

Vermont Power Sector Update

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Topics

Power Supply Considerations

2020 Annual Energy Report

Rate Design

Electric Vehicles

Scope of EVT

Electrification Efforts and Tier III of RES

Net metering

Power Supply Considerations

Regional Grid Operation

New England utilities have worked together for 60 years to plan transmission and coordinate generation

1971 NEPOOL formed: Formalized cooperation to increase reliability, greater resource diversity and lower cost to customers

1997 ISO New England created: Operates regional power system, implement wholesale markets, and ensure open access to transmission system



- 7.2 million households and businesses; population 14.8 million
- More than 1,900 generating resources:
 - Approximately 350 resources modeled in the Energy Management System
 - More than 1,600 settlement-only generating resources
 - More than 150,000 grid-connected and behind-the-meter solar PV installations, totaling about 2,900 MW (nameplate)
- More than 500 participants in the marketplace (those who generate, buy, sell, transport, and use wholesale electricity and implement demand resources)

- About 9,000 miles of transmission lines
- 13 interconnections to electricity systems in New York and Canada
- 136,355 gigawatt-hours (GWh), all-time annual energy served, set during 2005
- All-time peak demand of 28,130 megawatts (MW), set on August 2, 2006
- 22,818 MW all-time winter peak demand, set on January 15, 2004
- Approximately 31,000 MW of total generating capability for 2018 (summer seasonal claimed capability; SSCC) and 33,000 MW for 2018/2019 (winter seasonal claimed capability; WSCC)
- Over 3,000 MW of active demand resources and energy efficiency and other passive demand resources for 2019 (active demand response and energy efficiency)

- Market value in 2018—\$9.8 billion total; \$6.0 billion energy market; \$3.6 billion capacity market; \$0.1 billion ancillary services market
- Approximately \$10.9 billion in transmission investment since 2002; approximately \$1.3 billion planned

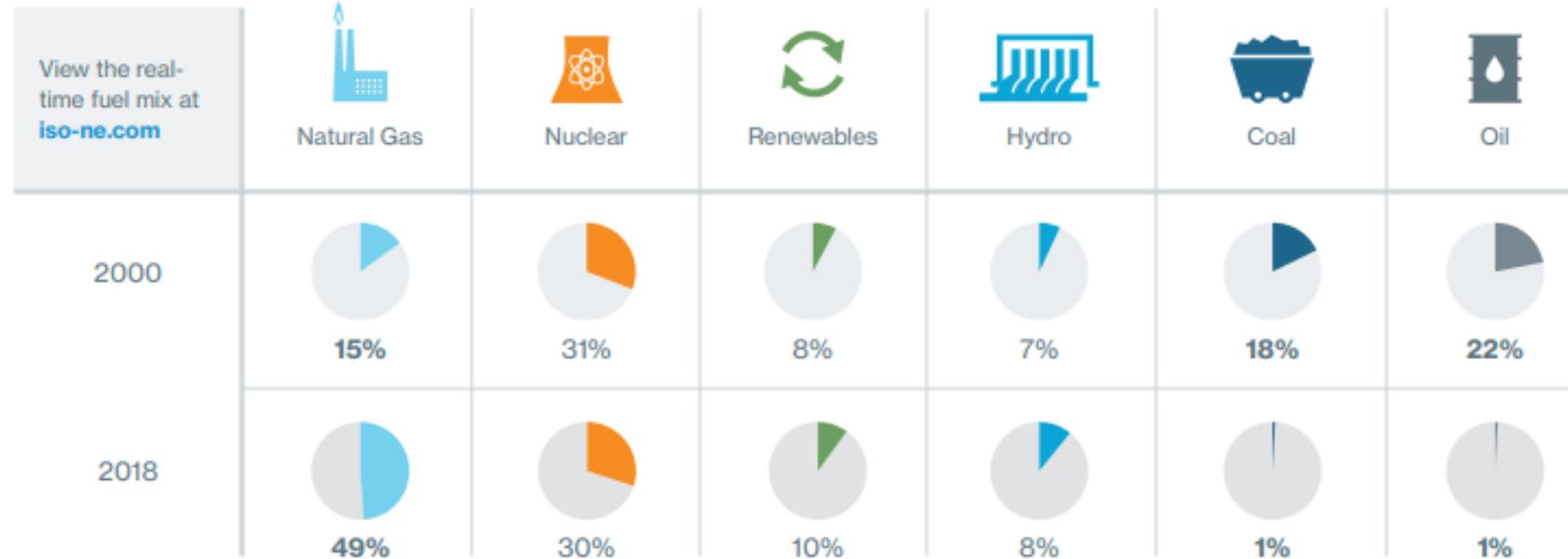
Source: ISO-NE
Regional System
Plan 2010

<https://www.iso-ne.com/system-planning/system-plans-studies/rsp>

Significant decline in Coal and Oil-fired generation in New England

Sources of Electricity Production

Major shift from oil and coal to natural gas over the past 18 years



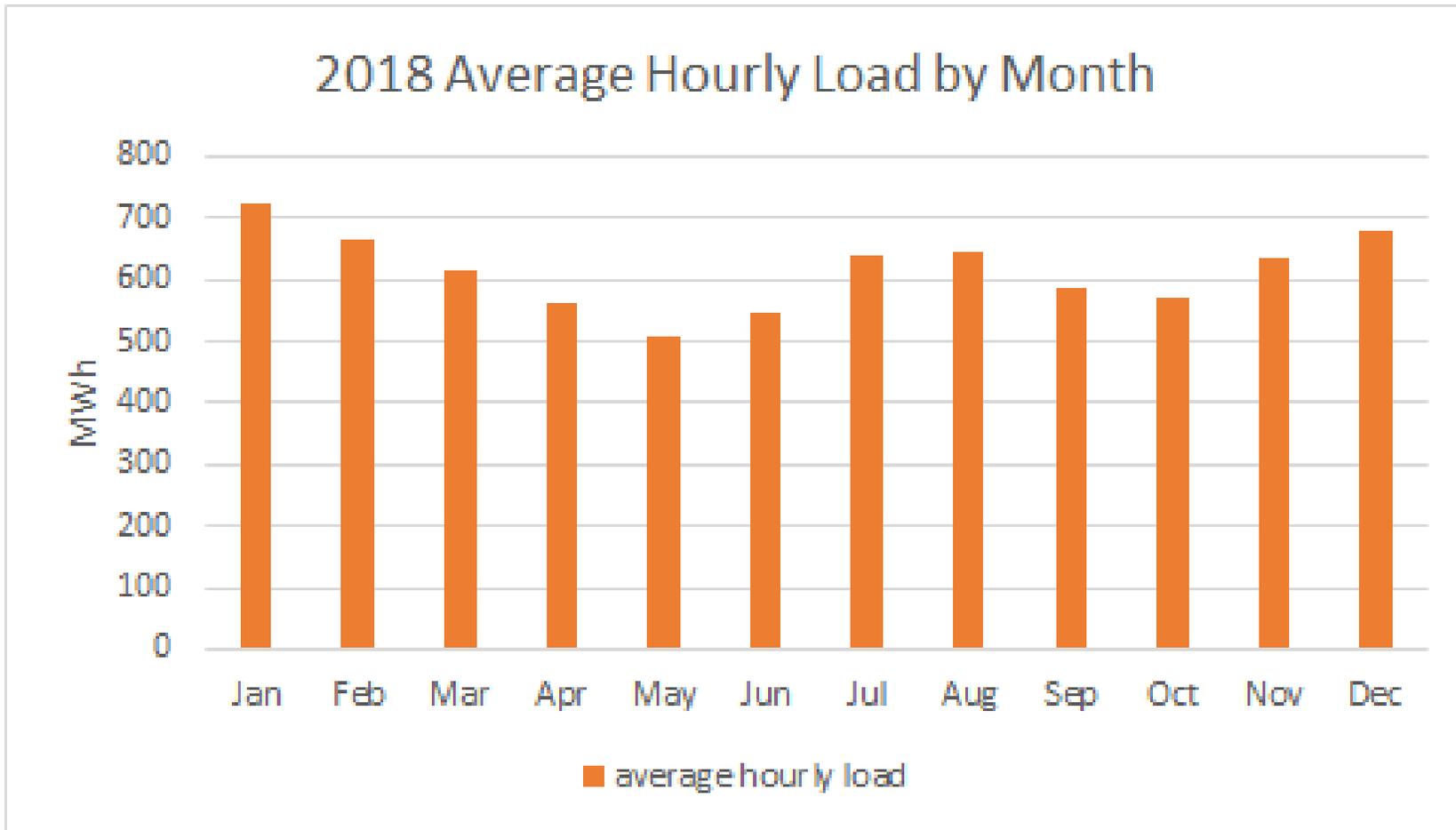
Source: ISO-NE

https://www.iso-ne.com/static-assets/documents/2019/01/new_england_power_grid_regional_profile_2018-2019.pdf

Vermont in-state renewable generation

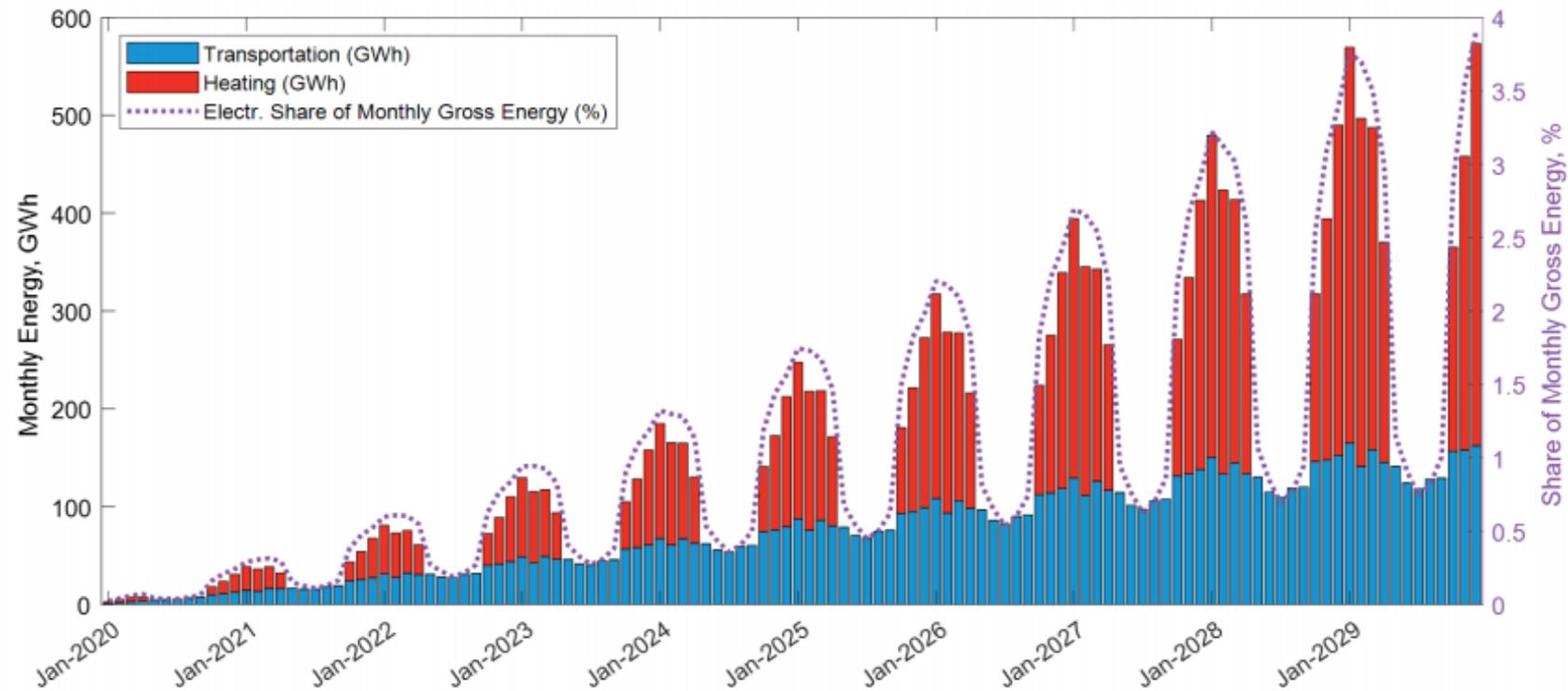
Technology	MW
Solar	345
Hydroelectric	200
Wind	151
Biomass	74
Landfill Gas	11
Anaerobic Digesters	8
Total	789

Vermont Average Loads



Electrification will primarily impact winter load

Draft Energy Impacts of Electrification

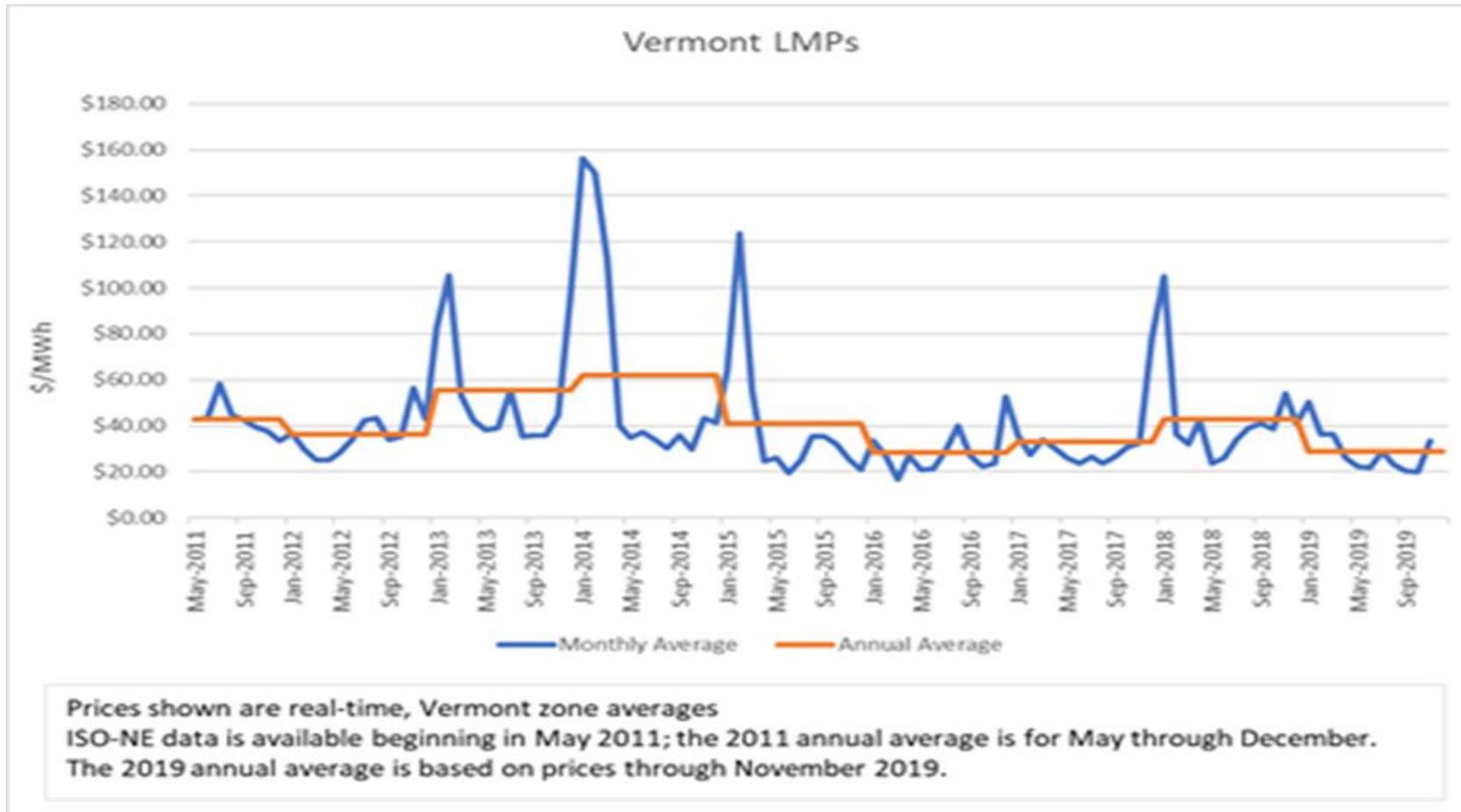


Source: ISO-NE

Source: ISO-NE
Load Forecast
Committee.

https://www.iso-ne.com/static-assets/documents/2019/12/draft_2020_energy.pdf

New England Wholesale Prices Spike in Winter



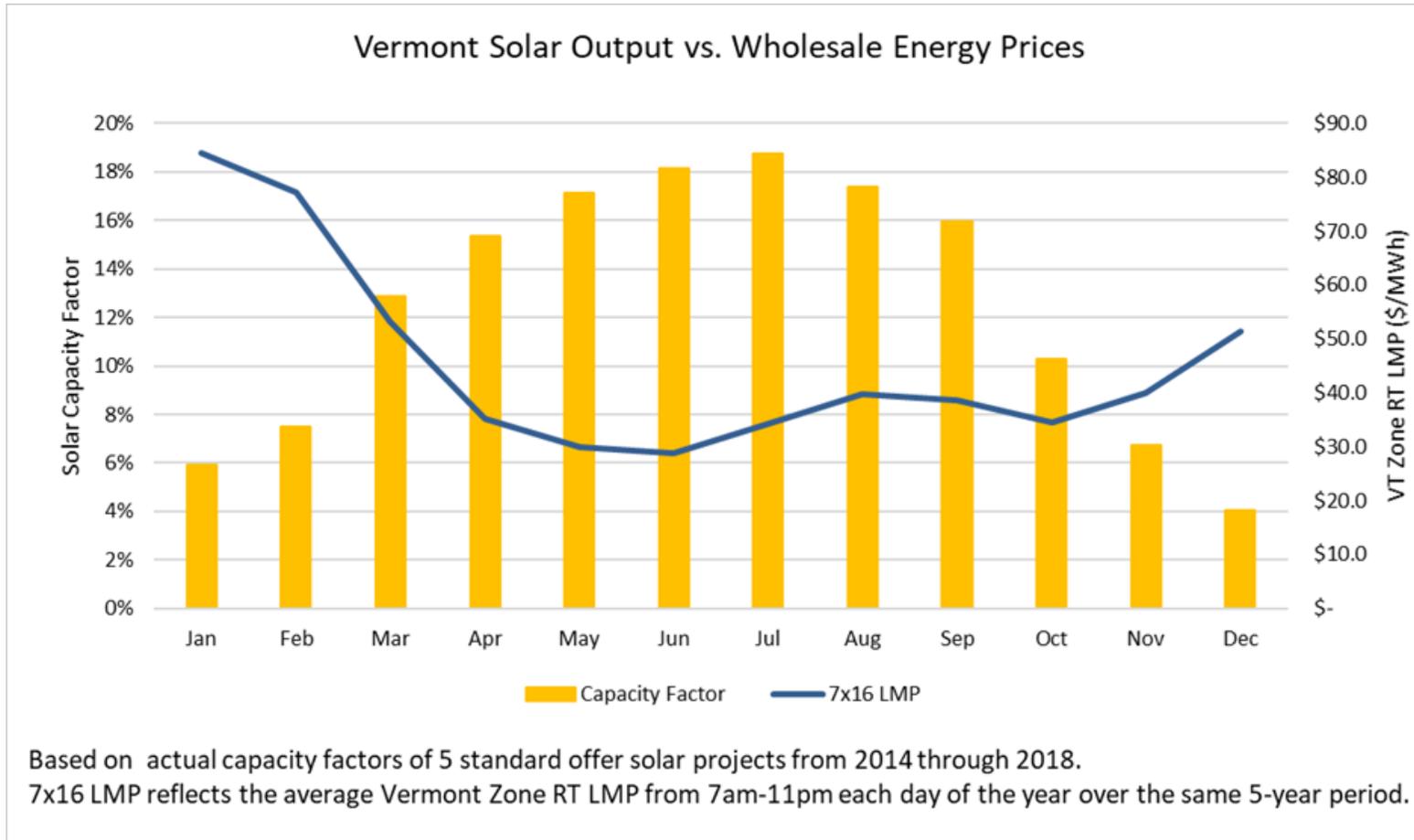
Source: VT
PSD

Fastest Growing Resource in Region = Solar

States	Annual Total MW (AC nameplate rating)											Totals
	Thru 2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
CT	464.3	68.4	91.1	97.5	97.5	71.6	71.6	71.6	71.6	43.5	42.1	1,190.9
MA	1871.3	292.0	288.0	272.0	272.0	272.0	204.0	176.0	170.7	165.3	160.0	4,143.2
ME	41.4	7.1	7.1	6.7	6.7	6.7	6.7	6.7	6.7	6.7	6.7	109.7
NH	83.8	12.7	12.7	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	205.6
RI	116.7	51.3	51.3	48.5	42.4	42.4	42.4	42.4	42.4	42.4	42.4	564.6
VT	306.3	31.5	22.5	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	530.3
Regional - Annual (MW)	2883.8	463.1	472.8	458.0	451.9	426.0	358.0	330.0	324.7	291.3	284.6	6,744.4
Regional - Cumulative (MW)	2883.8	3346.9	3819.8	4277.8	4729.7	5155.7	5513.8	5843.8	6168.5	6459.8	6744.4	6,744.4

Source: ISO-NE 2019 PV forecast. <https://www.iso-ne.com/static-assets/documents/2019/04/final-2019-pv-forecast.pdf>

Solar is increasingly disconnected from regional need and prices



Source: VT
DPS

2020 Annual Energy Report



Electric Sector

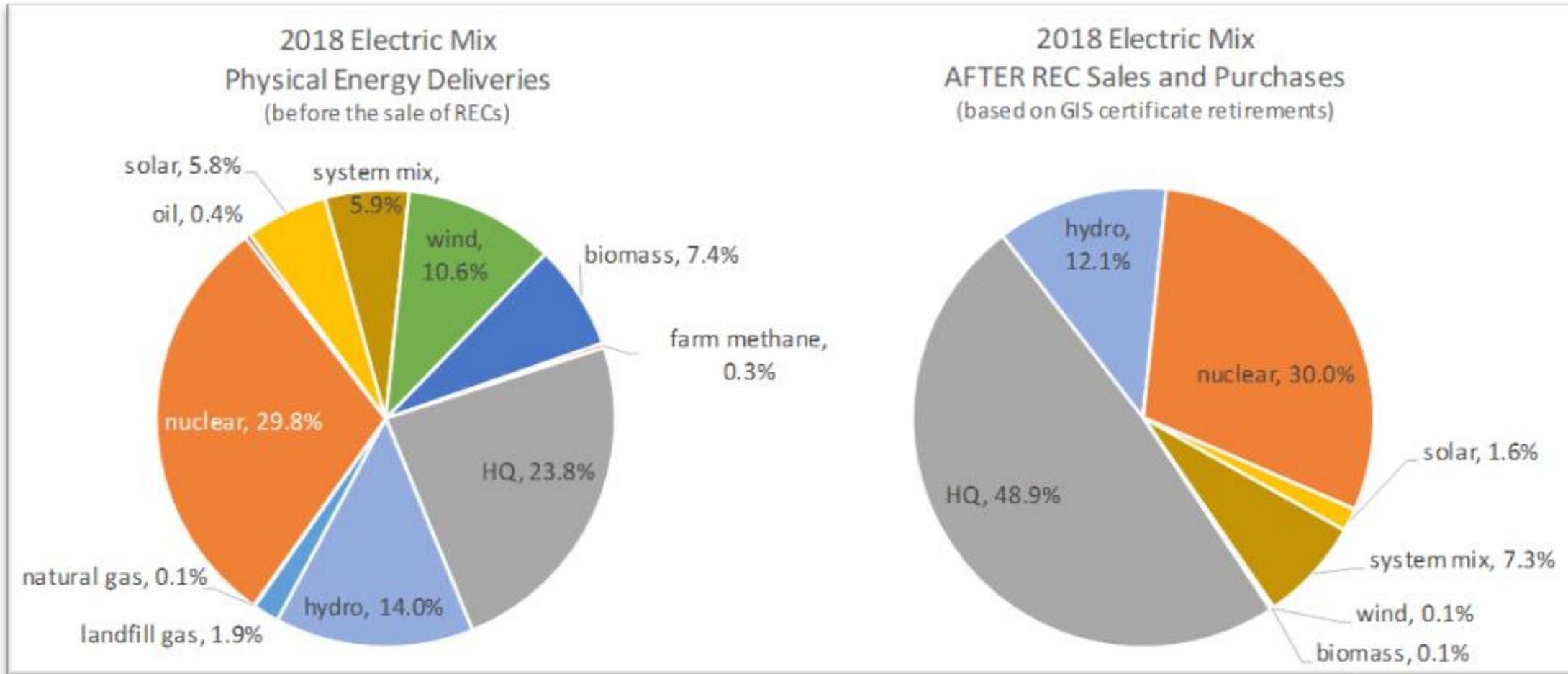
Renewable Energy Standard sets the pace for renewable energy in the electric sector

- “Power supply questions now revolve around the most cost-effective way to meet the RES requirements, not around how much renewable energy to acquire.” 2016 CEP at 277.

63% renewable in 2019

Maintaining affordable electric rates is critical for electrification of transportation and thermal sectors, and therefore GHG reduction goals

Electric Power Supply Sources



Thermal Sector

27% renewable

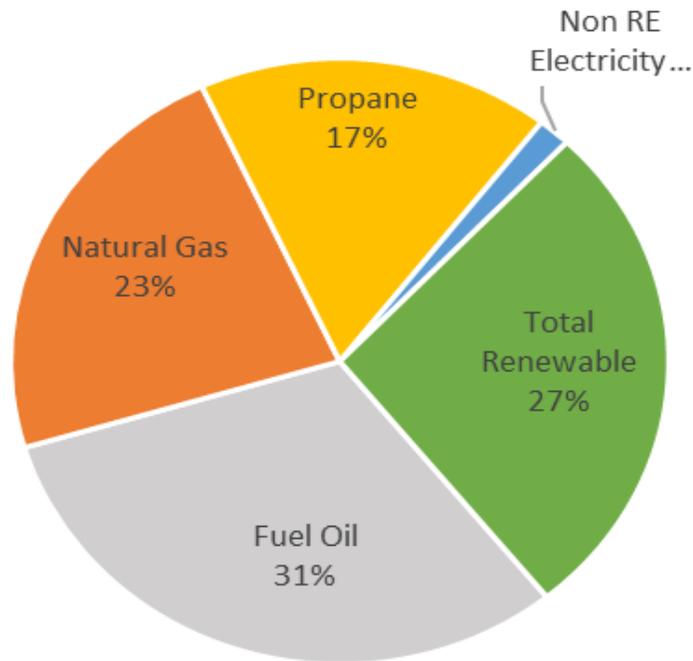
- Primarily cordwood

Well behind on weatherization goals

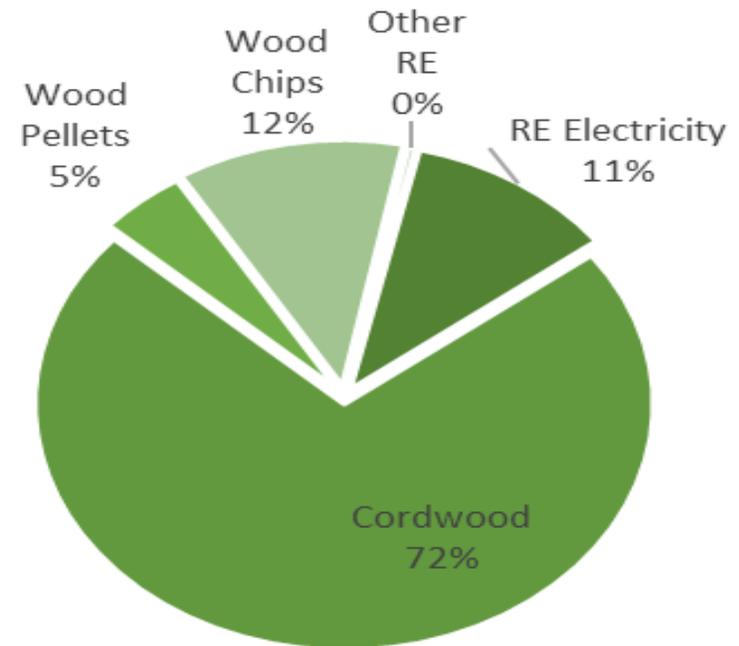
- 80,000 buildings by 2020
- 27,186 buildings actually weatherized by end of 2018

Thermal Renewable Supply

Thermal Site-Energy Fuel Use Percentages



Renewable Energy Portion Percentages



Weatherization

Figure 1: Cumulative Housing Units Retrofit by Provider 2008-2018

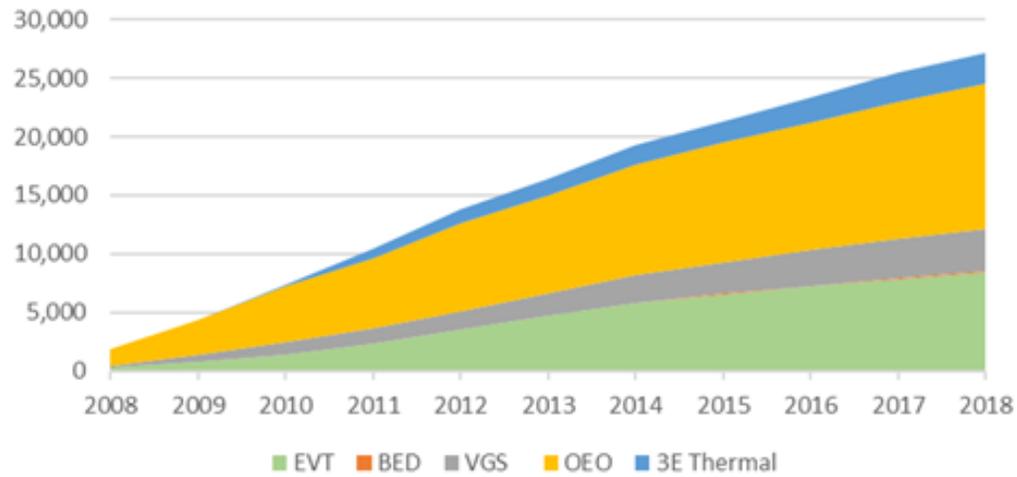
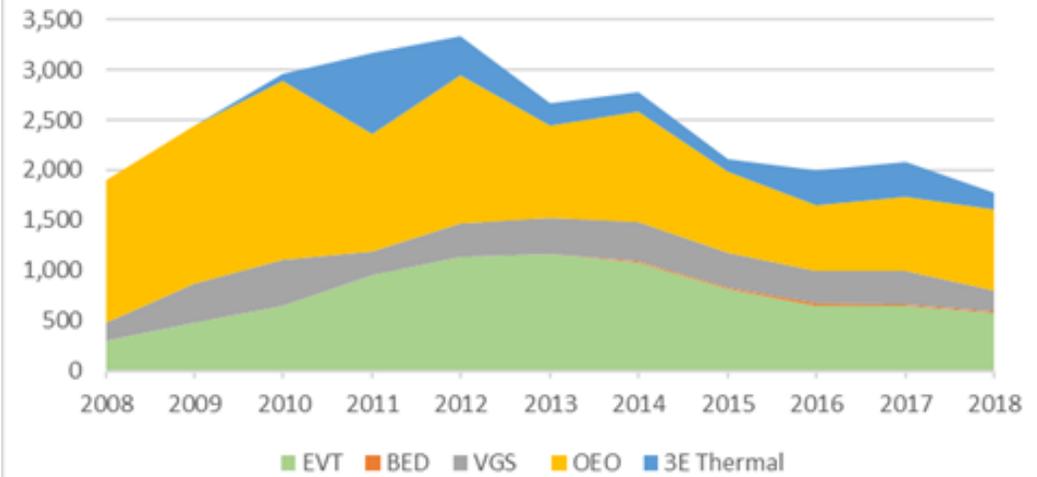
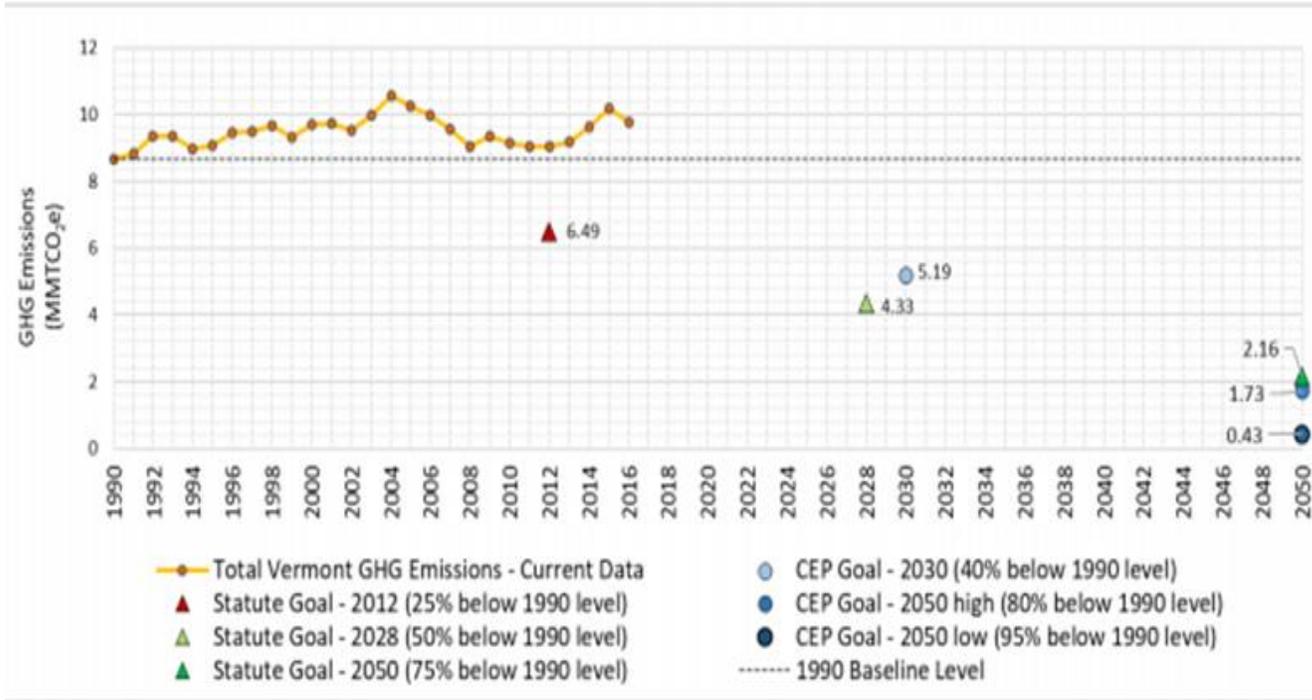


Figure 2: Annual Housing Units Retrofit by Provider 2008-2018

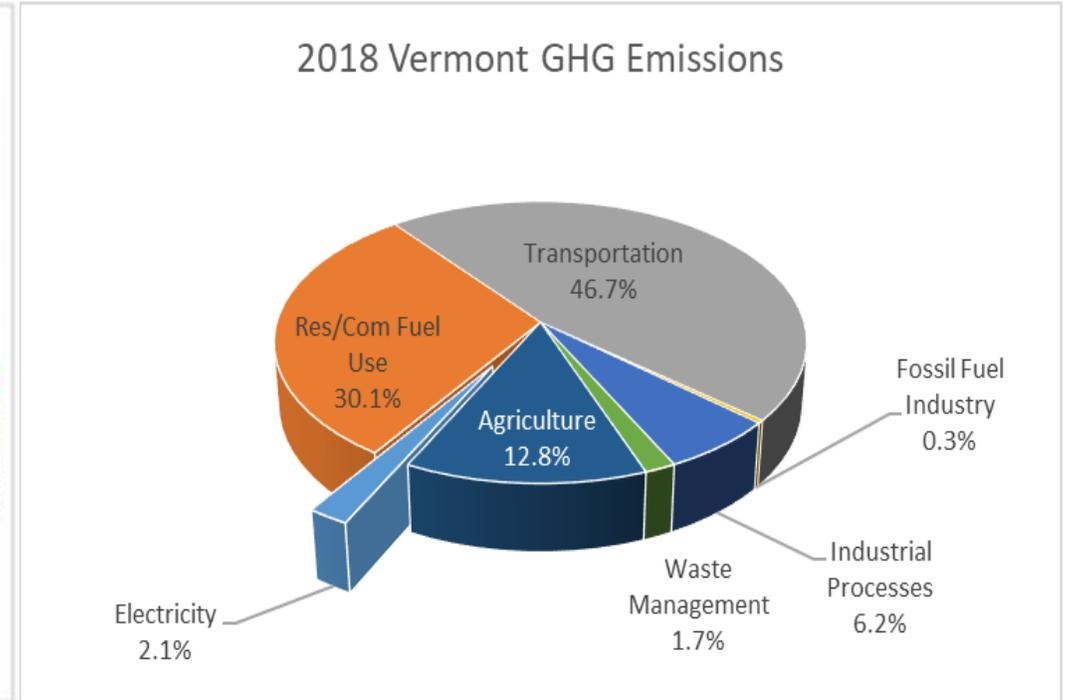


GHG Emissions

Vermont GHG Emissions Compared to 1990 Baseline



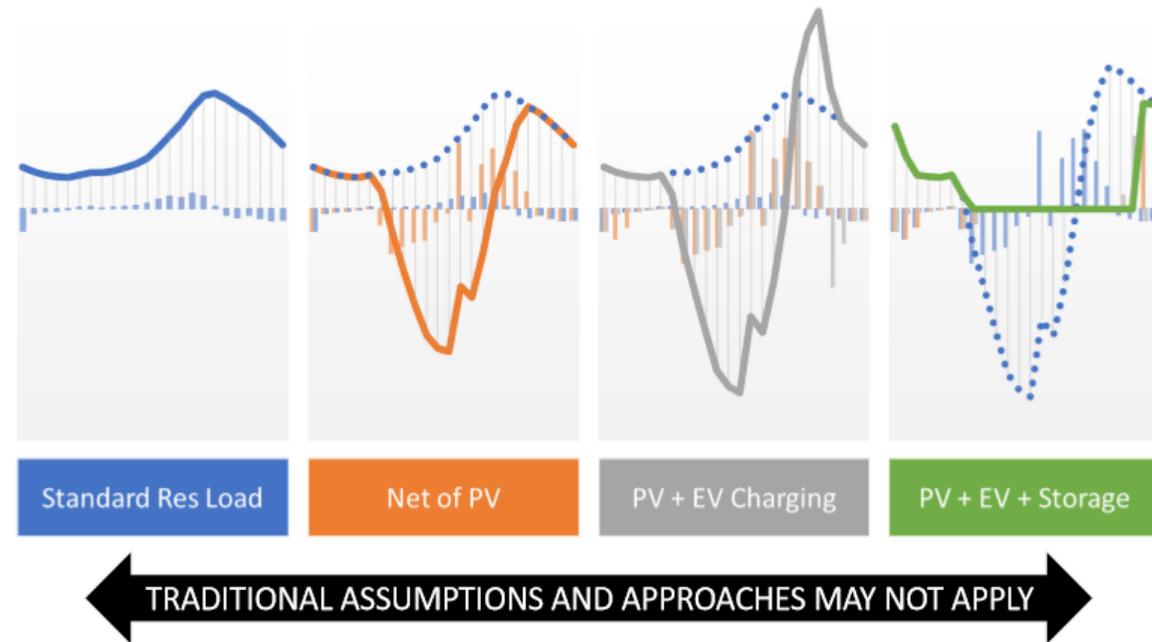
Estimated 2018 GHG Emissions



Rate Design

DERS ARE EVOLVING THE USE OF ELECTRICITY

- Rate Design Initiative
- Storage Tariffs
- EV Tariffs
- Net metering/ distributed generation



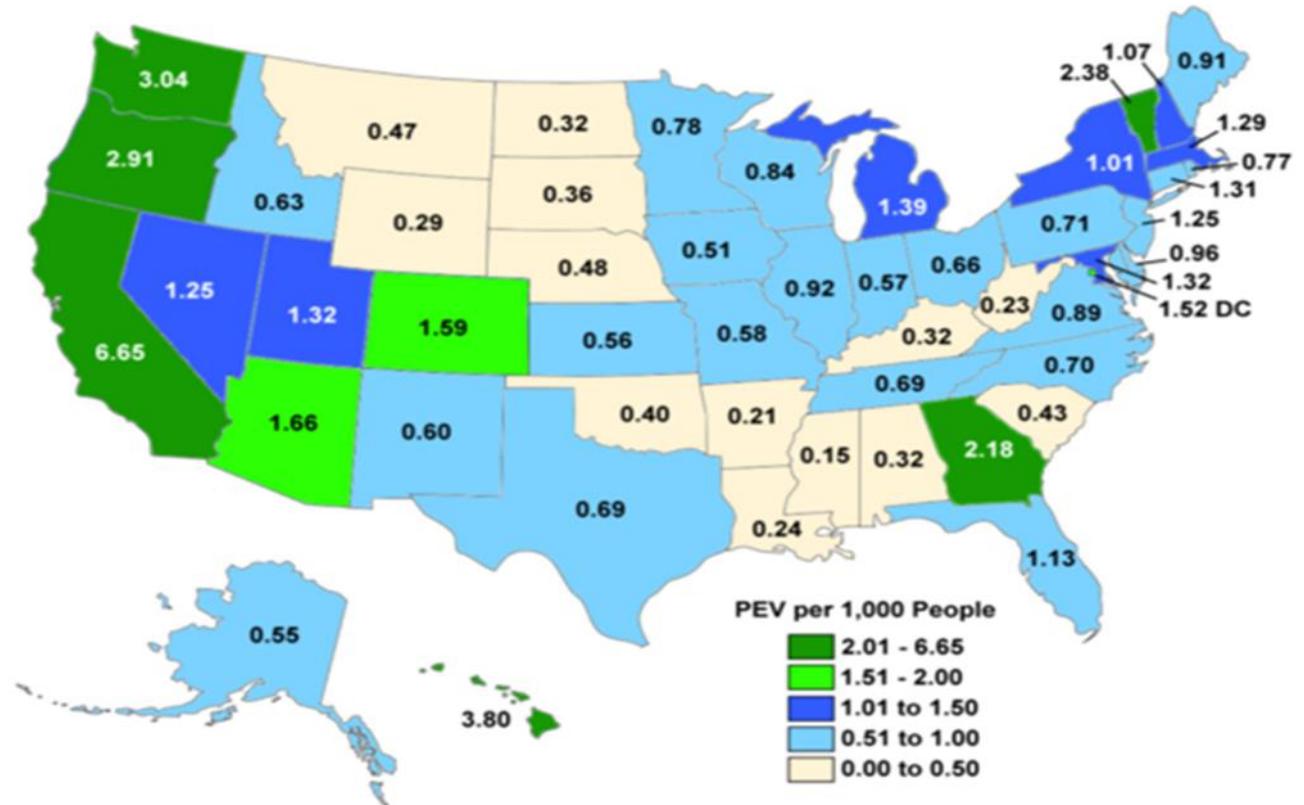
Transportation Sector

5.9% renewable

- Mostly ethanol in fuel

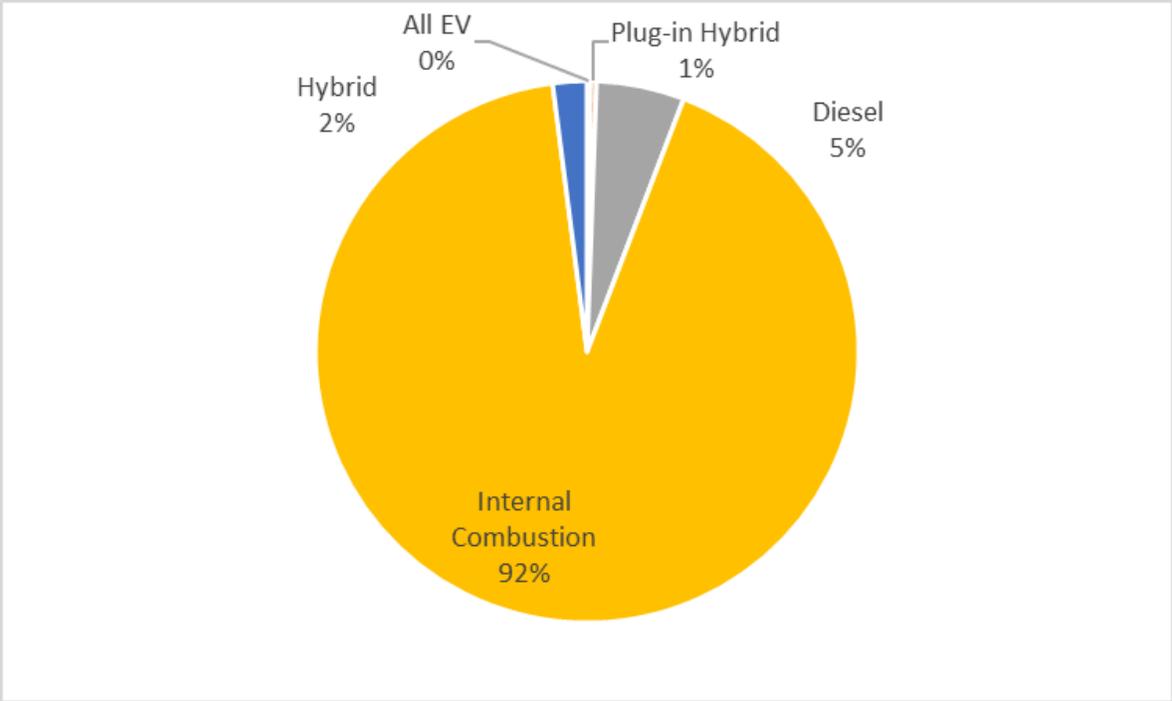
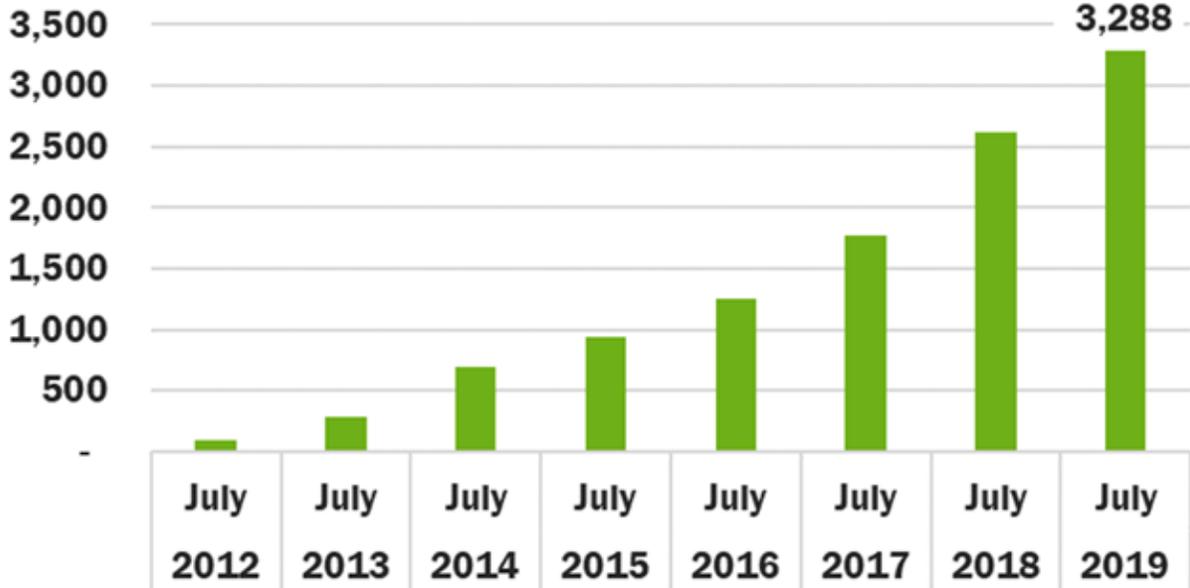
Remains largest contributor to GHG

PEV Registrations per 1,000 People by State, 2016



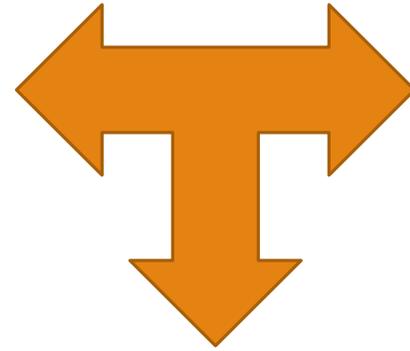
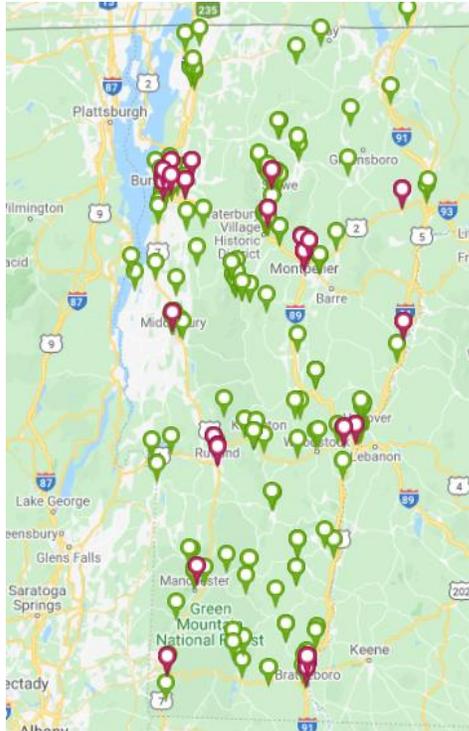
EV Deployment

Total Passenger EVs in Vermont



Electric Vehicles Vermont Activities

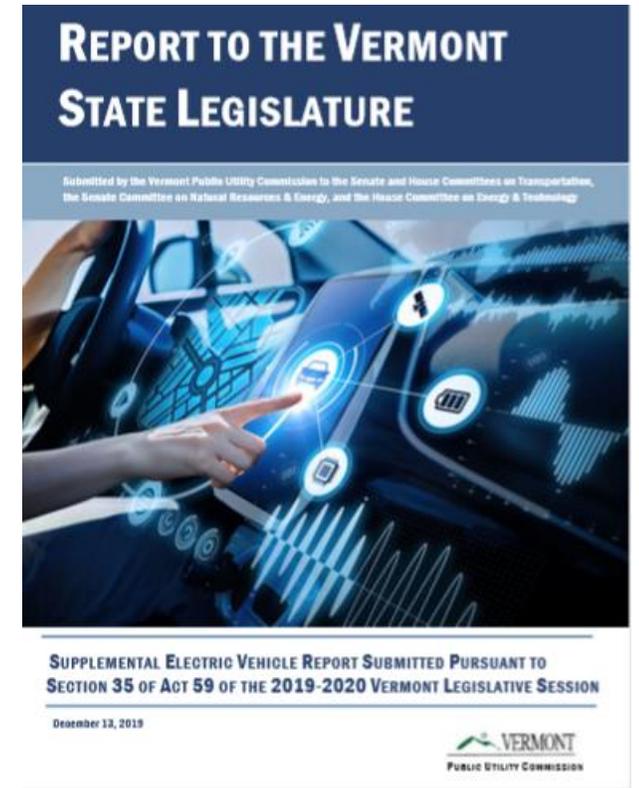
Public Charging Stations



Rate Design

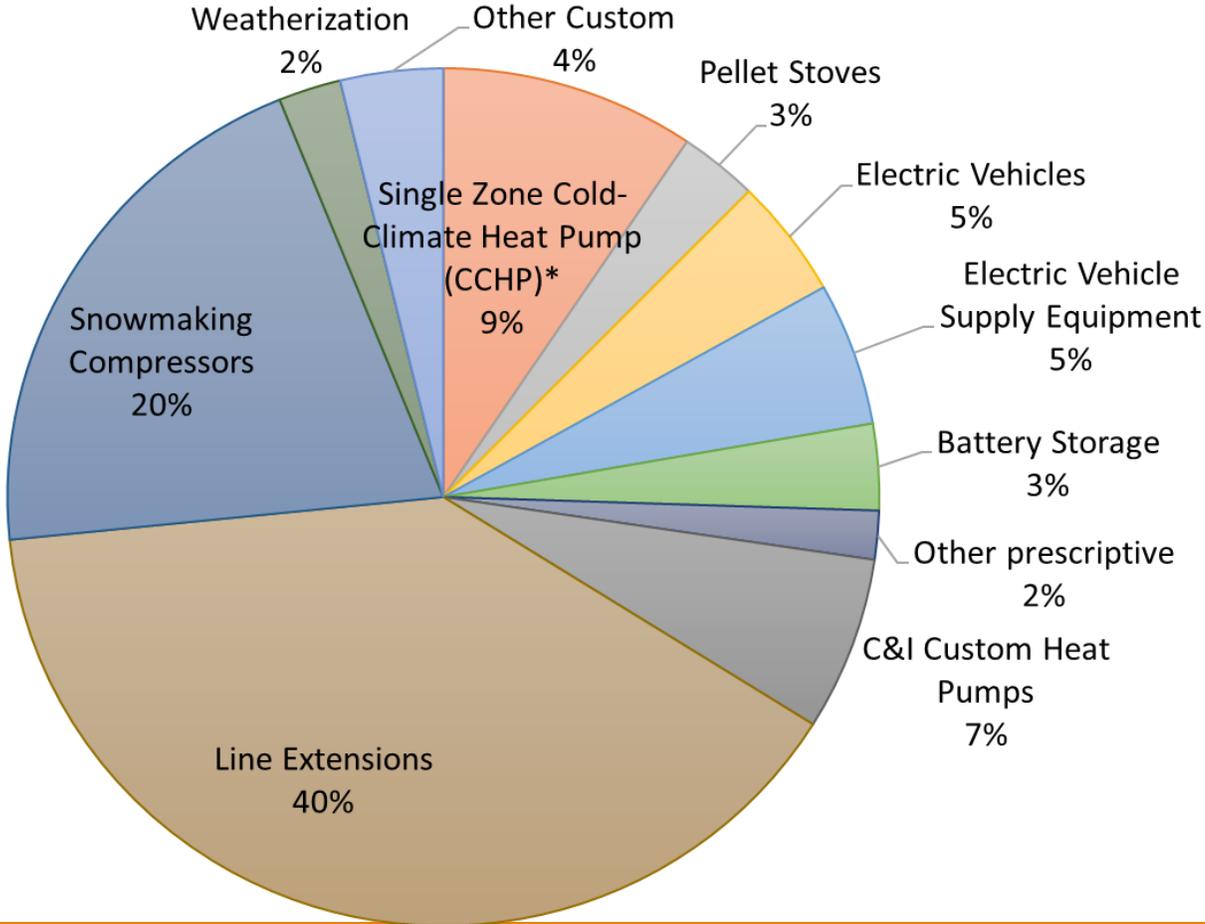
Public Utility Proceedings on Electric Vehicle Tariffs

Rate Design and Trans Fees



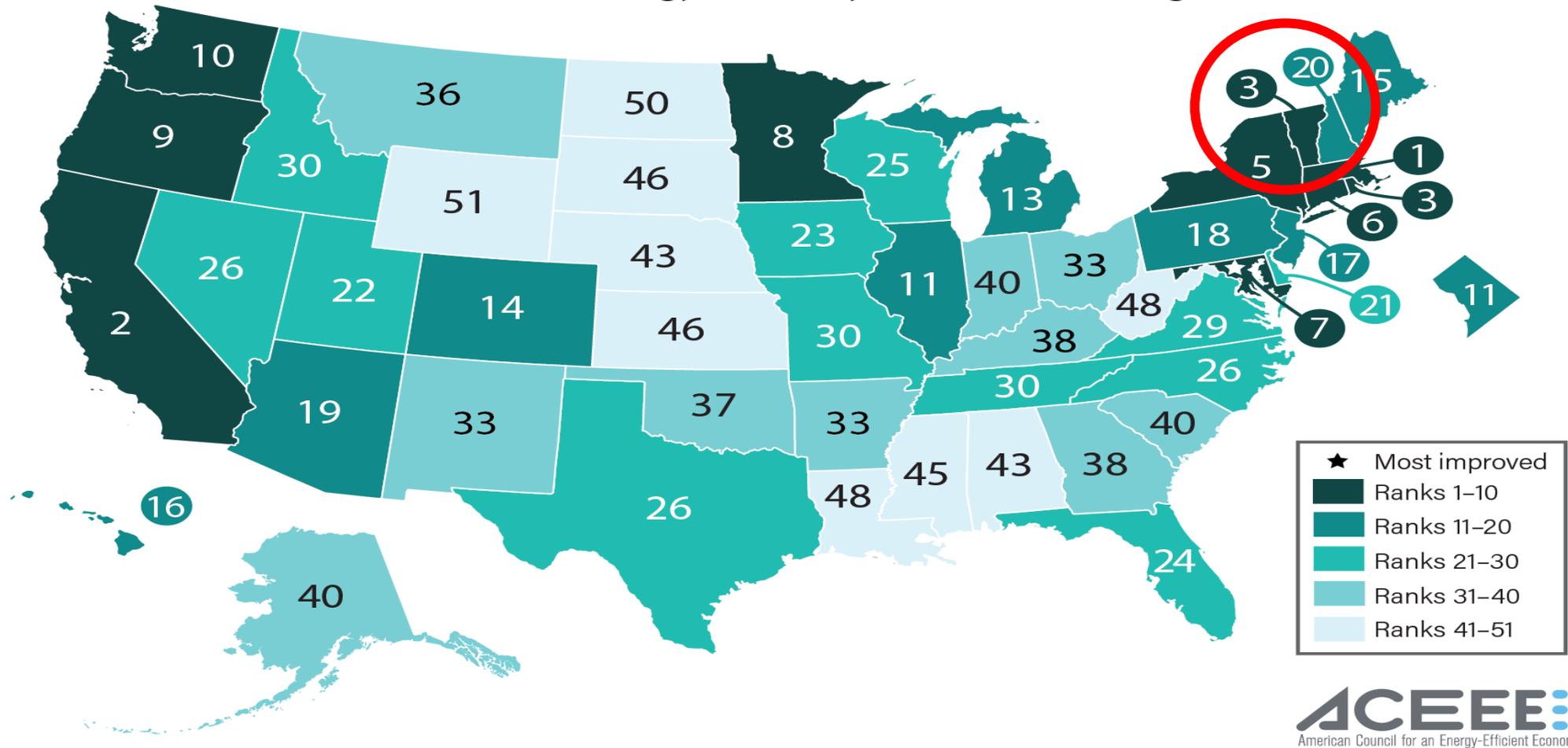
Energy Transformation – Tier III

2018 Measure Mix



Efficiency

2019 State Energy Efficiency Scorecard Rankings



Electric Energy Efficiency

2018-2020 PUC Approved Electric Energy Efficiency Charge Budgets			
	2018	2019	2020
EVT	\$50,944,146	\$51,106,595	\$51,403,668
BED	\$2,632,256	\$2,804,805	\$2,825,080
Total	\$53,576,402	\$53,911,400	\$54,228,748

Savings cost
~\$0.04/kWh over
lifetime

16% of Vermont's
annual energy need
met by Efficiency

Energy Efficiency Utilities Major Proceedings

Demand Resources Plan Proceeding

- 2021-2023 Budget Setting Process at PUC

Act 62 of 2019

- Proceeding to examine best way to deliver energy services to Vermonters

Battery Storage

Clean Grid

Optimization H 676

- Income Tax Deductions
- R&D income Tax Credit
- Grant Funding to Clean Optimization Companies



ACT 31 STORAGE REGULATION - FINAL RECOMMENDATIONS

January 9, 2020

Public Utility Commission Proceedings on New Storage Tariffs

Questions?