Energy Workforce Analysis

By Cameron Salo

Background

As Massachusetts and Rhode Island transition to a clean energy economy, workforce development is key to ensuring economic growth, sustainability, and energy security. Expanding renewable energy infrastructure, modernizing the grid, and implementing energy efficiency measures require a skilled labor force. Massachusetts, New Bedford, Rhode Island, and Providence are actively investing in training programs and economic initiatives to support this transition, with a strong focus on equitable access to employment.

Massachusetts leads the region of New England in clean energy job creation, with significant investments in solar, offshore wind, and energy storage. The state's ambitious climate goals necessitate a workforce skilled in electrical work, HVAC installation, and offshore wind maintenance. New Bedford has become a national leader in offshore wind workforce development, ensuring local workers, including veterans and previously incarcerated individuals, benefit from job opportunities created by the Vineyard Wind Project and other renewable energy initiatives. Rhode Island focuses on a just transition, implementing policies that expand clean energy jobs for underrepresented communities while investing in microgrids, advanced metering, and solar energy expansion. Project Labor Agreements (PLAs) ensure fair wages and safe conditions, while the Renewable Energy Standard (RES) mandates 100% renewable electricity by 2033, creating further demand for solar, energy storage, and HVAC professionals. Providence integrates workforce training with renewable energy projects, prioritizing pathways for disadvantaged workers while supporting the city's broader economic development goals.

Despite these advancements, challenges persist, including labor shortages, workforce diversity gaps, and equitable access to high-paying clean energy jobs. Addressing these barriers is critical to sustaining the clean energy workforce and ensuring long-term economic benefits. This paper explores workforce development strategies in Massachusetts and Rhode Island, highlighting key training programs, economic investments, and labor policies shaping the future of energy employment in the region.

Grid modernization and maintenance

Grid modernization and maintenance initiatives in Massachusetts and Rhode Island are critical to creating jobs, improving energy efficiency, and building resilience against climate change. In Massachusetts, grid modernization is projected to create 1,645 direct jobs by 2027, with an additional 11,902 jobs expected from installing high-voltage transmission infrastructure by 2040. These grid upgrades are estimated at $514.3 million by 2026, while new high-voltage transmission infrastructure could cost up to $3.72 billion by 2040. These investments underscore the state's commitment to a modern, reliable energy grid that meets future demands.[1]

The City of New Bedford, Massachusetts, is at the forefront of this transition, aiming to lead in climate and energy solutions through an ambitious energy grid modernization plan. Central to New Bedford's goal is achieving 100% renewable energy by 2050. In the near term, the city is working to reduce energy consumption across residential, municipal, and commercial sectors by 35% by 2030, using 2013 levels as a baseline. Concurrently, New Bedford plans to cut community-wide greenhouse gas emissions by 35% compared to 2017 levels by 2030, positioning itself for net-zero emissions by 2050. The city's efforts include enhancing system resilience against extreme weather and peak demand by partnering with key stakeholders to

[1] Hoek Spaans, Avalon, et al. Cornell University School of Industrial and Labor Relations, 2024, *Building the Clean Energy Commonwealth: A Climate Jobs Roadmap for Massachusetts*, https://www.ilr.cornell.edu/sites/default/files-d8/2024-05/Building%20the%20Clean%20Energy%20Commonwealth.pdf. Accessed Aug. 2024.Pg 34-35

strengthen energy infrastructure. Already, New Bedford has demonstrated its commitment to sustainable energy development by replacing 8,000 street and traffic lights with energy-efficient LEDs, adding 23 electric vehicles to its municipal fleet, and installing over 400 residential rooftop solar systems. Additionally, the city has saved residents $4 million through energy aggregation since June 2014.[2]

In Rhode Island, grid modernization is projected to create 1,867 direct jobs by 2030 under a scenario that emphasizes distributed energy resources and advanced metering technologies. To create high-quality jobs, the state plans to require Project Labor Agreements (PLAs) for all transmission and modernization work, ensuring that highly skilled workers fill these jobs in a safe environment. The PLA also aims to foster pathways into the construction industry for under-resourced communities, contributing to economic equity. The cost of Rhode Island's grid modernization efforts is estimated at $583 million, positioning the state for a more resilient, efficient, and future-proof electrical grid.[3] In Rhode Island, most utility meters are essential devices that record monthly energy usage without detailed insights or real-time communication. These older meters are nearing the end of their lifespan, highlighting the need for an upgrade. In November 2022, Rhode Island Energy submitted an Advanced Metering Functionality (AMF) proposal to the Public Utilities Commission to modernize the grid. Advanced meters enable time-varying utility rates, helping customers better control their energy consumption and costs. They also improve visibility into the electric grid, supporting more

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[2] Office of Environmental Stewardship , & City of New Bedford , NB Resilient: Climate & Energy (2021). NB Resilient. Retrieved September 2024, from https://kladashboard-clientsourcefiles.s3.amazonaws.com/New+Bedford/New_Bedford_FACTSHEET_Climate_FINAL.pdf

[3] Skinner, L., Mijin Cha, J., Hoek Spaans, A., Moskowitz, H., & Raman, A. (2022). (rep.). *Building A Just Transition For A Resilient Future : A Climate Jobs Program for Rhode Island*. Cornell University School of Industrial and Labor Relations. Retrieved August 2024, from https://www.cjnrc.org/wp-content/uploads/2022/02/Rhode-Island-Report-Final-2.3-Compressed.pdf. Pg 26

intelligent energy distribution and grid modernization efforts. By integrating these advanced meters, Rhode Island can enhance efficiency, improve consumer energy management, and align with broader efforts to update and optimize the state's utility infrastructure. This transition is a critical step in advancing Rhode Island's energy future.[4]

Renewable energy infrastructure development

Renewable energy infrastructure development in Massachusetts and Rhode Island is rapidly advancing, with substantial investments in solar power, offshore wind, and energy storage, all of which promise significant economic and environmental benefits. In Massachusetts, solar power infrastructure, with a capacity of 30 Gigawatts, requires an investment of $77.3 billion and is expected to create 293,664 direct jobs. Offshore wind, projected to generate 26 GW, demands a significantly smaller investment of $8.5 billion yet will create 30,634 jobs. Energy storage solutions, accounting for 6 GW, will involve an expenditure of $1.04 billion, resulting in 3,636 jobs. In addition to the economic benefits, these renewable energy projects contribute to massive emission reductions: solar energy is set to avoid 33,895,999 metric tons of CO2 emissions, offshore wind will prevent 77,315,161 metric tons, and energy storage will reduce emissions by 160,358 metric tons of CO2 equivalent. These developments are a testament to Massachusetts' commitment to transitioning toward cleaner energy sources.[5]

The City of New Bedford leads by example with significant solar and wind energy advancements. The city government has installed over 16 MW of solar power across various

[4] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

[5] Hoek Spaans, Avalon, et al. Cornell University School of Industrial and Labor Relations, 2024, *Building the Clean Energy Commonwealth: A Climate Jobs Roadmap for Massachusetts*, https://www.ilr.cornell.edu/sites/default/files-d8/2024-05/Building%20the%20Clean%20Energy%20Commonwealth.pdf. Accessed Aug. 2024.Pg 32-33

facilities, producing enough electricity to power more than 2,500 homes. New Bedford residents have added 11 MW of solar capacity on private properties, further contributing to the city's renewable energy goals. A key highlight of New Bedford's clean energy journey is the Vineyard Wind project, the first large-scale offshore wind farm in the United States. Once operational, it will produce 800 MW of electricity to power over 400,000 homes. Despite these accomplishments, New Bedford continues to rely heavily on natural gas and petroleum products for energy. To lower greenhouse gas emissions, the city is actively working to transition toward electricity powered by renewable energy sources.[6]

Rhode Island's Renewable Energy Standard (RES), established in 2004 and updated in 2022, sets an ambitious goal of achieving 100% renewable energy by 2033. This policy requires electric distribution companies and independent power producers to gradually increase the share of renewable energy in their retail electricity supply by purchasing and retiring Renewable Energy Certificates (RECs). Achieving this standard could significantly reduce greenhouse gas emissions, potentially eliminating emissions from the electric sector entirely, which accounted for 18.9% of the state's total emissions in 2019. The RES establishes a schedule of annual targets, starting with a 4% increase in renewable electricity sales in 2023 ramping up to a 9.5% increase in 2032 and 2033. Additionally, municipalities participating in aggregation programs are encouraged to include voluntary renewable energy products to help meet these goals. This updated RES positions Rhode Island as a leader in the transition to a clean energy future, aligning with the state's broader climate objectives.[7] The state has set ambitious renewable energy targets for the coming decades. By 2030, Rhode Island aims to install 900 MW of solar

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[6] Office of Environmental Stewardship , & City of New Bedford , NB Resilient: Climate & Energy (2021). NB Resilient. Retrieved September 2024, from https://nbresilient.com/category/climate-and-energy

[7] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

energy across utility, commercial, and residential sectors, with a long-term goal of 2,000 MW by 2040. The state is also expanding its offshore wind capacity, aiming for 1,300 MW by 2030 and 3,000 MW by 2040. To support these renewable energy initiatives, Rhode Island plans to modernize its electrical grid by 2030, ensuring it can efficiently manage and distribute the increased renewable energy production. These plans will help Rhode Island position itself as a leader in renewable energy infrastructure, supporting the state's long-term sustainability goals.[8]

Rhode Island continues to make significant strides in renewable energy development through its energy efficiency initiatives. In 2021, the General Assembly extended requirements for energy efficiency programs through 2029, providing expanded benefits to customers of Pascoag Utility District and Block Island Utility District. One key outcome has been the widespread adoption of energy-efficient LED lighting, driven by earlier program incentives that lowered consumer costs. With LEDs now standard, these programs are shifting focus to support advanced technologies, such as high-efficiency HVAC systems, building automation, and improved weatherization practices. Rhode Island's proactive approach demonstrates its dedication to sustainable energy solutions, reducing overall energy consumption, and paving the way for more resilient, environmentally friendly infrastructure statewide.[9] Installing geothermal systems can be complex and costly for individual homeowners, often requiring specialized engineering and significant upfront investment. With their expertise in managing large-scale infrastructure projects, gas utilities are particularly suited to overcoming these challenges. Recognizing this, Rhode Island's Office of Energy Resources (OER) plans to collaborate with

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[8] Skinner, L., Mijin Cha, J., Hoek Spaans, A., Moskowitz, H., & Raman, A. (2022). (rep.). *Building A Just Transition For A Resilient Future : A Climate Jobs Program for Rhode Island*. Cornell University School of Industrial and Labor Relations. Retrieved August 2024, from https://www.cjnrc.org/wp-content/uploads/2022/02/Rhode-Island-Report-Final-2.3-Compressed.pdf. Pg 6

[9] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

utilities over the next one to three years to explore the feasibility and potential benefits of implementing district-scale geothermal systems, paving the way for more accessible and sustainable energy solutions.[10]

Reducing methane leaks in the gas system is essential for cutting Rhode Island's emissions. However, the long-term effectiveness of the Leak Prone Pipe Replacement Program must be reassessed in light of the Act on Climate's objectives. Replacing gas mains through this program locks the state into gas infrastructure for 50-100 years, far beyond the 2050 deadline for achieving net-zero emissions. With the limited availability of low-carbon gas alternatives and uncertain future costs for decarbonized gas, it's critical to avoid expanding or reinforcing infrastructure that may not be cost-effectively decarbonized. Moving forward, Rhode Island should prioritize innovative non-pipe alternatives (NPA) that align with the state's climate goals and offer a more sustainable path for energy infrastructure development.[11] Rhode Island's Renewable Energy Fund (REF), managed by CommerceRI, supports renewable energy development through grants. Since its launch in 2014, the program has awarded nearly $3.7 million to close to 500 projects, contributing over 11 MW of renewable energy to the grid. In 2020, the REF introduced incentives for solar installations on brownfields—previously industrial or commercial sites impacted by contamination. Utilizing these locations for solar projects not only repurposes disturbed land but also helps protect open spaces, forests, and farmland from development pressures. Additionally, the REF began piloting enhanced incentives for solar projects combined with battery storage. These systems store renewable energy for use when

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[10] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

[11] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

demand is high, alleviating grid strain, improving reliability, and providing backup power during outages.[12]

Providence, Rhode Island, is also making significant progress in expanding its renewable energy infrastructure. The city operates a large net metering project that currently generates about half of the energy used by the city government and the Providence Public School District (PPSD). Though the developer currently owns this project's Renewable Energy Credits (RECs), Providence will take ownership of these credits starting in 2029, allowing the city to apply them toward its carbon neutrality goals. In addition to this project, Providence is expanding its solar capacity by installing rooftop solar panels at five locations, generating 722 kW of electricity. Feasibility studies are also being conducted to identify additional buildings that could accommodate rooftop solar or solar canopies, further reducing the city’s reliance on non-renewable energy sources.

Creation of Microgrids

The development of microgrids in Massachusetts and Rhode Island is emerging as a vital component of modern energy strategies aimed at enhancing energy resilience and sustainability. In Massachusetts, implementing microgrids is projected to create 320 direct jobs by 2030, with an estimated cost of $100 million. In New Bedford, creating microgrids is a key part of the city’s broader energy strategy. Recognizing the intermittent nature of renewable energy sources such as solar and wind, New Bedford views microgrids as a way to provide a consistent secondary power source, ensuring that energy gaps are filled when more significant power plants experience

[12] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

fluctuations. The construction, maintenance, and potentially the design of these microgrids are expected to generate local jobs, further contributing to New Bedford's clean energy economy.[13]

Rhode Island, in particular, has made significant strides in the microgrid sector. By 2020, the state-supported 451 jobs in the microgrid industry, accounting for 2% of all U.S. microgrid employment, a concentration 2.8 times higher than the national average. Rhode Island's Office of Energy Resources (OER) has been instrumental in this progress, allocating $1.5 million from the Regional Greenhouse Gas Initiative (RGGI) for community-based microgrid projects. These efforts not only enhance energy resilience but also stimulate local employment and support the state's transition to a more sustainable energy grid.[14] In August 2022, the Pascoag Utility District (PUD) launched a 3MW/9MWh standalone battery storage system, marking a significant step in Rhode Island's microgrid infrastructure. This installation enhances grid reliability and reduces peak demand for 5,000 customers. By integrating this battery system with a substation upgrade, PUD avoided nearly $12 million in traditional infrastructure costs, ensuring reliable service during summer peak loads without significant financial strain on customers. This innovative project, made possible through partnerships with the Office of Energy Resources, the Rhode Island Infrastructure Bank, and Agilitas Energy, exemplifies the benefits of non-wires alternatives. Beyond cost savings, the battery system supports the state's Act on Climate goals by reducing greenhouse gas emissions. By storing energy and deploying it during high-demand

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[13] Hoek Spaans, Avalon, et al. Cornell University School of Industrial and Labor Relations, 2024, *Building the Clean Energy Commonwealth: A Climate Jobs Roadmap for Massachusetts*, https://www.ilr.cornell.edu/sites/default/files-d8/2024-05/Building%20the%20Clean%20Energy%20Commonwealth.pdf. Accessed Aug. 2024.Pg 36-37

[14] Jordan, P., Young, R., Schirch, M., Lehmann, S., Williams, V., & Frongillo, C., 2020 Rhode Island Clean Energy Industry Report (2020). BW Research Partnership. Retrieved August 2024, from https://energy.ri.gov/sites/g/files/xkgbur741/files/cleanjobs/2020/RICEIR-2020-Report.pdf.

periods, the system helps balance the grid and facilitates the integration of more renewable energy sources, advancing Rhode Island's clean energy transition.[15]

Providence is actively exploring the potential for microgrid development as part of its commitment to sustainability. Although no microgrids are currently operational in Providence, city officials are considering implementing them at critical locations. These plans align with Providence's ongoing efforts to expand its solar capacity through rooftop solar projects. Microgrids, in conjunction with solar energy, are seen as crucial for boosting energy resilience, reducing dependency on traditional power grids, and facilitating the city's transition to renewable energy sources.

Training and Education Professionals

Massachusetts is making significant strides in advancing green workforce training through initiatives such as the "Climate Jobs Roadmap." This program aims to support pre-apprenticeship opportunities and address challenges financially vulnerable workers face. The City of Boston's Office of Workforce Development is providing funding to enhance these efforts; however, there is still a need for more comprehensive outreach and wraparound services to ensure the success of these programs. Additionally, the Inflation Reduction Act has allocated $2.2 billion for Environmental and Climate Justice block grants, which can be utilized for workforce development to reduce greenhouse gas emissions. Massachusetts can also receive up to $5 million from the U.S. Department of Labor's Building Pathways to Infrastructure Jobs Grant Program. These funds are intended to prioritize rural and underserved communities, expanding access to green jobs and fostering a more equitable workforce development

[15] RI Executive Climate Change Coordinating Council, Rhode Island 2022 Climate Update (2024). RI Executive Climate Change Coordinating Council. Retrieved January 2025, from file:///Users/cameronsalo/Downloads/aoc-update-22-F-031723.pdf.

landscape.[16] From 2010 to 2022, Massachusetts has seen significant growth in its clean energy workforce. Employment in this sector rose from approximately 60,000 jobs in 2010 to over 104,000 in 2022. This represents a steady increase, with notable surges between 2015 and 2019. Despite a slight dip in 2020, the numbers have rebounded strongly, emphasizing the state's commitment to renewable energy and sustainability. Massachusetts' clean energy sector has consistently grown across all segments of its value chain. From 2021 to 2022, companies focused on installation experienced the highest growth rate, expanding by 7% and adding 1,866 jobs. Engineering and research followed closely, showing steady gains. Professional services increased by 4%, equating to 383 new roles, while the utilities, nonprofits, and other categories grew by 4%, adding 200 jobs. Sales and distribution companies experienced a more minor but notable rise of 1.5%, bringing in 383 new workers.

When looking at the value chain's composition in 2022, installation claimed 28% of the workforce, cementing its role as a cornerstone of clean energy employment. Engineering and research accounted for 20% of the total, followed by manufacturing at 14%. Sales and distribution represented 9%, professional services comprised 24%, and utilities, nonprofits, and other segments rounded out the sector at 5%. Installation jobs increased from 27,170 in 2021 to 29,037 in 2022. Sales and distribution employment saw a modest uptick, rising from 24,802 to 25,185. Engineering and research increased slightly, growing from 20,936 to 21,048 jobs. Manufacturing also edged higher, from 14,442 in 2021 to 14,559 in 2022. Professional services and utilities expanded from 8,852 to 9,235 and 5,006 to 5,226, respectively.

[16] Hoek Spaans, Avalon, et al. Cornell University School of Industrial and Labor Relations, 2024, *Building the Clean Energy Commonwealth: A Climate Jobs Roadmap for Massachusetts*, https://www.ilr.cornell.edu/sites/default/files-d8/2024-05/Building%20the%20Clean%20Energy%20Commonwealth.pdf. Accessed Aug. 2024.Pg 66-67

The sectoral breakdown highlights energy efficiency, demand management, and clean heating and cooling as the most prominent areas of clean energy employment. These areas maintained their leadership position, with jobs increasing from 72,535 in 2021 to 74,305 in 2022, a 2% growth rate. Renewable energy showed a similar trend, expanding from 25,510 to 26,226 jobs, reflecting a 3% growth. Alternative transportation emerged as a notable growth sector, growing by 26%, from 2,607 jobs in 2021 to 3,275 in 2022. Other clean energy jobs decreased slightly from 556 to 484 during this period. Massachusetts continues to lead in energy efficiency, demand management, and clean heating and cooling employment.

These sectors represent the largest share of the state's clean energy workforce, showcasing steady growth in key areas. Advanced and recycled building materials saw the highest job increase, adding 542 positions between December 2020 and December 2021. Clean, high-efficiency heating and cooling systems, including ENERGY STAR-certified products, grew significantly, with 453 additional positions. Breaking down the employment numbers, advanced materials and recycled building materials jobs climbed from 18,054 in 2021 to 18,595 in 2022. Jobs in clean and ENERGY STAR heating and cooling rose from 17,013 to 17,466. Other energy efficiency positions increased from 8,125 to 8,365, while ENERGY STAR appliances grew from 6,548 to 6,781 jobs. Efficient lighting, including LED and CFL technology, rose from 5,430 to 6,627 jobs. Energy storage made notable gains, rising from 5,091 jobs in 2021 to 5,171 in 2022, surpassing pre-pandemic levels. Smaller but impactful growth was also recorded in other subcategories. Reduced water consumption products and appliances grew from 3,131 to 3,225 jobs. Woody biomass jobs rose modestly from 3,159 to 3,180. Combined heat and power systems added 47 jobs, growing from 1,605 to 1,652. Microgrids increased slightly from 1,055 to 1,077, and smart grids saw a minor rise from 570 to 603 jobs. Other biofuels grew from 423 to 482, while other grid modernization roles climbed to 81 positions from 64. In renewable energy, wind energy saw a 7% increase, with 166 jobs added, bringing the total to 2,448. Solar energy also grew, adding 777 jobs, a 5% increase, for 15,873 jobs in 2022. This marks the first solar job growth since 2017. Other renewable energy roles saw a slight decline from 8,132 to 7,904 jobs.

Massachusetts' clean energy sector significantly contributed to the state’s economy in 2021, adding $14.2 billion to the Gross State Product (GSP). This represented approximately 2.2% of the total GSP, reflecting a 55% growth in clean energy GSP from 2012 to 2021. This increase far outpaced the state's overall GSP growth of 43% during the same period. Between 2020 and 2021 alone, the clean energy sector's GSP increased by 3.7%, or over $500 million. The value chain analysis highlights each sector's substantial role in driving the clean energy economy. Manufacturing emerged as the most significant contributor, accounting for 24% of the total clean energy GSP in 2021, equivalent to $3.4 billion. Installation and maintenance ranked second, contributing 17.9% or $2.5 billion. Sales and distribution followed closely at 16.5% or $2.3 billion. Professional services experienced significant growth, with their contribution increasing by 39%, adding $1.9 billion (13.3%) to the total GSP. Engineering and research added $1.7 billion, representing 11.7% of the total, while other services contributed $1.3 billion, or 9.3%. Sole proprietors accounted for $1.1 billion, making up 7.6% of the clean energy GSP. Massachusetts' clean energy industry faces ongoing challenges in recruiting skilled workers as it rebounds from the effects of the COVID-19 pandemic. Tight labor markets, inflation, and supply chain disruptions have created hurdles for businesses, with 88% of employers stating that finding qualified candidates was either “very difficult” or “somewhat difficult” as of December 2021. This represents an increase from the pre-pandemic rate of 86%. Employers reporting “very difficult” hiring conditions rose significantly to 41%, marking the highest level over a decade.

Comparing data from 2020 and 2022 reveals worsening conditions. In 2020, 28.2% of employers described hiring as “very difficult,” while 56.9% found it “somewhat difficult.” By 2022, those figures shifted to 40.6% and 47.1%, respectively. Only 12.3% of employers in 2022 said hiring was “not at all difficult,” a drop from 14.9% in 2020. Regarding worker demographics, the composition of Massachusetts' clean energy workforce remained broadly consistent from 2021 to 2022. However, significant disparities persist. Men comprise 69.5% of the clean energy workforce, a stark contrast to the state’s overall workforce, representing 49.1%. Women account for 30.5% of clean energy workers, compared to their 50.9% share in the broader workforce.

Ethnic representation shows an underrepresentation of Hispanic or Latino workers, who make up 16% of the clean energy workforce but only 10.8% of the statewide workforce. Conversely, non-Hispanic or Latino workers hold 84% of clean energy jobs. Racially, white workers dominate the clean energy sector, comprising 73.8% of the workforce, slightly below their 80.9% share of the broader state workforce. Black or African American workers account for 8% of clean energy roles, marginally less than their 9.3% share statewide. Asian workers are better represented in clean energy at 8.4%, compared to 7.2%. Smaller demographic groups face more significant challenges in accessing clean energy jobs. Native American or Alaska Native workers represent only 1.1% of the sector despite making up 0.5% of the workforce. Native Hawaiian or Pacific Islanders hold 0.8% of clean energy jobs, slightly above their 0.2% representation statewide. Individuals with two or more races hold 7.9% of clean energy positions, surpassing their 1.9% share in the general workforce. Veterans are a notable part of the clean energy workforce, making up 9.5%, a significant proportion compared to their 3.8% share of the broader Massachusetts workforce. Workers aged 55 and older also play a vital role, representing 14.1% of clean energy jobs, though they account for 25.6% of the workforce.

Efforts to improve equity in clean energy are ongoing. The state actively promotes education, training, and career pathways for underrepresented groups, including women, minorities, and individuals in environmental justice communities. Massachusetts has seen remarkable progress in clean energy investments, driven by a robust innovation ecosystem. These investments fall into three stages: Stage I (Research and Prototyping), focusing on theoretical exploration and prototype development; Stage II (Demonstration and Acceleration), covering testing and market evaluations; and Stage III (Commercialization and Growth), emphasizing manufacturing expansion and customer engagement.

In 2021, clean energy investments in Massachusetts reached a decade-high, totaling $1.8 billion. While there was an increase in investor activity, much of this growth came from later-stage technologies. Stage III investments accounted for $1.16 billion, up significantly from $734 million in 2020, reflecting the focus on scaling mature technologies. Stage II investments remained strong at $406 million, consistent with the previous year. However, Stage I investments experienced a decline, dropping to $76 million in 2021, compared to $84 million in 2020. This decrease in early-stage funding highlights a shift towards technologies closer to market readiness.

Over the last decade, investment trends have shown consistent growth. For example, Stage III investments have grown significantly since 2011, when they amounted to just $267 million. Similarly, Stage II investments, which were $286 million in 2011, have steadily risen. In contrast, while modest to other stages, Stage I funding peaked at $84 million in 2020 but declined the following year. The number of deals also highlights these shifts. In 2021, Massachusetts saw 21 Stage I deals, slightly increasing from 18 in 2020 but significantly fewer than earlier peaks. Stage II deals declined from 25 in 2020 to 23 in 2021. Stage III remained consistent, reflecting a strong interest in mature technologies. The overall number of clean energy deals surged between 2011 and 2021, peaking at 60 in 2018, underscoring the state's innovation-driven clean energy growth.[17]

New Bedford, Massachusetts focuses on preparing education professionals to facilitate the community's transition into the clean energy sector. This includes training for data analysts, HVAC technicians, electricians, and offshore wind turbine technicians. The city is leveraging strategic cross-sector partnerships to create clear pathways for professional development and leadership within the local workforce. This initiative emphasizes inclusivity by engaging a diverse range of community members, including youth, seniors, veterans, immigrants, and individuals who have been previously incarcerated. By equipping these groups with the necessary skills, New Bedford is building a robust and diverse workforce that is well-positioned to thrive in the growing clean energy industry.[18]

The Southeast region of Massachusetts plays a vital role in the state's clean energy landscape, showing strong growth and specialization in key areas. Between 2021 and 2022, this region experienced a 3.1% increase in clean energy employment, rising from 23,318 to 24,031 jobs. Additionally, the number of clean energy businesses grew modestly by 0.8%, from 1,675 to 1,689. This growth marks the Southeast as the Massachusetts region with the highest percentage

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[17] Massachusetts Clean Energy Center, & BW Research Partnership, 2022 Massachusetts Clean Energy Industry Report (2022). Massachusetts Clean Energy Center. Retrieved January 2025, from https://www.masscec.com/sites/default/files/documents/2022%20Massachusetts%20Clean%20Energy%20Industry%20Report_Final.pdf.

[18] MassCEC. (n.d.). *Students & Job Seekers*. https://www.masscec.com/students-job-seekers

increase in clean energy businesses during this period. Clean energy jobs in the Southeast region are heavily concentrated in Sales and Distribution, which accounts for 55.4% of the workforce. Other areas contributing to the value chain include Installation (22.3%), Manufacturing (11%), Engineering and Research (7.3%), and Consulting and Finance (2.5%). This distribution reflects the region's strength in ensuring that clean energy products and solutions reach consumers efficiently while maintaining significant contributions in technical and support roles.

When analyzing employment by technology, a remarkable 90% of clean energy jobs in the Southeast region focus on Energy Efficiency, Demand Management, and Clean Heating and Cooling. This underscores the region's leadership in advancing energy-saving technologies and systems. Renewable energy jobs comprise 8.5% of the workforce, while Alternative Transportation and other technologies account for the remaining 1.5%. These figures highlight the Southeast's commitment to reducing energy consumption and transitioning to sustainable energy practices. The Southeast region's clean energy industry accounts for 23% of Massachusetts' clean energy jobs and 23.6% of the state's clean energy businesses. Notably, the region's clean energy jobs and businesses represent 2.3% of its total employment and businesses, showcasing the sector's growing economic significance in the area.[19]

A strong push exists in Rhode Island to create a just transition for climate-related jobs that ensures worker protection and high wages. This effort includes the proposal to establish a multi-stakeholder Office of Just Transition with labor representation on government agency councils responsible for climate change mitigation and adaptation. To safeguard workers' rights

[19] Massachusetts Clean Energy Center, & BW Research Partnership, 2022 Massachusetts Clean Energy Industry Report (2022). Massachusetts Clean Energy Center. Retrieved January 2025, from https://www.masscec.com/sites/default/files/documents/2022%20Massachusetts%20Clean%20Energy%20Industry%20Report_Final.pdf.

and promote economic equity, legislation is recommended to enforce Prevailing Wage, Project Labor Agreements, Labor Peace, Build RI, and Buy America provisions. These measures aim to expand job opportunities in the non-residential renewable energy sector. Furthermore, all projects funded by Rhode Island's Renewable Energy Fund and Infrastructure Bank should adhere to these labor standards. Establishing a Wage Board to set a minimum wage specific to the renewable energy industry is also seen as a critical step in ensuring fair compensation for workers in this emerging sector.[20]

Rhode Island's workforce landscape is undergoing a transformation, particularly in industries with high-growth potential. The data reveals significant insights into employment trends, wages, demographics, and educational requirements for various occupations projected to expand in the coming years. Several occupations in Rhode Island's workforce show notable growth trajectories, particularly in the construction and energy sectors. For example, solar photovoltaic installers have experienced a 53.8% growth in employment from 2016 to 2022. Heating, air conditioning, and refrigeration mechanics and installers have shown an even more dramatic increase, with a 90.8% growth rate over the same period. These occupations align with broader trends emphasizing renewable energy and sustainable infrastructure. Conversely, some roles, such as construction managers, have seen significant declines, with employment dropping by nearly 48%, highlighting disparities in growth across related professions.

In terms of overall employment, roles like office clerks and general operations managers maintain high numbers, but they exhibit slower growth or even declines. Construction laborers, electricians, and first-line supervisors in construction trades, on the other hand, show steady

[20] Skinner, L., Mijin Cha, J., Hoek Spaans, A., Moskowitz, H., & Raman, A. (2022). (rep.). *Building A Just Transition For A Resilient Future : A Climate Jobs Program for Rhode Island*. Cornell University School of Industrial and Labor Relations. Retrieved August 2024, from https://www.cjnrc.org/wp-content/uploads/2022/02/Rhode-Island-Report-Final-2.3-Compressed.pdf. Pg 76-77

increases, reflecting ongoing demand for skilled tradespeople. The educational requirements for high-growth roles vary widely. Many construction-related jobs, such as construction laborers and insulation workers, do not require formal educational qualifications beyond a high school diploma or equivalent. This makes these positions accessible to a broader demographic, including individuals entering the workforce for the first time. By contrast, managerial roles, such as general and operations managers or construction managers, typically require a bachelor's degree and significant prior work experience. Heating, air conditioning, refrigeration mechanics, and installers represent a middle ground, requiring a postsecondary non-degree award. These differences underscore the need for targeted education and training programs to meet workforce demands at various levels of specialization.

The wage data illustrates a considerable range among the high-growth occupations. General and operations managers stand out with annual median earnings of $123,910, significantly above the living wage benchmark of $52,270 for a household of two working adults with two children. Similarly, construction managers and electrical power-line installers earn high median wages of $104,030 and $105,900, respectively. In contrast, solar photovoltaic installers and insulation workers earn lower median wages, at $54,000 and $45,000 annually, respectively. This discrepancy may influence career choices and underscore the importance of advancing wage equity in emerging sectors like renewable energy. The gender breakdown of high-growth occupations reveals a pronounced imbalance. Roles in construction and skilled trades, such as electricians and HVAC mechanics, have disproportionately low female representation, often below 5%. This trend indicates ongoing challenges in diversifying these traditionally male-dominated fields. Conversely, office clerks, a less rapidly growing occupation, exhibit a much higher female participation rate of 83.5%.

Data on racial diversity highlights another disparity. White workers dominate most high-growth occupations, accounting for over 90% of electricians, first-line supervisors, and solar photovoltaic installers. Representation among Black or African American workers remains low across most occupations, often below 7%, with slightly higher participation in construction laborer roles (5.7%). Hispanic or Latino workers show higher representation in construction laborers (38.6%) and solar photovoltaic installers (22.9%), reflecting their growing presence in specific labor market segments. Age distribution trends further illustrate workforce dynamics. Younger workers aged 16-24 are most prominently represented in roles such as construction laborers and solar photovoltaic installers, reflecting their entry-level nature and appeal to individuals early in their careers. Conversely, more experienced age groups dominate supervisory and managerial roles requiring greater expertise and experience. Notably, roles such as first-line supervisors of construction trades have a significant proportion of workers aged 45-54 (28.9%), reflecting the career trajectory associated with these positions. The trends highlighted in this data reveal challenges and opportunities for Rhode Island's labor market.

The significant growth in renewable energy and HVAC occupations suggests a shift toward green infrastructure and sustainability. However, the underrepresentation of women and minorities in these fields underscores the need for targeted inclusion efforts. Programs to increase access to training and apprenticeships could help bridge these gaps and diversify the workforce. The wage disparities between managerial and entry-level roles also highlight potential barriers to upward mobility. Ensuring equitable wage growth and opportunities for skill advancement will be essential to maintaining a robust and motivated workforce. Moreover, as younger workers increasingly populate entry-level roles, mentorship and career development programs will be critical for fostering long-term growth and retention.[21]

Conclusion

The transition to a clean energy economy in Massachusetts and Rhode Island creates significant workforce opportunities, but challenges remain in ensuring equitable access to these jobs. Investments in renewable energy, grid modernization, and energy efficiency drive demand for skilled labor, requiring strategic workforce development initiatives. Massachusetts has positioned itself as a leader in solar, offshore wind, and energy storage job creation, with training programs to address labor shortages and prepare workers for the evolving energy sector. New Bedford continues to be a national hub for offshore wind workforce development, ensuring local workers, including veterans and previously incarcerated individuals, benefit from projects like Vineyard Wind.

Rhode Island promotes a just transition, implementing policies to ensure clean energy jobs reach underrepresented communities while investing in microgrids, advanced metering, and solar energy expansion. Project Labor Agreements (PLAs) guarantee fair wages, while the Renewable Energy Standard (RES), requiring 100% renewable electricity by 2033, will further expand employment in solar installation, energy storage, and HVAC efficiency. Providence integrates workforce training with clean energy projects, prioritizing job access for disadvantaged workers while supporting broader economic development.

[21] BW Research Partnership, 2023 Rhode Island Clean Energy Report (2023). Rhode Island Office of Energy Resources (OER) and the Executive Office of Commerce (EOC). Retrieved January 2025, from https://energy.ri.gov/sites/g/files/xkgbur741/files/2024-01/2023%20Clean%20Jobs%20Report.pdf.

Despite these advancements, challenges remain in meeting workforce demand, addressing labor shortages, improving diversity, and ensuring equitable access to high-paying energy jobs. The success of clean energy expansion depends on continued investment in workforce training, apprenticeships, and inclusion initiatives. By addressing these barriers, Massachusetts and Rhode Island can ensure their workforce is prepared for a clean energy future, creating economic opportunities while meeting ambitious climate goals. This paper highlights the strategies shaping workforce development in the energy sector, demonstrating how targeted investments, labor policies, and training programs will sustain long-term job growth and a resilient clean energy economy.

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