A SUSTAINABLE FUTURE | Trends and Opportunities

Zac Bloom, ***VP of Sustainability & Renewables***

Competitive Energy SERVICES

NEW ENGLAND AEE ANNUAL ENERGY OUTLOOK FORUM 2019

AGENDA

1. Introduction
2. Why Renewables?
3. State Legislation
4. Behind the Meter
   - **Solar + Storage**
5. Offsite Renewable Energy

CES WHO WE ARE

- Full Service Energy Consulting Firm
- Based in Portland, ME and Topsfield, MA
  - With agents in CT/RI, NH, and northern ME
- Over 800 clients
- $2 billion in energy spend
- Clients across the US and Canada
- 100% supplier neutral/ product neutral
  - Over 50 suppliers throughout North America
- Transparent fees
- Customized energy solutions

CES WHO WE ARE

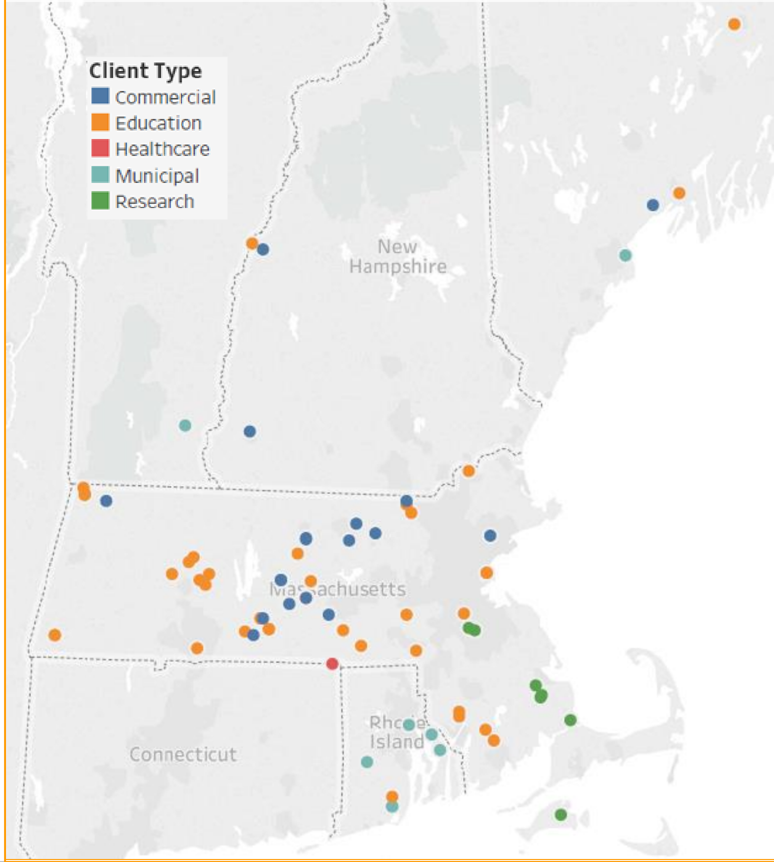
SERVICE OFFERINGS

- Onsite Solar Consulting
- Energy Procurement and Price Forecasting
- Renewable Energy Credit Procurement & Sales
- Battery Storage & Optimization
- Alternative Fuel Feasibility
- Efficiency Project Financial Analysis
- Greenhouse Gas Tracking
- Climate Action Planning
- Energy Master Planning
- Grant Assistance

SELECT CLIENTS

- Adobe
- Amherst College
- Axcelis
- Big Y
- Cartamundi
- City of Boston
- City of Providence
- City of South Portland
- Dartmouth College
- Hannaford Bros LLC
- Hypertherm
- Kendal at Hanover
- LL Bean
- New Balance Athletics
- Raytheon
- Town of Narragansett, RI
- Town of South Kingstown, RI
- University of Massachusetts
- University of Rhode Island
- Williams College

CES CURRENT NEW ENGLAND SOLAR PV PROJECTS



WHY RENEWABLES?

Why Now?

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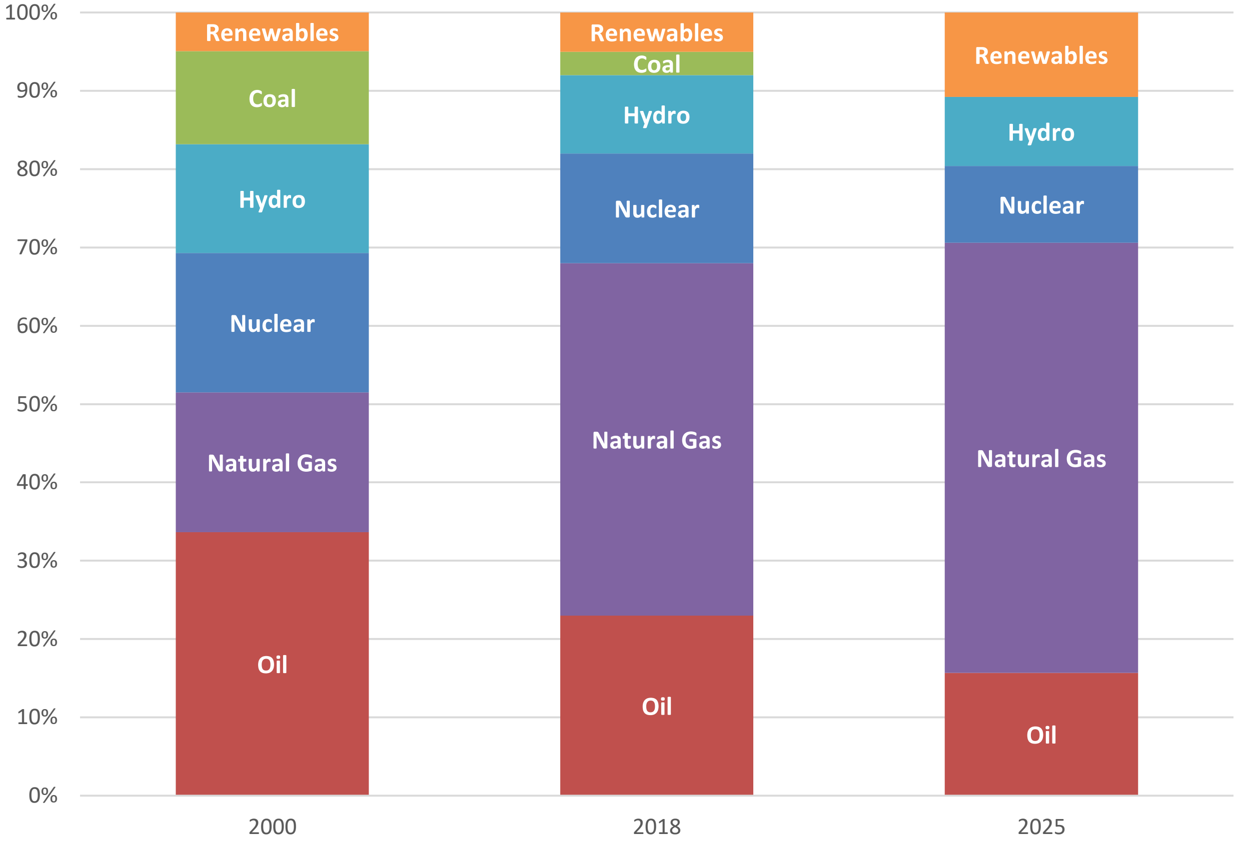
WHY RE? | Existing ISO-NE Plant Capacity By Fuel Type

New England is shifting rapidly to a power grid that has mostly natural gas…



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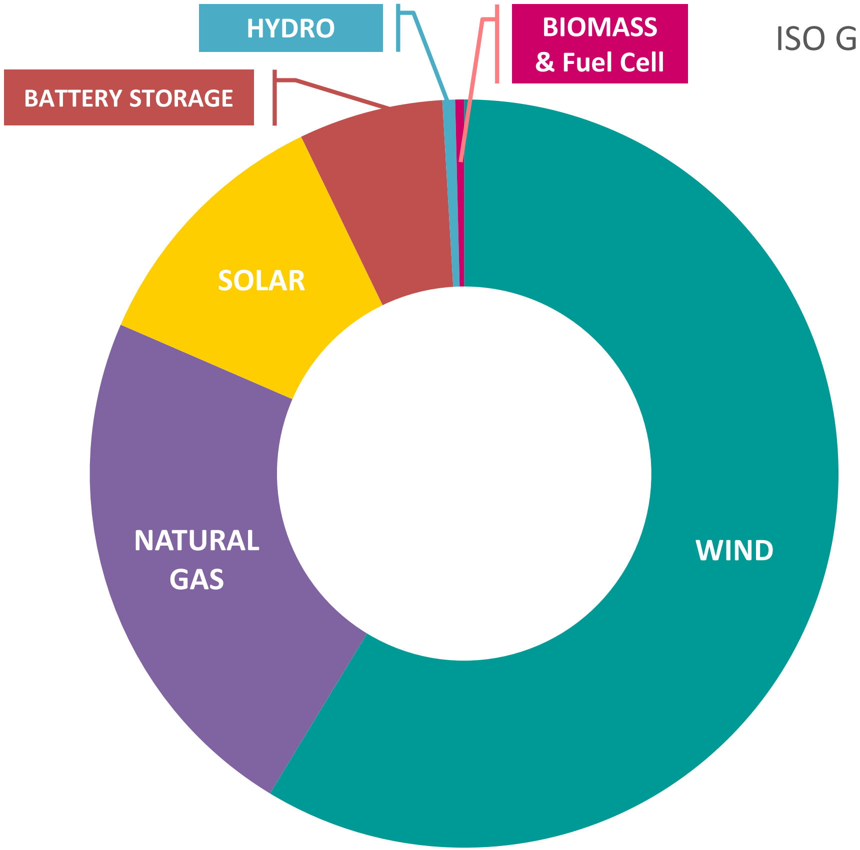
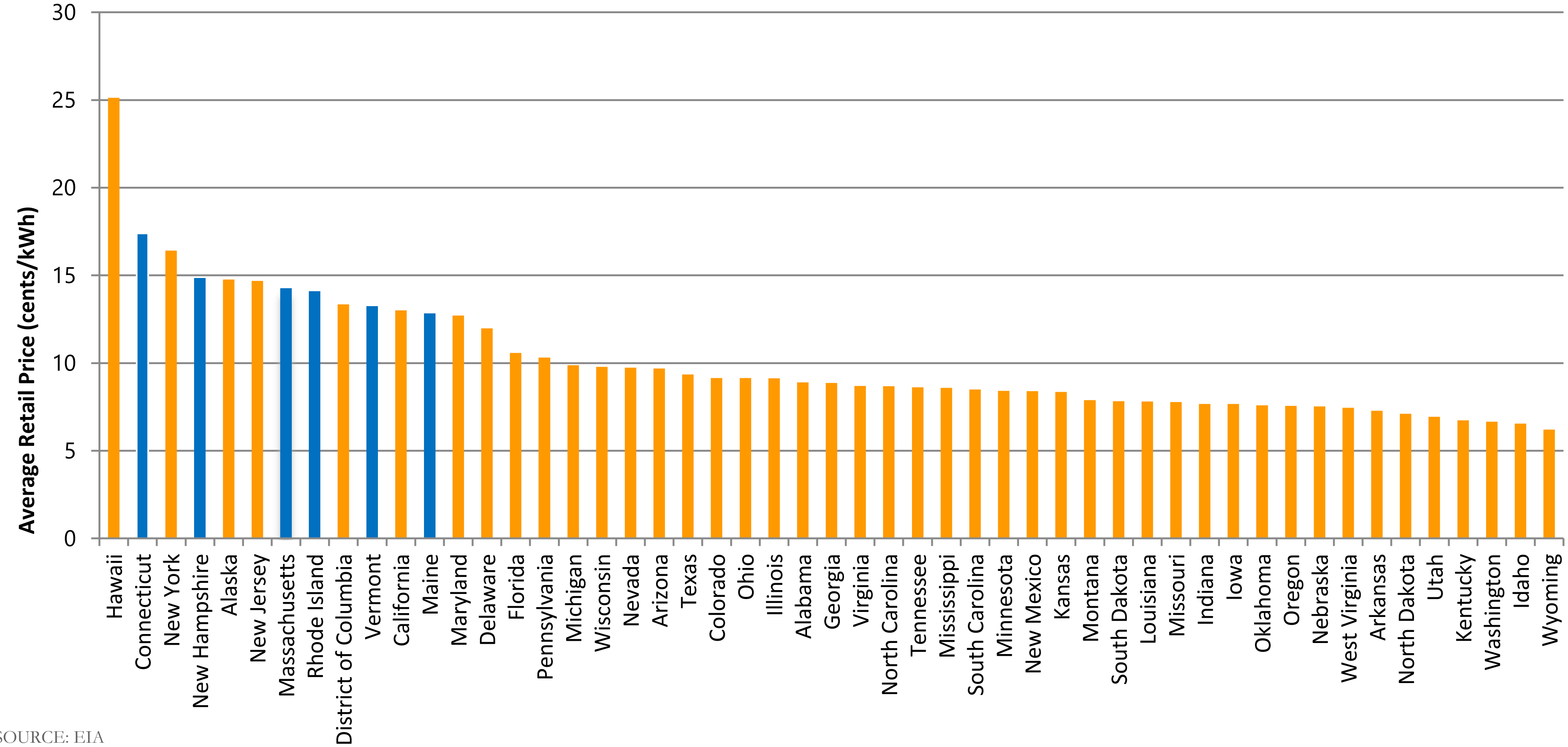
ISO Generator Queue
(August 2018)



…and **wind** and **solar**

WHY RE? | Avoided Cost of Electricity



SOURCE: EIA

WHY RE? | Federal Tax Incentives Sunsetting

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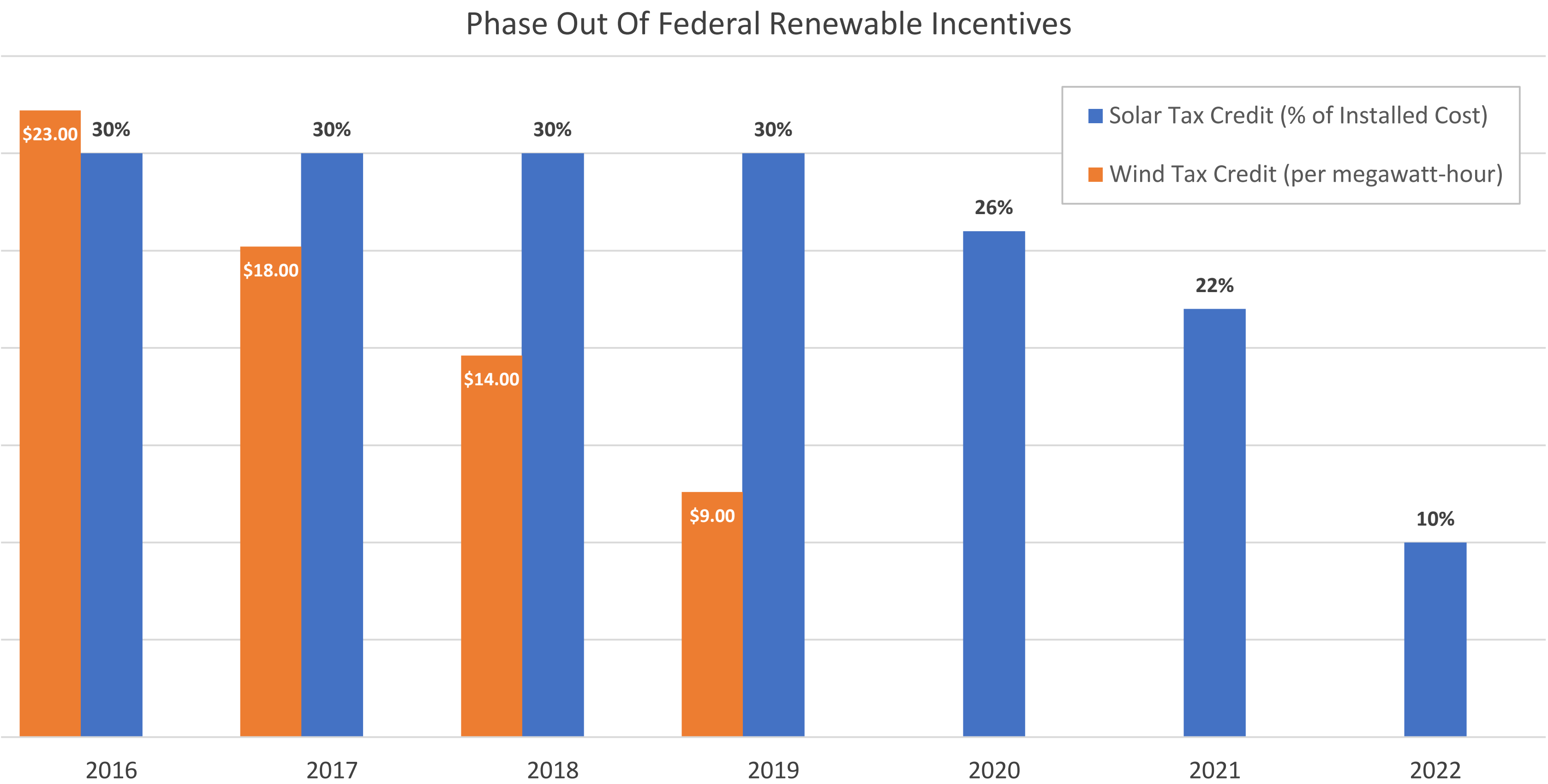
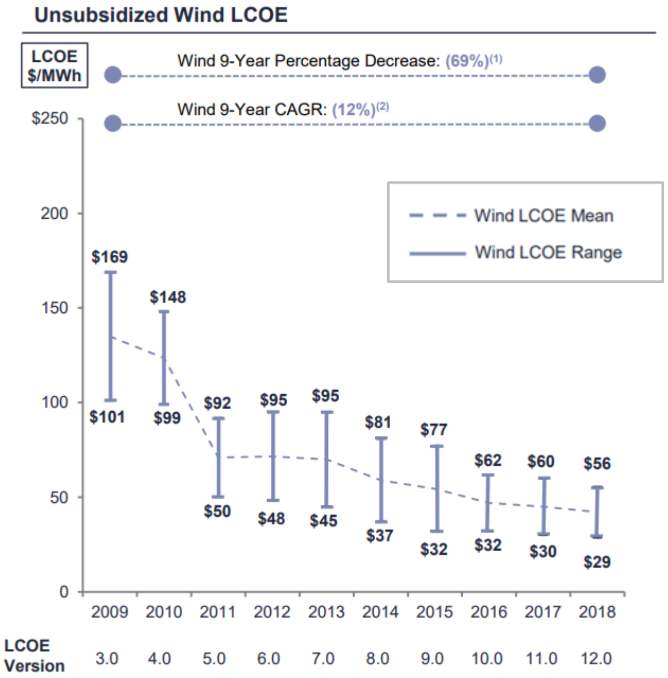
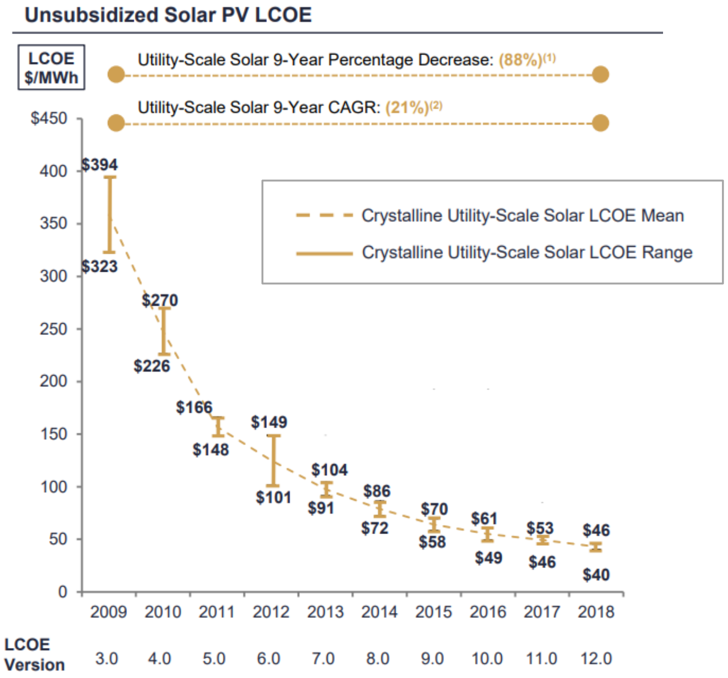


WHY RE? | Price Decline

Levelized Cost of Energy Comparison – Historical Alternative Energy LCOE Declines

In light of material declines in the pricing system components (e.g., panels, inverters, turbines, etc.) and improvements in efficiency, among other factors, wind and utility-scale solar PV have seen dramatic historical LCOE declines; however, over the past several years the rate of such LCOE declines have started to flatten.





Source: LAZARD- Lazard's Levelized Cost of Energy Analysis

WHY RE? | Falling Costs

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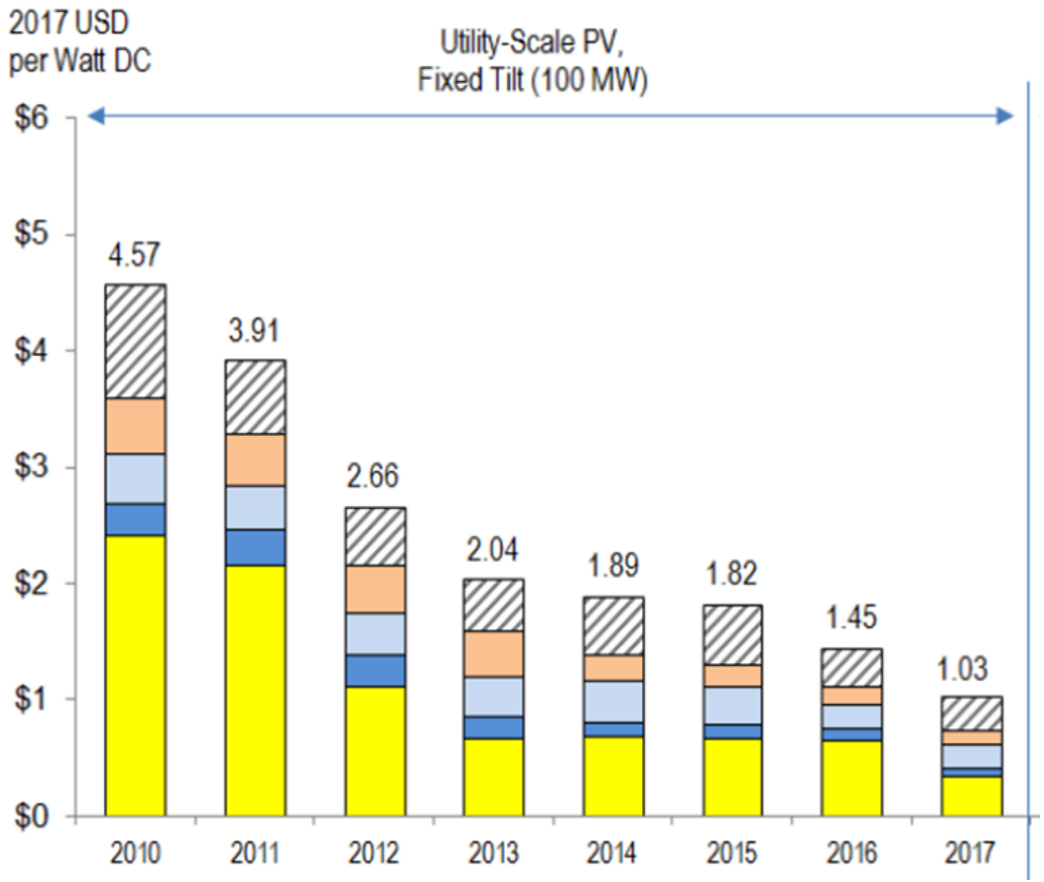
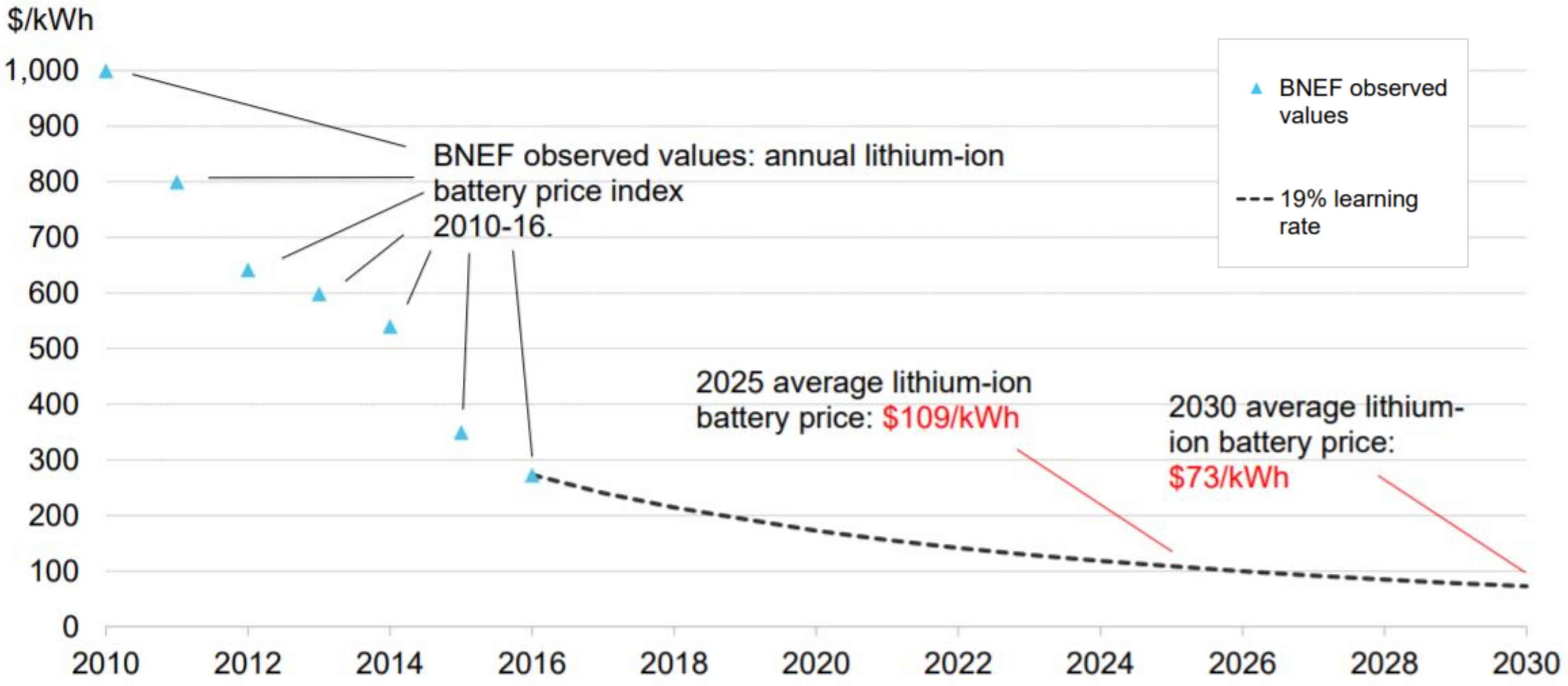
- **Soft Costs - Other** (PII, Land Acquisition, Sales Tax, Overhead, and Net Profit
- **Soft Costs - Install Labor**
- **Hardware BOS -** Structural and Electrical Components
- **Inverter**
- **Module**

SOURCE: National Renewable Energy Laboratory



WHY RE? | Learning Rate of Battery Storage



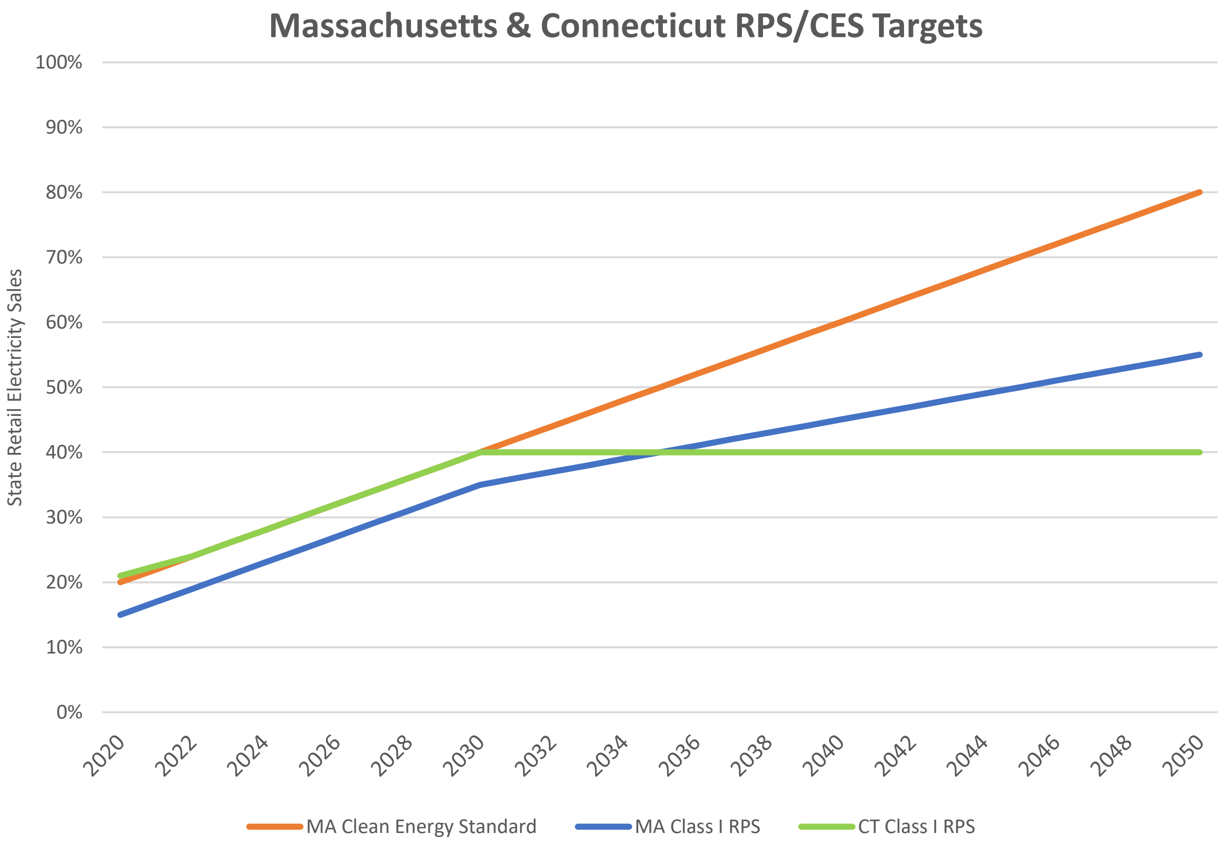
Source: Bloomberg New Energy Finance - Approaches for Using Scenarios in Strategic Decision Making

2020-2030 | State-sponsored Clean Energy

In the last year, MA and CT have both passed bills **increasing RPS** standards over the next 10 years.

New England states' out-of-market procurement may support **7+ GW** of generation capacity over the next 10 years:

- HQ Hydro: 1200 MW
- Offshore Wind: 3200 MW
- MA SMART: 1600 MW
- CT Z-Carbon: 1400 MW



STATE LEGISLATION

MA SMART Example

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SMART | A Brief History

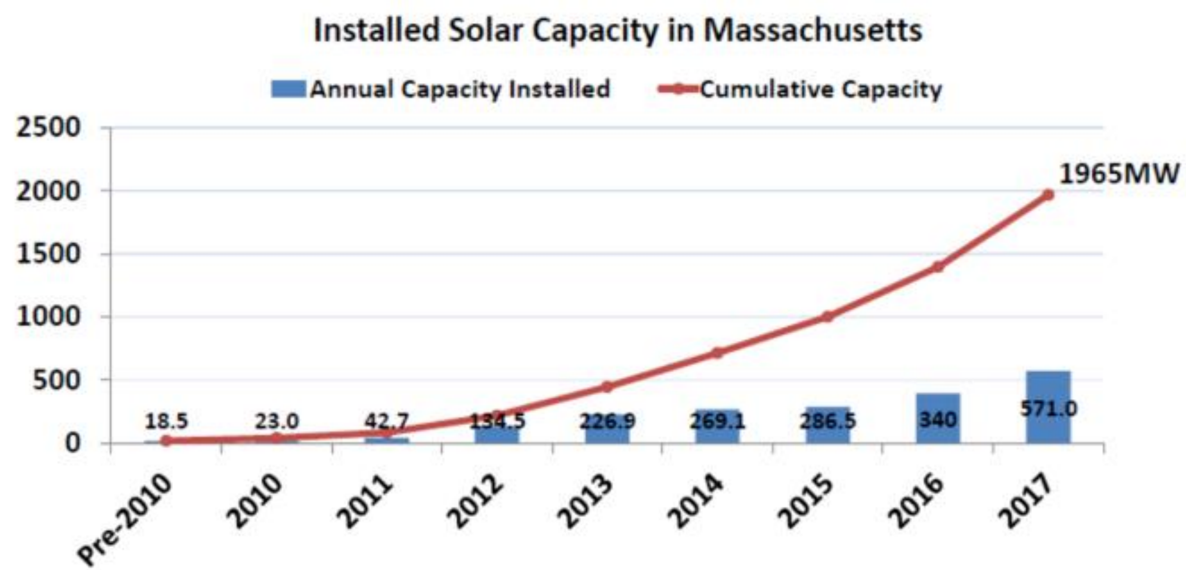
2008: Green Communities Act

- Expansion of **net metering**
- Creation of solar-carve out under the existing renewable portfolio standard **(est. SRECs)**
- Green Jobs Act - Est. MassCEC, solar rebate programs

2010 – 2014: SREC I

2014 – 2018: SREC II
SRECs target 1600 MW installed

2016: SMART Program authorized by legislature, 1600 additional MW



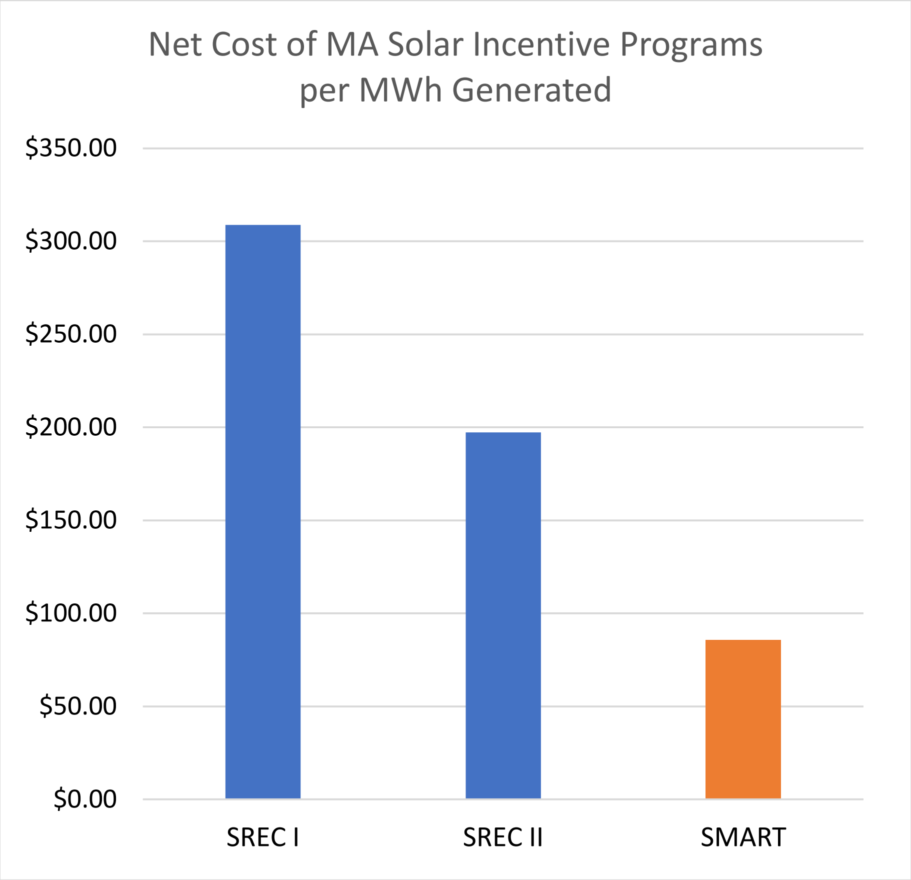
Massachusetts has an aggressive target of 1600 MW of solar power installed for 2020. The above figures represent the cumulative amount installed as of December 2017 in 77,870 projects.

Creating a Clean, Affordable and Resilient Energy Future for the Commonwealth

DOER
Massachusetts Department of Energy Resources

SOURCE: MA DOER

SMART | Relative Program Costs



- SMART program costs will be recovered through a new utility charge – "SMART Factor"
- Cost of incentives and administrative payments will be partially offset by market revenue gained from utility ownership of the renewable credits
- Charge will be set by each utility for 12-months at a time based on costs of the program
- SMART Factor is expected to go into effect in January 2019

SMART | Key Features

FEED-IN TARIFF FOR NEW SOLAR INSTALLATIONS

- Succeeds SREC II incentive program
- 1,600 MW AC statewide target, 5 MW system size cap per location
- 20-year incentive rate for system owners
- RECs are retained by the utilities

INCENTIVE FORMULAS INCORPORATE SEVERAL FACTORS

- Base compensation rate to be established in competitive auction
- Two different system types:
  1. Standalone systems
  2. Behind-the-meter systems
- Incentives adders for system sizing and offtaker
- Incentive adder for energy storage tied to solar production

DECLINING BLOCK STRUCTURE

- Program capacity is split into eight blocks per utility
- Incentives and adders expected to decline 4% per block
- Block reservation requires executed interconnection agreement

BTM – SOLAR/STORAGE

Behind-the-Meter Installations

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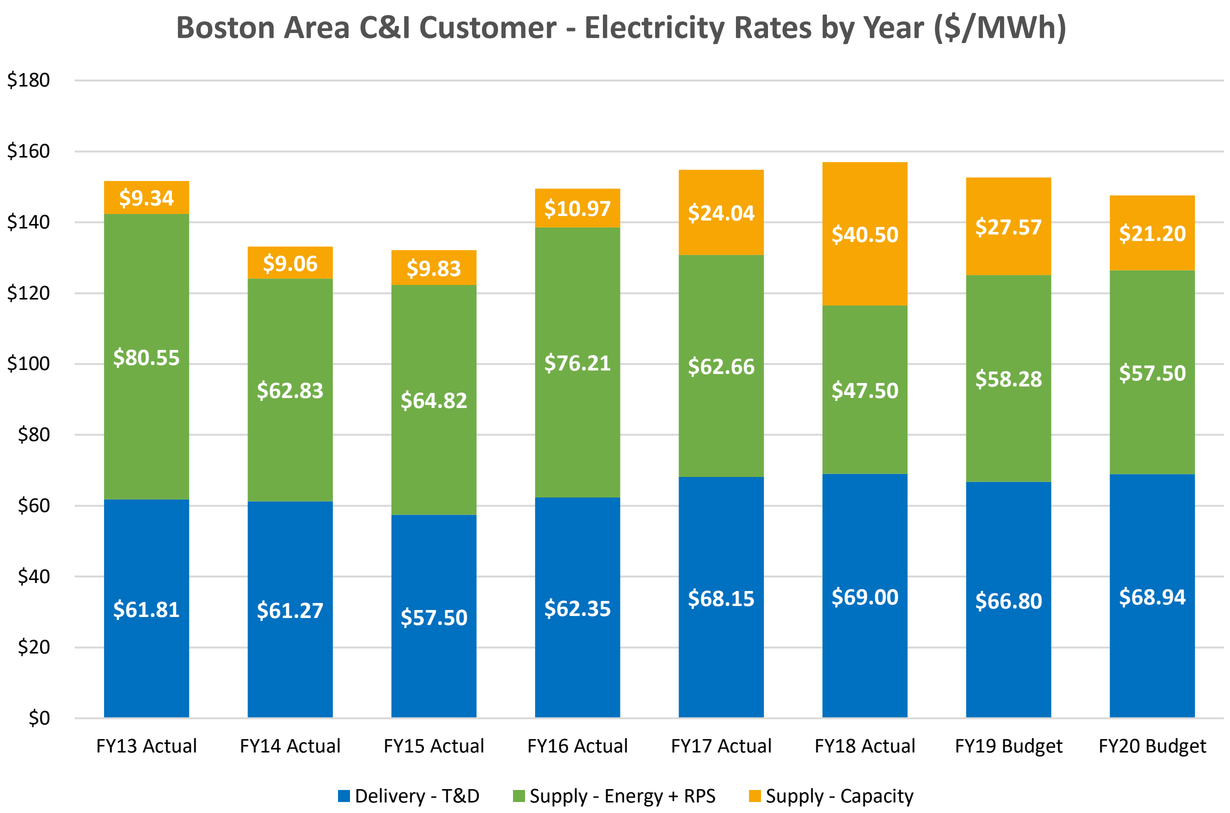
BTM | Energy Costs 101

Most MA C&I customers currently pay between **$0.14 and $0.16 per kWh** in total for grid electricity.

Retail electricity rates consist of four primary components:

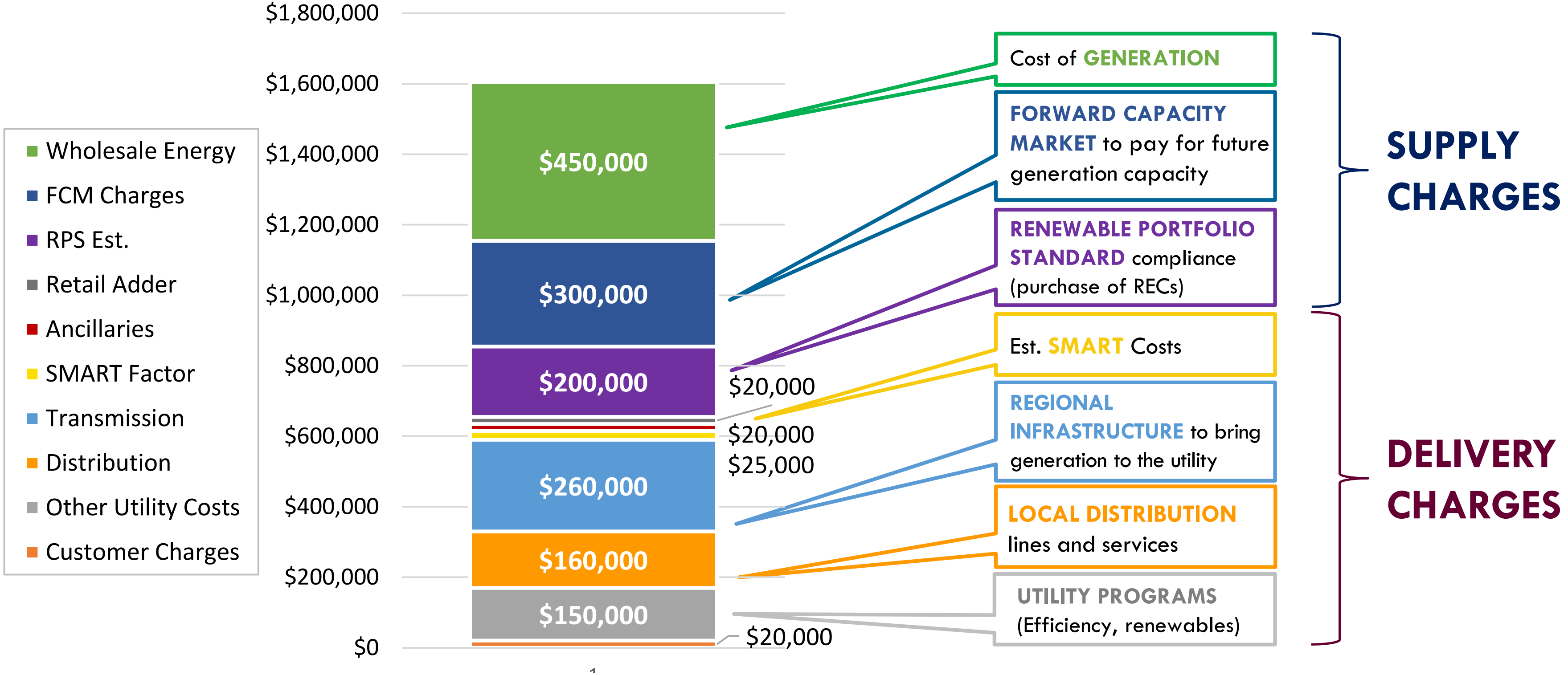
- Supply – Capacity
- Supply – Energy
- Supply – RPS
- Delivery – T&D



BTM | SMART Relative Program Costs

Sample Total Electricity Costs by Component Based on 10,000,000 kWhs of Manufacturing Load

NOTE: Cost estimates are intended to show relative magnitude for a typical MA client – rates vary by utility, rate class, existing contracts, etc.



BTM | Value of a Solar kWh

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SOLAR PV KWH VALUE

OFFSET SUPPLY PURCHASE	Hourly profile – on peak vs. off-peak Seasonality
OFFSET UTILITY DELIVERY CHARGES	Tariff Structure - $/kWh, $/kW
REDUCE CAPACITY CHARGES	Demand reduction during the annual hour of the New England system peak
RENEWABLE BENEFITS	Offset carbon associated with grid purchase Claims depend on REC ownership
EXCESS GENERATION	Compensation depends on net metering availability

BTM | Impact Of Renewable Energy Policies

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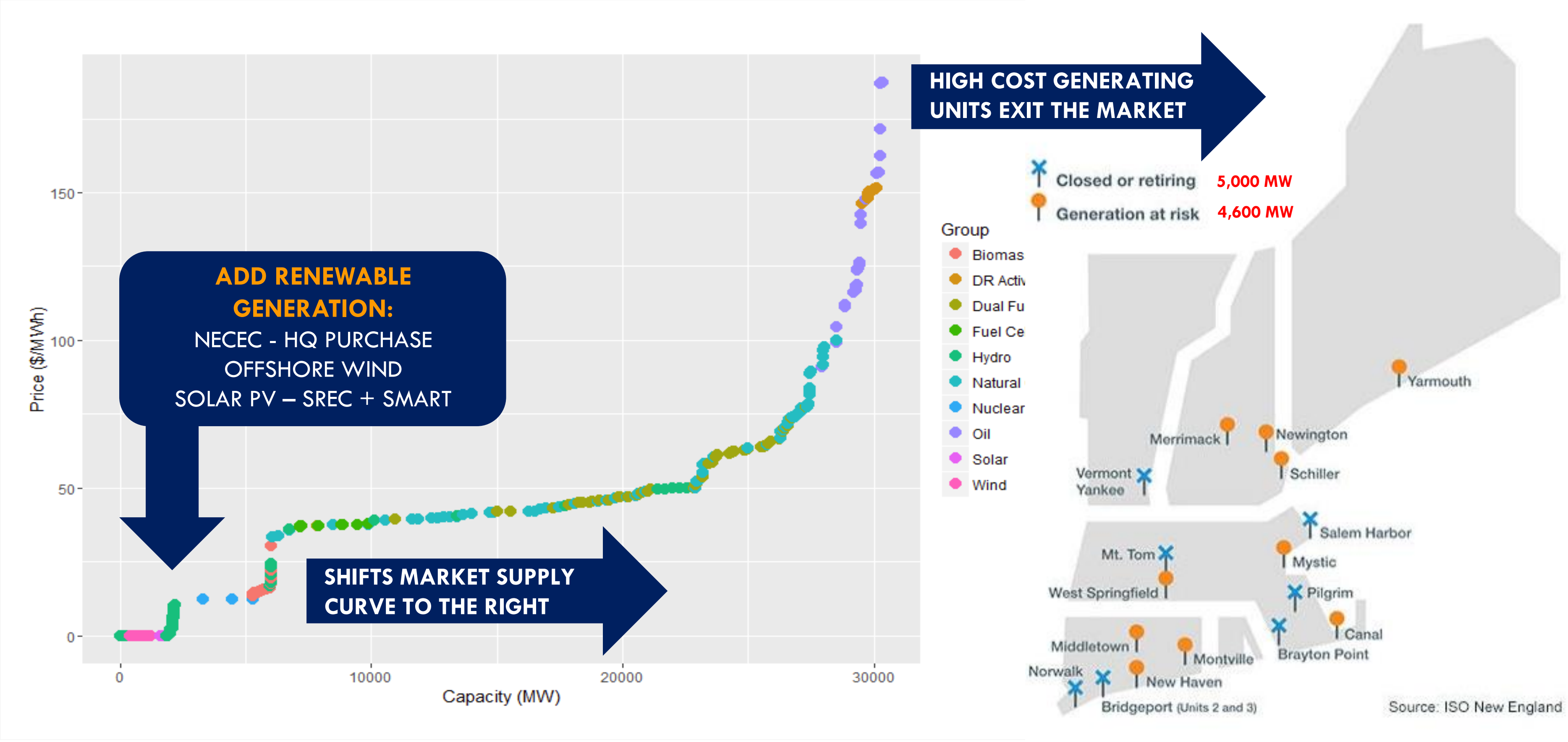
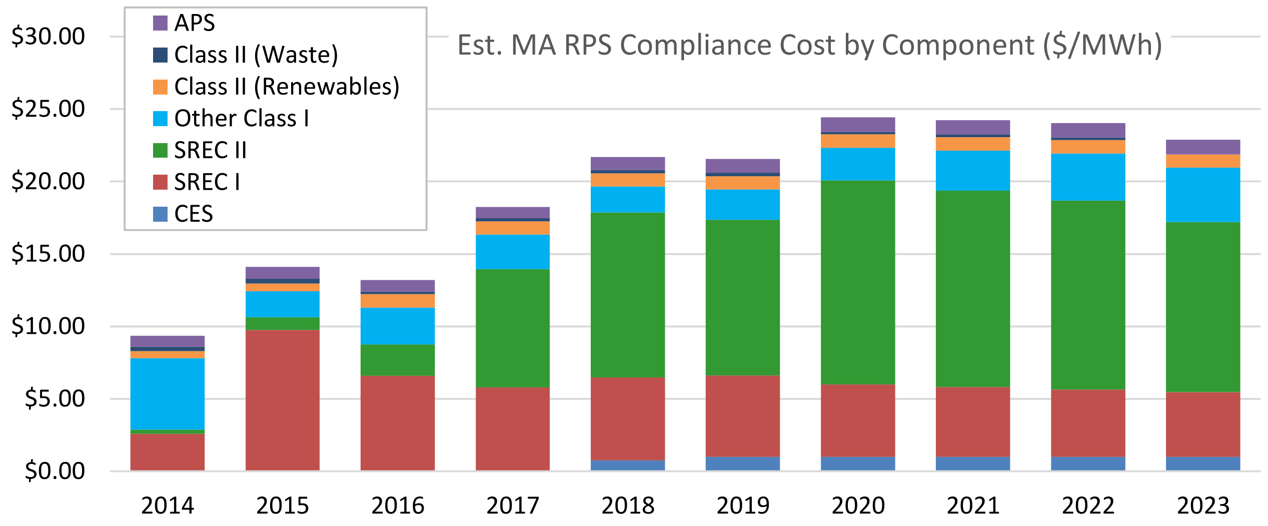
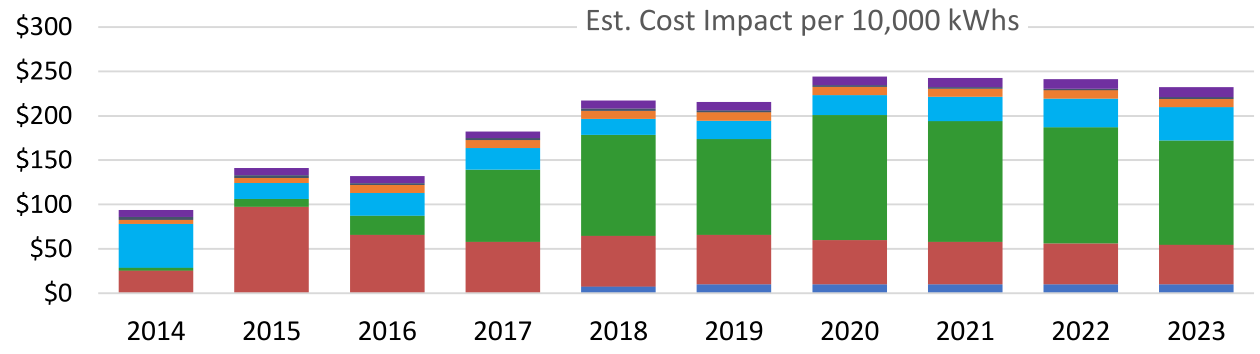


BTM | Est. Impact on Ratepayers



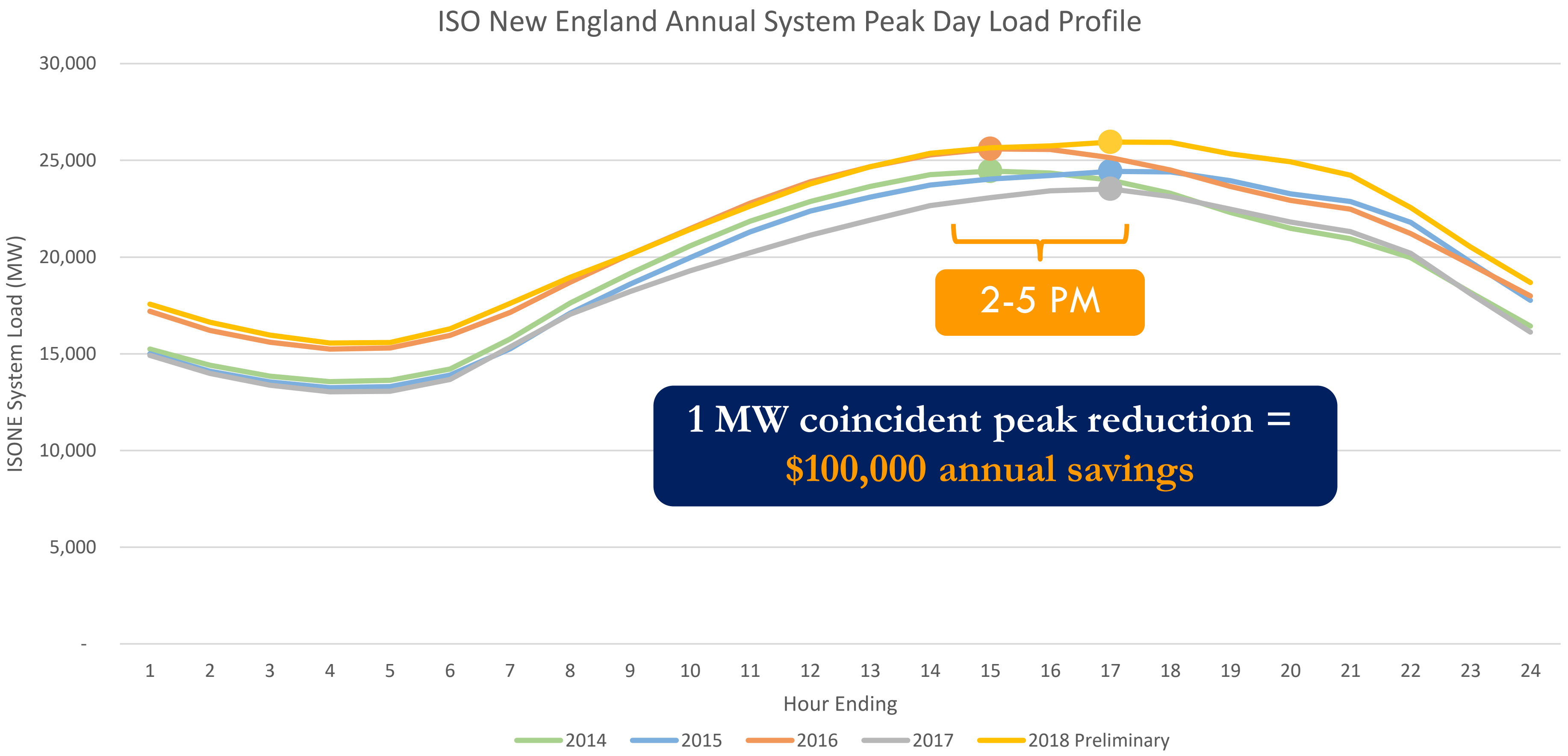


A growing part of electricity costs is the rate paid to cover electricity supplier's cost to purchase RECs.

As REC prices and required quantities increase, so do those costs.

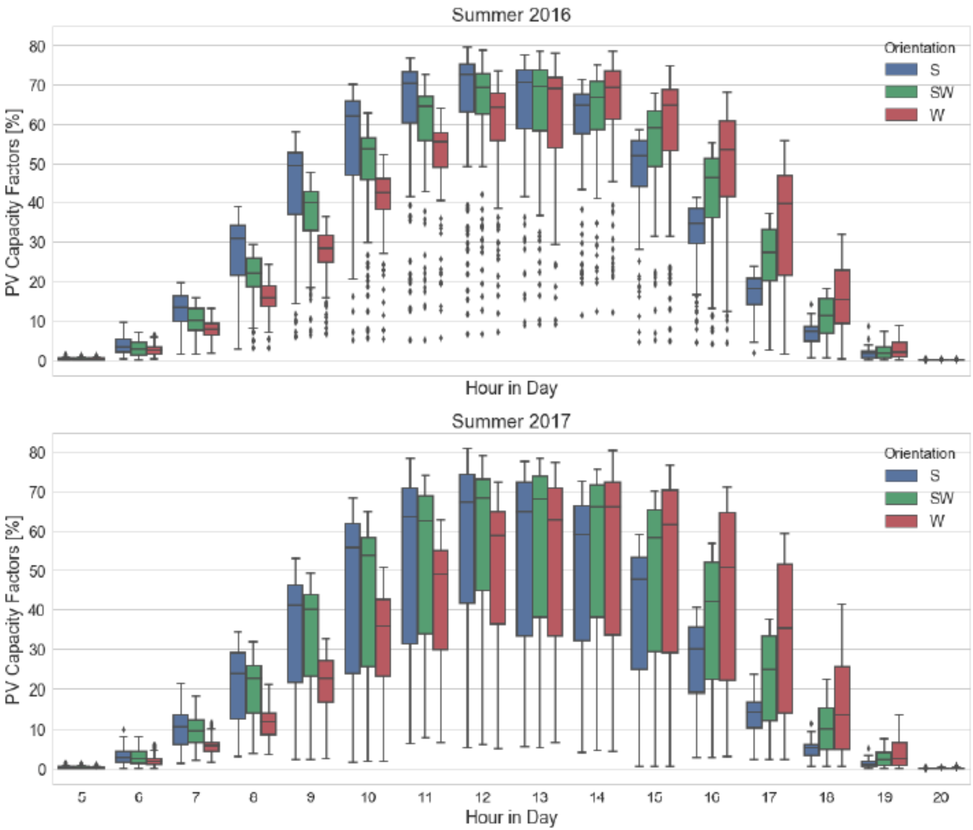
New renewable procurements are likely to show up as new delivery costs on your utility bill

BTM | ICAP Charge Reduction



BTM | Capacity Savings

Figure 5. Capacity Factors of Rooftop-Mounted System During Hours of Sunlight by Orientation*



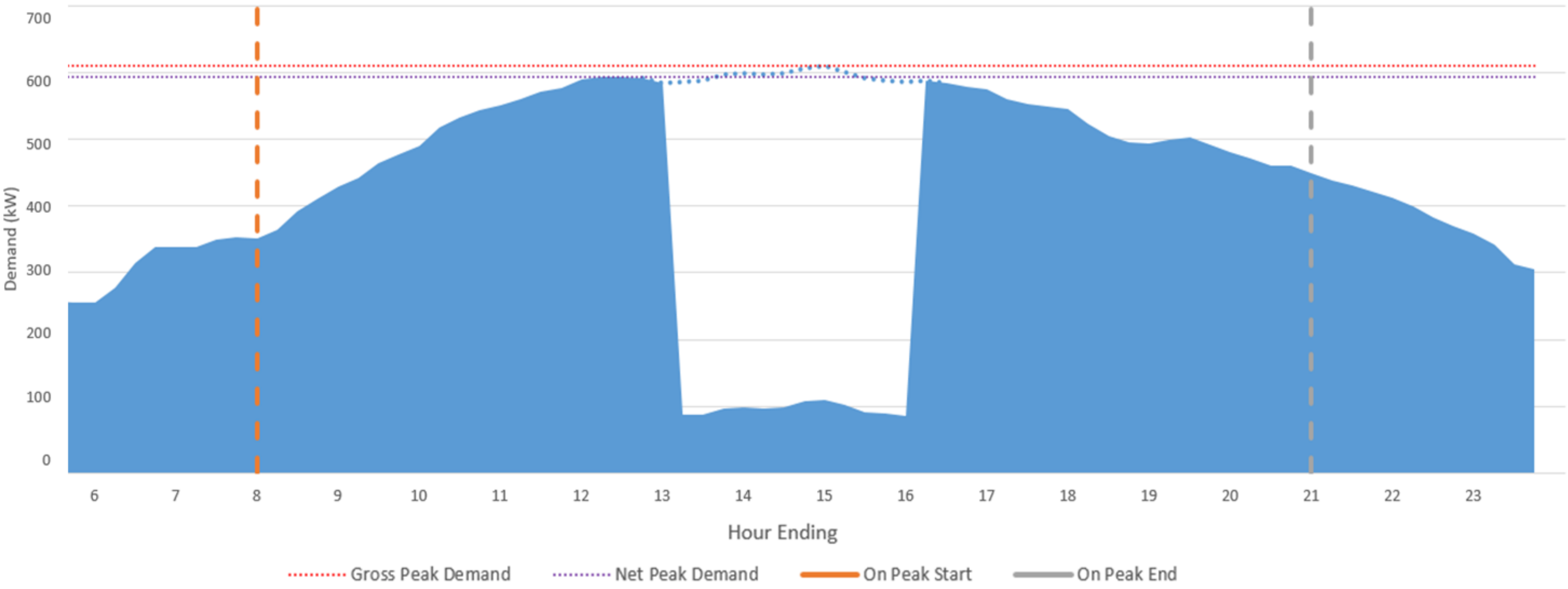
Source: CADMUS & RI Office of Energy Resources – System Reliability Procurement Distributed Generation Pilot Evaluation Report

BTM Solar ICAP Savings:

- Supply procurement structure
- Generation during ISONE peak
- Forward clearing auction rate
- Reserve margin

BTM | Demand Charge Reduction (Storage)

1 MW monthly Regional Network Service peak reduction = $15,000 OATT savings



OFFSITE SOLAR

Options and Key Considerations

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OFFSITE SOLAR | SMART Opportunity

FINANCIAL OPPORTUNITY

- SMART program includes Alternative On-Bill Credit ("AOBC") option to substitute for net metering, where customers receive credits from remote solar systems
- System owners sell these credits to those with utility bills in addition to the utility incentive payments received for their RECs
- SMART program tariff bases AOBC rates on default supply rates

KEY DECISIONS

- Deals will likely be 20-years – Must evaluate tradeoffs and risks of maintaining sufficient utility cost liability
- Need to consider factors such as expected future load changes, efficiency projects, purchasing strategy, etc.
- Price structures may vary –fixed discount (indexed) options, potential escalation or floor prices

OFFSITE SOLAR | Options for Systems

STANDALONE SMART PROJECTS

VIRTUAL NET METERING

- Generates utility net metering credits at retail rate (~$0.10- $0.20 per kWh)
- Requires net metering cap allocation

ALTERNATIVE ON-BILL CREDITING (MA ONLY)

- Generates utility on-bill credits at set supply tariff rate
- Any remote project may qualify

VIRTUAL POWER PURCHASE AGREEMENTS

- Does not generate utility bill credits and instead gets paid directly by the ISO at avoided supply (based on LMP rates, ~$0.04/kWh)

OFFSITE SOLAR | Flow Chart

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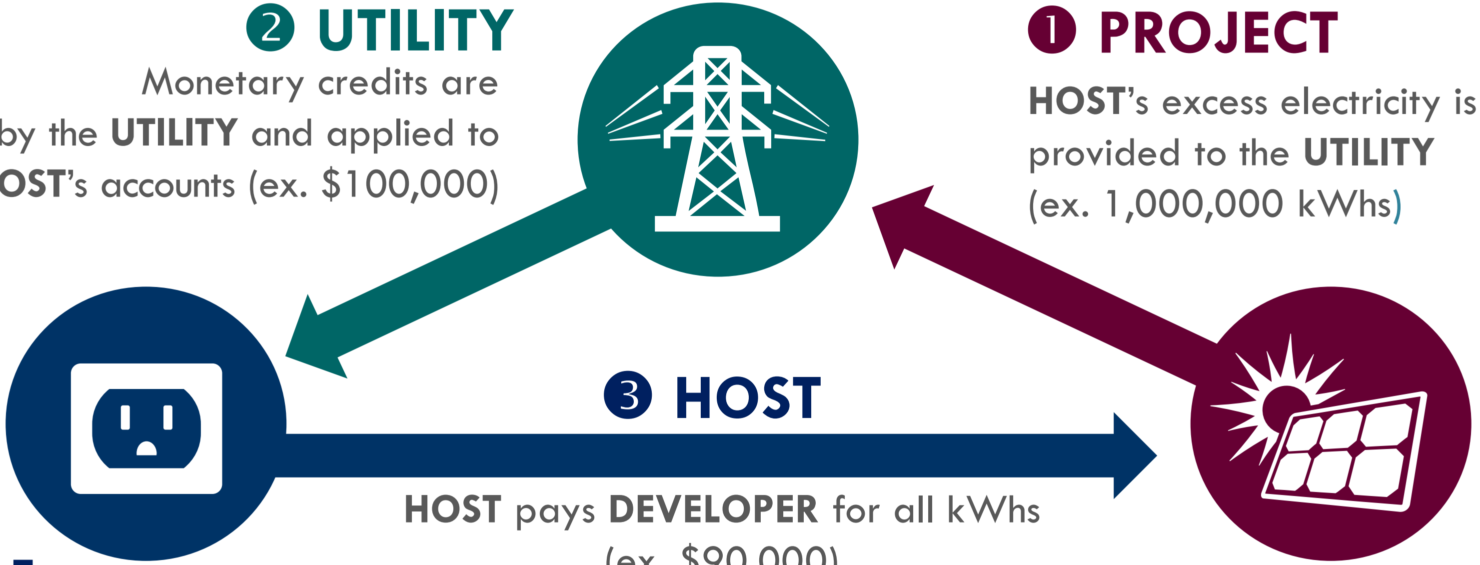

❷ UTILITY

Monetary credits are issued by the **UTILITY** and applied to **HOST**'s accounts (ex. $100,000)

❶ PROJECT

HOST's excess electricity is provided to the **UTILITY** (ex. 1,000,000 kWhs)

❸ HOST

HOST pays **DEVELOPER** for all kWhs (ex. $90,000)

EXAMPLE

GENERATION (KWh)	×	CREDIT VALUE ($/KWh)	=	TOTAL CREDITS ($)	−	CREDIT PRICE ($/KWh)	→	NET SAVINGS ($)
1,000,000 kWhs (annual output of ~800 kW system)		$0.10/kWh (est. On-Bill Crediting Rate)		$100,000 (Must have utility costs)		$90,000 (10% discount example)		$10,000 in reduced utility spend

OFFSITE SOLAR | SMART Considerations

- There are important limits on utility bill credits, depending on where you are and how excess credits are valued:
  - Total electricity spend across eligible accounts
  - Supply vs. T & D – important to consider which components of your bill can be avoided and which cannot
  - Future reductions in electricity spend based on future consumption, load patterns, and tariff changes
- The puzzle can be allocating credits to various accounts and continuously monitoring for accounts that run negative balances
- CES recommends leaving a buffer between total credit value and total spend to which it can be applied

THANK YOU

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