LANDGATE

Massachusetts
Solar Development Analysis

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Massachusetts Solar Development

ANALYSIS

The state of solar development in Massachusetts can be evaluated by key factors such as federal and local regulations, incentives, grid interconnection and integration. The current state of development activity in Massachusetts is growing and can be seen in this analysis summarizing all facets of solar energy project development.

We will break down the various federal and state incentives available to solar energy developers in Massachusetts and how to access them.

LandGate provides key data to the top developers and financiers in the country. To learn more about access to this platform, or to talk about how to apply the information below to your business, book time with a member of our dedicated energy markets team.

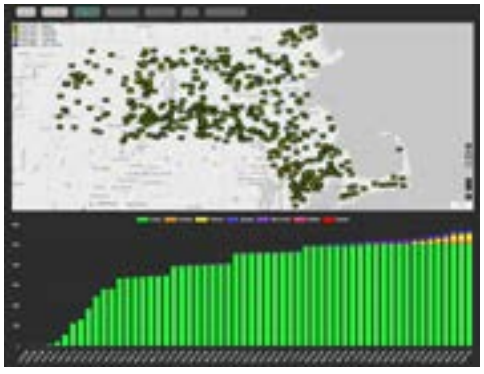
Massachusetts Solar Energy **ACTIVITY**

Status	MA Solar Farm Count	MA Solar Farm Capacity (MWac)	MA Solar Farm Generation (MWh)
Operating	504	2,048.22	200,470
Under Construction	19	55.55	14,566
Planned	32	125.12	40,672 (est.)
Queued Projects	27	273.97	21,456 (est.)
Site Control (Lease Options)	0	0	0 (est.)

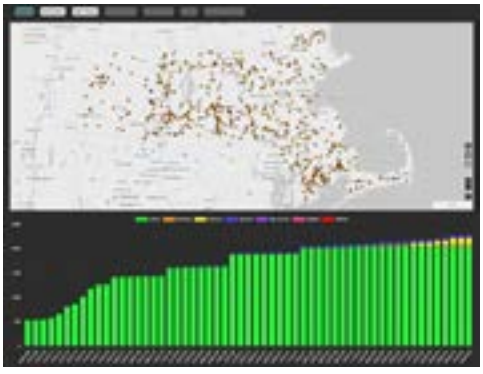
*est is the estimated peak total electricity generation that those solar farms will produce once operational

Massachusetts currently has **504** active and operating utility-scale solar farms with a total capacity of **2,048.22 MW** and an average capacity of 4.6 MW. Massachusetts also has an extensive pipeline for future development with 32 planned farms with a total capacity of 125.12 MW and 27 queued projects with a total capacity of 273.97 MW.

Overall, if all under construction, planned, queued, and site control farms go into operating status, Massachusetts will expand its capacity by **454.64** MW. In Massachusetts, the average solar farm size is 48.9 acres, producing 4.6 MW of electricity under ideal conditions.



Solar farm count in Massachusetts



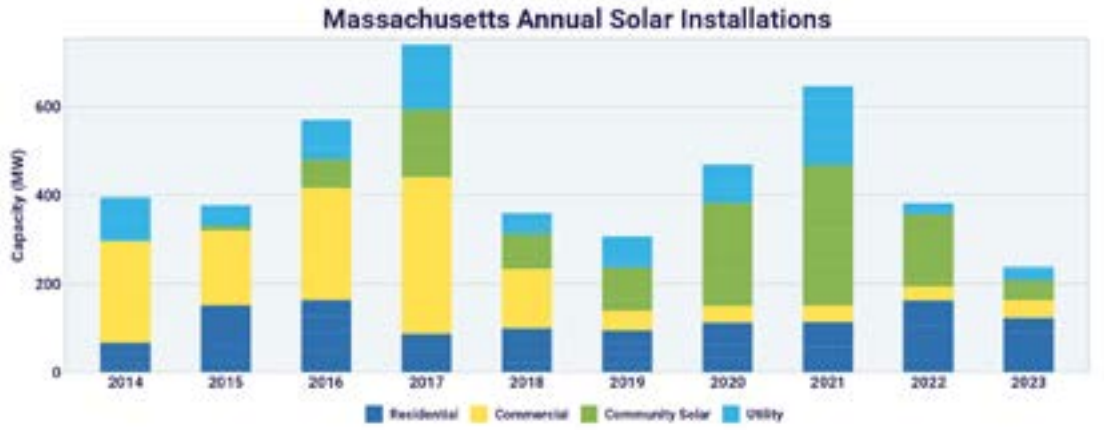
Solar farm capacity by farm status in Massachusetts

Overview: Past, Present & Future of Solar in Massachusetts

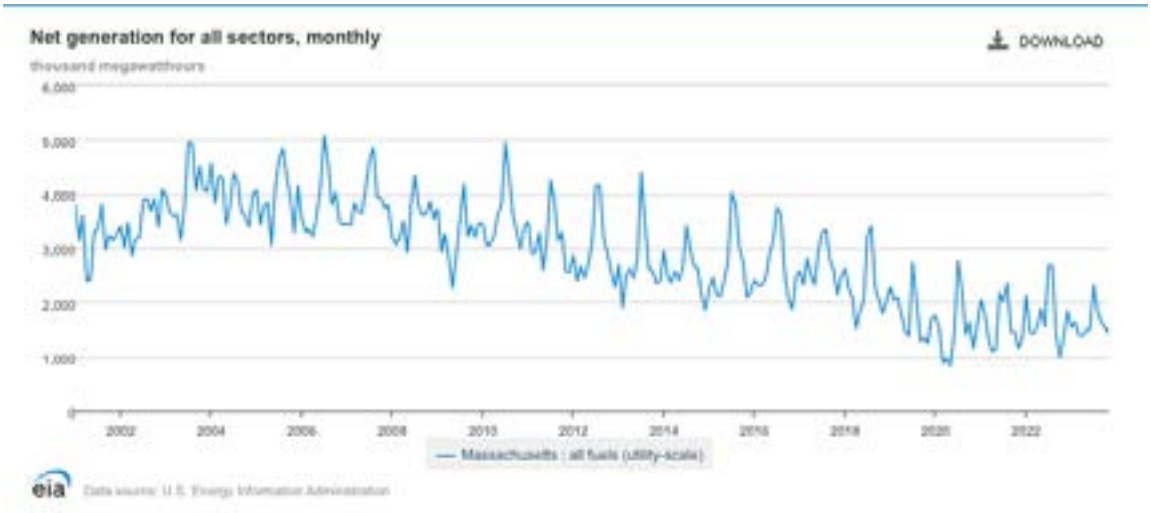
Massachusetts has a rich history of pioneering renewable energy development, particularly in solar power, amidst a diverse energy landscape. Since the late 1970s, the state has made significant strides in fostering renewable energy growth, initially through policies such as the Public Utilities Regulatory Policy Act (PURPA). PURPA laid the groundwork for Massachusetts' net metering system, which allowed customers to offset their electricity bills by generating solar power and exporting excess electricity to the grid. This early framework set the stage for subsequent advancements in solar energy adoption.

The restructuring of the electric industry in the 1990s further propelled Massachusetts towards renewable energy expansion. The state's transition to a competitive wholesale electricity market and the establishment of the Renewable Energy Trust Fund played pivotal roles in fostering the growth of solar technology. Through programs like rebates for solar installations, funded by the Renewable Energy Trust, Massachusetts incentivized solar development and empowered consumers to embrace renewable energy solutions.

Over the years, Massachusetts has continued to expand its solar capacity through initiatives like the Solar Massachusetts Renewable Target (SMART) program. SMART has incentivized solar development by providing financial incentives for solar installations, driving significant growth in solar adoption across the state. In 2022, solar power accounted for nearly one-fifth of Massachusetts' total net generation, with small-scale solar photovoltaic (PV) systems comprising the majority of the state's solar capacity. With approximately 2,000 megawatts of installed solar capacity as of 2024, Massachusetts ranks among the nation's leaders in solar energy generation. The chart below shows that the number of utility-scale solar installations in Massachusetts haven't necessarily increased as consistently as other proactive renewable energy driven states, but has still continued through 2023.



In Massachusetts, solar development has been shaped by a series of legislative milestones aimed at fostering renewable energy growth and combating climate change. **The Green Communities Act (GCA)** expanded net metering and virtual net metering, while subsequent amendments in 2016 adjusted net metering capacity limits and introduced Market Net Metering Credits calculation. **The Global Warming Solutions Act (GWSA)** mandated the monitoring and regulation of greenhouse gas emissions, setting a statewide emissions limit for 2020. **The Green Jobs Act** established the Massachusetts Alternative and Clean Energy Investment Trust Fund to finance clean energy research and development, supporting initiatives like clean energy technology development and workforce training. These efforts yielded significant results, with the state surpassing its original 250 MW solar goal four years ahead of schedule. Subsequent programs, such as the Renewable Portfolio Standard and Solar Renewable Energy Certificates, further incentivized solar development.



Solar energy has emerged as a significant contributor to Massachusetts' electricity generation landscape, with nearly **one-fifth** of the state's total net generation stemming from solar power. Small-scale solar photovoltaic (PV) systems played a pivotal role in this expansion, accounting for more than three-fifths of the state's total solar capacity and nearly three-fifths of the solar electricity generated in 2023.

Utility-Scale **SOLAR**

Utility-scale solar refers to solar farms often created and managed by utilities, independent power producers, or energy firms. These projects aim to produce electricity on a large scale and deliver it directly into the distribution grid. These solar farms generally have **more than 10 MW** in capacity. Below is a breakdown of the different types of solar farms and their development statuses.

Utility-Scale

The state of Massachusetts is regulated by the **Independent System Operator of New England (ISO-NE).**

Projects Queued for Development in Massachusetts

ISO	Number of Solar Farms	Capacity (MWac)
ISO-NE	27	273.97

A project in queue means that the project enters the interconnection queue of that region waiting for regulatory approval. During this period, the analysis of possible engineering and land factors is conducted to determine the feasibility of the project to be constructed and connected to the grid. The average amount of time it takes for a farm to go from queue to operational in Massachusetts is **1.6 years.** As per the projected in-service dates for the current projects in queue, Massachusetts will most likely add **1 GW** of Utility Scale farms by the end of 2025.

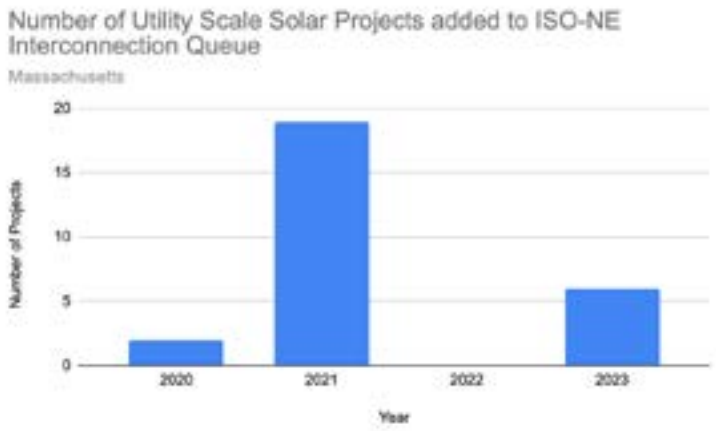
How do developers screen and run due diligence for those solar farm projects in site control?

Factors to take into consideration:

- Electricity generation
- Electricity commodity prices (LMP, incentives, PPA)
- Capital costs
- Operating costs
- Timing
- Risks

Using the factors above and a standard solar panel size, the buildable acreage and a land coverage ratio (encompassing row spacing and maintenance spacing) we calculate the maximum number of panels that could fit on the parcel. This helps us estimate the capacity the project lease will add to the grid and calculates a Market Value of the solar project.

Solar PowerVal enables similar capabilities to evaluate land parcels for solar development and get an independent economic report for solar projects of all statuses. This tool allows developers and project financiers to fast-track the process of submitting a feasibility study to the queue for approval through independently produced Engineering & Economic analytics and Solar 8760 reports or evaluate projects and parcels for origination and M&A.



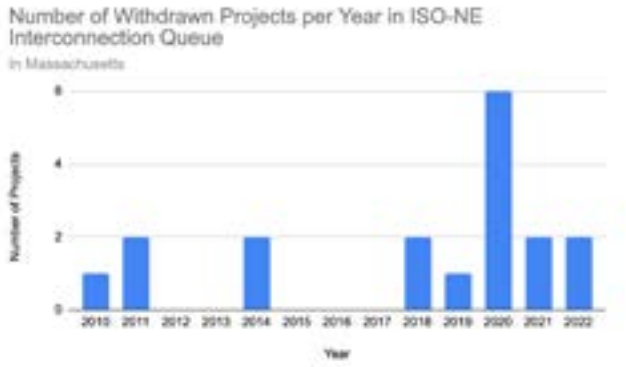
The number of utility scale solar projects in Massachusetts have been on the decline since 2021. It's become more challenging with higher LMP prices and a lack of policy support to stimulate the origination of more solar projects. The decline in the number of solar projects in Massachusetts' interconnection queue in recent years can be attributed to various factors. These include policy changes affecting incentives and targets, market saturation with existing solar installations, constraints in grid capacity for new connections, economic fluctuations impacting project feasibility, challenges in land use and siting, advancements in solar technology influencing project preferences, and shifts in utility procurement programs. These factors collectively affect the pace and scale of solar project development in the state.

Massachusetts sees a higher prevalence of **community solar** projects compared to utility-scale ones due to a variety of factors. Firstly, the state's policies are tailored to incentivize and facilitate community solar initiatives, offering favorable regulations, financial incentives, and simplified permitting processes to attract developers. Secondly, community solar projects provide accessibility, allowing individuals and businesses to partake in solar energy generation without the need for on-site installations, thus driving greater interest and participation.

The state's urban density also plays a role, as Massachusetts' limited space for large-scale solar installations makes community solar projects more feasible, particularly in densely populated urban areas where utility-scale projects face land constraints. Additionally, community solar initiatives benefit from strong community engagement, often involving collaboration among local communities, utilities, and developers, which fosters support and helps overcome obstacles. Lastly, there's a notable market demand for community solar among residents, businesses, and institutions, driven by factors like environmental consciousness, desire for energy independence, and support for local renewable energy initiatives. Together, these elements contribute to the proliferation of community solar projects in Massachusetts over utility-scale installations. (See below: Commercial, Community, & Behind-the-Meter Solar Farms).

Withdrawn Projects

There are **18** projects in ISO-NE that have changed their application status from queued to “withdrawn”. Solar projects in Massachusetts are often withdrawn due to the insufficient grid capacity in many areas of the MISO regional grid, which can lead to considerable interconnection expenses for developers of affordable renewable energy sources such as solar farms. Massachusetts stood to gain a total of over 280 MW just from their withdrawn projects.



How is a Utility-Scale solar project submitted to the queue to connect to the electric grid?

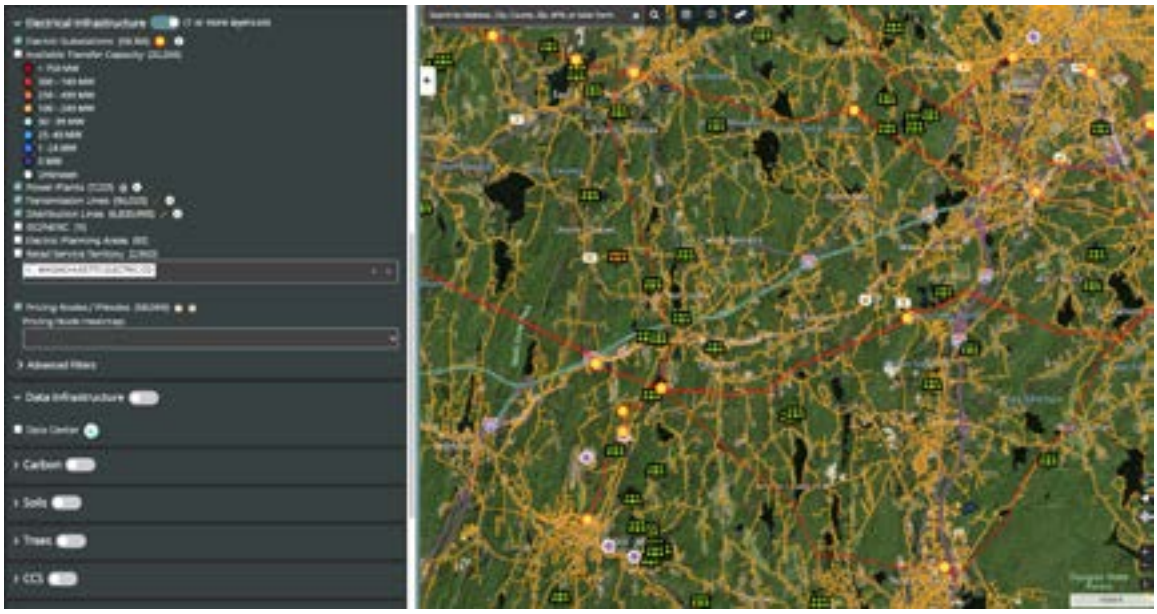
Typically, the queue submission process within an ISO or Utility area follows similar steps.

The solar developer needs to complete and submit an official interconnection request form provided by the ISO or utility, that captures essential project details and starts the interconnection process. Project specifications should include details like name, location (latitude and longitude), point of interconnection, capacity, expected energy production, environmental impact, technology layout- inverters, solar panels, system layout through a Feasibility study with an 8760 report to help initially assess the project’s compatibility with the existing grid infrastructure. The Solar developer will also have to pay an initial payment to secure a position in the interconnection queue and contribute towards the cost of initial studies and evaluations conducted by the ISO/Utility. Post the submission of the form, reports

and payment, the project is now effectively in the queue.

After the project has entered the queue, Injection reliability study and system impact study is conducted. These studies determine the exact impact of the project on existing infrastructure and identifies any potential network updates required to reliably interconnect the solar project to the grid. Once the study is completed, the developer gets a complete picture of the financial cost of the solar farm with regards to the complete CAPEX and Budget. This helps the decision making process of whether to move forward with the development of the solar project or withdraw the application from the queue. If the project seems viable to move forward the developer signs an interconnection agreement with the ISO/Utility and essentially looks to produce Economic and Financial reports for Bankers and Investors to help facilitate the construction of the solar project.

How does a Utility-Scale project connect to the Electric Grid?



These projects are interconnected through transmission lines that carry electricity from one point to another in an electric power system grid. These lines are used to transmit electrical power from power generation sources to distribution centers, which are then distributed to end-users. Through LandGate's accessible transmission line data, developers and landowners can evaluate land parcels based on segments & feeders, proximity to existing distribution lines and distribution hosting capacity.

Commercial, Community, & Behind- the Meter
SOLAR FARMS

Projects Under Development in Massachusetts

Community Solar Programs

Massachusetts stands out from many other community solar markets due to its lack of a standalone community solar program. Instead, the state has integrated an iterative incentive approach into its solar mandate, leading to one of the highest rates of community solar adoption nationwide. As of early 2024, Massachusetts boasts over 600 megawatts (MW) of community solar spread across over 400 projects, ranking it as the third-largest market in the country. This substantial figure is noteworthy considering the state's total installed solar capacity of 4000 MW, indicating that community solar holds a significant portion of the solar energy landscape.

The current solar incentive framework in Massachusetts is known as the Solar Massachusetts Renewable Target (SMART) Program, which commenced operations in 2018. This program employs a declining block incentive structure applicable to all solar types, capped at 3200 MW. Originally set at a capacity of 1600 MW, the SMART program was doubled in 2020 to spur the solar market's post-pandemic recovery. Under SMART, incentives are provided on a kilowatt-hour basis over 20-year periods for solar farms exceeding 25 kilowatts (kW) AC in 200 MW blocks, with compensation rates decreasing by 4% for each subsequent block up to 16 blocks.

Additional incentives, referred to as adders, are available for various solar development priorities, following a similar declining block structure termed tranches. As of early 2023, the Community Shared Solar adder is the most utilized, situated in tranche 13 out of 16, an exception compared to other adders allocated in tranches of 80 MW. This disparity is significant, particularly as the Low-Income Community Shared Solar (LICCS) adder is only in tranche 3 out of 16. With considerable SMART program capacity still available and impending federal incentives from the Inflation Reduction Act (IRA), Massachusetts' well-established community solar market suggests the imminent arrival of a second wave, primarily focused on low-income community solar initiatives.

Highlights: Community Solar Projects in in Massachusetts

In Massachusetts, Eversource is a major electric and natural gas utility provider, serving millions of customers across the state. Eversource's solar initiative prioritizes the establishment of large-scale solar installations in locations that maximize efficiency and cost-effectiveness in energy generation. To support this effort, Eversource has dedicated $146.3 million from green bond proceeds to develop 19 photovoltaic solar generation sites situated in various cities and towns across Massachusetts, collectively boasting a total capacity of **62 megawatts (MW).**

Project	Capacity	Description
East Longmeadow Solar 	7.01 MW	• 3,596 metric tons of carbon saved per year • Equivalent of 765 cars taken off the road per year • Equivalent of 1,150 Homes powered per year • June 2019 In-Service Date
Springfield Solar 	5.62 MW	• 2,883 metric tons of carbon saved per year • Equivalent of 613 cars taken off the road per year • Equivalent of 922 homes powered per year • November 2018 In-Service Date
Hampden Solar 	4.89 MW	• 2,508 metric tons of carbon saved per year • Equivalent of 534 cars taken off the road per year • Equivalent of 802 homes powered per year • June 2019 In-Service Date

Unitil, a leading energy provider in Massachusetts, has been actively involved in promoting renewable energy initiatives like the SolarWay solar project. SolarWay, a collaborative effort between Unitil and Nexamp, aims to increase solar energy generation in the region. This project involves the installation of solar arrays on various sites, including brownfields, landfills, and rooftops, across Massachusetts.

Project	Capacity	Description
Solarway 	1.3 MW	• Collaboration with Nexamp • 144 homes powered yearly • 3,708 panels • 10,766 kWh

EDF Renewables spearheaded the development, construction, and financing of the 10.30 MW Massachusetts Municipal Whole Electric Company (MMWEC) solar project in Ludlow, Massachusetts, which commenced operations in 2023.

Project	Capacity	Description
MMWEC Solar 	10.30 MW	• Operational in 2023 • Capacity to power 1,500 homes • will displace nearly 13,220,400 pounds of CO2 emissions from MA power plants per year

Clearway Community Solar

Clearway's Community Solar projects play a significant role in delivering locally generated renewable solar energy to municipalities across Massachusetts, assisting local utilities like National Grid and Eversource in managing grid loads. Recent Community Solar farms, including Partridgeville and Wilmarth, have been equipped with energy storage solutions, collectively adding 8.6 MWh of energy storage capacity to the state. The Spencer Road Community Solar Farm, situated on 200 acres at St. Joseph's Abbey, stands as the largest of its kind in the United States. The lease of this land supports the Trappist monk community residing there, while the solar panels provide energy cost savings to over 1,369 customers, including low-income families.

Community Solar initiatives like those offered by Clearway provide a renewable energy alternative for both renters and homeowners who may not have the means or desire to install rooftop solar panels. Massachusetts residents can subscribe to their local Community Solar program, with energy from these solar farms being fed into the local power grid. Subscribers then receive reductions on their utility bills in the form of solar bill credits.

nrg.

NRG offers a community solar program in Massachusetts, providing residents with an opportunity to access solar energy without installing panels on their property. Through their program, subscribers can support renewable energy generation and potentially save on their electricity bills. NRG's community solar projects are designed to be accessible and convenient, allowing subscribers to enroll online with no upfront costs or long-term contracts required.

One notable feature of NRG's community solar program is its flexibility. Subscribers have the freedom to choose the amount of solar energy they want to support each month, tailoring their participation to meet their individual needs and budget. Additionally, NRG ensures that subscribers receive credits on their electricity bills for the solar energy generated by their share of the community solar project.

Common Energy offers a community solar program in Massachusetts, providing residents with an opportunity to support renewable energy and potentially save on their electricity bills. Through their program, subscribers can access solar energy generated by local projects without needing to install solar panels on their property. Common Energy's community solar program is designed to be hassle-free, with no upfront costs or long-term contracts required for enrollment.

Commercial Solar

Similar to community solar, commercial solar projects in Massachusetts are thriving, with a significant emphasis on smaller-scale distributed generation initiatives. The majority of solar farms and projects in the state fall under the category of smaller-scale distributed generation, typically boasting capacities of under 10 megawatts (MW). These projects cater to a diverse array of commercial entities, including businesses, schools, and municipalities, aiming to harness solar energy to reduce electricity costs and environmental impact.

Status	Solar Count	Capacity (MWac)
Queued	52	632.74

Solar Massachusetts Renewable Target (SMART) Program: This provides ongoing payments to homeowners with solar systems. Eligible customers of Eversource, National Grid, and Unitil can receive a fixed rate per kilowatt-hour of electricity generated, with rates varying based on individual circumstances. These payments last for 10 years, with incentives gradually decreasing over time.

The SMART program in Massachusetts stands as a cornerstone of the state's renewable energy initiatives, with a combined total capacity of over 1,500 MW of projects both approved and qualified for installation. Launched in 2018, SMART offers incentives to solar energy producers based on a declining block structure, encouraging the development of solar projects across the state. Through SMART, Massachusetts aims to accelerate the adoption of solar energy while ensuring fair compensation for solar producers.

Massachusetts
LMP Data

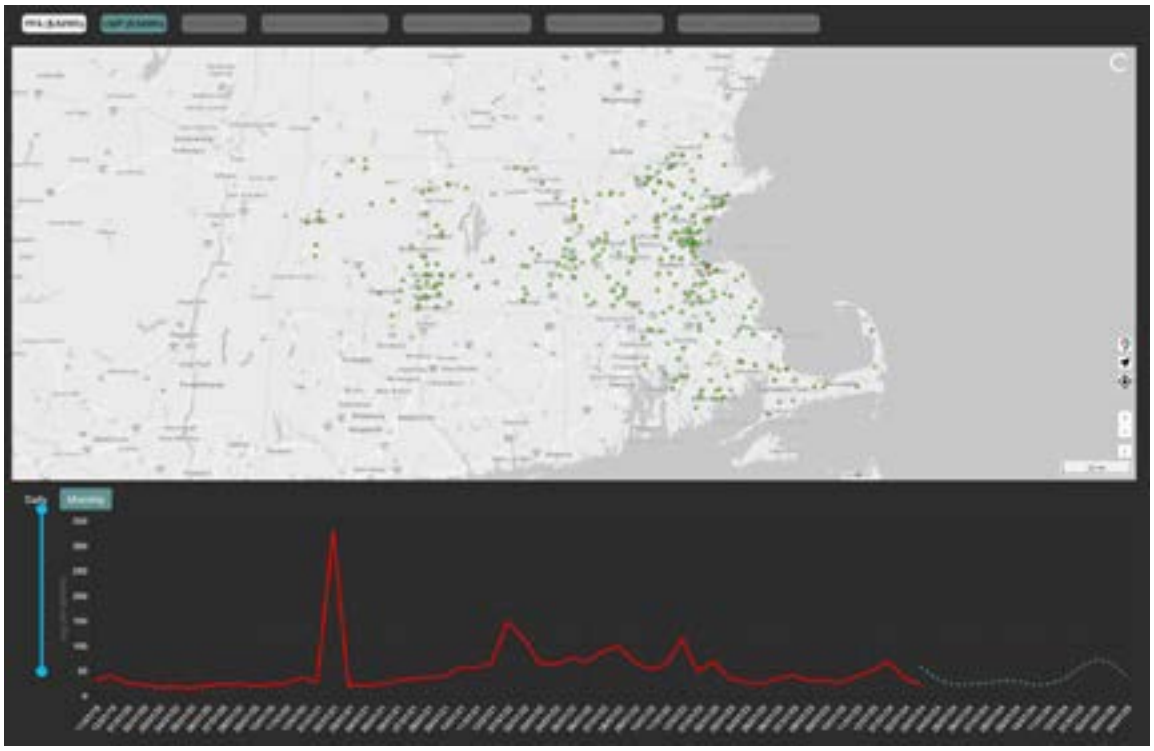
LMP (Locational Marginal Price) is a pricing mechanism used in wholesale/merchant energy markets to determine the cost of electricity at specific locations (node) within the grid. LMP considers a number of variables, including the cost of generating power, transmission constraints, grid congestion, losses, and load at certain nodes or locations within the electrical grid. The prices at which electricity is bought and sold in the market in real time or on an hourly basis are reflected in its calculation, which is done through market procedures.

Massachusetts saw the average LMP price increase by 70.5% in the past 3 years with an average price of $36.35 $/MWh in 2023. This price is expected to further increase by 14.3% in 2024. Similarly, consumer electricity purchase cost has also increased drastically for the past few years in Massachusetts. The current commercial electricity rate is 19.33 ¢/kWh which is a 17.1% increase compared to the commercial electricity rate of 16.51 ¢/kWh in 2020.

Higher LMP prices correspond to higher electricity costs, which could mean more money for solar installations. When compared to solar projects in areas with lower LMP pricing, locations with higher LMP prices may result in higher revenue. Power purchase agreements (PPAs) and solar project participation in energy markets are both impacted by LMP. The ability to engage in market transactions and maybe land more advantageous PPAs gives solar projects situated in areas with favorable LMP pricing a competitive edge in the electricity markets. LMP can affect the PPAs for solar projects' pricing conditions, lengths, and general allure.

Massachusetts

LMP Scorecard



Merchant Energy Pricing: **Market: ISO-New England**	
Number of price nodes active:	**646**
Average LMP price as of 5/12/24:	**$36.35**
Average retail price as of 05/12/24 (how much a community solar farm or behind the meter electricity generation sales electricity for + consumer purchase cost)	**19.33¢/kWh** Current commercial electricity rate **16.61¢/kWh** Rate in January 2020
Percentage change in average LMP in the past 4 years	**+17.1%**
Forecasted percentage change in average LMP Price for 2024:	**+14.3%**

Average LMP Prices: Historical & Forecasts

Year	Avg LMP Price ($/MWh)
2018	$77.50
2019	$48.54
2020	$32.22
2021	$46.65
2022	$131.68
2023	$36.35
2024 (est.)	$51.56
2025 (est.)	$46.23
2026 (est.)	$52.87

Based on the LMP and ISOs data in Massachusetts, the 2024 average LMP is estimated to be $41.56/MWh, increasing by 14.3% compared to 2023

Massachusetts
PPA Data

Utility-scale solar can be integrated into the grid and electricity can be sold at a predetermined price thanks to PPAs (Power Purchase Agreements) with utilities or power purchasers. Even if they are unable to put solar panels on their own homes, PPAs for community-scale solar projects allow local participants to profit from solar energy generation. The time and amount of power sales are governed by the PPA's terms, which guarantees a steady market for the solar installation.

The average Estimated Utility-Scale PPA price in Massachusetts is $480.68 $/ MWh. In Massachusetts, Power Purchase Agreement (PPA) prices are notably higher than in other states due to several key factors. Firstly, the state's ambitious renewable energy goals and policies, such as the Renewable Portfolio Standard (RPS), drive up demand for renewables like solar and wind. This demand influences PPA prices as developers strive to meet regulatory requirements while remaining profitable. Additionally, limited land availability poses challenges for large-scale renewable projects, increasing costs associated with land acquisition and development, thus impacting PPA prices.

Furthermore, Massachusetts' high development costs contribute to elevated PPA prices. Factors like

Massachusetts
PPA Scorecard

Average Utility-Scale PPA price 2023:	**$480.68/MWh**
Average PPA price change in the last 3 years	**-0.17%**
Largest PPA buyers:	**Amazon, Meta**

Average PPA Prices:

Year	Price ($/MWh)
2020	$481.01
2021	$481.48
2022	$481.22
2023	$480.68

Federal & MA State

Tax Incentives for Solar Developers

There are several federal and state incentives available for solar development in Massachusetts, intended to encourage the use of solar energy by making solar power more affordable for businesses and organizations that install solar systems. These incentives can improve the financial viability of solar projects since they lower the initial costs and increase the return on investment. Solar project incentives aid in the switch to clean, renewable energy sources, which lower greenhouse gas emissions and slow climate change. Incentives aid in increasing the deployment of solar projects by making solar energy more financially appealing, replacing fossil fuel-based power and lowering the environmental effects related to traditional energy sources.

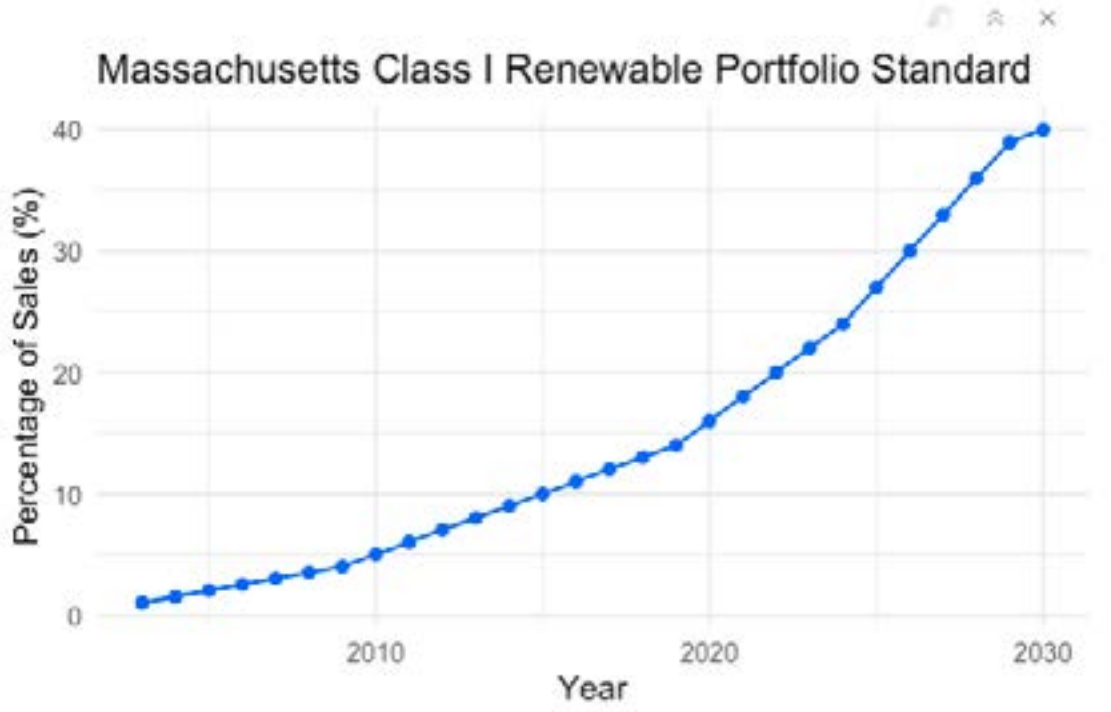
Solar Development Incentive	Type	About
Net Metering	State	With net metering, consumers are allowed to get retail credit for the surplus electricity generated from local power systems that are sent back to the grid.
Federal Solar Tax Credit (ITC)	Federal	Developers can claim 30% of the installation cost as a credit on their federal income taxes.
Solar Massachusetts Renewable Target (SMART) Program	State	This provides ongoing payments to homeowners with solar systems. Eligible customers of Eversource, National Grid, and Unitil can receive a fixed rate per kilowatt-hour of electricity generated, with rates varying based on individual circumstances. These payments last for 10 years, with incentives gradually decreasing over time.

Federal Solar Tax Credit, also known as the Investment Solar Tax Credit (ITC):

Developers of community-scale and utility-scale solar projects are eligible for the Federal Solar Tax Credit as long as the solar energy systems they install meet the requirements. The tax credit percentage for community-scale solar and utility-scale solar projects is also 30% of the total project cost. This means that developers can claim 30% of the installation cost as a credit on their federal income taxes.

Renewable Portfolio Standard (RPS):

The Renewable Portfolio Standard (RPS) in Massachusetts, launched in 1997 and expanded in 2008 through the Green Communities Act, sets mandates for renewable energy use. It is divided into Class I and Class II categories, requiring retail electricity suppliers to meet minimum percentages of kilowatt-hour sales from eligible renewable sources. Class I includes solar PV, wind, hydroelectric, biomass, and geothermal energy, with additional emphasis on in-state solar through programs like the Solar Carve-Out and Solar Carve-Out II.



The Class II RPS, established in 2009, mandates a portion of sales from pre-1998 renewable systems, including solar, wind, hydroelectric, biomass, and waste energy from municipal solid waste combustion. These standards are periodically adjusted by the Massachusetts Department of Energy Resources to drive progress towards renewable energy targets and environmental sustainability.

Inflation Reduction Act:

This bill passed in 2022 and became effective at the beginning of 2023 provides incentives to reduce renewable energy costs for organizations on a business, educational institution, and state level. More specifically, in Massachusetts, solar energy is eligible for a tax credit.

The Residential Energy Credit:

This is available to all Massachusetts state taxpayers who install solar panels in their homes, offering a tax credit equivalent to 15% of the total installation cost, capped at $1,000.

Net metering programs:

These programs enable homeowners to earn bill credits for surplus electricity fed back into the grid, which can offset future electric bills. However, unlike in some other states, such as Florida, these credits cannot be converted into cash payments.

With such a wealth of new data on the state of Solar Development in West Virginia, we imagine you might have questions about how to apply these trends, data, and tools to your own solar development efforts in West Virginia. Our dedicated energy markets team can help walk you through how to access and interpret this information in a way that is relevant to your business needs. Schedule time with our team here to talk one on one.

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