Energy 101b

January 22, 2021

DEPARTMENT OF PUBLIC SERVICE

BEFORE HOUSE COMMITTEE ON ENERGY & TECHNOLOGY

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VERMONT

PUBLIC SERVICE DEPARTMENT

Topics Covered

- Efficiency Utilities
- Weatherization
- Renewable Energy Standard
  - Tiers 1 and 2
  - Tier 3
  - RES Report
- Standard Offer Program
- Net Metering
- Grid Modernization
- Sheffield Highgate Export Interface

Vermont’s Energy Efficiency Utilities

Efficiency Vermont

- “Statewide” Electric & Thermal Efficiency Programs for unregulated fuels

Burlington Electric Department

- Electric and unregulated Thermal Efficiency services in own territory

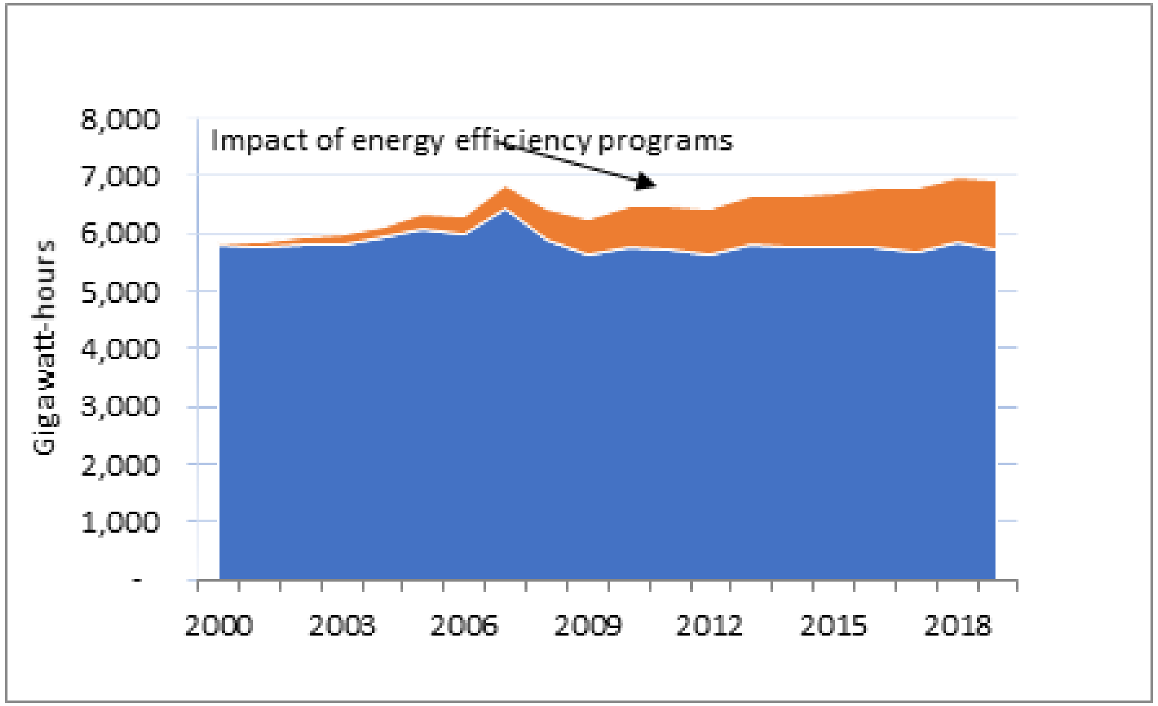
Vermont Gas Systems

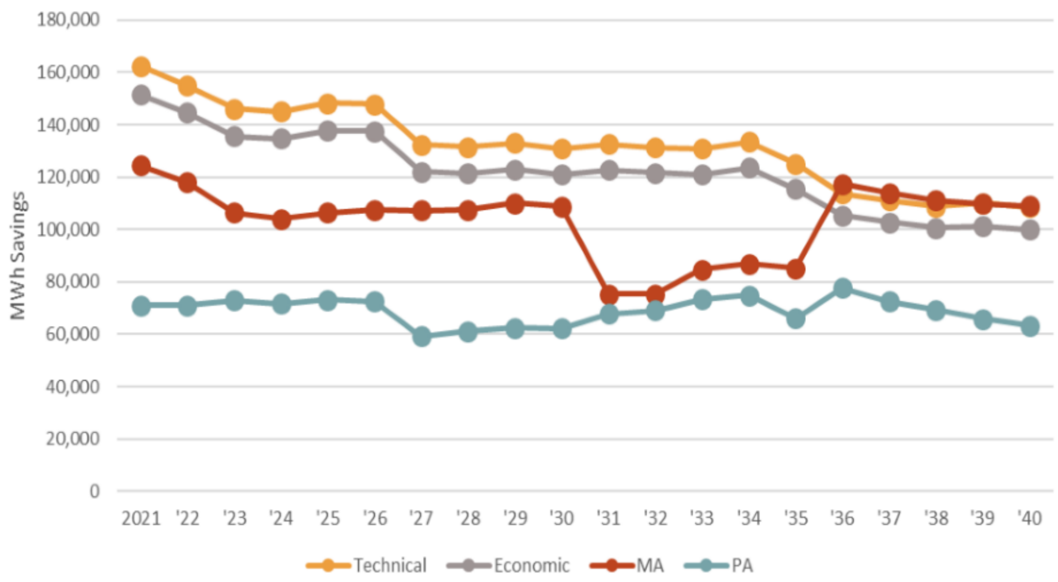
- Natural Gas Efficiency Services

30 V.S.A §209 creates an Energy Efficiency Charge to acquire “all reasonably available cost- effective energy efficiency”

- Directs revenues from Vermont’s participation in Regional Greenhouse Gas Initiative and Forward Capacity Market to Thermal Fuels

Traditional Electric Efficiency in forecast

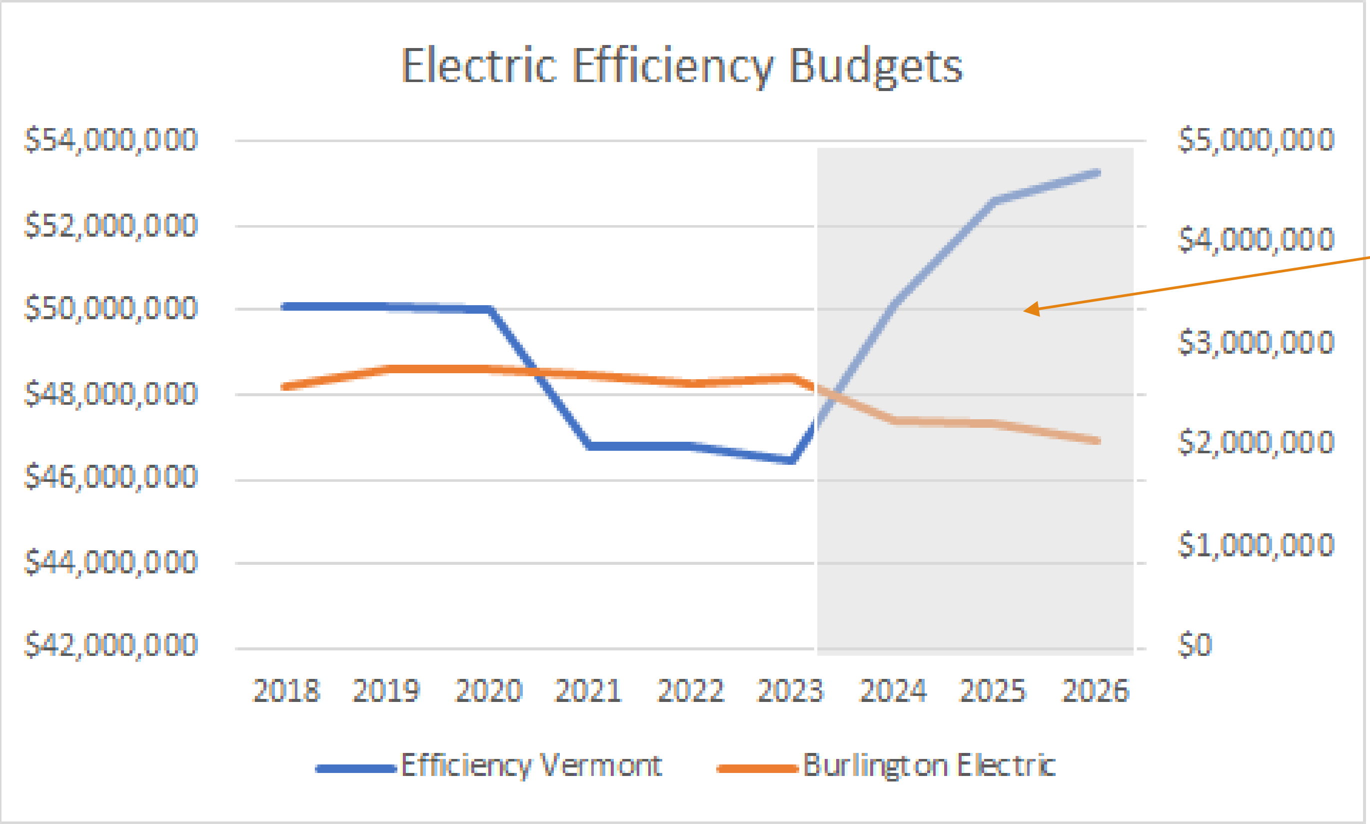




Efficiency Innovation 2021-23

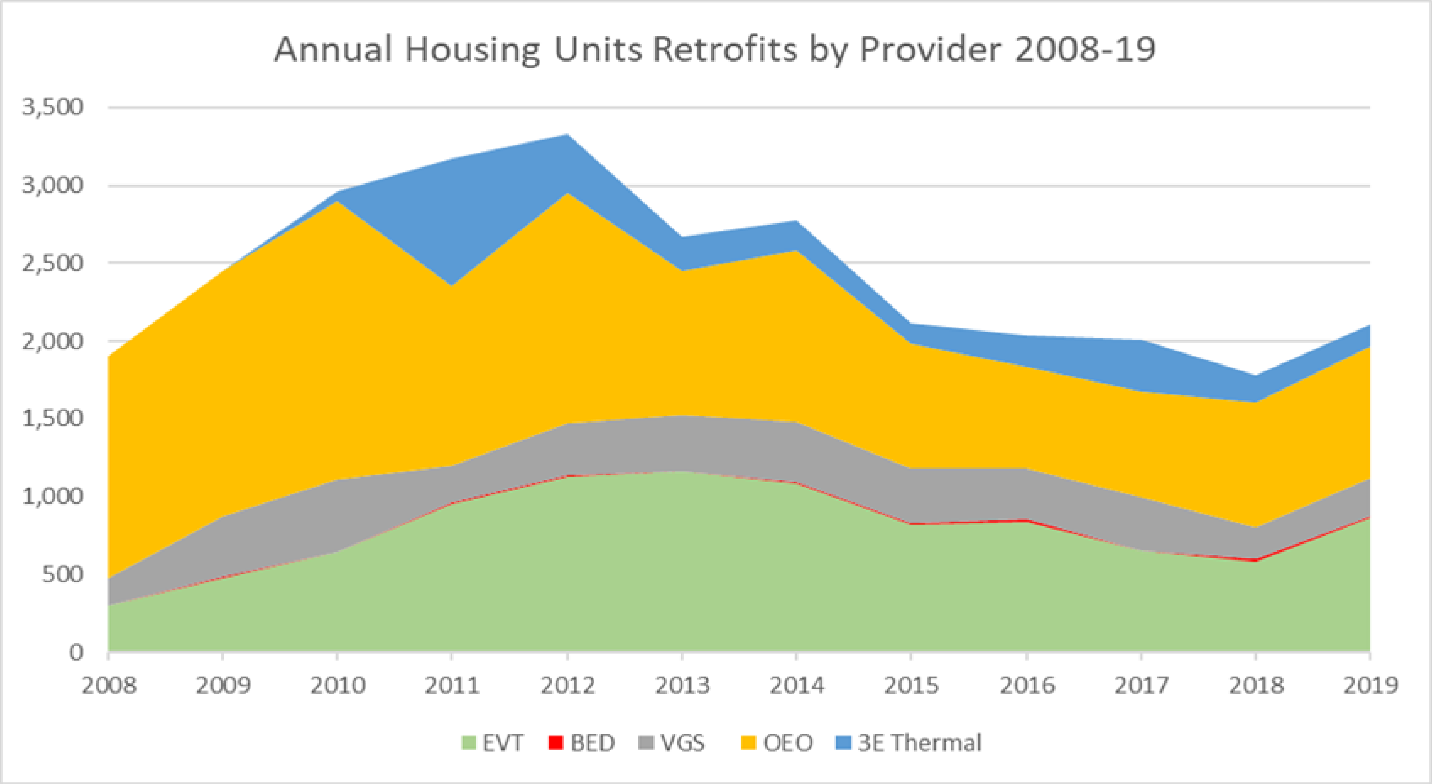
- Flexible Load Management Pilot (~$3.3m)
- Greenhouse Gas Performance Metrics
- Refrigerant Management Program (~$3.4m)
- Act 151 Programs – Upstream Transportation

Electric Efficiency Budgets

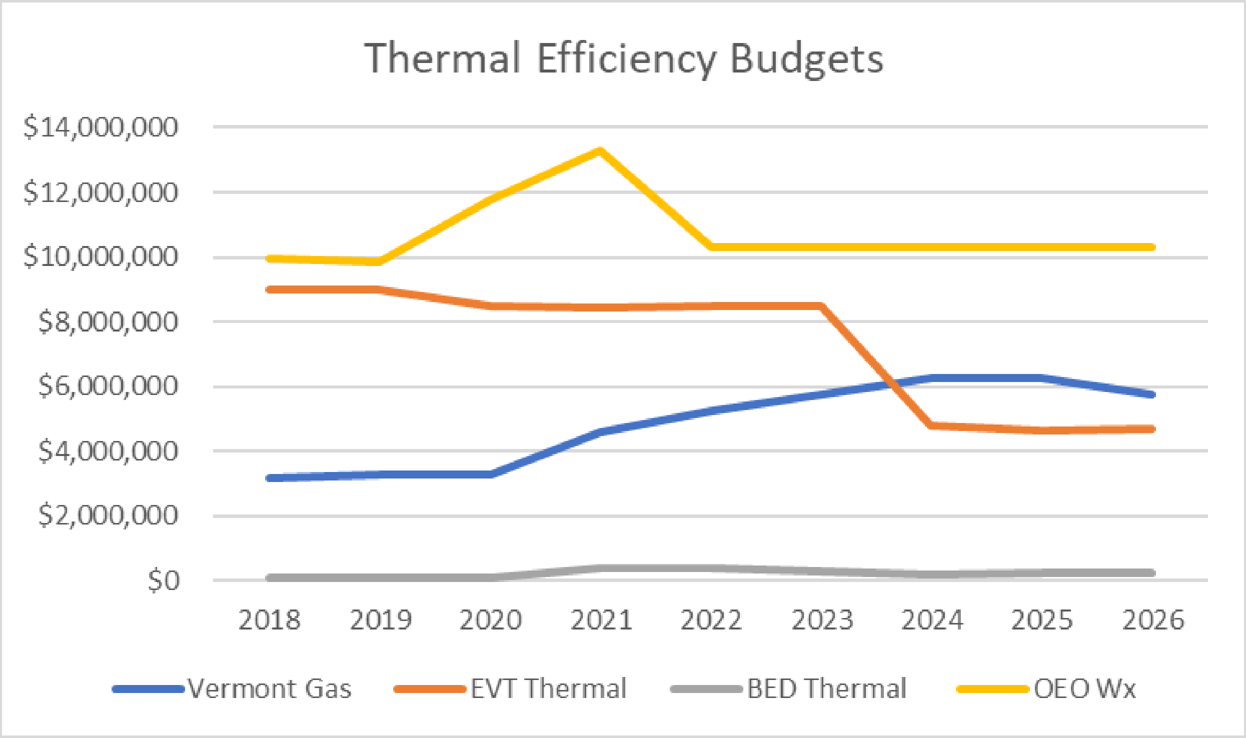


Provisionally Approved Budgets – 15% increase in Efficiency charge outside of BED territory from 2023-26

Weatherization



Thermal/Process Efficiency Funding



Sources of Funds

- OEO Weatherization
  - Two cents per gallon on fuel oil, propane, kerosene
  - Gross receipts tax on natural gas and electricity
- 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

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

History of Electric Renewable Requirements

2005 – Sustainably Priced Energy Enterprise Development (SPEED) Program
- Required utilities to enter into long-term stably priced contracts for renewable resources
- Did not require retirement of RECs

2009 – Standard Offer Program
- Created a single, statewide procurement process for small (2.2 MW or less) renewable resources
- Initially 50 MW, expanded to 127.5 MW in 2012
- Initially, administratively determined price, moved to reverse bid process in 2012
- Did not require retirement of RECs

Net metering
- 1998 – first introduced, 15 kW customer cap (farms could have 100 kW anaerobic digesters), 1% cap
- 2008 – allowed group net metering, expanded overall cap to 2%; increased project size cap to 250 kW
- 2011: Project cap expanded to 500 kW; registration process for small systems begins; overall cap expanded to 4%; solar adder introduced
- 2014: Cap expanded to 15%; NM 2.0 process initiated
- 2017: NM 2.0 starts; compensation based in part on whether RECs are given to utility

2017- Renewable Energy Standard
- 3 Tiers of requirements that increase annually: Total Renewables, Distributed Generation, & Energy Transformation

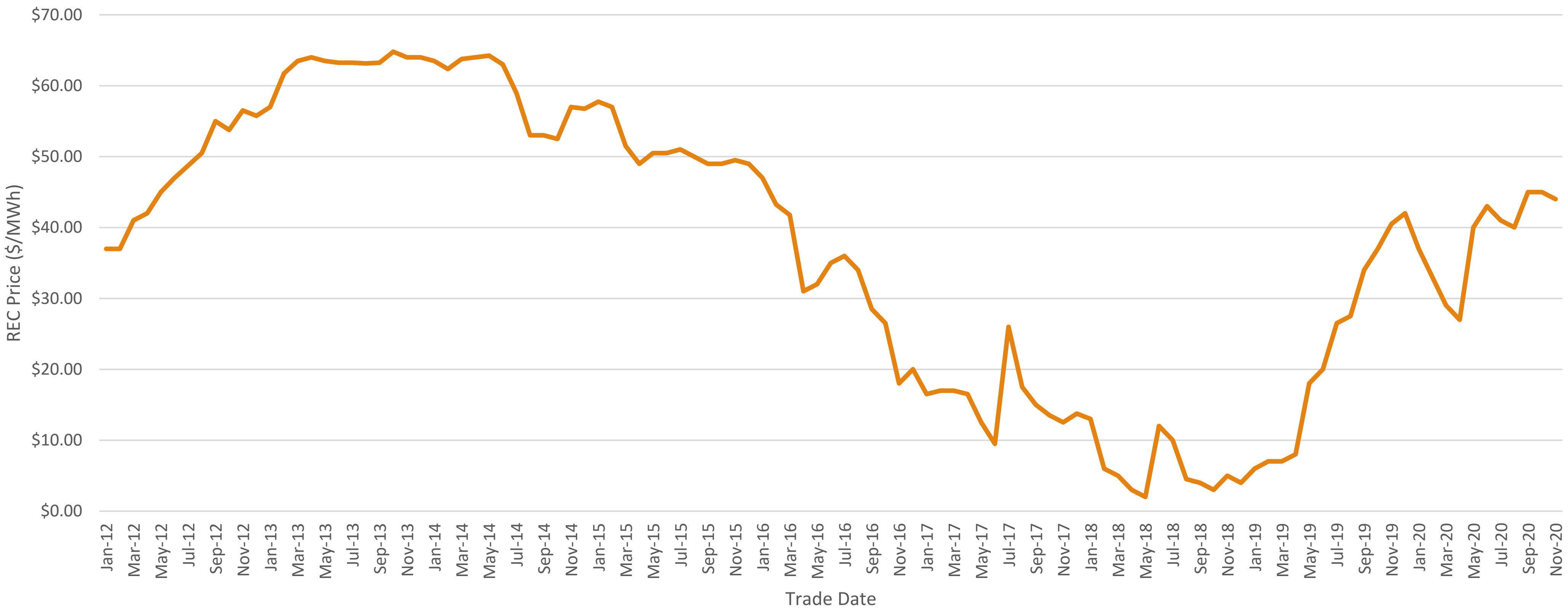
Renewable Energy Standard (RES)

- Enacted in 2015, compliance started 2017
- Tiers 1 and 2 require retirement of renewable energy credits (RECs)
- Brings Vermont into line with the rest of the region
- Tier I: Total Renewables – any renewable resource that can deliver into New England, regardless of project size and when resource was constructed. Includes resources from NY and Quebec.
- Tier II: Distributed Generation- renewable resources commissioned after June 30, 2015; connected to a distribution or subtransmission line in Vermont; nameplate capacity of less than 5 MW
- Tier III: Energy Transformation- requires utilities to provide programs that reduce fossil fuel use by customers or retire Tier 2 RECs
  - Examples of Tier 3 measures include:
    - Cold climate heat pumps
    - Electric vehicles and charging stations
    - Weatherization
    - Custom projects- line extensions to electrify sawmills and maple sugaring

Renewable Energy Credits (RECs)

- RECs are the tool used for accounting, tracking and assigning ownership of renewable attributes.
- One MWh of renewable generation = one REC
- RECs are used throughout U.S. to track renewability
- Renewable attributes are separated from underlying generation
- Creates fungible commodity that can be traded
- Creates uniform system for ensuring that there is no double counting
- Value of REC
  - Theory is that REC value should represent the difference between the revenues a resource receives from wholesale markets (e.g. energy, capacity, reserves, etc.) and the cost to build
  - Reality is that value is based on supply and demand
  - Different Tier/Class eligibility means different values

MA Regional Class I REC Prices



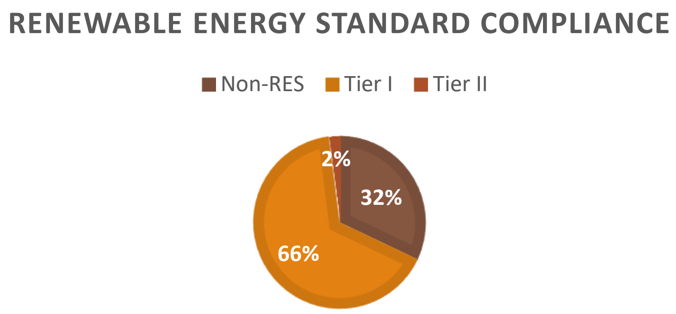
Tier 1 – Total Energy

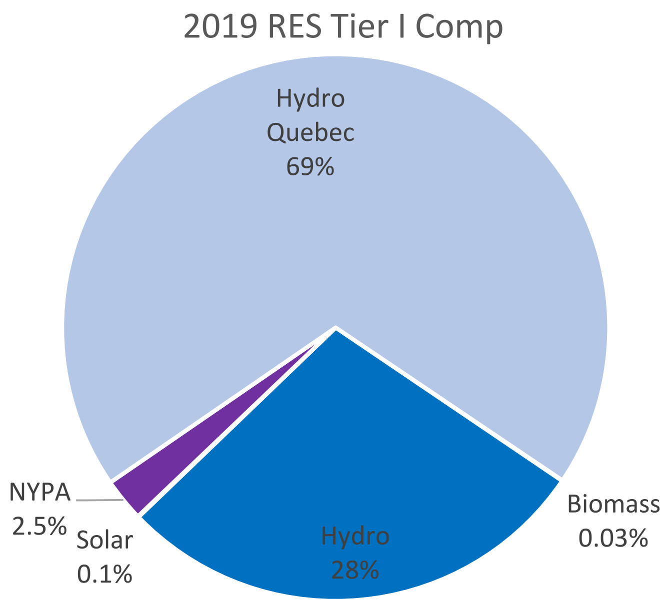
- Eligibility – any renewable resource that can deliver into New England, regardless of when resource was constructed
- Required Amounts:
  - 55% of retail sales in 2017, increasing 4% every three years, until 75% in 2032
    - Tier II is included in Tier I
  - Maintained at 75% thereafter
- Alternative Compliance Payment = $10/REC in 2017, increasing by CPI annually
- REC prices relatively low: $0.35/REC average in 2019; $1 - $6 per REC estimated going forward

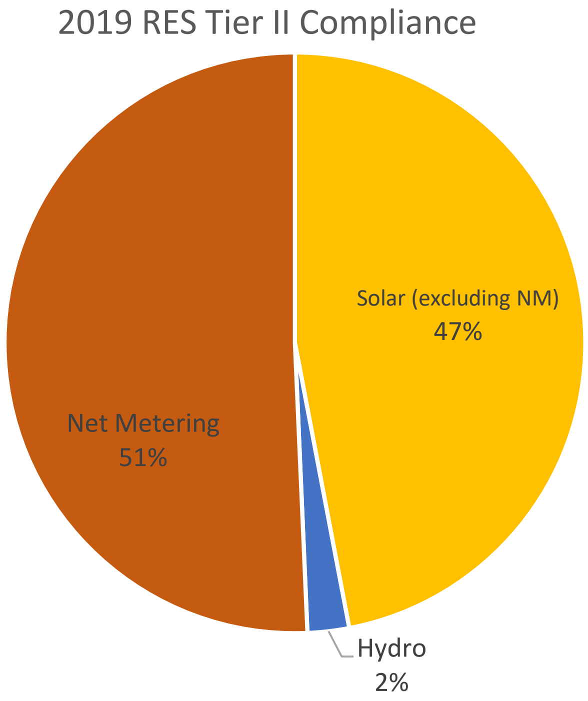
Tier 2 – Distributed Generation

- Eligibility – renewable resources commissioned after June 30, 2015; connected to a distribution or subtransmission line in Vermont; nameplate capacity of less than 5 MW
- Required Amounts: 1% of retail sales in 2017, increasing 0.6% every year, until 10% in 2032
  - Maintained at 10% thereafter
  - Carve out of Tier 1 requirements (not additional)
- Alternative Compliance Payment = $60/REC in 2017, increasing by CPI annually
- Tier II compliance costs averaged $39/REC in 2019; REC prices vary considerably
- Tier 2 REC price forecast for new RECs: ~$40/REC in the near-term, decreasing to $10 - $30/REC by 2030

2019 RES Compliance



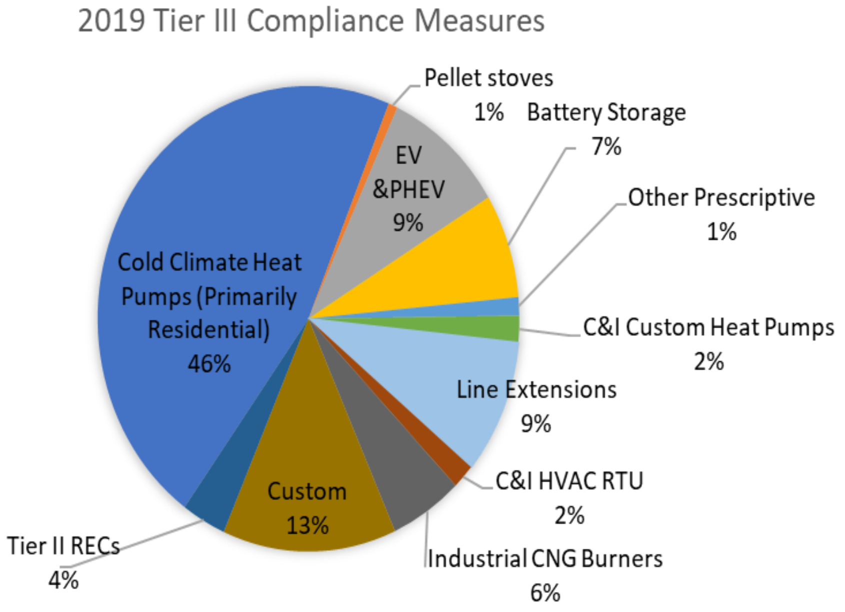


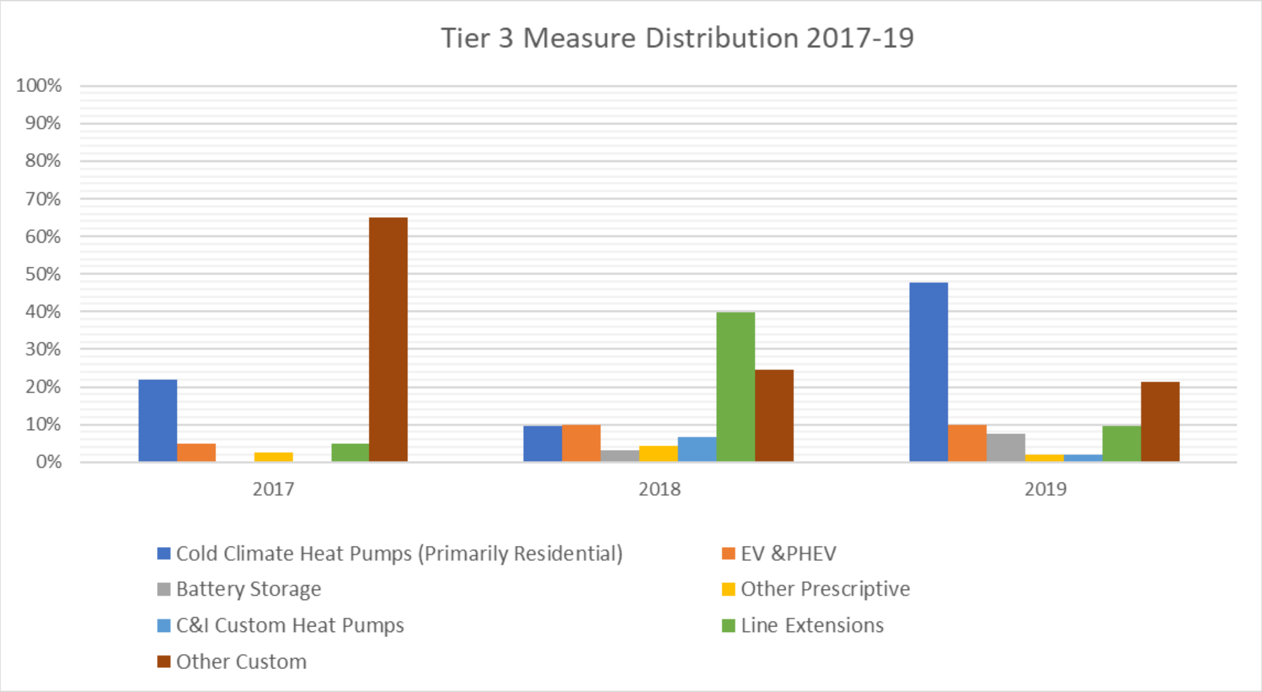


Tier 3 – Energy Transformation

- Purpose: Support fossil fuel reductions for utility customers
- Eligibility: electrification (vehicles, heat pumps); sawmills; sugaring operations; weatherization; Tier 2 RECs
- Required Amounts: 2% of retail sales in 2017, increasing by 0.67 % each year until reaching 12% in 2032
  - Maintained at 12% thereafter
  - Later start date and lower overall requirement for small municipal utilities
- Alternative Compliance Payment = $60/REC in 2017, increasing by CPI annually
- Costs vary considerably in terms of incentives paid to customers. Average cost was $34/ MWhe in 2019

RES Tier 3 Compliance





RES Benefits: Tier 3

- Equivalent of 176,839 MWh of fossil fuel savings in 2019
- 2019 carbon reduction of 11,000 tons
  - Tier 3 savings claims are based on lifetime savings, but emission reductions are on an annual basis and will continue for the life of the project.
- Increased kWh sales from electrification efforts can reduce electric rates
  - Fixed costs of the system are spread over a greater number of kWh, reducing the cost per kWh for all customers
  - Assumes that new electric loads are managed so they do not increase peak

2019 RES Costs

Tier	REC Retirements	Compliance Cost	Average Price ($/ REC)
Tier I	3,564,110 RECs	$1,240,000	$0.35 / REC
Tier II	118,262 RECs	$4,650,000	$39 / REC
Tier III	176,839 Mwhe	$6,030,000	$34 / MWhe
Total Cost of Compliance		**$11,920,000**	

If REC prices were at ACP, total cost would have been almost $48 million

Rate Pressure of RES

- In the past 2 years, there have been five rate increases by five utilities
- No recent rate cases have been a direct result of RES compliance costs or standard-offer
- Tier II of RES can be met with RECs from the following sources, ranked in order of cost:

1. net-metering ~ $60/REC - $40/REC
2. standard-offer ~ $25/REC (contracts are for bundled energy, capacity and RECs– utilities assign the cost to each product)
3. utility owned projects or long-term purchases ~ $20/REC
4. short-term REC only ~ $40/REC *there is limited availability of Tier II RECs in Vermont

Projections of Future Performance (2029)

- 30 V.S.A. 8005b(b)(2) requires the DPS to conduct analysis of expected performance of RES over ten-year period
- Results vary significantly depending on assumption
- Overall reduction in fossil fuel-based energy (all sectors) = 15%
  - Additional 5% reduction resulting from increased nuclear

Estimated ten-year RES compliance costs

	HIGH INCREMENTAL COST	LOW INCREMENTAL COST
REC Price Forecast	HIGH	LOW
NM Adoption Rate	HIGH	LOW
Peak contribution of New Load	90%	None
Fossil Fuel Price	LOW	HIGH
Tier 1 Cost	$136,000,000	$20,000,000
Tier 2 Cost	$63,000,000	$48,000,000
Tier 3 Net Cost	-$28,000,000	-$60,000,000
TOTAL Cost of RES	$171,000,000	$8,000,000
Rate Pressure	5.02%	0.56%

Standard Offer Program

- Program was established in 2009 to stimulate small, in-state renewable energy development
- Total program capacity of 127.5 MW expected to be contracted by 2022
- Program is structured to encourage technology diversity, but has proved hard to achieve
- Currently, there are 70 MW online with a total of 113 MW that have been awarded contracts
- In 2020, the program cost was $22.3 million, for an average price of $199/MWh
  - The average cost per MWh has been decreasing as new contracts are awarded at more competitive prices

- Includes a baseload renewable power portfolio requirement (Ryegate) that expires in 2022. Ryegate is not included in Standard Offer program summaries.

Standard Offer Project Summary

Technology	Contracted		Online		In Development	
	Capacity (kW)	Number of Projects	Capacity (kW)	Number of Projects	Capacity (kW)	Number of Projects
Biomass	865	1	865	1	0	0
Farm Methane	5,249	15	5,205	14	44	1
Food Waste	3,388	5	0	0	3,388	5
Hydroelectric	4,939	6	4,939	6	0	0
Landfill Methane	0	0	0	0	0	0
Large Wind	0	0	0	0	0	0
Small Wind	886	15	0	0	886	15
Solar PV	97,647	57	58,797	39	38,850	18
TOTAL	**112,974**	**99**	**69,806**	**60**	**43,168**	**39**

Standard Offer Program Production & Costs

Year	MWh Generation	Program Cost	Average Price per MWh	Avg. Capacity Factor
2015	90,126	$20,100,371	$223	20.1%
2016	101,377	$22,042,023	$217	19.8%
2017	103,519	$21,342,884	$206	18.8%
2018	103,658	$21,250,884	$205	18.1%
2019	109,516	$21,991,994	$201	17.9%
2020	112,185	$22,273,981	$199	20.0%

Net Metering (30 V.S.A. § 8010 and PUC Rule 5.100)

- PUC directed by Legislature in Act 99 of 2014 to initiate proceedings to redesign net metering.
- Current program (“NM 2.0,” “NM 2.x”) started January 1, 2017
- Four categories of NM systems, plus hydro
  - Category I: 15 kW and under
  - Category II: 15-150 kW on preferred sites*
  - Category III: 150-500 kW on preferred sites
  - Category IV: 15-150 kW not on preferred sites
- 150-500 kW must be on a preferred site to net-meter
- No cap on aggregate installations or % of utility peak
- Production is netted with consumption within the billing period (i.e. these kWh are valued at retail rate)
- Compensation for any excess generation is based on whichever is lower, the utility’s blended residential rate or the statewide average blended residential rate (now $0.15417/kWh, increasing to $0.16413/kWh for all NM 2.x systems starting February 2). Group system generation is generally all treated as excess.
- Credits roll over for 12 months from genesis (i.e., summer production can offset winter consumption). Credits cannot be used toward non-bypassable charges.

*Pre-existing structures, parking lot canopies, previously developed land, brownfields, landfills, gravel pits, town-designated sites, Superfund sites, on the same parcel as a customer taking at least 50% of output

Adjustors: Siting and RECs

REC adjustors:

- Currently +1 cent/kWh credit for ten years if RECs go to utility; decreasing to 0 cents/kWh 2/2/21
- Currently -3 cents/kWh (debit) for the life of the system if RECs are held by the customer; decreasing to -4 cents/kWh 2/2/21

Siting:

- By Category
  - I and II: currently +1 cent/kWh for 10 years; 0 cents/kWh starting 2/2/21 and -1 cent/kWh starting 9/1/21
  - III: currently -2 cents/kWh (debit) for lifetime; -3 cents/kWh starting 2/2/21 and -4 cents/kWh starting 9/1/21
  - IV: currently -3 cents/kWh (debit) for lifetime; -4 cents/kWh starting 2/2/21 and -5 cents/kWh starting 9/1/21
  - Hydro: 0 cents/kWh

Biennial proceeding to revisit adjustors, category definitions, and levels of compensation

- Last biennial review occurred in 2020 (see Case No. 20-0097-INV and Order issued 11/12/20 for details)

After 10 years, NM 1.0 systems will come under the contemporaneous net-metering rules and corollary tariffs

Generic Compensation Overview

Table 6. Summary of Changes to Net-Metering Compensation[106]

Category	Current	February 2, 2021 -August 31, 2021	September 1, 2021
Category I (up to 15 kW)	$0.17417	$0.16413/kWh	$0.15413/kWh
Category II (>15 to 150 kW on preferred site)	$0.17417	$0.16413/kWh	$0.15413/kWh
Category III (>150 to 500 kW on preferred site)	$0.14417	$0.13413/kWh	$0.12413/kWh
Category IV (>15 to 150 kW on non-preferred site)	$0.13417	$0.12413/kWh	$0.11413/kWh

Source: Final Order issued by the PUC 11/12/20 in Case No. 20-0097-INV

Net-metering bill example

My Energy Use Snap Shot

Learn how your renewable generation has contributed towards a sustainable energy future. For more details visit your account at greenmountainpower.com

Total Solar Generated
147
kWh

Total Energy Used
583
kWh

75 kWh used by your home
72 kWh Solar to the grid

508 kWh delivered to your home
75 kWh from generation

Bill Details

163 ACORN LN

New Charges

508 Total KWH Consumed	
72 Total KWH Generated	
436 Total KWH Net Billed @ $0.16859	$73.51
Customer Charge: 30 Days @ $0.492	$14.76
Energy Efficiency Charge 436 x $0.01188	$5.18
Electric Assistance Program Fee	$1.00
Past Storm & Power Fixed Charge	$1.24
Emerald Ash Borer Charge	$0.17
147 Total KWH Generation	
147 Solar Siting Incentive KWH @ $-0.01	-$1.47
147 Renewable Energy Certificate Incentive KWH @ $-0.01	-$1.47
New Actual Charges	**$92.92**

*Please note that non-bypassable charges cannot be paid with net metering credits.

NM 2.0 behind-the-meter system

NM 2.0 standalone group system

My Energy Use Snap Shot

Learn how your renewable generation has contributed towards a sustainable energy future. For more details visit your account at greenmountainpower.com

Your Share of Generation
225
kWh

Your Energy Used
997
kWh

Bill Details

163 ACORN LN

Rate: General (Small) Commercial Net Metering non bypassable charges
Group Rate 06
Group Solar Incentive

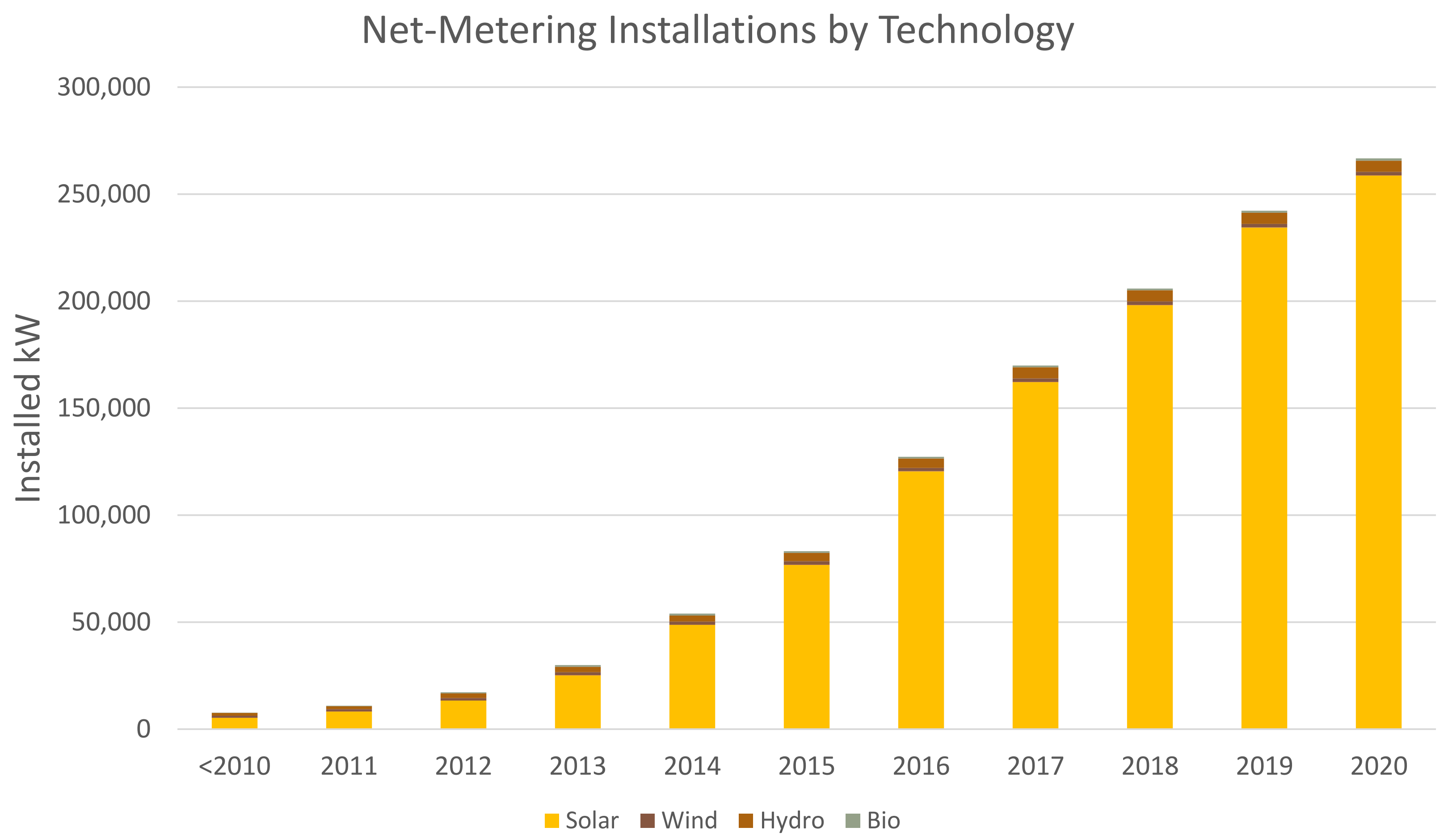
New Charges

Customer Charge: 33 Days @ $0.618	$20.39
Energy Efficiency Charge 997 x $0.01024	$10.21
Electric Assistance Program Fee	$1.67
Past Storm & Power Fixed Charge	$2.76
Emerald Ash Borer Charge	$0.38
Total 997 KWH Consumed	
Total 225 KWH Generated	
Group Excess Shared 21,800 KWH	
997 Total KWH Consumed Billed @ $0.17754	$177.01
225 Total KWH Excess Credit @ $-0.15417	-$34.69
Total Gross 22000 KWH Generated	
Total Group Excess Shared 22,000 KWH	
227 Solar Siting Charge KWH @ $0.01	$2.27
227 Renewable Energy Certificate Incentive KWH @ $-0.03	-$6.81
New Actual Charges	**$173.19**

Adjustments

Transfer Credit To/From Net Meter Bank	-$137.78
Total Adjustments	**-$137.78**

Cumulative Net-Metering Installations



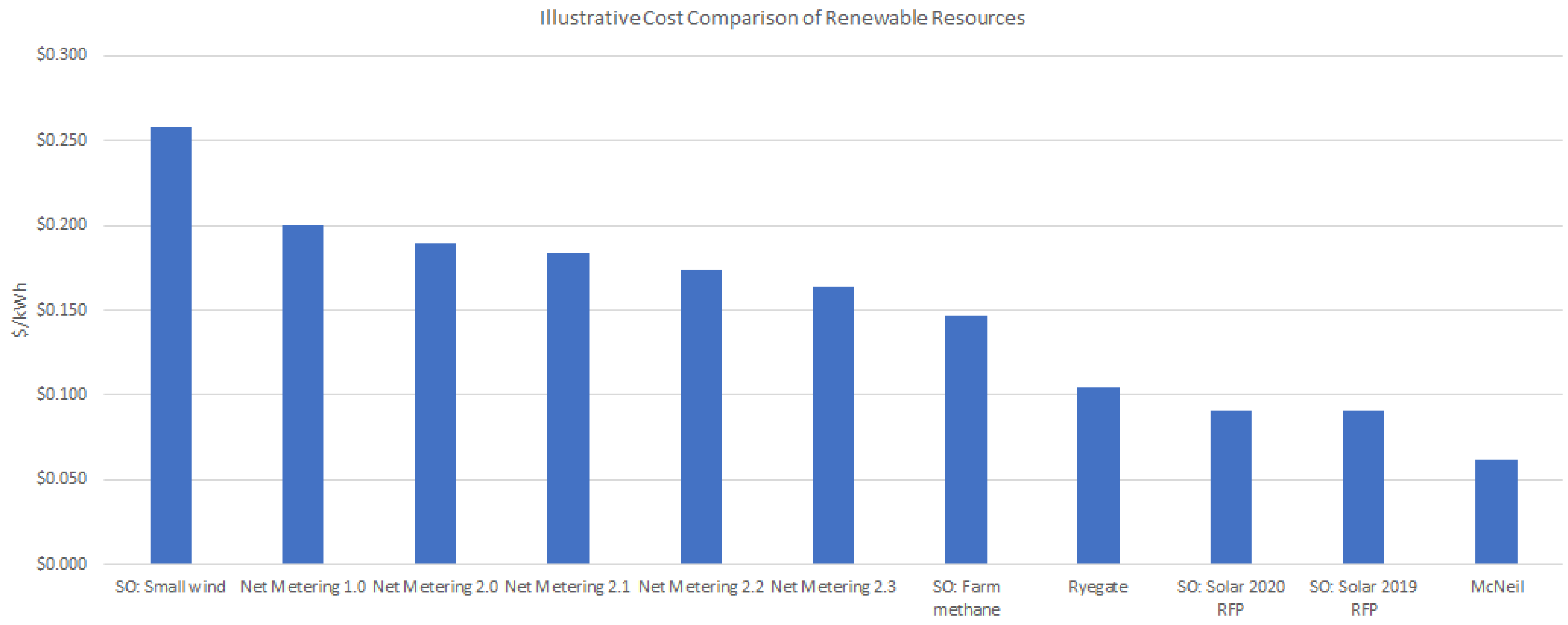
**Derived from utility monthly DG resource surveys to ISO-NE and includes data for GMP through 11/30/20, VEC through 12/31/20, Stowe through 10/31/20, and BED and WEC through 8/30/20. Another ~5.5 MW of net-metered PV came online in December in GMP, for a total of ~264 MW of net-metered PV through December 2020.*

***This is net-metered generation only. Current VT overall distributed generation penetration is ~ 428 MW, with PV penetration comprising ~ 397 MW of that amount.*

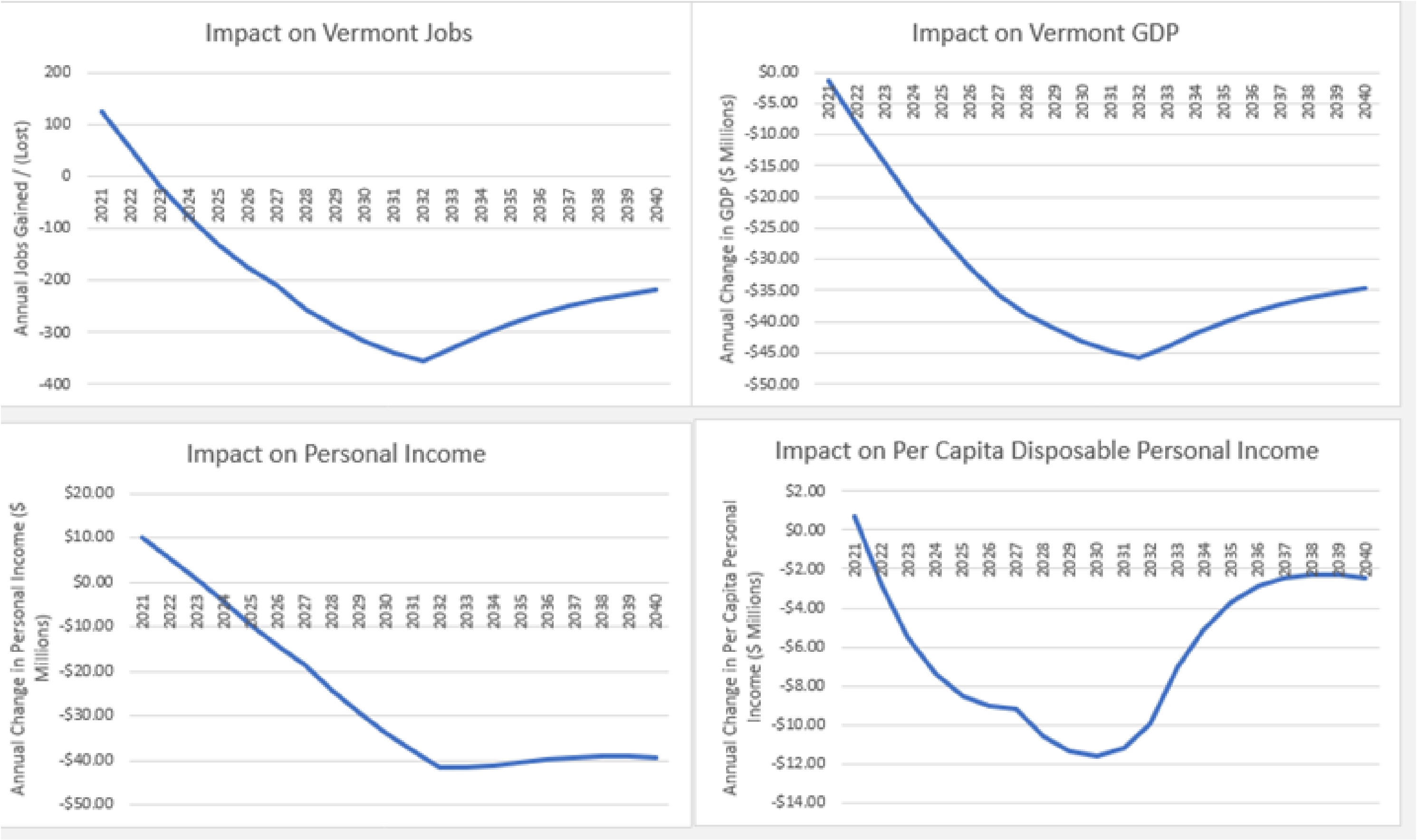
Net Metering by Utility

Utility	Total Installed NM (kW)	2019 Non-Coincident Peak	NM as % of Peak Load	Percent of NM Capacity	Percent of Retail Sales
Green Mountain **Power**	221,266	684,450	32%	84.2%	76.4%
Vermont Electric **Cooperative**	20,720	80,082	26%	7.7%	8.4%
Vermont Public **Power Supply Authority**	10,251	71,019	14%	4.0%	6.4%
Burlington Electric **Department**	4,718	63,076	7%	1.8%	6.0%
Washington Electric **Cooperative**	3,722	16,067	23%	1.4%	1.3%
Stowe Electric Department	1,645	17,655	9%	0.6%	1.4%
Hyde Park **Electric**	528	3,370	16%	0.2%	0.2%
TOTAL	262,850	909,433	29%	100%	100%

Cost Comparison of Renewable Resources



Economic Impact of Net Metering



Net Metering - Summary

- Net metering has resulted in significant expansion of distributed renewable resources
  - Largest resource for Vermont in terms of nameplate, exceeding HydroQuebec
  - Supports a number of jobs in Vermont
- Current net metering system is substantially different from initial intent
  - 77% of net metered generation is exported to the grid (I.e., not used onsite)
  - Solar is a mature technology that can stand on its own
- Substantial cost shift to non-participating customers
  - $0.17/kWh compared to $0.10/kWh or less
  - Economic analysis shows upfront development benefits and long-term drag on the Vermont economy
  - Overall cost shift increases as net metered customers add electric vehicles and heat pumps
- New compensation structure needed
  - Customers should be able to offset own usage and reduce electric bills
  - Customers should get paid for the exported solar at the value to Vermonters

Grid Modernization

"Grid modernization is a broad term, lacking a universally accepted definition. In this report, the authors use the term grid modernization broadly to refer to actions making the electricity system more resilient, responsive, and interactive. Specifically, in this report grid modernization includes legislative and regulatory actions addressing: (1) smart grid and advanced metering infrastructure, (2) utility business model reform, (3) regulatory reform, (4) utility rate reform, (5) energy storage, (6) microgrids, and (7) demand response."

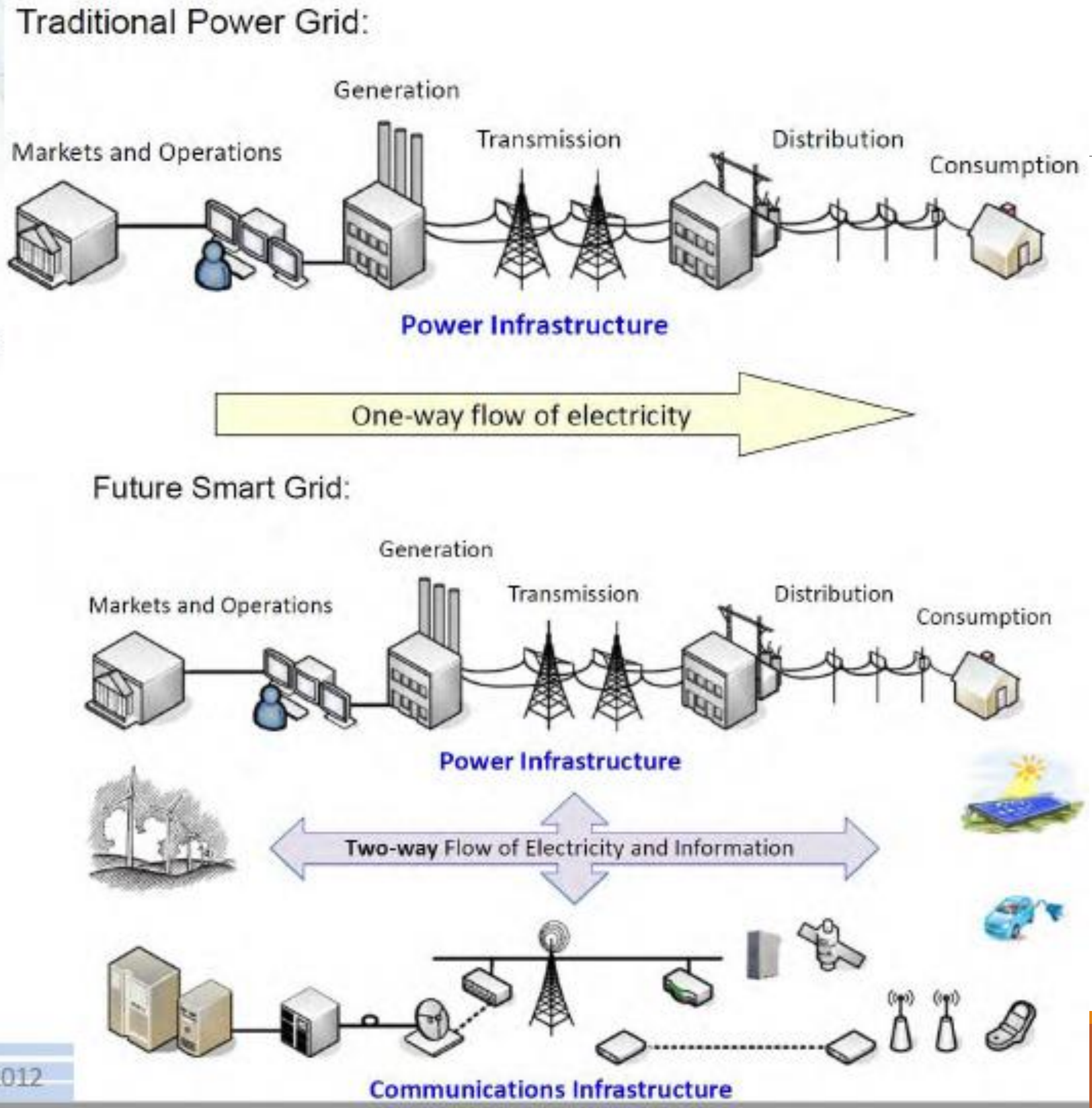
-50 States of Grid Modernization, NC Clean Energy Technology Center

"'Grid modernization' and 'distribution system planning' are understood to refer to the process of identifying how to build the distribution system and integrate non-wires solutions to integrate and optimize distributed energy resources and other aspects of a rapidly evolving energy ecosystem while maintaining and improving safety and reliability, consistent with the state's energy policies, goals, and longstanding least-cost planning principles.

-Memorandum of Understanding in Case No. 18-4166-PET (GMP 2018 IRP)

Grid Modernization and a Vision for the Future

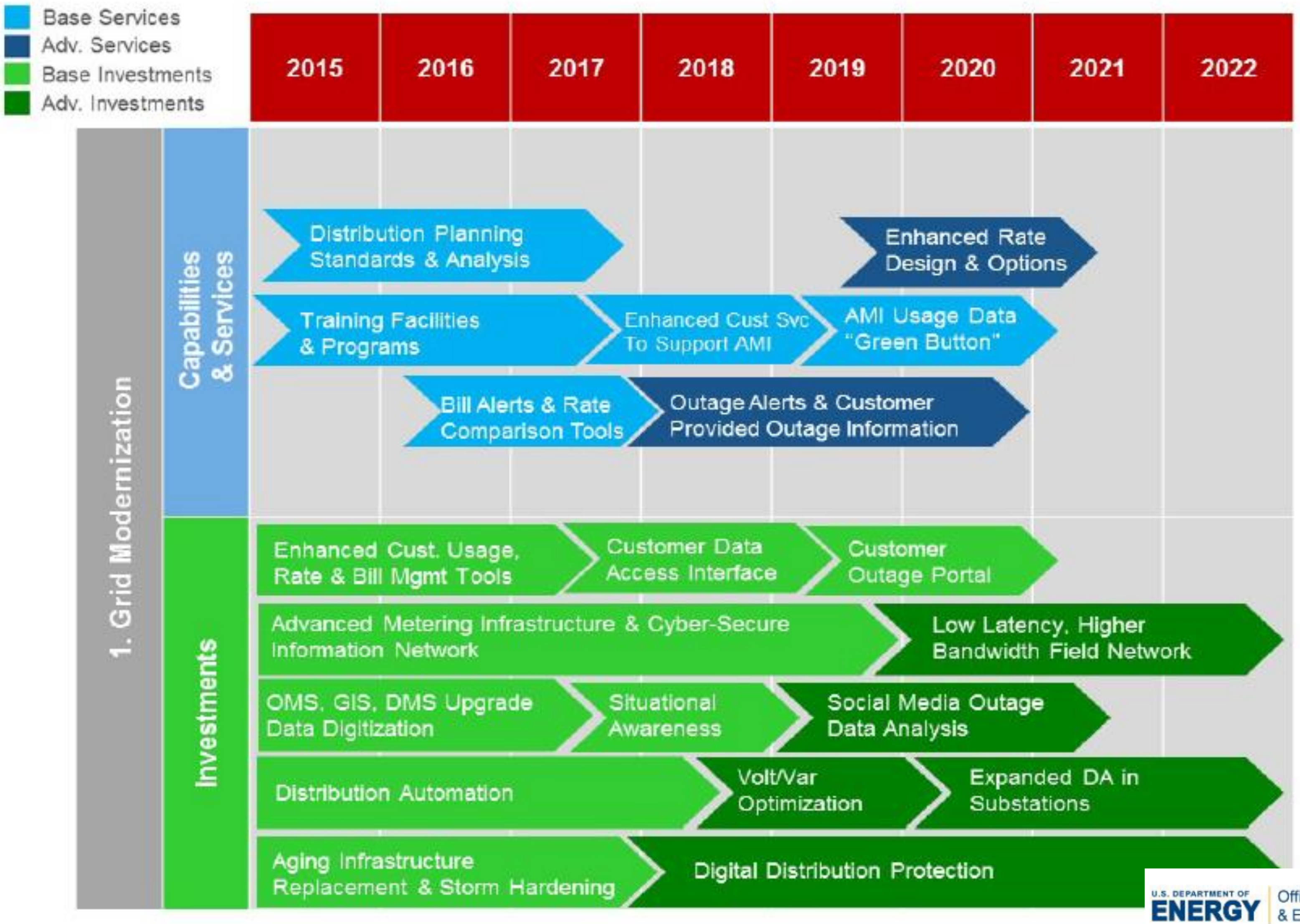
- Centralized generation
- Generation follows load
- One-directional power flow
- Limited automation
- Limited situational awareness
- Consumers lack data to manage use
- Limited accessibility for new producers



- Centralized + distributed generation
- Variable resources
- Consumers become producers
- Multi-directional power flow
- Flexible load

Source: ABB 2009; Texas Tech 2012

Generic Grid Mod Roadmap – post AMI



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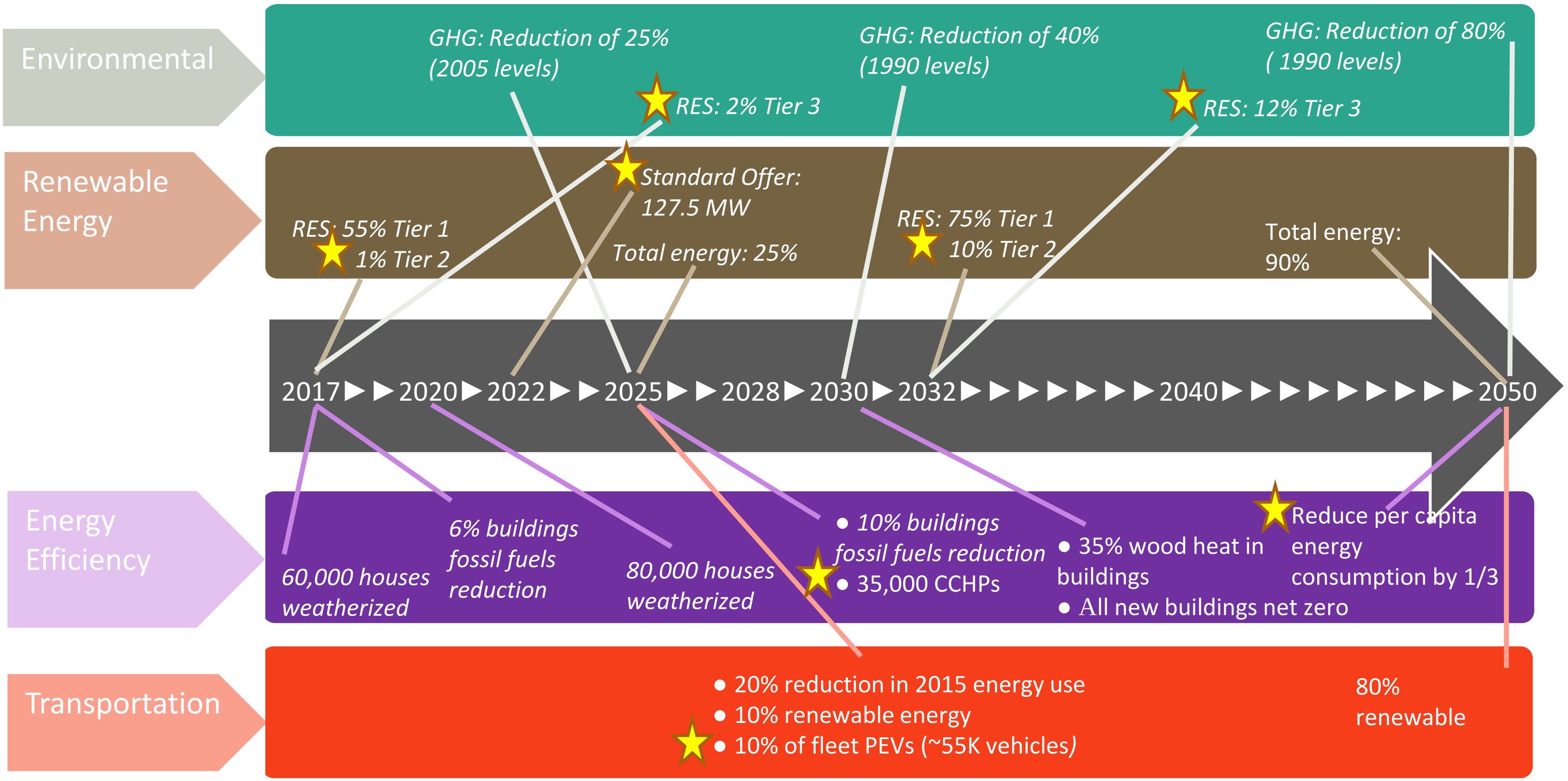
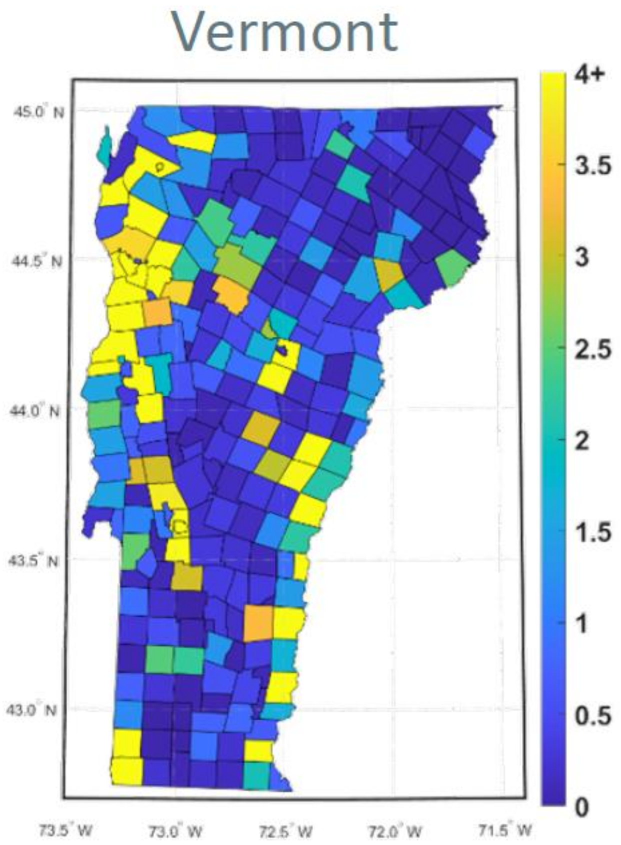
VT Policy Drivers w/Distribution System Implications

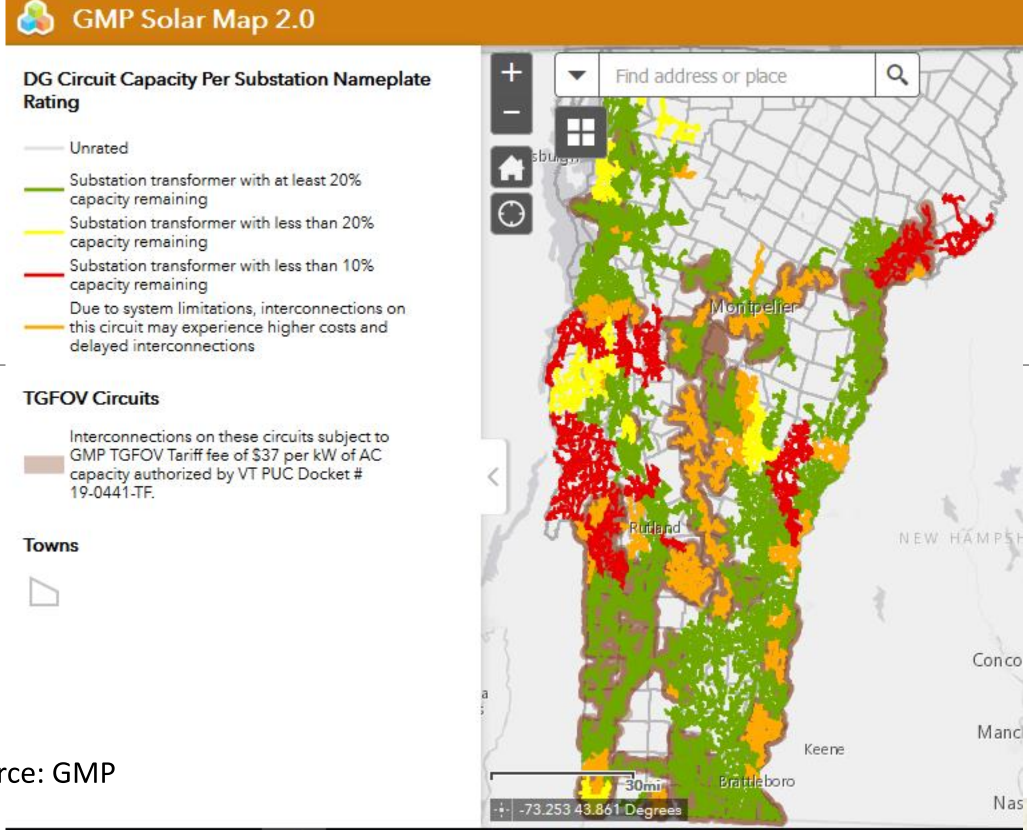


Italics indicate statutory requirements/goals

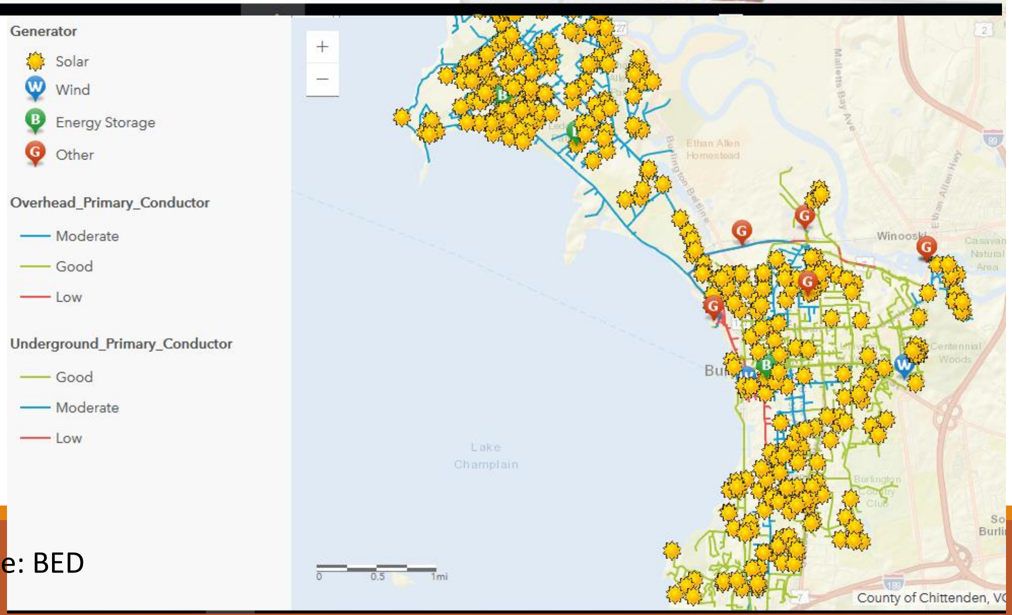
Solar: hosting capacity & D-system constraints



Source: ISO-NE. Scale indicates MW/town as of August 2020

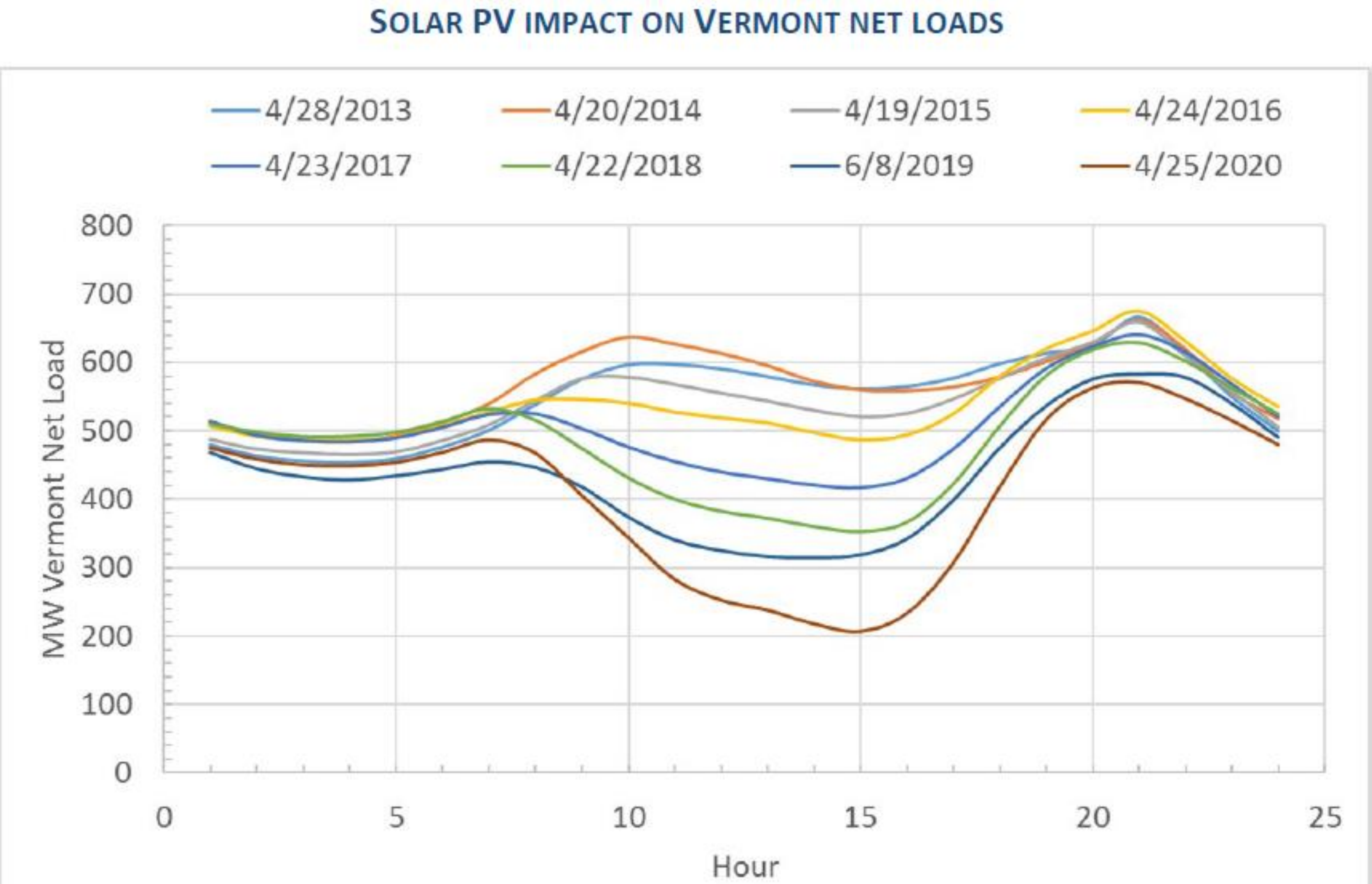


Source: GMP



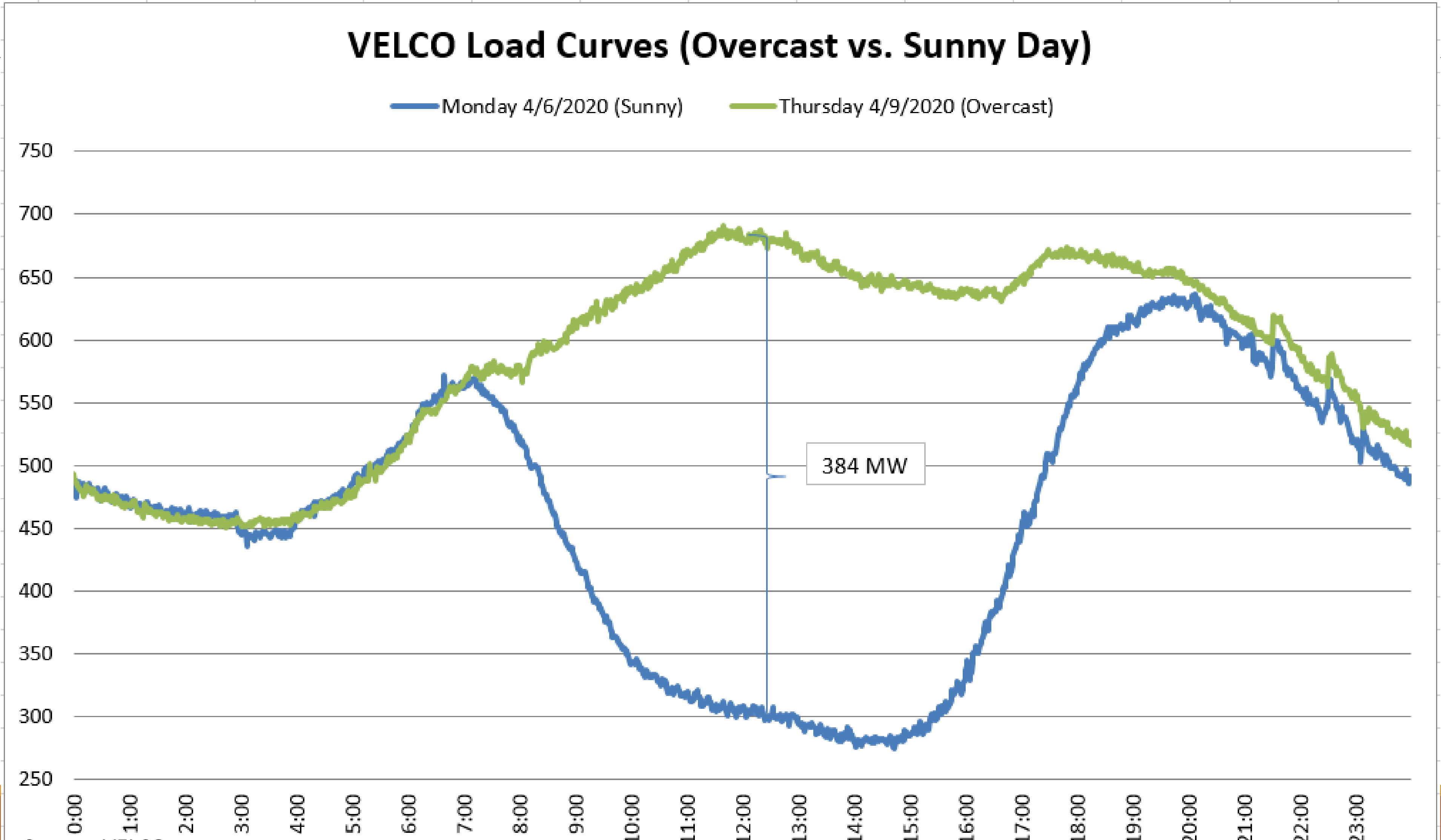
Source: BED

Solar: lowering & shifting peak demand



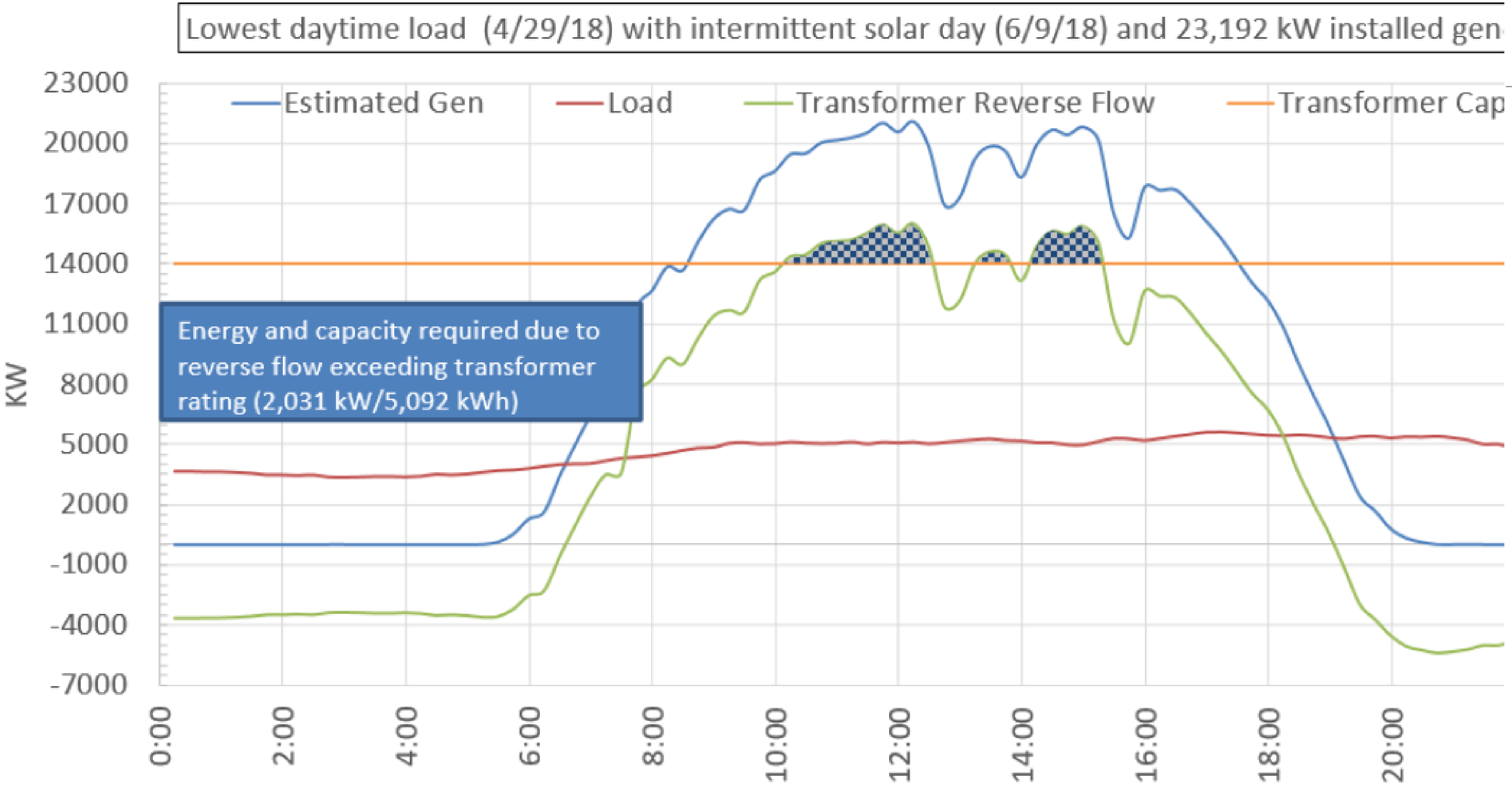
Source: VELCO DRAFT 2021 Long-Range Transmission Plan

Variability and uncertainty: daily



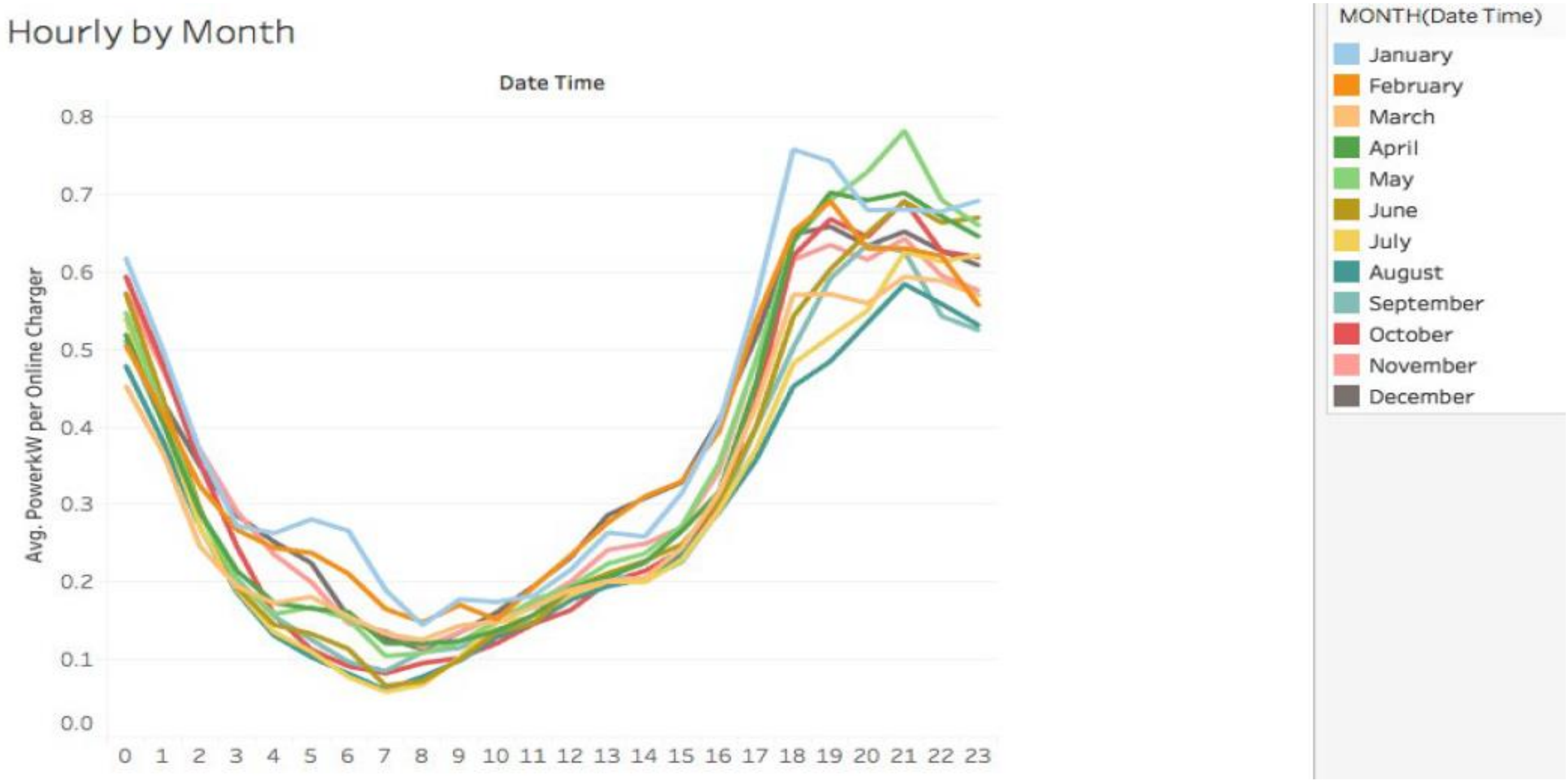
Source: VELCO

Variability and uncertainty: hourly



Source: GMP presentation to VSPC Generation Constraint Subcommittee 9/9/20

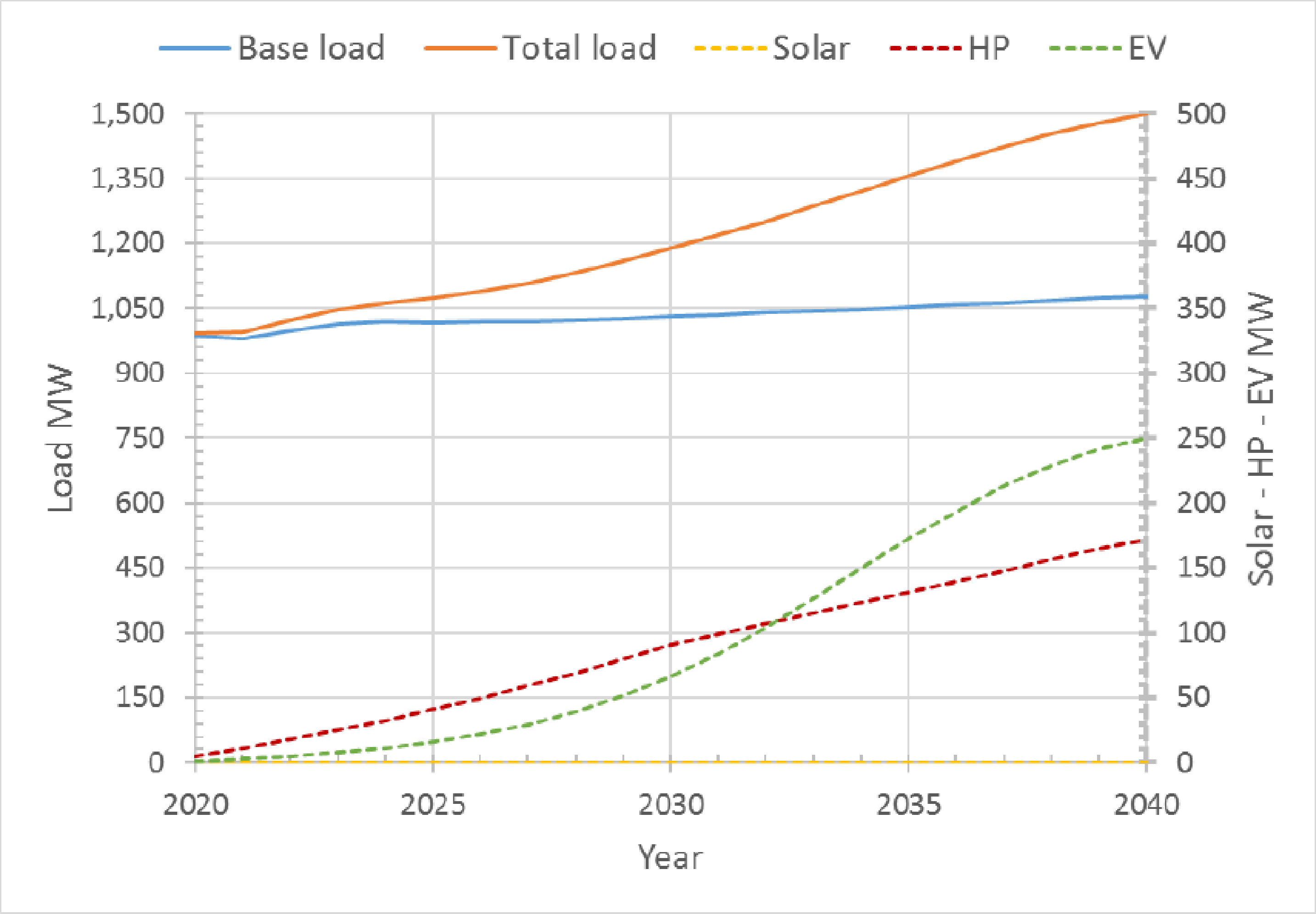
Electric vehicles: charging profiles



Source: GMP

Electrification & seasonal demand patterns (VT)

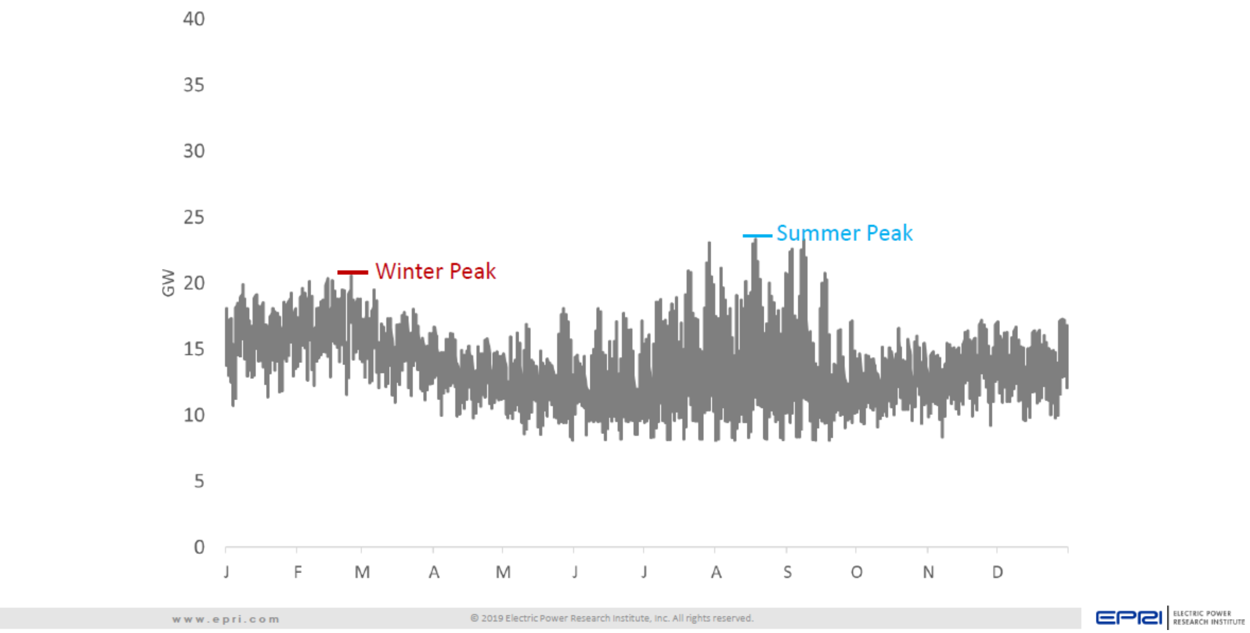
PROJECTED VERMONT WINTER PEAK LOAD AND ITS COMPONENT FORECASTS



Source: VELCO DRAFT 2021 Long-Range Transmission Plan

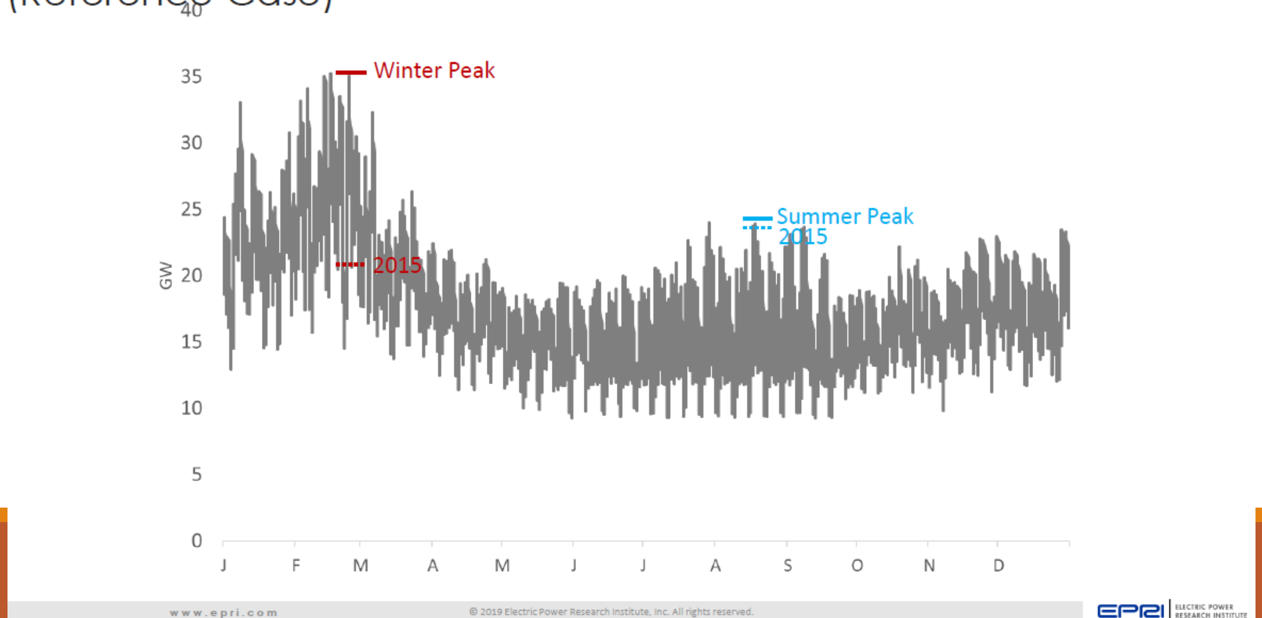
Electrification & seasonal demand patterns (N.E.)

New England 2015 Aggregate Load Profile



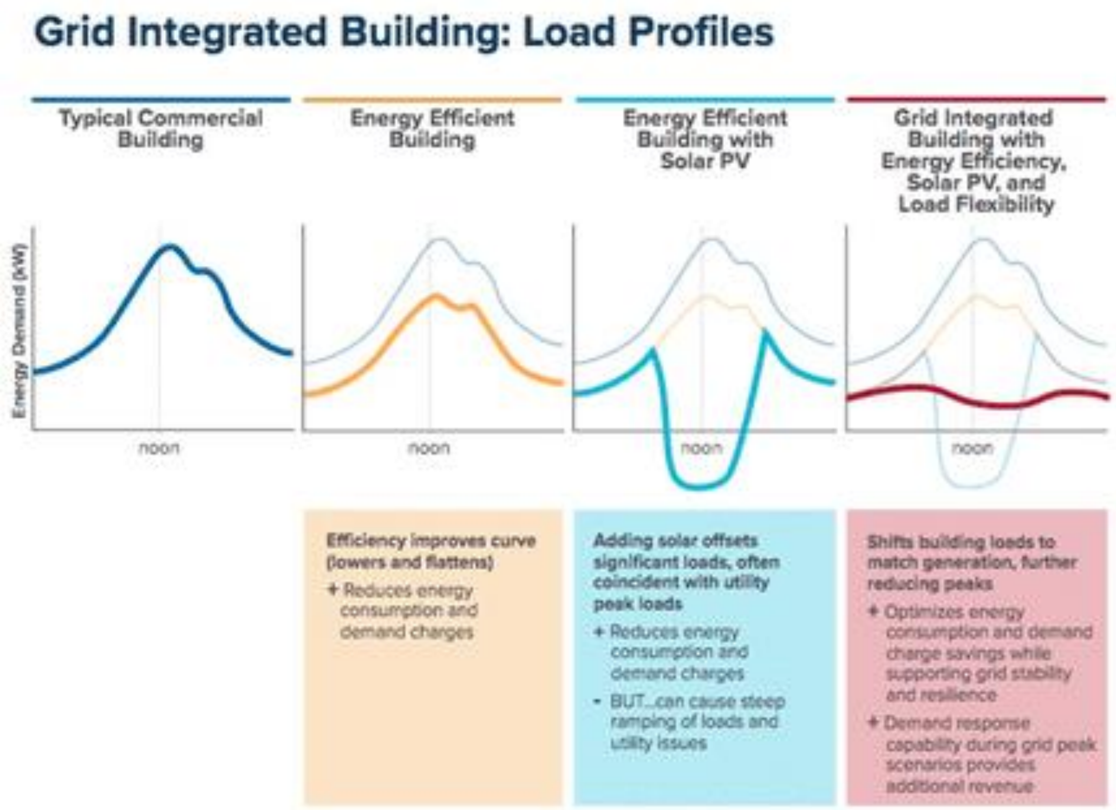
Potential New England 2050 Aggregate Load Profile

(Reference Case)

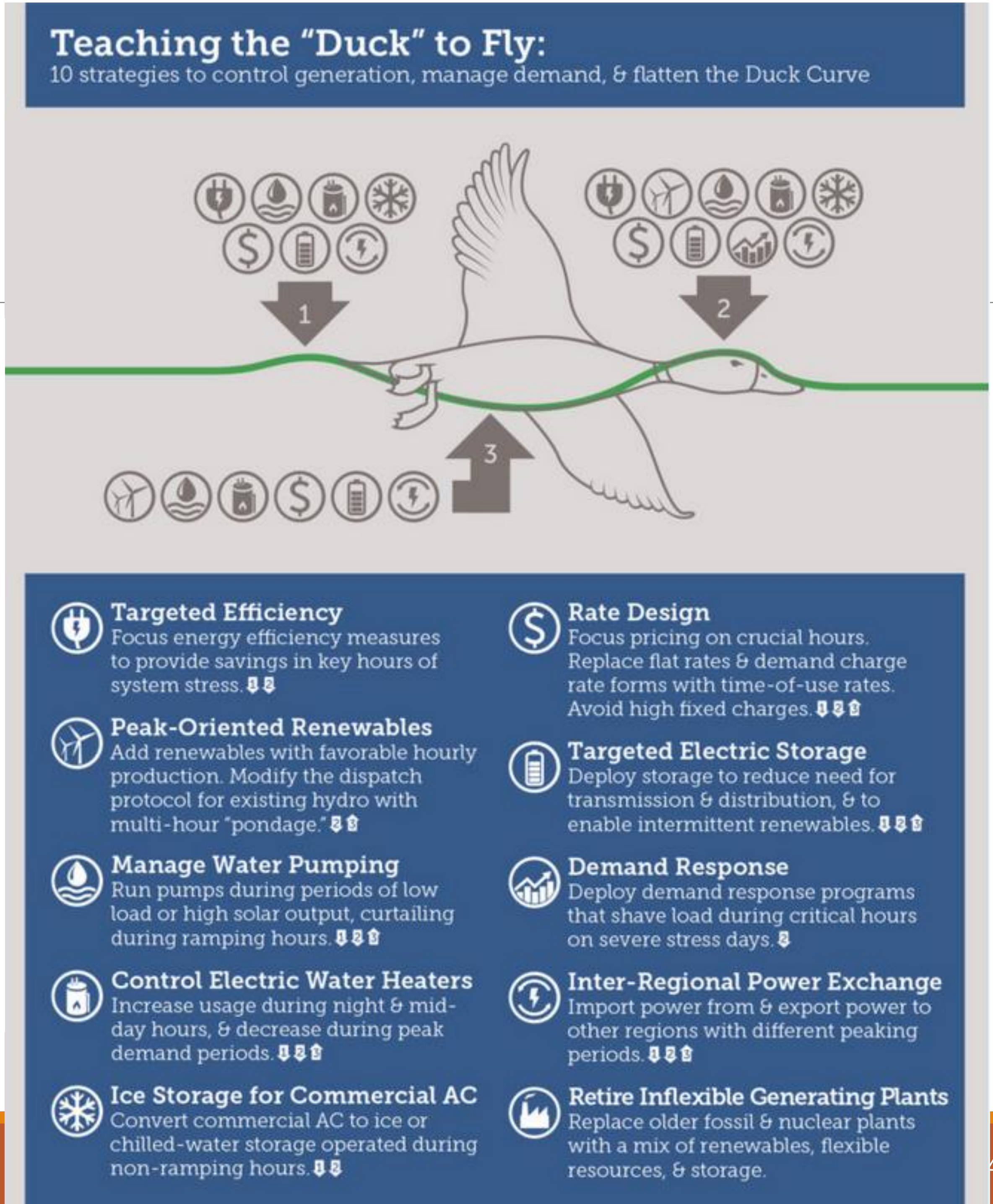


Source: Aidan Tuohy, EPRI: ISO-NE Grid Transformation Day, May 23, 2019: https://www.iso-ne.com/static-assets/documents/2019/05/a2_grid_transformation_solving_technical_challenges_tuohy_epri.pdf

Optimizing demand & supply in real time

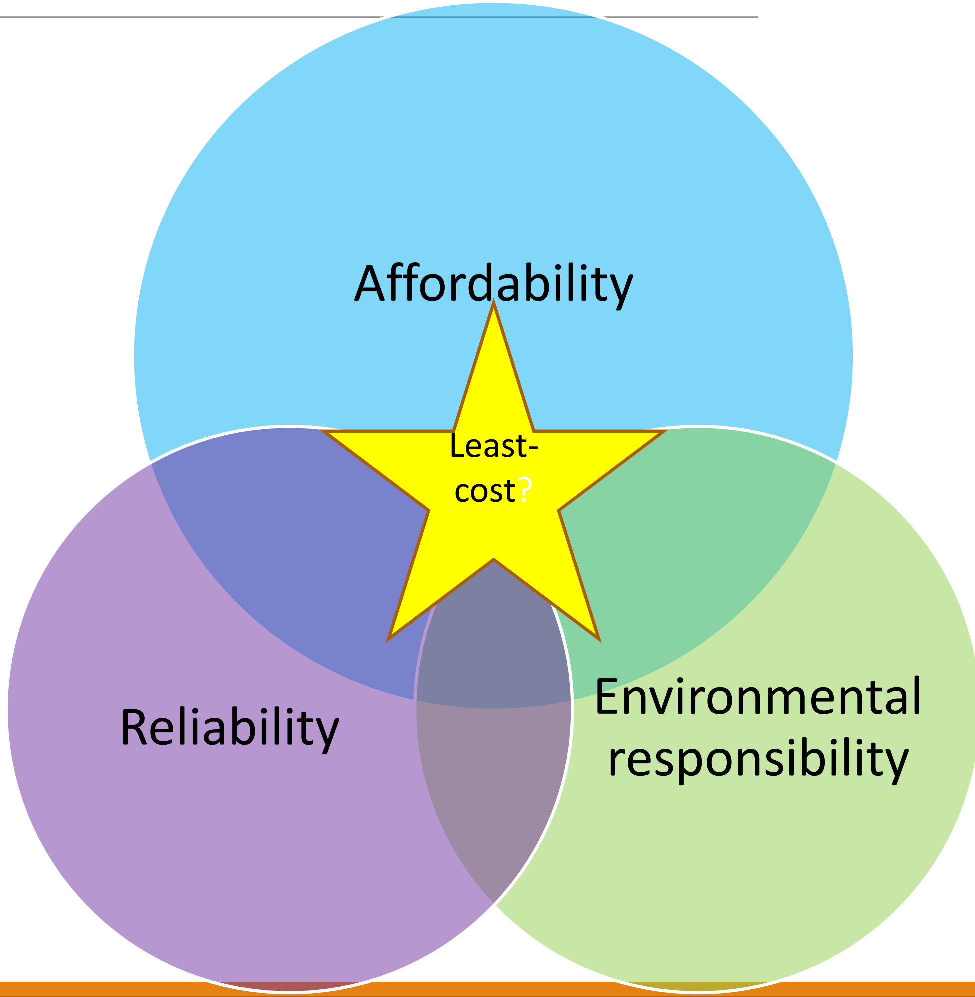


Sources: RMI (above), RAP (right)



Big picture questions

- What are the objectives of grid modernization?
- Who can and will participate, and how?
- What is necessary to reach goals (planning, programs, rate design, regulation)
- Where & when do investments need to be made
- Why?
  - Utility activities
    - Pilots & investments (RES Tier III, AMI, storage, charging stations, rate design, flex load management….)
  - PUC investigations
    - EVs
    - Act 62
  - Legislative reports
    - Demand charges
    - SHEI
    - Storage
- How do we…
  - Value integration of DERs?
  - Value reliability & resiliency?
  - Achieve no- or low-regrets least-cost outcomes



FERC Order 2222

- Removes barriers to the participation of DER aggregations in wholesale markets
- DER **defined** as “any resource located on the distribution system, any subsystem thereof or behind a customer meter.”
- ISO-NE must revise its tariffs by July 19, 2021 to address size thresholds (minimum of not > 100 kW), participation models, locational requirements, bidding parameters, data, metering, telemetry, etc. Implementation not likely until 2022.
- ISO-NE must also figure out **coordination** with the aggregator, distribution utility, Relevant Electric Retail Regulatory Authority (e.g., PUC), and allow for dual retail and wholesale participation
- No opt-out, but rather an **opt-in** for small utilities (4 million MWh or less distributed in previous FY)
- FERC will have jurisdiction over sales of aggregators into wholesale markets, but states are not pre-empted from regulating the safety and reliability of the distribution system (e.g., states retain **interconnection** jurisdiction)
- States can **condition participation** of a DER in a retail program on not also participating in a wholesale program

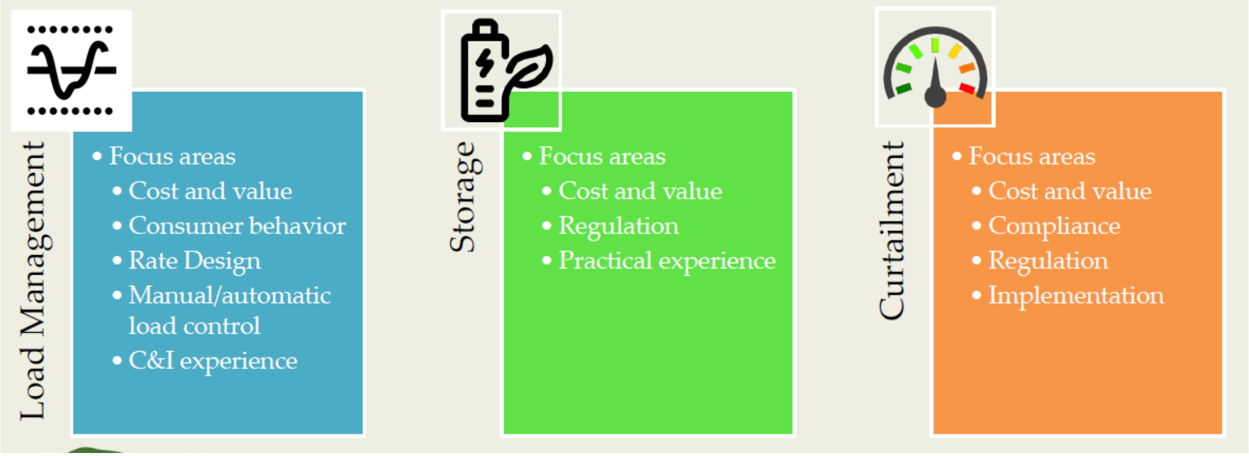
Hypothetical DER aggregations

Technology/Use Case	Participation Model
C&I Load Curtailment/Infrequently Dispatched DG	Existing Active DR Program
Behind-the-meter solar, resi storage, and EE	Passive DR Options
Behind-the-meter technologies that frequently dispatch (e.g. storage/electric buses) and/or provide retail-level use cases (e.g. a Non-Wires Solution to a distribution utility). *See Use Case #1 on Slide 12.*	Active DR Baseline rules and prohibition on real-time energy market participation for DR challenge the ability of these resources to participate; we expect these use cases to proliferate in New England
Residential and Small Commercial "dispatchable" use cases (e.g. electric vehicle charging). *See Use Case #2 on Slide 17.*	Current ISO-NE metering and telemetry requirements coupled with lack of Advanced Metering Infrastructure (AMI) renders participation nearly impossible
Front of the Meter Distributed Solar + Storage. *See Use Case #3 on Slide 18.*	Existing four options presented in April 2020 webinar properly integrate these DERs, with exception of reserves accounting for co-located resources; interconnection remains a challenge, as does inability to aggregate

Source: Feedback to ISO-NE on FERC Order 2222 Compliance Considerations from Advanced Energy Economy, Borrego Solar, ChargePoint, ENEL North America, ENGIE North America, Modern Energy, Northeast Clean Energy Council, RENEW Northeast, and Sunrun, 12/22/20

VSPC activity

- Forecasting
- Geotargeting EE
- Generation constraints subcommittee

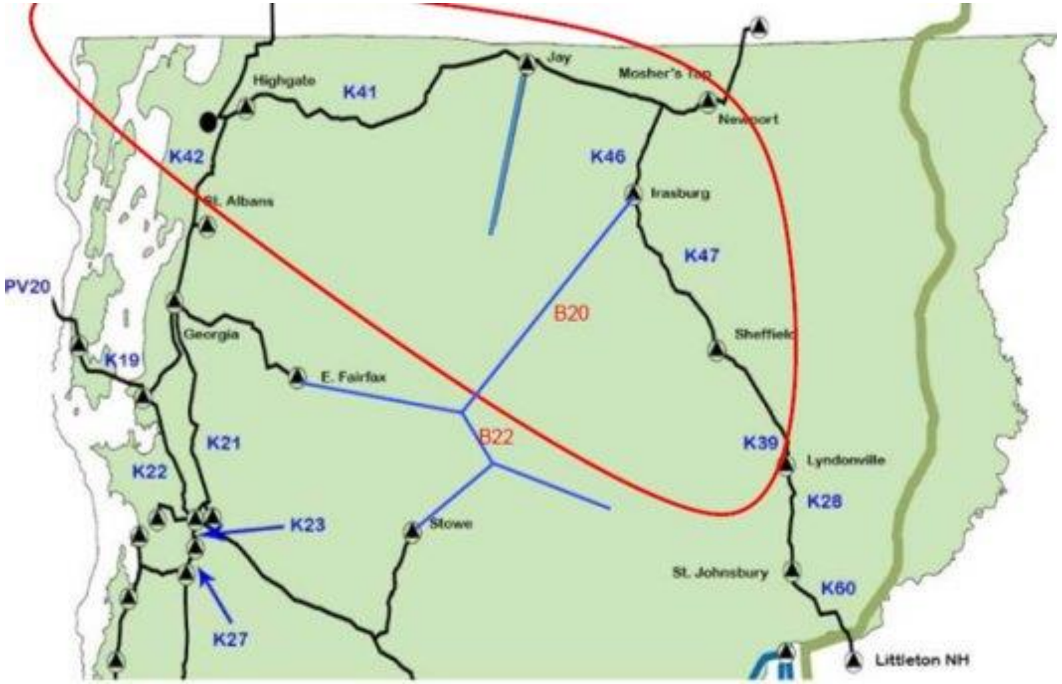


- Metering, telemetry, coordination, interconnection

Sheffield Highgate Export Interface

- SHEI is a region in northern Vermont with transmission constraints– the boundaries may shift as additional generation is added.

- Renewable electric generation (385 MW) almost always exceeds demand (20-60 MW), and at times the transmission system does not have the capacity to transport the energy elsewhere.



Costs of SHEI

CURTAILMENTS

ISO-NE manages the interface by limiting generation through curtailments to ensure system capacity is not exceeded.

The result is existing renewable resources (typically Kingdom Community Wind) must reduce their output

These resources are owned by or under contract with Vermont utilities. With less output, revenue is lost from energy, RECs and ITC.

CONGESTION

When the system is constrained, congestion costs increase which reduce the financial value for ALL generation in the region participating in the markets (almost all generation in the area is owned by or under contract to a VT utility)

Congestion is a component of Locational Marginal Prices (LMPs), which is the rate that generators are compensated. More congestion = lower revenues for generators

Proposed Mitigation Grid Adjustor

- Fee to be applied to solar net-metering projects smaller than 500 kW
- Larger projects would require an individualized analysis
- Fee intended to offset the incremental cost caused by additional solar
- Collected fees would be distributed to affected utilities
- PSD projected the incremental cost over 25 years of new DG solar
  - based on an assessment performed by GMP and VEC that 10 MW of additional DG in SHEI would have increased costs by about $163,000 over the previous 2 years
  - additional costs due to increased congestion and curtailments
  - Projection accounts for existing mitigation actions including Lowell-to-Morrisville line upgrade

--> PSD recommended one-time upfront collection of $75/kw-installed

Mitigation Grid Adjustor Process

The Mitigation Grid Adjustor may be implemented through a rule, tariff or other mechanism.

- October 30, 2020: Department Straw Proposal filed
- December 1, 2020: Workshop held by PUC, attended by PSD, utilities, and developers
- February 16, 2021: Draft recommendations and proposals by participants, and comments on PSD's Straw Proposal
- February 23, 2021: Second Workshop
- April 23, 2021: Final draft recommendations
- April 30, 2021: Third Workshop

Vermont Seasonal Load Profiles