REPORT

HIGH IMPACT: How Massachusetts Energy Policy is Raising Electricity Rates

Lisa Linowes

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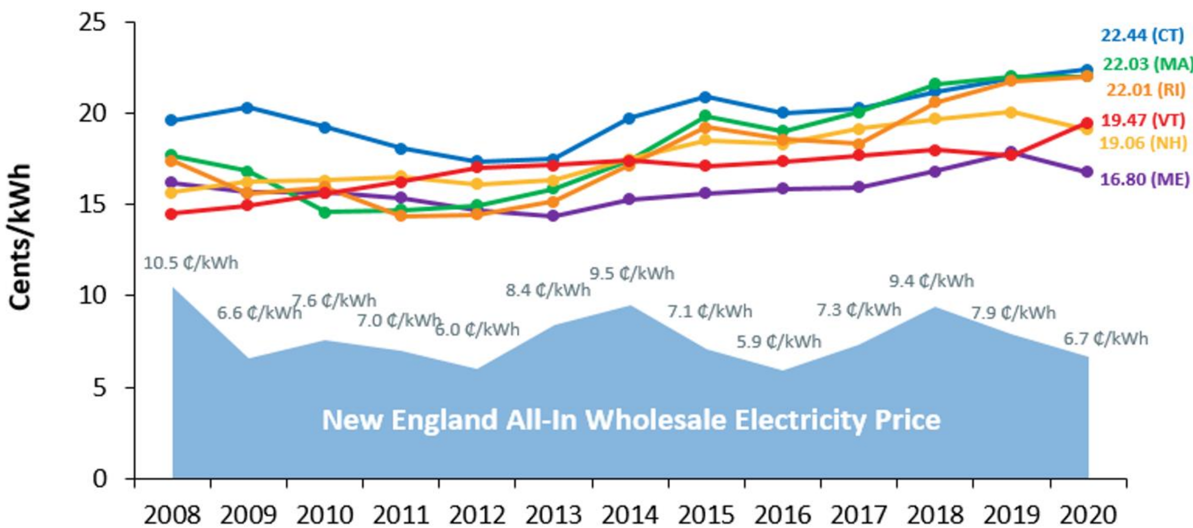
Executive Summary

Several years ago, the ISO New England[1] (ISO) shared the below graph showing the all-in cost of operating the wholesale electricity market in New England compared to residential retail rates for each of the six New England states (ISO New England Inc., 2021, p. 127). Included in the all-in price were fuel and transmission costs, capacity payments, and all other costs related to the different markets and ancillary resources necessary for ensuring the grid's reliable and efficient operation.



Source ISO New England 2021 Regional System Plan

The graph shows that for each of the years from 2008 to 2020, administration of the grid was significantly less expensive than retail residential rates on a kilowatt hour basis. In 2020, the cost to operate the grid was just 30 percent of the retail rates charged to most New England consumers. In that same year, average residential rates for electricity in the United States were 13.15¢ per kilowatt hour.

[1] The ISO New England is the independent, not-for-profit corporation responsible for managing New England's grid and ensuring reliable, competitively priced wholesale electricity.

The advent of cleaner low-cost fracked natural gas produced in the United States prompted a shift in New England's fuel mix away from coal and oil. Carbon emissions from the electricity sector dropped precipitously and so did costs. More natural gas meant that New England, with the rest of the United States, was on a path to lower wholesale prices that would last more than a decade. In this same period, New England also experienced an 11.4 percent drop in annual energy demand from 132 million megawatt hours in 2008 to 117 million megawatt hours in 2020 (ISO New England Inc., 2022b). Yet despite lower wholesale prices and a drop in energy consumption, retail electricity rates in Massachusetts and New England remained stubbornly high.

The delta between residential rates and the all-in wholesale price is directly related to energy policies that state governments have implemented, including renewable energy mandates and incentives, energy efficiency, and climate programs.

As various government officials have expressed frustration at global events, electricity and fuel suppliers, and the ISO for the high rates, it appears that the first place to look for the cause would be the ambitious energy policies enacted in the states where the growing costs fall squarely on New England ratepayers.

This paper examines several of the policies contributing to higher electricity rates in Massachusetts, and throughout New England.

Key findings

- New England has experienced an 11.4 percent drop in energy demand from 2008 to 2020 yet New Englanders pay 20 percent more on average for each kilowatt hour of electricity delivered to their homes (Energy Information Administration, n.d.). As renewable energy and climate policy requirements expanded, the costs increased.[2] This outcome suggests that the promise of alternative energies lowering and stabilizing rates has not been realized.
- New England's renewable energy mandates represent some of the most complex and costly in the country. Twenty-six separate programs are active across the six states, with nine in

[2] The drop in demand is due to many factors including milder winters and loss of industry. Energy efficiency and behind-the-meter solar generation act as negative demand on the system and effectively reduce the need for grid-scale generation but do so at a large cost to ratepayers as discussed in this paper.

Massachusetts alone. Each covers different technologies with different annual compliance requirements and costs. Entities that sell electricity retail in New England are obligated to satisfy the mandates in every state where their electricity is sold.

- Renewable energy technologies, particularly wind and solar, require substantial public funding in the form of federal tax credits and state programs that pay a premium for their renewability. Massachusetts, among other states, also require electric utilities to negotiate long-term power contracts with renewable energy generators at prices above New England's competitive market rates. To the extent renewables may lower wholesale energy prices, the contract rates and added subsidies are passed through to ratepayers in the form of higher retail rates.

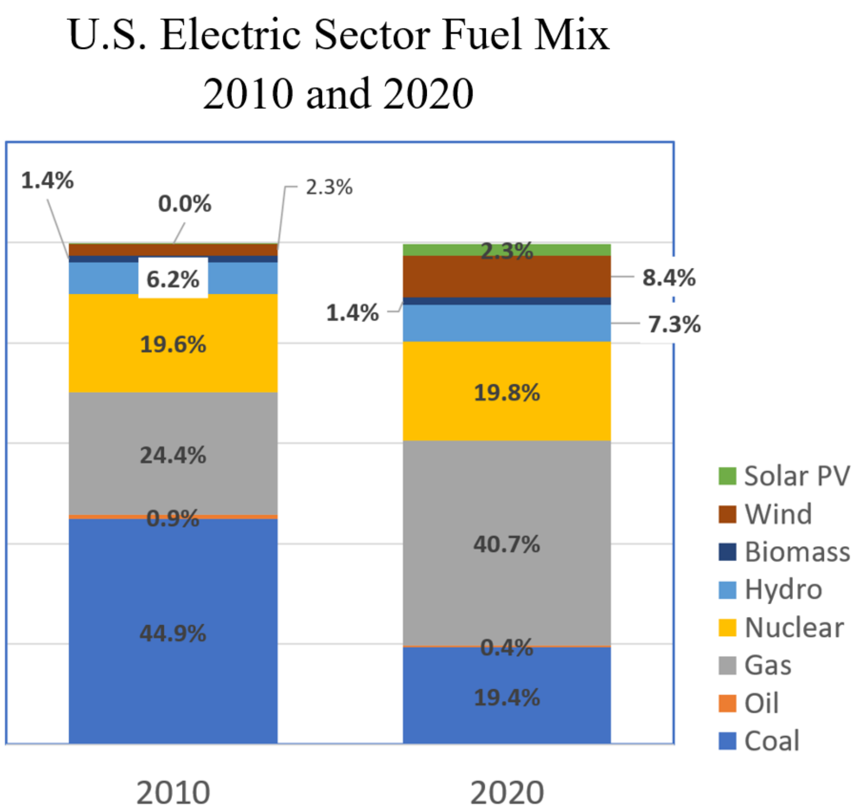
- The annual cost of Massachusetts renewable energy policies has quadrupled in 10 years from $250 million in 2011 to $1 billion in 2020. Cumulatively, this has cost Massachusetts ratepayers $6 billion in increased electricity prices in that period.

- The Regional Greenhouse Gas Initiative (RGGI) has cost ratepayers in the participating states $3.8 billion in higher electricity rates in the period from 2008 to 2020. Fifty-three percent of the cumulative RGGI funds raised went towards energy efficiency programs, however, limited data are available to validate the corresponding cost savings and avoided emissions. For projects where information is available, it appears the cost per carbon ton avoided is significantly higher than the value of the allowances sold suggesting that RGGI is an inefficient use of resources.

- If the region's climate policies are followed to their expected conclusion of zero emission energy, recent modeling shows that the amounts of new wind, solar, and high-voltage transmission needed would produce significant land-use conflicts in the region, both onshore and off.

Introduction - The rise of renewable energy

The United States has been encouraging renewable energy development since before President Carter celebrated solar panels on the roof of the West Wing in June 1979 (Biello, 2010). At the time, the country was suffering through its second oil-shock that again saw long gas lines and spiking oil prices (Graefe, 2013). In response, Congress passed the Public Utility Regulatory Policies Act of 1978 (PURPA) with the intent of reducing reliance on foreign oil, incentivizing smaller (under 80 megawatt) renewable and cogeneration resources, and promoting greater competition for electric generation from a new category of supplier known as independent power producers (American Public Power Association, n.d.).



Source EIA Monthly Energy Review

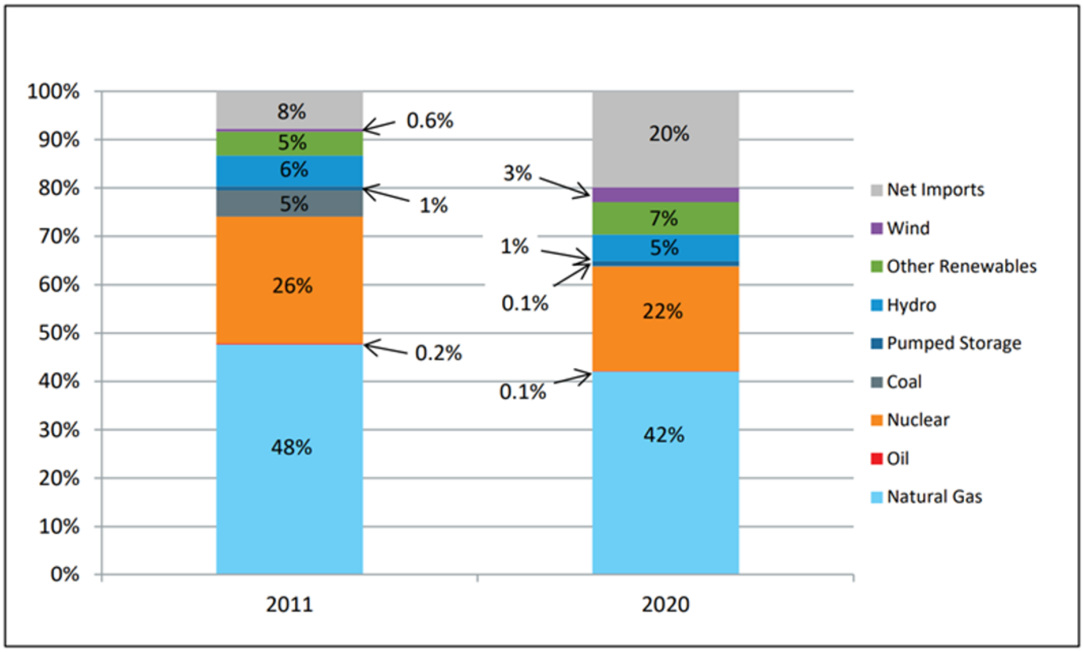
PURPA laid the foundation for the renewable energy industry to get its start in the U.S. by requiring utilities to purchase the output from qualified technologies. Purchase prices were based on avoided cost, which is the cost a utility would incur for energy if it built the generation itself. Long-term power contracts locked in rates well above the current market price with the assumption that energy prices would only increase into the future (Union of Concerned Scientists, 2002). By securing prices in the contract, utilities believed they were protected from future market increases.

California adopted lucrative contract prices that favored PURPA qualified facilities with rates as high as 6¢ to 10¢ per kilowatt hour. This coupled with generous federal and state tax credits for renewable energy spurred the rapid building of new assets. Thousands of kilowatt-scale turbines were erected in California. By 1995, the U.S had 1,731 megawatts of operating wind with 84 percent sited in that state. But by then, oil prices had moderated, demand growth did not materialize as expected, and a glut of new capacity including PURPA-qualified assets caused electricity prices to collapse (Calamitsis et al., 1998). New contracts were offered but at much lower rates causing renewable energy development to stall.

With the growing emphasis on reducing emissions, the United States experienced a seismic shift in the fuel mix powering its electricity grid needs. By 2020 coal usage dropped by more than half and was largely replaced by cleaner natural gas. In New England the transition from coal and oil was already underway in the early 2000's when a substantial amount of new gas capacity was placed in service between 1999 and 2004 (ISO New England Inc., 2012, Figure 4.1). By 2010 New England had all but eliminated coal and oil from its fuel mix except for the incremental supply needed during the coldest periods in winter.[3]

[3] Of the 9,053 MW of new generation added in this period, nearly all was natural gas fired. Additional generation added in the latter half of the decade (1,339 MW) included a combination of nuclear uprates, and new oil, natural gas, hydro-electric, and other renewable generation. (ISO New England Inc., 2012, 14).

New England Electric Sector Fuel Mix
2011 and 2020



Source ISO-NE 2020 Electric Generator Air Emissions Report

Mandating renewable energy

Existing renewable energy options were not financially viable without substantial tax subsidies and long-term contracts at above-market rates. Wind energy had garnered positive press from its early success in California and was viewed as the most scalable alternative, but as long as it produced at low capacity factors and typically during low demand periods, energy sales alone were not sufficient to recoup the high capital costs and earn a profit. Building wind turbines and the transmission lines needed to deliver the power to customers was expensive.

With the fuel crisis abated, the market for existing renewable energy technologies did not exist except in states that encouraged renewable generation. It is no accident that the bulk of new wind generation built after 1996 occurred in four states with supportive renewable energy policies -- California, Iowa, Minnesota, and Texas (Wind Energy Technologies Office, n.d.-a.). Similar policies were needed in other states if the transition to cleaner fuels was to continue.

Most state governments saw no downside to legislatively mandating renewable energy. Industry advocates assured tentative policymakers that advances in technology would ultimately increase output, reduce costs, and help make renewable energy competitive with traditional generation sources. Alternative energies with no fuel costs were viewed as a way to protect ratepayers from dramatic swings in fuel prices, and eventually stabilize and lower electricity rates. Siting renewable facilities in their states also meant greater economic opportunity, particularly for more rural, economically depressed communities.

By 2009, twenty-nine states and the District of Columbia adopted mandatory policies requiring a certain percentage of electricity sold in a state or district be derived from renewable fuels (Barbose, 2017). These policies, referred to as Renewable Portfolio Standards (RPS), created demand for higher-priced renewables by setting aside non-competitive segments of the power market for qualifying resources. The policies also provided a subsidy stream in the form of renewable energy credits or RECs. One REC represents the 'environmental attribute' associated with a megawatt hour of renewable energy placed on the grid. RECs have value and are generally sold to electricity suppliers to show compliance with state mandates.

Wind energy was the dominant technology for meeting RPS compliance nationwide but solar has increased rapidly. By the end of 2022, over 135,000 megawatts (MW) of land-based wind generation operated in the U.S. with most sited in the mid-section of the U.S. The largest capacities could be found in Texas (37,000 MW), Iowa (12,400 MW) and Oklahoma (12,000 MW). Moving eastward and into New England, large-scale renewable energy development is limited by many factors including less available land, difficult terrain, denser populations of people, more stringent siting regulations, and intense community opposition. Without RPS policies, it is unlikely large amounts of new renewable energy would be constructed in the six states. Maine has the most operating wind with 1,000 MW followed by New Hampshire with 210 MW. In total, the New England states have an installed wind capacity of about 1,550 MW compared to neighboring New York which claims 2,200 MW of installed wind.

New England RPS policies

Massachusetts and all other New England states have enacted ambitious renewable energy and climate policies aimed at lowering emissions and moving the region off fossil fuel electricity generation.

The initial goals were modest, seeking to satisfy a percentage of the region's electricity demand with renewable energy balanced against higher energy prices. In 2008, Massachusetts asked that 3.5 percent of the electricity sold retail in the state come from renewable energies with a one-half-percent increase annually. Most of the requirements were met by a combination of existing biomass, landfill gas, and wind generation. Seeing early success, the Commonwealth passed the *Green Communities Act of 2008 (GCA)* which increased the mandate to one percent annually, added new programs for different power generation technologies including the *Solar I and II* mandates, and required Massachusetts utilities to secure PURPA-like energy contracts with qualified renewable energy providers.

By 2010, there were sixteen different renewable energy programs across the six states, each representing different technology classes for new and existing resources and each with different annual compliance requirements. Since then, the number has ballooned to 26 programs. The below table lists the active programs as of 2020 and their total mandates as a percent of electricity sold that must come from qualified resources.[4]

A detailed analysis of each RPS is beyond the scope of this report but what follows is a general description of how the programs are implemented in the New England power market.

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[4] In 2020, Massachusetts' demand for electricity that was subject to the RPS programs was 44.7 million megawatt hours. A megawatt hour is equivalent to 1,000 kilowatt hours. The average household in Massachusetts consumes about 600 kilowatt hours (0.6 megawatt hours) of electricity per month or 7,200 kilowatt hours (7.2 megawatt hours) each year. To satisfy the MA Class I RPS in 2020, 16 percent of the 44.7 million megawatt hours would need to be sourced from qualified Class I energy sources. The Class I program includes two carve-outs for the Solar I and II mandates.

State	2020 Programs (% mandate)	Total 2020 Mandates
CT	Class I (21%) Class II (4%) Class III (4%)	29%
ME	Class I (10%) *Class IA (2.5%) *Class I Thermal Class II (30%)	42.5%
MA	Class I (16%) - Solar I carve out (1.61% of the 16%) - *Solar II carve out (3.8% of the 16%) *Clean Energy Standard (CES) New (4%) *Clean Energy Standard (CES) Existing Class II Renewable (3.21%) Class II Waste-to-Energy (3.5%) Class APS (5%) *Clean Peak Energy (1.5%)	33.21%
NH	Class I (8.9%) *Class I Thermal (1.6%) Class II (0.7%) Class III (8%) Class IV (1.5%)	20.7%
RI	RI New (14%) RI Existing (2%)	16%
VT	*Tier I (56.2%) *Tier II (2.8%) *Tier III (4%)	63%

**Program enacted since 2010*

How RPS policies work

RPS policies were first adopted to incentivize the development of new renewable energy facilities and encourage existing renewable resources to continue operating. Qualifying technologies vary according to the RPS program but generally include wind, solar, some small hydro, low-emission biomass, landfill gas, and ocean thermal facilities. Not all renewable energy facilities are recognized as renewable. Only those technologies defined in the respective state statutes or regulations can participate.

To track RPS compliance, states record the RECs that are produced and traded. Substantial numbers of RECs, including those created from resources sited in neighboring New York and Canada, can be purchased to meet compliance requirements throughout New England.[5] Most renewable energy resources are co-qualified under different New England programs which means their RECs can be used to satisfy any number of RPS mandates. RECs that are not retired for compliance purposes or reserved for future use[6] can be sold into the voluntary REC market.[7]

The price of RECs is set by the market according to supply. As with any supply and demand scenario, if there are sufficient RECs to satisfy the mandate, the price drops and in some cases dramatically. Conversely, if RECs for a specific RPS are in shortage the price will rise to a level established in statute known as the alternative compliance payment (ACP). High-priced RECs are intended to signal the need to build more generation. In New England, a shortage of renewable energy credits can also encourage substantial numbers of RECs to be imported from facilities sited in New York and Canada.

Different RPS programs have different ACPs which can have a direct impact on where a REC settles. For example, generation from older biomass facilities in New Hampshire can satisfy both the NH Class III RPS and the CT Class I RPS. In 2020 the ACP for NH Class III was $34.54; for CT Class I the ACP was $55. Consequently, the biomass RECs flowed to the Connecticut market that provided the highest price, leaving New Hampshire energy suppliers with little hope of finding RECs to meet their NH Class III mandate. In situations where electricity suppliers cannot secure adequate RECs to meet their RPS obligation within a state, they can satisfy the mandate

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[5] If a REC from New York or Canada is used to satisfy an RPS obligation, the energy must be delivered to New England over various tie-lines connecting the areas. The same energy cannot be claimed as renewable in NY.

[6] Banked RECs need to be used within 1-2 years from when they were generated depending on the statutes.

[7] Individuals and companies can purchase RECs to offset their consumption of fossil generation. Purchasing RECs has no effect on the energy consumed by the buyer. Proceeds from the sale serve as added revenue to an operating renewable energy facility and generally carry no stipulations on how the proceeds are to be spent.

though alternative compliance payments equivalent to the number of RECs needed.[8] This payment typically goes into a state-controlled fund to be spent on programs that advance renewable energy and energy efficiency goals (MA Department of Energy Resources, 2021, p.32).

ACP payments can represent a substantial revenue flow to the states in any given year. For example in 2020, Massachusetts collected $87 million in alternative compliance payments to be spent under the direction of the Massachusetts Department of Energy Resources (DOER). However, reporting on how the funds are spent has been limited. DOER has not posted an ACP Spending Plan explaining the distribution of the funds since 2013 (MA Department of Energy Resources, 2014). The New Hampshire Department of Energy files a report with the state's legislature each year by October 1. The Rhode Island Commerce Corporation files its annual report by December 31.

Defining and tracking renewability

States officials often tout how renewable their state is by matching the number of megawatt hours of renewable energy produced within their borders to their annual electricity consumption. This might pass for promotional purposes, but the claim is highly misleading.

States with RPS policies define renewability according to where the REC is claimed, not where it is produced. This distinction is important but often overlooked. For example, 18.2 percent of Vermont's in-state electricity generation in 2022 came from wind turbines but all corresponding RECs were sold to satisfy RPS mandates in other New England states (Wind Energy Technologies Office, n.d.-b). Consequently, Vermont cannot lay claim to the wind energy. Utilities like Green Mountain Power and Burlington Electric Department show on their websites the makeup of their energy portfolio both before and after the RECs are sold (Burlington Electric Department, n.d.).

[8] New Hampshire law RSA 362-F:4, VI acknowledges the issue of RECs flowing to higher priced programs and grants the NH Department of Energy the authority to annually review and administratively lower the Class III mandate if a shortage of Class III RECs is expected. Absent this mechanism, energy suppliers would make substantial ACP payments to the state fund to satisfy their obligation, the cost of which is passed on to New Hampshire ratepayers.

Where a REC ultimately settles depends on the price of the REC within any state.

Massachusetts and Connecticut together represent nearly 70 percent of the region's total RPS load. Since RPS mandates are based on a percentage of electricity demand, the requirement for RECs in these two states is substantial and can influence the flow of RECs in any given year. In 2020 alone, 4.6 million RECs were retired to satisfy the MA Class I RPS, of which 63 percent were generated outside Massachusetts (MA Department of Energy Resources, 2022). This is more than the 2020 RPS obligations for NH Class I, RI New, and ME Class I combined. Similarly, while Maine has the most operating wind energy in the region, just ½ of one percent of its 2020 Class I requirement was met with wind energy (ME Public Utilities Commission, 2022). Most of Maine's wind RECs went toward meeting RPS mandates in other states.

As an added incentive, Section 83 of the Massachusetts Green Communities Act of 2008 also requires all electricity distributions companies operating in the Commonwealth to solicit and enter "long-term power contracts to facilitate the financing of renewable energy generation" (An Act Relative to Competitively Priced Electricity in the Commonwealth, 2012). These competitive solicitations are in addition to the requirement for the utilities to meet their RPS obligations. Under this policy, renewable energy producers benefit in Massachusetts from both REC revenue and state-ordered purchase agreements that guarantee set prices for their energy and RECs (Electric Power Division, n.d.).[9] The law provides that the utilities can receive reimbursement through the rate base for the costs of the contracts plus a remuneration up to 4 percent of the annual contract payments to compensate the utility for assuming the financial obligation of the long-term contract.

RPS and the false promise of lower cost energy

State officials and renewable energy advocates have long insisted that RPS policies reduce electricity prices, through a mechanism known as 'price suppression' where alternative

[9] The Act to Promote Energy Diversity of 2016 amended the Green Communities Act to add Sections 83C and 83D requiring contracts to include offshore wind energy. Massachusetts approved long-term contracts with Vineyard Wind 1 (800 MW), Commonwealth Wind (1200 MW) and Southcoast Wind (400 MW) planed for southern New England waters. The effect of these contracts will not appear in retail rates until the projects are operational.

resources with no fuel costs are assumed to displace generation with fuel costs (i.e., higher operating costs) in the wholesale market (Ohio Public Utilities Commission, 2013, p. 2). This was a primary selling point for states like New Hampshire when their legislators deliberated on passing an RPS program (Gittell & Magnusson, 2007).

In New England the claim of price suppression does not match reality.

New England's power market uses a day-ahead auction where all reliable generators (95+ percent of generation) are required to offer firm levels of production for each hour of the next power day. The ISO matches available generation with forecasted hourly demand and schedules resources as needed. The most expensive generation dispatched at any hour sets the marginal price of supply. In turn, all generators *receive the same price per megawatt hour of production for that hour* (Baldick, 2009). Significant penalties are imposed if a generator fails to deliver on its supply commitment.

Weather-dependent renewables typically do not participate in the day-ahead market, preferring the real-time (spot) market which carries no penalties for non-performance.

Consider the scenario where the winds pick up causing an uptick in wind generation and real time prices to fall. Generators that bid in day-ahead are likely to voluntarily curtail output to the greatest extent possible and satisfy their day-ahead supply obligation by purchasing energy at the lower real-time price. In doing so, they save fuel costs and still receive payment for their committed energy at the day-ahead price. Any downward pressure on pricing caused by an oversupply of wind energy relative to demand would be limited to the smaller real-time market and largely go unnoticed.[10]

[10] Under certain conditions it is possible for wholesale electricity prices to go negative. Generally, this is a short-lived situation signaling more generation was produced than there was demand and generators voluntarily curtail operation if possible. However, since wind project owners only earn federal and state subsidies, including RECs, when their energy is placed on the grid, they would rather produce at a loss than not produce at all. As of this writing, wind energy facilities placed in service prior to 2022 can receive up to $63+ per megawatt hour in the form of tax credits and RECs. This is in addition to the value of the wholesale energy sold.

Wind and solar could potentially reduce wholesale electricity prices in certain locations and during certain seasons and times of day, but absent better forecasting tools, it is unlikely project owners will move into the day-ahead market in a major way.

Long-term power purchase agreements between utilities and renewable energy facilities also work counter to the idea that price suppression lowers electricity rates. With contracts in place, the price that a renewable energy facility is paid for its energy and RECs is governed by the agreement and outside of any competitive market forces. Regardless of a reduction in market prices that might occur due to price suppression, the cost passed on to ratepayers is governed by the contract terms.

The high price of RPS-subsidized electricity

Transparency is necessary for the public to assess whether the RPS programs are delivering on the mandates and doing so at a reasonable cost. RPS statutes in New England require annual compliance reports to be filed by the agencies responsible for administering the policies. These reports generally explain the current mandates, the level of compliance by electricity suppliers for the reported year, the number of RECs retired, ACPs paid, and in some cases, the number of RECs banked forward.

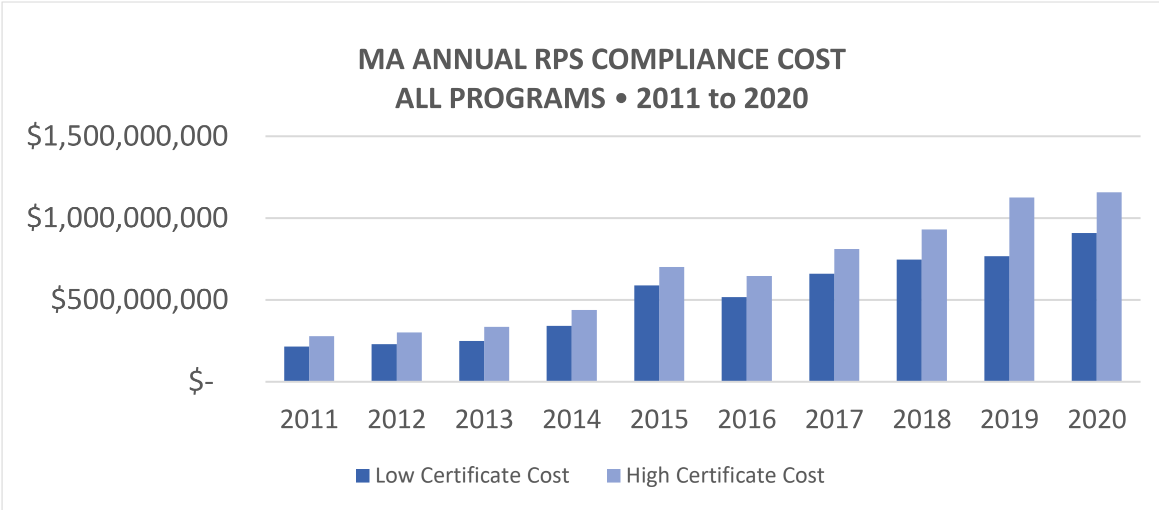
To the extent states report RPS costs (not all do), the information is typically vague, incomplete, and often not available until several years after the compliance year ends. Massachusetts has the largest RPS mandate and the most complex and costly policies, but it is one of the slowest in releasing its RPS reports. The most recent report available is from November 2022 for the 2020 compliance year (Renewable and Alternative Energy Division & MA Department of Energy Resources, n.d.).

The table below is derived from the 2020 report and details the estimated total cost of Massachusetts' RPS for that year. The figures show the cost of the programs collectively depending on the value of the RECs. The word 'Certificate' used in the table is the same as a REC.

In 2020 alone, Massachusetts ratepayers were billed an average of $1 billion for its RPS policies, which works out to between 2¢ and 3¢ per kilowatt hour of electricity consumed. Given an average monthly consumption of electricity of 600 kilowatt hours per household, the RPS costs each ratepayer as much as $191 a year.

The cost of the RPS programs have only gone up as the mandated percentages increased and new RPS programs were added. Cumulatively since 2011, Massachusetts RPS programs cost ratepayers $6 billion. Annual costs have quadrupled in that time from $278 million in 2011 to $1 billion in 2020 ($191 per ratepayer).

Scenario	RPS/APS Class	Estimated Total Cost Impact (RECs & ACPs)	Estimated Annual Ratepayer Impact ($/year)
Low Certificate Cost	RPS Class I	$90,180,680.00	$14.87
	SREC	$222,140,480.00	$36.62
	SREC II	$435,736,930.00	$71.83
	RPS Class II Renewable	$48,549,542.00	$8.00
	RPS Class II Waste	-$114,635.00	-$0.02
	APS	$43,553,528.00	$7.18
	CPS	$69,443,200.04	$11.45
	Total	**$909,489,725.04**	**$149.94**
High Certificate Cost	RPS Class I	$202,906,530.00	$33.45
	SREC I	$266,568,576.00	$43.95
	SRECII	$509,973,248.00	$84.07
	RPS Class II Renewable	$57,813,448.00	$9.53
	RPS Class II Waste	-$263,660.50	-$0.04
	APS	$42,290,651.00	$6.97
	CPS	$78,123,600.04	$12.88
	Total	**$1,157,412,392.54**	**$190.81**



Source MA RPS and APS Annual Compliance Reports

Solar energy and net-metering

The most expensive RPS programs in recent years are the Massachusetts Solar carve-outs known as SCO I and SCO II. Together, these programs cost $3.7 billion in the period from 2011 to 2020 representing more than one-half of the $6 billion average cumulative price for all RPS programs in that period.

SCO I jumpstarted solar generation in Massachusetts beginning in 2010 with a cap of 400 megawatts and RECs valued at *$600 a megawatt hour*. At that high value, the cap was quickly reached and increased to 650 megawatts to account for solar proposals in the pipeline after which eligibility was closed. The SCO II program followed in 2014 for the remaining generation up to a total of 1,600 megawatts. SCO II REC prices were less costly at $375 per megawatt hour but still significantly above any of the other RPS programs. Solar I and II RECs continue for ten years from when a system is placed in-service with the final subsidies ending in 2025 and 2029 for SCO I and II respectively.

HISTORIC ACP PRICES SCO I and SCO II		
YEAR	MA SREC 1 ACP	MA SREC II ACP
2010	$ 600	$ 0
2011	$ 550	$ 0
2012	$ 550	$ 0
2013	$ 550	$ 0
2014	$ 523	$ 375
2015	$ 496	$ 375
2016	$ 472	$ 350
2017	$ 448	$ 350
2018	$ 426	$ 350
2019	$ 404	$ 333
2020	$ 384	$ 316

Solar RECs (SRECs) in the SCO I and II programs do not fluctuate with supply as do other RPS RECs. Rather, the DOER who administers the program, annually calculates the minimum number of SRECs utilities must purchase to meet compliance according to a formula that considers, in part, the number of solar megawatts installed in prior years (Stone, 2017). Invariably, the price of SRECs stays close to the ACP price. In 2020, SCO I and II RECs were $384 and $316 respectively.

But the costs do not end there.

More than 95 percent of the megawatts built under SCO I and II are behind-the-meter, meaning the generation is located at the point of consumption. Net-metering encourages consumers to supply their own electricity with the idea that the systems are sized to closely match the expected need, but it is not unusual for systems to exceed hourly consumption on sunny days. The energy produced in excess of need is sold back to the utility at the premium retail rate. The utility, in turn, resells the energy at the much lower real time wholesale price.[11] That delta between retail and wholesale rates represents a cost to the utility that is passed on to all customers as a surcharge on their monthly electricity bill. Depending on the size of the

[11] Basic service rates for residential customers in Massachusetts were over 30¢ per kilowatt hour during the 2022-23 winter.

solar system, net-metered customers are also credited up to 100 percent of the transmission and distribution rates which is another cost recovered by the utility in rates (EnergySage, n.d.).

These net-metering surcharges for energy, transmission, and distribution are not accounted for in the SCO I and II compliance costs described above. Determining their impact on Massachusetts residential ratepayers involves wading through pages of filings posted under Massachusetts Department of Public Utilities (DPU) dockets (Executive Office of Energy and Environmental Affairs, n.d.). For example, in October 2020, NSTAR sought and received DPU approval to increase its residential retail rates by $0.00763 per kilowatt hour to recover its net-metering obligation, among other state-mandated energy costs (MA Department of Public Utilities, 2020). For an average NSTAR resident, this comes to about $55 per year.

In response to the NSTAR filing, the MA Office of Ratepayer Advocacy (AGO) expressed frustration at the size of the rate increase and the timing which was at the height of the Covid 19 pandemic (Tepper & Boecke, 2020). Most notable, however, was the AGO's apparent unfamiliarity with the established rule that utility costs derived from state-mandated energy policies are passed on to ratepayers in the form of higher electricity prices.

Now comes SMART

Beginning in 2018, Massachusetts launched its Solar Massachusetts Renewable Target (SMART). The intent of SMART was to continue encouraging distributed solar development in the Commonwealth but at a lower cost than the closed SCO I and SCO II programs. The SMART program is not an RPS. Rather, the policy acts as a feed-in tariff where program participants receive a fixed-price for the solar generation they sell back to the utility over a term of 10 years for smaller projects (< 25 kW) and 20 years for larger sites (> 25 kW).

Depending on the location, size in kilowatts, and various other characteristics of the facility (building mounted, tracking capability, co-located with storage), the value of the generation can be substantially higher than the standard *retail* price of electricity, reaching nearly 40¢ a kilowatt hour ($400 a megawatt hour) under some circumstances (MA Department of Energy Resources, 2023). The SMART program was initially capped at 1,600 MW of new solar installed. In 2020, SMART II raised the cap to 3,200 MW.

The costs of SMART I and II that utilities pass through to Massachusetts ratepayers are not reported by DOER, but filings before the DPU show that the programs will impose billions in higher electricity prices for all consumers in the Commonwealth (MA Department of Public Utilities, 2021, p.47). Thus, while SMART participants might save money on their electricity bills through net-metering and the premium earned on generation sold to the utility, Massachusetts ratepayers pay higher prices in the aggregate to cover those savings.

By the end of 2022, Massachusetts claimed the most megawatts of behind-the-meter solar in New England with 3,289 MW operating across 150,000 separate installations (ISO New England Inc., 2023). This growth in capacity was driven by the SCO I, II, and SMART programs and contributed to the drop in overall electricity demand from the larger New England grid system. But it did so at a heavy price. Massachusetts is spending billions in ratepayer dollars to incentivize solar at a more affordable price (ISO New England Inc., n.d.).

Finally, while injecting a large amount of solar generation into the grid each day can have a depressing effect on wholesale electricity prices, there are no direct means by which this solar generation can lower the price ratepayers are charged.

RGGI – The CO_2 tax and waste program

While the region's RPS policies encourage and subsidize renewable generation, the New England states are working cooperatively with others to penalize generation that emits carbon. The Regional Greenhouse Gas Initiative ("RGGI") was launched in 2008 and represents the first mandatory system in the United States aimed at capping and reducing CO_2 emissions in the electric sector.[12]

[12] The Regional Greenhouse Gas Initiative (RGGI) states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Virginia, and Vermont. Pennsylvania is seeking to join RGGI through an executive order, but this action is under court challenge. The governor of Virginia has proposed removing the state from RGGI (Ramseur, 2023).

The original RGGI states, including New York, New Jersey,[13] Delaware, Maryland, and the six New England states, agreed to an initial cap of 188 million short tons, based on anticipated CO_2 emissions that power plants in the ten states were expected to emit in 2009, the first full year RGGI went into effect.[14] The cap was to remain in place until 2015 and then drop by 2.5 percent per year from 2015 to 2019 for a total reduction of 10 percent.

Over two-hundred generators were subject to RGGI within the ten states, including all fossil fuel-fired power plants (coal, oil, and gas) with a capacity of at least 25 megawatts. Each state was allocated a portion of the total CO_2 allowances according to previous emission history. One allowance is equivalent to one ton of CO_2. New York State was assigned the highest quantity at 64 million allowances, Vermont the lowest at 1.2 million and Massachusetts received 26.6 million (Regional Greenhouse Gas Initiative Inc, 2005).

Online auctions are conducted quarterly where generators within the respective states purchase allowances for every ton of CO_2 emitted. The proceeds are returned to the member states where at least 25 percent of the funds must be spent for "consumer benefit or strategic energy purpose" (Regional Greenhouse Gas Initiative Inc, 2005, Section 2 (G)(1)).

RGGI allowances are subject to a "reserve" or floor price below which auction prices cannot fall, thereby ensuring minimum revenues for state supported energy programs even in periods when emission limits are met or exceeded. In 2008, the reserve price was set at $1.86 per carbon ton and increases annually by 2.5 percent.

Compliance under RGGI is evaluated at the end of each 3-year control period and trading rules may change, sometimes substantially, in response to how the carbon market behaved. The first

[13] New Jersey left RGGI in 2011 which removed its 22.9 million allowances and dropped the cap to 165 million (188 million – 22.9 million). This change had no effect on compliance obligations for the other RGGI states.

[14] Seven states signed the 2005 Memorandum of Understanding for RGGI including Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York, and Vermont. Massachusetts, Rhode Island and Maryland joined the program in 2007.

control period was 2009 to 2011, the second from 2012 to 2014, and so on to the currently active period from 2021 to 2023.

RGGI auctions

The initial RGGI cap of 188 million tons assumed business-as-usual emissions with natural gas prices remaining high and electric generation expected to grow roughly 1 percent each year (Regional Greenhouse Gas Initiative Inc, 2009). But by the time the first auction was held in September 2008, low-cost natural gas had begun to replace oil and coal in the RGGI states. This coupled with increases in nuclear capacity (uprates)[15] and a drop in electricity demand caused emissions to fall to 126 million tons, 33 percent below the 188 million cap and well below RGGI's target 10 percent reduction set for 2019 (New York State Energy Research and Development Authority, 2010). The supply of allowances exceeded demand and their value collapsed to near the reserve price where they remained from 2009 to the end of 2013.

The low price per ton incentivized generators to purchase and bank forward considerable numbers of allowances for compliance in later years. At the time, RGGI did not limit the number of banked allowances or establish a timeframe when they would expire. By 2014, it was determined that as many as 140 million carbon allowances had been banked for future use against a 2014 cap of 91 million tons (Ramseur, 2017, p. 11). It quickly became evident that RGGI's role in reducing emissions was negligible and the program acted more as a tax on carbon than a scheme to reduce carbon.

The next step was to bring the RGGI cap in line with already lower emission levels. In 2014, the cap was dropped to 91 million and additional downward adjustments were applied that would cause banked allowances to be used. Banked allowances added to the available supply which depressed prices and helped generators meet the more aggressive RGGI caps. For RGGI to have any impact on lowering carbon, cost pressures on generators were required to make them pollute less.

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[15] Uprates are the process of increasing the output of a licensed nuclear power plant. In New England, the Vermont Yankee, Millstone 3 and Seabrook nuclear plants were uprated in the period from 2006 to 2008 (United States Nuclear Regulatory Commission, 2022).

The 2.5 percent annual drop in the cap remained in effect through to 2019 (80.4 million tons) representing a target 45 percent reduction in emissions from 2005 levels. Beginning in 2020, state emission caps decline 3 percent per year with a 2030 target for CO_2 emissions of 30 percent below 2020 levels (Sullivan & Johnson, 2021). The following table lists the CO_2 allowances allocated to each state for the years 2014-2020 and the total CO_2 cap to be met.

Distribution of CO2 Allowances (TONS) by State per Year							
State	2014	2015	2016	2017	2,018	2019	2020
CT	5,891,895	5,744,598	5,600,983	5,460,958	5,324,434	5,191,324	5,061,540
DE	4,064,687	3,963,069	3,863,993	3,860,079	3,763,577	3,613,361	3,523,027
ME	3,277,250	3,195,319	3,115,436	3,037,550	2,961,611	2,887,571	2,815,382
MD	20,360,944	19,851,920	19,355,622	19,149,790	18,671,045	17,931,922	17,483,623
MA	14,487,106	14,124,929	13,771,805	13,612,882	13,083,598	12,756,508	12,437,596
NH	4,749,011	4,630,286	4,514,529	4,401,665	4,291,624	4,184,333	4,079,725
NJ							18,000,000
NY	35,228,822	34,348,101	33,489,399	32,837,536	32,016,597	31,216,182	30,435,778
RI	2,284,975	2,227,851	2,172,154	1,357,826	1,512,843	2,005,354	1,955,221
VT	655,310	638,927	622,954	625,917	610,269	577,390	562,955
Total	**91,000,000**	**88,725,000**	**86,506,875**	**84,344,203**	**82,235,598**	**80,363,945**	**96,354,847**

Also in 2014, RGGI adopted a mechanism to constrain the price of allowances by controlling the number available for auction. Under the rules, if the price of an allowance rises above a predetermined threshold, additional allowances from the “cost containment reserve” (CCR) are released for sale causing the price to fall. Beginning in 2021, an “emissions containment reserve” (ECR)[16] was also added to enable participating states to withhold allowances for sale in order that prices stay above a pre-set level. In effect, these reserves are used to dynamically raise and lower supply to keep allowance prices within a set range (Ramseur, 2019). Even if generators meet the aggressive limits on carbon, the RGGI program would become increasingly more expensive for ratepayers. RGGI allowances range between $6.87 and $14.88 in 2023 and jump to between $11.02 and $23.89 by 2030. The following table shows the CCR and ECR from the years 2021 through 2030.

[16] New Hampshire and Maine did not agree to impose an ECR.

Reserve	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
CCR	$13.00	$13.91	$14.88	$15.92	$17.03	$18.22	$19.50	$20.87	$22.33	$23.89
ECR	$ 6.00	$ 6.42	$ 6.87	$ 7.35	$ 7.86	$ 8.41	$ 9.00	$ 9.63	$10.30	$11.02

RGGI's costly and uncertain benefits

Given the complexity of energy markets and the many factors that impact emissions, demand, and price, assessing RGGI's actual influence on carbon levels is highly challenging. In the ten years since its first control period ended, RGGI struggled with excess banked allowances and depressed carbon prices while New England's competitive energy market succeeded in reducing carbon emissions another 34 percent (ISO New England Inc., 2022a, p. 2). This raises questions about the relevancy and effectiveness of RGGI.

Lower RGGI caps, higher costs per ton, and fewer banked allowances could further accelerate the move to zero-emitting resources, but will it do so more efficiently than the market itself?

RGGI has already cost ratepayers in the participating states $3.8 billion in higher electricity rates in the period from 2008 to 2020. That is the amount generators paid the RGGI states for the carbon tons they emitted. By 2020, the six New England states and New York had the highest electricity prices in the U.S., behind Hawaii, with each experiencing increases in the last decade that ranged from a low of 5 percent (Maine) to over 20 percent (Massachusetts and Rhode Island). While not all price increases can be attributed to RGGI, the cost of RGGI allowances is added to wholesale electricity prices and passed on to ratepayers.

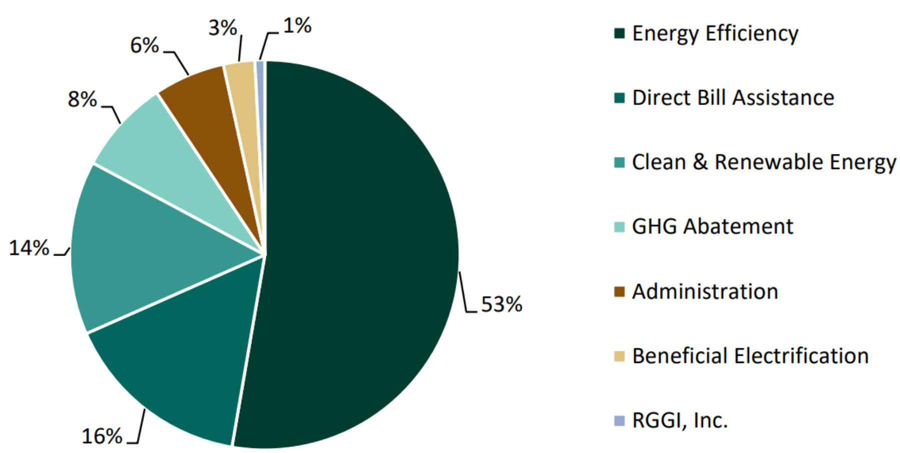
Of the $3.8 billion in funds raised, the states allocated $199.7 million to meet budget shortfalls and another $571 million for future use, leaving $2.99 billion for RGGI investments.[17] Of that, 16 percent was used to assist low-income communities and the remaining $2.5 billion was invested in projects that promised a lifetime carbon avoidance of 49.2 million tons. The below

[17] A fiscal adjustment of -$39,673,943 was also applied to the cumulative total proceeds for two states, Maine and Maryland, which report their program data using a July 1 to June 30 fiscal year. The downward adjustment enables a comparison between the states (The Regional Greenhouse Gas Initiative Inc, 2016, p. 14).

chart from RGGI, Inc.'s 2022 report on the investment of proceeds provides a breakdown of the funds spent.

Energy efficiency is considered the most cost-effective use of RGGI proceeds. Fifty-three percent of the cumulative RGGI funds went towards energy efficiency programs such as energy audits, home heating upgrades and municipal lighting. Another 14 percent was spent on clean and renewable energy programs to help promote behind-the-meter electricity generation. The bulk of the remaining funds supported greenhouse gas abatement (8 percent)[18] and the administration of the RGGI program (The Regional Greenhouse Gas Initiative Inc, 2022). It is not clear how these lifetime carbon savings were determined or whether the states conducted follow-up studies to validate the claimed reductions.[19]

Chart 4: Cumulative RGGI Investments by Category



The states participating in RGGI invested $2.99B as of 2020.

[18] Greenhouse gas abatement funding supports a broad range of programs aimed at reducing greenhouse gas emissions including research funding and transportation programs (The Regional Greenhouse Gas Initiative Inc, 2020, p. 11).

[19] The author reached out to RGGI coordinators in New Hampshire and Connecticut but was unable to get a direct answer to this question. A call was made to RGGI, Inc. but was not returned.

Predicted energy and emission savings are generally based on models where the methods and assumptions used can grossly overstate lifetime outcomes. The rebound effect is also a factor. Rebound is the change in behavior or spending in response to improvements in energy use. One study found that models typically overlooked broad rebound effects where actual energy savings were found to be less than half of that predicted (Brockway et al., 2021).

A practical example of the difficulty in predicting energy savings comes from California. In 1978 the state enacted efficiency mandates for newer buildings. At the time, the California Energy Commission estimated the change in residential building codes would result in a total savings of 7,039 gigawatt hours by 2012. But the savings were not realized for several reasons. First, enforcement was lacking, and builders did not always follow the stringent regulations. In cases where the requirements were followed, the pre-construction analysis on energy savings proved wrong and the expected savings did not materialize. And finally, the rebound effect occurred where homeowners utilized the systems more frequently due to the assumed savings (Levinson, 2016).

Annual reports released by RGGI, Inc., the non-profit administrative arm of the program, provide very little information regarding how RGGI proceeds are invested which makes validating the claimed emissions reductions difficult.

In Connecticut, the 2020 annual report issued by the Energy Efficiency Board shows that RGGI funds made up just 5.5 percent of the $269 million the state spent on energy efficiency for that year suggesting RGGI plays a very small role in reducing emissions even in an area seen as the best use of RGGI funds (Energize CT, 2021). In a small number of instances, the RGGI annual reports highlight “success stories” by state where project costs and carbon tons avoided are provided. The below table lists several of these stories. In every case, the computed cost per ton of carbon avoided was well above the price of the allowance sold, suggesting the money spent could have been put to a more productive use.

Year	State	Project	Cost	Annual and Lifetime CO_2 Tons Avoided[20]	Cost per CO_2 ton saved (Cost/LT tons)
2014	CT	PV Rooftop Project	$ 1,500,000	(275) 5500	$ 273
2014	RI	Rocky Hill School	$ 104,000	997	$ 104
2016	CT	330 Blake Street Apartments	$ 113,767	(76) 1520	$ 75
2017	NH	Contemporary Automotive	$ 61,000	268	$ 228
2018	CT	Powerhouse Partners	$ 306,142	1677	$ 183
2019	CT	Wyndham Park – Forest Properties	$ 47,000	547	$ 86
2020	CT	UCONN at Avery PT	$ 242,675	(25) 500	$ 485
2020	MA	City of Methuen Green Community	$ 268,640	(89) 1780	$ 151
2020	RI	Pascoag Utility District Battery Storage	$ 2,300,000	(80) 1600	$ 1,438

Reality of powering New England on renewables

In 2010, the ISO released the findings of its New England Wind Integration Study (NEWIS) which looked at the feasibility of meeting up to 24 percent of the region's electricity demand with wind power (Hinkle et al., 2010). This meant increasing New England's wind capacity from the existing 200 megawatts in 2010 to 12,000 megawatts. Various scenarios were looked at including the combination of on- and offshore wind and importing a portion of the generation from Canada or the Midwest.

The NEWIS study concluded that 24 percent penetration was possible but with conditions.

The intermittent nature of wind power, particularly in the summer months, meant that the entire existing fleet of New England's power plants would remain with no significant plant retirements relative to capacity resources. In other words, wind power could displace fossil generation when available, but it could not be relied on to replace it. The U.S. Department of

[20] Figures in parentheses represent the annual avoided carbon tons cited directly from the RGGI reports. Lifetime avoided values for these projects assume a 20-year life (i.e., annual avoided tons * 20 years). In cases where only lifetime savings are reported, these numbers are shown without an annual estimate.

Energy arrived at the same conclusion in its *20% Wind Power by 2030* report released in 2008 (Wind Energy Technologies Office, 2008, p. 88).[21]

Since many of the favorable sites for wind development are long distances from New England's demand centers, the NEWIS study also found that over four-thousand miles of new, high voltage transmission would be needed to deliver the energy to consumers at an estimated cost in 2010 dollars of between $19 and 25 billion. By displacing conventional generation, primarily natural gas, the report states that revenues for displaced plants would decrease and their economic viability put at risk. Increases in capacity market payments may be necessary to ensure these plants do not shut down.

By the end of 2022, New England claimed about 1,550 megawatts of wind energy and 5,473 megawatts of solar. Most of the solar operates as smaller, kilowatt-scale systems behind-the-meter in Massachusetts (3,289 MW) and Connecticut (912 MW) (ISO New England, Inc., 2023). Despite various factors that constrain the expansion of large-scale renewable energy in New England, including difficult terrain and land-use conflicts, meeting state climate policies will require substantially more development.

A recent study released by the ISO found that meeting the deep decarbonization policies adopted by Massachusetts and other states, including electrifying the transportation and heating sectors, would require 89,900 megawatts of wind, solar and battery storage to be operational with adequate, two-directional transmission connections to Canada and New York (Boughan et al., 2022). But even then, the region would likely experience energy supply shortages during the winter months. The study was a first look at the operational and reliability challenges of meeting the ambitious climate policies. At some point, the unreal expectations of these policies will need to be recognized.

[21] The Department of Energy states in the report that wind power cannot replace capacity resources and "if wind has some capacity value for reliability planning purposes, that should be viewed as a bonus, but not a necessity."

Conclusion

New England has experienced a decline in energy demand over the past decade, yet the region's residents continue to pay higher prices for electricity. This is due in large part to state energy policies. With 26 separate programs spread across six states, New England has some of the most complex and costly renewable energy mandates in the country, the costs of which are passed through to ratepayers in the form of higher retail rates. Meanwhile, economic pressures placed on carbon-emitting generators risk their financial condition, and with it the region's access to lower-cost reliable electricity.

Achieving the deep decarbonization objectives set by Massachusetts and other states would require substantially more ratepayer support and more land and ocean development to accommodate the wind, solar, and transmission infrastructure needed within New England. Yet reporting on these impacts is generally limited, and where it is available it is often difficult for the public to follow.

While the goal of a cleaner energy future is undoubtedly important, it is crucial for all stakeholders, particularly the ratepayers who are shouldering the brunt of the costs, to be engaged in an honest and informed debate about the region's energy future. These costs are not just financial but include the impacts to the environment and the communities where energy infrastructure will be expanded. Only after the debate, and with the consent of an informed public, should these policies proceed.

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About the Author

Lisa Linowes is an energy policy expert with a focus on the costs and deployment of large-scale renewable energy, particularly wind energy. With over 20 years of executive business experience, she has held elected and volunteer positions in community planning, land negotiation, and education outreach. Since 2006, Linowes has served as the Executive Director and spokesperson for the Industrial Wind Action (IWA) Group (https://www.windaction.org/), a national advocacy organization analyzing the impact and benefits of energy development on the natural environment, communities, and regional electricity grids. As the publisher and editor of the IWA website, she actively monitors and reports on energy policy and facility siting.

Ms. Linowes serves on the board of Michael Shellenberger's Environmental Progress. She has testified before Congress on federal tax policy relative to renewable energy, and the impacts of offshore wind development and has participated in numerous debates and presentations on renewable energy. Linowes holds a BS in Software Science from the Rochester Institute of Technology and a master's in business administration from Southern New Hampshire University.

About the Fiscal Alliance Foundation

The Fiscal Alliance Foundation promotes individual liberty and greater fiscal responsibility and transparency in government for a better New England, through education and legal assistance.