

2024 MASSACHUSETTS CLEAN ENERGY INDUSTRY REPORT





Photo courtesy of 621 Energy
located in Concord, MA

Inside cover photo: Staging
of offshore wind turbine
components at MassCEC's New
Bedford Marine Commerce
Terminal

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ABOUT MASSCEC

Massachusetts Clean Energy Center (MassCEC) is accelerating the clean energy transformation and powering the climatetech economy.

MassCEC works closely with our partners across state government, including the state's Executive Offices of Energy and Environmental Affairs, Economic Development, Labor and Workforce Development, and the Office of Climate Innovation and Resilience. The Commonwealth's whole-of-government approach to climate action, led by Governor Healey and Lt. Governor Driscoll, has positioned Massachusetts as a national leader in combating the climate challenge.

A state economic development agency, MassCEC works to spur job creation, deliver statewide environmental benefits, and secure long-term economic growth for the people of Massachusetts.

MassCEC is governed by a Board of Directors, chaired by Massachusetts Energy and Environmental Affairs Secretary Rebecca Tepper. The agency fosters collaboration among industry, state government and municipalities, higher education institutions and schools, community-based organizations, labor, and the financial sector to advance the state's clean energy and climatetech economy.

Our team has a proven track record of identifying and supporting promising climate solutions. We specialize in funding early-stage technology crucial for reducing carbon emissions and protecting communities from the impacts of climate change. Our program teams and partners are breaking down barriers by accelerating the adoption of new commercially ready climate technologies, creating

and scaling business models, and developing and supporting critical clean energy infrastructure.

We're committed to creating a diverse, equitable, and inclusive clean energy and climatetech industry anchored by a workforce that produces good jobs and fulfilling careers.

Improving the quality of life for residents and strengthening local economies is central to our mission. Our work is rooted in the belief that every resident of Massachusetts should benefit from clean energy and climate innovation.

Most of the infrastructure we own supports the Commonwealth's growing offshore wind industry, an energy source vital to achieving our climate goals. MassCEC's Wind Technology Testing Center in Charlestown, the only facility of its kind in North America, conducts endurance testing for commercial-scale wind blades. MassCEC's New Bedford Marine Commerce Terminal, the nation's first purpose-built offshore wind port, recently launched an expansion and improvement project to meet the increasing demands of the industry and position the facility as a clean energy asset for years to come. In August 2024, MassCEC broke ground on the Salem Offshore Wind Terminal, sparking the transformation of a former oil- and coal-fired power plant into Massachusetts' second offshore wind port.

Together with partners and communities across Massachusetts, we're building a clean energy and climatetech industry that will meet the climate challenge and unlock economic opportunities for generations to come. For more information about our work, visit our website at masscec.com.

¹ All MassCEC metrics since 2010 and the MassCEC Spotlight Metrics were compiled from awardee data and other internal data sources.

SINCE 2010 MASSCEC HAS:¹



Awarded **\$788M** through clean energy programs and investments, and attracted over **\$2.8B** in private and federal capital.



Supported **6,500+** internships for college and vocational students with **670+** clean energy employers, **67%** of which were women and minority interns.



Tested **57** wind turbine blades at the Wind Technology Testing Center, generating over **\$28M** in revenue.



Developed the **1st** purpose-built port in the U.S. for staging and deployment of offshore wind projects.



Supported the verification of **23M** renewable, solar, thermal, and clean peak certificates, accounting for transactions exceeding **\$5.6B** in revenue to Massachusetts residents and business owners.

MASSCEC FOCUS AREAS



Emerging Climatetech

We help new climate-focused businesses grow faster by backing a vibrant community of researchers, startups, and established industry players - creating an ecosystem where they connect and thrive.



Accelerating Decarbonization

We contribute to meeting our state's ambitious climate goals by tackling barriers to widespread use of clean energy and climate technology in buildings, transportation, and the grid.



Large Scale Deployment: Offshore Wind & Solar

We're building a cutting-edge offshore wind industry, marshaling world-class ports, while addressing supply chain and workforce development challenges.



Clean Energy & Climate Workforce Development

We're growing a diverse and talented clean energy workforce by supporting a dynamic network of community-based organizations, labor, training providers, schools, and employers committed to a sustainable future for all.



"From Brockton to the Berkshires, my experiences over the past year have made me more optimistic than ever that a clean energy future is within our grasp and that we are well-positioned to make Massachusetts the climate innovation hub for the world!"

-Emily Reichert, Ph.D., MassCEC Chief Executive Officer



EMILY REICHERT | NOTE FROM THE CEO

I am proud to present MassCEC’s 2024 Massachusetts Clean Energy Industry Report!

Over the past year, I’ve had the privilege to travel to communities across the Commonwealth, visiting climatetech companies and manufacturing facilities, touring world-class labs and high school clean energy training programs, and meeting with the hard-working individuals responsible for our progress towards our climate goals.

This annual report provides an in-depth look at Massachusetts’ growing clean energy industry and highlights the collaborative steps we’re taking to stimulate economic development across the state. In the following pages, you’ll read about the talented workers and thriving businesses driving this industry forward. I’m also thrilled to share that we’ll expand next year’s report to include the entire climatetech industry in Massachusetts, not just clean energy.

Thanks to the leadership of the Healey-Driscoll Administration and the Massachusetts Legislature, we are taking a whole-of-government approach to achieve our climate goals and strengthen this growing industry. In addition, MassCEC is partnering with the private sector to develop solutions that will drive down emissions globally while creating jobs here at home. We want climatetech and clean energy companies to stay and scale in Massachusetts, and we have a time-limited opportunity to make it happen. Spurred by the passage of the Mass Leads Act of 2024, we’re on track to make a significant and strategic investment not only in the climate solutions that will emerge from these companies but also in massive economic opportunities for our cities and towns.

Our collective work is already paying off. The clean energy industry has experienced 100% job growth since 2010. Massachusetts is home to **115,291** direct clean energy jobs, with the industry further supporting an additional **118,136** jobs.

But we must continue this momentum to lower costs, secure energy independence, and protect communities from the worst impacts of climate change. To meet our climate goals, we know we must add almost **29,000** more workers to the industry by 2030.

MassCEC is working hard every day to make that happen.

Last fall, I had the pleasure of visiting with students and educators at Brockton High School to announce more than **\$16 million** in MassCEC workforce development grant awards. These grants will support business creation and expansion, helping more than **200** Minority- and Women-Owned Businesses (MWBES) in industries whose workers, like electricians and HVAC technicians, are essential to meeting our climate goals. For example, IBEW Local 103 and


the National Electrical Contractors Association will develop a program to empower MWBE contractors, setting them up for success in the clean energy market. Additionally, the grants will ensure that over **1,850** participants will benefit from training programs, focusing on Environmental Justice communities. Finally, the funding will raise awareness of clean energy careers for over **600** learners and provide improved training access and modern equipment for over **1,700** students and job seekers.

While at Brockton High, I had the opportunity to meet with auto shop students who were excited to learn how to repair electric vehicles and another group of students who participated in the school’s summer solar energy program. These young leaders and their aspirations to make positive change with their career choice truly inspired me, and I know that one day we will have them to thank for powering our clean energy transformation.

From Brockton to the Berkshires, my experiences over the past year have made me more optimistic than ever that a clean energy future is within our grasp and that we are well-positioned to make Massachusetts the climate innovation hub for the world!

There is much to look forward to in 2025. I encourage you to reach out to our team at MassCEC to explore how we can support your business, career, or community. We have a lot of work ahead, but Massachusetts has a history of tackling big problems with innovative ideas, and a revolutionary spirit, and our response to the climate challenge will be no different.

Onwards,


Emily Reichert, Ph.D.,
Chief Executive Officer



2024 INDUSTRY HIGHLIGHTS

The Massachusetts clean energy industry has seen continued growth in jobs, businesses, and economic impact. Sustained expansion of the industry across sectors, subsectors, and the value chain will be critical to meeting the state’s clean energy and climate goals.

115,291

Direct clean energy workers in Massachusetts

100%

Industry job growth (57,610 workers) since 2010



5%

(Or 5,226) increase in jobs since 2023 compared to a 1% increase in overall jobs in MA.



3%

Of all MA jobs are in the clean energy industry.



4%

Of national clean energy jobs are in MA vs. only 2% of the U.S. population.

CLEAN ENERGY AND CLIMATETECH ECONOMIC IMPACT

233,427

total direct, indirect, and induced jobs supported by the clean energy industry.

7,512

clean energy businesses in Massachusetts.

\$36.8B

in Gross State Product generated by 233,427 total direct, indirect, and induced jobs supported by the clean energy industry.



#1

In U.S. climatetech startups per capita.



#2

For solar jobs in the U.S.



#2

For clean energy storage jobs per capita.

MA CLEAN ENERGY GROWTH OUTSIDE GREATER BOSTON:



9%+

Job growth in both the Central Mass and Pioneer Valley Workforce Skills Cabinet regions since 2023.

\$15B

in Gross State Product contributed from direct clean energy jobs in 2023, or 2% of the state's overall GSP that year.

\$3.4B

invested in early-stage MA climatetech companies in 2023.

\$59M

in public grant funding received by all clean energy companies, researchers, and innovators in MA in 2023.



CLEAN ENERGY JOBS BY SECTOR, SUBSECTOR, & VALUE CHAIN

#1
Nationally for the highest rate of growth in Electric Vehicle jobs in 2024.

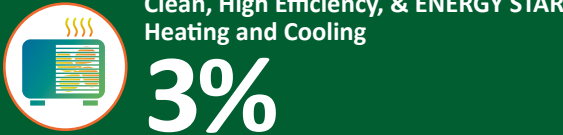
22%
increase in Clean Transportation jobs since 2023.

66%
of clean energy jobs are in the Energy Efficiency, Demand Management, and Clean Heating and Cooling sector.

28%
of clean energy jobs are in the Installation segment of the value chain, which experienced the highest rate of growth since 2023.

SUB-SECTORS THAT EXPERIENCED GREATEST INCREASE IN JOBS

Between 2023-2024 reports



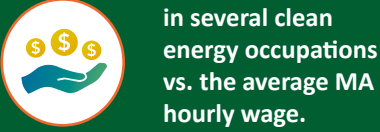
CLEAN ENERGY BUSINESS INSIGHTS

74%
of businesses are located outside of Greater Boston.

58%
of businesses are small, with 10 or fewer workers.

53%
of businesses are focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.

37%
of employers found it very difficult to hire qualified workers.



MASSACHUSETTS IS A LEADER

#1

- On the Clean Energy Community Power Scorecard^A
- In U.S. climatetech startups per capita^B
- Most educated U.S. state across degree levels^C
- Most environmentally friendly state^D
- Highest rate of growth in electric vehicle jobs in the U.S.^E

#2

- For overall innovation in the U.S.^F
- For solar jobs in the U.S.^E
- For clean energy jobs as a percentage of total state employment^E
- For clean energy storage jobs per capita^E
- For energy efficiency policy and implementation^G

A. Institute for Local Self-Reliance (2023)

B. Boston Consulting Group provided based on Powerhouse | The Geography of Climate Tech: Findings from Powerhouse's Data. 2. 2022-23 (>3k total). Boston Consulting Group Greentech Portal informed by natural language processing of United States Patent and Trademark Office filing data.

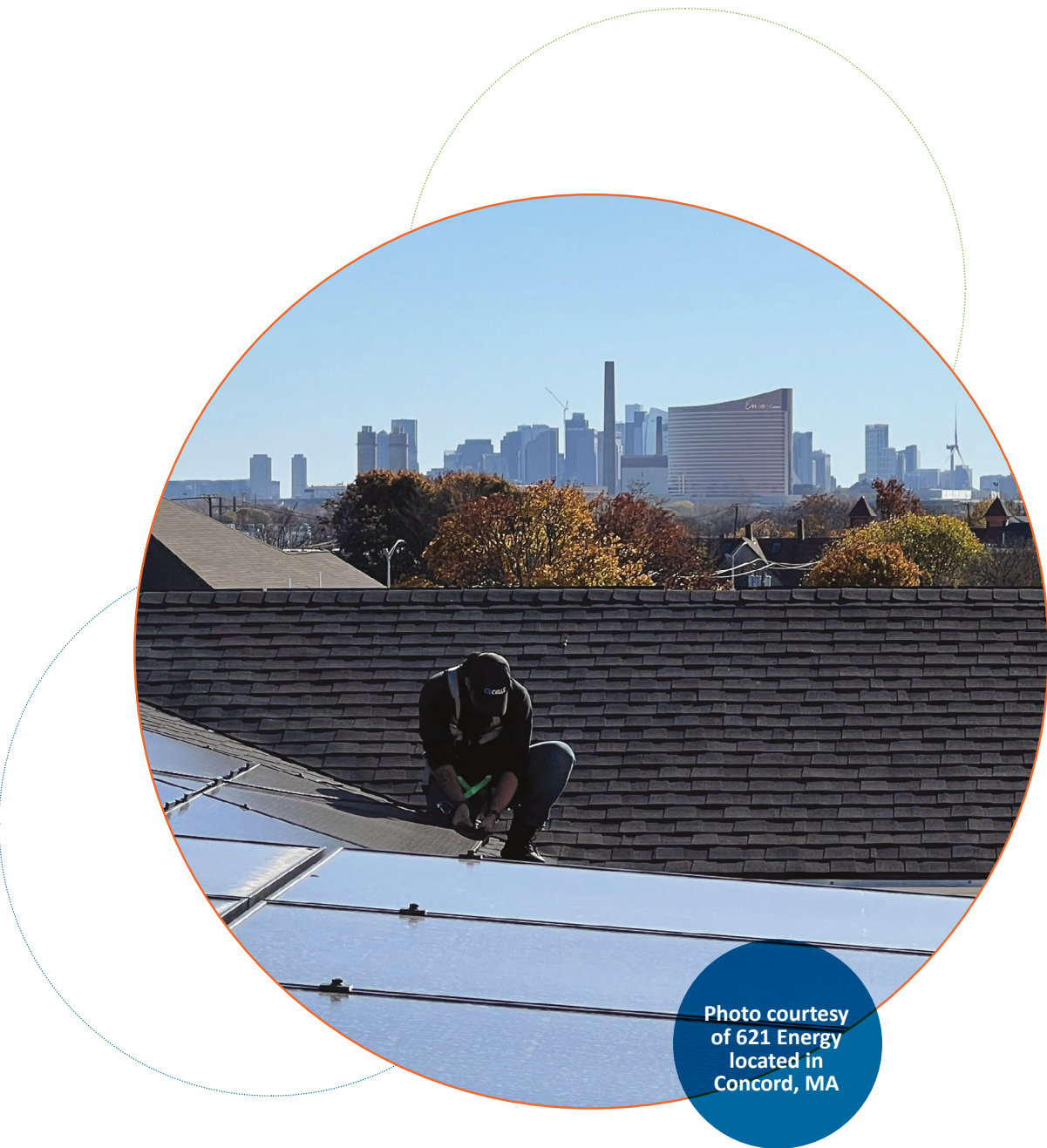
C. U.S. Census American Community Survey, based on HS diploma, Bachelor's, and advanced degree attainment.

D. Forbes Sustainability Index ranking of 50 states' environmental policy based on water use, energy use, and solar friendliness.

E. U.S. Department of Energy USEER Report (2024)

F. WalletHub (2024)

G. American Council for an Energy-Efficient Economy (2025)

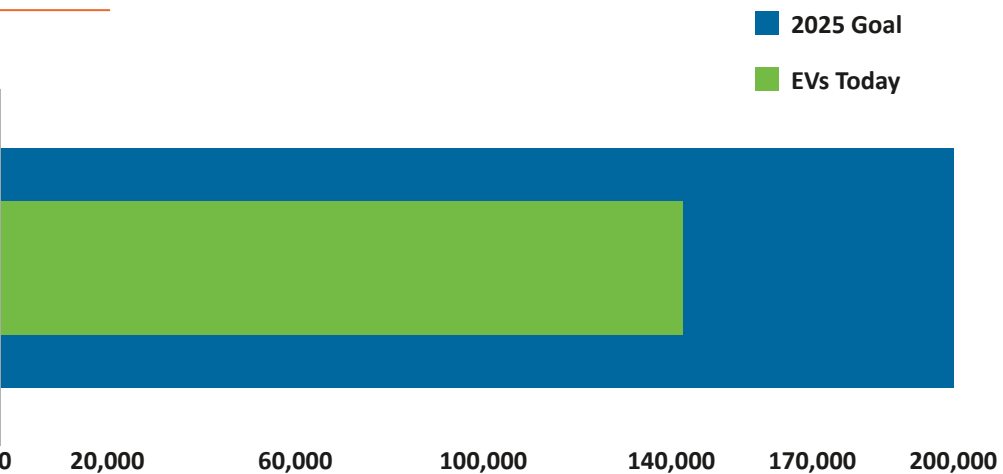


MASSACHUSETTS CLIMATE GOALS

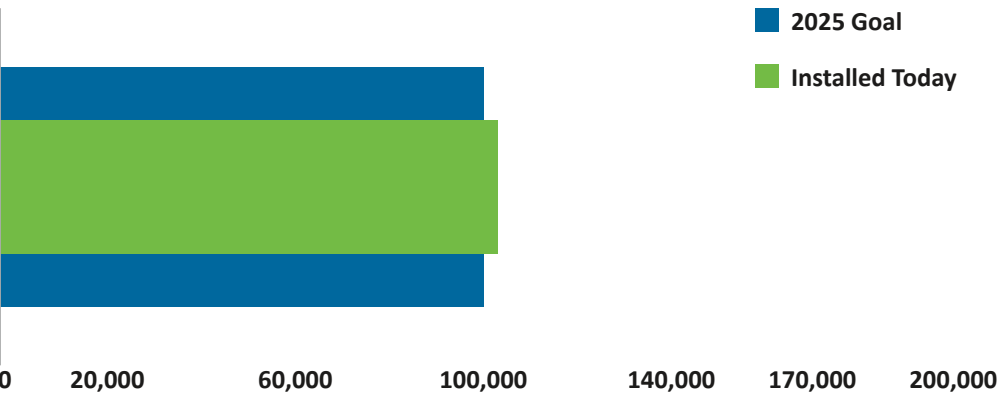
Massachusetts has demonstrated its leadership by setting a goal to fully decarbonize the state’s electricity generation and reach net-zero greenhouse gas emissions by 2050. The Commonwealth has made progress in decarbonizing the electric grid, buildings, and vehicles, but more needs to be done to ensure the state meets its ambitious and critical goals. MassCEC and its state government partners are poised to help tackle the most difficult challenges to achieving this climate goal, including testing and demonstrating new technologies and business models, supporting budding climatetech startups, supporting complex supply chains, engaging and informing consumers, and training a diverse and equitable workforce.

² 2024 Massachusetts Climate Report Card: www.mass.gov/info-details/massachusetts-clean-energy-and-climate-metrics.

As of March 1, 2025, there were **143,425 electric vehicles** in Massachusetts, relative to the **2025 goal of 200,000**.²



As of December 31, 2024, there were over **103,000 homes** with **heat pumps** installed in Massachusetts since 2020, relative to the **2025 goal of 100,000 heat pumps**.²



MASSACHUSETTS LEADERSHIP IN OFFSHORE WIND

Offshore wind will be the Commonwealth's largest source of clean energy to meet the increased demands of electrification. MassCEC provides pivotal support to the offshore wind industry through work that accelerates the responsible development of offshore wind projects while increasing the role of Massachusetts companies, institutions, and workers in the industry.

As part of this work, MassCEC has entered into a unique private-public partnership with Crowley Wind Services and the City of Salem to redevelop the site of a former oil- and coal-fired power plant, transforming it into the Salem Offshore Wind Terminal. When complete, this site will be the second purpose-built port specifically designed to support the construction of offshore wind in Massachusetts. The Salem Offshore Wind Terminal will support both fixed-bottom wind projects as well as the construction and installation of floating offshore wind in the Gulf of Maine.

To Learn More: www.masscec.com/masscec-focus/offshore-wind/infrastructure

The first dedicated offshore wind port in Massachusetts is the New Bedford Marine Commerce Terminal, which is owned and operated by MassCEC. Vineyard Wind began its lease of the Terminal in January 2023 and, in January 2024, announced the delivery of the first offshore wind power in the state.



Schematic of the developing Salem Offshore Wind Terminal



³ www.vineyardwind.com/press-releases/2023/2/16/report-shows-vineyard-wind-far-exceeded-job-creation-and-economic-output-projections-during-development-and-early-construction-period

A 2023 report found that Vineyard Wind's reported numbers for the Vineyard Wind 1 project doubled the initial projections in both jobs created and economic output, a fact attributed partly to a longer than expected development period and changes to the overall project parameters.³

Gulf of Maine

Planning Process

- Four areas leased in 2024 auction
- BOEM, states, developers, and stakeholders planning for future floating wind projects

Southern New England

Largest Offshore Wind Area in U.S.

- Informed by 15 years of stakeholder engagement, wildlife surveys, and metocean data collection
- More than **14GW** of renewable energy capacity to serve regional markets
- 1 project operating, 2 projects in construction, 6 projects in development

Massachusetts Offshore Wind

5.6 GW Authorized

- **2 GW** awarded in state's 4th procurement
- **20+ GW** needed to meet climate goals

TOTAL CLEAN ENERGY JOBS

Total clean energy jobs in Massachusetts have increased to **115,291**, after a brief decline due to the COVID-19 pandemic, and doubled in size since 2010.⁴⁻⁵ Between 2010 and 2023, the Commonwealth's clean energy industry added a net **57,610** jobs, which accounts for **12%** of all net jobs created in the state during that same time.

MA clean energy industry ranks nationally:



#2

For total jobs relative to number of overall jobs in the state



#3

Total jobs per capita



#6

For total jobs

Total clean energy jobs in Massachusetts have increased **13%** following COVID-19-induced job losses in 2021, while total employment in the state has grown 0.02%.⁶

⁴ This report defines a clean energy worker as a person who spends some portion of their time working in renewable energy, energy efficiency, clean transportation, or other carbon management technologies. Only those workers who directly support clean energy activities, such as conducting research, manufacturing products, performing installations, or repairing and maintaining clean energy systems, are included as clean energy workers. However, the impact of the industry is significantly greater than these “direct” jobs alone.

⁵ The definition of clean energy has been updated from previous reports to remove Woody Biomass and include Hybrid Electric and Plug-in Hybrid Electric Vehicles, along with Hydropower. Previous years' figures have been updated to this definition unless otherwise noted.

⁶ Annual job numbers are based on 4th quarter averages from the Bureau of Labor Statistics.

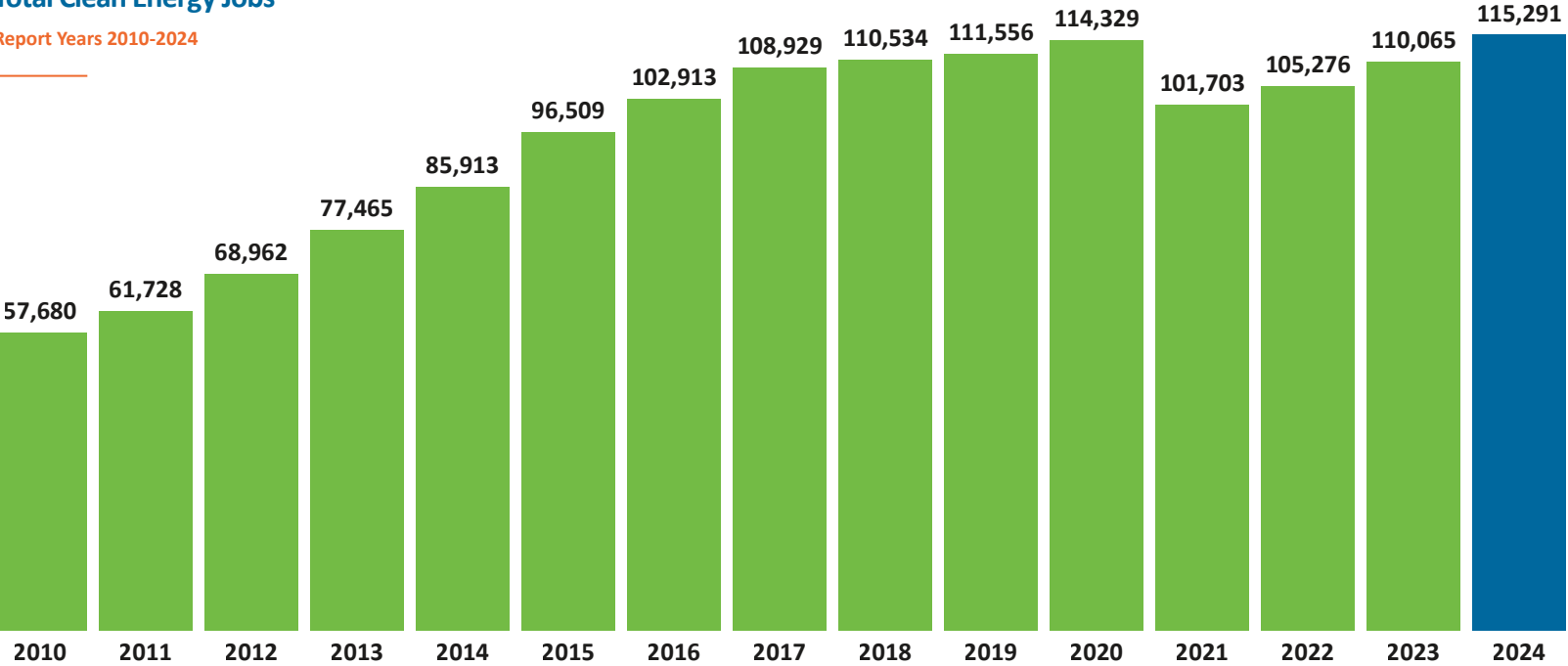
Photo courtesy of Emvolon located in Woburn, MA

100% job growth since 2010

Although the COVID-19 pandemic had an impact on the Massachusetts labor market, clean energy jobs have fully recovered from pandemic-related losses. Between the 2023 and 2024 reports, clean energy businesses added **5,226** jobs, which is a **5%** increase compared to **1%** growth of the overall state economy during the same time frame.⁷⁻⁸

Total Clean Energy Jobs

Report Years 2010-2024



⁷ 2024 job numbers represented in this report are based on the 2024 USEER data collection effort and represent the net change in employment between December 2022 and December 2023.

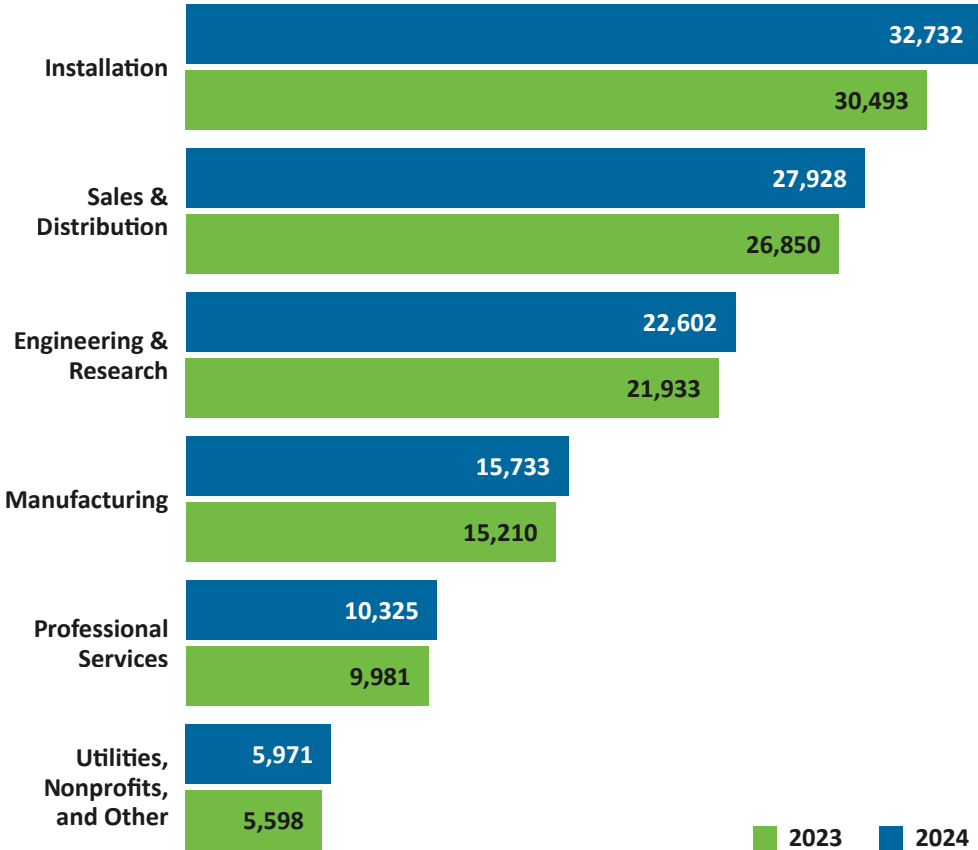
⁸ The definition of clean energy has been updated from previous reports to remove Woody Biomass and include Hybrid Electric and Plug-in Electric Vehicles, along with Hydropower. Previous years' figures have been updated to this definition unless otherwise noted.

CLEAN ENERGY INDUSTRY JOBS BY VALUE CHAIN SEGMENT

All parts of the clean energy industry value chain continued to grow, adding jobs between the 2023 and 2024 reports. Businesses with a primary focus on Installation represent the largest portion of the industry and experienced the highest growth rate (**7%**), adding **2,239** workers.⁹⁻¹⁰

Although the Utilities, Nonprofits, and Other segment represents the smallest portion of the value chain, it also experienced a **7%** increase in jobs (**373** jobs). The second largest value chain segment, Sales & Distribution, grew by **4%** (**1,078** jobs).

Over **28%** of clean energy jobs are in the Installation segment of the value chain, which also experienced the highest rate of growth between the 2023-2024 Reports.



⁹ Definitions for all clean energy value chains, sectors, and sub-sectors can be found in the Glossary of this report.

¹⁰ 2024 job numbers represented in this report are from the 2024 USEER data collection and represent the net change in employment between December 2022 and December 2023.

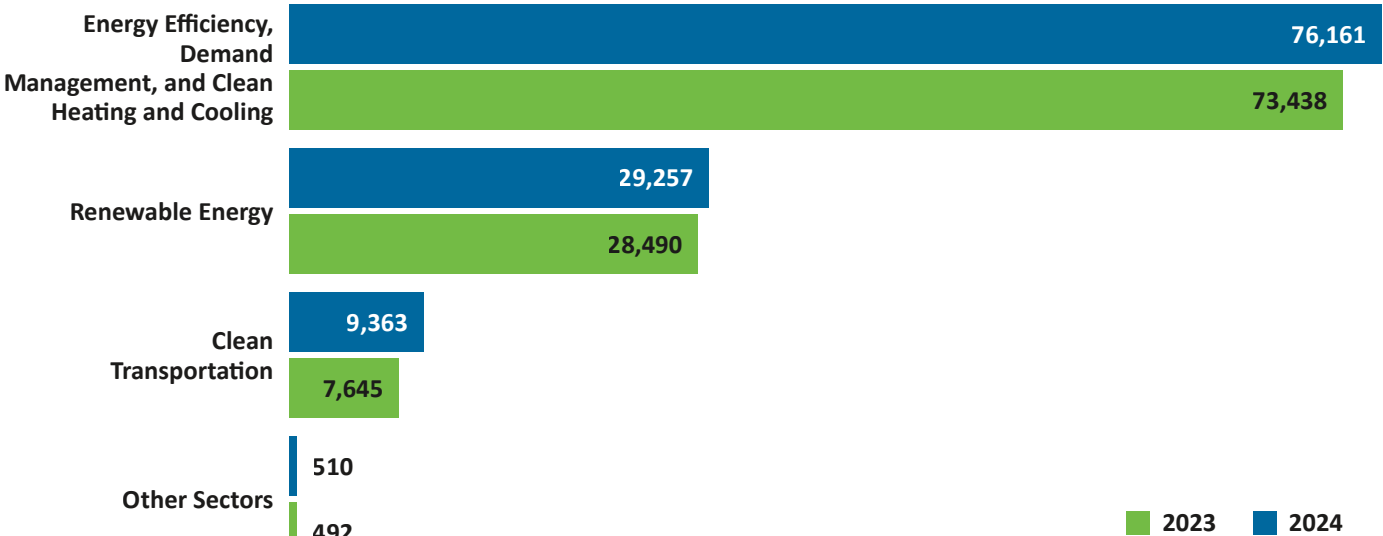
CLEAN ENERGY JOBS BY SECTOR

Clean Transportation saw the greatest growth rate at **22%**, adding **1,719** jobs. This is attributed to the increasing number of Electric Vehicle jobs, which aligns with a national trend.¹¹⁻¹²

The Renewable Energy sector grew by **3%**, and the Energy Efficiency, Demand Management, and Clean Heating and Cooling sector grew by **4%**.

While the Energy Efficiency, Demand Management, and Clean Heating and Cooling sector continues to have the largest number of jobs (**68%**), Clean Transportation now represents **8%** of clean energy jobs, an increase from **4%** in the 2023 report.

All clean energy sectors experienced job growth between the 2023-2024 Reports.



¹¹ Definitions for all clean energy sectors and sub-sectors can be found in the Glossary section of this report.

¹² 2024 job numbers represented in this report are from the 2024 USEER data collection and represent the net change in employment between December 2022 and December 2023.



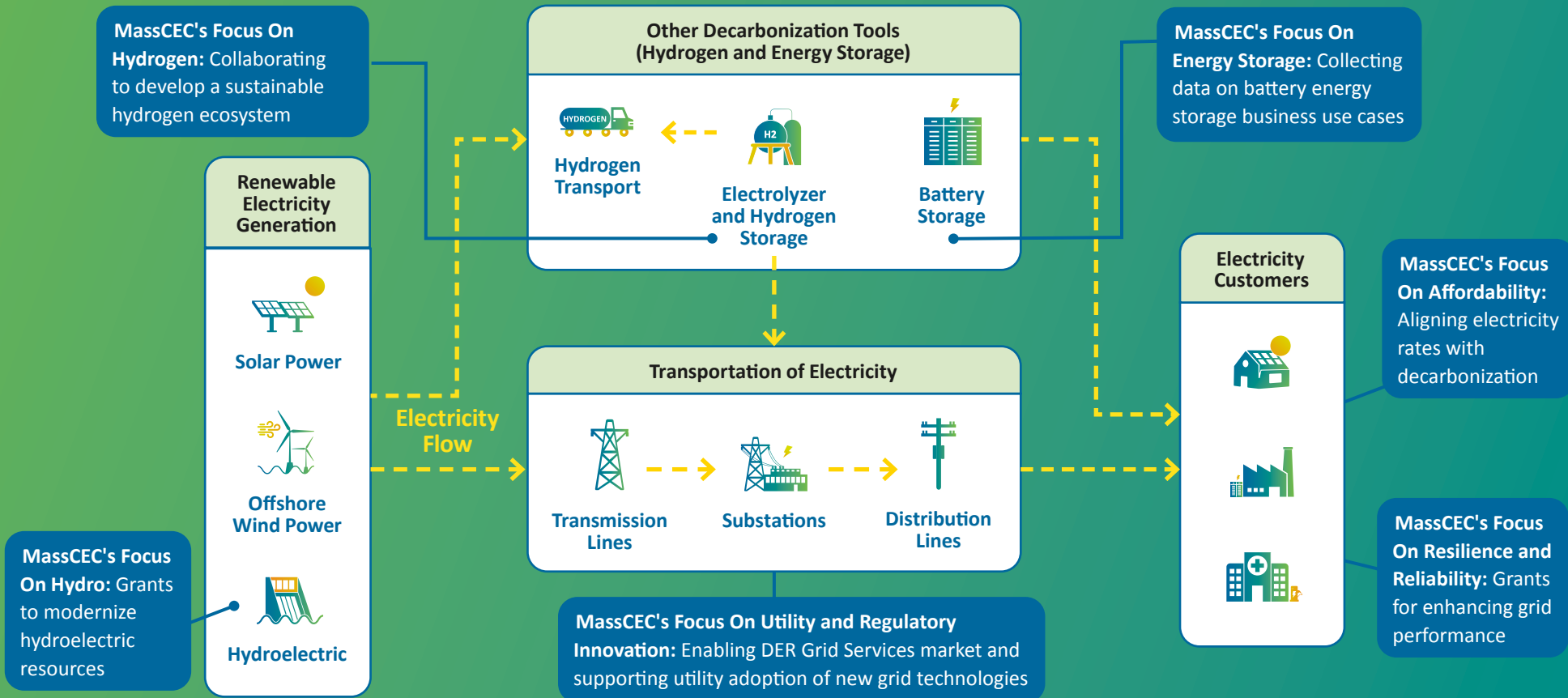
Photo courtesy of Multiscale Systems located in Worcester, MA

MODERNIZING THE ELECTRIC GRID

The majority of our country's electric grid was built in the 1960s and 1970s, and it is increasingly apparent that it is ill-equipped to address the needs of a changing climate. It was not designed to accommodate distributed renewable energy generation, energy storage, increased electrification of buildings and transportation, and more frequent and higher intensity weather and natural disasters. The grid must be upgraded and modernized, but questions remain about how to do it equitably and cost-effectively.

To Learn More: www.masscec.com/masscec-focus/net-zero-grid

MassCEC's Net Zero Grid programs span the electric grid



"The future electric grid is one that enables a decarbonized energy system and supports:

- Massachusetts' 2050 climate goals
- High levels of reliability, resilience, efficiency, and flexibility
- Pathways for innovative solutions
- An equitable energy transition

MassCEC's Net Zero Grid program helps Massachusetts stakeholders answer some of these difficult questions and develop innovative solutions to equitably meet our climate goals.

Tracking key barriers to modernizing the electric grid

Cost is one of the key barriers to our transition to a future grid, and utilizing the flexibility of distributed energy resources (DERs) is one solution to make the grid more cost-efficient. MassCEC's Grid Services Study is a multi-stakeholder project that will create a new method for compensating DERs for responding to grid needs and an implementation plan for how to maximize the value of DERs to the distribution grid. This work, which will unlock additional opportunities for virtual power plants to develop and support the grid, is conducted in partnership with the Massachusetts investor-owned utilities (National Grid, Eversource, and Unitil), the Massachusetts Department of Energy Resources, and the Massachusetts Office of the Attorney General.

Accelerating the adoption of key grid technologies

Grid resilience, or the ability of the electric grid to prepare for, withstand, and recover from disruptive events, will become increasingly important as homes, businesses, and transportation electrify and are more dependent on the grid. MassCEC will deploy **\$13.5M** in federal funds to support projects that equitably enhance the resilience and reliability of Massachusetts' grid, support the state's clean energy and decarbonization goals, and create good-paying jobs.

Emerging grid technologies (gridtech) will be pivotal in the grid transition, helping to optimize existing grid capacity, enable more flexible operations, and empower customer control of energy usage. However, gridtech faces many barriers to adoption and scaling, particularly given the complicated regulatory environment that utilities are in. MassCEC's Net Zero Grid program provides support to gridtech companies and utilities by providing grants and facilitating partnership opportunities for technology adoption and scaling the deployment of gridtech to benefit ratepayers.

Facilitating collaboration and convening key stakeholders and decision makers

MassCEC, in partnership with the Alliance for Climate Transition, a Massachusetts-based non-profit organization, developed the Transitioning to the Future Grid Event Series to discuss how innovation and collaboration across the industry can help achieve the "future grid." The series concluded with a set of actionable recommendations that would facilitate an efficient, equitable, and clean grid. Over three hundred diverse stakeholders from across the grid landscape attended the events and contributed to the recommendations.

"Events like this foster the excellent dialogue needed to pave the way forward as we collaborate, act, and lead the response to the climate crisis. Let's continue to work together to make a meaningful impact!"

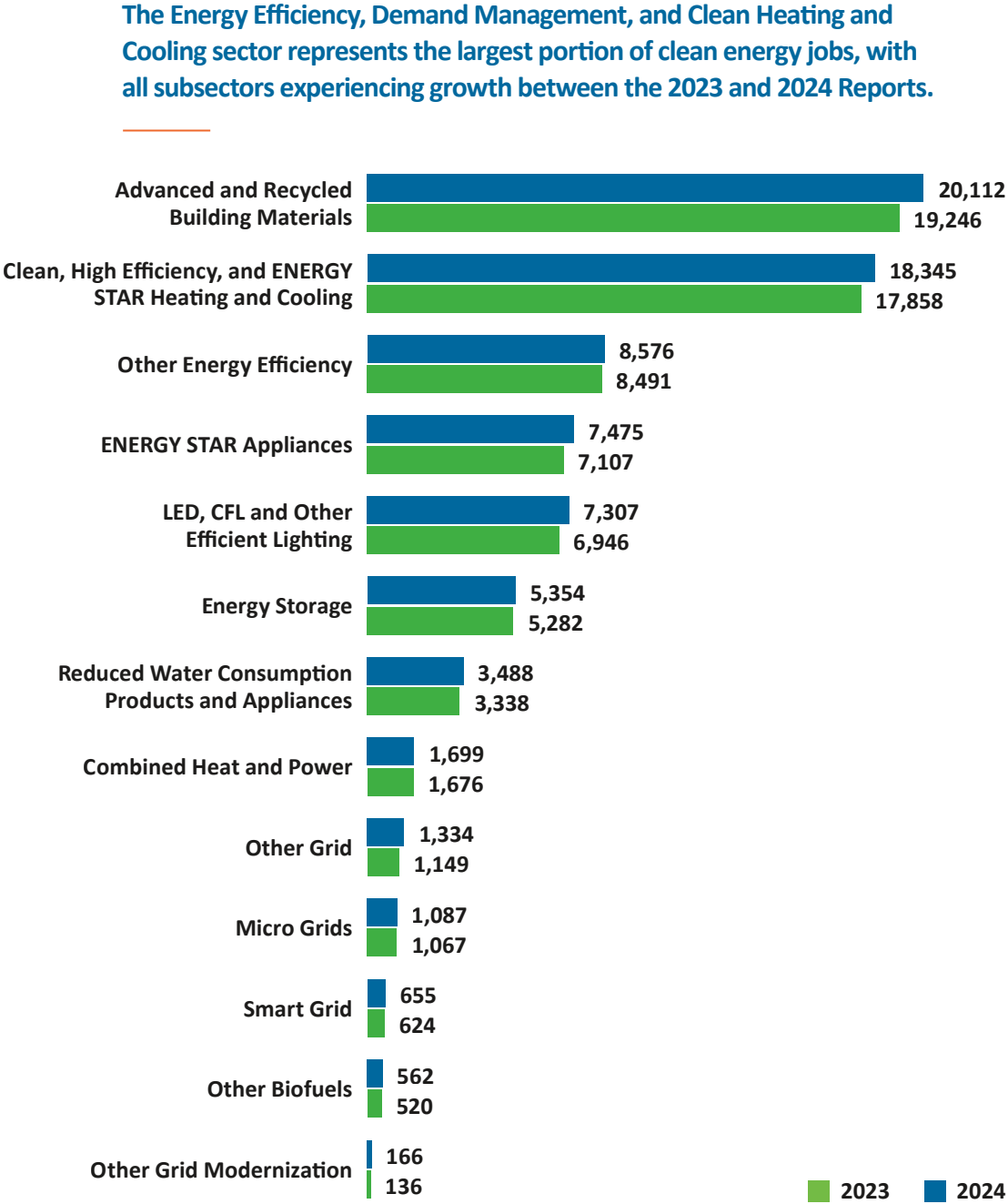
— Transitioning to the Future Grid Event Participant



ENERGY EFFICIENCY, DEMAND MANAGEMENT, AND CLEAN HEATING AND COOLING JOBS

Within the Energy Efficiency, Demand Management, and Clean Heating and Cooling sector, Advanced and Recycled Building Materials saw the largest number of jobs (866) added, followed by Clean, High Efficiency, and ENERGY STAR Heating and Cooling (487 jobs) between the 2023 and 2024 reports.¹³⁻¹⁴

The highest rates of growth were seen in the Other Grid Modernization (22%) and Other Grid (16%) subsectors.



¹³ 2024 job numbers represented in this report are from the 2024 USEER data collection and represent the net change in employment between December 2022 and December 2023.

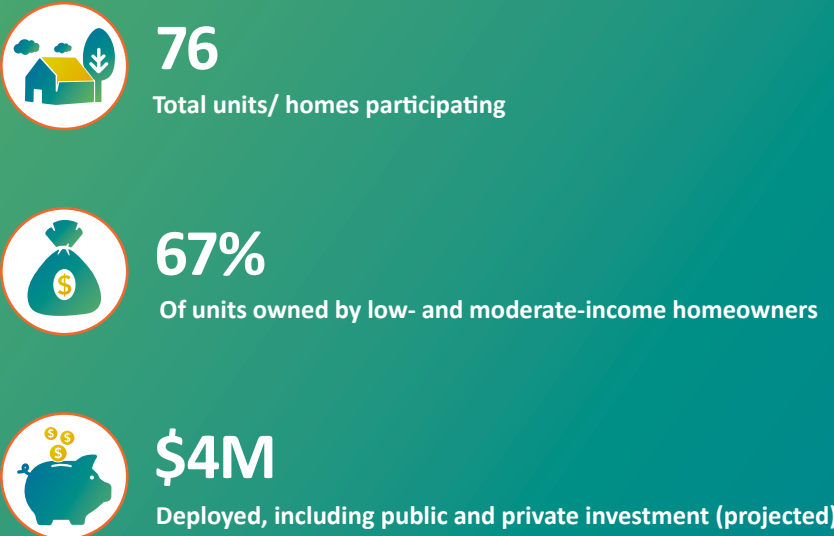
¹⁴ This year's report removes Woody Biomass from this sector. Previous years' numbers have been adjusted to reflect this change.

CHARTING A PATH TO HOME DECARBONIZATION

Transitioning existing homes away from fossil fuels can be challenging. Many homeowners struggle to navigate the planning, new technologies, and home improvements needed. MassCEC's Decarbonization Pathways program has developed comprehensive home decarbonization assessments, providing homeowners with a plan, technical assistance, and financial incentives for implementation. With this pilot, MassCEC created and tested a model for comprehensive consumer engagement and home decarbonization that could be scaled for statewide adoption.

To Learn More: www.masscec.com/program/decarbonization-pathways-pilot

Decarbonization Pathways by the Numbers:



Courtesy of a homeowner in Plainfield, MA participating in the pilot program

"I never could have done it by myself – having that roadmap and the prioritizations were really helpful to visualize everything and make sure everything gets accomplished... I am so grateful for this project. It has really enhanced the quality of all of our lives."

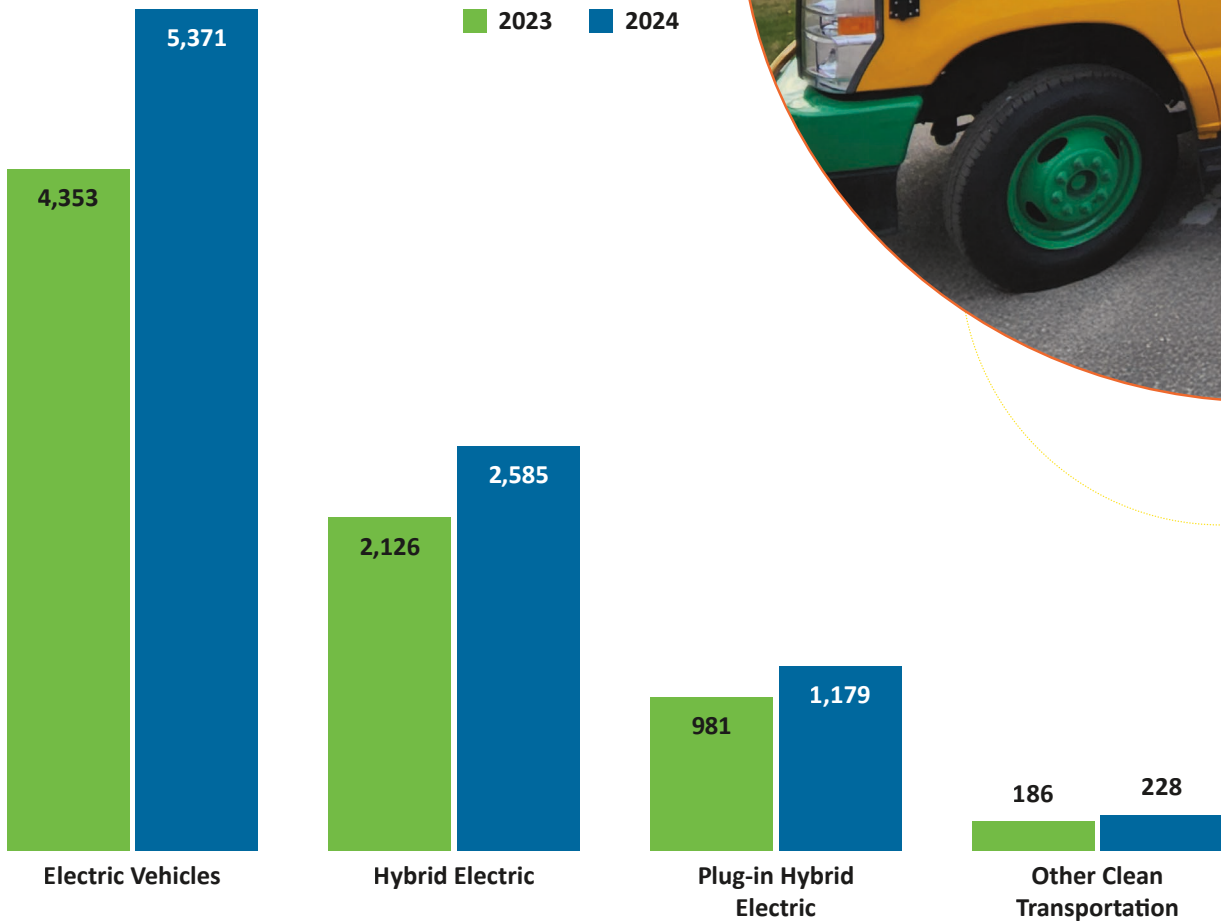
– Holyoke, MA Homeowner

CLEAN TRANSPORTATION JOBS

The Massachusetts Electric Vehicle workforce continued to grow, adding **1,018** jobs for a growth rate of **23%**. This is significantly higher than the rate of Electric Vehicle job growth in the U.S., which increased by only **13%** over the same time.¹⁵⁻¹⁶

The Commonwealth ranks **1st** in growth rate of Electric and **4th** for total number of Electric Vehicle jobs created in the U.S. between the 2023 and 2024 reports.

All Clean Transportation subsectors experienced job increases between the 2023 and 2024 Reports, with the largest increase seen in Electric Vehicle jobs.



¹⁵ 2024 job numbers represented in this report are from the 2024 USEER data collection and represent the net change in employment between December 2022 and December 2023.

¹⁶ This year's report includes the addition of Hybrid Electric and Plug-in Hybrid Electric in the Clean Transportation sector. Previous years' numbers have been adjusted to also include this clean energy definition change.



Electric school bus in Quincy, MA

MassCEC Spotlight

ELECTRIFYING MASSACHUSETTS SCHOOL BUSES

MassCEC’s Accelerating Clean Transportation (ACT) School Bus program assists public school districts and transportation providers in completing successful electric school bus deployments. The program prioritizes underserved and overburdened school districts and offers free consulting services to provide a long-term path for fleet electrification. ACT School Bus also assists award recipients of the Environmental Protection Agency’s (EPA) Clean School Bus program, which helps bring millions of federal funding into the state.

Electric school buses eliminate tailpipe exhaust, which is a significant source of air pollution linked to asthma and other respiratory issues in children. Replacing a single diesel school bus with an electric one helps eliminate the equivalent of about 147 metric tons of carbon dioxide each year. This transition also improves air quality around schools and along bus routes, directly benefiting students' health. ACT School Bus has informed the development of similar programs in New Jersey, the National Renewable Energy Lab, the Connecticut Green Bank, and other financing entities across the country. **MassCEC’s ACT School Bus program was recognized by the Clean Energy States Alliance (CESA) and awarded the 2024 State Leadership in Clean Energy (SLICE) Award for leadership in innovation, cost-effectiveness, and replicability.**¹⁷

To Learn More: www.masscec.com/accelerating-clean-transportation-act-school-bus-overview

MassCEC's Impact:



\$133M
Leveraged in public and private funding



272
Electric buses and charging infrastructure funded to date



22
School districts awarded across Massachusetts



3M+
Kilograms of carbon dioxide prevented from former diesel buses

"Diesel-fueled school bus emissions are especially harmful to vulnerable children in low- and moderate-income communities...It is a thoughtful approach to equity, creating tangible public health benefits, while decarbonizing transportation. By working with school districts to increase a wide range of capacities needed to roll out a successful conversion to EV buses, this program stands out."

— CESA SLICE Award Judge on MassCEC's ACT School Bus Program

¹⁷ <https://www.cesa.org/projects/state-leadership-in-clean-energy/2024-awards/>

RENEWABLE ENERGY
GENERATION JOBS

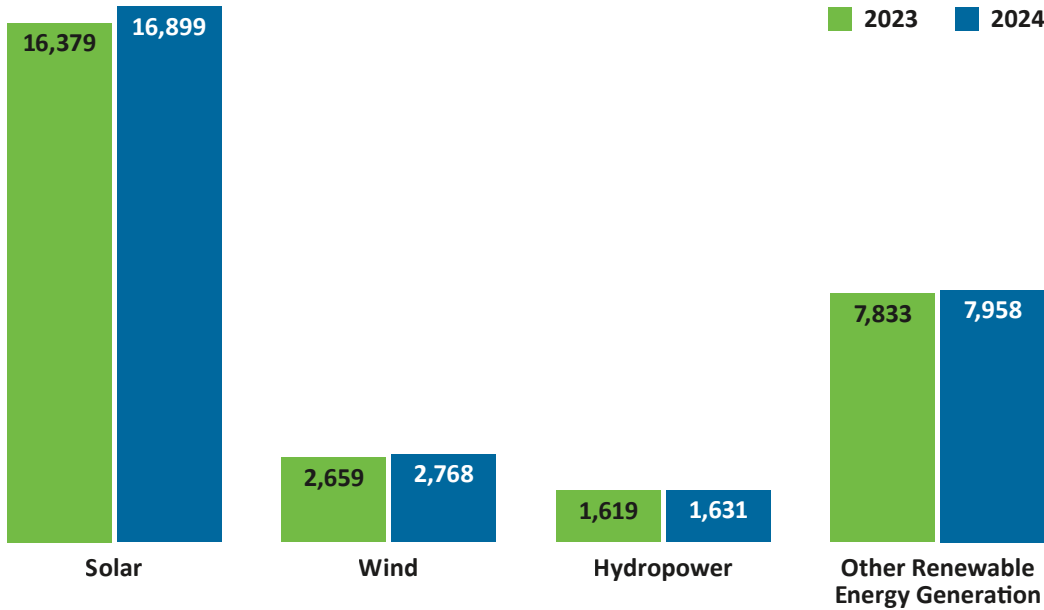
Wind energy employment grew by **4%** between the 2023 and 2024 reports, adding **110** new jobs. This is lower than the nationwide growth in wind jobs of **5%**, but higher than New York’s wind energy job growth of **3%**.¹⁸⁻¹⁹

Massachusetts’ solar industry grew by **3%** (**520** jobs), which is lower than the nationwide growth in solar jobs of **5%**.



Photo courtesy
of Sol Clarity in
Somerville, MA

Jobs were added in all Renewable Energy Generation subsectors, with Solar experiencing the largest total increase of **520 jobs** between the 2023 and 2024 Reports.



¹⁸ 2024 job numbers represented in this report are from the 2024 USEER data collection and represent the net change in employment between December 2022 and December 2023.

¹⁹ This year's report includes the addition of Hydropower into the Renewable Energy sector. Previous years' numbers have been adjusted to also include this addition in the clean energy definition.

7,512 clean energy
businesses
in 2024

CLEAN ENERGY BUSINESS

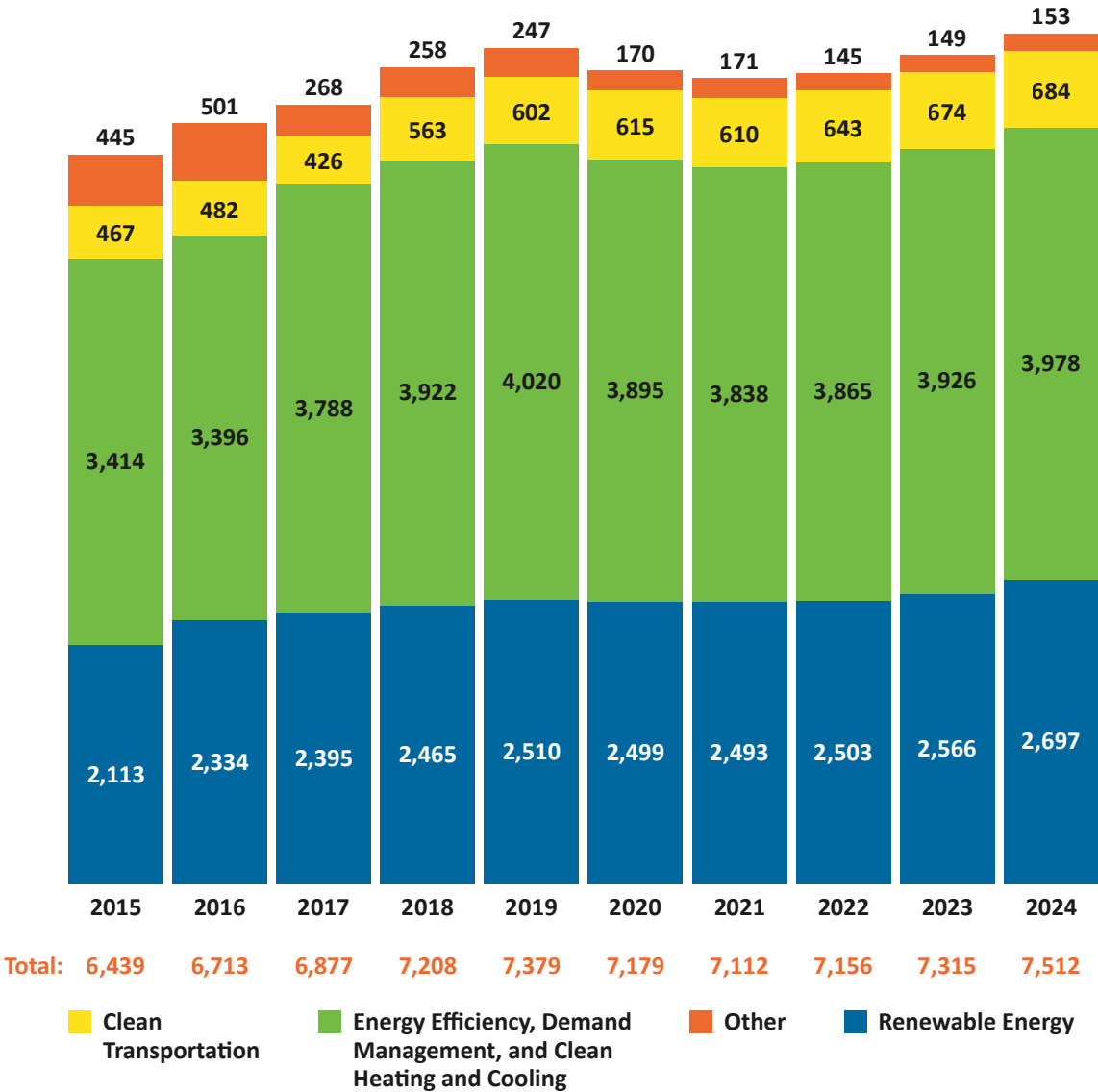
The overall number of clean energy businesses in Massachusetts increased by **139** (or **2%**) relative to the year before, with the largest addition of Renewable Energy businesses, at **72**.²⁰ Similar to prior years, the majority (**53%**) of businesses focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.

For the last few report years, small businesses (1 to 10 employees) account for **58%** of all clean energy firms, while mid-size businesses (11 to 49 employees) represent **27%**.

²⁰ For purposes of this report, a business is an establishment location. A clean energy business or firm with multiple locations would be counted multiple times in this analysis, based on the number of unique locations.

²¹ Employment extrapolations are based on BLS QCEW and survey data, resulting in totals that carry precise decimal values. As a result, some totals for tables and graphs in the report will sum differently due to rounding.

The composition of clean energy businesses in Massachusetts remains relatively unchanged since 2015, with the majority of businesses focused on Energy Efficiency, Demand Management, and Clean Heating and Cooling.²¹

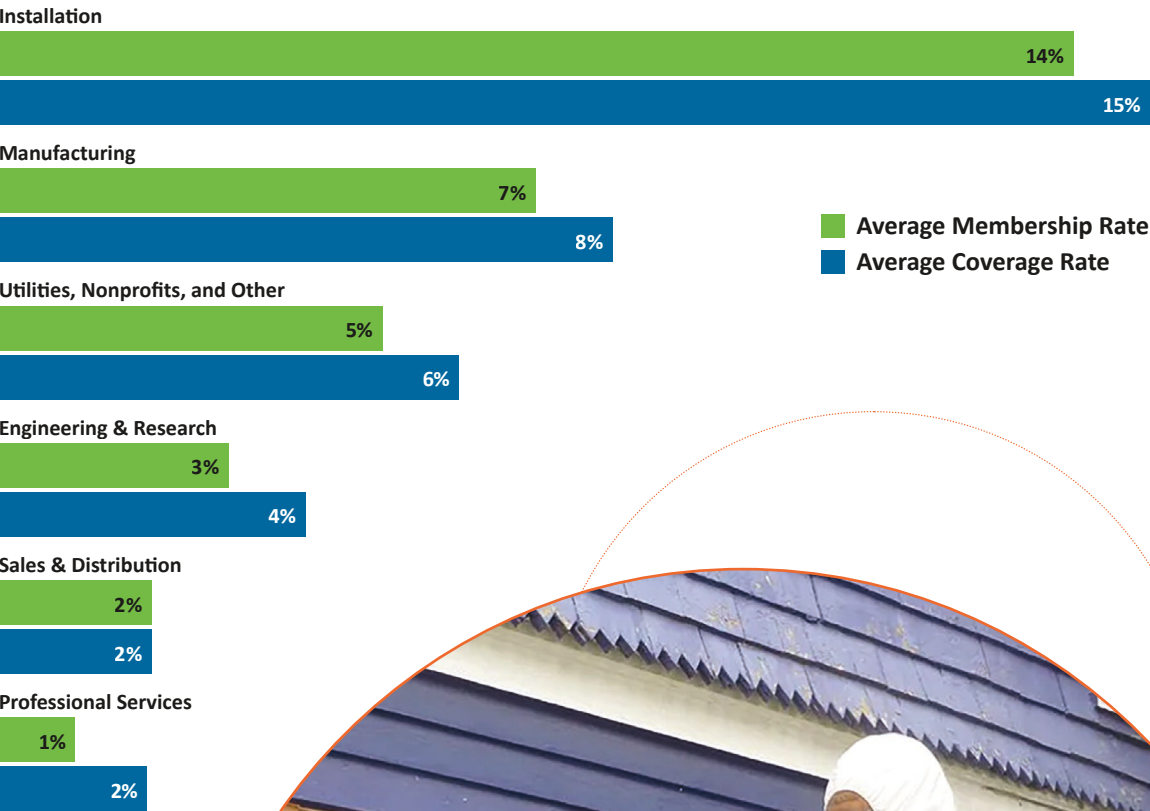


UNIONIZATION AMONG
CLEAN ENERGY WORKERS

Unionization rates across the clean energy value chain vary.²² The Installation segment has the highest average rates of membership and coverage, at **14%** and **15%** respectively. This is likely driven by the number of workers in occupations that have higher rates of unionization, such as electricians, plumbers, HVAC technicians, and construction workers.

The average unionization rate of the clean energy industry within Massachusetts is **6%**, less than half of the overall unionization rate of the state at **13%**.

The Installation segment of the value chain has the highest rates of union membership and coverage.



²² Union coverage refers to workers who are represented by a union through collective bargaining but may not be members of the union directly.



CLEAN ENERGY OPPORTUNITY:
TALENT WANTED

As of December 2023, **84%** of clean energy employers reported that it was “very difficult” or “somewhat difficult” to find qualified talent.²³

Over **37%** of clean energy employers found it **very difficult** to hire qualified workers when surveyed for the 2024 Report.

Very difficult



Somewhat difficult



Not at all difficult



²³ Massachusetts clean energy employer hiring difficulty was extrapolated from national hiring difficulty by technology, applied to MassCEC-defined sector and subsector segments, and averaged with Massachusetts all energy hiring difficulty from the 2024 United States Energy and Employment Report (USEER). See the methodology for more details.



OFFSHORE WIND WORKFORCE AND COMMUNITY OF PRACTICE

Since 2017, MassCEC has awarded over **\$18M** to **30** different organizations and institutions to advance offshore wind workforce development, improve access to opportunities, and conduct workforce studies. This funding has enabled the construction of multiple facilities and infrastructure projects, the purchase of specialized equipment, targeted recruitment for existing training programs, support to enable workforce participation, and increased interest in offshore wind careers.

MassCEC has also established a Community of Practice for Massachusetts Offshore Wind Workforce Training and Development. This unique initiative connects a network of **30** offshore wind workforce grantees, partners, and stakeholders to facilitate information sharing, collaboration, and resource coordination. Through this effort, MassCEC is supporting a cohesive ecosystem of training providers, educational institutions, community development organizations, and support services across the Commonwealth to cultivate a world-class offshore wind workforce in Massachusetts.

To Learn More: www.masscec.com/our-focus/offshore-wind/sector-development



Staging of offshore wind turbine components at MassCEC's New Bedford Marine Commerce Terminal.

“

"The Offshore Wind Works program has been instrumental in advancing Massachusetts Maritime Academy's Maritime Center for Responsible Energy (MCRE) Global Offshore Wind (GWO) training initiatives, providing more than 1,000 course participants with the skills necessary to work safely in this thriving industry. Through the OSWW Community of Practice, we have fostered collaboration and shared expertise, amplifying the impact of our programs and strengthening the region's offshore wind workforce."

— Captain Michael Burns, Jr., Executive Director, MCRE, Massachusetts Maritime Academy

“

"MassCEC has awarded Local 56 a grant to support workforce training specifically for offshore wind projects. This funding will significantly enhance our capabilities in this rapidly growing sector. Over the past three years, our operations have seen remarkable growth. In 2022, we logged 15,000 work hours. This increased to 35,000 hours in 2023; in 2024, we achieved an impressive 70,000 work hours. MassCEC's support is a tremendous opportunity for Local 56 to excel and lead in the offshore wind industry."

— John Dunderdale, Business Manager - Pile Drivers and Divers Local Union 56

REGIONAL LEADERSHIP IN OFFSHORE WIND

MassCEC, the U.S. Department of Energy, and the State of Maryland provided funding to a team led by University of Massachusetts Amherst and Johns Hopkins University to establish the Academic Center for Reliability and Resilience of Offshore Wind (ARROW). Offshore wind must provide reliable power at scale and be resilient to recover quickly from disruptions. ARROW's regional approach is a cross-cutting effort to advance these national priorities for offshore wind.

ARROW will prepare the next generation of offshore wind professionals, researchers, and educators to achieve U.S. deployment goals through a multidisciplinary program of education and research.

ARROW brings together 8 institutions, 25+ industrial partners and governmental agencies, and 3 National Labs, and will operate in three program areas:

- **ARROW-Empower** prepares the next generation of offshore wind professionals through leadership in comprehensive offshore wind education.
- **ARROW-Innovate** focuses research and innovation on increasing reliability of offshore wind and advancing targeted solutions for offshore wind resilience.
- **ARROW-Engage** encompasses outreach aspects of the center and integrates principles of diversity, equity, inclusion, and accessibility into the fabric of ARROW's operations, education programs, and research initiatives.



ACADEMIC CENTER FOR RELIABILITY
& RESILIENCE OF OFFSHORE WIND

To Learn More: www.arrowosw.org/



EMPOWERING MASSACHUSETTS COMMUNITIES' ADOPTION OF CLEAN ENERGY

Everyone needs and deserves to be part of our clean energy future, but underserved populations have less access to the benefits of clean energy and spend more of their paycheck on energy costs. MassCEC's Empower Massachusetts program provides funding for local organizations to innovate, develop, and implement targeted community-based clean energy solutions. The program provides funding to address resource gaps, facilitate local engagement, and drive collaboration in underserved communities.

Results Across the Program

Awarded over **\$13.3** million over 3 years to grantees to support:



130
Projects



20+
Workshops to share approaches



200+
Organizations



24+
Projects advanced to receive additional funding

Worcester HEART received a **\$25K** grant focused on efficiency and electrification of triple-decker housing and development of a local workforce.



Learn More: www.masscec.com/program/empower-massachusetts



TAKING CONTROL OF HOMEOWNER ENERGY BILLS

MassCEC provided a **\$150K** Empower Massachusetts grant to All In Energy to work with communities in North Suffolk and Merrimack Valley regions to assist residents and small businesses in reducing energy use, improving buildings, and saving money.

All In Energy provided energy bill check-ups, which helped residents to better understand their electric bills and determine if they were overpaying for electricity.²⁴ This critical work demonstrated that **29%** of residents and businesses needed translation of energy information and options into a language other than English. All in Energy also collaborated with Mass Save® Community First Partnership to expand the effort and benefits offered.

Impact of MassCEC's Funding and Mass Save® Community First Partnership



2,215
No-cost home energy assessments for residents



317
Small business contractors connected to Mass Save®



369
Energy bill check ups completed



1,313
Completed weatherization or HVAC upgrades



"I have seen that Energy Bill Check Ups have been a force for empowering residents to take control of their energy bills and finances. Through this program, we've been able to shed light on what residents are actually paying for, which has turned their electricity bills from a mystery document that they blindly pay each month into something that is understandable and within their control."

— Lauren Krake, All In Energy Community Programs and Partnership Manager.

²⁴ www.allinenergy.org/billcheckup.html

CLEAN ENERGY WORKER
DEMOGRAPHICS

The representation of workers by demographic group as a percentage of the clean energy workforce remained roughly unchanged from the 2023 to 2024 reports.²⁵ There was a **10%** increase in female workers compared to a **3%** increase in male workers in absolute numbers, however, the percentage of women working in the clean energy industry is still significantly lower than the overall Massachusetts workforce. The industry also saw a **9%** increase in the number of workers over the age of 55.



Photo courtesy
of Lithios in
Medford, MA

²⁵ Data for age, race, ethnicity, gender: www.bls.gov/lau/table14full23.htm. Population percentages for American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, or Two or more races were used due to a lack of BLS data. Veterans' employment: www.bls.gov/news.release/vet.t06a.htm & BLS QCEW 2023 Annual Employment for Massachusetts.

The lower representation of women in the clean energy industry demonstrates the need to increase equitable workforce opportunities and resources (2024 Report).

	2024 Clean Energy Employment	Percent of 2024 Clean Energy Workforce	Percent of 2024 Overall MA Workforce
Male	77,475	67.2%	51.0%
Female	37,815	32.8%	49.0%
Hispanic or Latino/a/x	17,870	15.5%	12.0%
Not Hispanic or Latino/a/x	97,421	84.5%	88.0%
White	86,122	74.7%	78.7%
Black or African American	9,339	8.1%	9.1%
Asian	9,569	8.3%	8.3%
American Indian or Alaska Native	1,153	1.0%	0.6%
Native Hawaiian or other Pacific Islander	807	0.7%	0.2%
Two or more races	8,186	7.1%	2.1%
Veterans	9,684	8.4%	3.0%
Workers over the age of 55	17,985	15.6%	26.0%

CLEAN ENERGY WAGES

Massachusetts needs over **28,900** additional clean energy workers by the end of this decade to meet our decarbonization goals.²⁶ It is important to increase awareness of careers within the industry, as many clean energy occupations currently earn hourly wages that are higher than the average hourly wage in Massachusetts.²⁷



Several clean energy occupations earn higher wages than the Massachusetts average wage (2024 Report).

	25th Percentile Hourly Wages	Median Hourly Wages	75th Percentile Hourly Wages	Average Hourly Wages
Massachusetts Average	\$19.30	\$29.18	\$47.17	\$38.62
Clean Energy Occupations:				
Carpenters	\$27.26	\$31.86	\$44.41	\$36.01
Construction Managers	\$52.85	\$64.64	\$80.87	\$69.63
Electrical Engineers	\$45.34	\$60.32	\$73.12	\$61.50
Electricians	\$27.92	\$39.02	\$47.44	\$39.35
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	\$28.95	\$35.43	\$42.02	\$36.15
Insulation Workers	\$18.93	\$25.45	\$38.23	\$29.08
Mechanical Engineers	\$41.38	\$52.16	\$63.82	\$55.55

²⁶ Source: “Powering the Future: A Massachusetts Clean Energy Workforce Needs Assessment,” Massachusetts Clean Energy Center, July 2023. The definition of a clean energy job for the 2024 Industry Report differs slightly from that used in the MassCEC Workforce Needs Assessment. The 28,900 additional jobs estimate is based on this updated 2024 definition, while still adhering to the Workforce Needs Assessment methodology.

²⁷ Source: U.S. Bureau of Labor Statistics. Occupation Employment and Wage Statistics. May 2023. Accessed August 2024. www.bls.gov/oes/current/oes_stru.htm.

CLEAN ENERGY OCCUPATION DEMOGRAPHICS

The disproportionately high representation of people of color among some of the more physically demanding roles masks inequality. For instance, Hispanic or Latino/a/x workers make up **40%** of Insulation Workers in Massachusetts, but only **4%** of Mechanical or Electrical Engineers. Women are underrepresented industry-wide, particularly in some of the high-growth occupations, such as electricians, just **3%** of whom are women.²⁸

Demographic representation in many of the highest-paying clean energy occupations is not equal (2024 Report).

	Carpenters	Construction Managers	Electrical Engineers	Electricians	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Insulation Workers	Mechanical Engineers
Female	3.1%	10.1%	10.1%	2.9%	2.3%	5.4%	8.9%
Male	96.9%	89.9%	89.9%	97.1%	97.7%	94.6%	91.1%
Hispanic or Latino/a/x	28.3%	7.7%	4.1%	14.5%	14.2%	40.4%	4.1%
White	84.8%	87.8%	74.8%	85.5%	84.1%	70.3%	78.5%
Black or African American	4.3%	2.9%	2.5%	5.3%	7.7%	8.3%	2.1%
American Indian or Alaska Native	0.3%	0.1%	0.0%	0.4%	0.3%	1.0%	0.0%
Asian	1.5%	2.0%	21.0%	1.8%	0.8%	0.6%	15.3%
Native Hawaiian or other Pacific Islander	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%
Two or more races	9.0%	7.1%	1.8%	7.0%	7.2%	19.8%	4.1%
Workers over the age of 55	19.2%	32.1%	32.6%	23.0%	22.0%	14.1%	23.4%

²⁸ These data represent wages for a subset of occupations in Massachusetts, which have significant representation in the clean energy industry. The data are not for clean energy jobs specifically. Source: JobsEQ® accessed September 2024. Occupation Wages, Average Hourly in Massachusetts, 2024Q1 & Occupation Diversity, in Massachusetts, 2024Q1, based on place of residence estimates.

MASSCEC WORKFORCE DEVELOPMENT

MassCEC’s workforce development programs focus on expanding and diversifying the clean energy workforce, fostering heightened awareness of clean energy careers, and increasing the availability and effectiveness of training and advancement opportunities. The programs address three priority areas: students and young adults, new entrants and incumbent workers, and climate-critical businesses, with a focus on minority and women business enterprises.

To Learn More: www.masscec.com/workforce



In 2023, MassCEC awarded Greenfield Community College (GCC) **\$1.1M** to renovate and repurpose a campus greenhouse to launch an HVAC and heat pump training program. The program will help address the shortage of building decarbonization workers. GCC’s Workforce Development programs serve some of the neediest populations in the community by providing robust wraparound supports and a case management approach to build close relationships with students. GCC connects them to support through community-based organizations and offers communities of

practice to build economic and social stability.

GCC also received **\$150K** from MassCEC to support the development of a Youth Climate Corps, which will offer clean energy career awareness outreach and activities for middle schoolers and a summer work experience for older youth. Further MassCEC investments are helping GCC also pursue federal funds to add clean energy training program offerings for students.



“This grant provides GCC with an amazing opportunity to offer career pathways to skilled jobs by providing free training and reskilling programs in the high-growth sector of Clean Energy. These are good jobs in our communities. This equity workforce grant...will allow us to specifically focus recruitment efforts on historically underrepresented members of our community, to create new opportunities for them and their families.”

– Kristin Cole, GCC’s Vice President of Workforce Development



Expanding on a planning and capacity grant from FY22, in FY23, the Black Economic Council in Massachusetts received **\$667,664** in workforce equity grant funding to develop and expand its Electric Vehicle (EV) Kickstarter workshops, which help businesses expand into the EV charging industry as resellers, owner-operators, installers, or maintenance providers. MassCEC’s funding was critical in allowing the program to offer back-office support, coaching, and mentoring to **20** minority or women business enterprises to empower entry into the EV charger space. As a result, several participants have subsequently secured contracts on EV charger installation and maintenance, including Better Together Braintrust, which recently secured a contract with the City of Boston to install **68** EV chargers.



“The Black Economic Council of Massachusetts (BECMA) is incredibly grateful to MassCEC for their support in helping to scale our EV Kickstarter program, which guides and accelerates the transition of diverse and experienced entrepreneurs into the electric vehicle charging industry. With our proof of concept established and a growing number of businesses eager to participate, MassCEC stepped in at a crucial moment, providing the essential capital and guidance needed to replicate and scale the program. The initiative not only empowers entrepreneurs and expands their economic opportunities, but also plays a vital role in helping Massachusetts achieve its supplier diversity and clean energy goals.”

– Nicole Obi, President & CEO of BECMA



Energetics, in partnership with the Automotive Career Development Center, received **\$1.12M** from MassCEC to create a workforce development program focused on fossil fuel workers currently employed as automotive technicians. The program helps upskill workers from environmental justice neighborhoods in their transition to servicing hybrid and electric vehicles, which is a growing segment of the clean energy industry. Launched in March 2024, this program is expected to upskill over **60** participants through 2025.



“We are thrilled to partner with the Automotive Career Development Center and MassCEC to provide essential training to automotive technicians across Massachusetts and prepare the workforce for the growing presence of electric vehicles. This initiative not only strengthens our clean energy workforce, but also prepares technicians and shop owners for an evolving vehicle marketplace.”

– Victoria McGarril, Energetics, CLEAResult Energy Sustainability Consulting

REGIONAL ANALYSIS

The Central Mass and Pioneer Valley Workforce Skills Cabinet (WSC) regions saw the highest rates of clean energy job growth, at **10%** and **9%**, respectively, between the 2023 and 2024 reports.²⁹⁻³⁰ The Berkshire WSC region experienced **5%** growth in clean energy businesses over the same time, with clean energy businesses now representing **7%** of all businesses in the region.

Clean Energy Employment and Businesses in the Workforce Skills Cabinet Regions in Massachusetts, Report Years 2023 – 2024

		2023 Report	2024 Report	2023–2024 Report Change	Percent of Total Clean Energy Jobs / Businesses in 2024	Percent of Total Jobs/Businesses in Region
Berkshire	Employment	3,129	3,284	5.0%	2.8%	5.2%
	Businesses	244	257	5.2%	3.4%	6.8%
Cape Cod	Employment	5,579	5,928	6.3%	5.1%	4.6%
	Businesses	527	544	3.3%	7.2%	4.8%
Central Mass	Employment	17,987	19,724	9.7%	17.1%	5.2%
	Businesses	1,129	1,159	2.7%	15.4%	6.0%
Greater Boston	Employment	38,448	40,725	5.9%	35.3%	2.2%
	Businesses	2,342	2,409	3.1%	32.1%	3.4%
Northeast	Employment	11,001	11,642	5.8%	10.1%	2.7%
	Businesses	815	830	1.9%	11.1%	3.3%
Pioneer Valley	Employment	9,870	10,713	8.5%	9.3%	3.4%
	Businesses	829	845	1.9%	11.3%	5.8%
Southeast	Employment	22,436	23,274	3.7%	20.2%	3.9%
	Businesses	1,430	1,462	2.3%	19.5%	4.3%

²⁹ Source: JobsEQ accessed September 2024. Data Explorer, Industry Data, 4-quarter moving average employment in Massachusetts, 2022 & 2023.

³⁰ Business data is only available at the county level, and the Workforce Skills Cabinet (WSC) regions are determined by zip code. Some counties fall within only one WSC and can be categorized as a single WSC region. Other counties fall within multiple WSC regions, so establishment data from the county level is allocated proportionally between the multiple WSC regions based on employment data per region at the zip code level. Report change growth may be inflated due to state clean energy definition changes.

STATE-BY-STATE COMPARISON

Massachusetts continues to be a leader in clean energy jobs. The Commonwealth ranks **2nd** for total number of clean energy jobs as a percentage of total employment in the state.³¹

Subset Of State Clean Energy Job Rankings, Report Year 2024

TOTAL CLEAN ENERGY JOBS RELATIVE TO STATE WORKFORCE

1	Vermont	4.5%
2	Massachusetts	3.1%
3	Michigan	3.0%
4	Wyoming	2.9%
5	Utah	2.9%
6	Rhode Island	2.8%
7	Tennessee	2.8%
8	California	2.6%
9	Indiana	2.5%
10	Oregon	2.5%

TOTAL CLEAN ENERGY JOBS PER CAPITA

1	Vermont	2.2%
2	District of Columbia	1.9%
3	Massachusetts	1.6%
4	Wyoming	1.4%
5	Michigan	1.3%
6	Utah	1.3%
7	Rhode Island	1.3%
8	North Dakota	1.2%
9	Tennessee	1.2%
10	California	1.2%

TOTAL CLEAN ENERGY JOBS

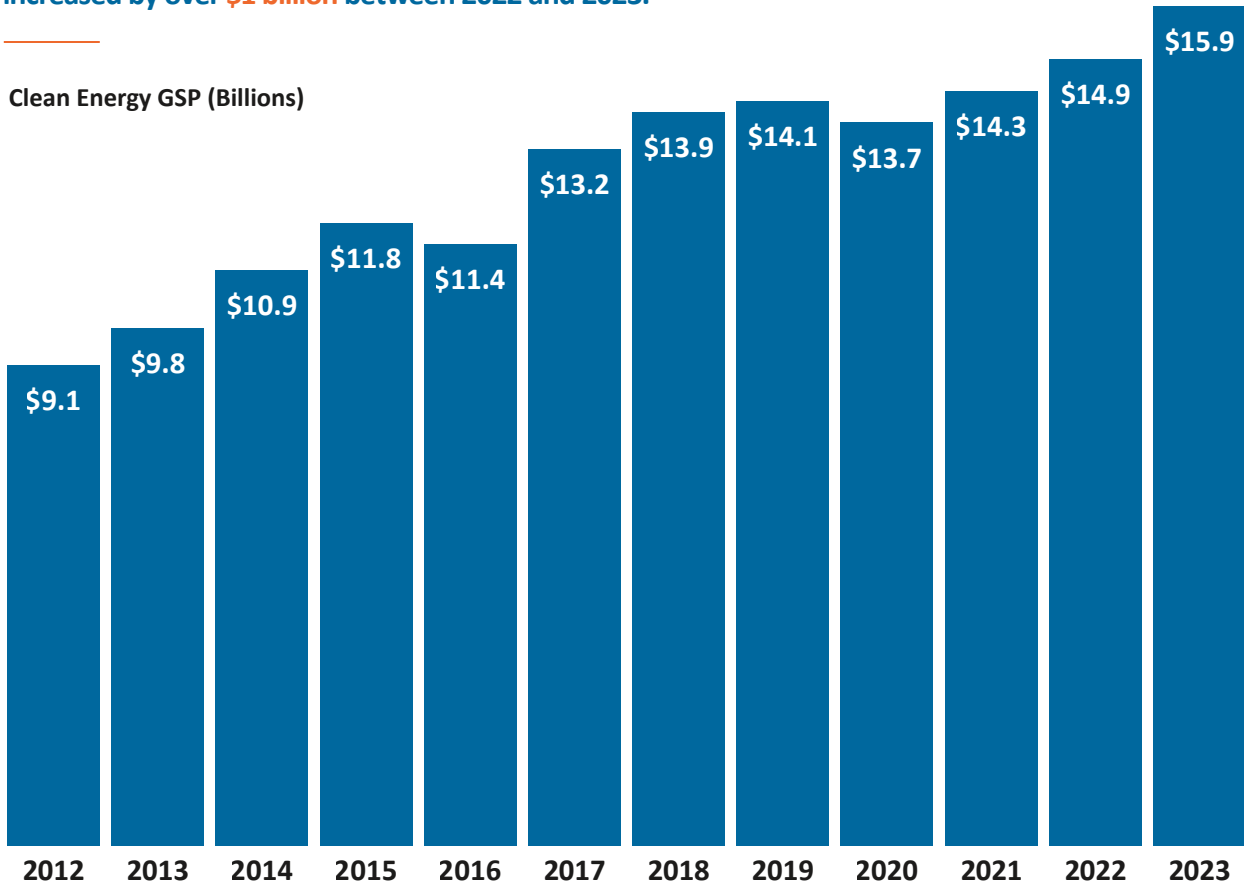
1	California	453,650
2	Texas	254,264
3	Florida	155,732
4	New York	144,215
5	Michigan	130,582
6	Massachusetts	115,291
7	Illinois	106,464
8	Ohio	102,798
9	North Carolina	91,283
10	Virginia	86,677

³¹ These employment values were calculated based on the Massachusetts clean energy definition, which may vary from the definitions of other states or organizations. For example, Massachusetts does not include HVAC or corn ethanol in its clean energy definition, while other states and organizations may. This was done for consistency so that employment values could be compared across states.

CLEAN ENERGY GROSS STATE PRODUCT

The clean energy industry contributed **\$15.9 billion**, or roughly **2%**, to the Commonwealth’s Gross State Product (GSP) in 2023.³² The industry’s GSP increased by **74%** from 2012-2023. This outpaces overall growth in Massachusetts GSP, which grew by **52%** over the same time. Clean energy GSP increased by **7%** between 2022 and 2023, compared to an industry such as Retail Trade, which grew by only **4%** during the same time.

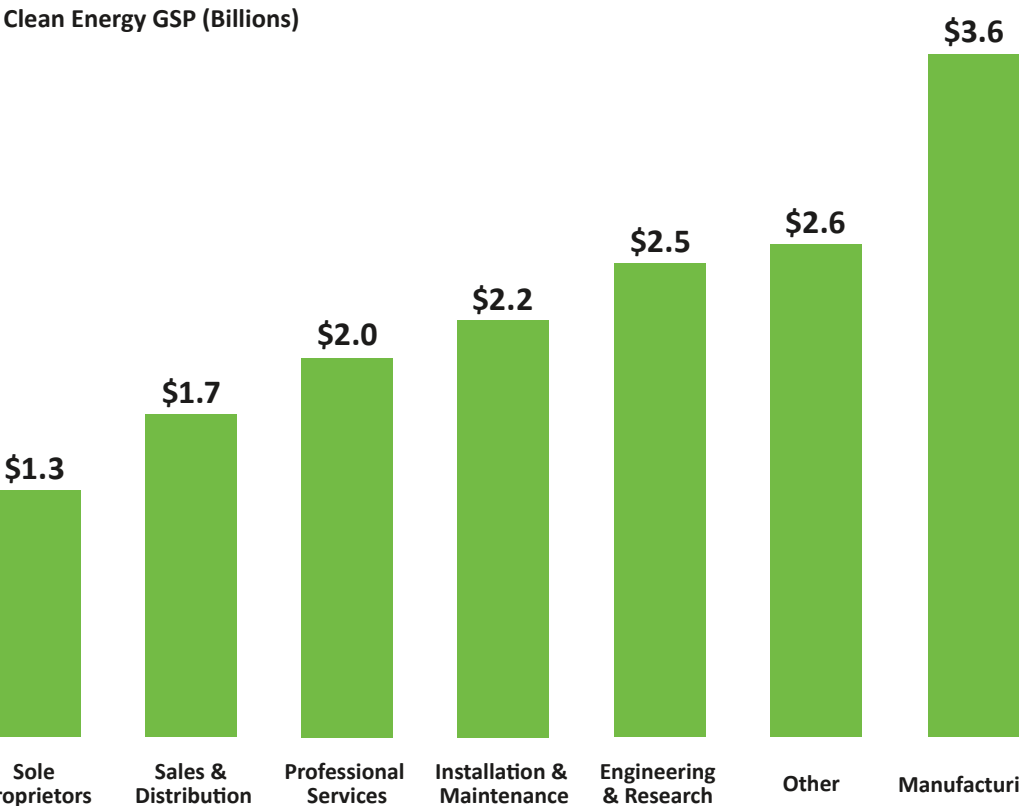
Massachusetts clean energy Gross State Product increased by over **\$1 billion** between 2022 and 2023.



³² 2023 data is the most recent available. The clean energy GSP was derived from survey incidence rates and proportional revenue reporting, together with existing data from the Bureau of Economic Analysis, calculated by NAICS code. Utility data and state government spending were included as direct inputs. Industry data from JobsEq, 2024.



The Manufacturing value chain segment was the largest contributor to the **\$15.9 billion** in Massachusetts clean energy GSP in 2023.



CLEAN ENERGY GROSS STATE PRODUCT BY VALUE CHAIN

The contribution to the Massachusetts clean energy GSP by the Sales & Distribution sector grew by **21%**, and Professional Services grew by **18%** between 2022 and 2023.³³

The Manufacturing sector continues to account for the largest contribution to clean energy GSP, at **23%**, or **\$3.6B**.

³³ 2023 data is the most recent available. The clean energy GSP was derived from survey incidence rates and proportional revenue reporting, together with existing data from the Bureau of Economic Analysis, calculated by NAICS code. Utility data and state government spending were included as direct inputs.

ECONOMIC CONTRIBUTION ANALYSIS

December 2023

For the purpose of this report, only those workers who directly support clean energy activities, such as conducting research, manufacturing products, performing installations, or repairing and maintaining clean energy systems, are included as clean energy workers. However, the impact of the industry is significantly greater than these “direct” jobs alone.³⁴

The clean energy industry has a similar number of direct jobs as the College & University or Scientific Research industries, yet exceeds both industries' economic contribution in indirect and induced jobs and state GSP.

The Massachusetts Clean Energy Industry Is Responsible For a Total Economic Contribution of:

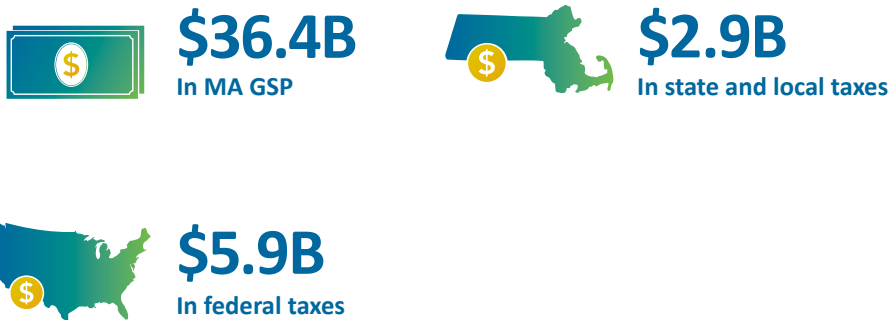


Photo courtesy of Fleet Robotics in Somerville, MA



115,291
DIRECT CLEAN ENERGY JOBS in Massachusetts supported an additional:



43,529
INDIRECT JOBS (those outside of the clean energy sector that provide critical supply chain goods and services)



74,607
INDUCED JOBS (those that result from increased spending in the economy)

233,427 TOTAL
direct, indirect, and induced jobs

³⁴ The economic contribution analysis in this report was calculated using IMPLAN modeling software. The study area was set as the State of Massachusetts, and the event year was set to 2022 since 2023 IMPLAN data was not yet available.

CLIMATETECH: AN ECONOMIC OPPORTUNITY FOR MASSACHUSETTS

Massachusetts is committed to taking a robust approach to addressing the challenges of climate change. “Climatetech” encompasses innovative technological solutions that mitigate the impacts of climate change, help communities adapt, and build resilience in systems and infrastructure.

In 2024, Governor Healey passed the Mass Leads Act, which unlocked funding for MassCEC to support climatetech companies and offshore wind economic development over the next ten years. Additionally, it formally established the climatetech definition within state law and expanded MassCEC’s scope of work beyond clean energy.

Mitigation

Capture or reduce greenhouse gas (GHG) emissions

Adaptation and Resilience

Prepare for, and respond to, the impact of climate change

Energy

Increasing renewable energy generation (e.g., offshore wind), improving energy efficiency, modernizing the grid, and leveraging batteries and energy storage technology.

Transportation

Transitioning to zero-emission vehicles (e.g., electric vehicles), enhancing public transit, and promoting alternative fuel options.

Buildings

We help new climate-focused businesses grow faster by backing a vibrant community of researchers, startups, and established industry players - creating an ecosystem where they connect and thrive.

Adaptation and Resilience

Implementing climate-smart planning, strengthening infrastructure, and promoting nature-based solutions to reduce vulnerability to climate change with a focus on equity.

Industry and Manufacturing

Adopting carbon-reducing technologies and processes, and implementing sustainable production practices through a circular economy.

Agriculture, Food, and Nature

Adopting sustainable farming and forest management practices, developing alternative proteins, and leveraging nature-based solutions.

Carbon Management

Developing and deploying carbon removal technologies, including bioenergy with carbon capture, direct air capture, and blue carbon technology.



Photo courtesy of Osmoses in Cambridge, MA

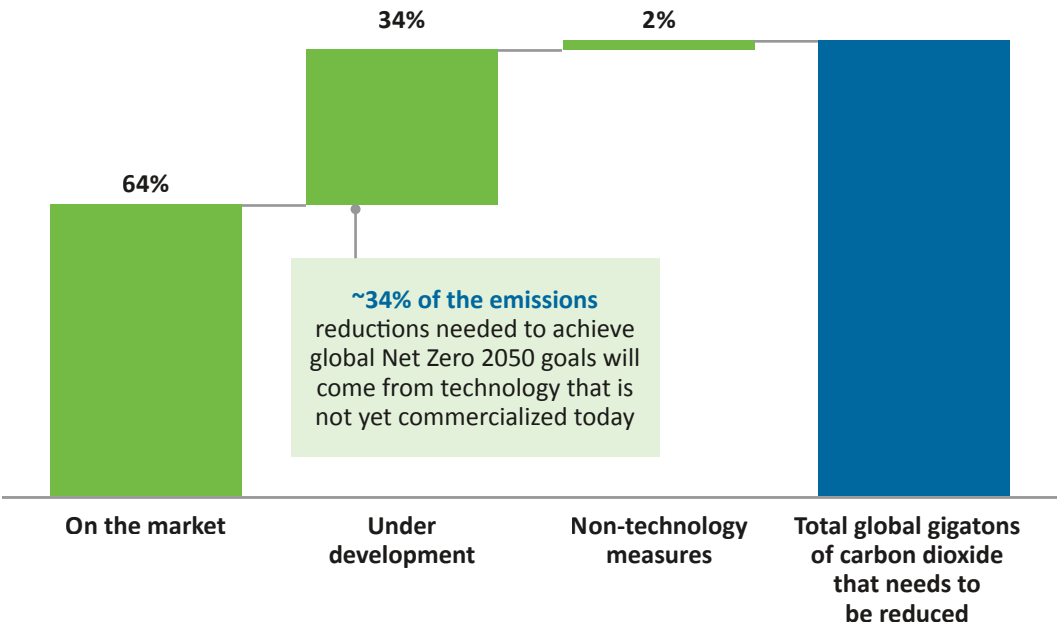
BREAKTHROUGH TECHNOLOGIES

Climatetech advancements will play a crucial role in Massachusetts reducing its greenhouse gas (GHG) emissions from ~64 million metric tons of carbon dioxide equivalent to its net zero GHG emissions goal by 2050.³⁵ On a global scale, about **34%** of emissions reductions will come from technologies that are not yet commercially available.³⁶ MassCEC’s support of emerging climatetech will be critical to help bridge this market gap while creating increased economic opportunities within the Commonwealth.

³⁵ www.mass.gov/info-details/massachusetts-clean-energy-and-climate-metrics

³⁶ International Energy Agency: Net Zero Roadmap <https://www.iea.org/reports/net-zero-roadmap-a-global-pathway-to-keep-the-15-0c-goal-in-reach>

Stage Of Development for Technology Required To Reach Global 2050 Net Zero Goals (2024)



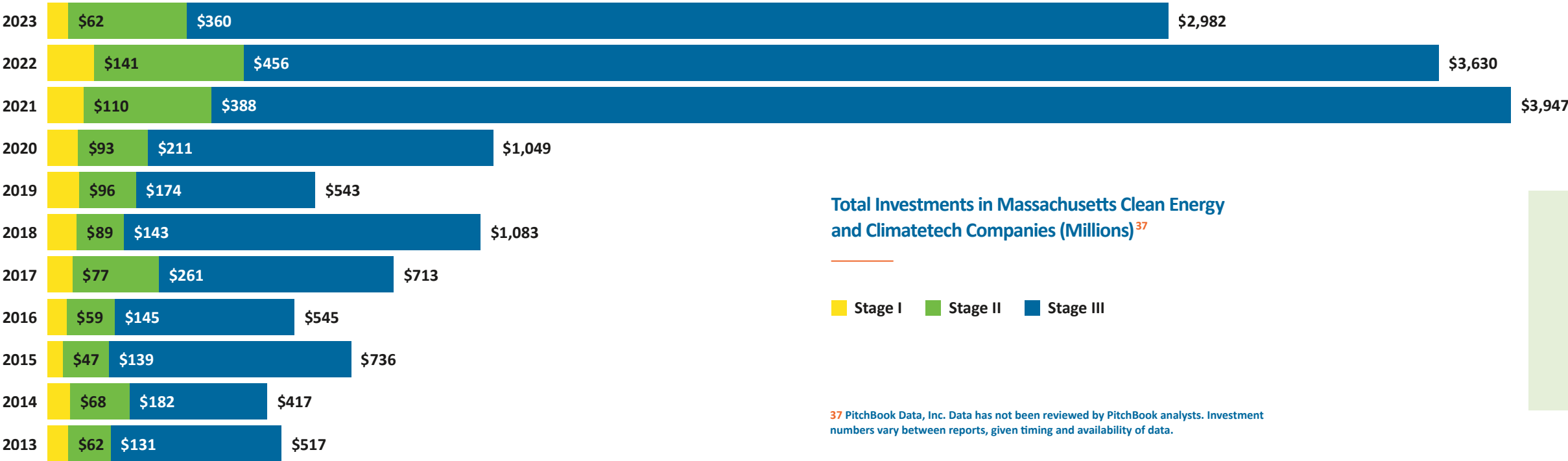
EMERGING CLIMATETECH INVESTMENTS

A robust innovation network is a key driver of the Massachusetts clean energy industry. Innovation support can take numerous forms, including ecosystem support, grants, and direct company investments.

Investments in clean energy companies can be divided into three stages:

- STAGE I:** Research & Prototyping – Companies at the ideation, theoretical research, and prototype development stage.
- STAGE II:** Demonstration & Acceleration – Companies at the product testing, system evaluation, and market research stage.
- STAGE III:** Commercialization & Growth – Companies that are expanding manufacturing capacity and identifying early-stage customers.

There has been a decline in clean energy and climatetech venture capital deal activity in Massachusetts following its peak in 2021, reflecting broader venture capital market trends. There are signs of an investor retreat, both from risky early-stage ventures as well as deals in more established companies. At the earliest stage, lower deal count has led to a notable decline in total investment: 2023's Stage I deals had the lowest total dollars invested since 2016.



Total Investments in Massachusetts Clean Energy and Climatetech Companies (Millions)³⁷

Stage I Stage II Stage III

³⁷ PitchBook Data, Inc. Data has not been reviewed by PitchBook analysts. Investment numbers vary between reports, given timing and availability of data.

\$3.4B was invested across all three stages in early-stage Massachusetts climatetech companies in 2023.

MassCEC Spotlight

MASSCEC’S 2030 FUND

MassCEC launched the **\$50M 2030 Fund** in 2022 to strategically invest in Massachusetts-based startups and provide funding for teams solving critical climate problems. The fund signals to the market that Massachusetts is increasing its commitment to the commercialization of climate technologies and filling the gap created by a reduction in private venture capital.

MassCEC’s 2030 Fund helps de-risk innovative technology, assists companies in reaching early commercial milestones, and attracts growth funding. MassCEC's strategy is to attract and leverage significant private venture capital alongside all investments.

Catalytic Capital: Value Created by MassCEC Investment Activities Since 2014



The 2030 Fund investment portfolio consists of 29 companies³⁸ across 7 areas of focus. Since 2014, MassCEC has invested almost **\$22M**, of which over **\$15M** has been recouped through exits to date.

To Learn More: www.masscec.com/program/2030-fund

³⁸ Includes 8 investments made prior to the launch of the 2030 Fund.

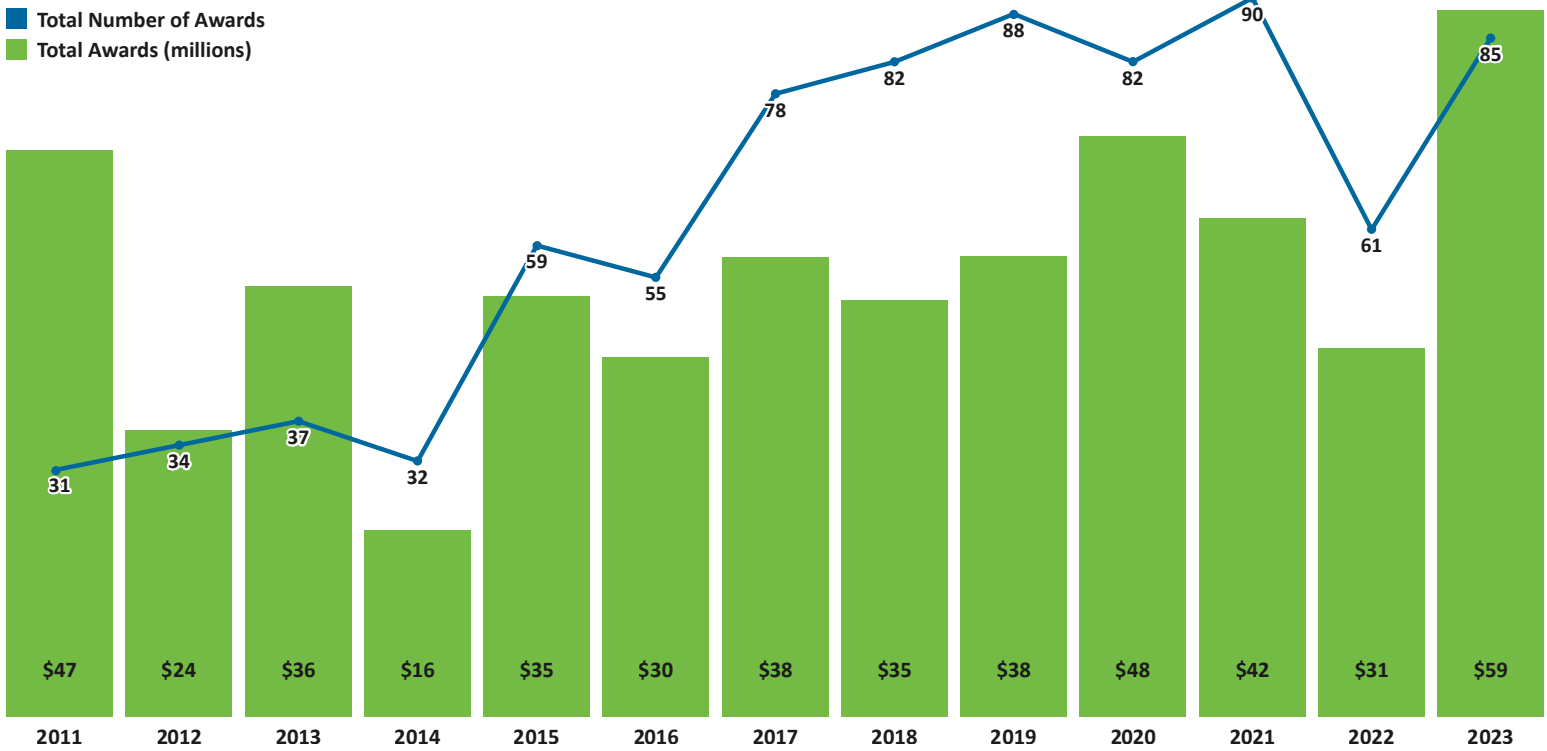
Total Portfolio by Area



EMERGING CLIMATETECH GRANTS

Public clean energy innovation grant and award funding for Massachusetts entities has increased for the first time since 2020.³⁹ From 2022 to 2023, innovation funding increased by **92%**, and the number of awards increased by **39%**. This increase is likely in part due to the deployment of funds from the Inflation Reduction Act and the Bipartisan Infrastructure Law.

Total public sector grants received by all Massachusetts climatetech companies and partners for innovation, project demonstrations, and pilots.³⁹



Public sector support is critical for the growth of climatetech companies, project demonstrations, and pilots.

³⁹ Sources include MassCEC innovation funding, ARPA-E, Office of Science, SunShot, SBIR, and STTR.

ACCELERATING TECHNOLOGY TO MARKET

MassCEC’s technology-to-market programs help new climatetech businesses grow faster by backing a vibrant community of researchers, startups, and established industry players - creating an ecosystem where they connect and thrive.

To Learn More: www.masscec.com/masscec-funding/technology-market

Tech to Market Program Impact



475 Awards



84% Startup Awardees Still in Business



6,208 New Hires



\$53M+ Awarded



\$350M+ Leveraged

⁴⁰ Cleantech Open Northeast Impact Report: www.canva.com/design/DAGaH0Osu0c/hlYKfILG4U9ivtKIRKXY7w/view



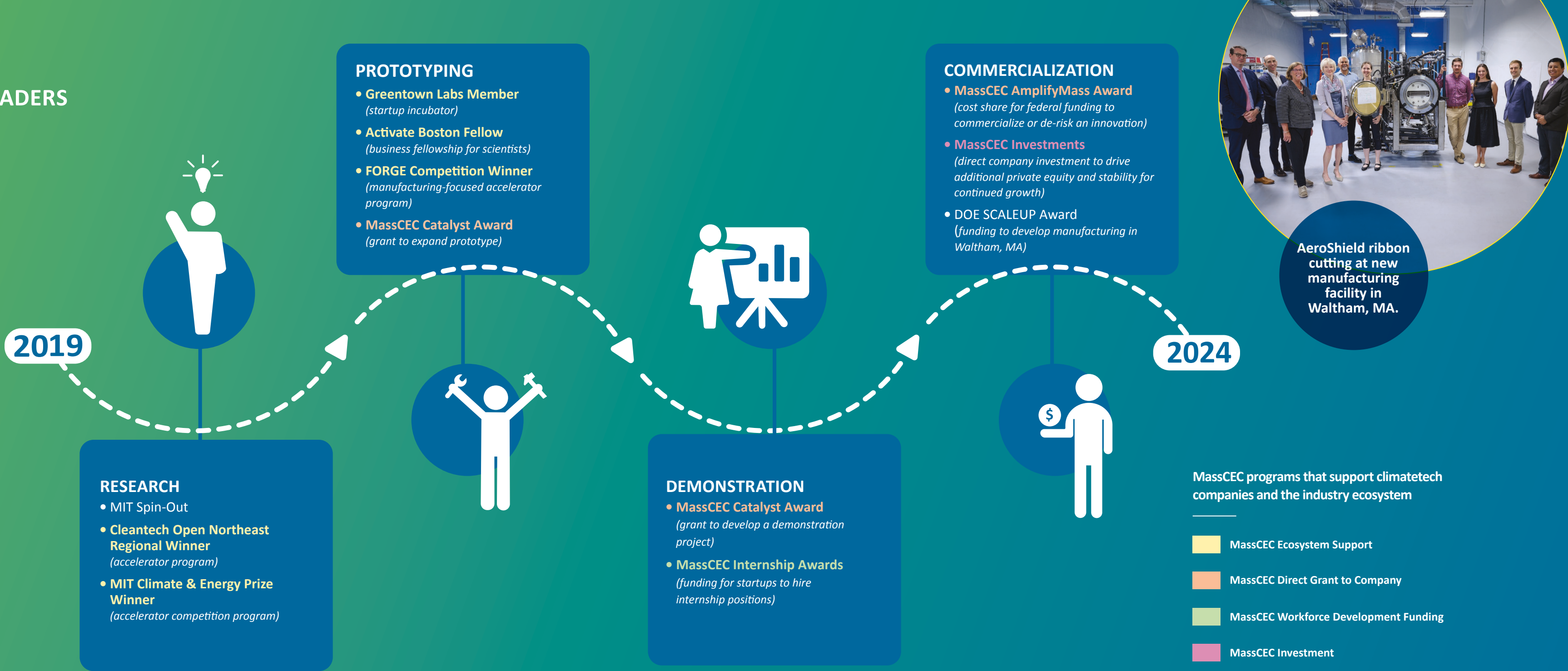
Through the Innovation Ecosystem Support program, MassCEC assists Massachusetts entrepreneur support organizations to provide robust support for climatetech startup companies. In 2024, MassCEC provided Cleantech Open Northeast, run by the Alliance for Climate Transition, a **\$120k** grant to support its accelerator program. The program provided companies with expert mentoring, professional connections, opportunities to compete for cash prizes, and access to goods and services. Since 2005, Cleantech Open Northeast, which spans from Eastern Canada to Virginia, has supported **642** companies, of which **62%** are still active or have had a successful exit. These companies have gone on to raise over **\$2B** in investments, created over 7,800 jobs, and generated over **\$697M** in revenue.⁴⁰

EMERGING CLIMATETECH LEADERS

Early-stage clean energy and climatetech companies often face funding gaps that threaten their path to commercial success. MassCEC's Emerging Climatetech programs help to fill these gaps with grant funding, equity and debt investments, and hands-on commercial and technical support for founders and startups. These programs support companies as they de-risk technology, reach commercial milestones, attract private capital, and grow their businesses in the Commonwealth and beyond.

AeroShield

AeroShield Materials has developed a transparent silica aerogel insert that enables affordable and highly energy-efficient windows, helping to save energy and costs, improve resiliency and reduce emissions from the built environment. MassCEC grant funding and investment capital have helped AeroShield in its prototyping, demonstration, and early commercial stages. Most recently, the company secured **\$5M** in financing from MassMutual Ventures, MassVentures, MassCEC, and other investors, and won a **\$14.5M** grant from the Department of Energy, enabling it to begin building its **first** manufacturing facility in Waltham, Massachusetts.



METHODOLOGY

The Massachusetts 2024 Clean Energy Industry Report uses publicly available data from the 2024 U.S. Energy and Employment Report (USEER)⁴¹ on Massachusetts energy employment produced by BW Research Partnership on behalf of the U.S. Department of Energy (DOE). These public data are refined and customized for Massachusetts based on additional analyses conducted by BW Research Partnership on behalf of the Massachusetts Clean Energy Center.

The 2024 USEER survey in Massachusetts was administered by telephone with approximately **28,100** outbound calls in Massachusetts, as well as by web, with more than **11,800** emails sent to potential participants across the state.

In total, **1,088** business establishments in Massachusetts participated in the survey effort, with **414** providing full responses to the survey. These responses were used to develop incidence rates among industries as well as to apportion employment across various industry categories in ways currently not provided by state and federal labor market information agencies. The margin of error is +/- 4.80 percent at a **95** percent confidence level.

See the full Expanded Methodology for more details on the 2024 Massachusetts Clean Energy Industry Report.⁴²

All MassCEC metrics since 2010 and the MassCEC Spotlight Metrics were compiled from awardee data and other internal data sources.

⁴¹ The full 2024 USEER report can be found at: www.energy.gov/policy/us-energy-employment-jobs-report-useer.

⁴² The 2024 Clean Energy Industry Report Expanded Methodology can be found at: <https://reports.masscec.com/2024/methodology-and-glossary/>

GLOSSARY

A

Advanced and Recycled Building Materials

Includes doors, windows, air sealing, floor, wall, or piping insulation, and any additional building envelope materials that represent advances in efficiency over traditional materials.

B

Battery Storage

A cell or connected group of cells used to convert chemical energy into electrical energy by reversible chemical reactions and may be recharged by passing a current through it in the direction opposite to that of its discharge.

Biofuels and Renewable Combined Heat and Power

Generates electricity and useful thermal energy in a single, integrated system from renewable sources. Heat that is normally wasted in conventional power generation is recovered as useful energy.

C

Clean Energy

Clean Energy is defined as any technology that either reduces or eliminates greenhouse gas emissions

from the generation, distribution, and consumption of electricity and fuels. The major sectors of the clean energy industry include Renewable Energy Generation; Energy Efficiency and Demand Management, Clean Heating and Cooling; Clean Transportation; and Other Sectors.

Clean Energy Business or Establishment

For the purpose of this report, a clean energy business or establishment is a business location in Massachusetts with at least one employee involved with an activity related to the clean energy industry.

Clean Energy Industry

The aggregate of establishments that are directly involved with researching, developing, producing, manufacturing, distributing, or implementing components, goods, or services related to Renewable Energy Generation, Energy Efficiency and Demand Management, Clean Heating and Cooling, Clean Transportation, and Other Sectors.

Clean Energy Worker

Full-time and part-time permanent employees who support the clean energy portion of the business, including administrative staff, and excluding interns and other temporary workers.

Clean Heating and Cooling

This refers to businesses that are involved with heating, ventilation, and

air conditioning (HVAC) from renewable energy sources or perform work that increases the energy efficiency of HVAC systems. This includes Solar Thermal, High-Efficiency Air-Source Heat Pumps, HVAC and Building Controls, Ground-Source Heat Pumps, Biofuels and Renewable Combined Heat and Power, Clean, High Efficiency, and ENERGY STAR Heating and Cooling.

Clean, High Efficiency, and ENERGY STAR Heating and Cooling

Includes ENERGY STAR/High AFUE HVAC and Renewable Heating and Cooling.

Clean Transportation

Clean Transportation includes non-fossil fuel-related vehicles, including Electric Vehicles, Hybrid Electric Vehicles, Plug-In Hybrid Vehicles, and Other Clean Transportation.

Demand Response Services

Operations that balance energy supply and demand. Include offering time-based rates such as time-of-use pricing, critical peak pricing, variable peak pricing, real-time pricing, and critical peak rebates. It also includes direct load control programs, which provide power companies with the ability to cycle air conditioners and water heaters on and

off during periods of peak demand in exchange for a financial incentive and lower electric bills.

E

Electric Vehicles

A vehicle that uses one or more electric motors for propulsion with no onboard generator or non-electric motor. This includes electric passenger or freight cars, trucks, or buses that use electric drive systems and electric motors for propulsion.

Energy Efficiency and Demand Management

Goods and services that reduce electricity demand, including energy efficiency upgrades to existing buildings (retrofitting and retrocommissioning) and installation of ENERGY STAR Appliances. Includes Energy Storage, Advanced and Recycled Building Materials, Demand Response Services, Smart Grid, Micro Grid, Other Grid, Other Grid Modernization, Water and Wastewater Technologies related to Conserving Energy, Electric Vehicles, ENERGY STAR Appliances, LED, CFL, and Other Efficient Lighting, and Other Energy Efficiency.

ENERGY STAR Appliances

Appliances that meet the international ENERGY STAR standard for energy-efficient consumer products originated in the United States.

ENERGY STAR/High AFUE HVAC

HVAC that meets the international ENERGY STAR standard for energy-efficient consumer products originated in the United States or has a high Average Fuel Utilization Efficiency (AFUE) rating of 90 or greater, or 15 SEER or greater.

Energy Storage

Devices or physical media that store energy. Includes Pumped Hydro Storage, Battery Storage, Mechanical Storage, and Thermal Storage.

Engineering & Research

Engineering & Research includes all engineering and scientific research businesses engaged in clean energy projects and technology development.

G

Gross State Product

Gross State Product (GSP) is a measurement of a state's output. It is the sum of value added from all industries in the state. In this report, clean energy is captured as a portion of the total Gross State Product.

Ground-Source Heat Pumps

Central heating and/or cooling that moves heat from or to the ground from a structure.

H

High-Efficiency Air-Source Heat Pumps

Transfers heat between a structure and the outside air efficiently.

HVAC and Building Controls

Heating, ventilation, and air conditioning systems, including building retro-commissioning and retrofits connected to heating and cooling.

Hybrid Electric Vehicles

Vehicles that use two or more distinct types of power, such as an internal combustion engine plus an electric motor.

Hydropower

Electricity generated by hydropower; the production of electrical power through the gravitational force of falling or flowing water.

I

Installation

Installation is comprised of businesses engaged in residential, commercial, and industrial building construction, contracting, electrical, insulation and weatherization, or plumbing and heating, air conditioning, and ventilation work.

L

LED, CFL, and Other Efficient Lighting

Energy-efficient lighting sources.

M

Manufacturing

Manufacturing refers to heating and air conditioning equipment manufacturing, engine and compressor manufacturing, semiconductor manufacturing, and energy-efficient products, appliance or lighting manufacturing, as well as motor vehicle and parts manufacturing and, solar panel and wind assembly.

Mechanical Storage

Includes technologies like flywheels and compressed air, which use kinetic or gravitational forces to store energy.

Micro Grid

A group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that act as a single controllable entity with respect to the grid.

O

Other Clean Transportation

Includes jobs in transportation technologies, such as biodiesel for on-road vehicles.

Other Biofuels

Other fuels derived directly from living matter.

Other Energy Efficiency

Includes: variable speed pumps; other design services not specific to a detailed technology; software not specific to a detailed technology; energy auditing,

rating, monitoring, metering, and leak detection; policy and nonprofit work not specific to a detailed technology; consulting not specific to a detailed technology, LEED certification, or phase-change material; and all other activities not specific to a detailed technology.

Other Grid

This sub-technology includes all other clean grid activities where employers were unable to assign work to a single sub-technology. This includes firms that conduct clean grid activity across multiple sub-technologies.

Other Grid Modernization

Other modernization of the nation’s electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth.

Other Renewable Energy Generation

Includes geothermal, bioenergy or biomass, low-impact hydro, and other electric power generation technologies that are not defined by the categories presented or cannot be assigned to a single category.

Other Sectors

Consists of all jobs that could not be classified into one specific clean energy technology sector because the work overlaps with multiple categories. An example of this could be greenhouse gas management or accounting.

P

Plug-In Hybrid Vehicles

A hybrid electric vehicle that uses two or more distinct types of power, such as internal combustion engine and an electric motor that is powered by rechargeable batteries, or another energy storage device, which can be recharged by plugging into an external source of electric power.

Professional Services

Professional Services refers to any sort of financial, legal, architectural, mathematical, or scientific services that support clean energy technology development and deployment.

Pumped Hydro Storage

Hydroelectric energy storage used by electric power systems for load balancing. The method stores energy in the form of gravitational potential energy of water pumped from a lower-elevation reservoir to a higher elevation.

R

Reduced Water Consumption Products and Appliances

Includes technologies such as high-efficiency washing machines, faucet aerators, and low-flow shower heads.

Renewable Energy Generation

Any businesses that are involved in the manufacturing, sale, installation, or research and development of renewable

electricity generation technologies. Includes Solar, Wind, Hydropower, and Other Renewable Energy Generation.

Renewable Heating and Cooling

Refers to establishments that are involved with heating, ventilation, and air conditioning (HVAC) and water heating from renewable energy sources or work that increases the energy efficiency of HVAC systems.

S

Sales & Distribution

Sales & Distribution includes mostly wholesale trade as well as some warehousing and distribution activity. For clean energy, this value chain category includes motor vehicles and parts wholesalers, electrical equipment, and household appliance wholesalers, plumbing and heating equipment and supplies wholesalers, and other wholesalers related to clean energy products, component parts, and technologies.

Sectors

For the purpose of this report, the sector refers to the primary application or end use of an establishment’s produced goods or services. The clean energy industry sectors include Renewable Energy Generation; Energy Efficiency and Demand Management; Clean Heating and Cooling; Clean Transportation; and Other Sectors.

Smart Grid

Automated, computer-based electricity supply network, including smart computing and software, which detects and reacts to local changes in electricity usage.

Solar

Technologies that generate electric power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect.

Solar Thermal

Technology that uses the sun’s energy to generate thermal energy.

Sub-Sectors

For the purpose of this report, sub-sectors refer to the specific technologies with which an establishment works within each sector. The sectors include Renewable Energy Generation, Energy Efficiency and Demand Management, Clean Heating and Cooling, and Clean Transportation.

T

Thermal Storage

Temporary storage of energy for later use when heating or cooling is needed.

U

Utilities, Nonprofits, and Other

This segment is largely comprised of automotive repair and maintenance, but also includes organizational and non-profit work, such as environmental and conservation organizations, business associations, and advocacy organizations, as well as electric power generation and distribution utilities.

V

Value Chain Segments

The clean energy industry value chain segments include Engineering and Research, Installation, Manufacturing, Professional Services, Sales and Distribution, and Utilities, Nonprofits, and Other.

W

Water and Wastewater Technologies Related to Conserving Energy

Products related to reducing energy for water purification, distribution, or treatment.

Wind

Technologies that convert the wind’s kinetic energy into electrical power.



Scan the QR code to read the interactive report, or visit
<https://reports.masscec.com/2024/>



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