

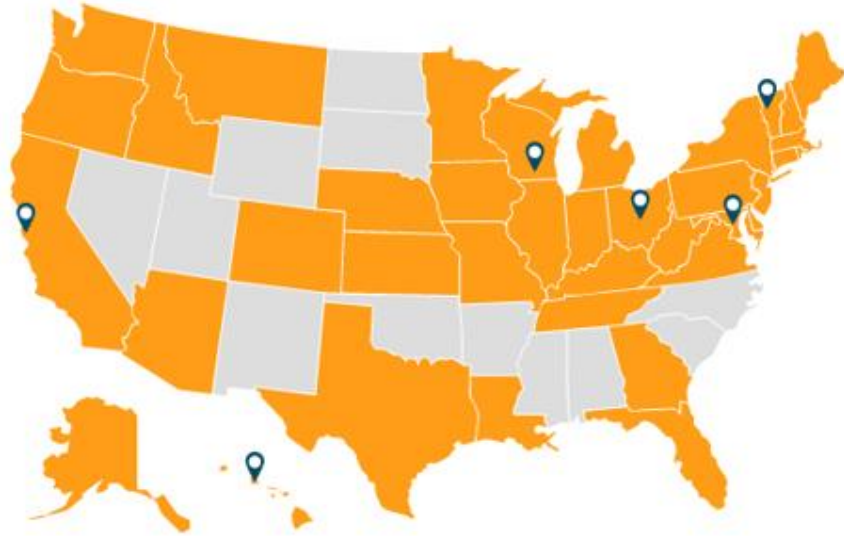


Advanced Wood Heat's Role in Renewable Energy and Clean Heating Policy

Wood Heater Design Challenge Workshop 3
April 27th, 2022

Adam Sherman

About VEIC



- Nonprofit founded in 1986 with a mission **to generate the energy solutions the world needs**
- Program administrator for Efficiency Vermont & the DC Sustainable Energy Utility; on administration team for TECH Clean California, Hawaii Energy, & Focus on Energy
- National consulting practice advising states, utilities, and businesses on decarbonization strategies



VEIC offices



Where we work



Energy
Efficiency



Clean &
Flexible Grid



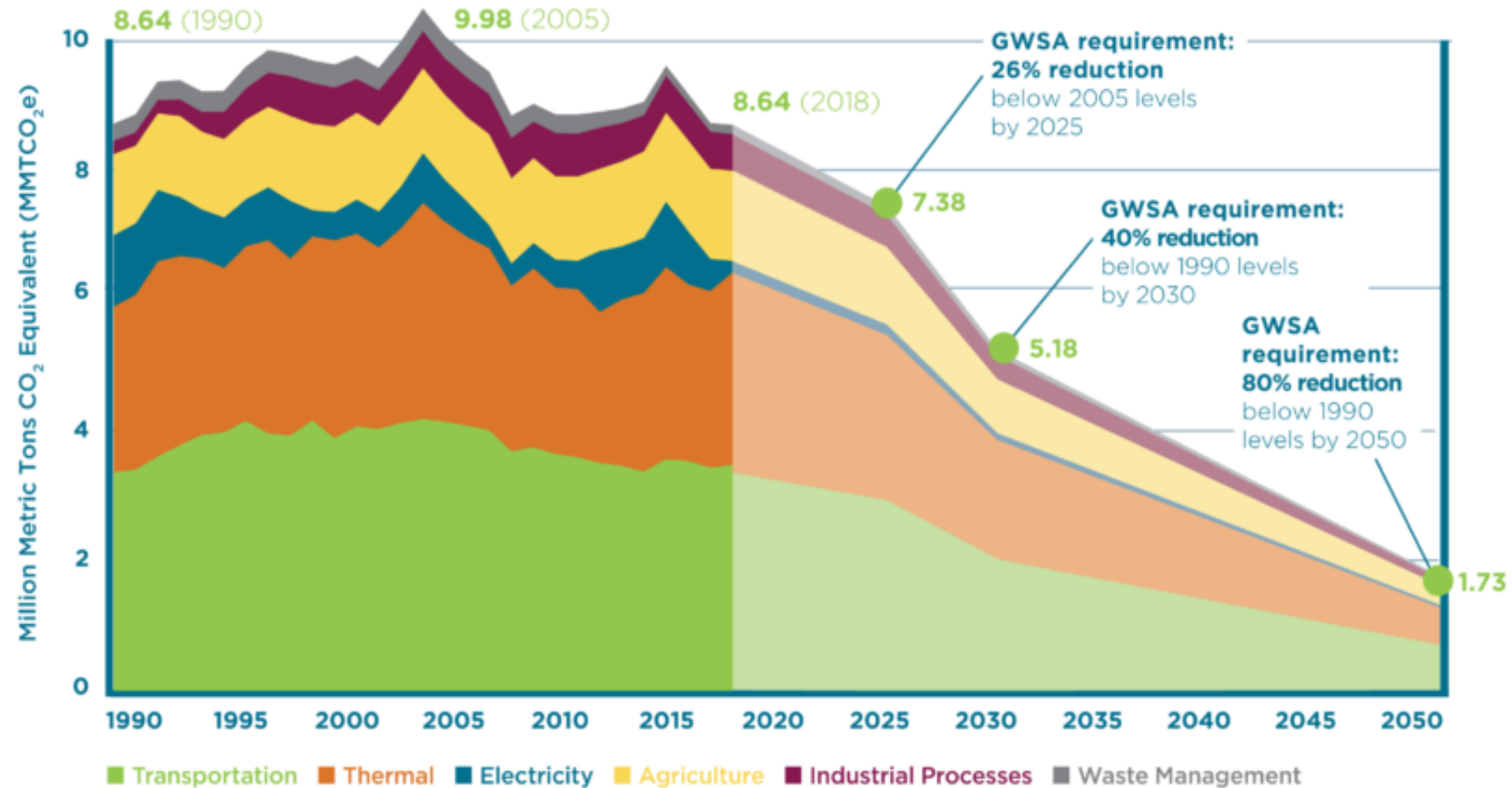
Building
Decarbonization



Transportation
Electrification

Meeting Ambitious Goals

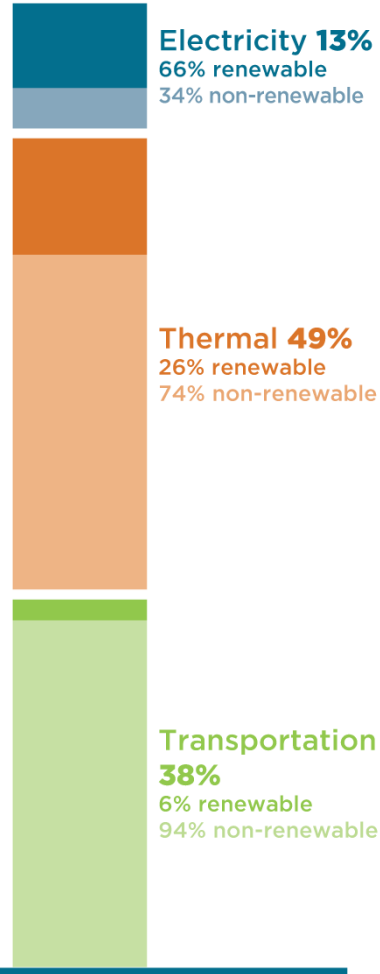
Vermont's historical GHG emissions and future requirements



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

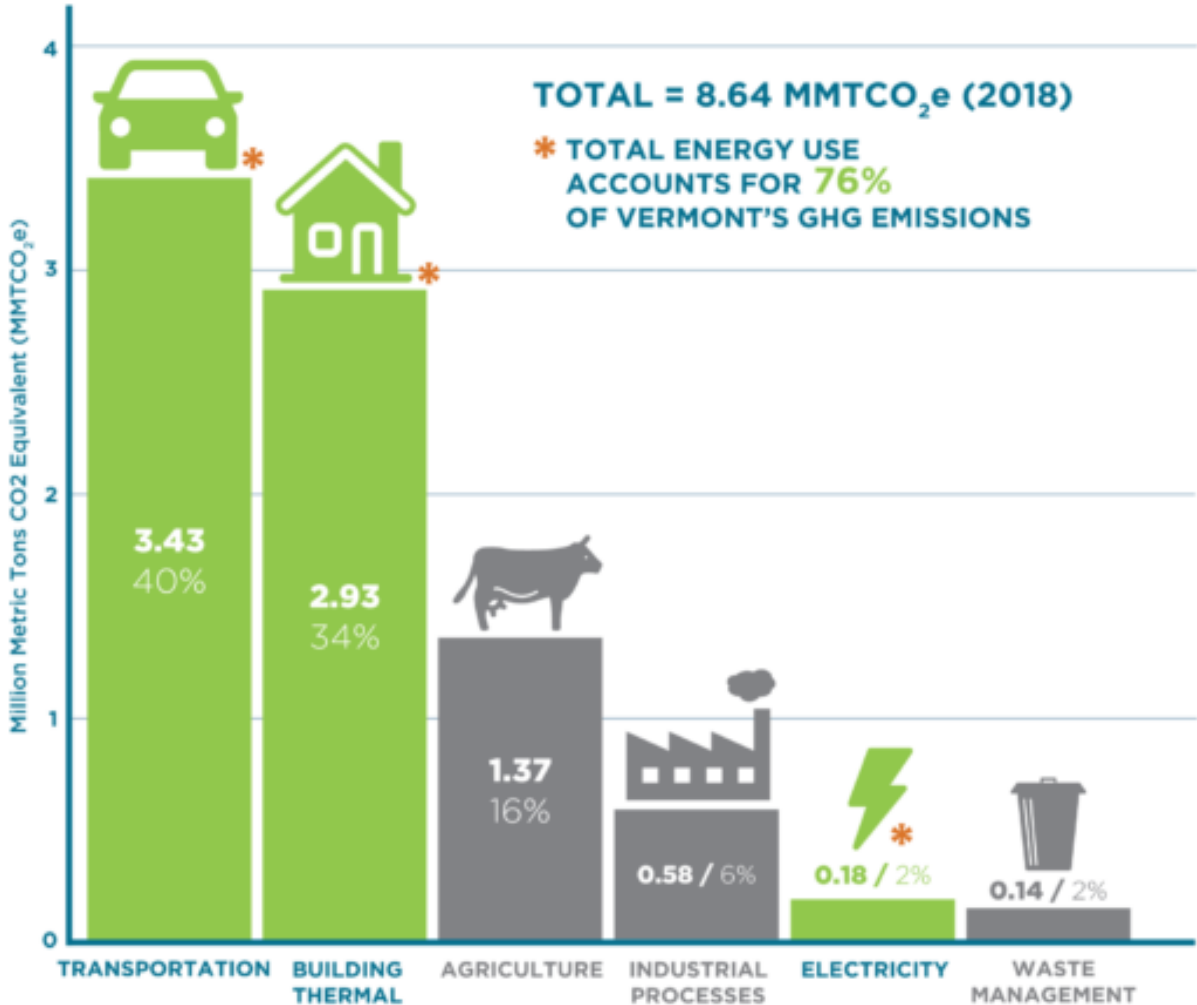
Importance of Thermal Energy

Vermont Energy Use



SITE ENERGY
120 TRILLION BTUS
24% RENEWABLE

Vermont's GHG emissions by sector, 2018



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

Thermal Energy in Renewable Energy Policy in Vermont

Renewable Portfolio Standard

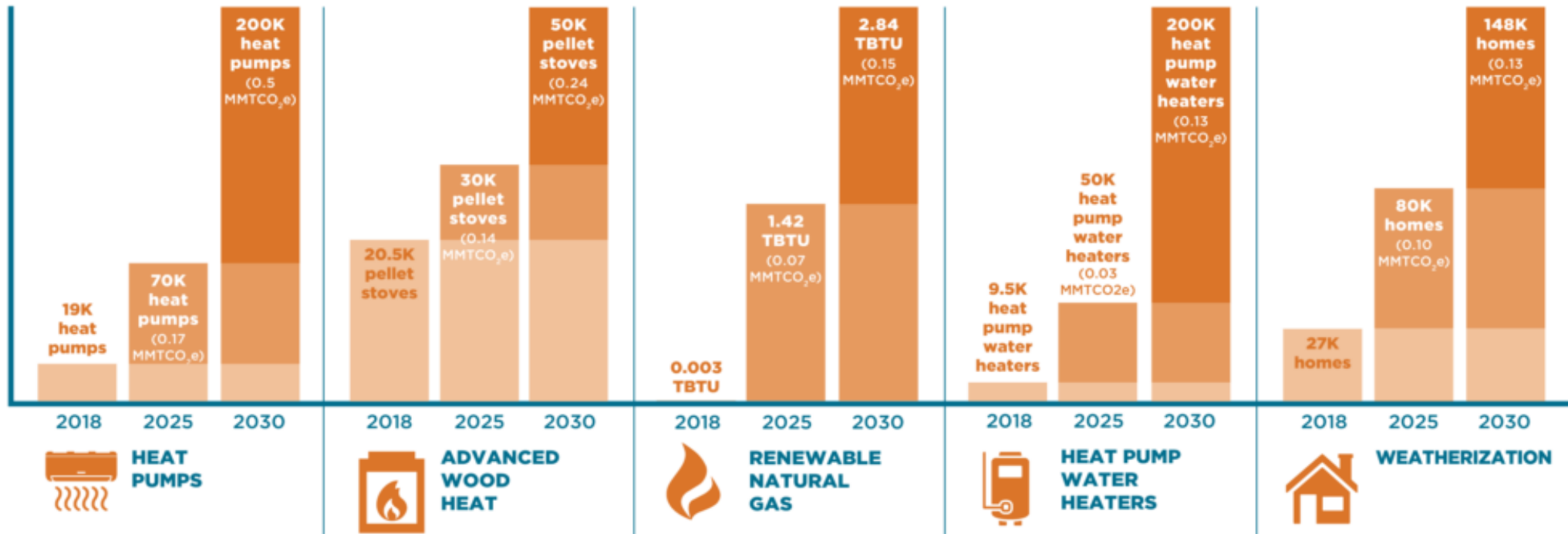
- Set on electric utilities
- Tier 1 and 2 focused on renewable power generation
- Vermont's Tier 3 for fossil fuel replacement
- Tier 3 is largely focused on electrification

Clean Heat Standard

- Concept Legislation from the Vermont Climate Council
- Passed House in March – currently in the Senate
- Fossil heating fuel providers required to buy or create Clean Heat Credits

Integrated Approach for Thermal

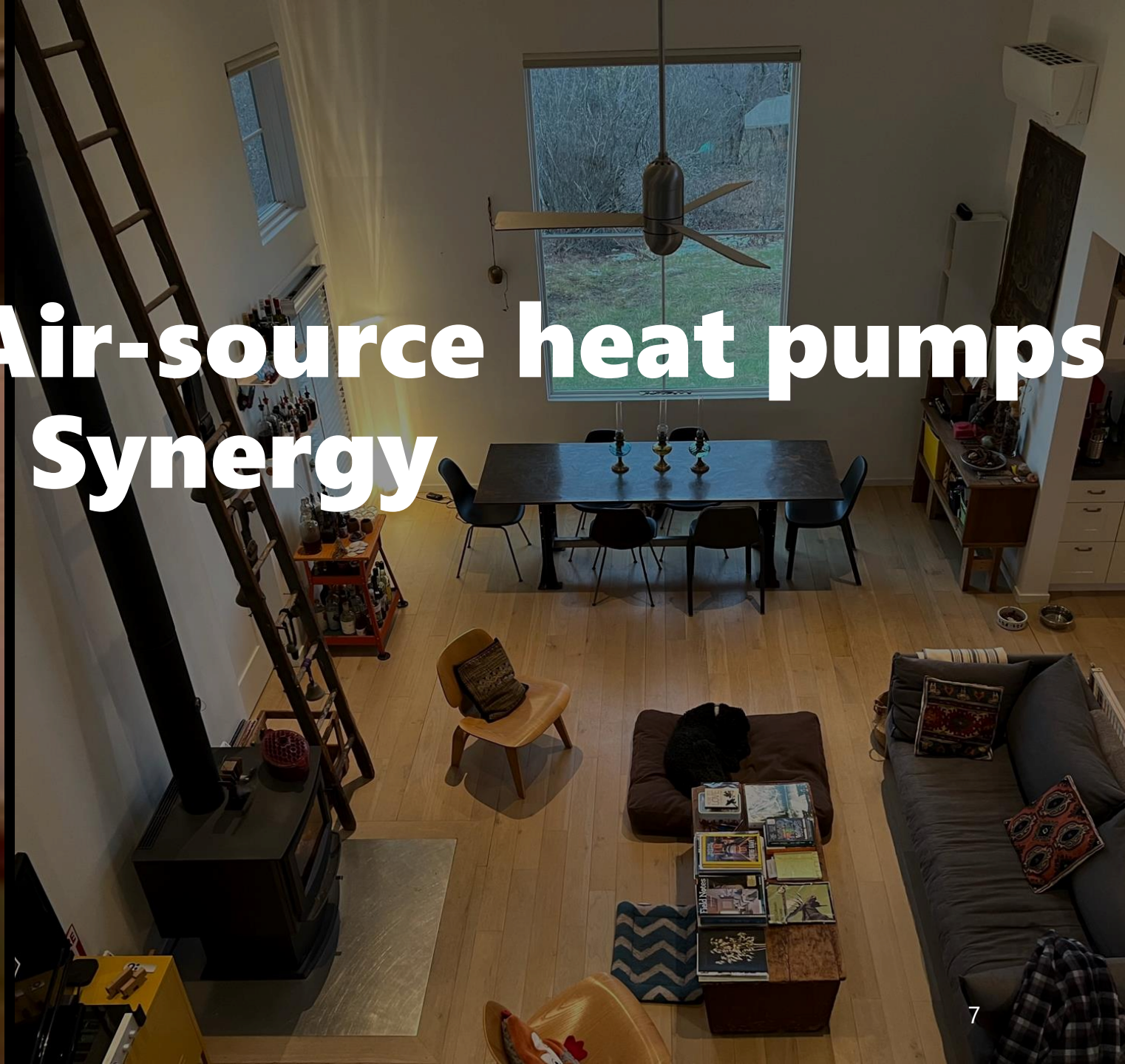
Portfolio of Thermal Measures to meet Vermont's Energy and GHG Targets



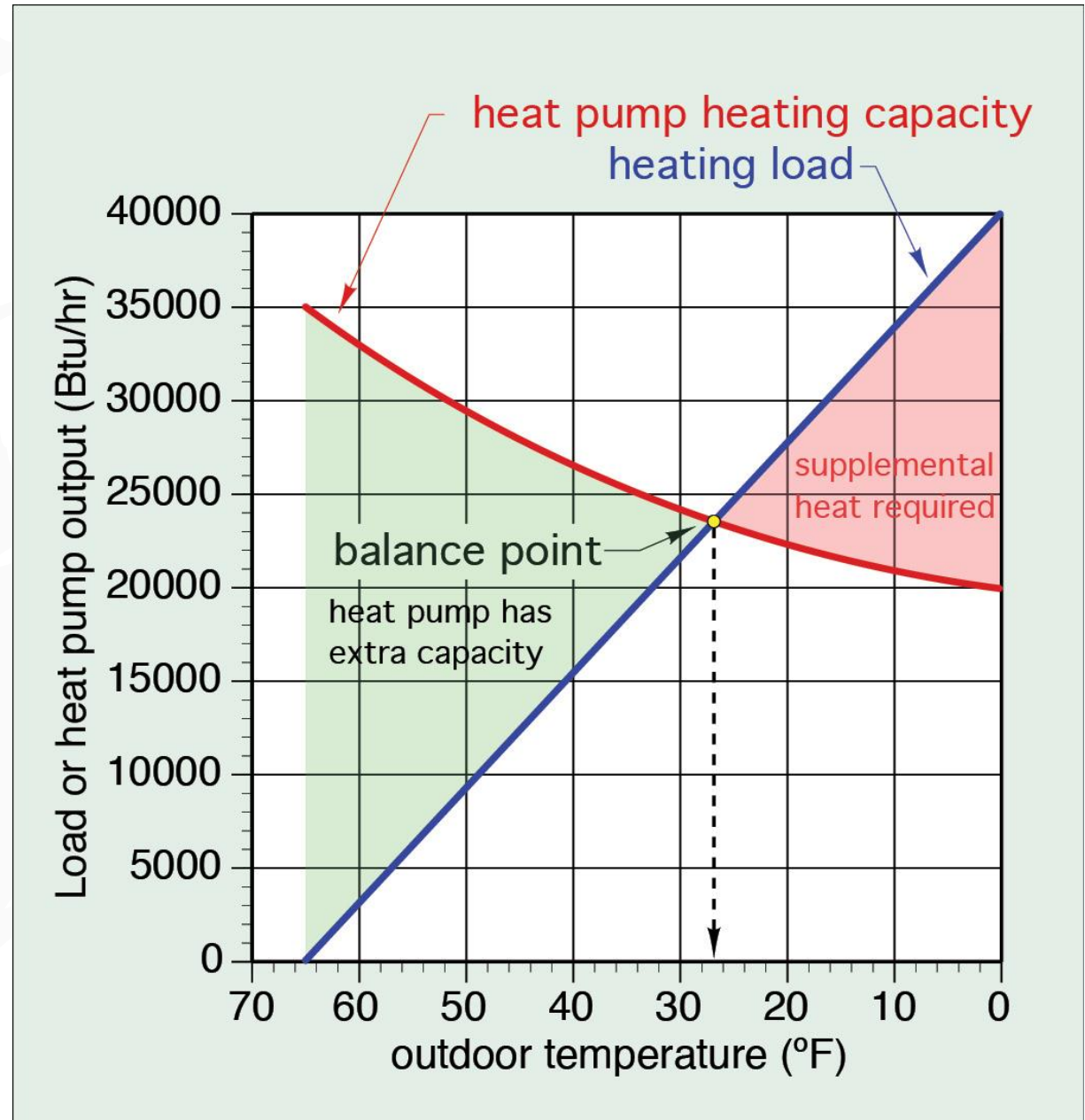
Source: EAN Emissions Reduction Pathways Model, 2021. Note: graph shows cumulative unit counts and is scaled based on unit count growth, not GHG reduction.

Not either this OR that. We need "all the above" Policies.

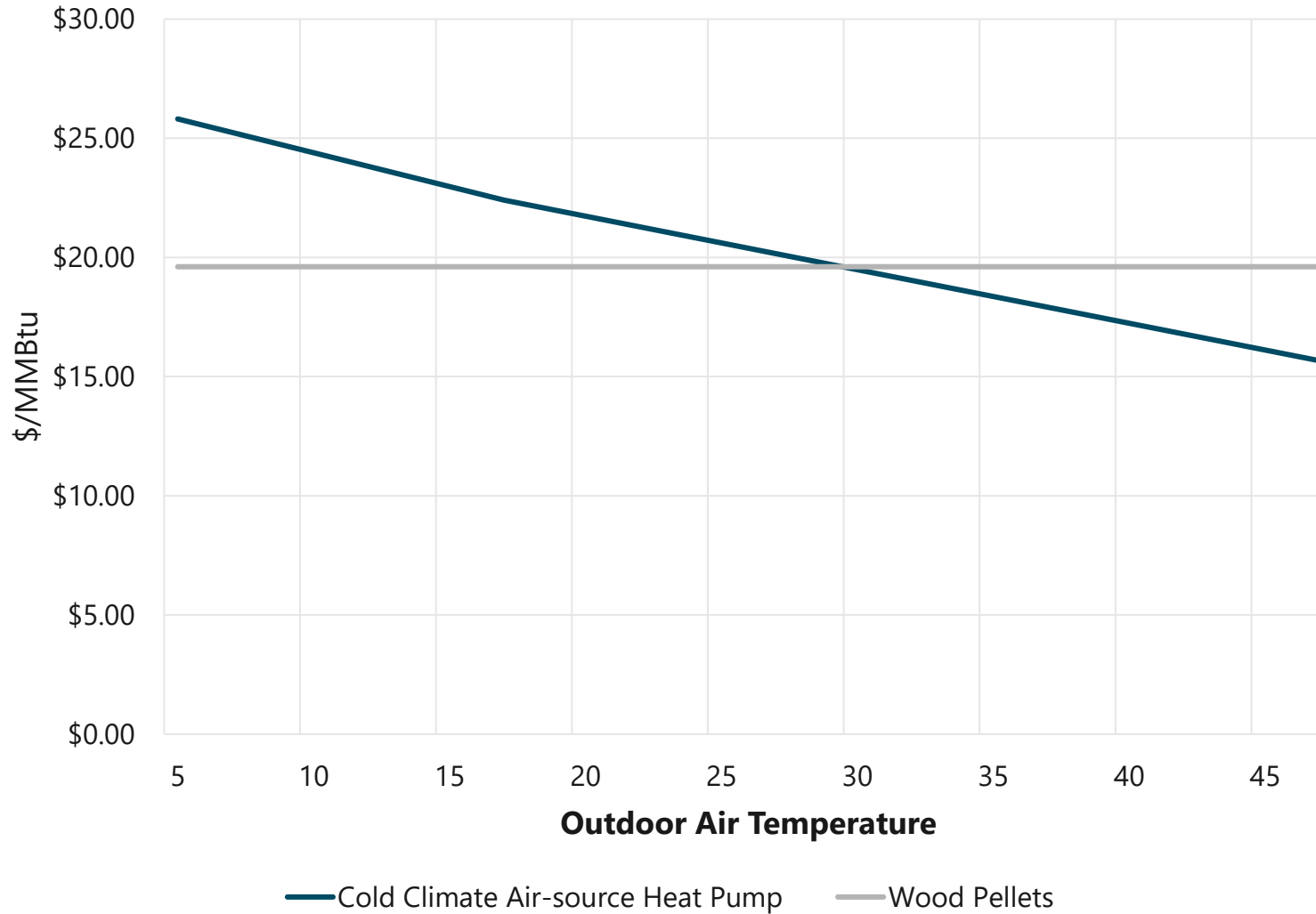
**Wood Heat + Air-source heat pumps
= Synergy**



Heat Pump Performance and Need for Supplemental Heating in Cold Climates



Economic Balance Point

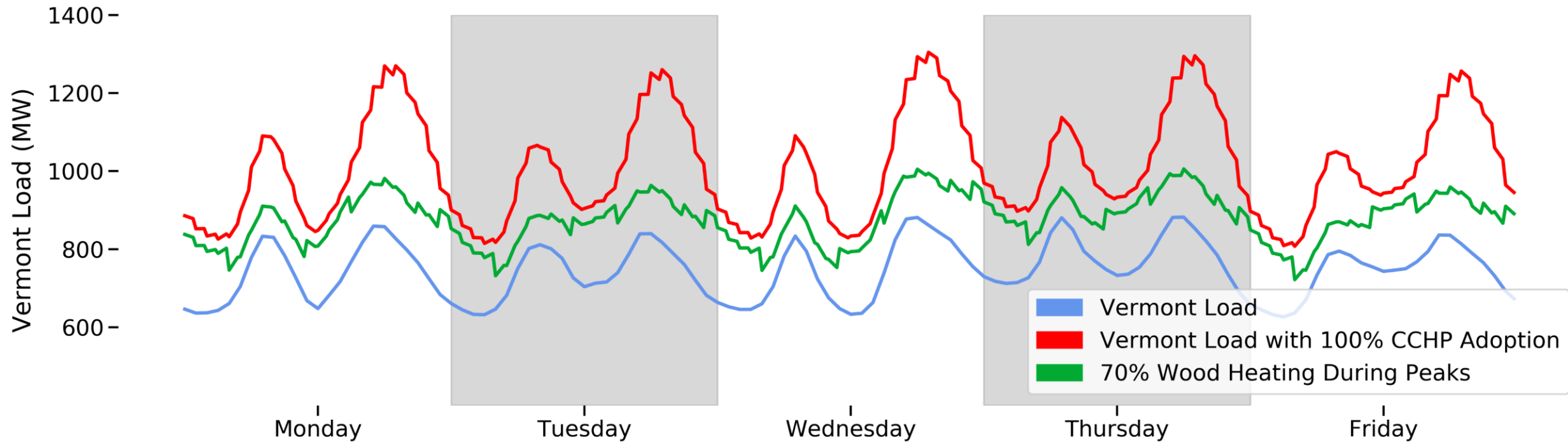


Assumes \$250 per ton for pellets and \$0.19/kWh electricity

**Using Heat
Pumps for
Heating Fuel
Displacement
vs.
Replacement**

Timing Matters

ISO-NE Grid Load Data for Vermont January 24th – 28th 2022



Wood Fuel as Energy Storage

One cord of wood = 345 Telsa Gen2 PowerWall Batteries

Integrating Wood Heating with Building Electrification Strategies



Go further, faster with AWH toward electrification/decarbonization goals



Thanks!

Adam Sherman

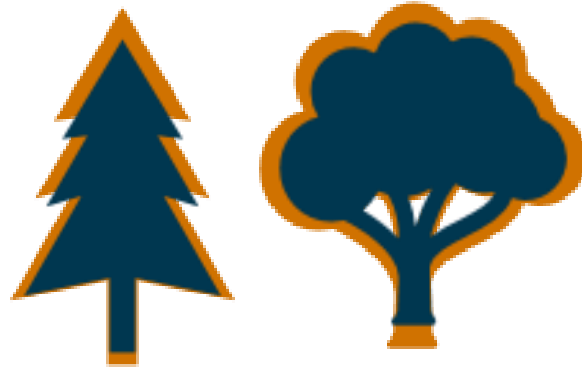
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Forest Resource Capacity

2018 study examined actively managed portion of forestland

Net Annual Growth of New Wood



Low-grade Forest Inventory

Less the amount of wood
currently harvested annually

= 1 million green tons of additional
potential wood fuel supply

Program Strategies to Improve Air Quality

- Target replacement of aging fossil heating equipment
- Install “Best in Class” wood heat technology
- Aggregate heating loads via district piping
- Consistent use of specified fuels matched to the right equipment
- Boiler tuning and maintenance
- Thermal storage when appropriate
- System controls
- Back-end PM control equipment
- Appropriate stack location and height
- **AND OFFER WOODSTOVE CHANGE OUTS**

Air Quality Impacts of Boiler Fuel Switching & Stove Change-outs

