

Committee on Energy Resources and the Environment

Strange Bedfellows: Energy Efficiency and
Electrification

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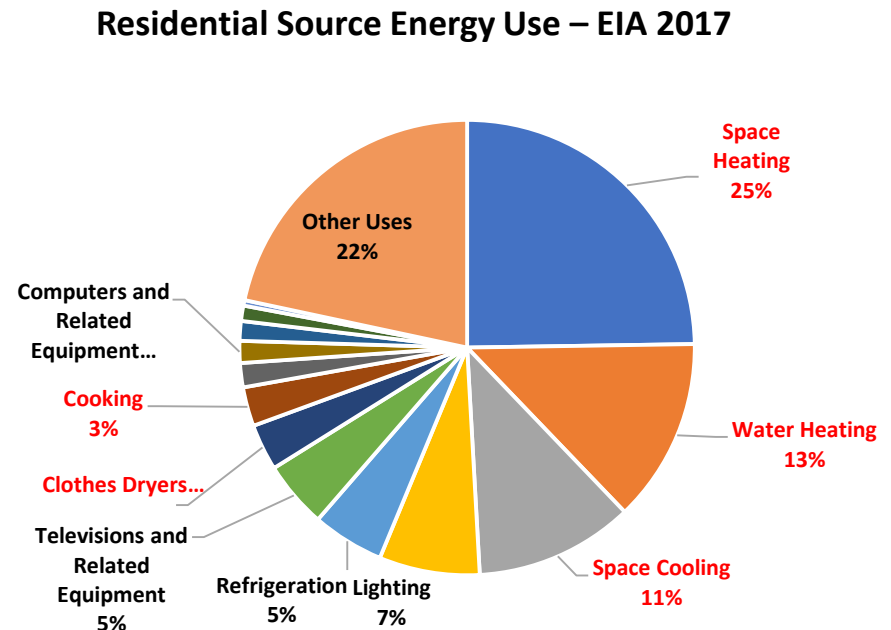
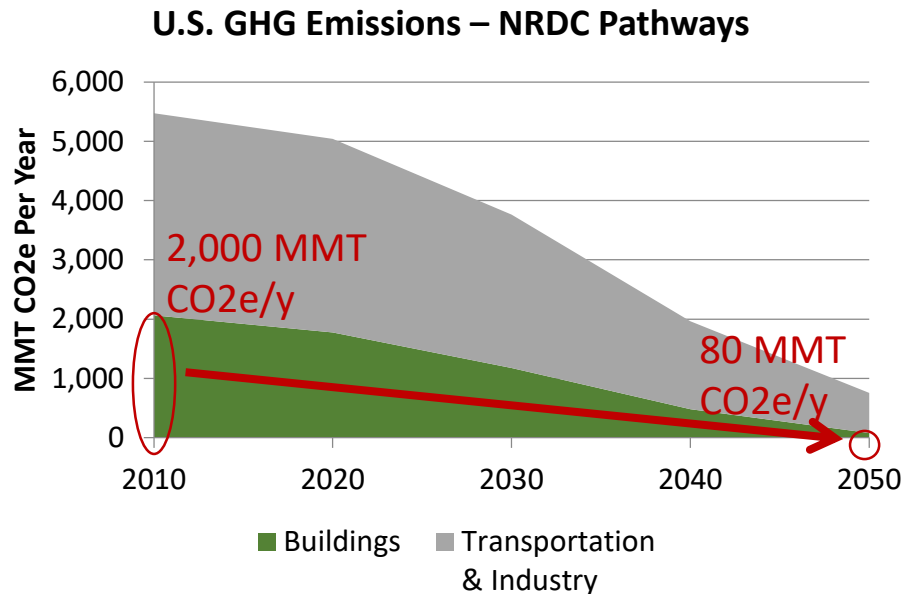


Sheryl Carter
Director, Power Sector
NRDC

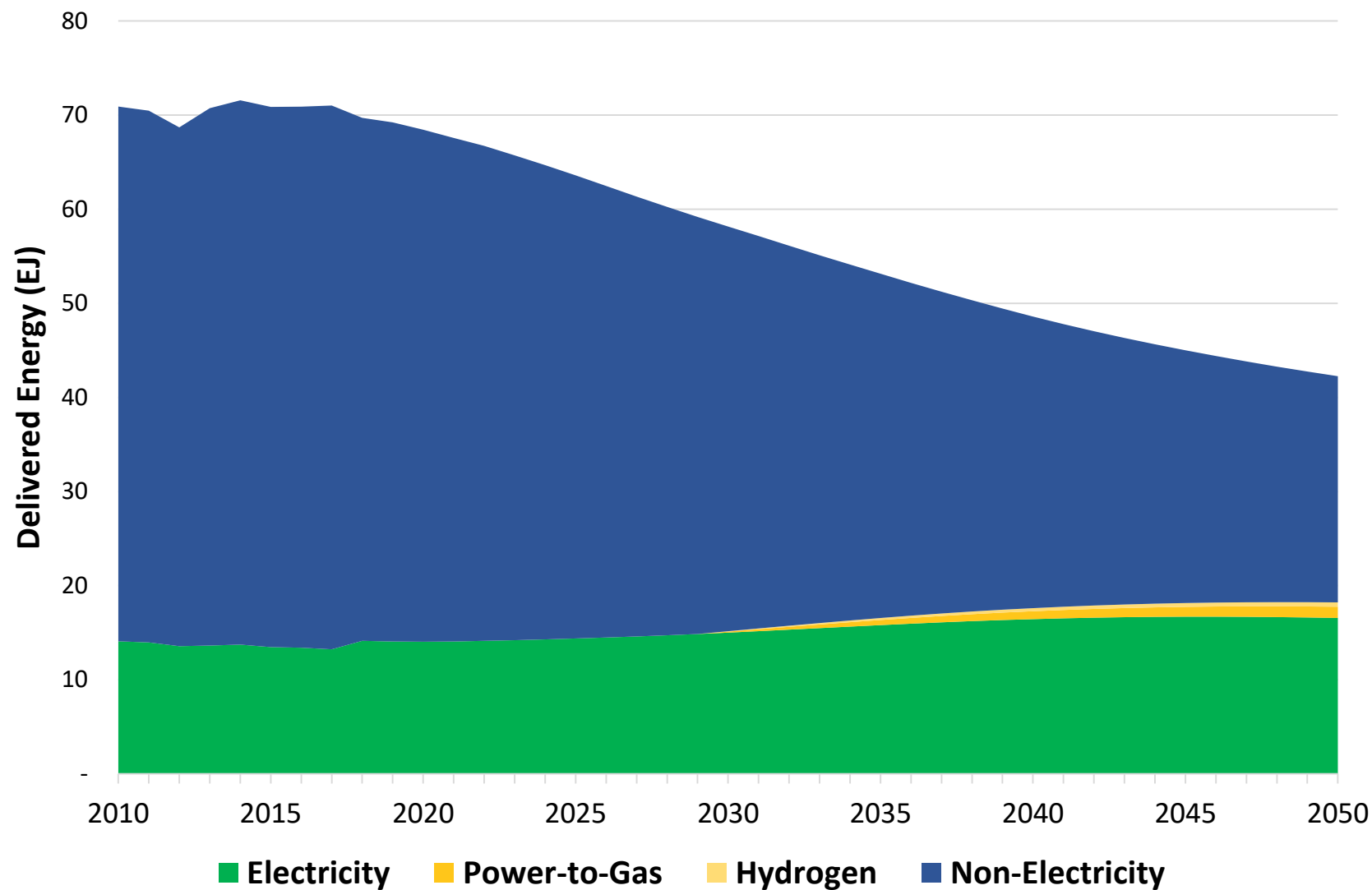
July 17, 2018
NARUC Summer Meeting

Why decarbonize thermal energy use in buildings?

- Buildings \cong **40%** of U.S. GHG emissions in 2010
- Space heating and cooling, water heating \cong **50%** of that
- Need **95%** reduction from EIA baseline by 2050



Energy Use Under Deep Decarbonization Approach



Committee on Energy Resources and the Environment

July 17, 2018

Beneficial Electrification EE Version 2.0

Committee on Energy Resources and the Environment
NARUC Summer Policy Summit
Scottsdale, Arizona

Jim Lazar
Senior Advisor
The Regulatory Assistance Project (RAP)®

Olympia, Washington
United States

jlazar@raponline.org
raponline.org

What Makes for Beneficial Electrification (BE)?

Three explicit criteria: Achieve At Least One Without Adversely Impacting The Others



1. Saves Customers Money Long-Term; New Services



2. Reduces Environmental Impacts



3. Enables Better Grid Management



WASHINGTON STATE
ENERGY OFFICE

Analysis of Consumer and Marginal Costs for Electric and Natural Gas Space and Water Heat in Single Family Residences in Puget Sound Power and Light Company Service Territory

Prepared Pursuant to inter-agency agreement between
Public Counsel Section of the Office of the Attorney
General of Washington State and Washington State
Energy Office

Prepared by:
Richard Byers
Washington State Energy Office
809 Legion Way SE
Olympia, WA 98504

September, 1989

DIRECT USE OF NATURAL GAS FOR RESIDENTIAL SPACE AND WATER HEAT COMPARED TO GAS-FIRED ELECTRIC GENERATION FOR HYDRO-FIRMING

**THERMODYNAMIC, ECONOMIC, AND
ENVIRONMENTAL IMPACTS**

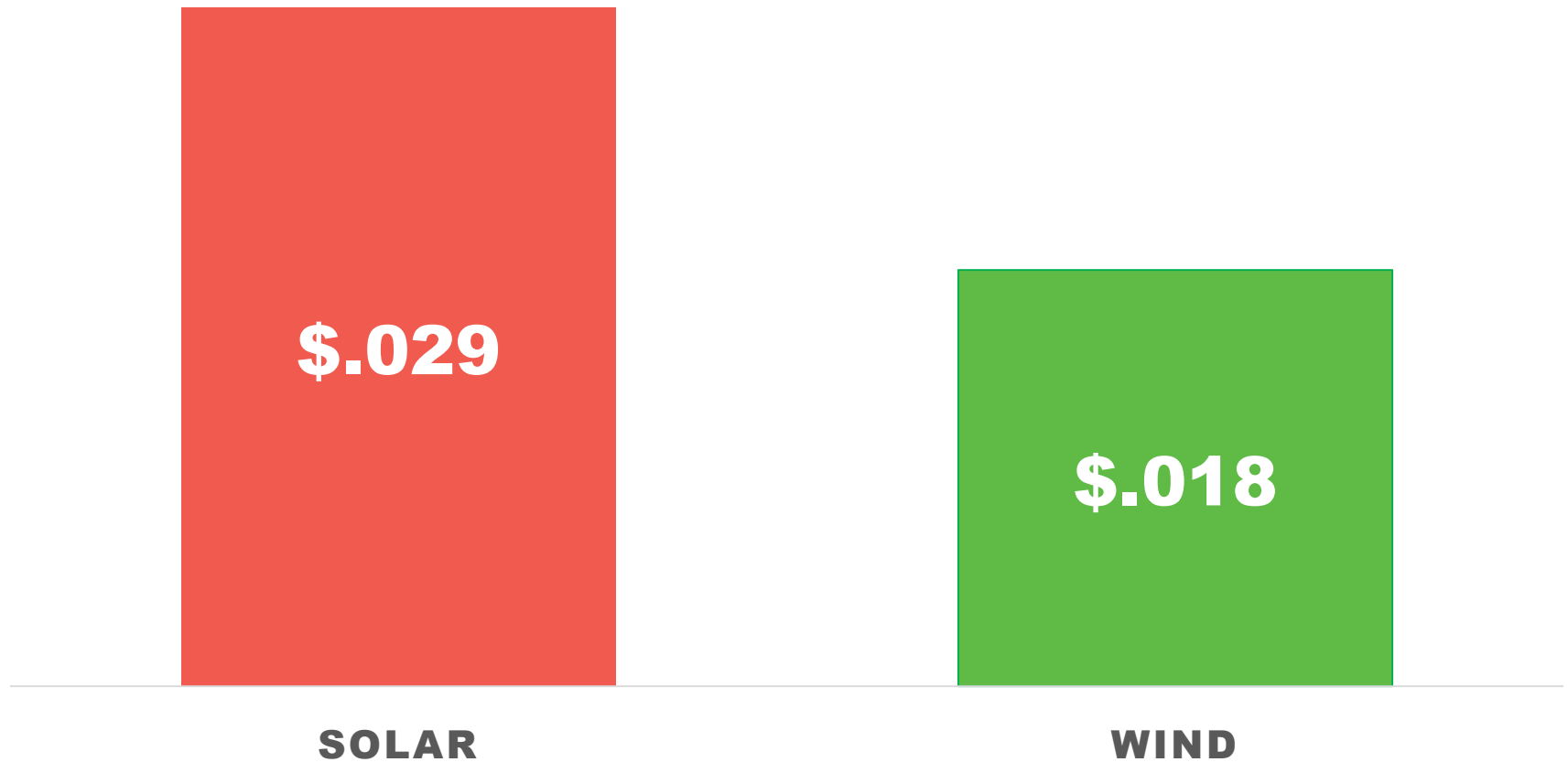
**PREPARED FOR
ASSOCIATION OF NORTHWEST GAS UTILITIES
Portland, Oregon**

**Jim Lazar
Consulting Economist
Olympia, Washington**



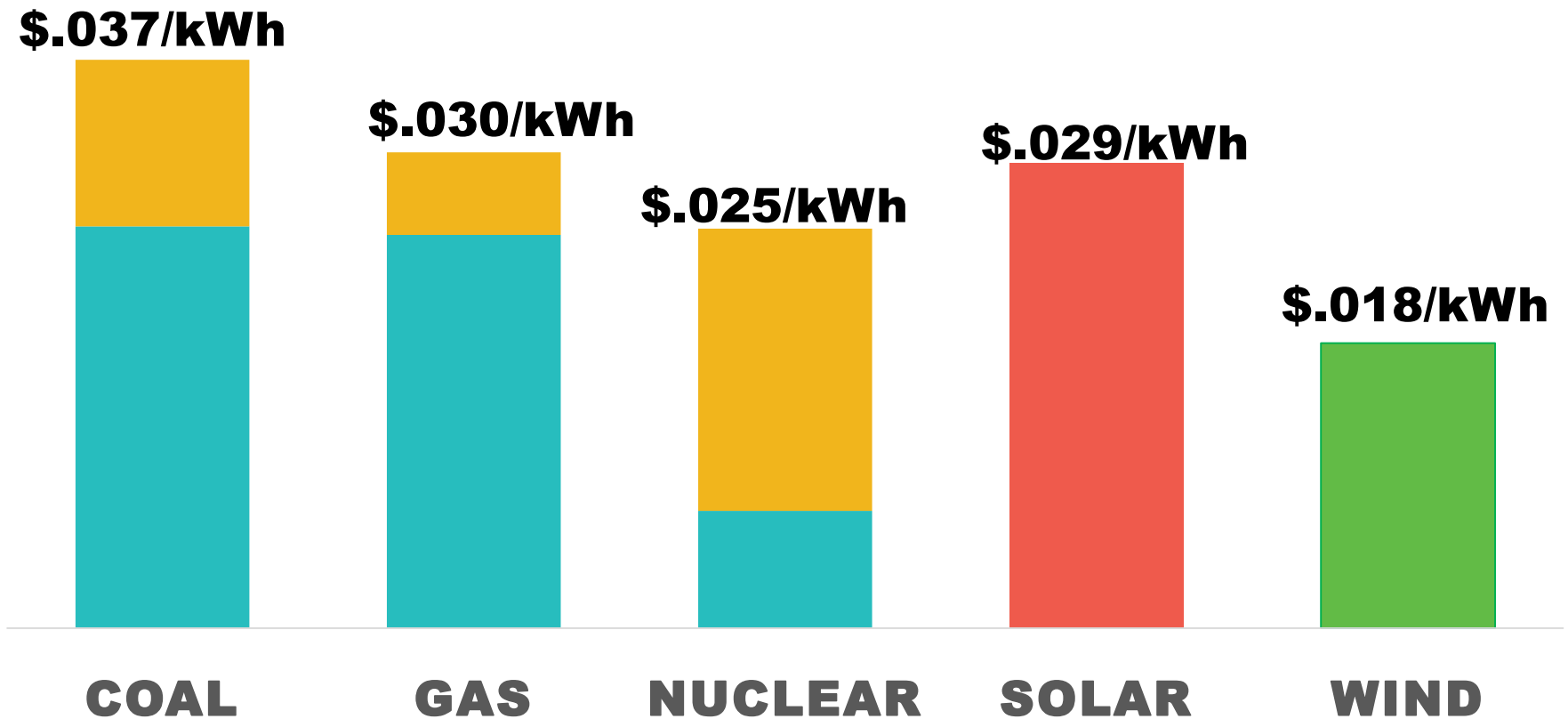
December, 2017

Xcel Bid Median Prices, \$/kWh



Existing Plants vs. Excel Bids

Fuel O&M Xcel Bids



Existing Plant Average Fuel and O&M from USEIA Table 8.4 Electric Power Annual 2016

An Easy Example: Oil vs. Heat Pump Water Heater



BOCK 58800 32E OIL FIRED WATER HEATER,
GALLON / 104000 BTU - TANK ONLY

Our Price Per Unit: \$1,054.83




Rheem Prestige Hybrid Electric Water Heater

\$1,389.00

Oil vs. Heat Pump Water Heater:

- Consumer Economics: 40% advantage
- Emissions: 40% advantage
- Grid Flexibility: Heat pump can be controlled into key hours.





**Even if we generate the
electricity with fossil fuels,
we use less primary energy
via a heat pump.**

**This is unambiguously a
form of energy efficiency.**



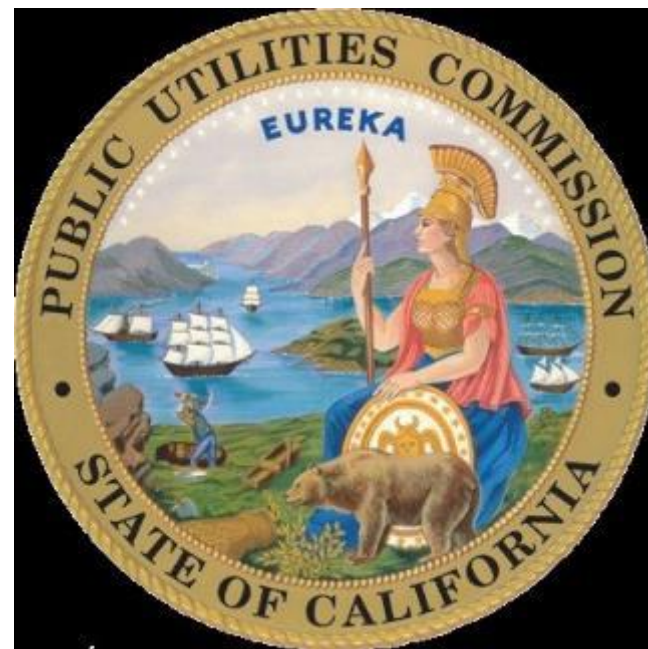
Easy Examples of Electrification

- Oil and propane water heater replacement
- Electric vehicles with smart charging
- Hotel water heating



The Easy Stuff Needs Support From Regulators

- Societal cost test, to determine what is truly “beneficial.”
- Time-varying rates, to align consumer and system costs.
- Programmatic support like other energy efficiency programs.



Promising Opportunities for Electrification

- New build super-efficient residences
- Oil and propane space heat
- Warm climate residential



Challenging Areas for Electrification Today

- Existing gas space and water heat
- Cold Climate space heat





Gnarly Issues for Regulators

#1: Electric Vehicle Supply Equipment

- Role of the electric utility
 - No special treatment
 - Make-ready only
 - Retail service at regulated prices
 - Exit the market when it is competitive



Gnarly Issues for Regulators

#2: New/Renewal Gas Infrastructure

- **New Construction:** Cost-effectiveness is driven by line extension cost.
- **Renewals:** Replacement of gas infrastructure may be uneconomic.



Regulators: Stay Ahead of the Curve

- Insist on transparency
- Consider an all-fuels IRP
- Reconsider bans on fuel switching programs
- Review line extension policies
- Invite innovation
- Remain skeptical

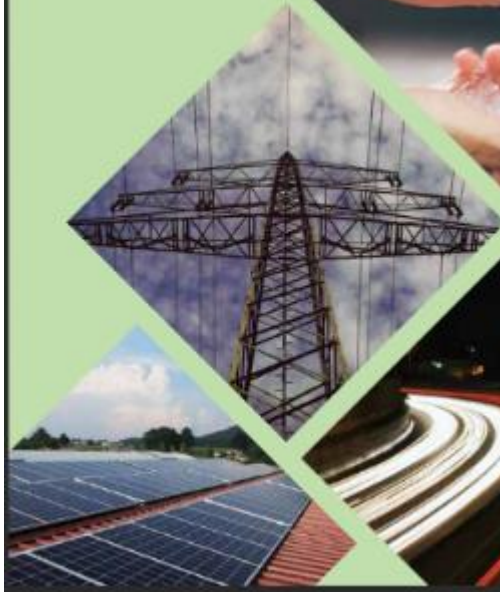




Beneficial Electrification

Ensuring Electrification in the Public Interest

By David Farnsworth, Jessica Shipley, Jim Lazar, and Nancy Seidman



Available at the RAP table

Or for free download at

www.raonline.org

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org



Jim Lazar
Senior Advisor
The Regulatory Assistance Project (RAP)®

Olympia, Washington
United States

jlazar@raponline.org
raponline.org

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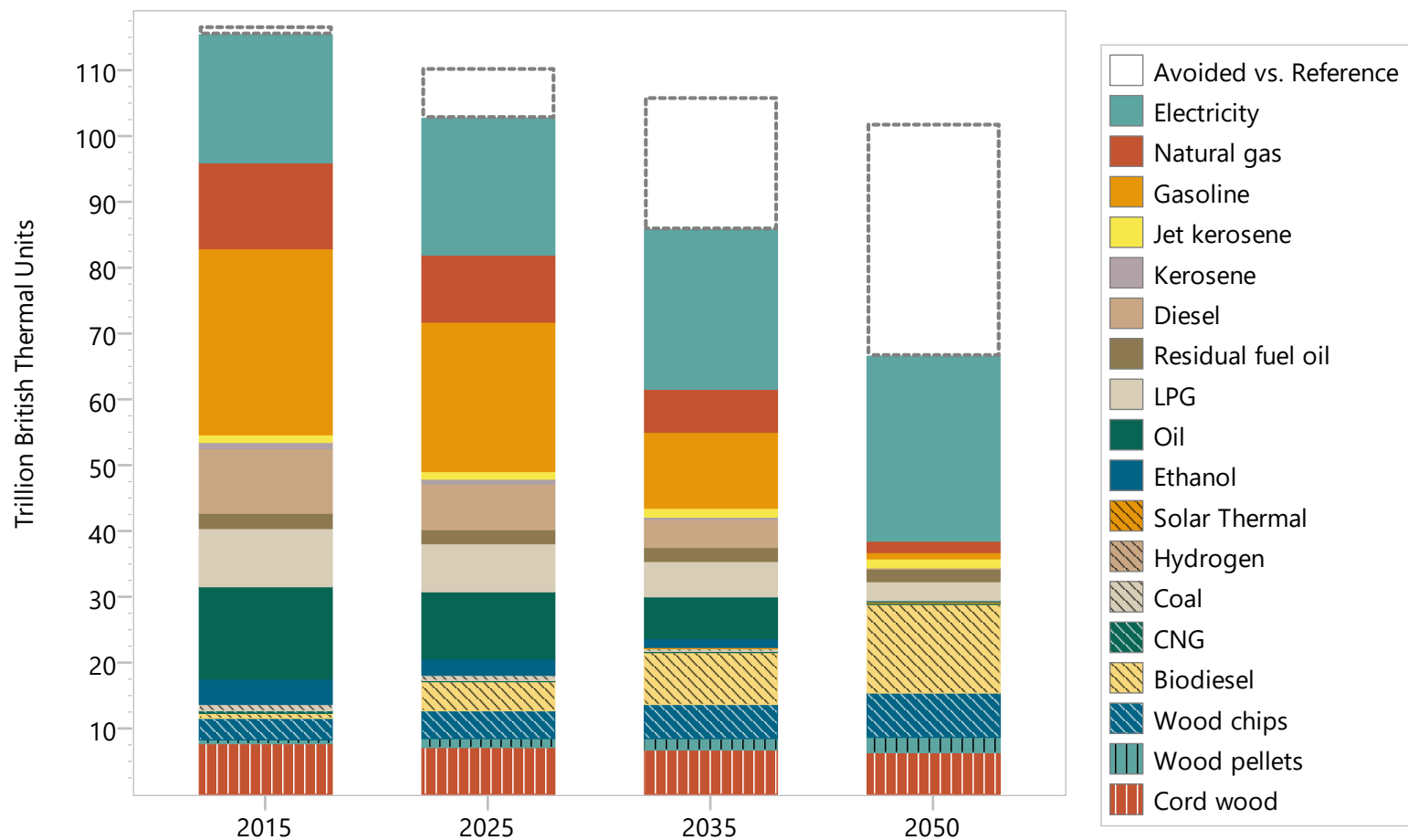
Electrification & Efficiency: Strategic Partners

NARUC 2018

Emily Levin

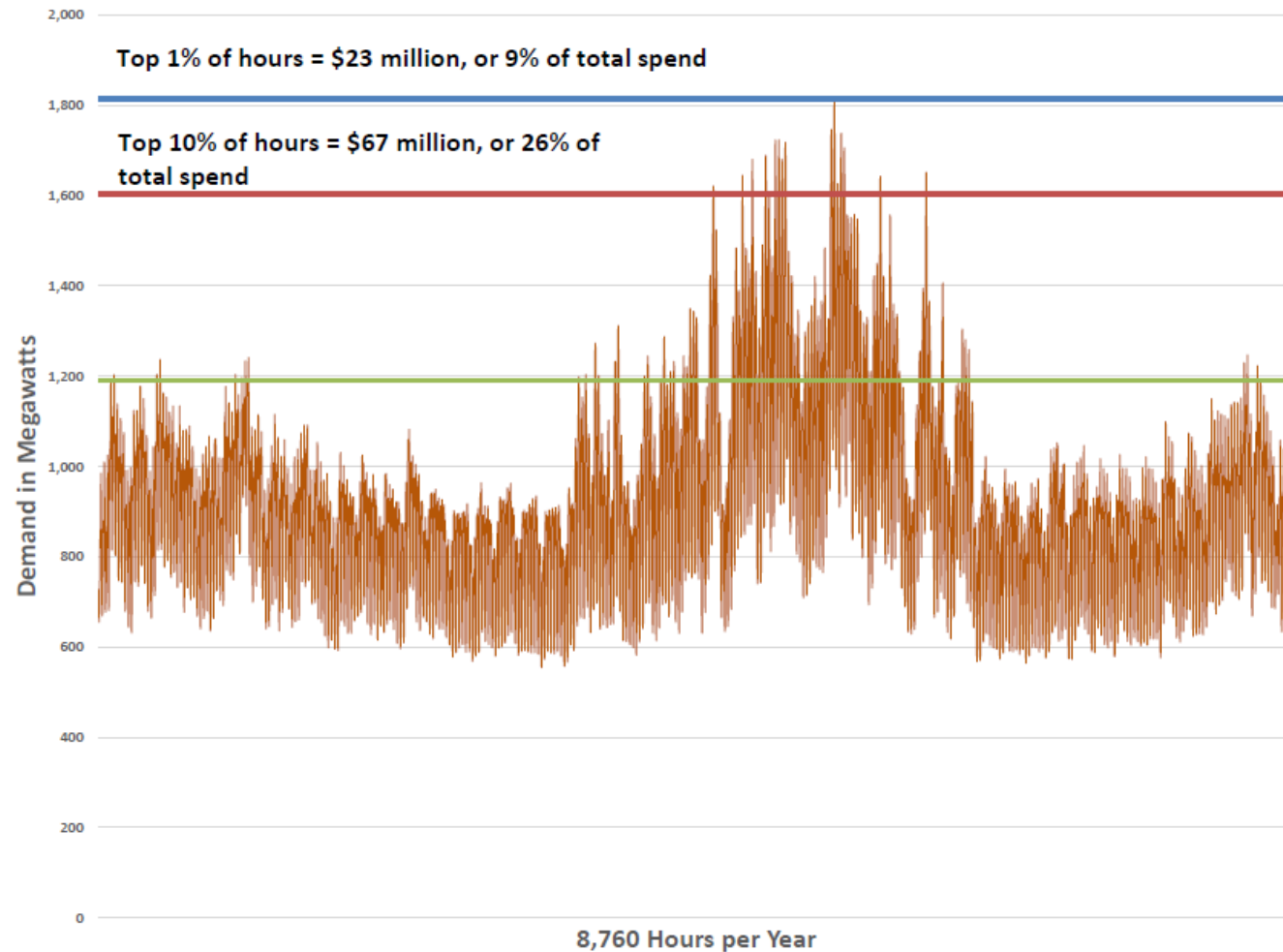


Vermont's Pathway: Efficiency, Electrification, and Renewables

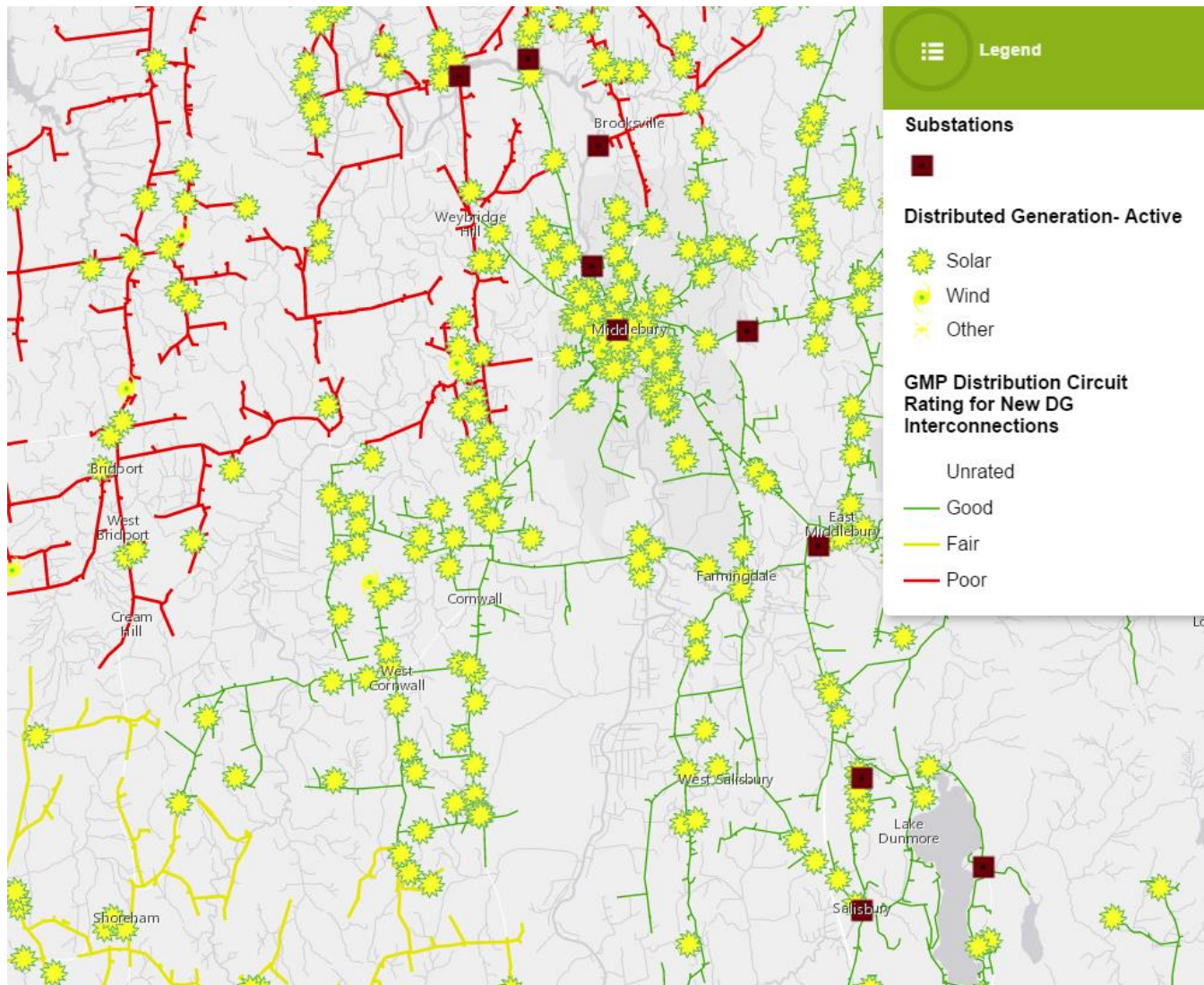


Bulk System Impacts

2016 Rhode Island Peak Energy Demand

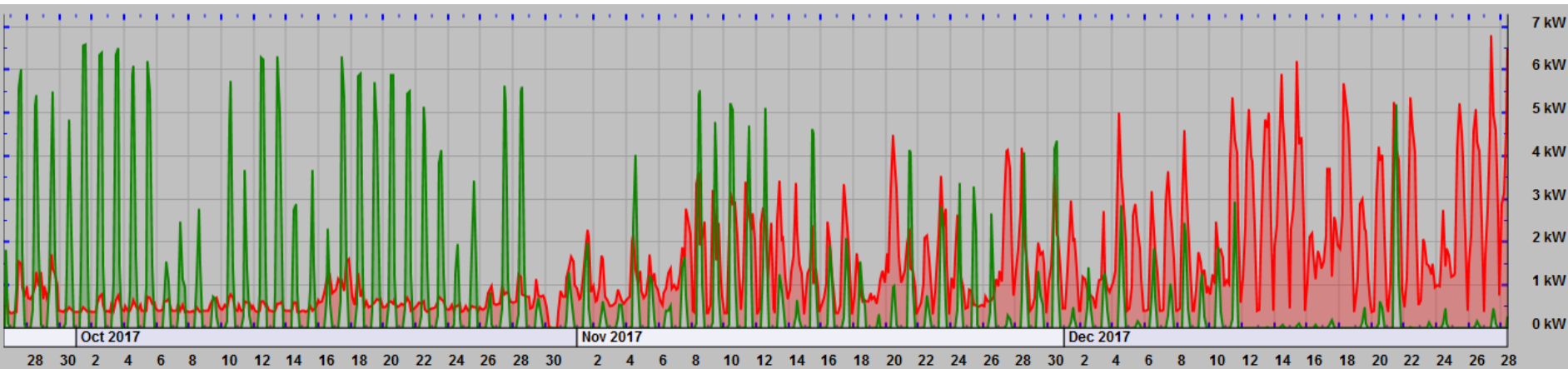


Distribution Grid Impacts



Building-Level Impacts: “Zero Energy”

- PV output and building electricity demand from October through December



- Small commercial office in Vermont
- High performance building envelope upgrades and cold climate heat pumps

The DER Toolbox: Deploying Electrification & Efficiency Strategically

New



Traditional

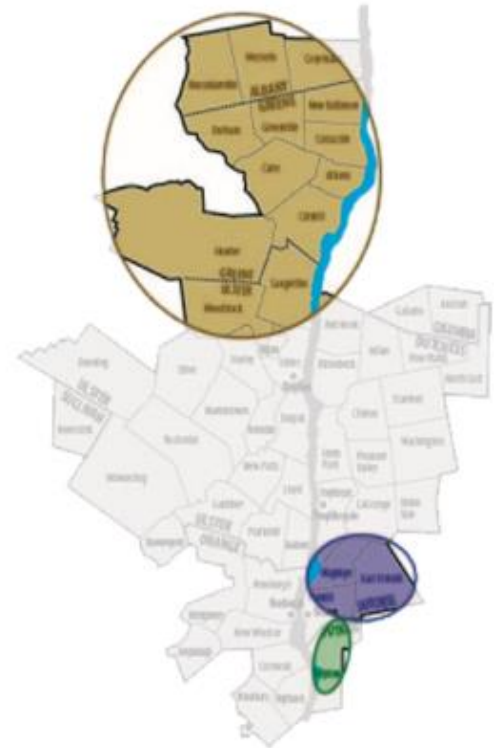


Efficiency



Example: Geotargeted Demand Response to Reduce Infrastructure Upgrades

- Central Hudson Gas and Electric Company, NY
- **Goal:** Defer distribution system upgrades in areas where peak demand is nearing system capacity
- **Solution:** Offer cash rewards and free control equipment to residential customers in targeted areas that use central AC and/or pool pumps, and commercial customers with large loads

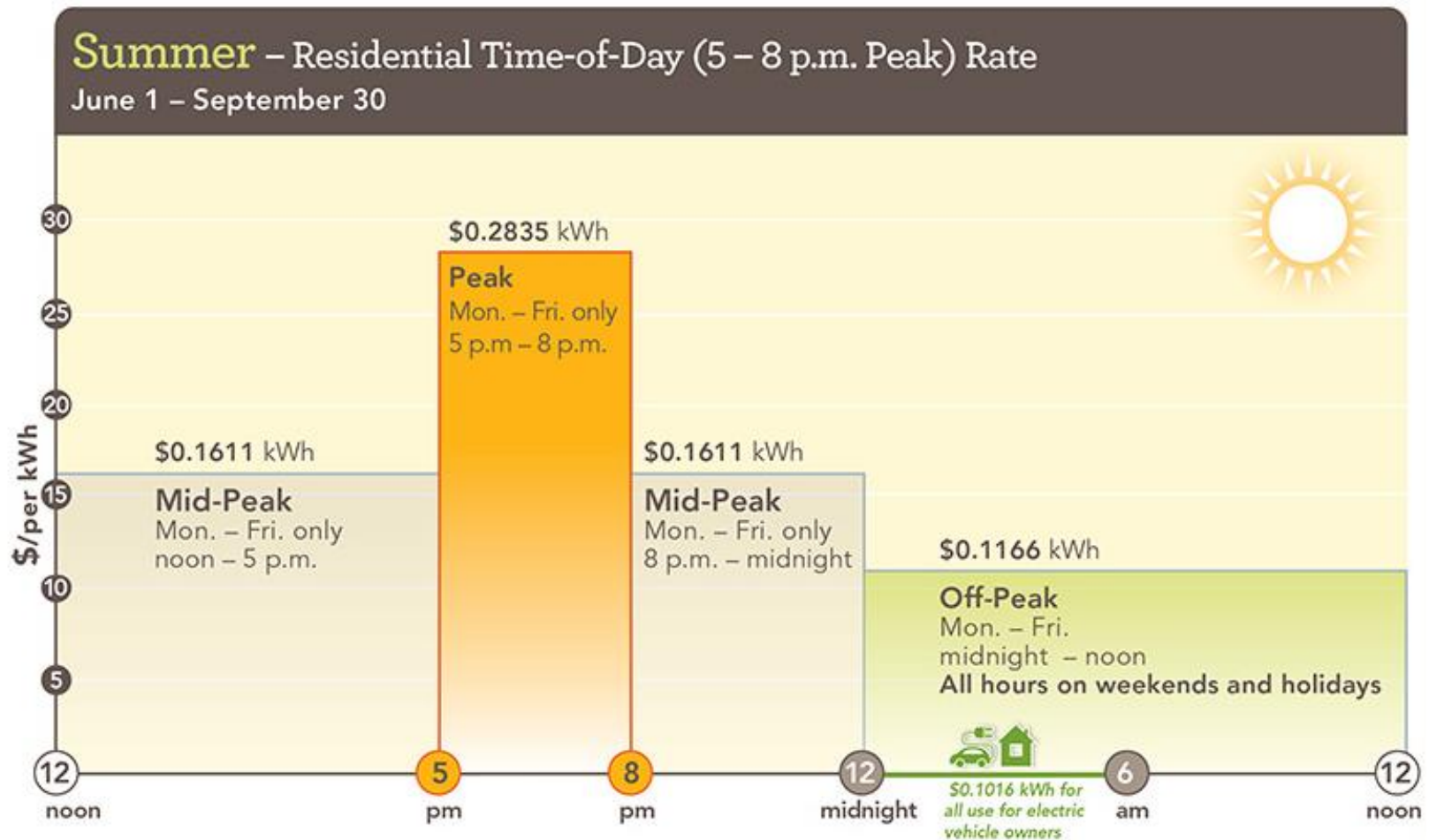


Example: Controllable Load to Accommodate Renewables

- Steele-Waseca Cooperative Electric, in Minnesota
- Community solar program allows members to subscribe to solar and receive a free, controllable electric water heater
- Thermal storage capacity now exceeds solar generation capacity
- Co-op was able to reduce coincident peak charges, keeping rates low for members

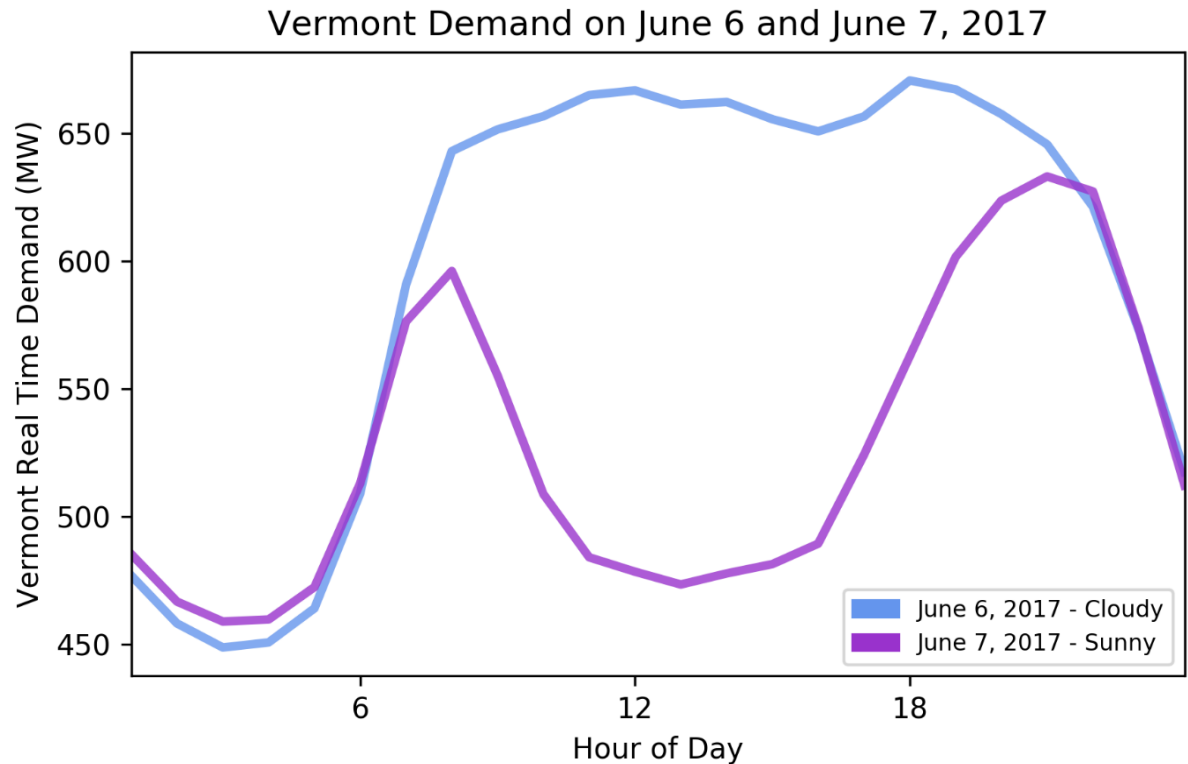


Example: SMUD Time-of-Use Rate for Electric Vehicles

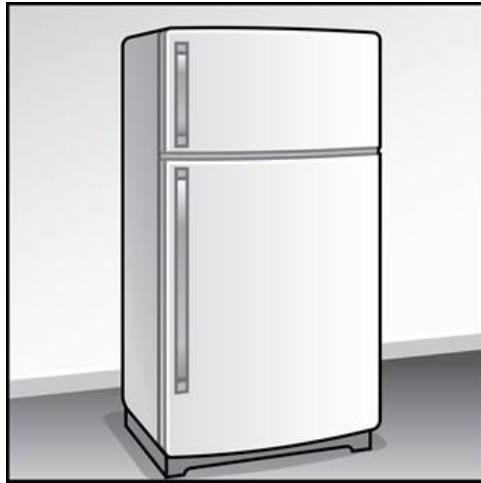


Example: Time-Targeted Efficiency

Vermont's duck curve problem:
sunny vs. cloudy days



Which Efficiency Measure Better Addresses Vermont's Duck Curve?



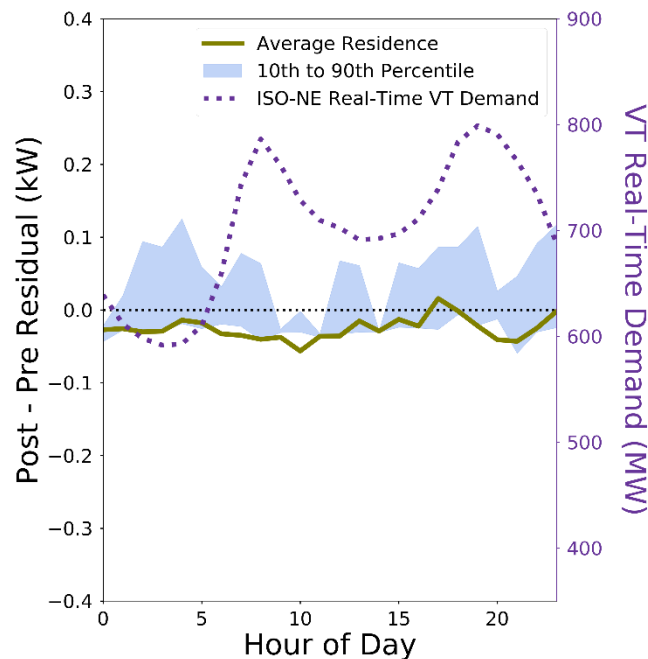
Efficient
Refrigerator



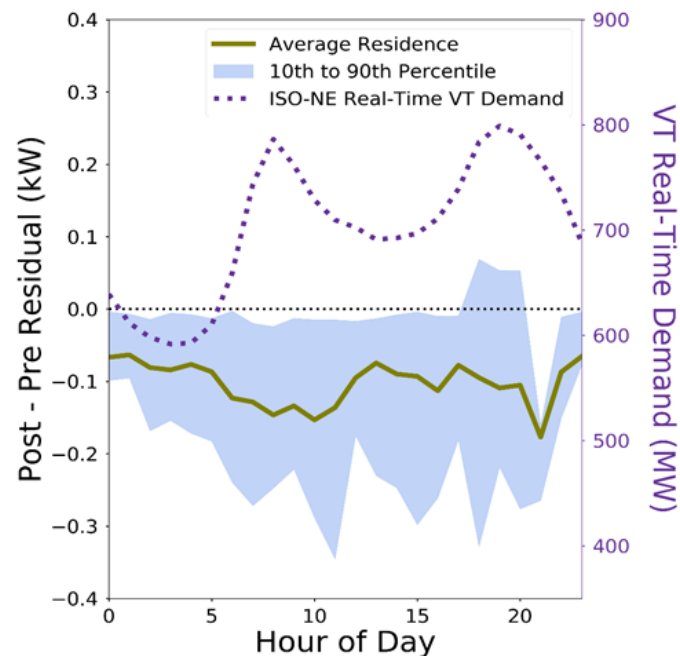
LED
Lightbulb

Different Measures Provide Different System Value

Green
Line:
Average
Efficiency
Shape



Efficient Refrigerator



LED

Electrification & Efficiency: Essential Partners

1. The grid has capacity for electrification at the right time and place
2. Efficiency can reduce peak demand and create space for electrification on the grid
3. Building shell improvements can make heat pump heating and cooling loads more flexible and avoid oversized HVAC and PV systems
4. But most electric utilities are not including energy efficiency and other DERs in distribution-level planning

Updating Efficiency Programs in the Context of Electrification

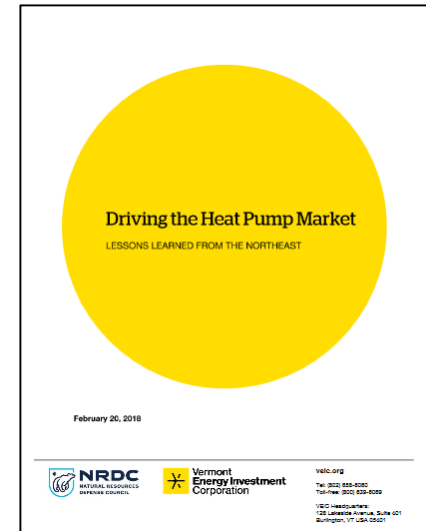
- ✓ **Build on efficiency program success**
- ✓ **Coordinate delivery** of efficiency, demand management, and electrification programs and avoid creating program silos
- ✓ **Set goals beyond kWh savings:** peak demand reduction, fuel-neutral energy savings, carbon reduction
- ✓ **Update cost-benefit tests** to include carbon externalities
- ✓ **Change program rules** that discourage fuel switching from natural gas to electricity
- ✓ **Support pilots and innovation**

In Short...



For More Information

Emily Levin
Managing Consultant, Innovative Programs
802-540-7694
elevin@veic.org



<https://www.veic.org/resource-library/driving-the-heat-pump-market-lessons-learned-from-the-northeast>

About VEIC



- 30 years reducing economic & environmental costs of energy
- Over 300 staff; offices in Vermont, Ohio, & Washington DC
- Services:
 - Design and implement energy efficiency, renewable energy, and clean transportation programs
 - Policy, planning, regulatory support

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