

2022 Renewable Energy Standard Report

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DEPARTMENT OF PUBLIC SERVICE

BEFORE HOUSE COMMITTEE ON ENERGY & TECHNOLOGY

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Topics Covered

- Overview of the Renewable Energy Standard (RES)
 - Tiers 1, 2, and 3
 - Resources used to meet the obligations
- 2022 RES Report
 - 2020 Compliance Year Results
 - Modeling Exercise – 10-year projections of impact
 - Methodology
 - Results
- Considerations & Opportunities for the Future

Renewable Energy Standard (RES)

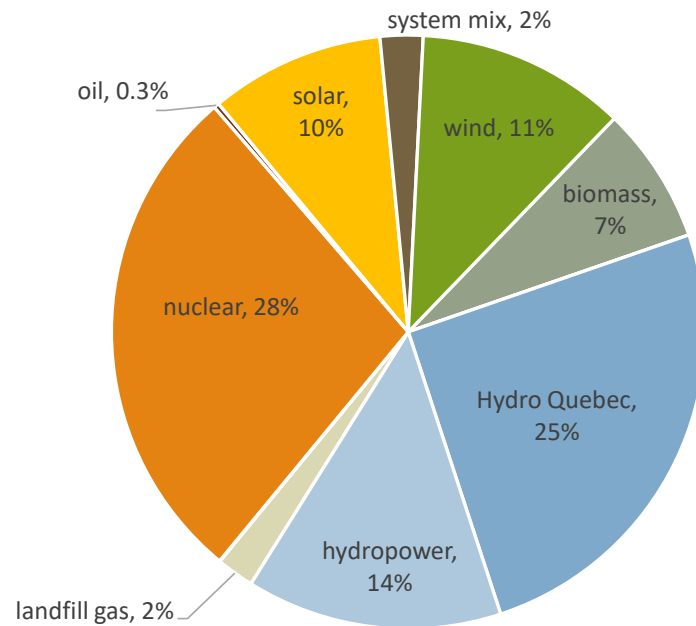
- Enacted in 2015, compliance started 2017
- Three Tiers of Obligations:
 - Tier 1: Total renewable requirement
 - Tier 2: Distributed Generation (*A carve-out of Tier 1*)
 - Tier 3: Energy Transformation
- Tiers 1 and 2 require retirement of renewable energy credits (RECs)
 - Brings Vermont into line with the rest of the region

Renewable Energy Credits (RECs)

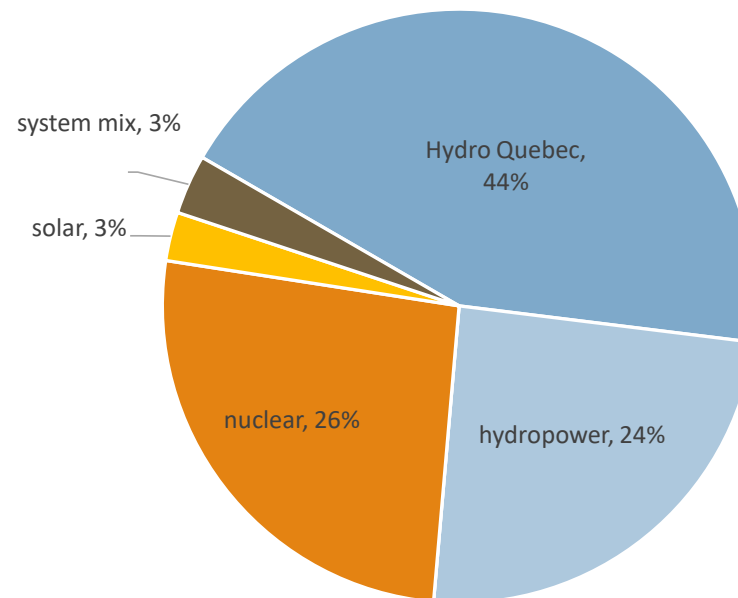
- RECs are the tool used for accounting, tracking and assigning ownership of environmental attributes.
- One MWh of renewable generation = one REC
- RECs are used throughout U.S. to track renewability
- Creates fungible commodity that can be traded; Renewable attributes can be separated from underlying generation
 - Attributes v RECs
- 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

Renewable Energy Credits (RECs) - 2020

Physical energy deliveries (i.e. before REC sales)



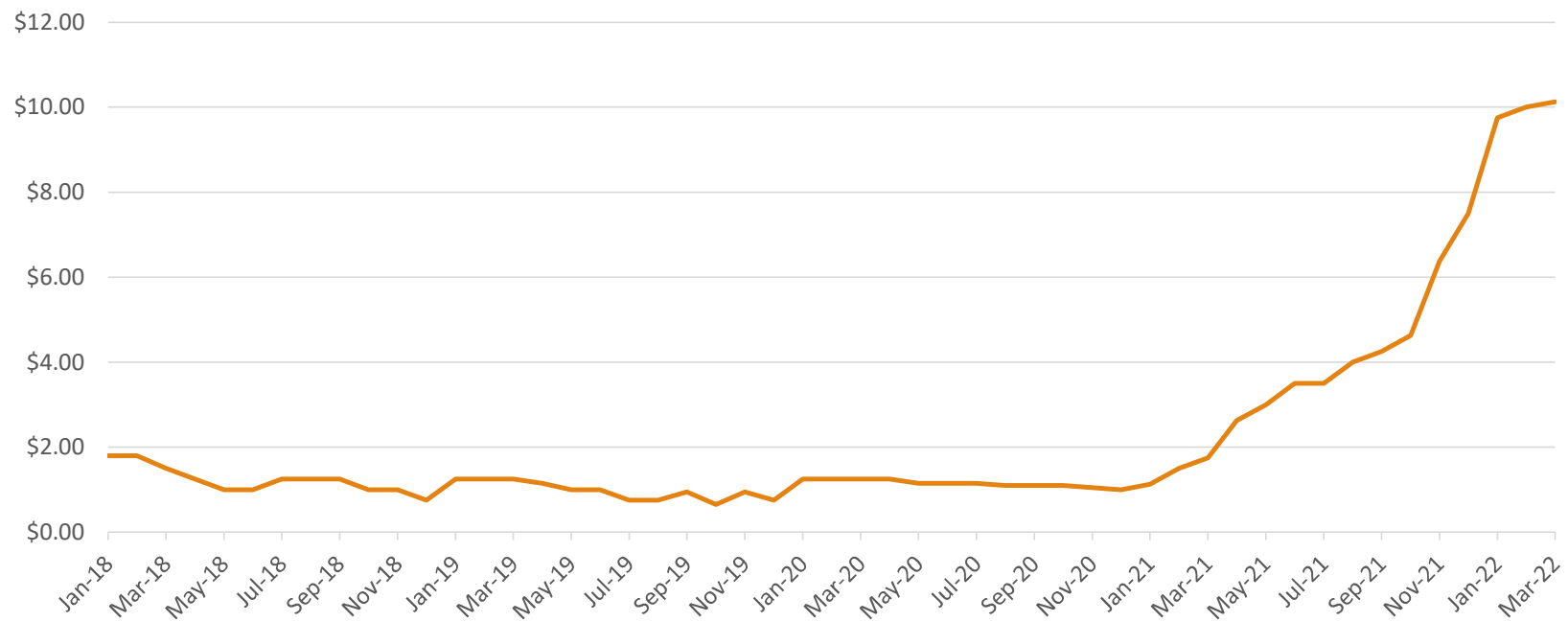
Based on REC certificate retirements



Tier 1 – Total Energy

- Eligibility – any renewable resource that can deliver into New England, regardless of when resource was constructed.
 - Includes resources from NY and Quebec
 - Has largely been met with hydroelectric resources from New England, NY, and Canada
- Required Amounts:
 - 55% of retail sales in 2017, increasing 4% every three years, until 75% in 2032
 - Tier II is included in Tier I
 - Current Requirements:
 - 2020-2022: 59%
 - Maintained at 75% thereafter
- Alternative Compliance Payment = \$10.58/REC in 2020, increasing by CPI annually
- REC prices have historically been relatively low (ex. \$0.35/REC average in 2019 & \$0.63/REC in 2020) although have increased substantially in the past year (\$5-9/REC)

Maine Class II (Existing) Historical REC Prices



Tier 2 – Distributed Generation

- Eligibility – renewable resources commissioned after June 30, 2015; connected to a distribution or sub transmission line in Vermont; nameplate capacity of less than 5 MW
 - Resources used to demonstrate compliance typically include net-metering, standard offer, utility PPAs
- Required Amounts: 1% of retail sales in 2017, increasing 0.6% every year, until 10% in 2032
 - Maintained at 10% thereafter
 - Current Requirements:
 - 2020: 2.8%
 - 2021: 3.4%
 - Carve out of Tier 1 requirements (not additional)
- Alternative Compliance Payment = \$63.48/REC in 2020, increasing by CPI annually
- Tier 2 REC price forecast for new RECs: ~\$40/REC in the near-term, decreasing to \$10 - \$30/REC by 2030

MA Regional Class I (New) Historical REC Prices

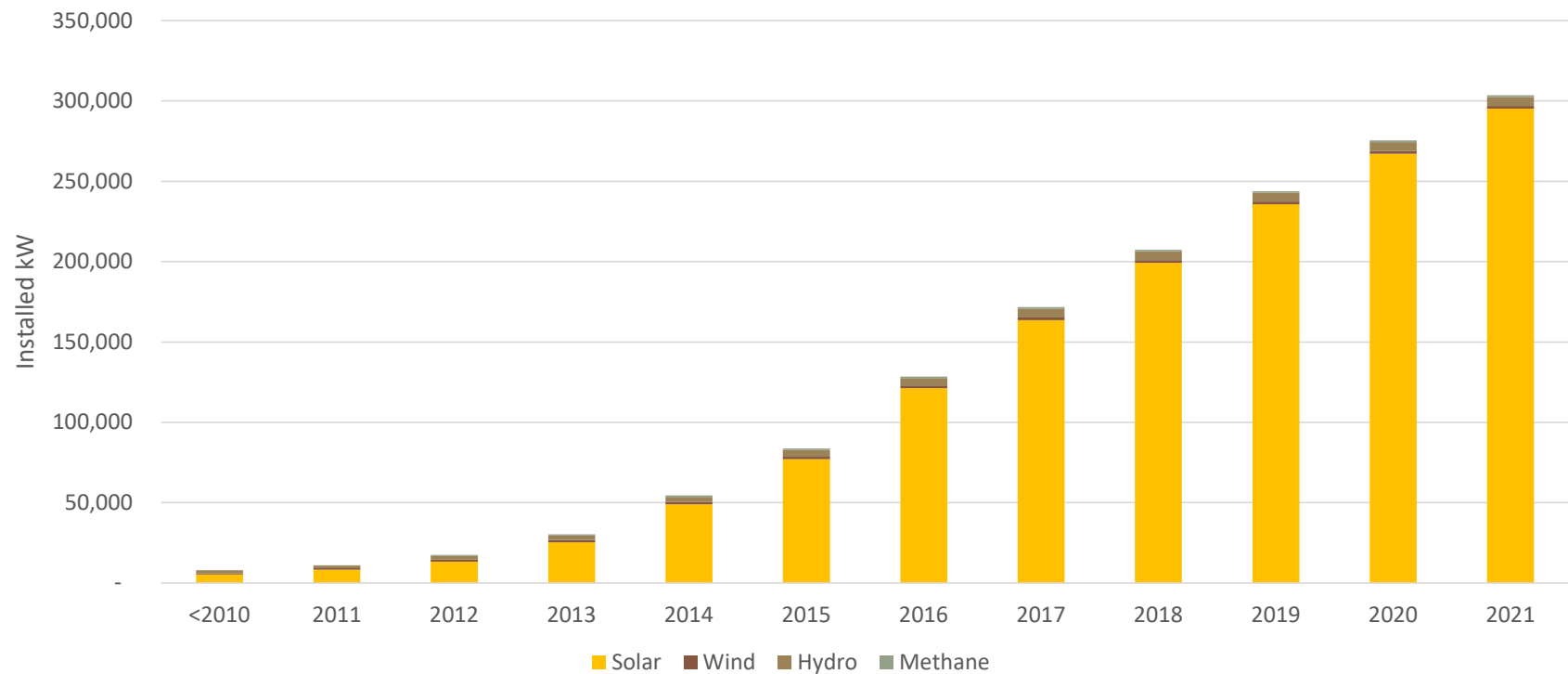


Net Metering (30 V.S.A. § 8010 and PUC Rule 5.100)

- PUC directed by Legislature in Act 99 of 2014 to initiate proceedings to redesign net metering.
- Current program (“NM 2.4”) 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 \$0.16413/kWh, PSD-recommended increase to \$0.17141/kWh in the current biennial review, Case No. 22-0334-INV). 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

Cumulative Net-Metering Installations



**Derived from utility monthly DG resource surveys to ISO-NE and includes data through 12/2021*

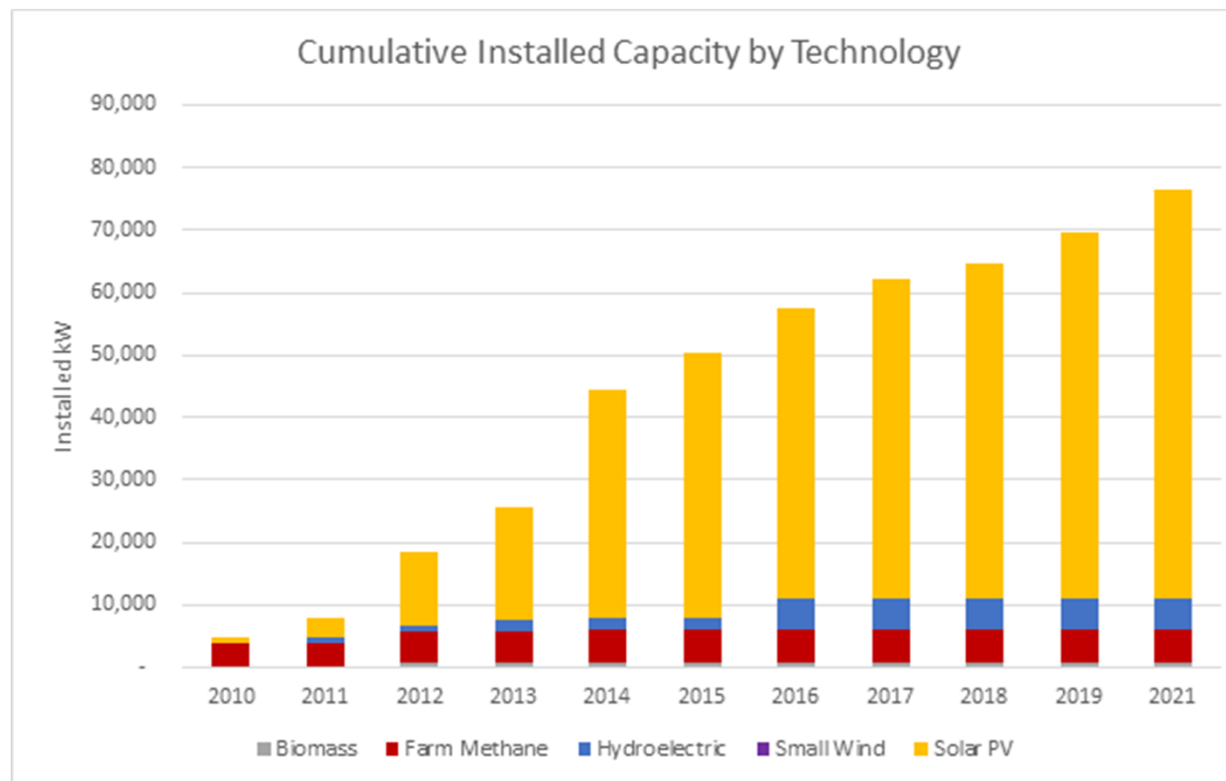
***This is net-metered generation only. As of Dec. 2021, VT overall distributed generation penetration was ~ 516 MW, with PV penetration comprising ~ 433 MW of that amount.*

Standard Offer Program

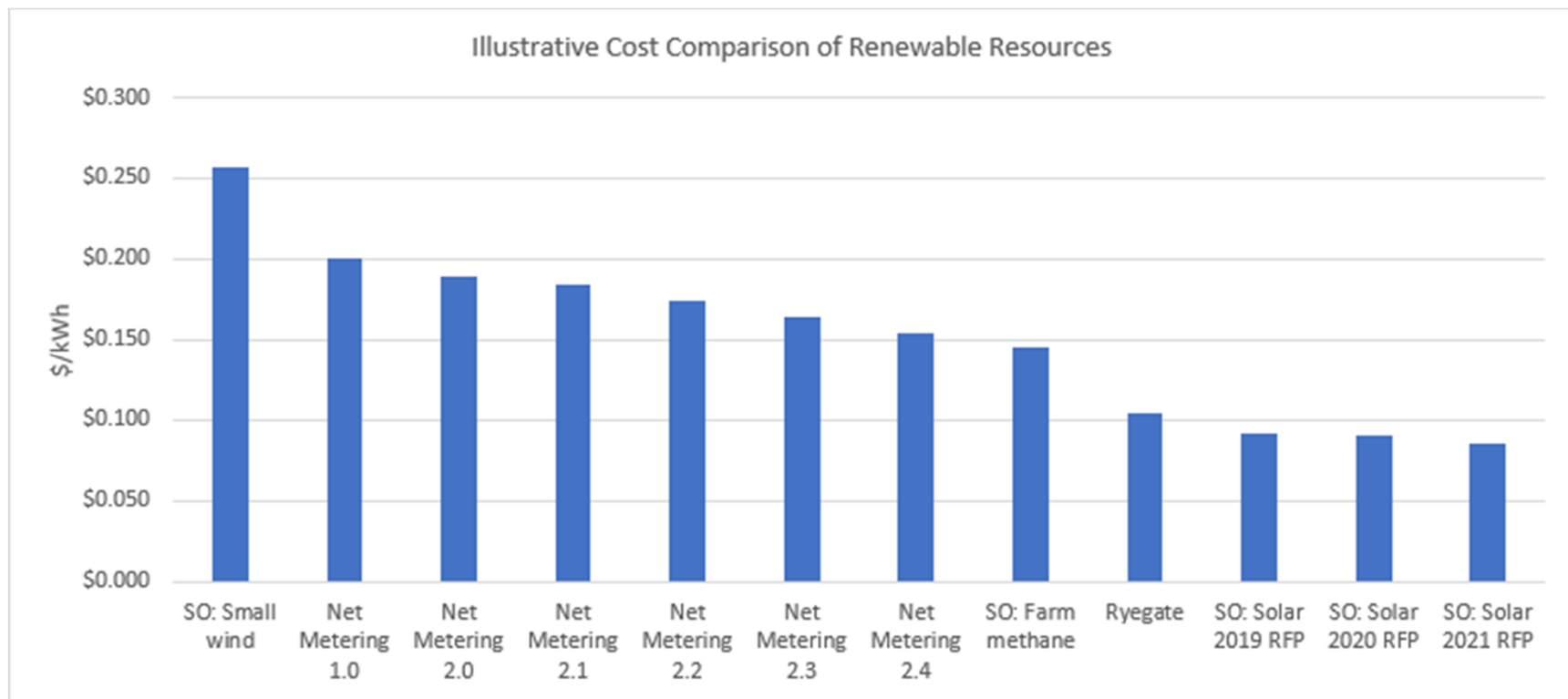
- Program was established in 2009 to stimulate small, in-state renewable energy development
- Total program capacity of 127.5 MW expected to be contracted by 2022
- Program is structured to encourage technology diversity, but has proved hard to achieve
- Currently, there are 73 MW online with a total of 122 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 2024. Ryegate is not included in Standard Offer program summaries.

**Program Costs through Nov. 2020*

Standard Offer Project Summary



Example Renewable Resource Costs



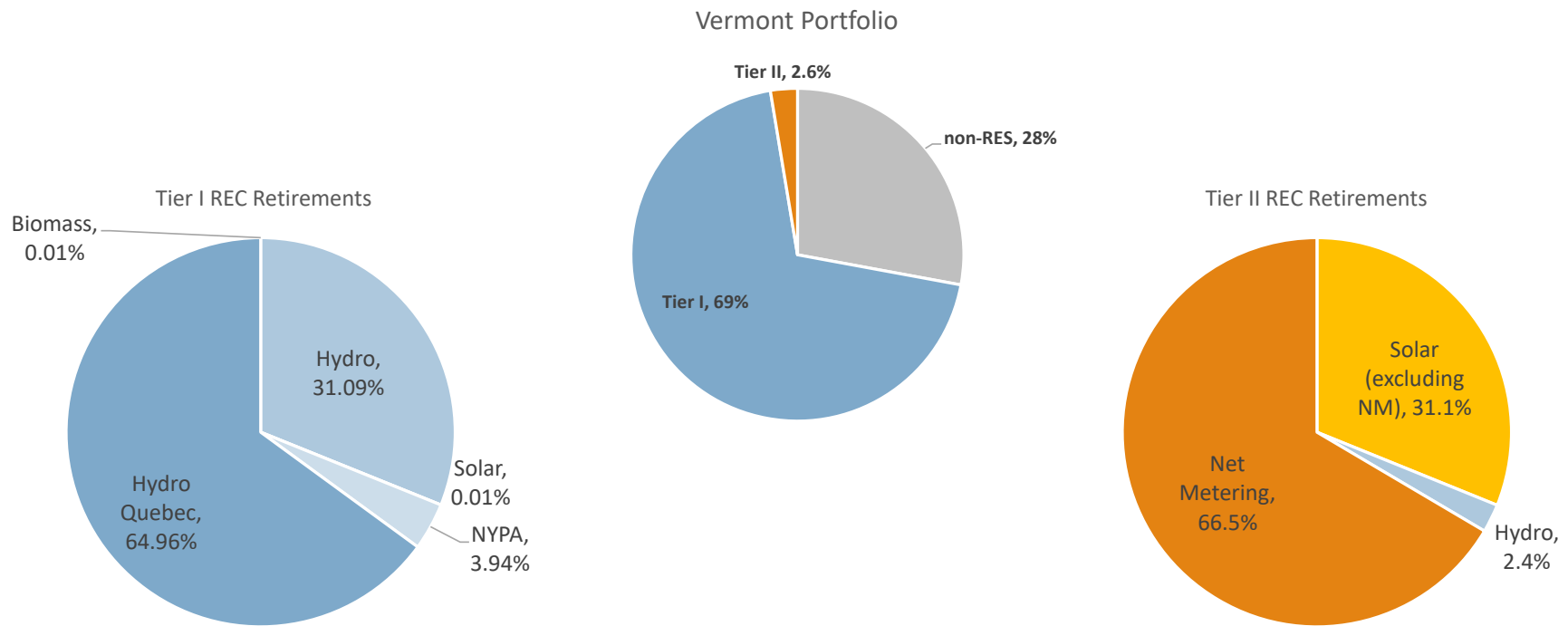
Tier 3 – Energy Transformation

- 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 = \$ 63.48 /REC in 2020, increasing by CPI annually
- Costs vary considerably in terms of incentives paid to customers. Average cost was \$51/ MWhe in 2020

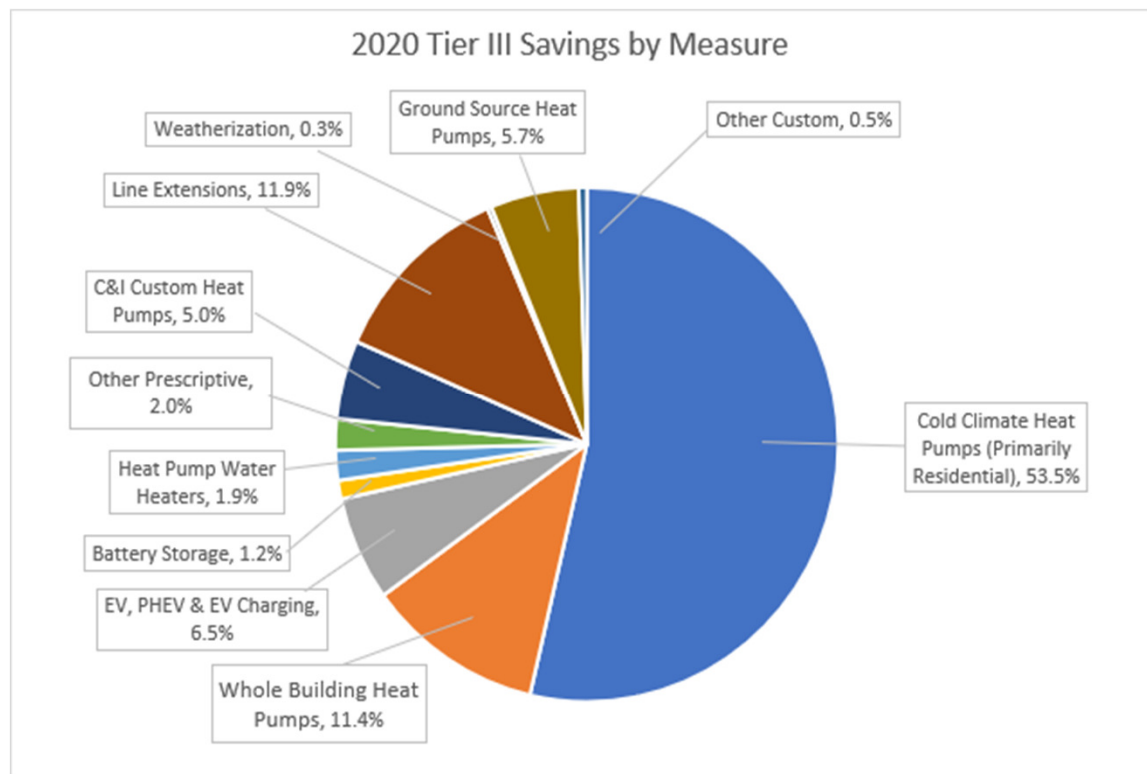
2022 RES Report

2020 COMPLIANCE YEAR & 10 YEAR PROJECTIONS

2020 Tiers 1 & 2 Compliance



2020 Tier 3 Compliance



2020 Tier 3 Cont.

- Equivalent of 248,953 MWh of fossil fuel savings in 2020
- 2020 carbon reduction of 18,377 tons
 - Note: 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

2020 RES Costs

Tier	REC Retirements	Compliance Cost	Average Cost (\$/REC)
Tier I	3,682,870 RECs	\$2,320,000	\$0.63/REC
Tier II	138,690 RECs	\$6,010,000	\$43/REC
Tier III	248,953 Mwhe	\$12,640,000	\$51/Mwhe
Total Cost of Compliance		\$20,970,000	

Retail Sales	5,300,757 kWh
Rate Impact of RES Compliance	2.3%
CO ₂ Reduction from RES	620,567 tons of CO ₂

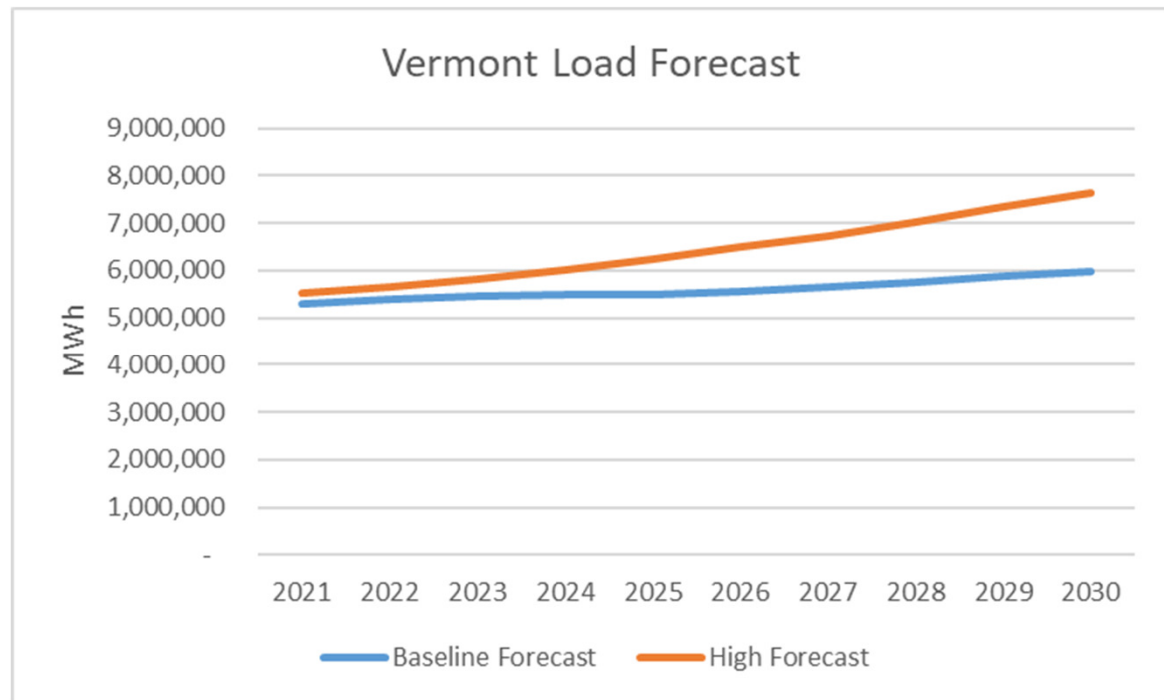
If REC prices were at ACP, total cost would have been over \$53.5 million

Projections of Future Performance (2021-2030)

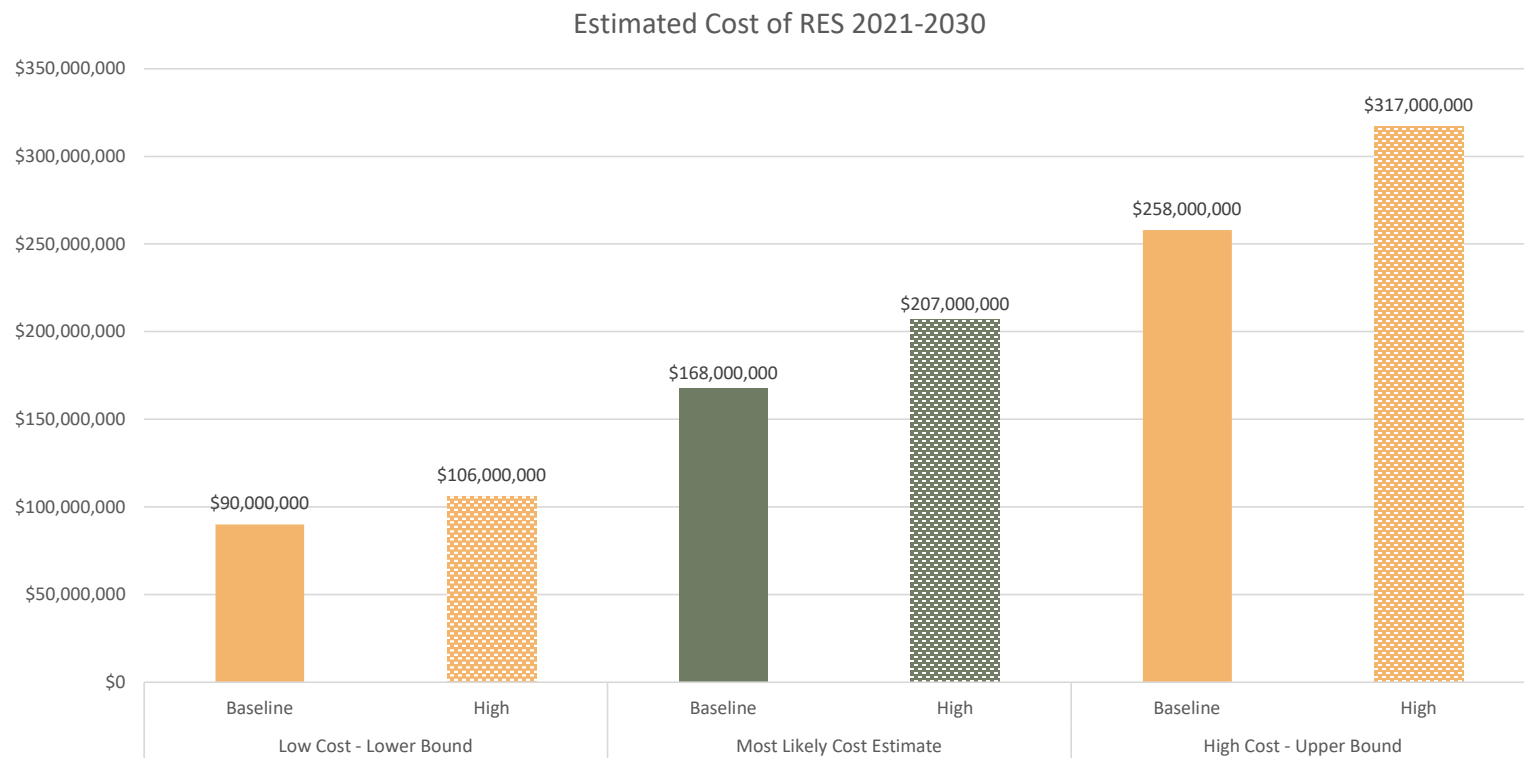
- 30 V.S.A. 8005b(b)(2) requires the PSD to conduct analysis of expected performance of RES over ten-year period
- Utilize “Consolidated RES Model” to estimate the credible range of outcomes based on key inputs:
 - Load forecast (*2 scenarios in 2020 - new*)
 - Tier III technologies and impact on peak loads
 - Net-metering adoption rates
 - REC prices (*Tiers 1 & 2*)
 - Energy & Fossil Fuel Prices
- Outputs include:
 - Costs of RES
 - Rate pressure
 - Carbon emission reductions

Model Input: Load Forecasts

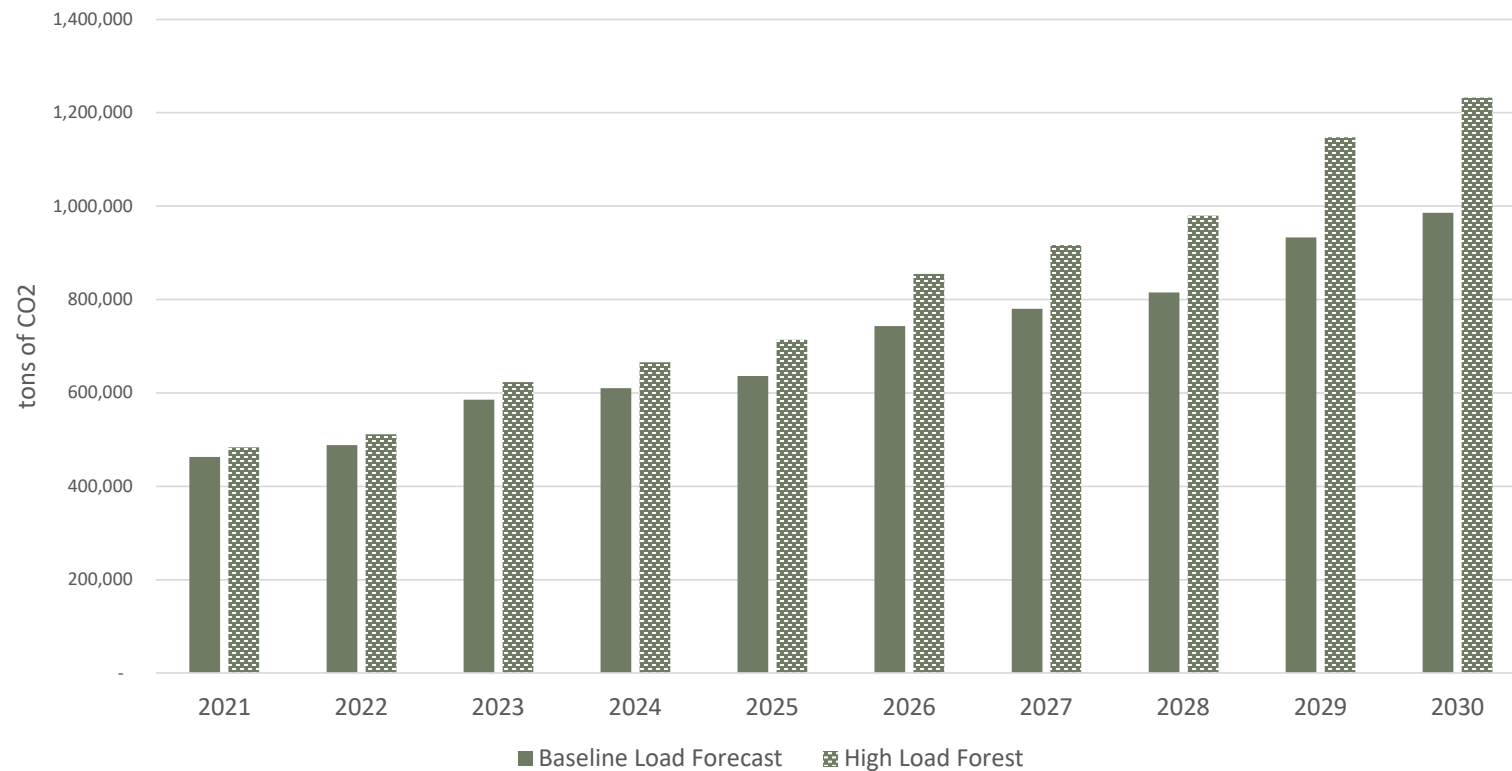
- **New in 2022** – Considered outcomes under two load forecast scenarios
- **Baseline Forecast:** Based on 2021 VELCO Long-Range Transmission Plan
- **High Forecast:** Based on modeling conducted for CEP/GWSA carbon reduction pathways



Model Outputs: Projected Costs



Model Outputs: Annual CO2 Savings (All Tiers)



Estimated RES compliance costs: 2021-2030

	LOW INCREMENTAL COST		HIGH INCREMENTAL COST	
REC Price Forecast	LOW		HIGH	
NM Adoption Rate	LOW		HIGH	
Peak contribution of New Load	10%		75%	
Fossil Fuel Price	HIGH		LOW	
Load Forecast Scenario	Baseline	High	Baseline	High
Tier 1 Cost	\$43,000,000	\$56,000,000	\$126,000,000	\$161,000,000
Tier 2 Cost	\$91,000,000	\$95,000,000	\$103,000,000	\$116,000,000
+Tier 3 Cost	\$132,000,000	\$149,000,000	\$203,000,000	\$232,000,000
-Tier 3 Additional Revenue	-\$176,000,000	-\$194,000,000	-\$174,000,000	-\$192,000,000
Tier 3 Net Cost	-\$44,000,000	-\$45,000,000	\$29,000,000	\$40,000,000
TOTAL Cost of RES	\$90,000,000	\$106,000,000	\$258,000,000	\$317,000,000
Rate Impact	0.84%	0.87%	4.77%	5.37%

Considerations & Future Opportunities

- 2022 Comprehensive Energy Plan recommended consideration of several design options to support achieving GWSA greenhouse gas reduction requirements:
 - 100% carbon-free or renewable energy standard
 - Maintaining existing cost-effective renewable generation
 - Supporting new resources within the region
 - Consideration of a cohesive set of programs to support the standard:
 - Better reflection of the time and locational values of resources
 - Modification of net-metering program to bring program costs into better alignment with benefits to allow for more well-sited, cost-effective, and equitable
 - Consideration of community solar / Standard Offer successor programs
 - Equitable engagement and distribution of costs and benefits

Questions?

EXTRA SLIDES

Modeling Exercise – Scenarios Analyzed

<u>MODEL INPUTS</u>	<u>LOW INCREMENTAL COST</u>		<u>MOST LIKELY COST SCENARIO</u>		<u>HIGH INCREMENTAL COST</u>	
REC Price Forecast	LOW		MID		HIGH	
NM Adoption Rate	LOW		MID		HIGH	
Peak contribution of New Load	10%		25%		75%	
Fossil Fuel Price	HIGH		MID		LOW	
Load Forecast Scenario	Baseline	High	Baseline	High	Baseline	High

NM 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 Compensation¹⁰⁶

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 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%

Elements of an RPS/RES/CES/CPS

- Targets (% of X, where X can be retail sales, total sales, peak demand....)
- Timeframe(s)
- Obligated entities
- Eligible resources
- Geographic restrictions
- In-service date restrictions
- Use of tiers/classes, carveouts, or multipliers
- Compliance enforcement mechanisms
- Mechanisms for limiting the program's costs

Connecticut

Connecticut

- **Title:** Renewables Portfolio Standard.
- **Established:** 1998.
- **Requirement:** 48% by 2030.
- **Applicable Sectors:** Investor-owned utility, local government, retail supplier.
- **Cost Cap:** Approximately 6%.
- **Details:** Class I renewable energy sources (including distributed generation): 40% by 2030. Class I or II (biomass, waste-to-energy and certain hydropower projects): 4% by 2018. Class III (combined heat and power, waste heat recovery and conservation): 4% by 2010. *If Class I contracts fall short of goal, large-scale hydro may fill the gap up to 5 percentage points, but it may not be traded in NEPOOL GIS.*
- **Enabling Statute, Code or Order:** [Conn. Gen. Stat. §16-245a et seq.](#); [Conn. Gen. Stat. §16-1](#); [Senate Bill 9](#) (2018).

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/195/renewables-portfolio-standard>

Maine

Maine

- **Title:** Renewables Portfolio Standard.
- **Established:** 1999.
- **Requirement:** 80% by 2030; statewide target of 100% renewables by 2050.
- **Applicable Sectors:** Investor-owned utility, retail supplier.
- **Cost Cap:** Approximately 15%.
- **Details:** Maine updated its RPS requirements in 2019 to include an additional 40% requirement for certain renewable sources (Class IA) in addition to a 10% requirement by 2022 and each year thereafter for Class I (new) sources and 30% requirement for Class II resources. The state also has separate goals for wind energy: 2,000 MW of installed capacity by 2015; 3,000 MW of installed capacity by 2020, including offshore and coastal; and 8,000 MW of installed capacity by 2030, including 5,000 MW from offshore and coastal. The state has a credit multiplier for community-based renewable energy.
- **Enabling Statute, Code or Order:** [Me. Rev. Stat. Ann. 35-A §3210 et seq.](#); [Me. Rev. Stat. Ann. 35-A §3401 et seq.](#) (wind energy); [Senate File 457](#) (2019).

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/452/renewable-portfolio-standard>



Massachusetts - RPS

Massachusetts

- **Title:** Renewable Portfolio Standard.
- **Established:** 1997.
- **Requirement:** Class I: 35% by 2030 and an additional 1% each year after, until 55% in 2050. Class II: 6.7% by 2020.
- **Applicable Sectors:** Investor-owned utility, retail supplier.
- **Cost Cap:** Approximately 16%.
- **Details:** Photovoltaic: 1,600 MW required by 2020. Class I resources are new sources. Class II (resources in operation by 1997) requirement includes 2.69% renewable energy and 3.5% waste-to-energy.
- **Enabling Statute, Code or Order:** [Mass. Gen. Laws Ann. ch. 25A §11F](#); [House Bill 4857](#) (2018).

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/479/renewable-portfolio-standard>

Massachusetts - CPS

[The Clean Peak Energy Standard](#) is designed to provide incentives to clean energy technologies that can supply electricity or reduce demand during seasonal peak demand periods established by DOER. The Clean Peak Energy Standard (CPS) was part of [An Act to Advance Clean Energy](#), which was signed into law in August 2018. Clean Peak Resources include new Class I Renewable Energy Resources, Existing Class I / Class II resources that are paired with an Energy Storage System, Energy Storage Systems, and Demand Response Resources. Any qualified resource that generates, dispatches or discharges energy to the electric grid during a Seasonal Peak Period will generate Clean Peak Certificates. Clean Peak Certificates can be sold to retail electricity suppliers, which are required to meet a baseline minimum percentage of sales each year. DOER is charged with establishing four Seasonal Peak Periods in which resources must operate, determine a metering and verification protocol to ensure that all data is collected, reviewed and reported in a consistent manner, set the Alternative Compliance Payment rate and procurement process, and establish annual compliance requirements.

<https://www.mass.gov/service-details/program-summaries>



Massachusetts - CES

Beginning in 2018, the Clean Energy Standard (CES) sets a minimum percentage of electricity sales that utilities and competitive retail suppliers must procure from clean energy sources. The minimum percentage begins at 16% in 2018, and increases 2% annually to 80% in 2050. The CES is met through acquisition of Clean Energy Credits (CECs) or by making an Alternative Compliance Payment (75% of RPS ACP from 2018 to 2020, and 50% of the RPS ACP thereafter).

- RPS Class I compliance (13% in 2018) counts toward compliance with the CES (16% in 2018). Thus, the net incremental CES requirement for 2018 is 3%.
- Any RPS Class I qualified generation attributes will also qualify for CECs.
- Technologies that meet the emissions and vintage requirement will qualify for CECs, as well as energy procured under the 2016 Energy Diversity Act (e.g., 83d). *These include nuclear, large hydro imports, and fossil generators with carbon capture and sequestration.*
- Existing customer contracts on or before August 11, 2017, will be exempt only for incremental CES obligation over and above the RPS obligation in any year.
- Banking will not be allowed until 2021

<https://www.mass.gov/service-details/program-summaries>



New Hampshire

New Hampshire

- **Title:** Electric Renewable Portfolio Standard.
- **Established:** 2007.
- **Requirement:** 25.2% by 2025.
- **Applicable Sectors:** Investor-owned utility, cooperative utilities, retail supplier.
- **Cost Cap:** Approximately 7%.
- **Details:** Solar: 0.7% new solar in 2020 and after. Requires at least 15% of requirement to be met with new renewables.
- **Enabling Statute, Code or Order:** [N.H. Rev. Stat. Ann. §362-F](#).

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/2523/renewable-portfolio-standard>

Rhode Island

Rhode Island

- **Title:** Renewable Energy Standard.
- **Established:** 2004.
- **Requirement:** 14.5% by 2019, with increases of 1.5% each year until 38.5% by 2035.
- **Applicable Sectors:** Investor-owned utility, retail supplier.
- **Cost Cap:** Approximately 13%.
- **Details:** The state has a separate long-term contracting standard for renewable energy, which requires electric distribution companies to establish long-term contracts with new renewable energy facilities.
- **Enabling Statute, Code or Order:** [R.I. Gen. Laws §39-26-1 et seq.](#); [R.I. Gen. Laws §39-26.1 et seq.](#) (contracting standard); [House Bill 7413a](#) (2016).

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/1095/renewable-energy-standard>

Vermont

Vermont

- **Title:** Renewable Energy Standard.
- **Established:** 2005 (voluntary target); 2015 (standard).
- **Requirement:** 55% by 2017; 75% by 2032.
- **Applicable Sectors:** Investor-owned utility, municipal utilities, cooperative utilities, retail supplier.
- **Cost Cap:** Approximately 6%.
- **Details:** Distributed Generation: 10% by 2032. Energy Transformation: 12% by 2032 (includes weatherization, thermal energy efficiency and heat pumps).
- **Enabling Statute, Code or Order:** [Vt. Stat. Ann. tit. 30 §8001 et seq.](#); [Standard: House Bill 40.](#)

Source: <https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx> and <https://programs.dsireusa.org/system/program/detail/5786/renewable-energy-standard>