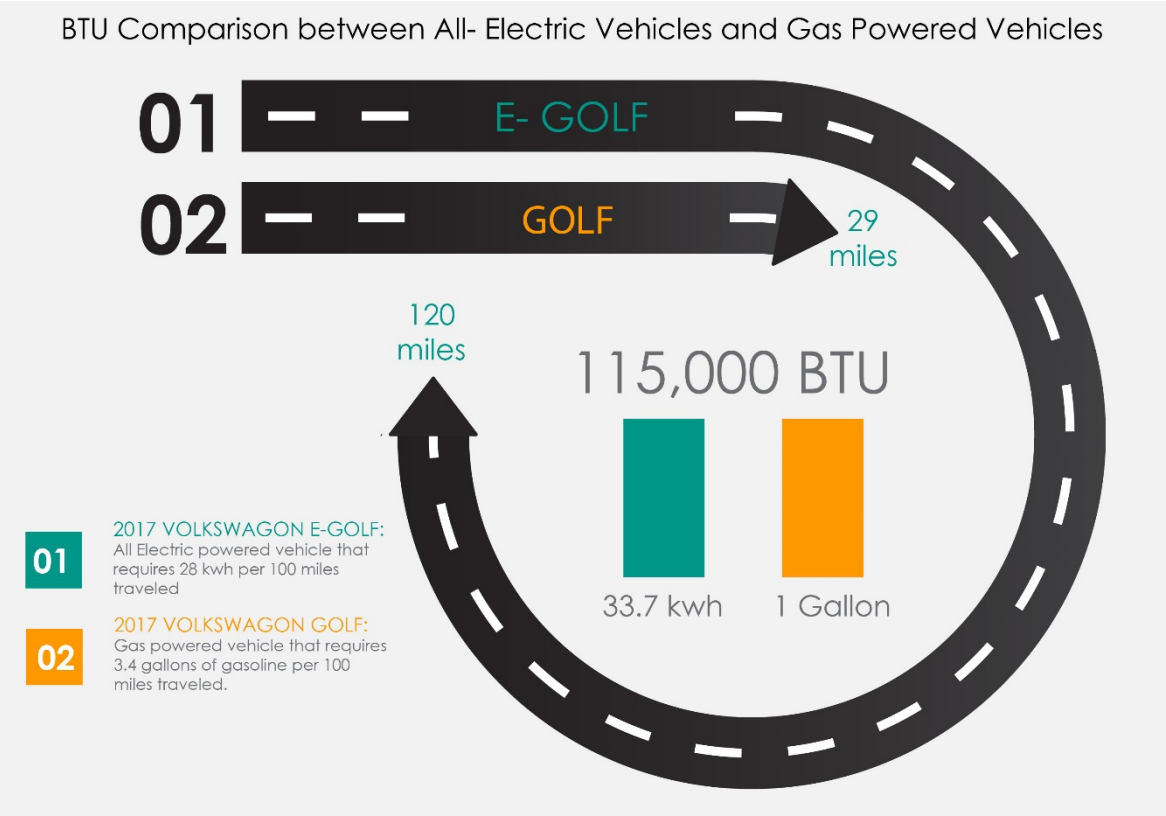
Source: VT ANR and VT DMV

More Models are Becoming Available



Source: Bloomberg New Energy Finance

EVs Are More Efficient



Electric cars can travel further than gasoline with the same amount of energy

Source: US EIA and TRORC