2022 Comprehensive Energy Plan & Initial Climate Action Plan

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Department of Public Service

February 16, 2022

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Energy Plan & Climate Plan

Climate Action Plan

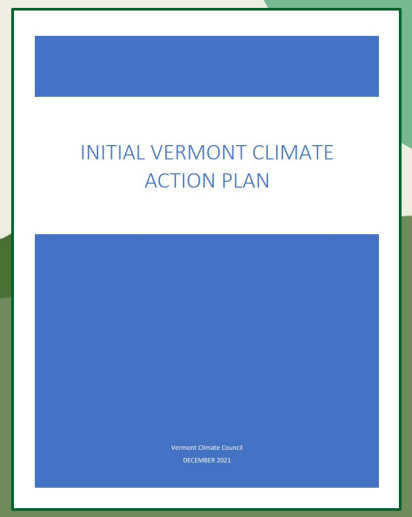
- Climate Adaptation
- Non-Energy GHG Emissions: Agriculture, Waste, etc.
- Sequestration
- GHG Inventory Review

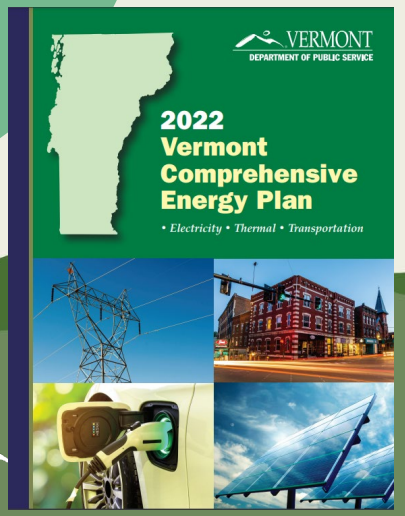
Overlap

- Cost-effective GHG Reduction Requirements
- Energy Sector Analysis incl. policy & technology scenarios & pathways
- Public Engagement & Modeling Efforts
- Equitable Transitions

Comprehensive Energy Plan

- Renewable Energy Development
- Electric Plan including Reliability
- Energy System Planning: Adequacy, security, sustainability, Affordability, Economic vitality
- Standards for Local Planning (Act 174)





Global Warming Solutions Act (GWSA), Act 153 of 2020:

- Enacted: September 23, 2020
- First meeting of the Vermont Climate Council: November 20, 2020
- Subcommittees
  - Cross-Sector Mitigation, Rural Resilience and Adaptation, Agriculture and Ecosystems, Just Transitions and Science and Data
- Initial Climate Action Plan adopted: December 1, 2021

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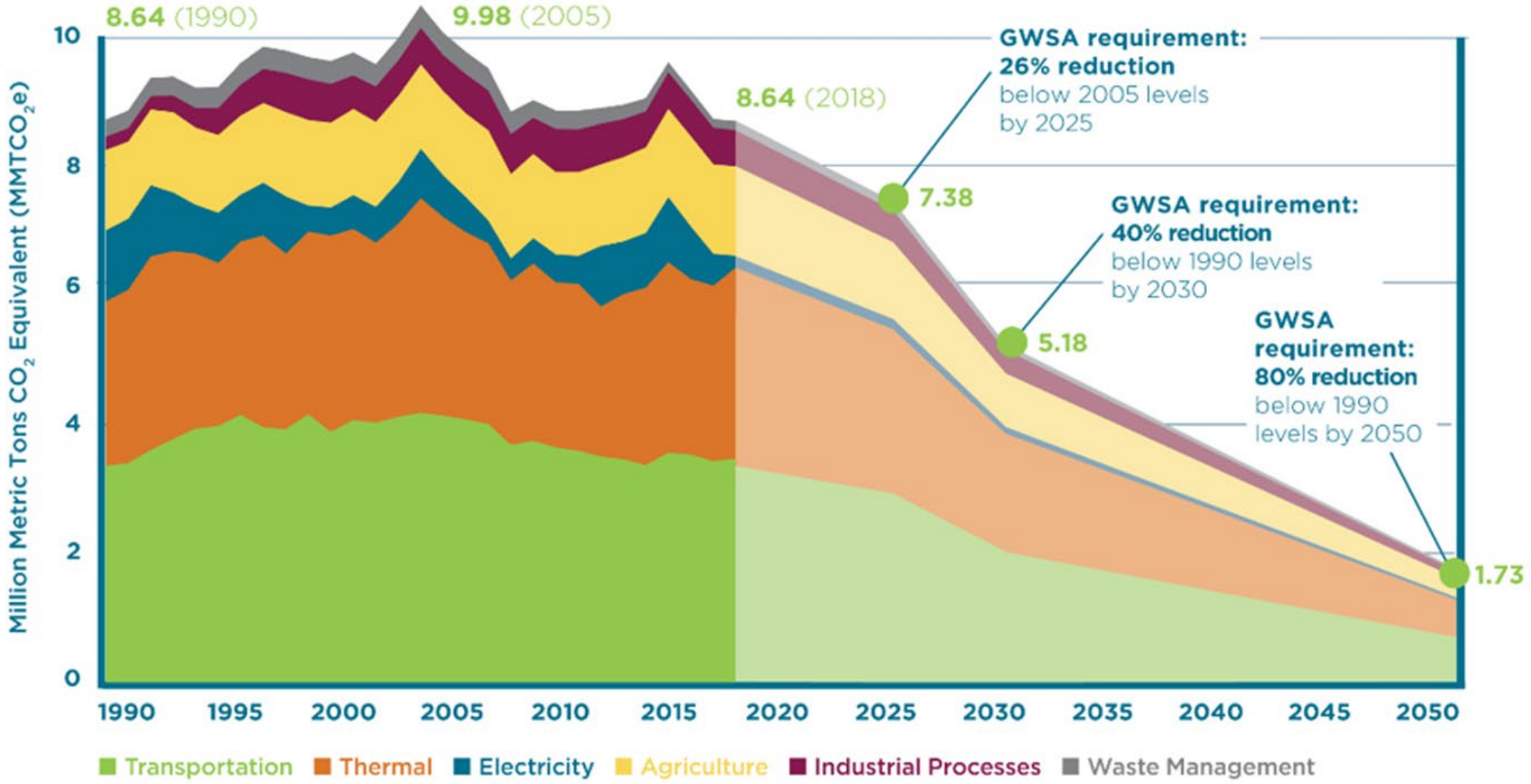
GWSA Emission Reduction Requirements



Source: Vermont Agency of Natural Resources, Vermont GHG Emissions Inventory and Forecast (1990-2017), 2021.

The Vermont Climate Action Plan

- ➔ Aims to cut climate pollution 40% below 1990 levels by 2030
  - ◆ approximately half of 2005 levels
- ➔ Prioritize those who are most affected
- ➔ Shaped by five subcommittees
  - ◆ with public input
  - ◆ in coordination with CEP
- ➔ Updated at least every 4 years
- ➔ Implementation section to inform decision-making
- ➔ Framework for measuring progress

Five Impact Areas

Cutting Climate Pollution

Reducing emissions from transportation, buildings, energy and products.

Capturing Carbon

Removing carbon from the air and storing it in soil or plants.

Resilient Working and Natural Lands

Preparing farms, forests and ecosystems for climate change.

Cross-Cutting Solutions

Investing in communities and workforce development.

Vital Communities

Protecting people and infrastructure from climate impacts.

Select Pathways:
Better Buildings and Homes

- Expand weatherization (“weatherization at scale”)
- Develop and implement a Clean Heat Standard
  - Performance standard driving transition to less carbon-intensive heating practices
- Incentivize adoption of clean, energy-efficient heating options, such as heat pumps and modern wood heat
- Institute a rental property efficiency standard (RPES)
- Regularly update and ensure compliance with the statewide residential building energy code

Select Other GHG Reduction Opportunities

- Reduce emissions of refrigerants with high global-warming potential
- Reduce emissions of fluorinated gases from semiconductor manufacturing
- Ensure flares are operational at all existing municipal wastewater digesters

The Climate Action Plan

CAP Strategies and Actions
Section 592 B

GHG mitigation

Adaptation, resilience and sequestration

"test" established in GWSA for required elements of CAP

"…the specific initiatives, programs, and strategies, including regulatory and legislative changes, necessary to achieve the State's greenhouse gas emissions reduction requirements…"

"…build and encourage climate adaptation and resilience of Vermont communities and natural systems…"

Suite of actions ***necessary*** to achieve…

Legislature

ANR (rulemaking)

Additional actions

VCC

Suite of actions ***consistent*** with…

Legislature

ANR (rulemaking)

VCC

possible lead entities (post-Dec 1)

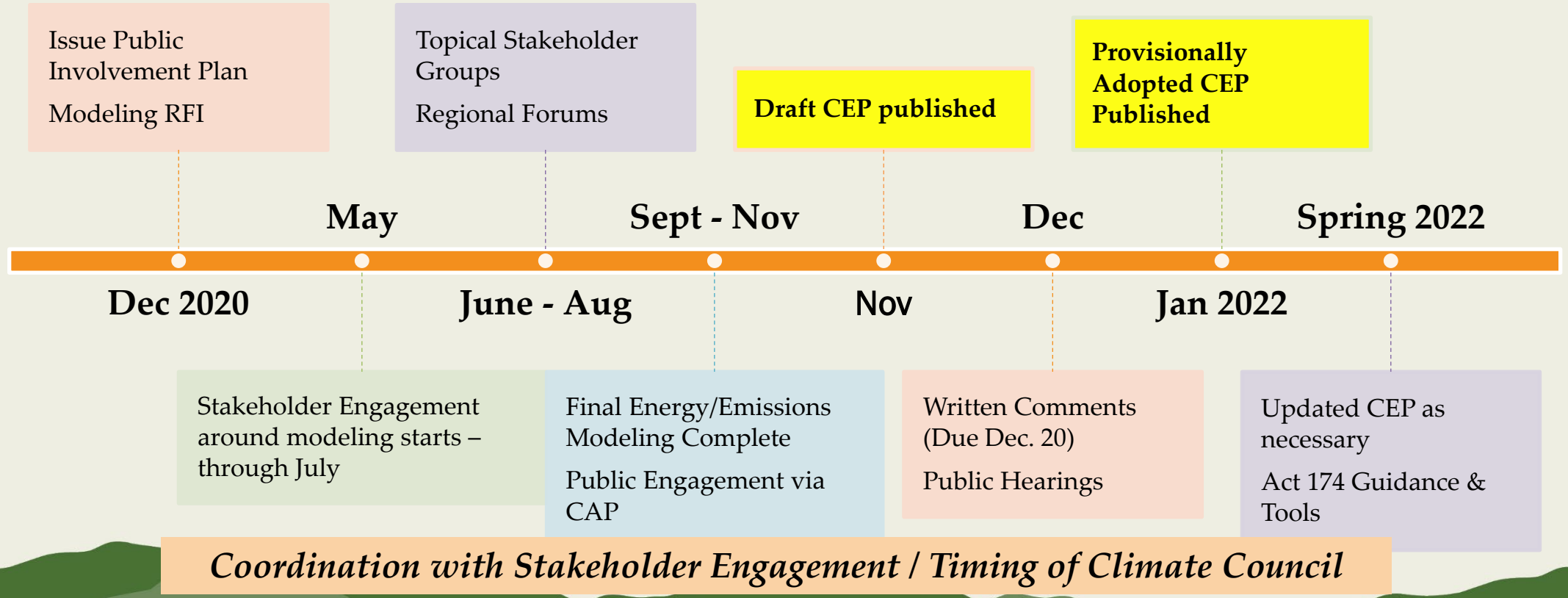
If the Council fails to adopt the Plan or update the Plan… the Secretary [of ANR] shall proceed with adopting and implementing rules… to achieve the greenhouse gas emissions reductions requirements…

Energy Plan Rooted in Vermont Energy Policy

Title 30, Section 202a:

- To ensure, to the greatest extent practicable, that Vermont can meet its energy service needs:
  - In a manner that is **adequate**, **reliable**, **secure**, and **sustainable**
  - Ensuring **affordability** and encouraging the state's **economic vitality**
  - Using energy resources **efficiently** and managing demands **cost effectively**
  - In a manner that will **achieve greenhouse gas reductions requirements**

2022 CEP Engagement Timeline



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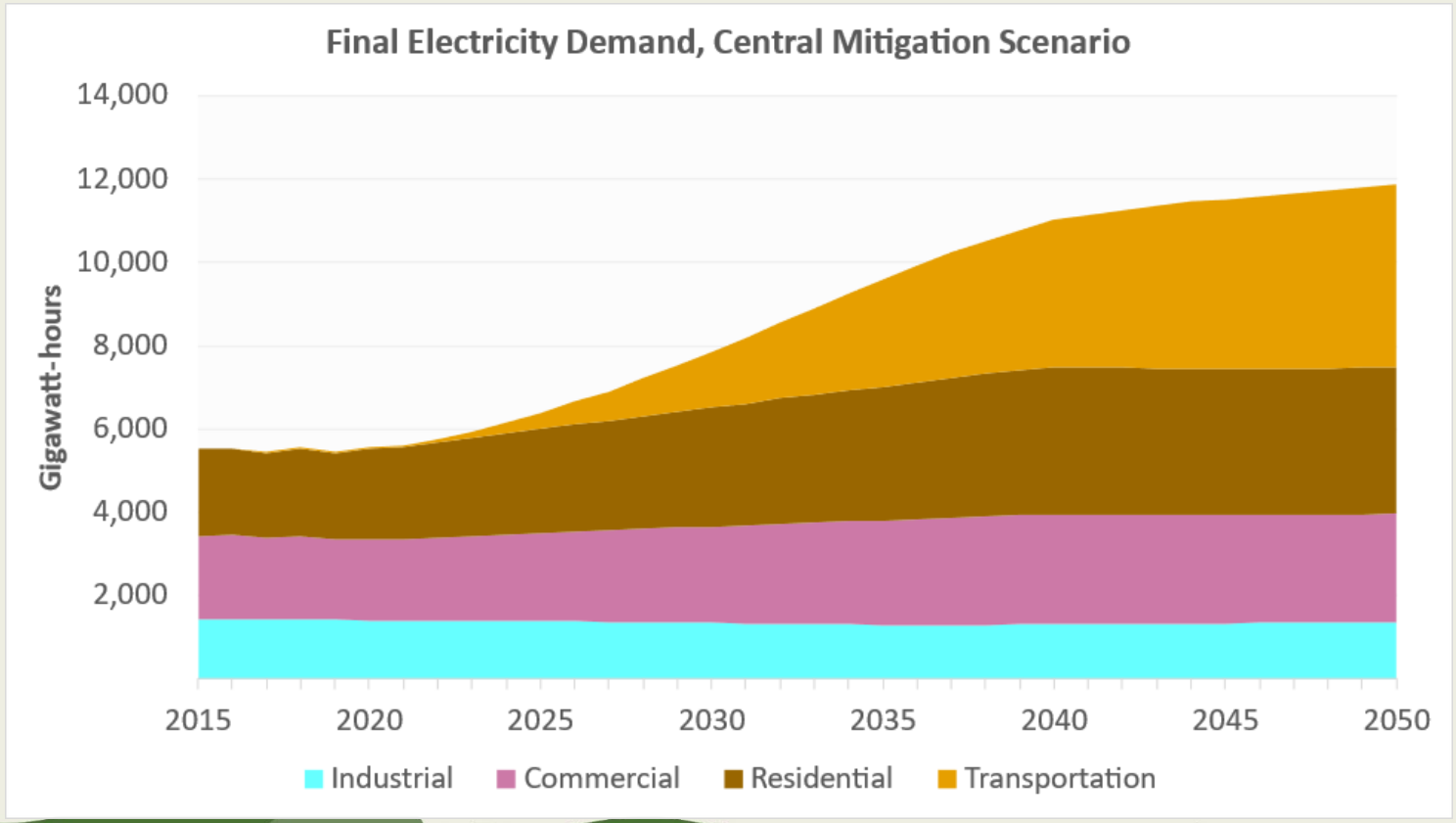
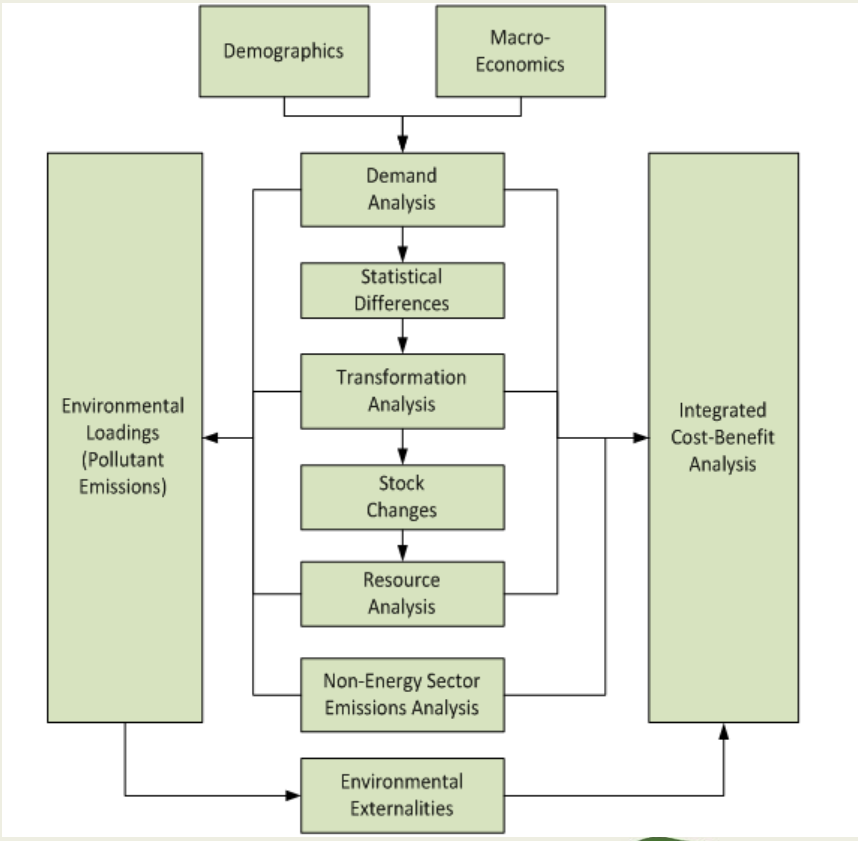
2022 CEP (& CAP) Modeling





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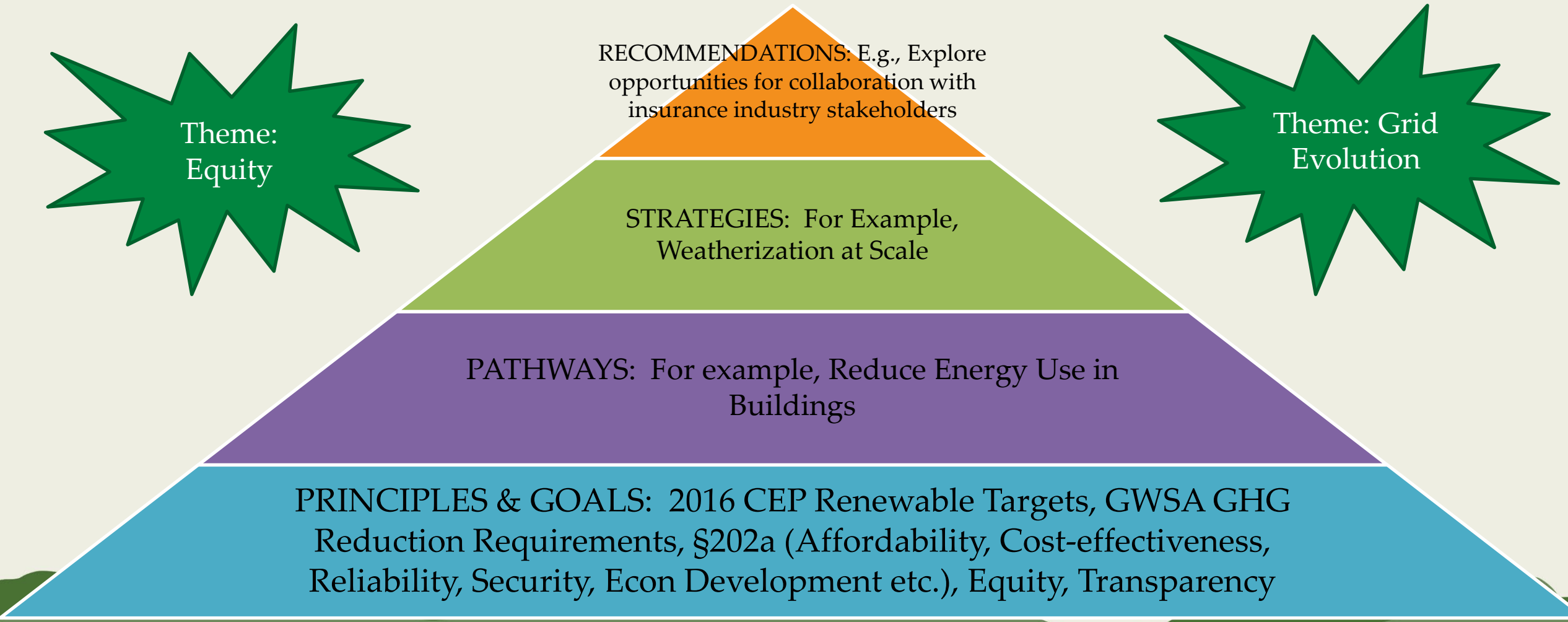
CEP Structure



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CEP Theme: Equitable Transitions

“Every one of us benefits when we make society fairer and more just”

Xusana Davis, Vermont’s Executive Director of Racial Equity, in her 2021 Report to the Legislature.

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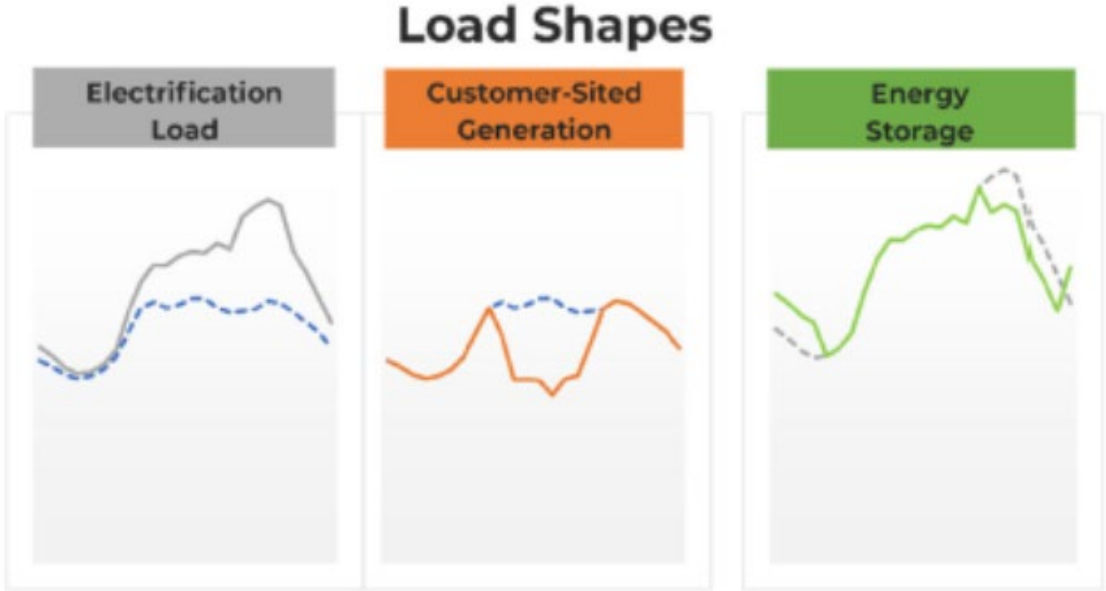
CEP Theme: Grid Evolution



CEP Vision for Optimized Grid:

- A secure and affordable grid that can efficiently integrate, use, and optimize high penetrations of distributed energy resources to enhance resilience and reduce greenhouse gas emissions.

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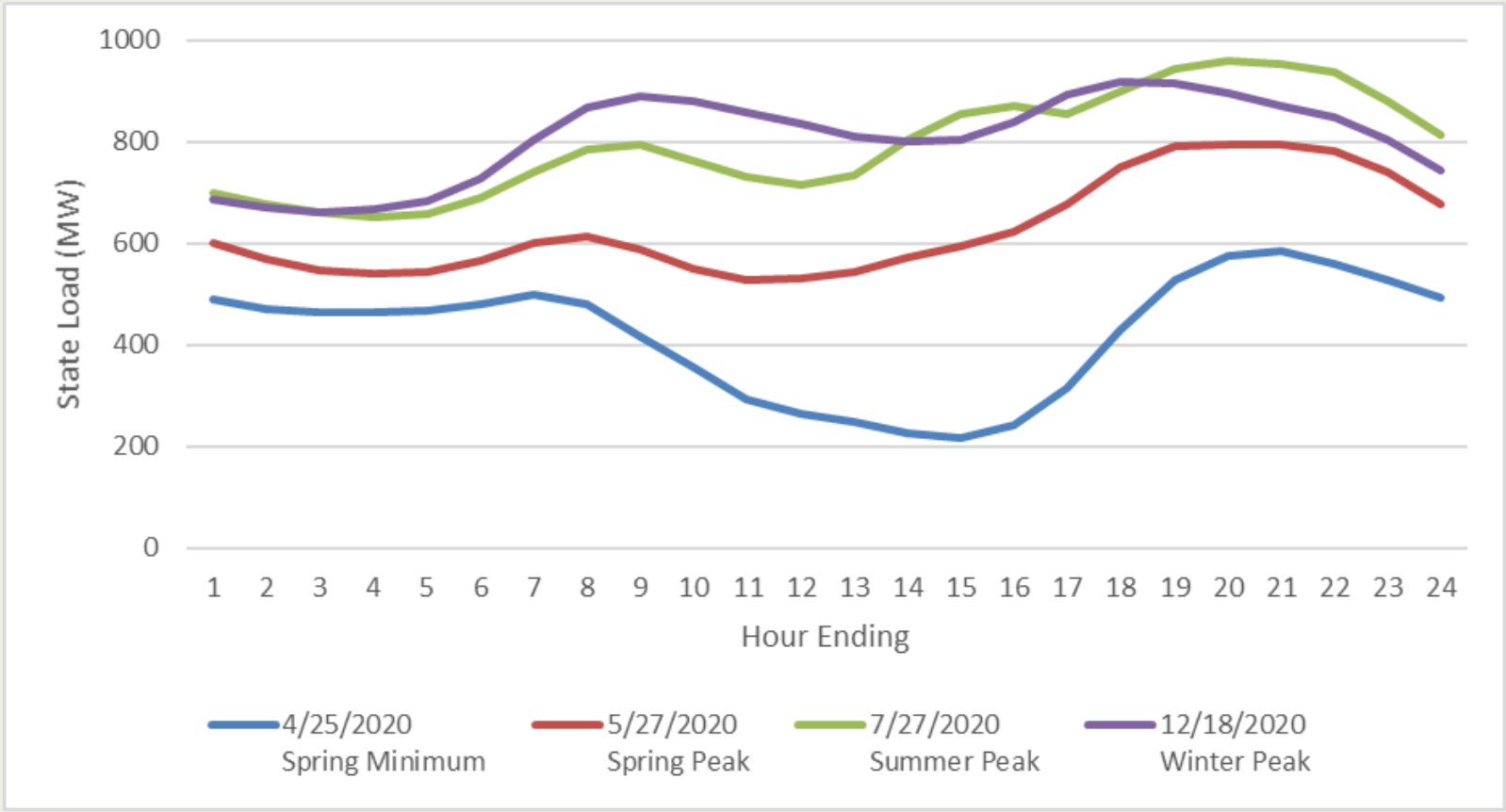
Vermont Load Shapes



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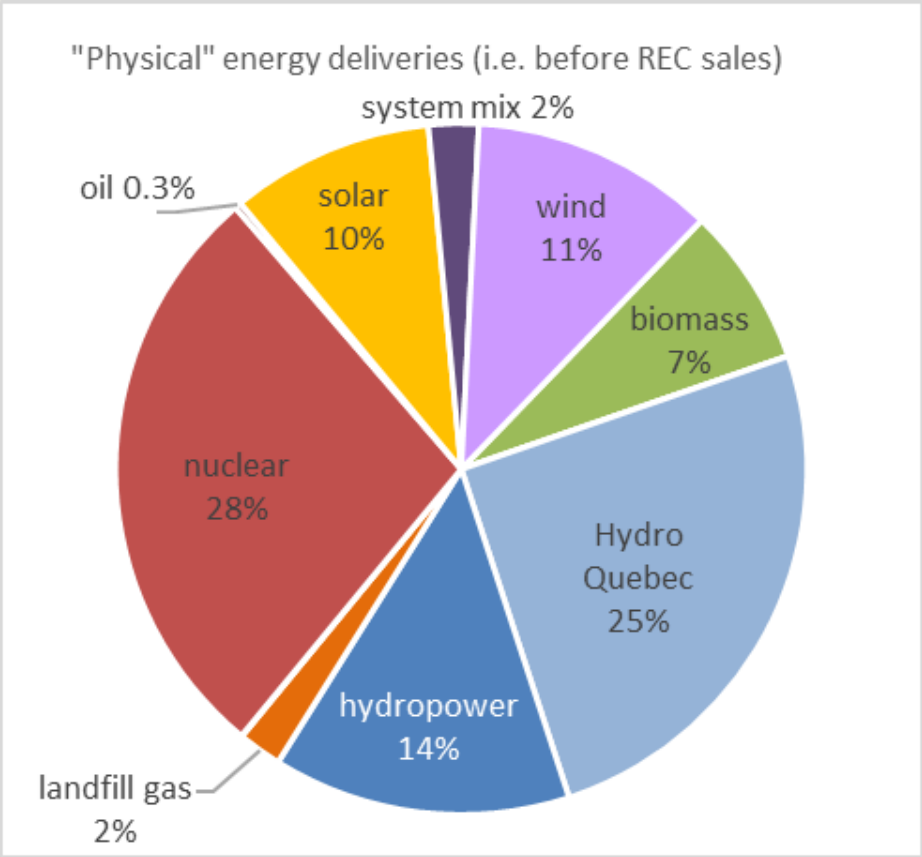
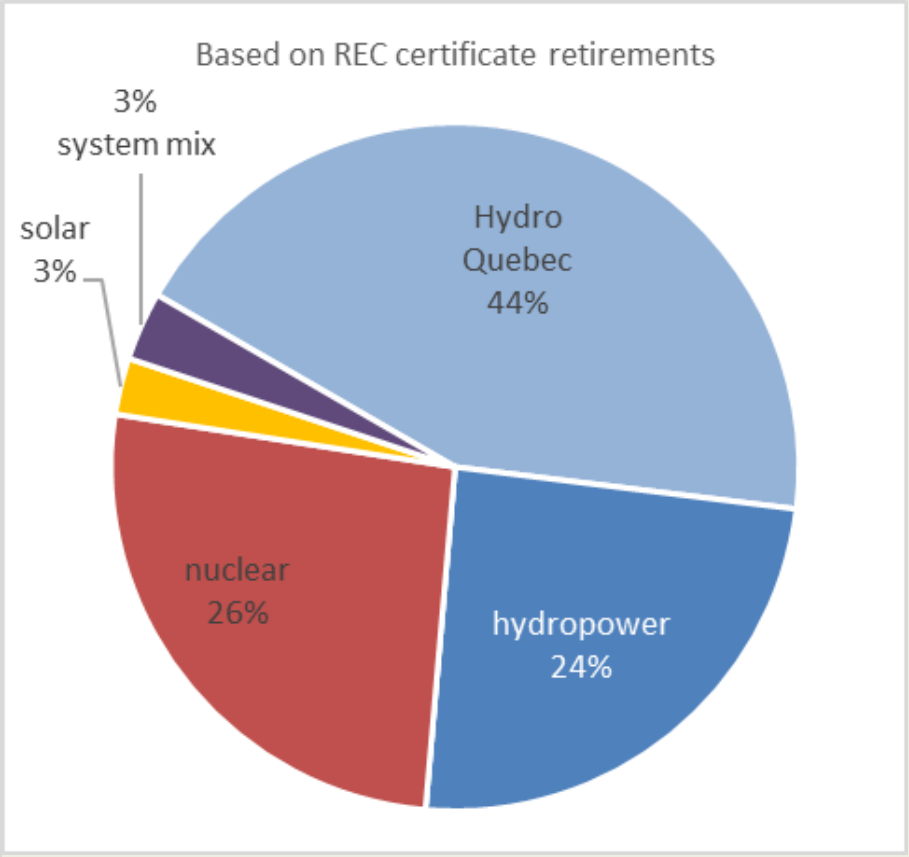
Sector Summaries

Vermont 2020 Electric Energy Supply





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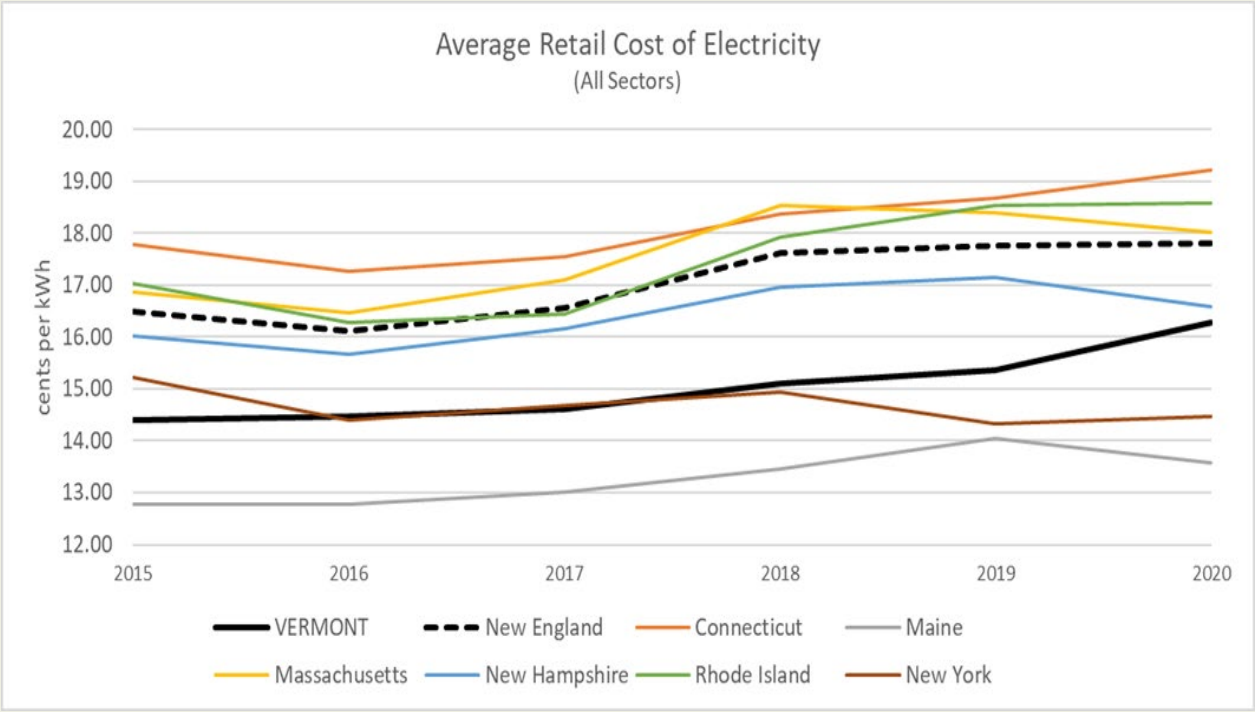
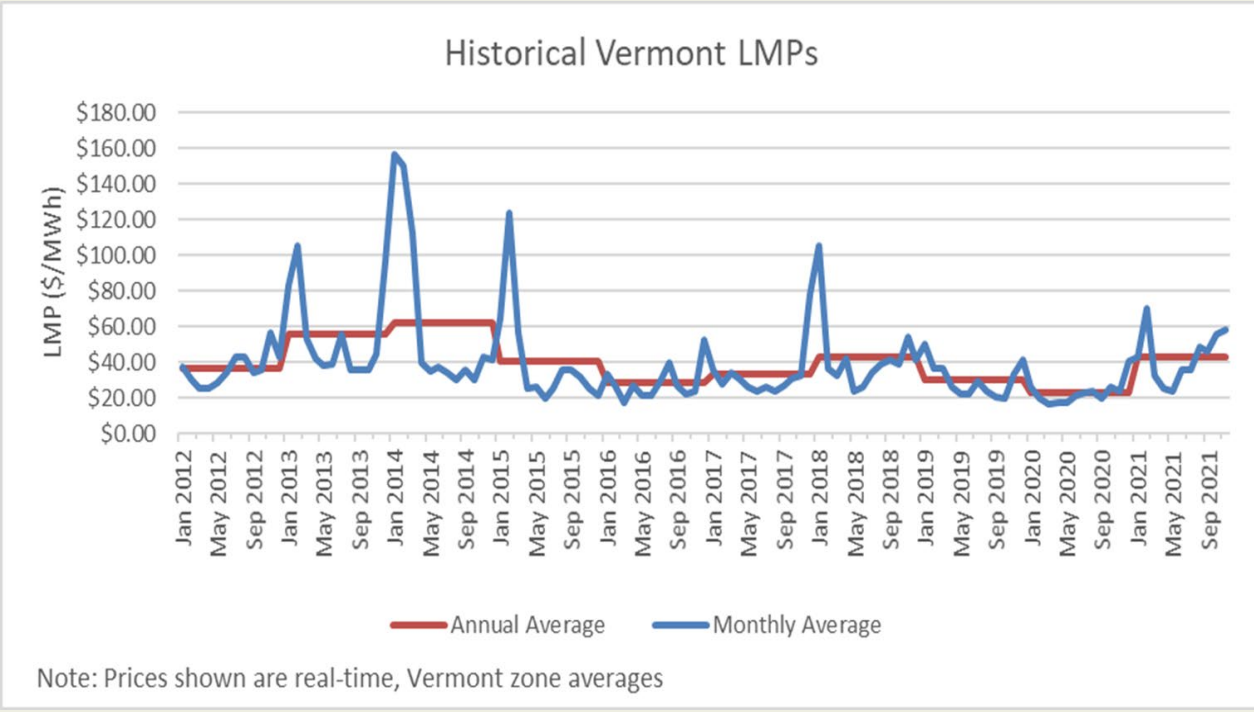
Retail and Wholesale Elec. Costs





Note: Prices shown are real-time, Vermont zone averages

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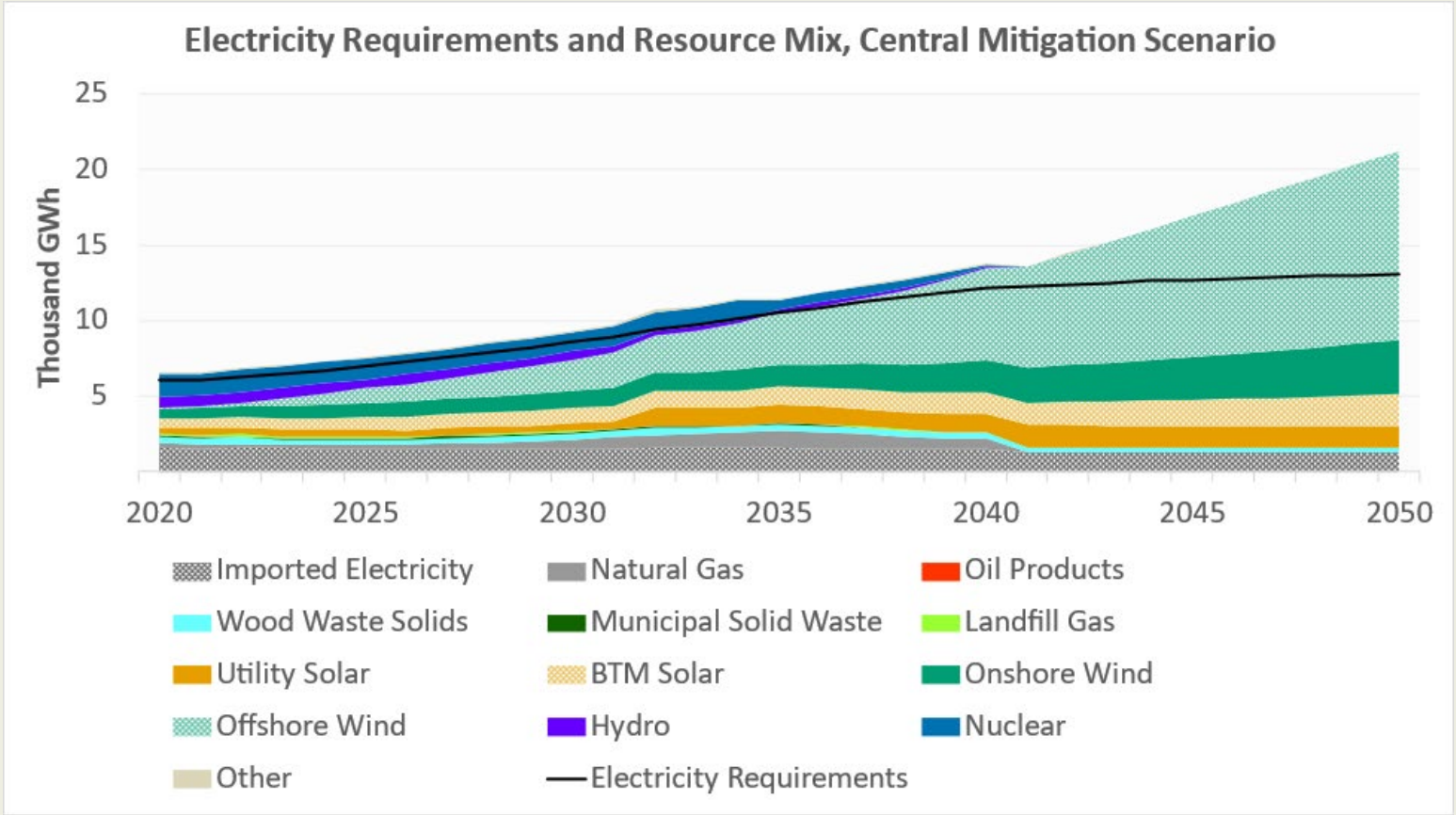

- Limited Load and Resource Management modeled = Opportunity

CEP Electricity: 100% carbon-free by 2032

Pathway: Comprehensive PUC Review of RES Design and Complimentary programs – Options to meet

- Current Programs
  - Net Metering
  - “Community Solar”
  - Standard Offer Program
- Time & Locational Values
- New versus existing generation
- In-state vs. Out-of-State generation

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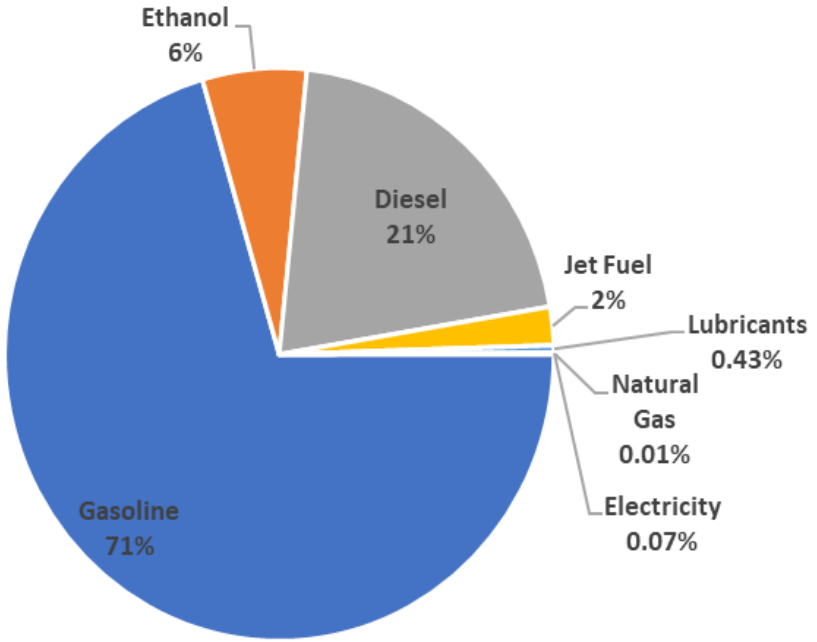
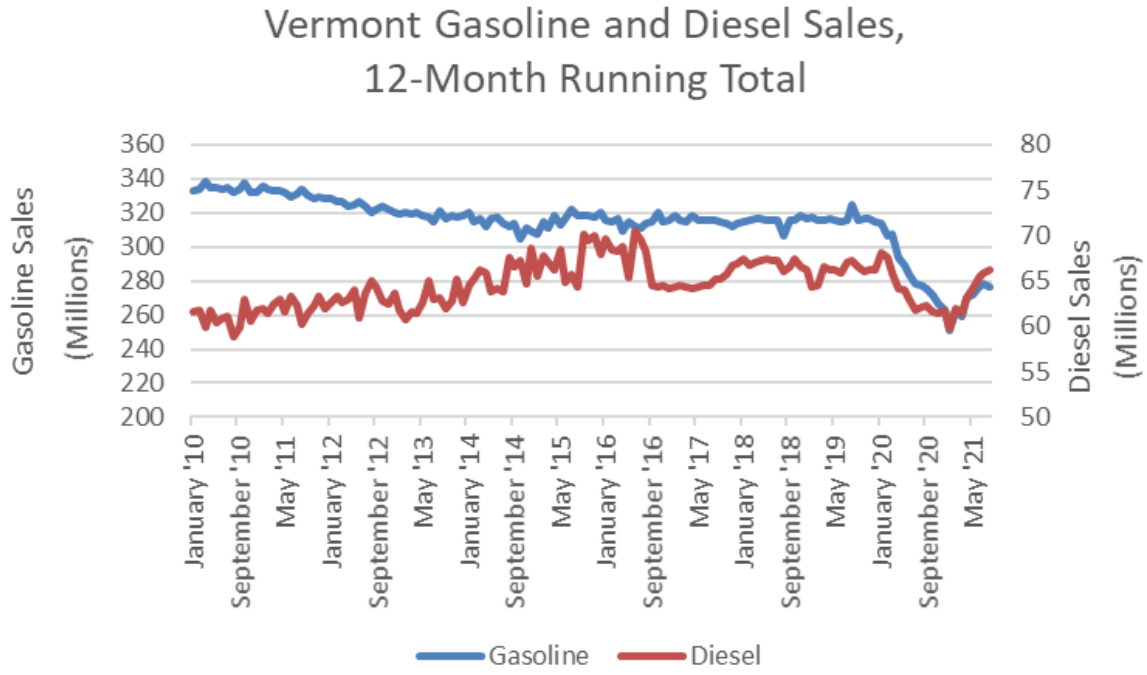
Transportation Currently



2019 Transportation Energy Consumption by Fuel Type



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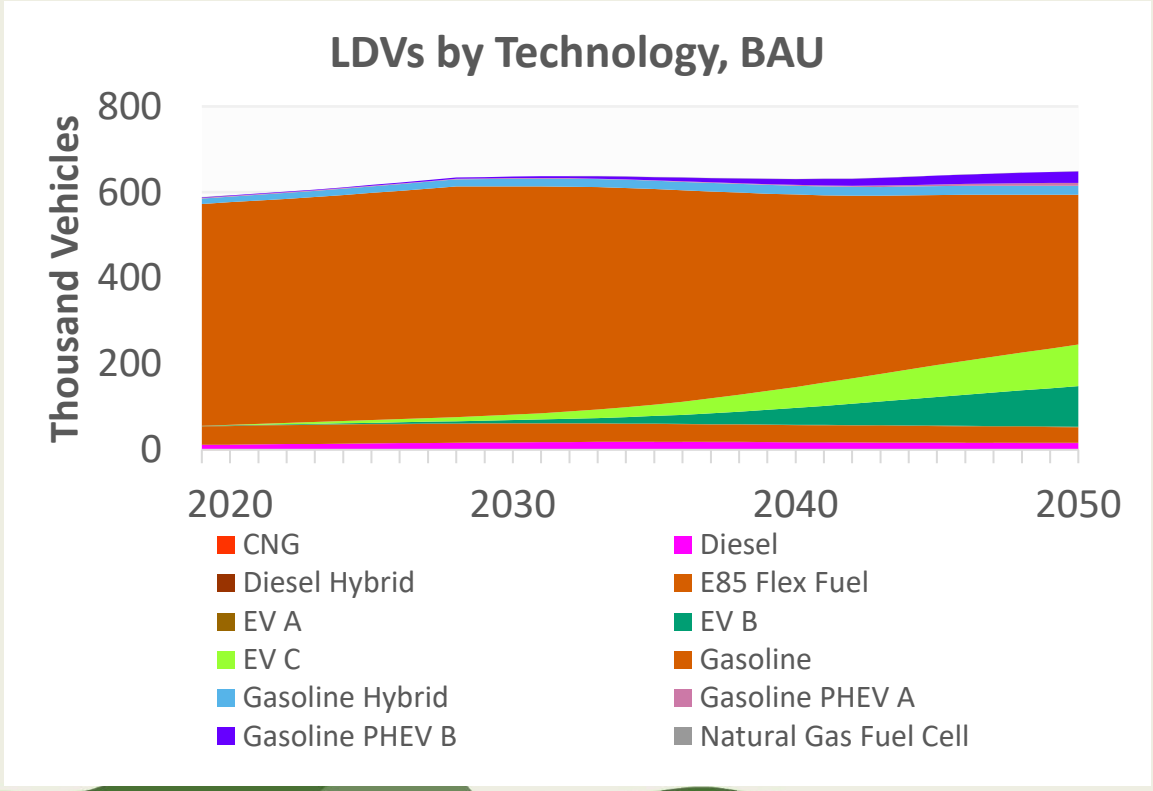
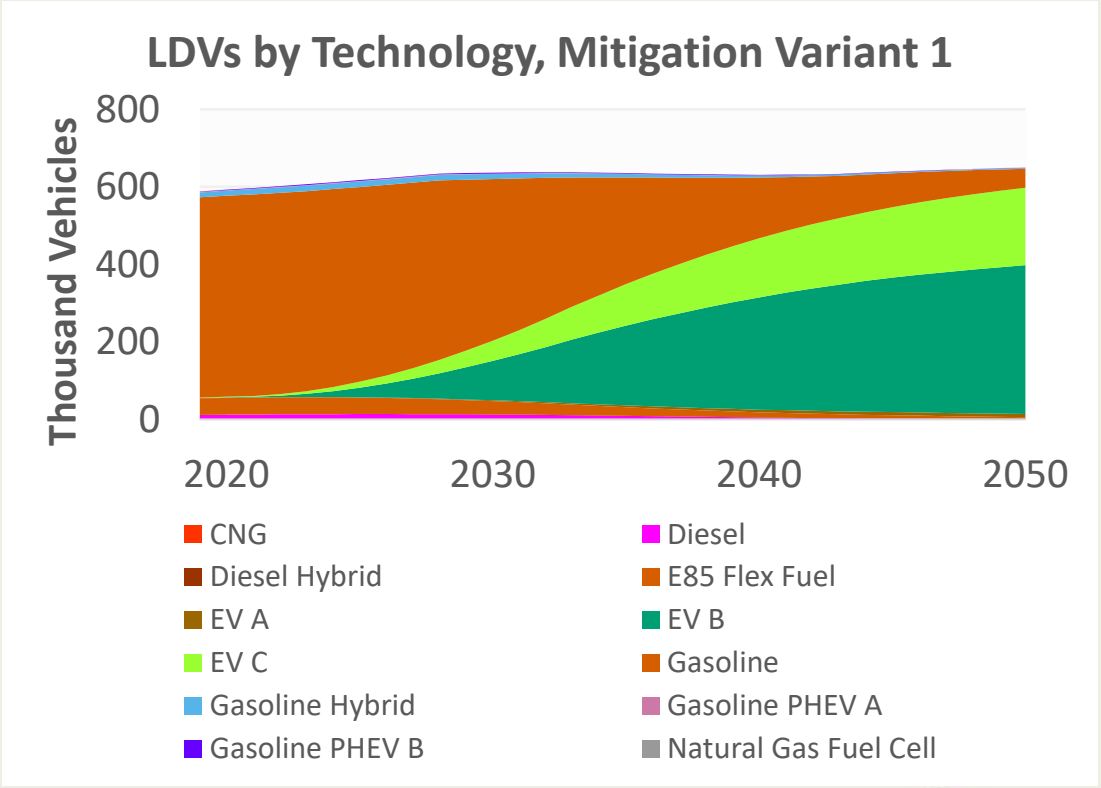
Light-Duty Cars and Trucks by Technology





EV A/B/C = battery electric vehicles with range up to 100/200/300+ miles.
PHEV A/B = plug-in hybrid vehicles with electric range 10+/40+ miles

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CEP Transportation & Land Use (1): GHG Reductions Proportional to GWSA, 100% LD vehicle Sales ZEV by 2035

Pathway: Vehicle Electrification

- Vehicle Incentives (new & used)
  - Light Duty, Medium Duty, Heavy Duty
  - MileageSmart, Replace Your Ride, etc.
- Infrastructure & Policy
  - **Rate Design & Load Control**
  - EV charging price transparency (via AAMF)
  - Dealer Awareness
  - Zero Emission Vehicle MOU
  - Road user charge/T-fund impacts discussed but awaiting VTrans study result

Pathway: Cleaner Vehicles & Fuels

- Participate in regional discussions on federal emissions and fuel economy standards
  - **CA Advanced Clean Cars II Regulations** (100% ZEV sales requirement by 2035)
- Monitor biofuels and low-carbon fuel development

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CEP Transportation & Land Use (2): GHG Reductions Proportional to GWSA, 100% LD vehicle Sales ZEV by 2035

Pathway: System Efficiency via Land Use Settlement Patterns

- Integration of Land Use Planning into Trans Decision Making Frameworks
  - Aligning planning across government agencies
  - Compact Development support
  - Smart Growth Designation programs

Pathway: Increasing Transportation Choices

- Public & Active Transportation Options
  - Public Transit, Rail, Biking & Walking, etc.

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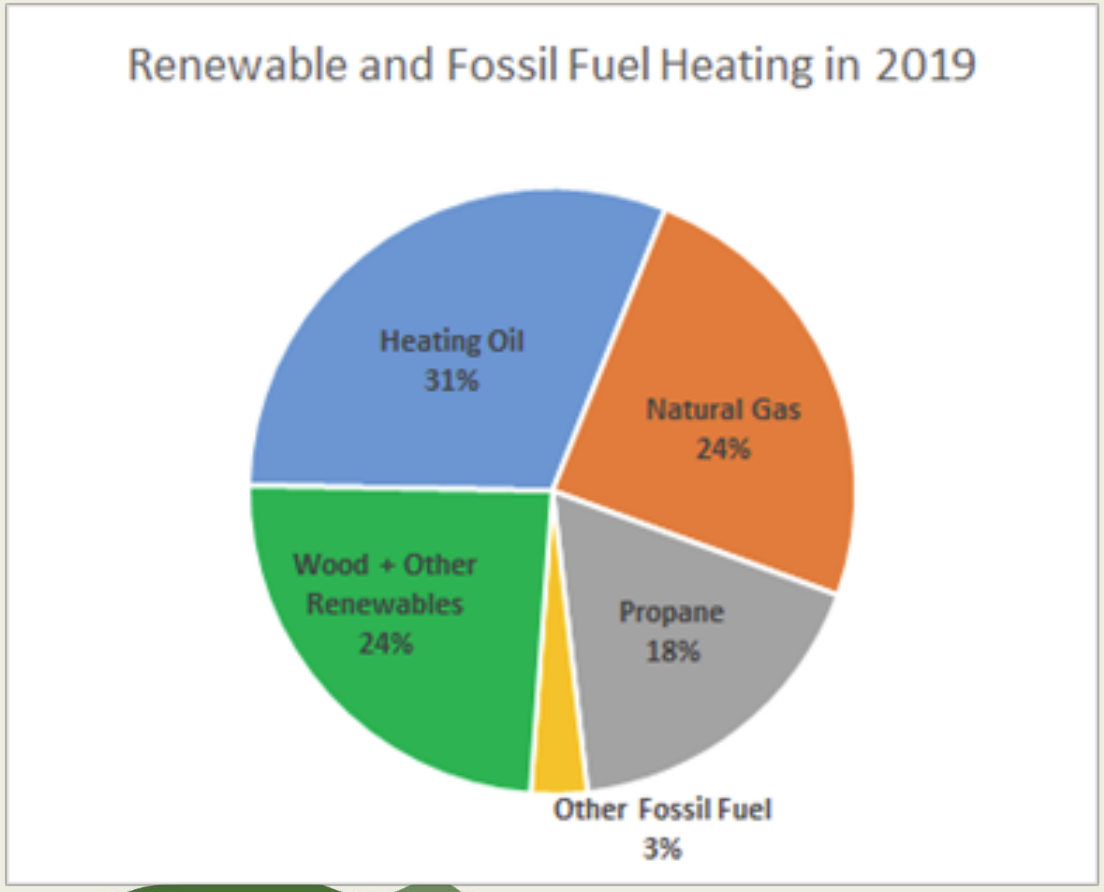
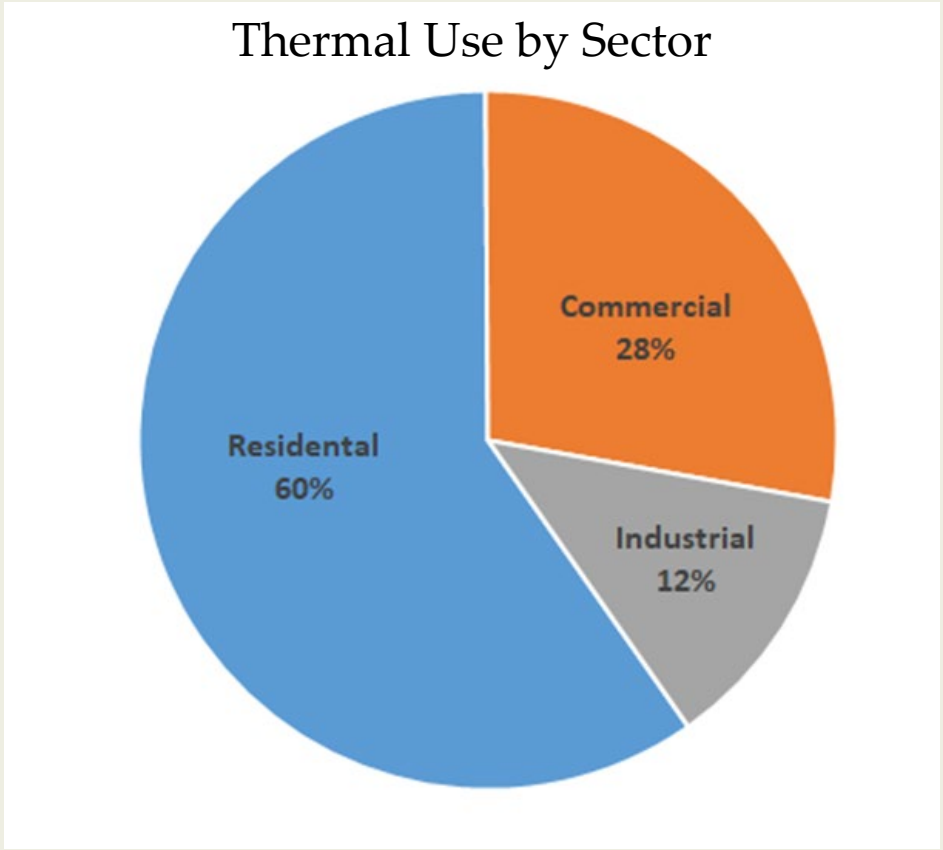
Thermal & Process Supply





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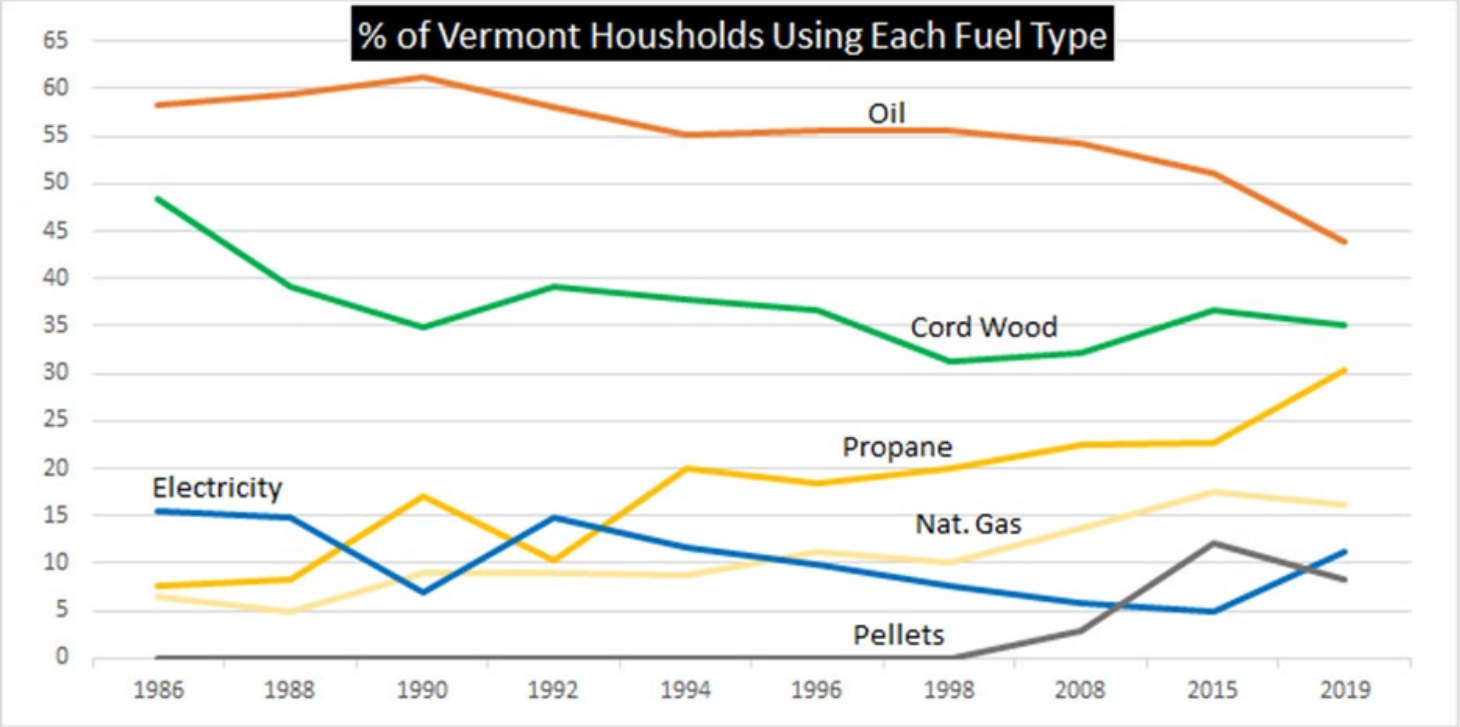
Fuel Types as Primary and/or Secondary Fuel



Sums are greater than 100% because both primary and secondary fuels are shown

https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Wood_Biomass_Energy/Library/2019%20VT%20Residential%20Fuel%20Assessment%20Report%20FINAL.pdf

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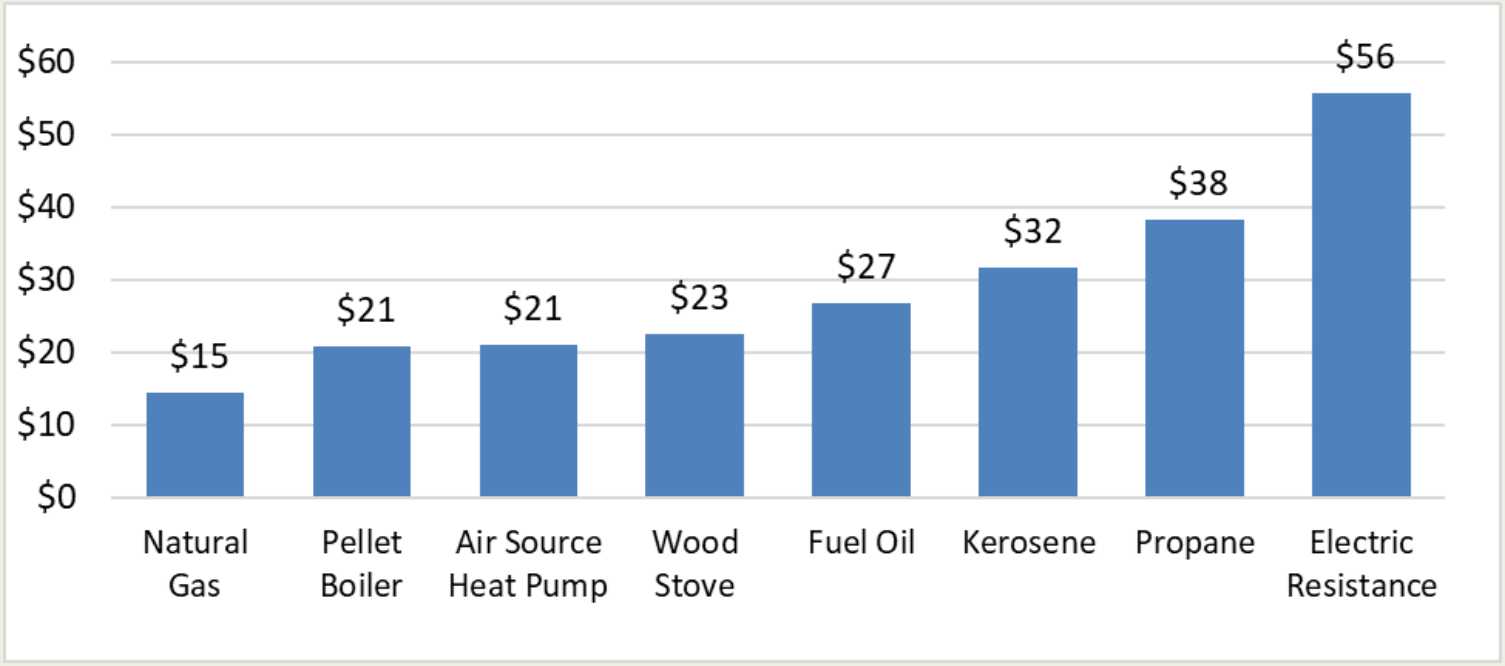
Residential Retail Fuel Prices ($/MMBtu)



CEP Thermal & Process: Goal Increase Renewable Supply to 30% by 2025, 45% by 2032, and 70% by 2042

Pathway: Reduce Energy Demand

- Weatherization at Scale
  - WAP, EEUs, Sustainable Funding, Counseling, Workforce
- Efficient Buildings
  - Building Energy Standards (Net Zero Ready by 2030)
- State Energy Management Program Enhancements

Pathway: Low Carbon Tech & Fuel Choices

- Consider Clean Heat Standard
  - Study, if reasonable then authorization for PUC
- Clean Fuels & Tech
  - ccHP, GSHP
  - Advanced Wood Heat, District Heat
  - Biofuels
  - RNG

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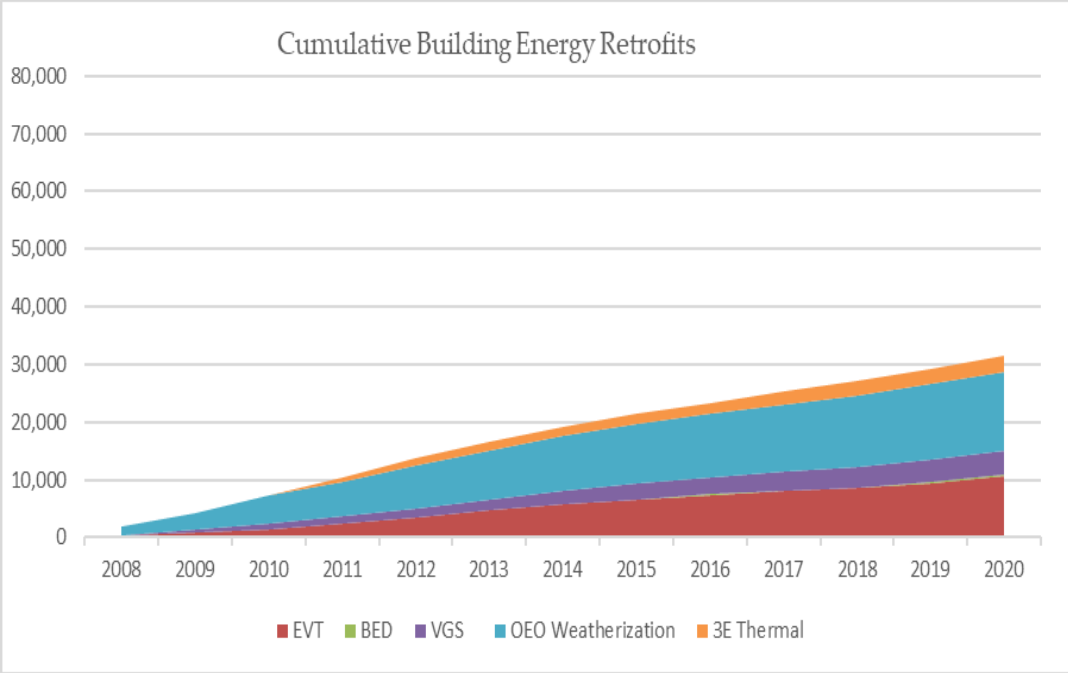
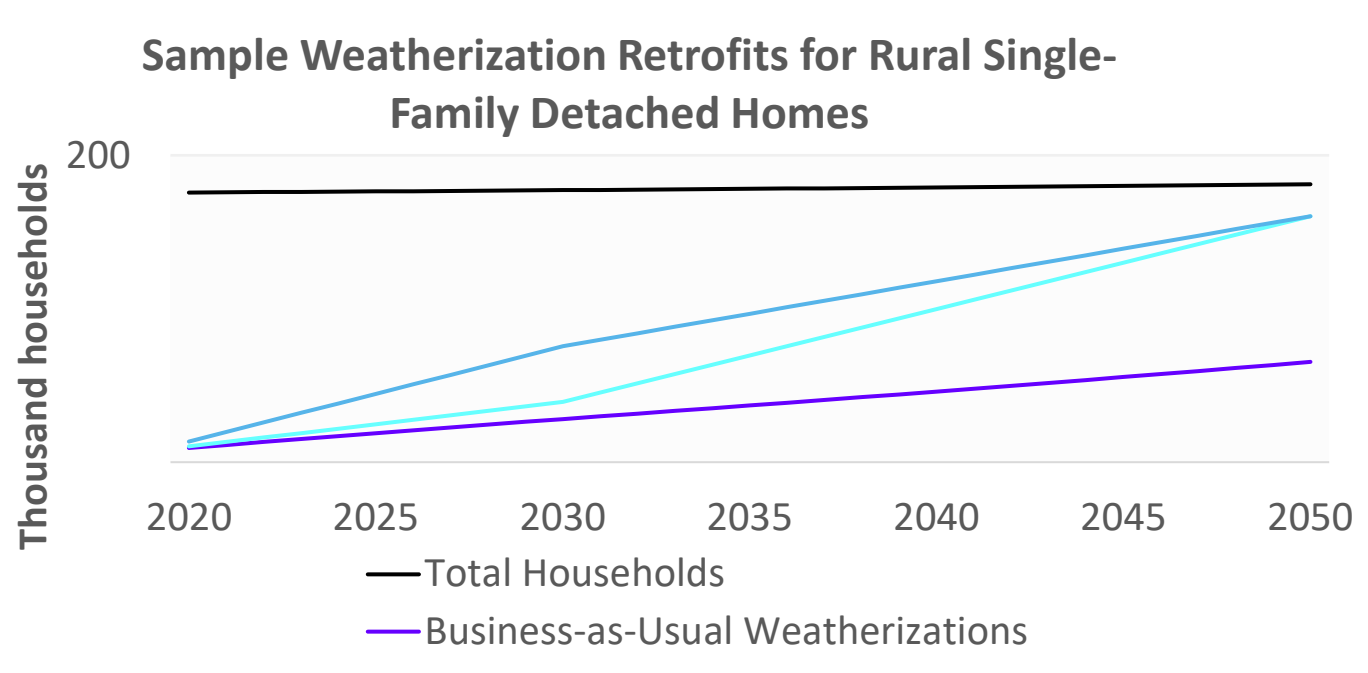
Cumulative Residential Weatherization 2008-2020





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Strategy 6.3.1: Weatherization at Scale

Driving Building Energy Efficiency Through Innovative Partnerships and Sustainable Funding Mechanisms

- Weatherization Assistance Program
- Energy Efficiency Utilities
- Weatherization + Health Initiative
- Climate Change and Insurance Industry
- Weatherization Repayment Assistance Pilot
- Thermal Energy Clearinghouse (www.energysaver.Vermont.gov)
- Energy Counseling Services

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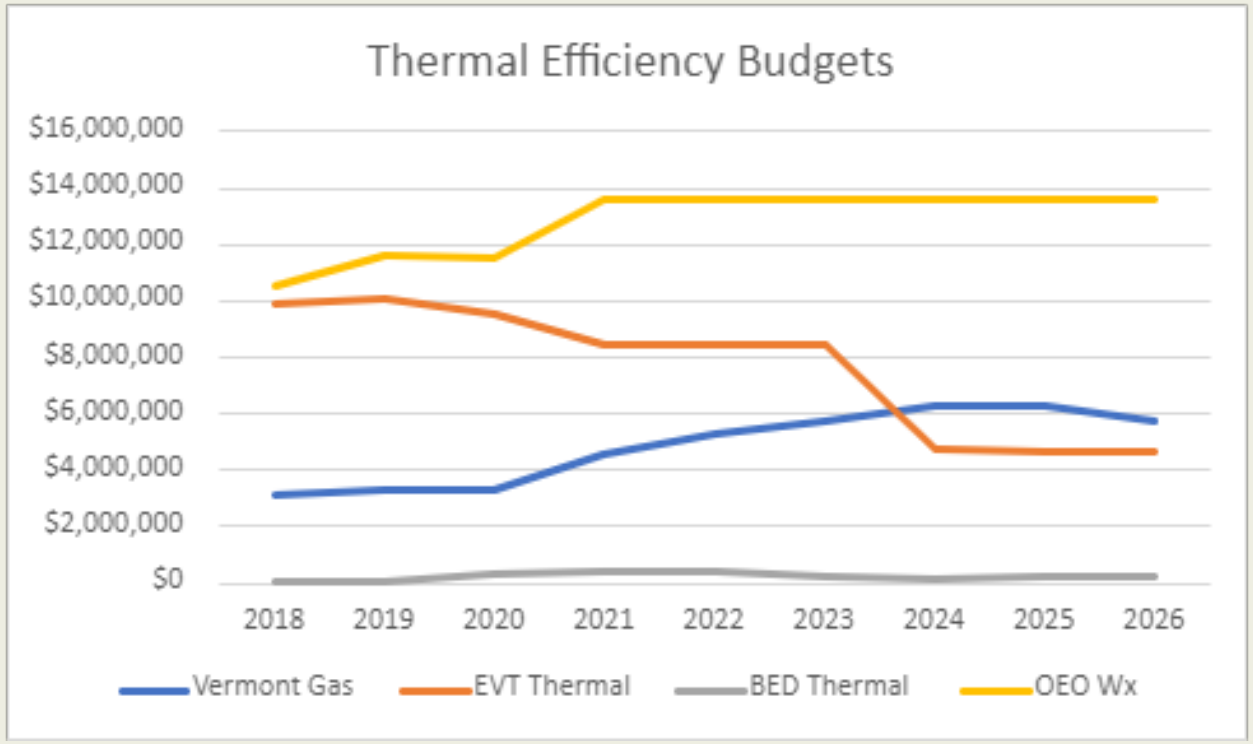
Current Thermal/Process Efficiency Funding



Note: OEO Weatherization is reported on fiscal year, Efficiency Utilities are calendar year

Sources of Funds

- OEO Weatherization
  - Two cents per gallon on fuel oil, propane, kerosene
  - Gross receipts tax on natural gas and electricity
  - Federal Funds
  - FY21 projected and carried forward – uncertain, ARPA not incl.
- Efficiency Vermont & Burlington Electric
  - Revenues from Regional Greenhouse Gas Initiative and Forward Capacity Market
  - *Does not include one-time transfer from electric ratepayers to fund thermal Act 62 of 2019 ($2.25 million)
- Vermont Gas
  - Natural Gas Efficiency Charge

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Strategy 6.3.2: Encourage Efficiency Buildings and Equipment

- Building Energy Standards
- Appliance Standards
- Building Energy Labeling
- Act 250

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Building Energy Standards

- Residential Building Energy Standards (RBES) since 1998
- Commercial Building Energy Standards (CBES) since 2007
- Apply to new construction, renovation, repairs, additions
- No statewide enforcement mechanism
  - Compliance: 90% in commercial, 66% in residential sector
- Residential stretch code – applies to Act 250 projects, can be adopted by municipalities
- Updated every 3-years

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Building Energy Standards

Recommendations:

- Net-zero ready new construction by 2030
- Authorize the Department to adopt a CBES stretch code
- Pass a builder registry requirement
- Consider requiring all new homes to have 200-amp service
- Municipalities should consider permitting and certificate of occupancy
- Municipalities should consider hiring a code official, perhaps regional

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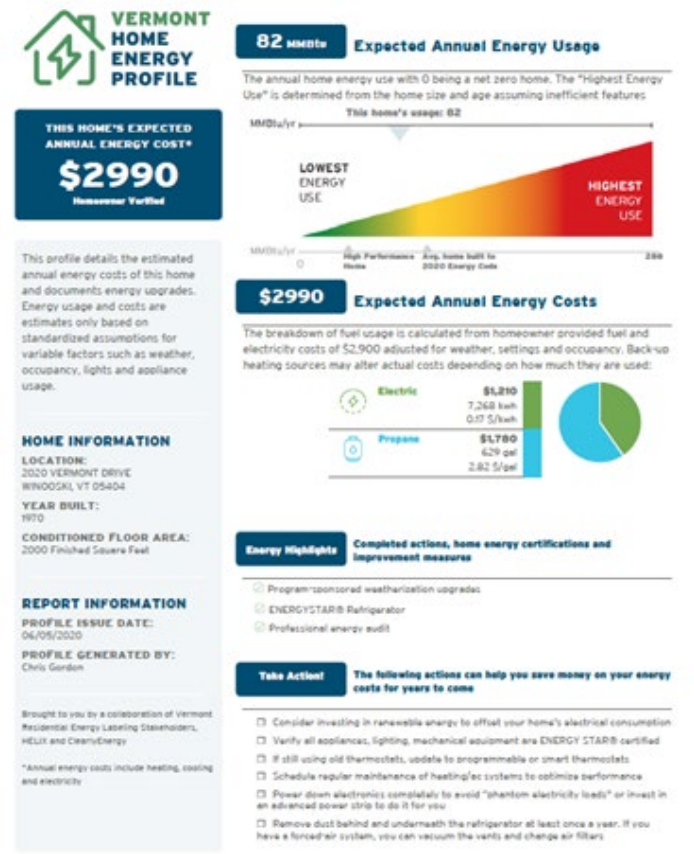
Building Energy Labeling



VERMONT HOME ENERGY PROFILE

THIS HOME'S EXPECTED ANNUAL ENERGY COST*

$2990

Homeowner Verified

This profile details the estimated annual energy costs of this home and documents energy upgrades. Energy usage and costs are estimates only based on standardized assumptions for variable factors such as weather, occupancy, lights and appliance usage.

HOME INFORMATION

LOCATION:
2020 VERMONT DRIVE
WINOOSKI, VT 05404

YEAR BUILT:
1970

CONDITIONED FLOOR AREA:
2000 Finished Square Feet

REPORT INFORMATION

PROFILE ISSUE DATE:
06/05/2020

PROFILE GENERATED BY:
Chris Gordon

Brought to you by a collaboration of Vermont Residential Energy Labeling Stakeholders, HELIX and CleanyEnergy

*Annual energy costs include heating, cooling and electricity

82 MMBtu Expected Annual Energy Usage

The annual home energy use with 0 being a net zero home. The "Highest Energy Use" is determined from the home size and age assuming inefficient features

This home's usage: 82

MMBtu/yr

LOWEST ENERGY USE

HIGHEST ENERGY USE

MMBtu/yr

0

High Performance Home

Avg. home built to 2020 Energy Code

280

$2990 Expected Annual Energy Costs

The breakdown of fuel usage is calculated from homeowner provided fuel and electricity costs of $2,900 adjusted for weather, settings and occupancy. Back-up heating sources may alter actual costs depending on how much they are used:

Electric $1,210
7,268 kwh
0.17 $/kwh

Propane $1,780
629 gal
2.82 $/gal

Energy Highlights Completed actions, home energy certifications and improvement measures

- Program-sponsored weatherization upgrades
- ENERGYSTAR® Refrigerator
- Professional energy audit

Take Action! The following actions can help you save money on your energy costs for years to come

- Consider investing in renewable energy to offset your home's electrical consumption
- Verify all appliances, lighting, mechanical equipment are ENERGY STAR® certified
- If still using old thermostats, update to programmable or smart thermostats
- Schedule regular maintenance of heating/ac systems to optimize performance
- Power down electronics completely to avoid "phantom electricity loads" or invest in an advanced power strip to do it for you
- Remove dust behind and underneath the refrigerator at least once a year. If you have a forced-air system, you can vacuum the vents and change air filters

- Benchmarking of building energy usage - analogous to MPG stickers on cars
- Commercial and Residential reports filed with legislature in January 2021:
  - Both reports recommended a voluntary labeling program
  - Both reports provide a framework for municipalities to use if they adopt an Energy Labeling ordinance (e.g. Montpelier)
  - Residential Working Group created an easy-to-read Home Energy Profile

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State Energy Management Program Enhancements

- Many of Vermont's municipal buildings are old and inefficient. High energy costs for taxpayers mean fewer resources for other priorities. Municipalities lack capacity and resources to assess, plan, and implement complex energy improvement projects to public buildings.
- **Response:** PSD and BGS working with Efficiency Vermont and the Vermont League of Cities and Towns to expand the successful SEMP to municipal buildings (and potentially schools)
  - **Reduce municipal energy consumption and GHGs, save taxpayer funds, increase local jobs, and accelerate the rate of building-efficiency project completion**
- **How**: Replicate the successful SEMP model with new staffing, audit resources, and access to affordable financing

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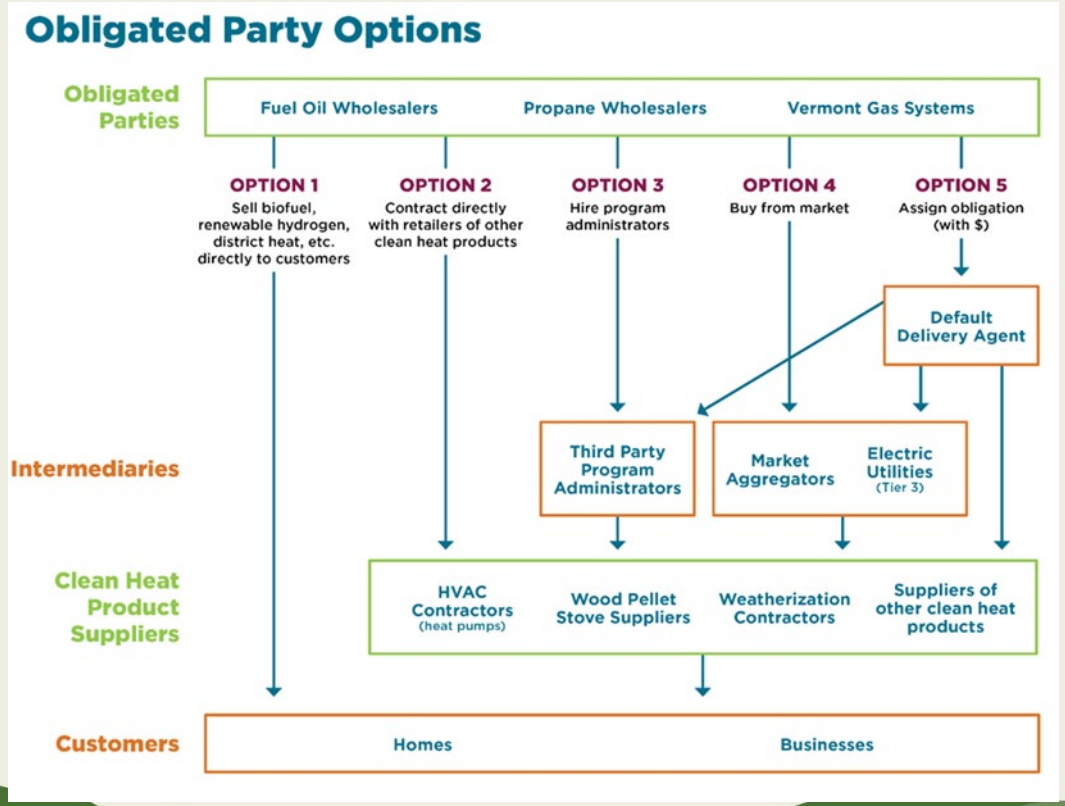
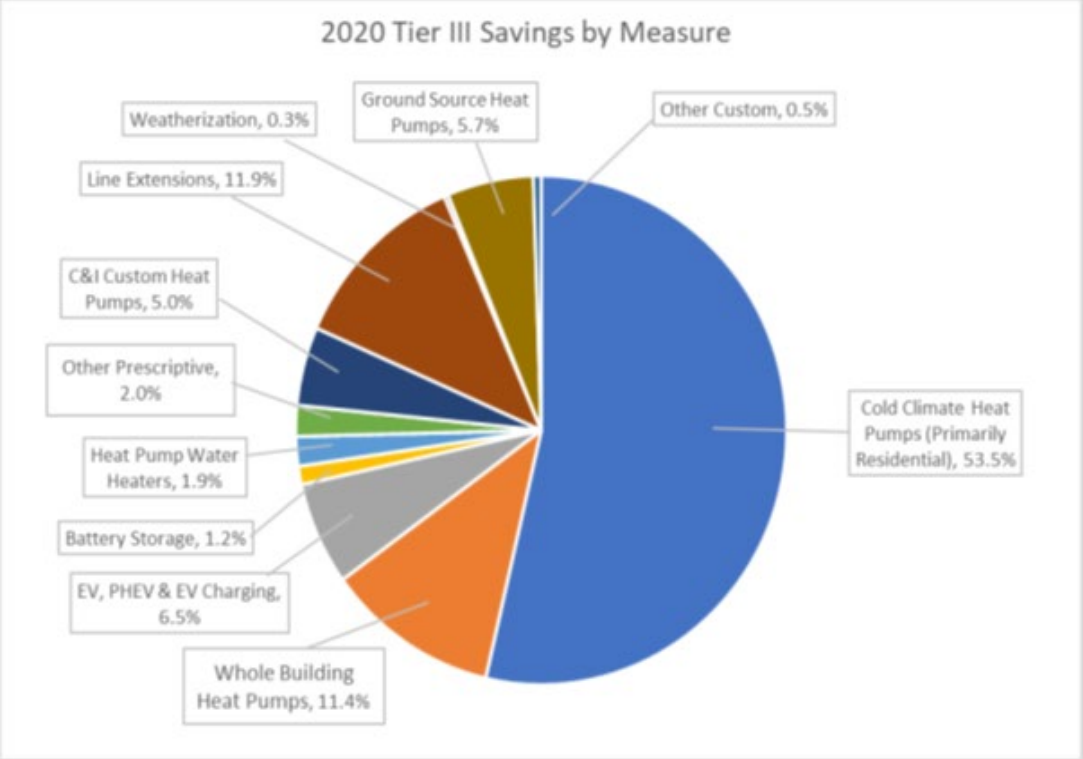
Strategy 6.4.1: Consider a Clean Heat Standard

- PUC Study completed by 2023 of cost, equity implications under various design parameters
- Following review, Legislature determine whether to authorize



Renewable Energy Standard Tier III

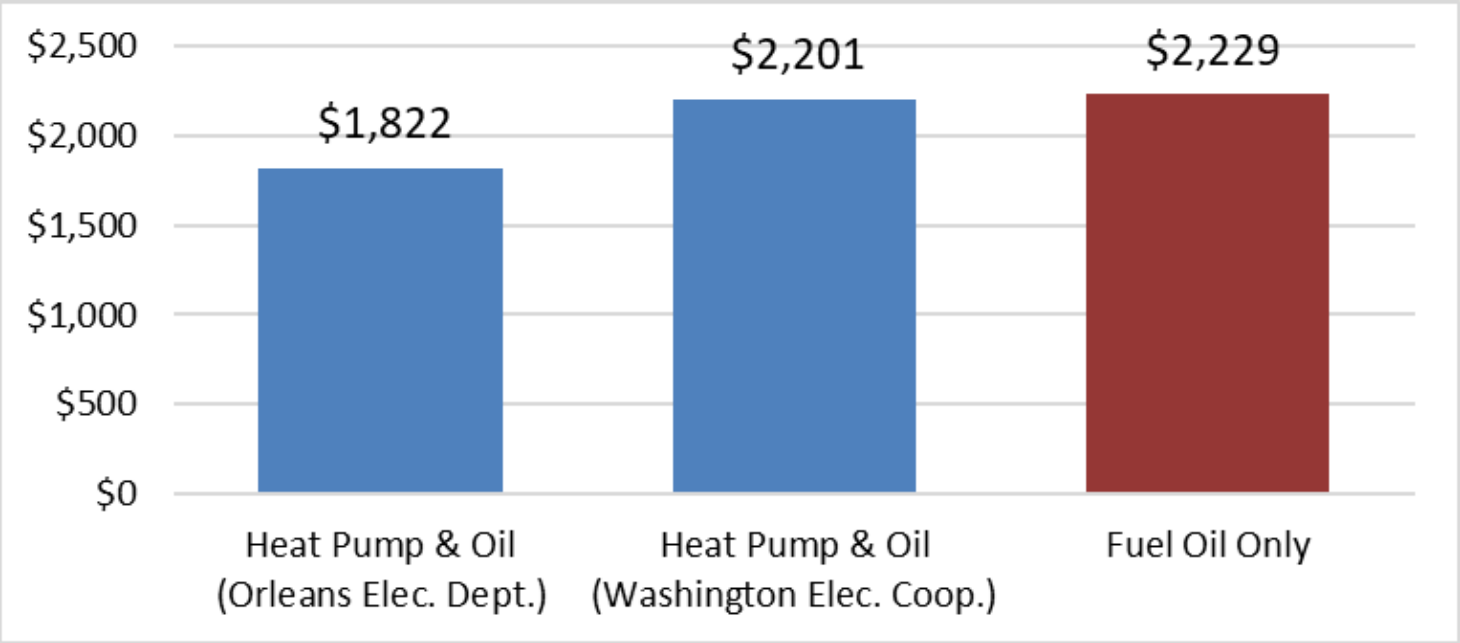


- Tier III is "Energy Transformation" – Reducing fossil fuel use through:
  - Efficiency
  - Biofuels substitution (includes RNG)
  - Electrification
- In practice, Tier III has become almost exclusively an electrification program
  - Electrification measures increase utility revenue, putting downward pressure on rates.
  - In 2020, nearly 75% of fossil fuel savings came from heat pumps, 53.5% from residential cold climate heat pumps

Strategy 6.4.2: Continue to Encourage Cleaner Technologies and Fuels

- Promote Electrification of Thermal Loads
- Develop Advanced Wood Heating Market
- Support District Heat
- Foster Greater Use of Biodiesel
- Support for Natural Gas Alternatives

Residential Heating Cost Comparison



- Underscores need to keep electric costs low
- Assumes:
  - Single mini-split ductless heat pump,
  - displaces approximately 40% of fuel oil demand,
  - fuel oil prices at $3.11.

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Advanced Wood Heat Market

- About 21% of total heating demand currently met by wood
- Goal: meet at least 35% of Vermont's total thermal demand with wood heat by 2030
- AWH uses high efficiency combustion technology, produces low levels of emissions, supports healthy forest ecosystems
- Supports local workforce, retains working forests
- For buildings and process-heat applications where efficient electric heat is not likely to work
- Can help manage peak loads
- Equity: Woodstove change out programs can help low-income and under-served Vermonters convert to healthier, more cost-effective replacements
- Concerns regarding emissions, forest harvesting, and carbon may limit uptake of advanced wood heating

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Thank You!