Overview of the Renewable Energy Standard

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History of 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
  - 2008 – allowed group net metering, expanded overall cap from 1% 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

Regional Grid Operation

- New England utilities have worked together for 60 years to plan transmission and coordinate generation
- 1971 NEPOOL formed: Formalized cooperation to increase reliability, greater resource diversity and lower cost to customers
- 1997 ISO New England created: Operates regional power system, implement wholesale markets, and ensure open access to transmission system

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 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 determine 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 and the cost to build
  - Reality is that value is based on supply and demand
  - Different Tier/Class eligibility means different values

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
  - Maintained at 75% thereafter
- Alternative Compliance Payment = $10/REC in 2017, increasing by CPI annually
- REC prices relatively low: $0.50 average in 2018; $1 - $5 estimated going forward

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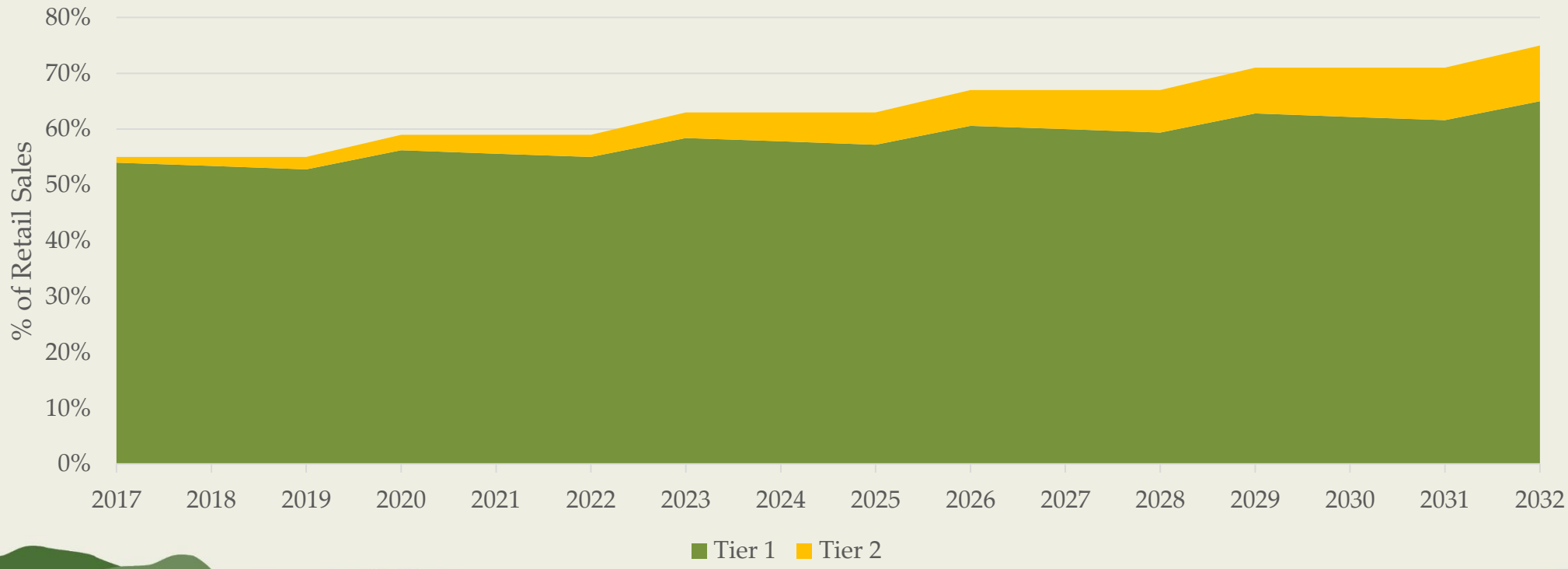
Tier 2 – Distributed Generation

- 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
- REC prices averaged $26/REC in 2018; compliance costs will increase going forward due to more net-metering RECs: avg compliance cost going forward ~$50/REC
- Tier 2 REC price forecast for new RECs: $12 - $35/REC

Tier 1 & 2 Annual Requirements



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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 $25/ MWhe in 2018

RES Benefits: Tiers 1 and 2

- Renewable energy displaces energy generated from fossil fuel-fired plants
- CO2 reduction as a result of RES = 610,000 tons in 2018
- CO2 emissions from Vermont's electricity sector went from 460 lbs/MWh down to 69 lbs/MWh in 2018
- Increased certainty regarding resale of RECs into the region

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RES Costs: Tiers 1 and 2

- Compliance costs were $4.3 million in 2018
  - Tier 1: 3,475,732 RECs retired statewide; average price = $0.50/REC
  - Tier 2: 98,222 RECs retired statewide; average price = $26/REC
- If REC prices were at ACP; total cost would have been over $40 million

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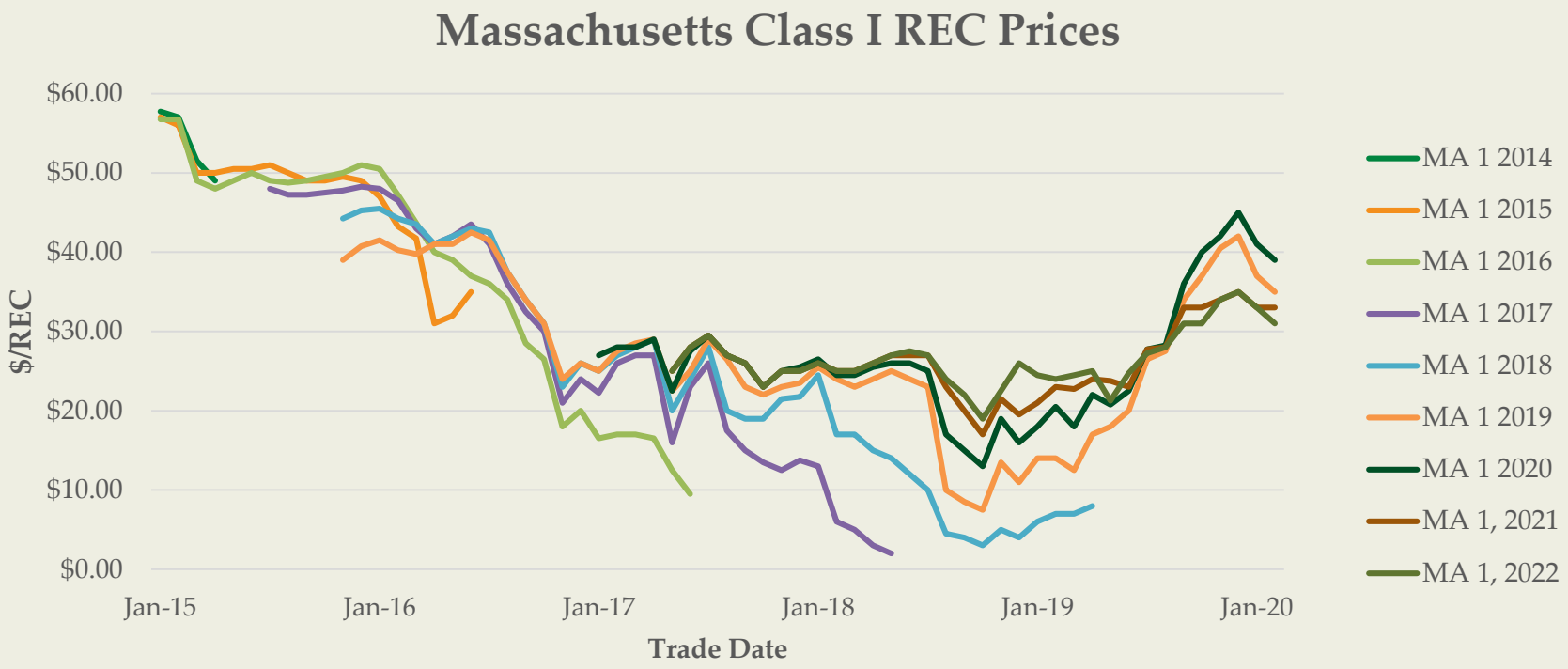
Historical Prices

REC price volatility makes predicting future costs difficult

- Small price difference in REC price can have significant impact, given number of RECs required



Source: GT Environmental REC Brokers

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REC Arbitrage

Arbitrage is the near-simultaneous buying and selling of commodities in different markets in order to take advantage of differing prices for the same or similar assets. REC arbitrage occurs when RECs from one project are sold and replaced by less expensive RECs from another project.

A VERMONT EXAMPLE

Project	Kingdom Community Wind
Owners	Vermont Utility Owned– GMP & VEC
Location	Lowell, VT
Commissioning Date	November 2012
Type	Wind
Size	63 MW
REC Qualifications	VT Tier I, CT-I, MA-I, MA CES, RI-new

In 2018, the project generated 160,500 MWh of energy. The utilities could retire or sell those RECs. Retirement would be for Tier I compliance; sales would be into the MA, CT, or RI REC markets, with corresponding purchases of less expensive RECs for Tier I compliance.

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RES Benefits: Tier 3

- Equivalent of 124,083 MWh of fossil fuel savings in 2018
- 2018 carbon reduction of 14,500 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
  - Fixed costs of the system are spread over a greater number of kWh, reducing the cost per kWh
  - Assumes that new electric loads are managed so they do not increase peak

RES Costs: Tier 3

- Equivalent of 124,083 MWh of fossil fuel savings in 2018
- 2018 Total cost = $3.15 million
- Cost per MWh saved = $25/ MWh

Projections of Future Performance (2028)

- 30 V.S.A. 8005b(b)(2) requires the DPS to conduct analysis of expected performance of RES over ten-year period
- General takeaway - Significant variations depending on assumption
- Overall reduction in fossil fuel-based energy (all sectors) = 14%
  - Additional 10% reduction resulting from increased nuclear

Projections of Future Performance (2028)

	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 Impact	5.02%	0.56%

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Questions?