September 21, 2018

NH Presentation

Efficiency & Electrification:
Strategic Partners

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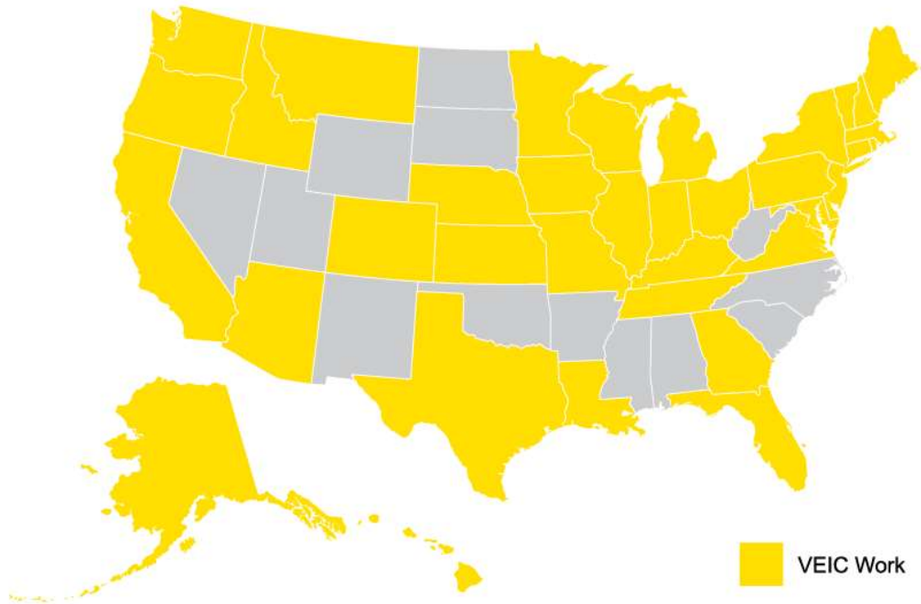
VEIC

About VEIC

- Nonprofit founded in 1986
- 300+ employees
- Locations: DC, NY, OH, VT
- Design and deliver programs and policies nationwide:
  - Energy efficiency
  - Clean transportation
  - Renewable energy



- Our customers:
  - Utilities
  - Government
  - Foundations
  - Environmental & consumer groups
  - Business

Topics

- Overview of heat pump policies and programs in the Northeast
- Efficiency and electrification: strategic partners
- Updating EE programs in the context of electrification

Heat Pumps in the Northeast:

Lessons Learned

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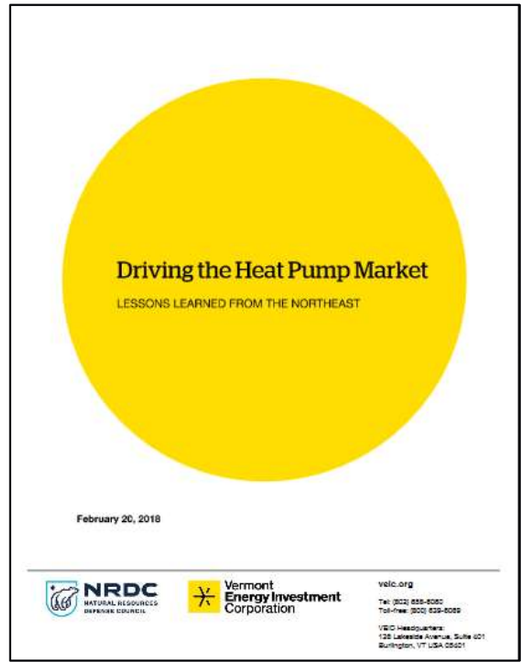
Research Objectives

- Review policy and program frameworks in Northeast states – New England & New York
- Identify key factors driving program success for air source heat pump (ASHP) adoption
- Develop recommendations for states and utilities interested in promoting heat pumps



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

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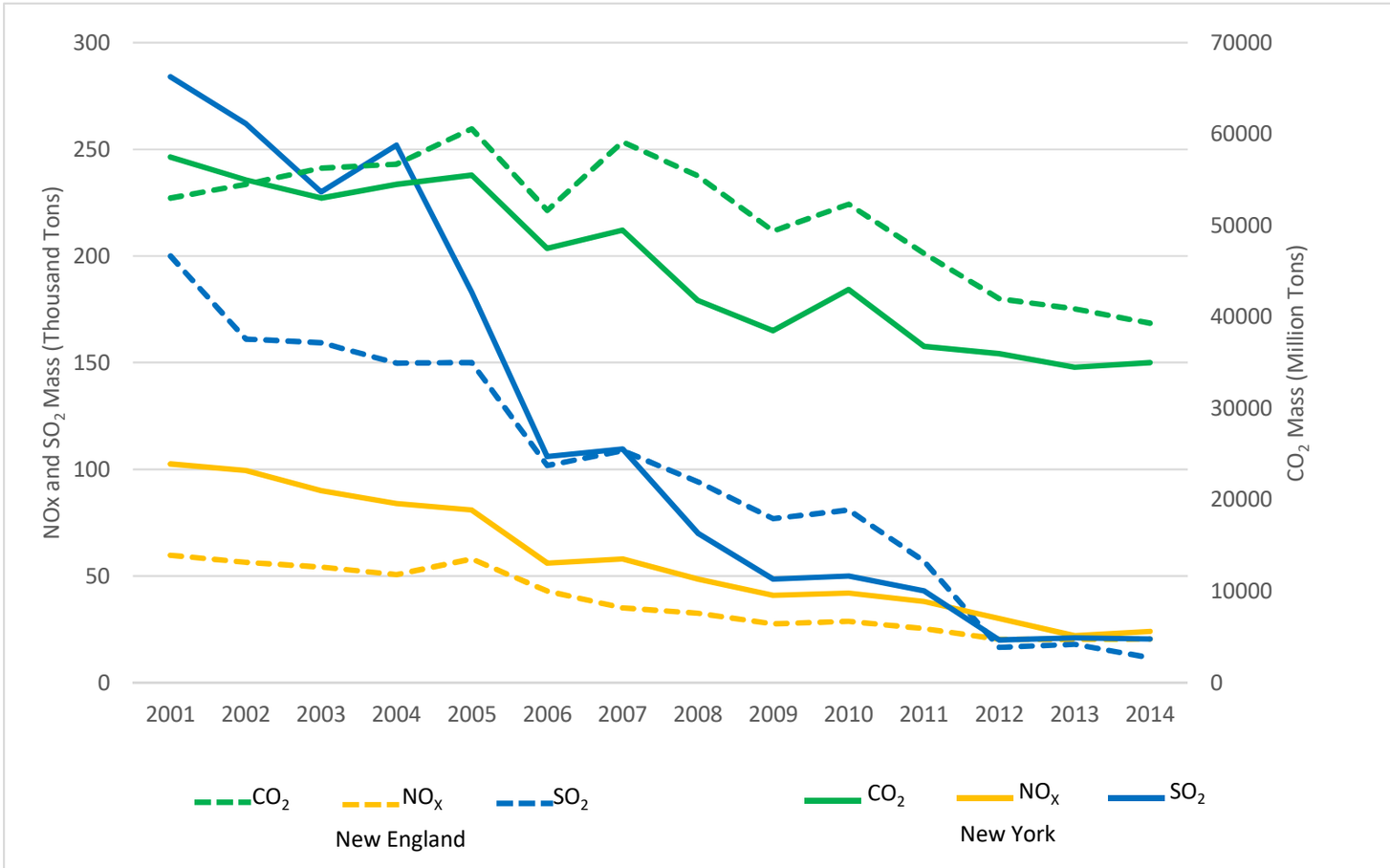
Northeast Electric Grid is Getting Cleaner

Emissions from Electricity Generation 2001-2014 (New York and New England)



Limited Access to Natural Gas in the Region

Natural Gas Pipeline in Northeast US

Source: U.S. EIA Energy Mapping System

State	Housing Units Heated with Natural Gas
CT	33.6%
MA	50.1%
ME	6.0%
NH	19.7%
NY	56.8%
RI	51.8%
VT	16.5%

Source: U.S. Census Data 2015

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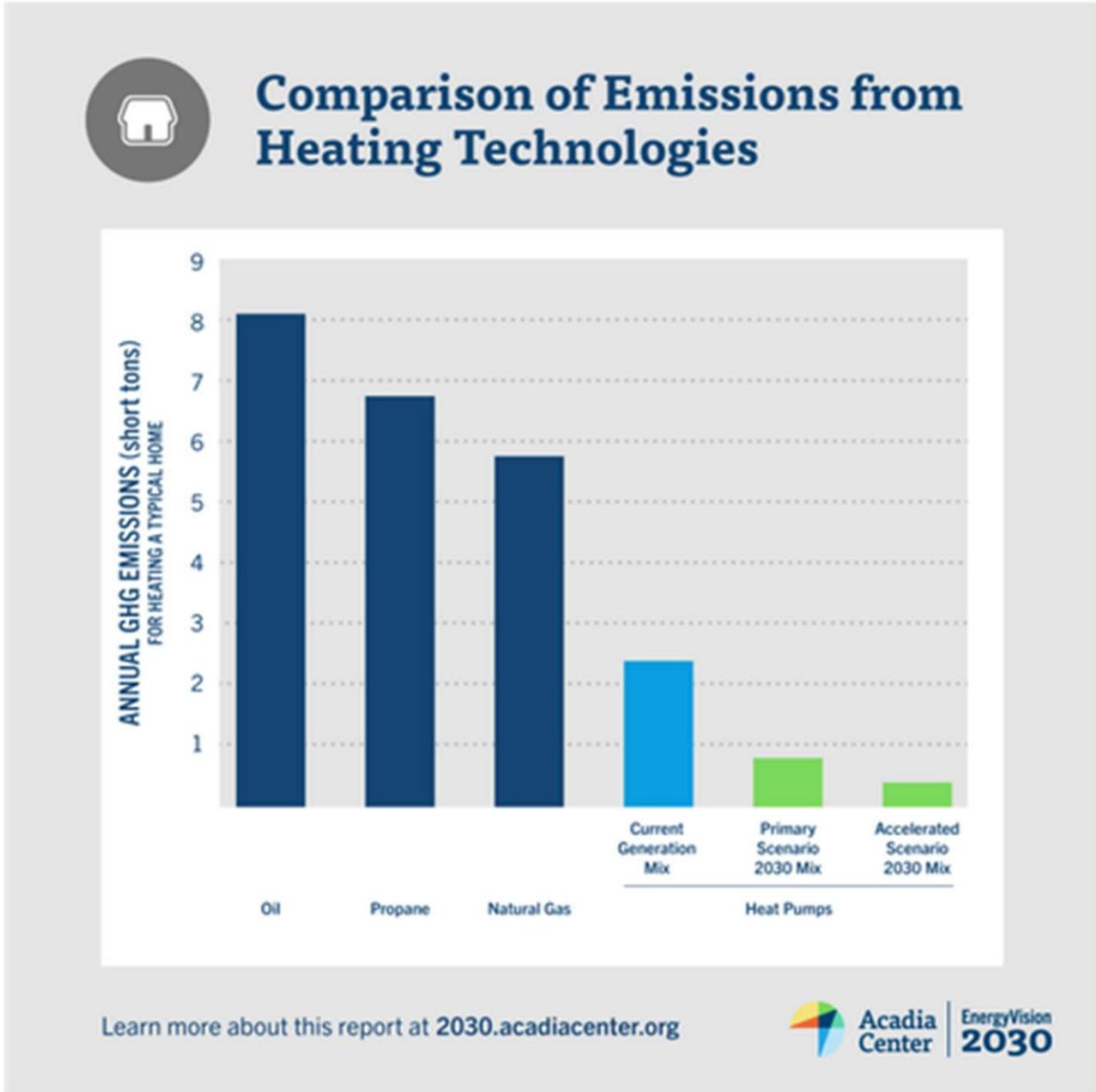
Heat Pumps Have Lowest GHG Emissions



Heat Pump Usage in the Northeast

- Most common application:
  - Ductless mini-split
  - Installed in home with oil or propane boiler
  - Home retains backup fossil fuel system
  - Adds new cooling load
- Wide variability in use of heat pump vs. backup system
- NEEP Cold Climate specification designates products that meet heating performance standards at low temperatures

State Policies Promoting Heat Pumps

State	Policy	Binding Target?	Dedicated Funding Source?
CT	Comprehensive Energy Strategy	No	No
MA	Alternative Portfolio Standard	Yes	Yes
ME	State Energy Plan Legislation directing Efficiency Maine to focus on reducing heating costs	No	Yes
NH	Thermal Renewable Energy Certificate program but ASHPs not currently included	No	No
NY	REV Clean Energy Fund	Yes	Yes
RI	Resilient Rhode Island Act Power Sector Transformation	No	No
VT	Comprehensive Energy Plan Renewable Energy Standard including energy transformation	Yes	Yes

Policy Lessons Learned

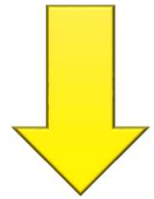
- Policies are most effective when backed by binding targets and dedicated funding
- EE savings targets are necessary but not sufficient to drive heat pump adoption
- Examples of program metrics to drive heat pumps:
  - Number of installations
  - Fuel-neutral energy savings
  - GHG reduction
- When there are multiple program administrators, careful coordination is needed to avoid customer and market confusion

Savings Assumptions

State	Program/Utility	Incentive Level	Incremental Electric Savings	Retrofit Fuel Savings
CT	Energize CT	$300	Yes	No
MA	Mass Save	$100-300	Yes	No
ME	Efficiency Maine	$500	Yes	No
NH	NH Saves	$375-750	Yes	No
NY	NYSERDA	$500	Yes	No
	Utility Programs	$100-300		
RI	National Grid	$100-300	Yes	Yes
VT	Efficiency Vermont	$600-800	Yes	Yes

Savings & Incentives Lessons Learned

- Electric utility programs that only value incremental electric savings tend to offer lower incentives ($100-300/unit)



- Programs that offer higher incentives (>$500/unit):
  - Count the fossil fuel savings towards program goals (e.g., Efficiency Vermont) OR
  - Have non-utility program administrators with broader goals for renewable thermal adoption or GHG reduction (e.g., Efficiency Maine, MassCEC, NYSERDA)

Incentives and Installation Rates

State	Program/Utility	Incentive Approach	Incentive Level	Annual Install Rate
CT	Energize CT	Midstream	$300	0.10%
MA	Mass Save	Downstream	$100-300	0.26%
	MassCEC	Downstream	$625-1000	
ME	Efficiency Maine	Downstream	$500	0.82%
NH	NH Saves	Downstream	$375-750	0.16%
NY	NYSERDA	Midstream to contractor	$500	0.06%
	Utility Programs	Downstream	$100-300	
RI	National Grid	Downstream	$100-300	0.22%
VT	Efficiency Vermont	Midstream	$600-800	1.20%
	Utility RES Compliance	Downstream	$150-375	

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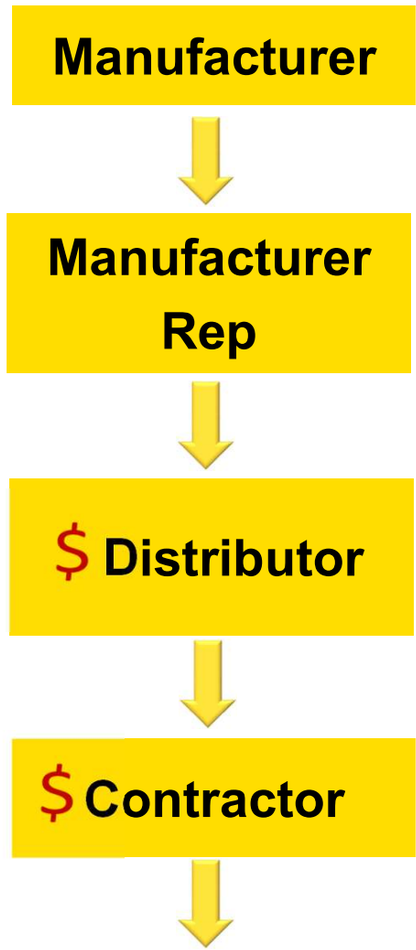
Program Design Lessons Learned

- Midstream programs are effective at driving the market
  - Proactive supply channel engagement
  - Instant discount at point of sale
  - Distributor and/or contractor incentives
- Contractor and customer training is key
  - Contractor incentives (NYSERDA)
  - Trade ally networks (Efficiency Vermont)
- Bundle installation of heat pumps with:
  - Weatherization (NH Electric Coop)
  - Controls (Eversource pilot in CT)



Energy Code Lessons Learned

- Federal preemption rules are a key barrier to promoting high-efficiency mechanical equipment like heat pumps
- States can use local amendments to IECC to work around this constraint:
  - Limit compliance options to only a performance-based path
  - Develop multiple prescriptive paths that include options for higher mechanical efficiencies while maintaining at least one package that utilizes the federal minimum standard
  - Include an additional high efficiency “Options” package from which builders must choose a minimum number of additional efficiency requirements
  - Promote a voluntary stretch code with more stringent requirements

Energy Efficiency & Electrification:

Strategic Partners

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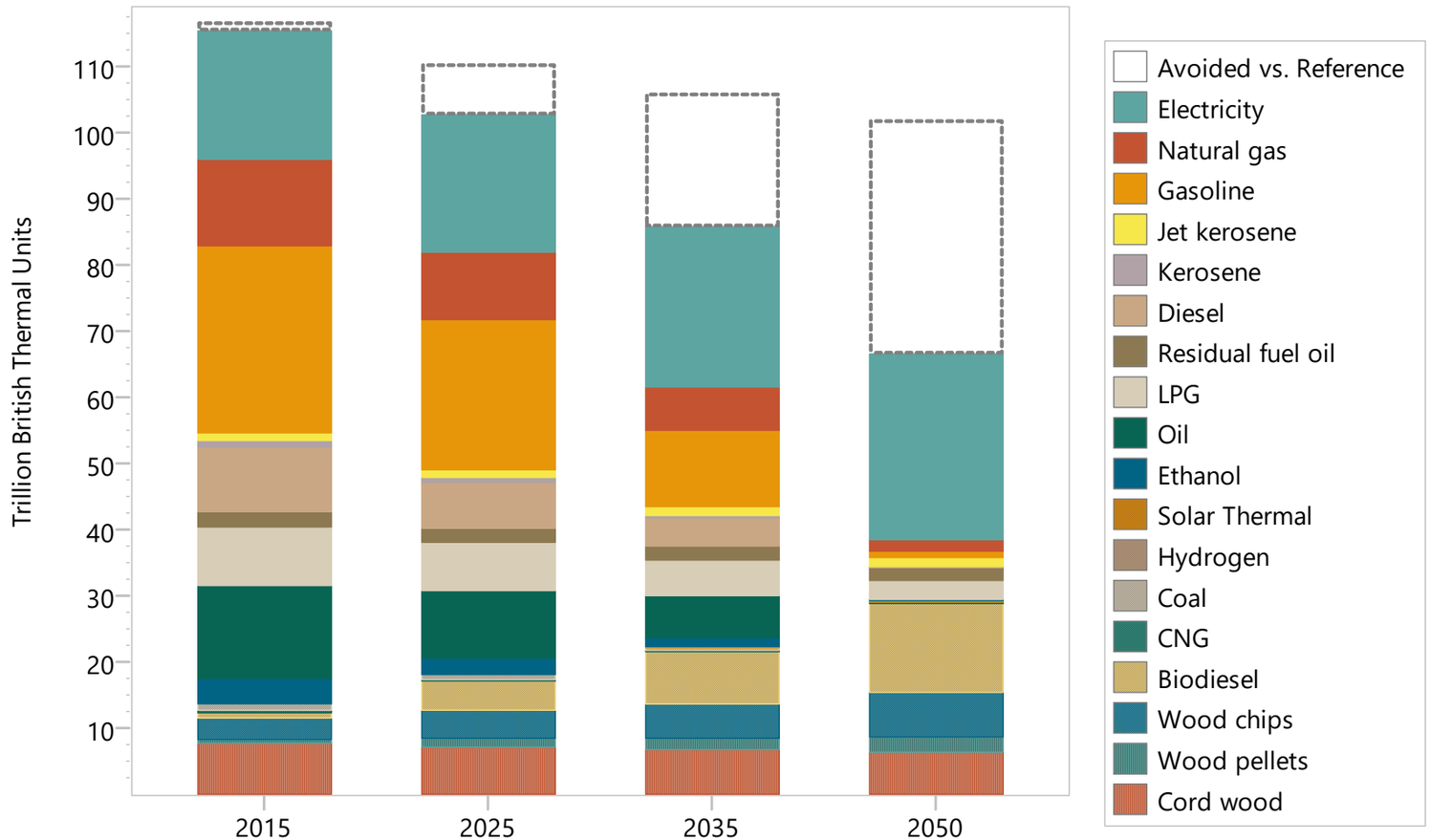
Vermont's Pathway: Efficiency, Electrification, and Renewables



Powered by SunShot U.S. Department of Energy

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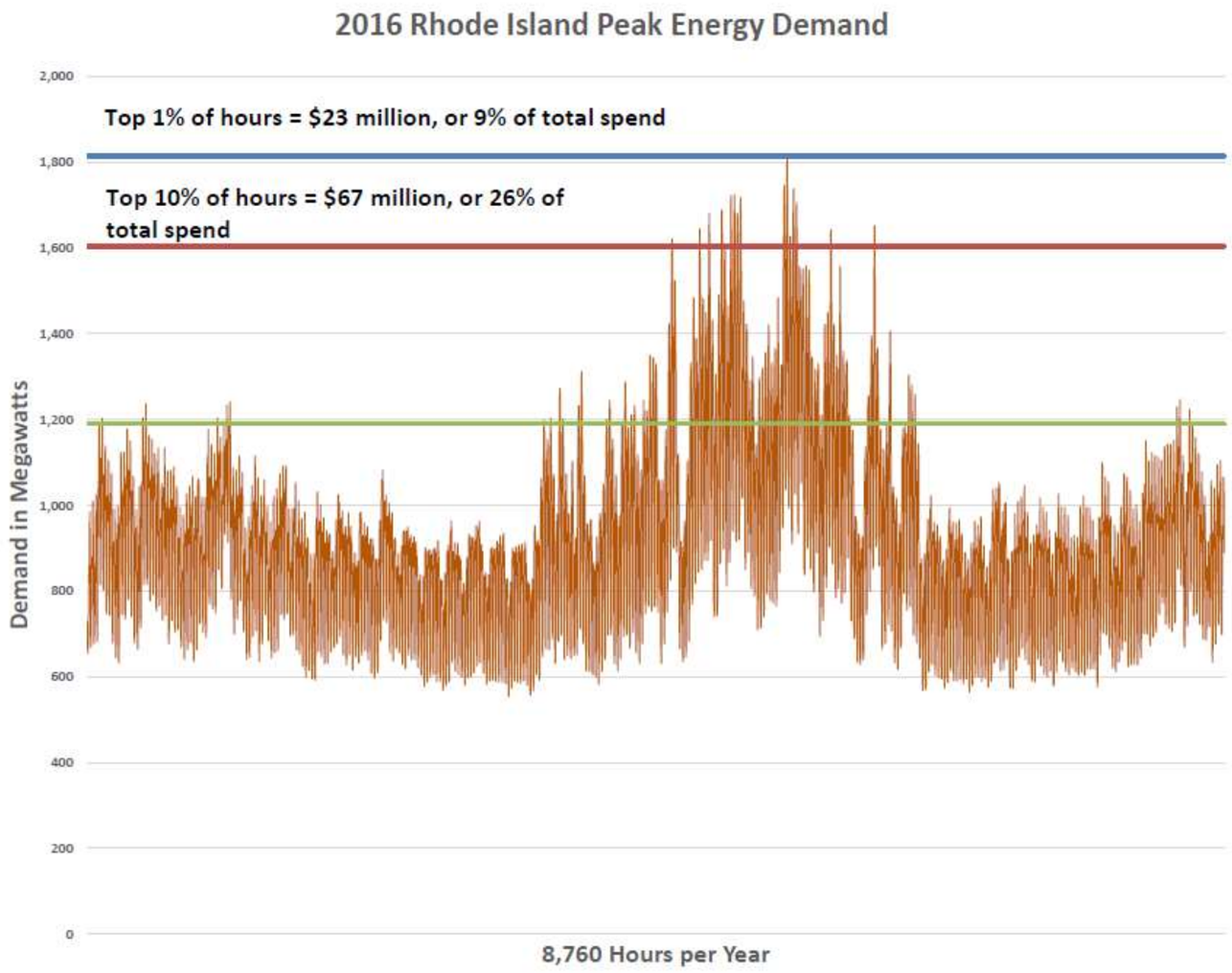
Bulk System Impacts



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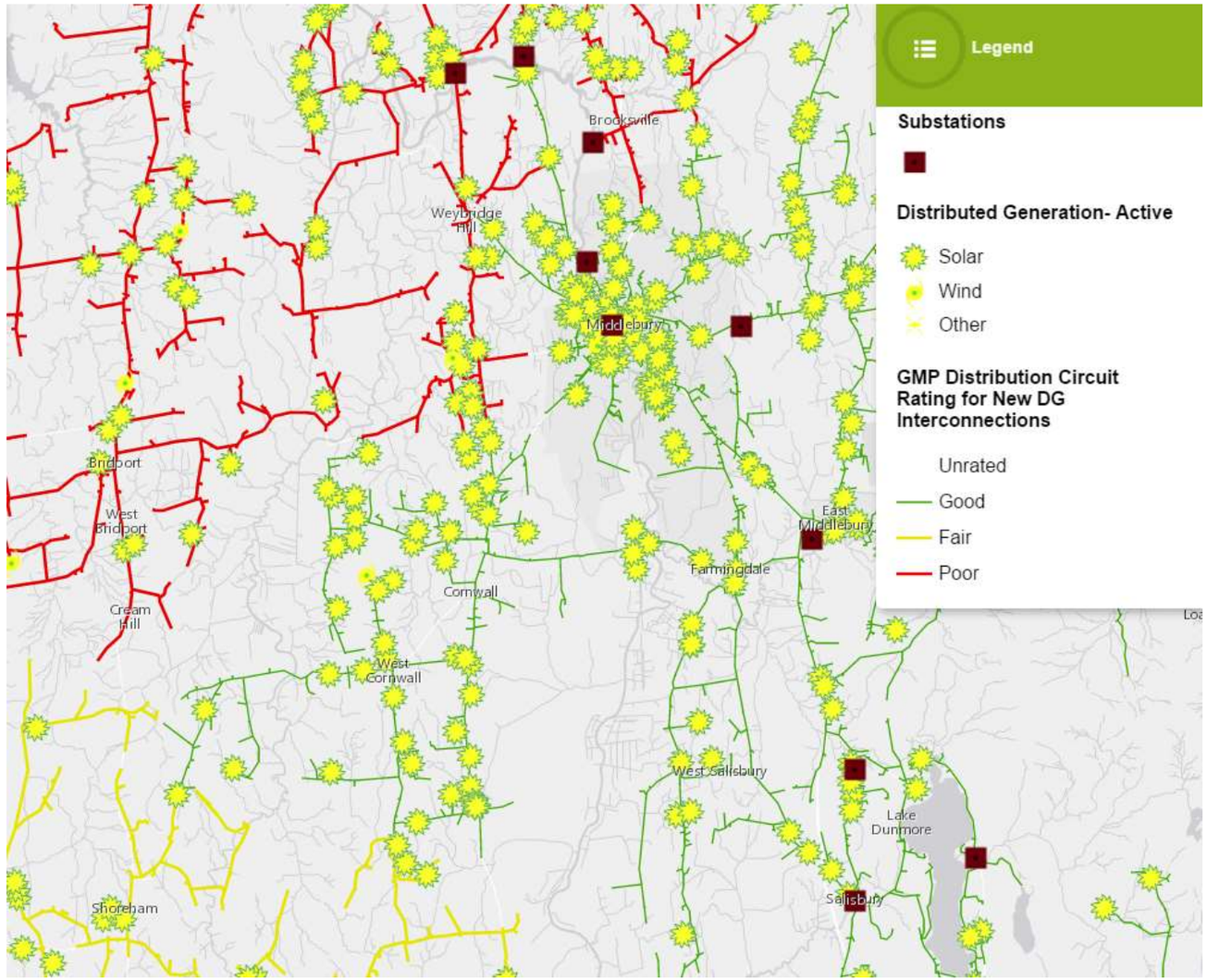
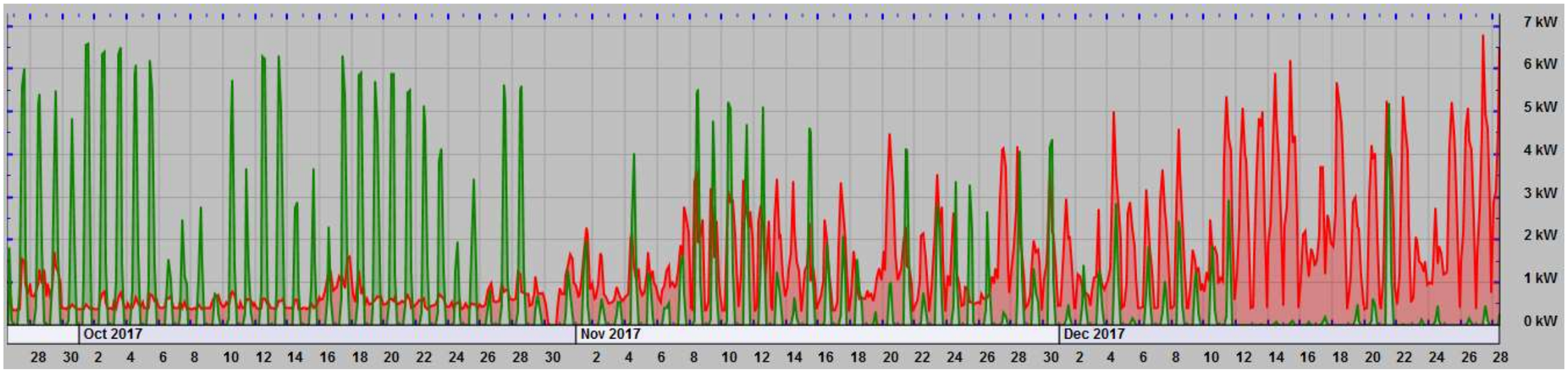
Distribution Grid Impacts



GMP Solar Map, updated weekly
http://www.greenmountainpower.com/innovative/solar/solar-map/

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

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The DER Toolbox: Deploying Electrification & Efficiency Strategically

New



Traditional



Efficiency

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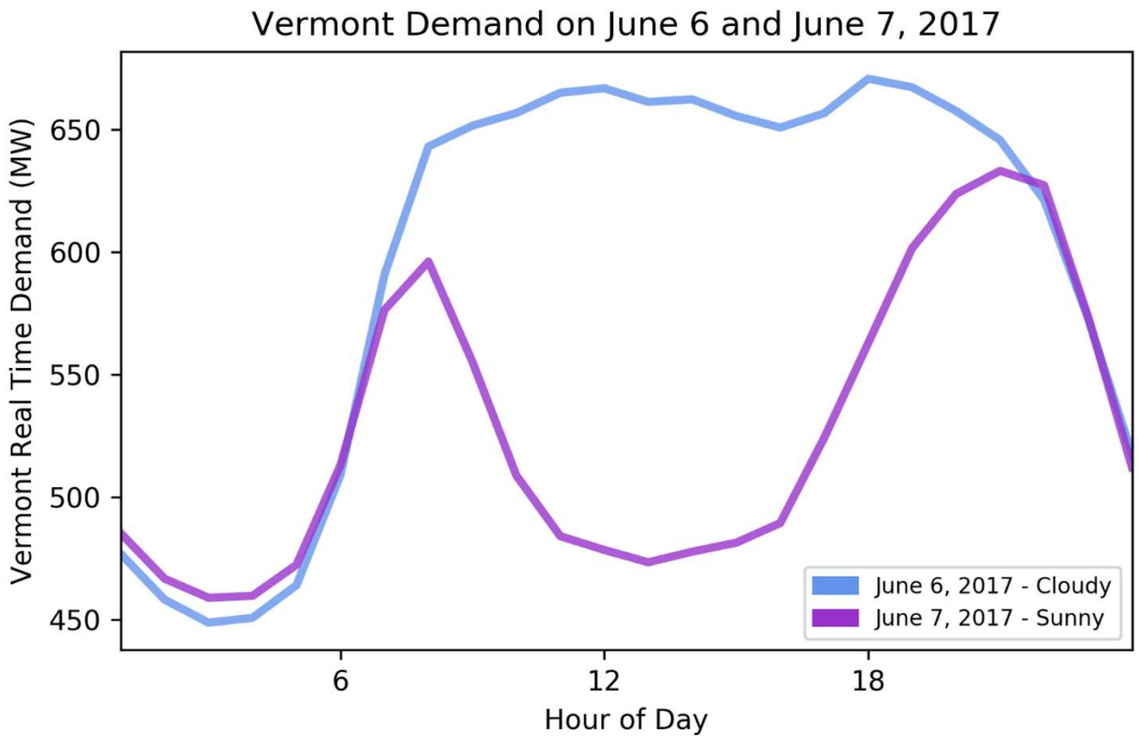
Example: Controllable Load to Accommodate Renewables

- 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

Example: Time-Targeted Efficiency

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



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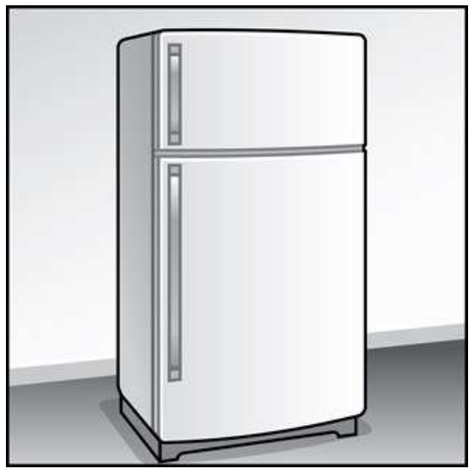
Which Efficiency Measure Better Addresses Vermont's Duck Curve?

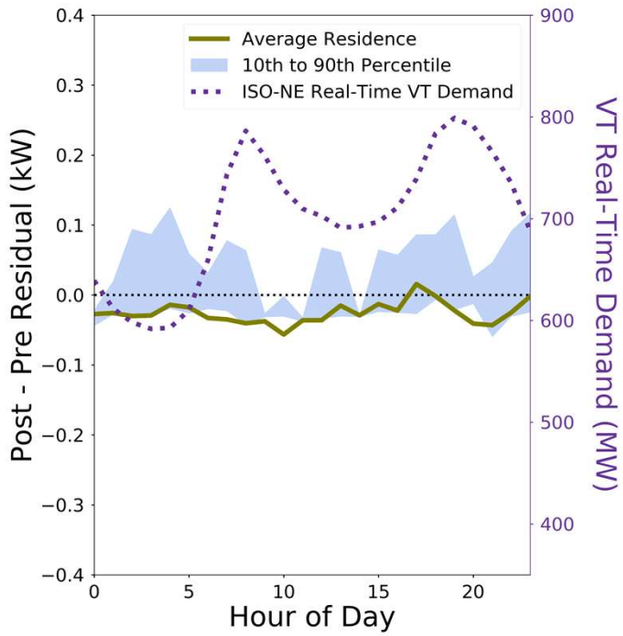


Efficient
Refrigerator

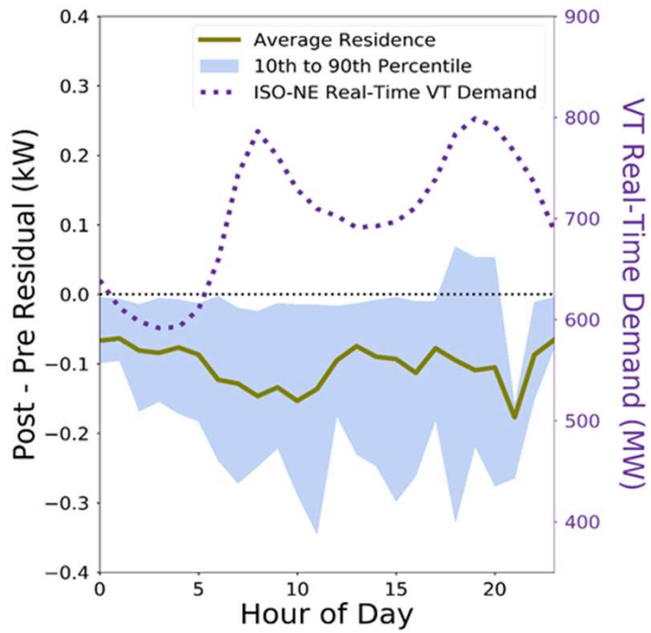
LED
Lightbulb

Different Measures Provide Different System Value

Green Line: Average Efficiency Shape



Efficient Refrigerator



LED

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Electrification & Efficiency: Strategic Partners

- ✓ The **grid has capacity for electrificat**ion at the right time and place
- ✓ Efficiency reduces peak demand and **creates space for electrification** on the grid
- ✓ **Building shell improvements** make heat pump heating and cooling loads more flexible and avoid oversized HVAC and PV systems

Updating EE Programs in Context of Electrification

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Northeast States Are Starting to Evolve EE Goals for the Future

- Massachusetts
- New York
- Rhode Island

Massachusetts: Broadening EE Program Scope

Old Goal	New Goal	Advantage
Lifetime kWh savings	Lifetime MMBtu savings	• Converts electric, oil, and propane savings to common units • Encourages energy optimization by providing holistic view of tradeoffs such as electrification
NA	Peak kW savings	• Measures savings from both active and passive demand reduction

MA Clean Energy Bill

- MA Legislature passed clean energy bill on July 31, 2018
- Key provisions of H.4857, An Act to Advance Clean Energy:
  - **Replaces “electric” with “energy”** in EE statute
  - Adds **energy storage, active demand management, and strategic electrification** as eligible under EE programs
  - Adds programs that result in customers switching to **renewable energy** sources or other clean energy technologies to EE plans
  - Broadens cost-effectiveness screening to ensure that programs "obtain energy savings and **other benefits with value greater than the costs** of the program" rather than energy savings and system benefits
  - Requires **cost-effectiveness at sector level** rather than measure level

New York: Incenting Key Outcomes

Under REV, New York seeks to:

- Transition from cost-of-service to **performance-based ratemaking**
- Provide incentives (**earning adjustment mechanisms** or EAMs) to utilities for achieving desired outcomes
- Take a system-wide view of energy impacts to **encourage private sector activity**, not just program-based activity

Earnings Adjustment Mechanisms : New Upside Performance Incentives in Niagara Mohawk Power Co. Joint Proposal

nationalgrid

EAM Category	Metrics	Measurement	Drivers
System Efficiency	Peak Reduction	NYCA-coincident peak load	Demand response, Storage, Peak-focused EE, DG Interconnection, VDER, VTOU, off-peak EV Charging, heat electrification, VVO/CVR
	DER Utilization	Sum of annualized MWh for incremental load-reducing DERs	
Energy Efficiency	Incremental EE	Incremental MWh EE Savings	ETIP, incremental NMPC administered EE, EE financing, E-Commerce Platform, LED Street Lighting, Project Juniper, NYSERDA coordination, 3rd party coordination
	LED Street Lighting	LED SL conversions	
	Resi Energy Intensity	% decrease in MWh/customer	
	C&I Energy Intensity	% decrease in MWh/customer	
Interconnection	Meeting SIR standards is threshold for earning		Developer cost sharing; Developer opportunity to construct upgrades; online interconnection portal
	Developer Satisfaction	Survey score	
Carbon Reduction	Beneficial Electrification	MT CO2 reduced from incremental heat pumps and EVs	Electric heat initiative, EV charging & marketing, rate design, Juniper

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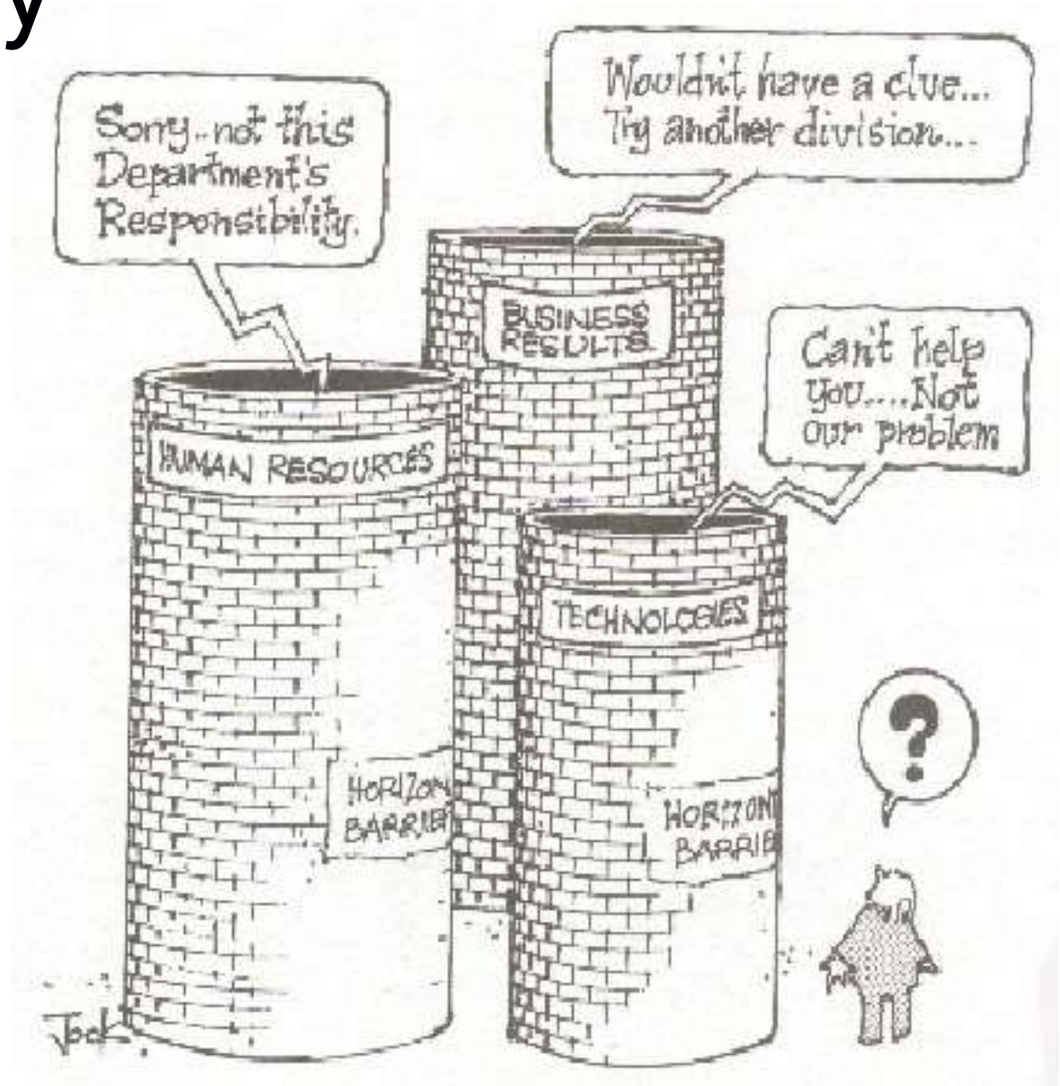
Rhode Island: Baby Steps Toward Performance-Based Regulation

PIM	Objective	Metric
System efficiency (new PIM)	Reduce demand during ISO-NE peak hour	Sum of annual MW capacity savings from: • Demand response • Incremental net-metered behind-the-meter PV distributed generation in excess of forecast levels • Incremental installed energy storage capacity • Non-wires alternatives that reduce system peak
EE savings (incentivized under EE program)	Annual MWh and therm savings	Also testing new metrics: • **CO2 reductions from delivered fuel programs (Wx, heat pumps, etc.)** • Lifetime MWh savings • Cost of energy saved • Customer satisfaction

Steps to Update Efficiency Programs in the Context of Electrification

- ✓ **Build on efficiency program skills and success**
- ✓ **Coordinate delivery** of efficiency, demand management, and electrification programs to avoid creating program silos



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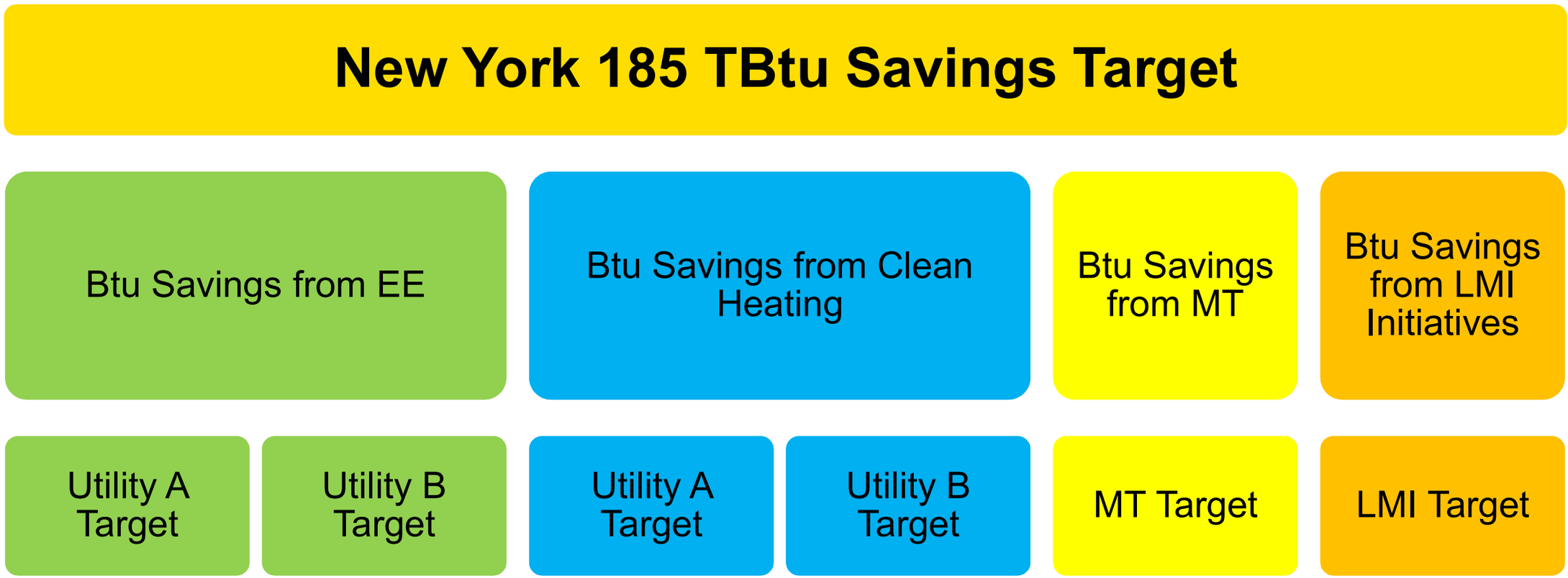
Steps to Update Efficiency Programs in the Context of Electrification

- ✓ **Update cost-benefit tests** to include the full benefits of building electrification
  - GHG reduction, fuel security, comfort, health, economic development
- ✓ **Change program rules** that discourage fuel switching from natural gas to electricity
- ✓ **Support – and dedicate funding for – pilots and innovation**

Set Next-Generation Goals

- ✓ **Align EE program goals (and utility performance incentives) with state policy goals:**
  - Peak demand reduction
  - Fuel-neutral energy savings or GHG reduction
  - Market transformation indicators
  - Energy or GHG savings for low-income customers or other target groups
- ✓ **Identify building blocks** to achieve statewide goals – including dedicated targets for EE savings
- ✓ **Assign responsibility (and funding)** for each building block

A Possible Model?



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Thank you!

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