2022 Vermont Comprehensive Energy Plan
Chapter 6 - Thermal & Process Fuels

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Department of Public Service
Before House Energy & Technology Committee
Jan 25, 2022

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Thermal Energy Use, Emissions, Expenditures

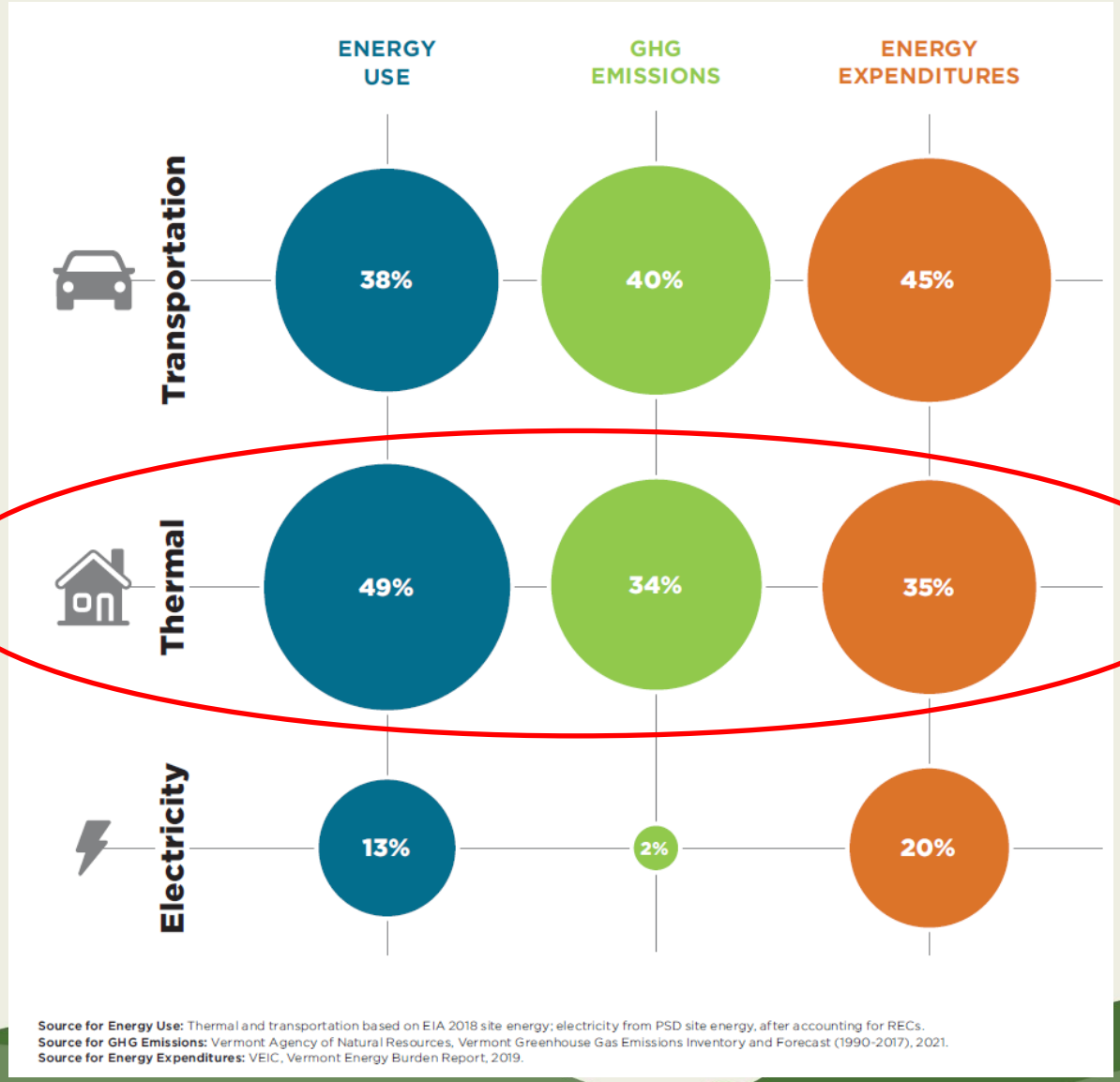

Chart courtesy of Energy Action Network: [Energy Action Network Annual Progress Report for Vermont 2020/2021]

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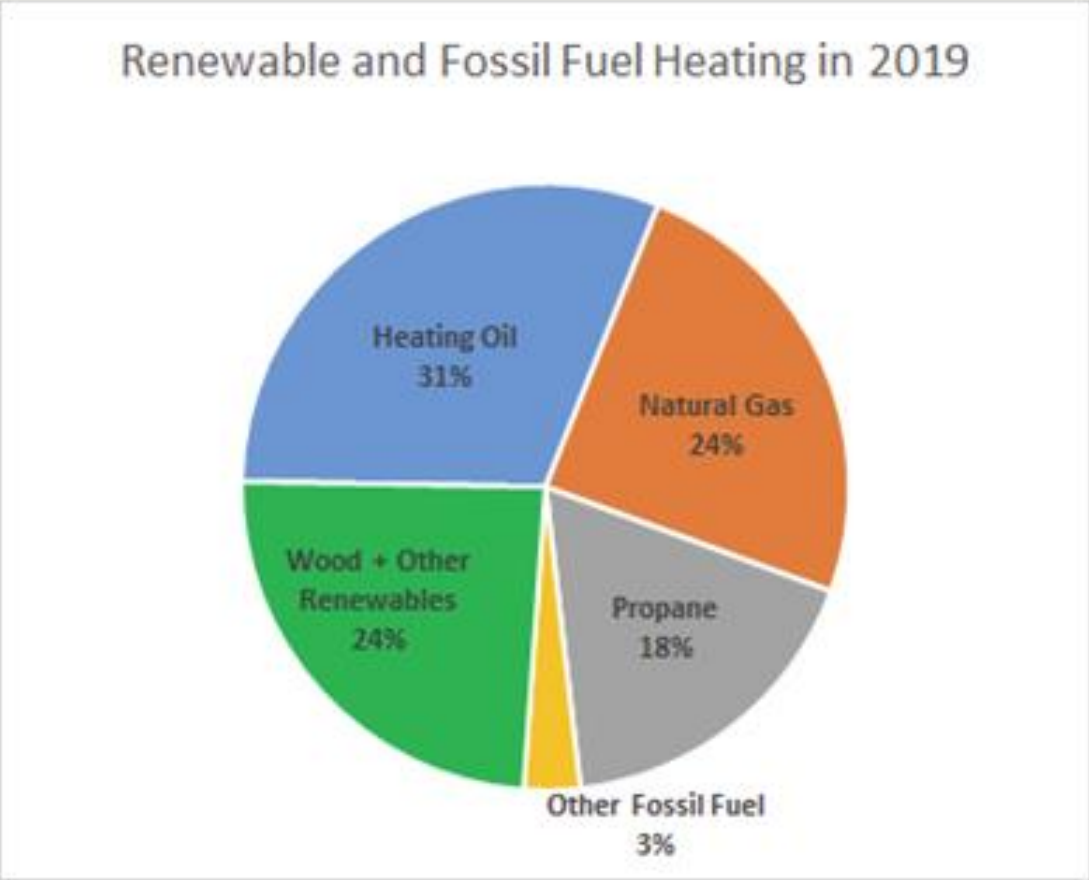
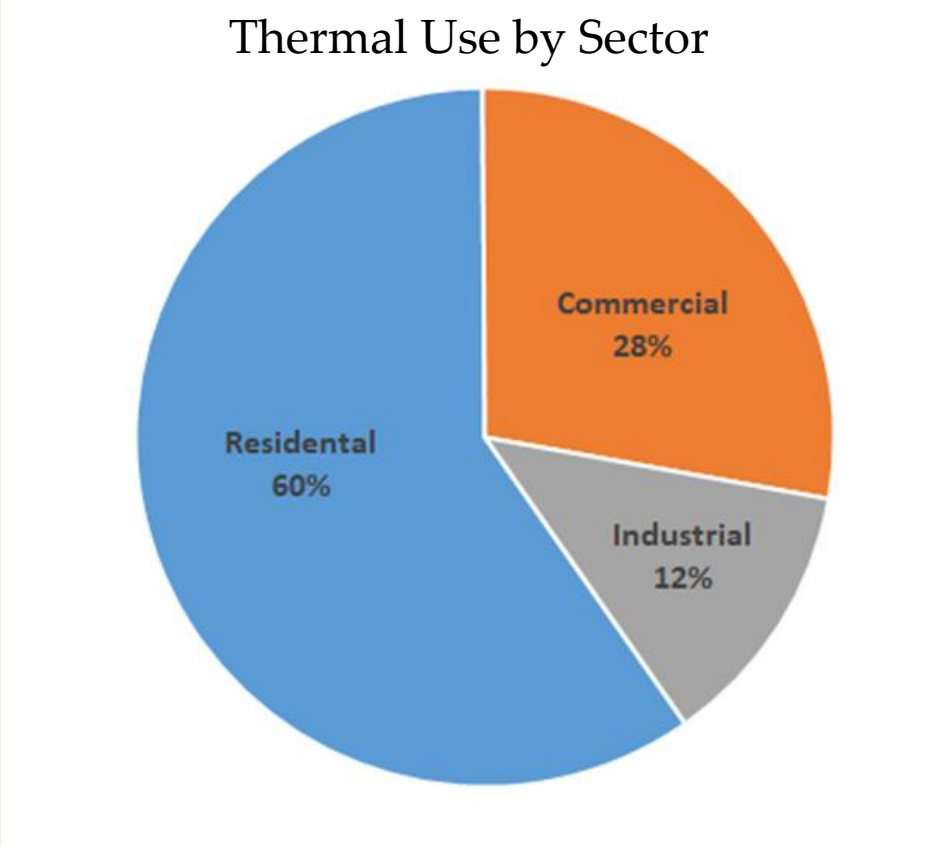
Thermal & Process Supply





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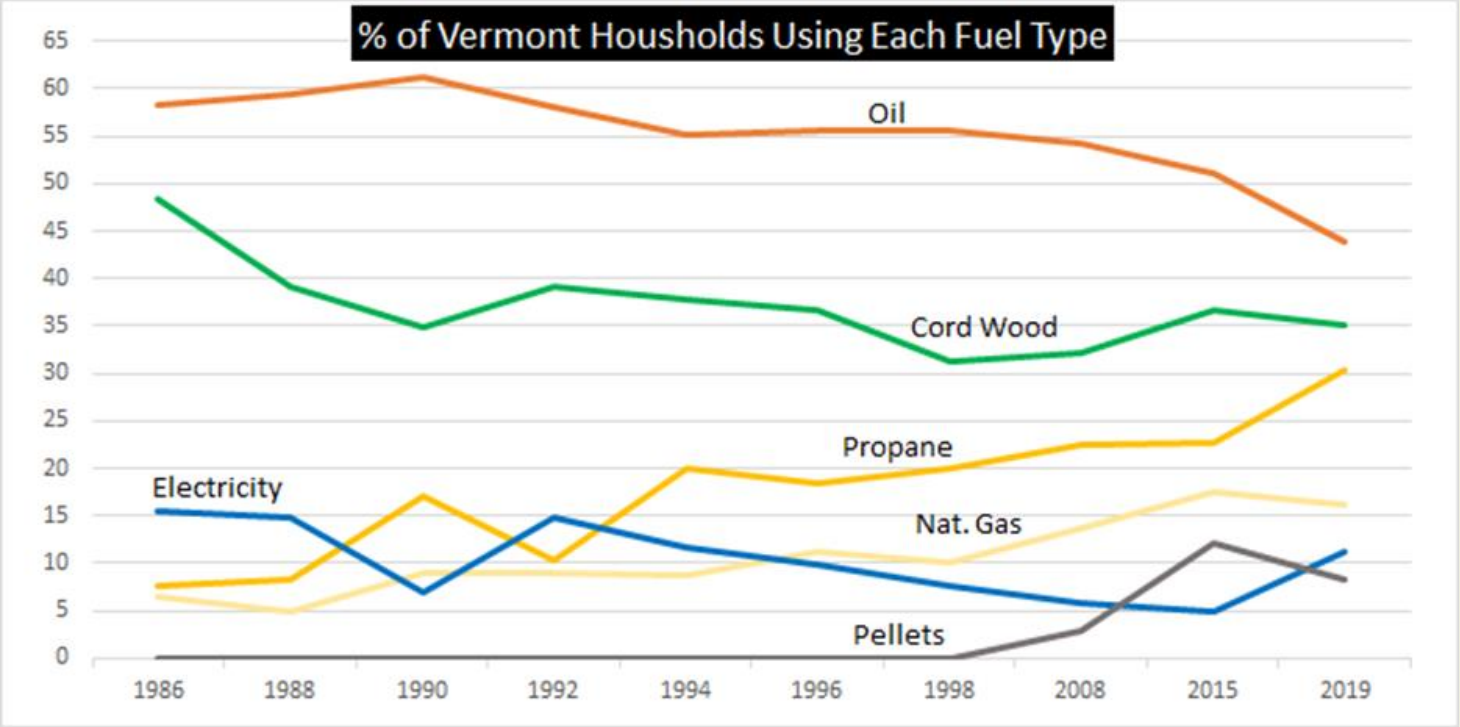
Fuel Types as Primary and/or Secondary Fuel



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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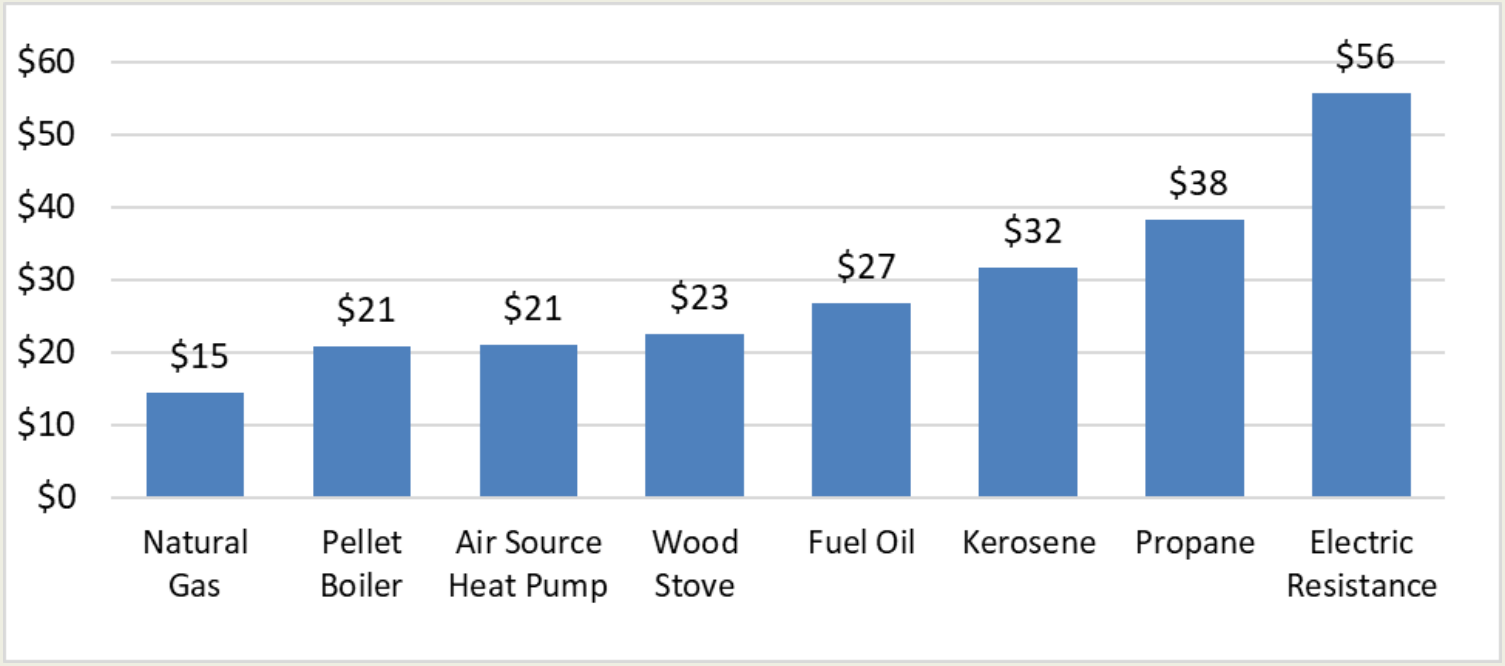
Residential Retail Fuel Prices ($/MMBtu Oct 2021)



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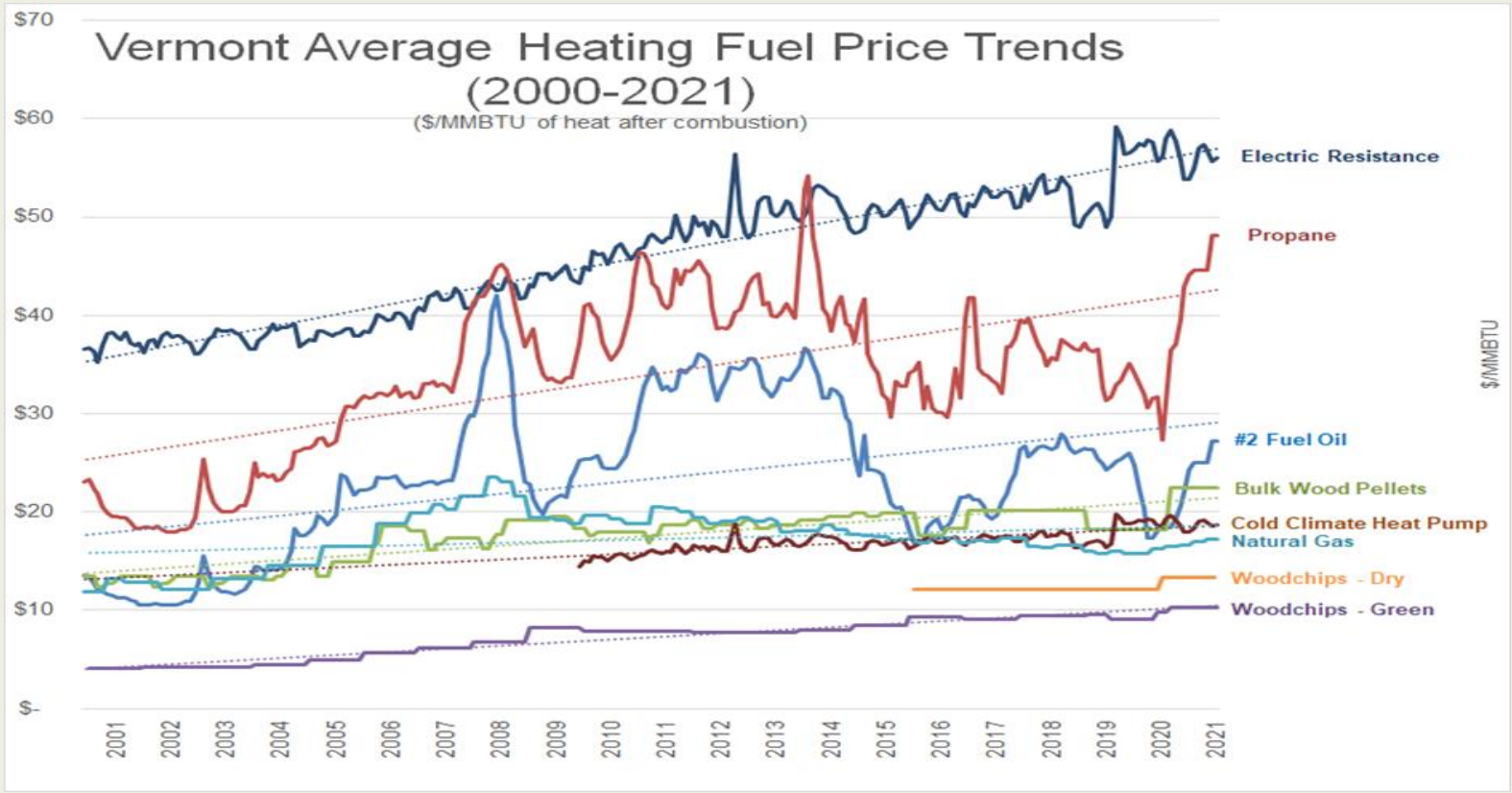
Price Trends



Fuel price data collected in November of 2021 from PSD data, the VT Fuel Price Report, and the U.S. EIA. This exhibit has some different $/MMBTU than previous slide mainly due to the differences in fuel prices between October and November 2021.

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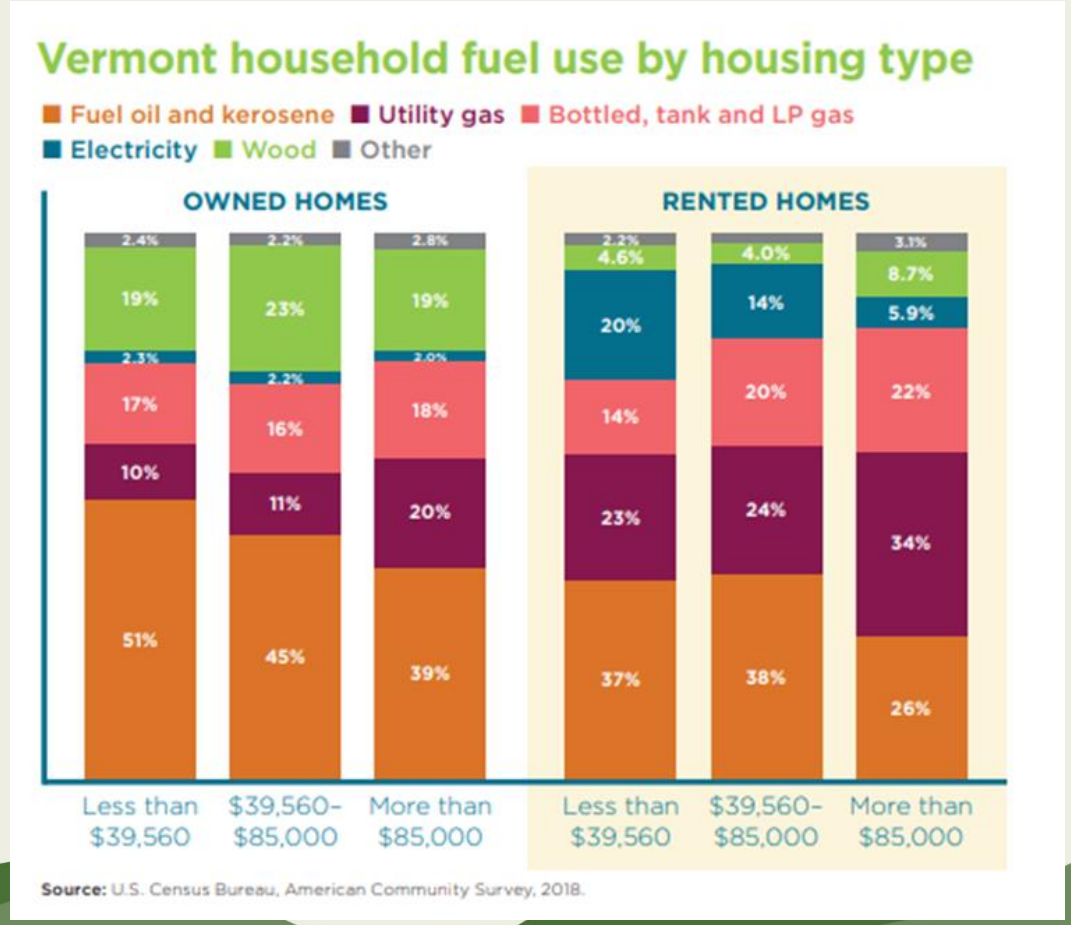
Vermont Fuel Use by Housing Type

- 73% own, 27% rent
- Lower-income households disproportionately using fuel oil
- Compared to rental properties, owned homes are more likely to heat with wood and less likely to heat with electricity. (often electric resistance)



Energy Action Network Annual Progress Report for Vermont 2020/2021.
https://www.eanvt.org/wp-content/uploads/2021/05/EAN-APR2020-21_web-1.pdf

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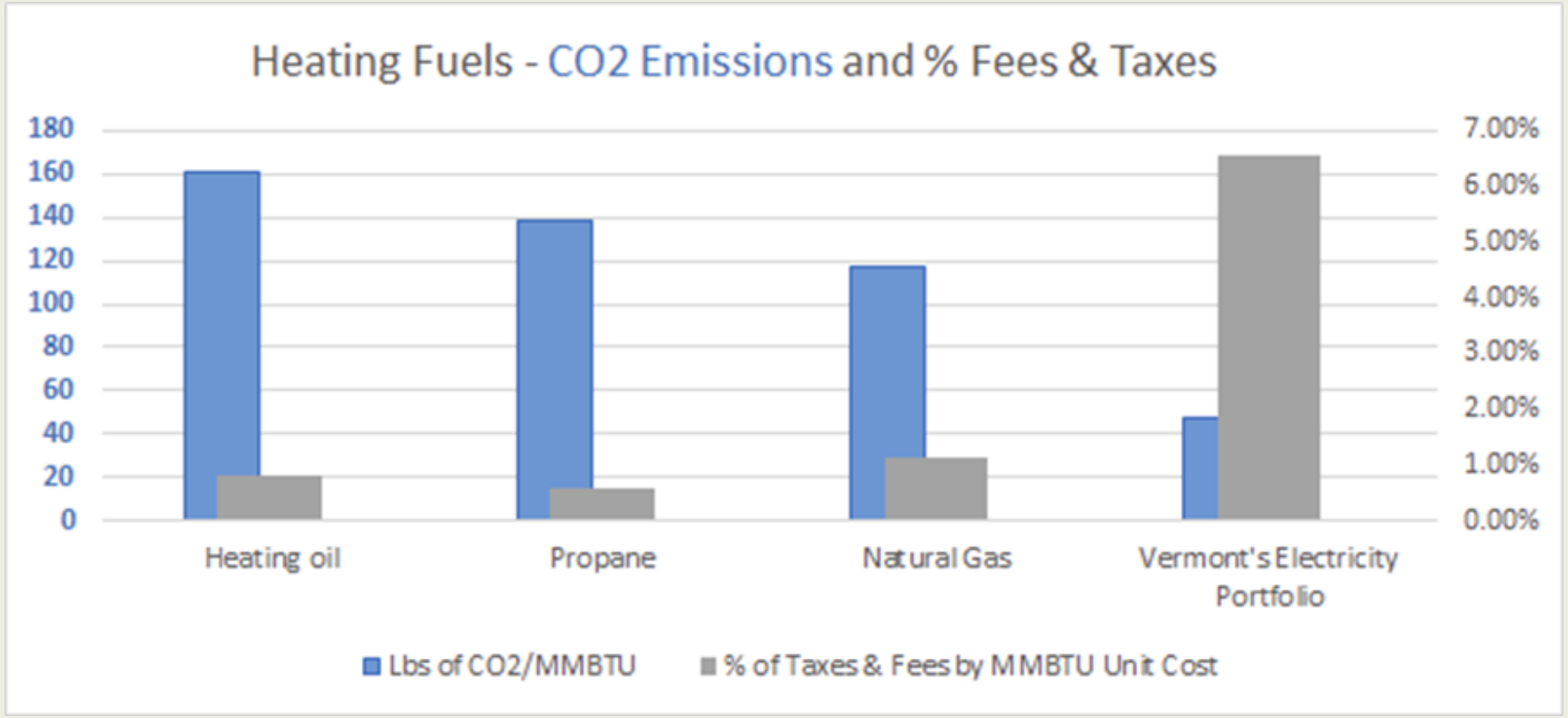
Thermal Fuels by CO2 emissions and amount Taxed as % of price



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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
  - Hydrogen

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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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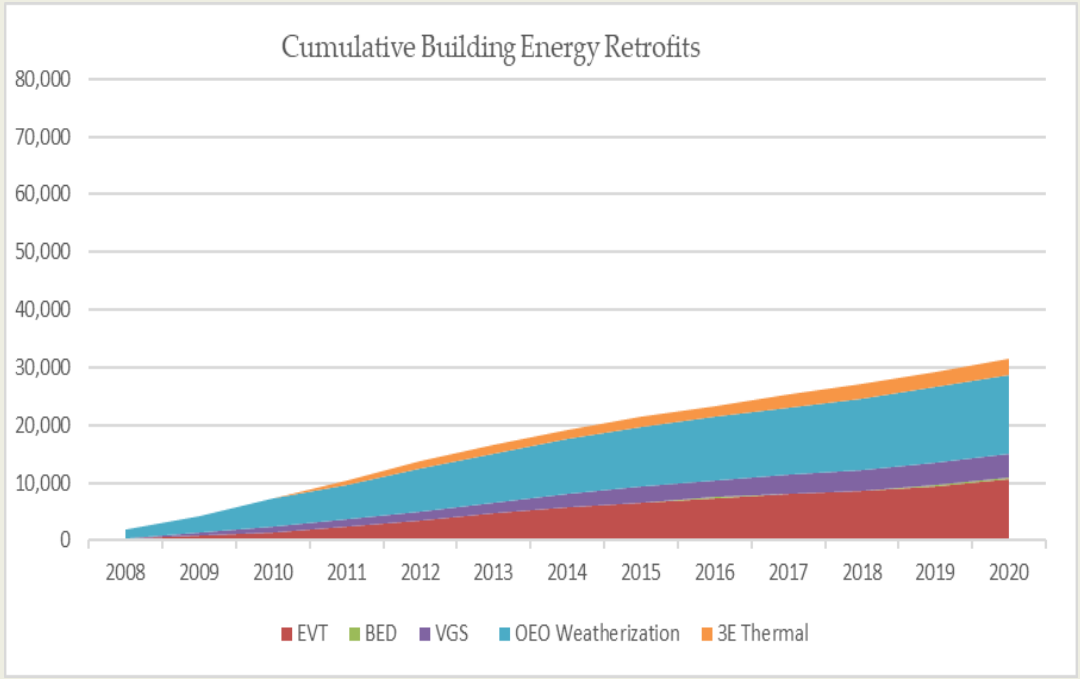
Cumulative Residential Weatherization 2008-2020



<-- 10 V.S.A. § 581 Goal:
80,000 homes weatherized
by 2020

2022 CEP sets a new goal:
120,000 homes weatherized
by 2030

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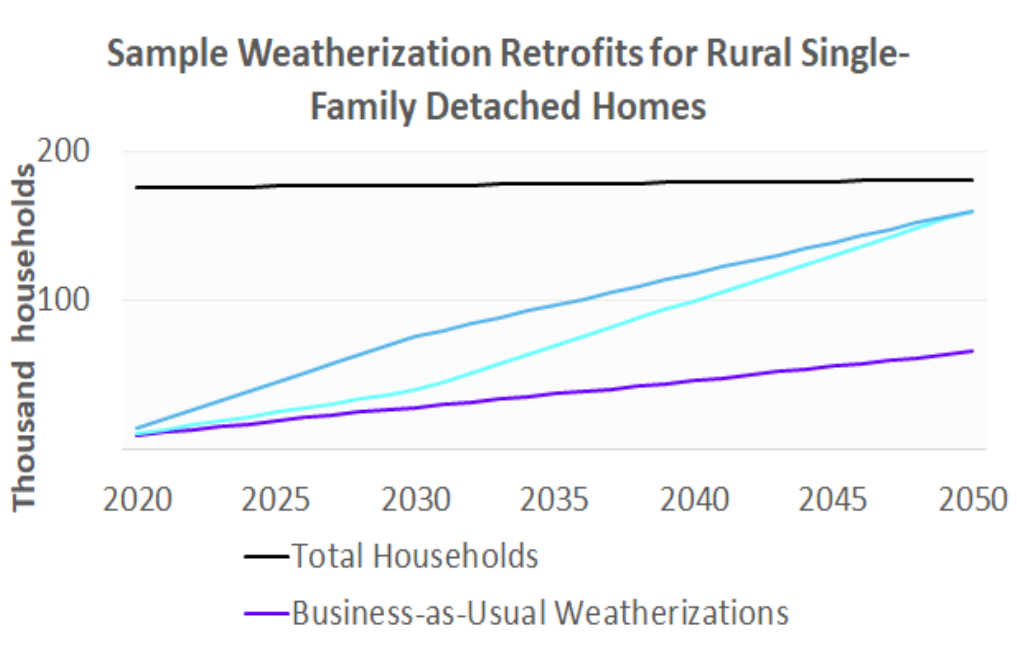
Residential Weatherization 2022-2050



How do we get there?

- Increased funding – 2020 ARPA Allocation
  - $4 million to OEO W/x Assistance Prog.
  - $9 million to VHFA to support W/x financing
  - $5 million to VEIC for W/x incentives
- Ramp up WAP and EEU programs
  - **Governor Proposed $80million for Weatherization**
  - On PSD Rec: VGS doubling its Home Retrofit prog.
  - New Long-Term Sustainable Funding needed
- Workforce Development
  - $2 million to PSD -> EVT for Workforce Dev. Initiatives and NeighborWorks
  - EAN Climate Workforce Coalition

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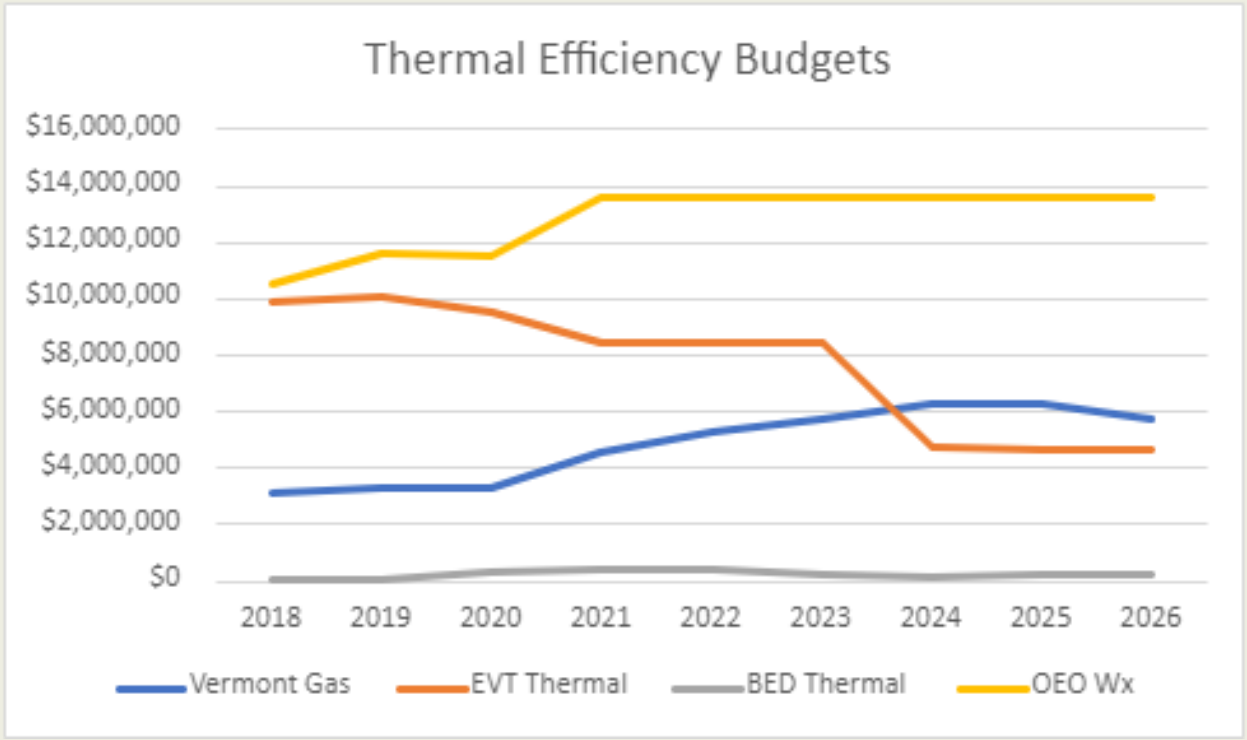
Current Thermal/Process Efficiency Funding



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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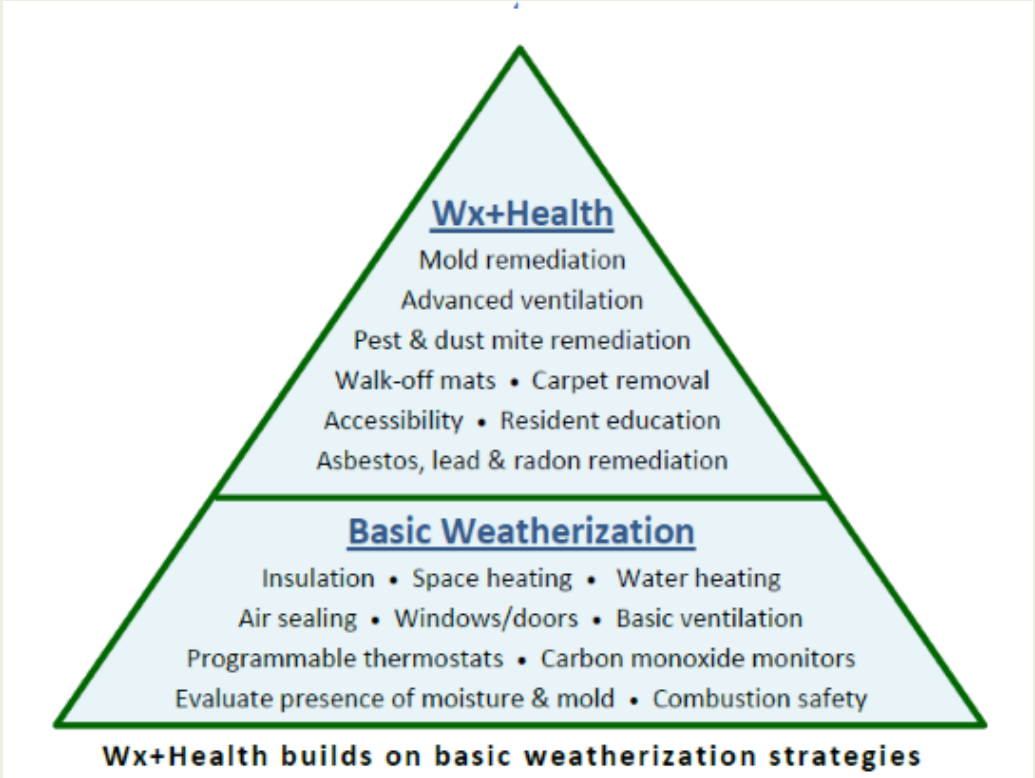
Example: Sustainable Funding - Weatherization + Health Initiative

- Poorly insulated and ventilated buildings increase the incidence and severity of asthma, heat-related stress, viral transmission, and other conditions. Insufficient funding to upgrade the number of houses required.
- **Response:** PSD, VDH, and OEO partnership to form *Weatherization + Health Initiative* (WHI) to leverage current resources to increase healthcare sector investment in energy-saving weatherization improvements
  - **More weatherized homes and better health outcomes**
- **Why Pursue?** Opportunity for "win-win" solutions where investments from healthcare system complement resources for weatherization to generate energy cost savings, healthcare savings & GHG reductions
- **How?** Work with key weatherization and healthcare system stakeholders to design next generation projects that build on pilot projects by NeighborWorks of Western VT, Rutland Regional Medical Center, Efficiency Vermont, Northern Vermont Regional Hospital, and the Weatherization Assistance Program



Wx+Health builds on basic weatherization strategies

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Strategy 6.3.2: Encourage Efficiency Buildings and Equipment

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

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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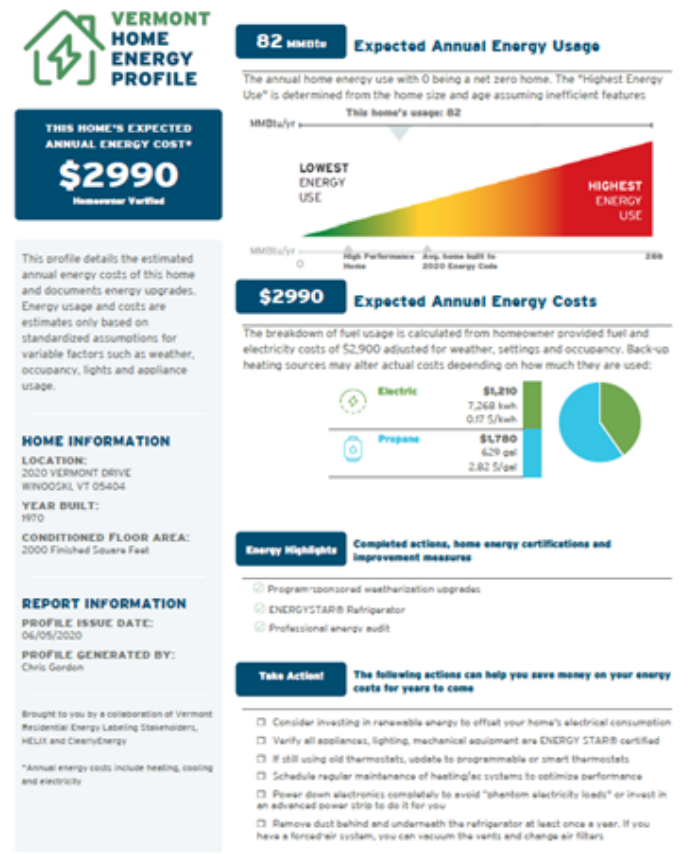
Appliance Standards

- Highly cost-effective policy for reducing energy, water and water heating costs
- The Vermont legislature has passed two bills:
  - Act 42 of 2017 adopted federal efficiency standards for many appliances in the event that the federal standards were repealed or voided
  - Act 139 of 2018 adopted efficiency standards for 17 appliances, plumbing and lighting equipment not covered by federal standards.

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

250

$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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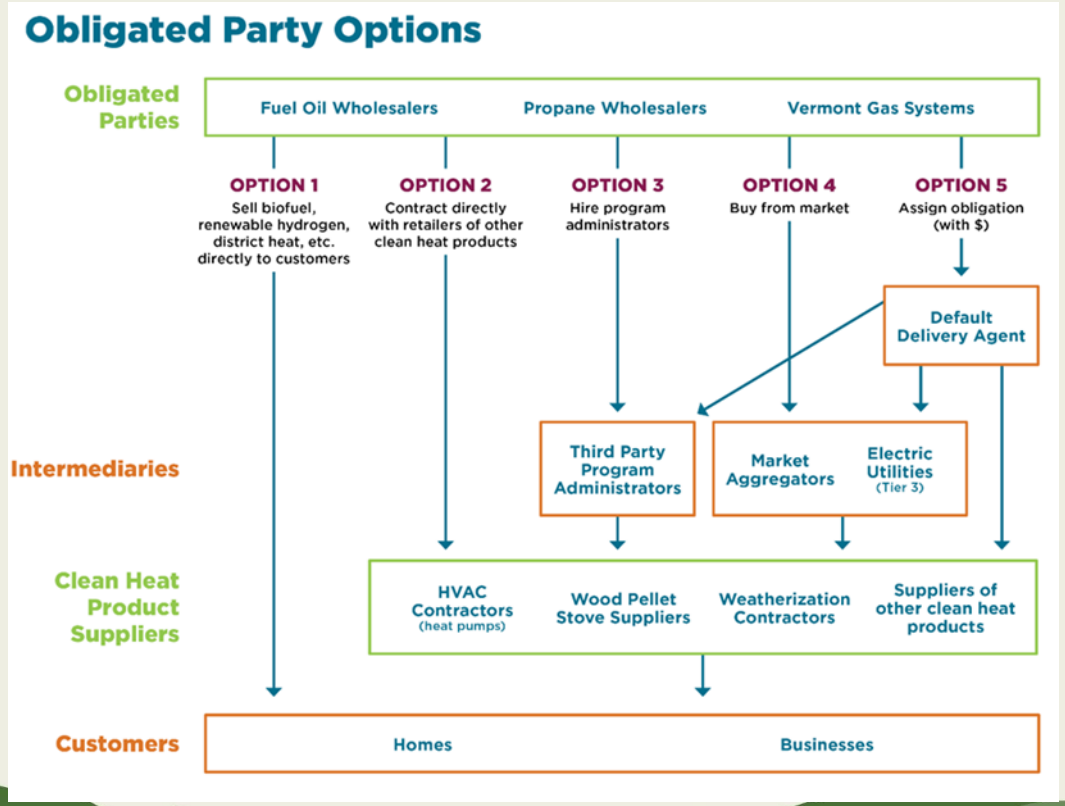
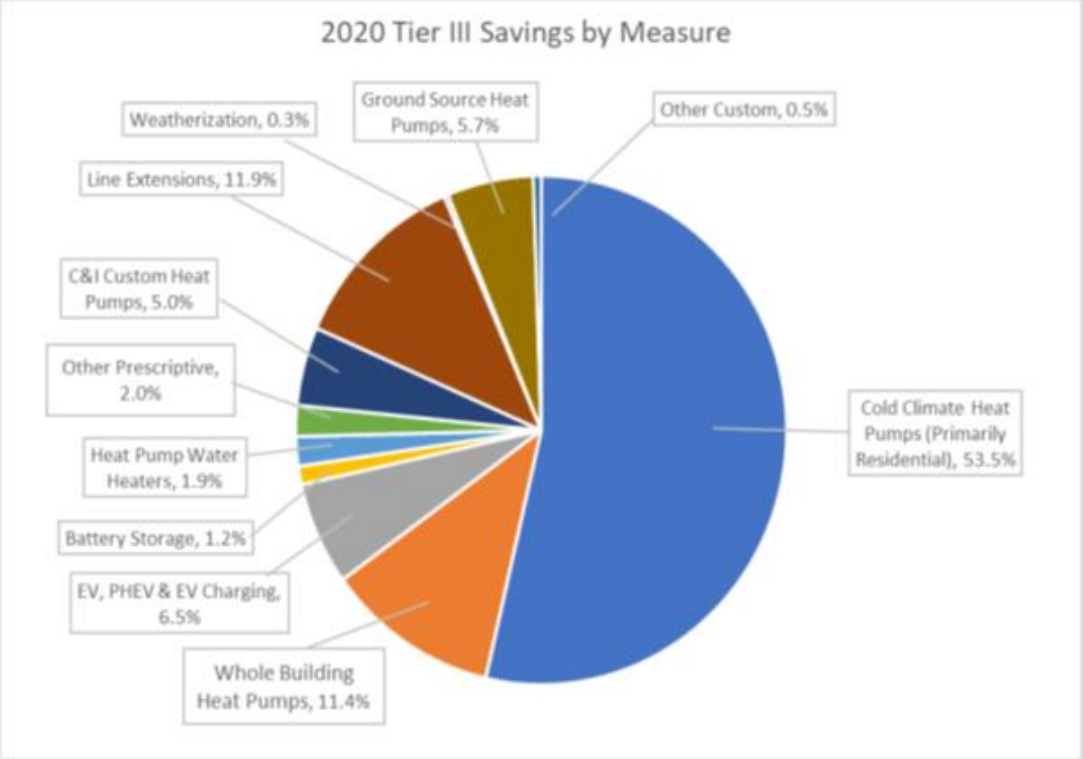
Strategy 6.4.1: Consider a Clean Heat Standard

- 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

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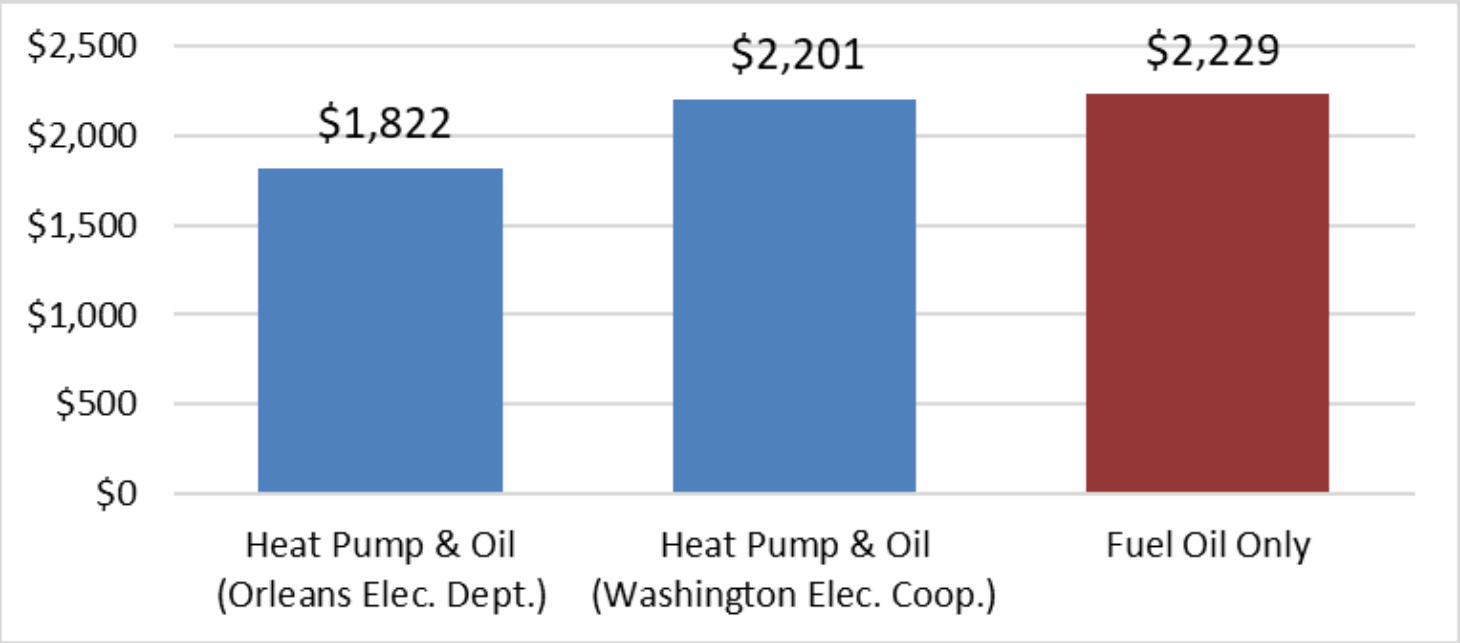
Strategy 6.4.2: Continue to Encourage Cleaner Technologies and Fuels

- 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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Natural Gas

- Natural gas is limited to only the northwestern corner of the state (55,000 customers).
- NG prices are cheaper per Btu and less volatile than heating oil or propane
- NG produces lower burner tip emissions than other fossil fuels
  - Climate Council evaluating upstream/lifecycle emissions
- Vermont Gas is a regulated utility – the sole NG utility in Vermont
- VGS' Climate Plan: carbon-neutral by 2050 through:
  - Energy efficiency (EEU)
  - Replacing fossil NG with Renewable NG, syngas and hydrogen

Renewable Natural Gas & Hydrogen

- Renewable natural gas (RNG), is produced by the anaerobic breakdown of organic waste
- Feedstock for RNG can come from farms, landfills, and wastewater treatment plants, among other sources.
- RNG can be injected directly into the natural gas distribution pipeline
- RNG consumption is currently voluntary and comes with a price premium (currently 3x)
- VGS plans to increase RNG to 20% of its supply mix for retail customers by 2030
  - An RNG potential study proposed by PSD and ordered by the PUC
- Hydrogen made by renewable electricity is completely carbon free, but the technology is in its infancy.

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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Biodiesel

- Act 47 of 2011: 7% biodiesel (BD) for heating oil if surrounding states (MA, NY, NH) have “adopted requirements that are substantially similar to”
  - NY, CT, RI now have requirements; MA has Alternative Energy Portfolio Standard
- BD can be used in existing infrastructure up to B20
- Currently no easy way to measure baseline of biodiesel in fuels used in the state
- Prices and availability driven largely by federal Renewable Fuels Standard
- BD sales help retain jobs among fuel dealers; some fuel dealers are transitioning to an energy service provider model
- Concerns about potential lock-in of fossil fuel systems and environmental impacts from expanded demand for biodiesel
- Equity Issue - BD for heating allows fuel users to retain equipment for backup use or regular use in case they cannot afford to electrify
- Recommend: Consider a biomass-based diesel blending requirement within the context of clean heat standard or other sector-wide requirement to determine whether one of these would be practical and effective.

Ch. 8. Energy Finance

- Enhanced financing capacity essential (funding/incentives not sufficient)
- Gaps for VT's underserved in private markets
- Aim to leverage financial institutions with experience
  - VHFA, VBB, VEDA
- Recommendation to investigate optimal structure needed to deploy low-cost capital
  - Identify ***mission-driven institutional arrangement*** between existing funding & finance agencies

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Thank You!