



The Finger Lakes Clean Energy Workforce

Current State & Future Prospects

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Prepared for
Climate Solutions Accelerator of the Genesee/Finger Lakes

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Summary

The transition to more renewable and less pollution-generating forms of energy is one of the most profound changes our society will make. How the Finger Lakes region can prepare its workforce to not only weather this transition, but gain the most from it, is the subject of this report.

CGR was engaged by the Climate Solutions Accelerator of the Genesee/Finger Lakes (the Accelerator) to better understand the region's Clean Energy economy, with a particular focus on the employment trends, educational needs, and hiring demands of the industry, and to identify regional assets and barriers to meeting the needs in an equitable manner. The Accelerator is designated by the New York State Energy Research and Development Authority as the Finger Lakes Clean Energy hub for this region.

This research has two main components: a qualitative engagement with Finger Lakes regional stakeholders, through interviews and focus groups; and a quantitative analysis of employment statistics and trends, including both core Clean Energy fields and related occupations, and "just transition" industries – those involving fossil-fuel energy sources – that are subject to reduction during a transition to Clean Energy. CGR engaged MRB Group as our partner to complete the quantitative analysis.

The Clean Energy ecosystem as defined for this study¹ encompasses industries and occupations with varying levels of connection to Clean Energy:

- Core – involving engineering, technician, scientific, production, installation and repair roles that are needed for the design and deployment of Clean Energy-related systems, goods, and technologies.
- Supportive – primary function is not specifically Clean Energy work but supports the Clean Energy economy and the supply chains for Clean Energy products and services.
- Tangential – primary function is not specifically Clean Energy work but can include services related to infrastructure and utilities, professional and technical services, various types of non-profit organizations, selected government industries whose counted jobs include a small portion related to the regulation and administration of housing and transportation services and more).

The Clean Energy ecosystem in the Finger Lakes region in 2023 employed an estimated 96,000 people,² or 16% of the regional workforce, including core, supportive and tangential connections to CE.

¹ MRB, CSA and CGR selected industries and occupations to include in this analysis; details, including lists of included industries and occupations, are in the Appendices.

² All data in this section is from MRB's analysis of Lightcast data on industry employment, detailed in Appendix A.

This workforce has increased just 0.3% in the last 10 years but is expected to grow 10% in the next 10 years. Among the 7 sectors included, most of the jobs are in a Multisector category and in the Buildings sector, while the smallest sector is Agriculture, Food and Forestry, with just 36 jobs.

Overall, average earnings in the CE ecosystem are 33% above the regional average at more than \$80,000, showing the opportunities available for workers.

CGR and the Accelerator identified seven groups of regional stakeholders to engage with to discover the breadth of potential impacts of an increasing transition to a Clean Energy economy. These were:

- Employers
- Workforce developers
- Educational entities
- Labor unions
- Social service providers
- Current job seekers
- Just transition workers

The Accelerator worked with CGR to develop a list of organizations and potential contacts in each of the above stakeholder areas. For employers, this included the main local utility in the Rochester area (Rochester Gas & Electric – RG&E), the Regional Transit Service (RTS) that provides public mass (bus) transit in our area, and a variety of companies working on large- and small-scale Clean Energy and energy efficiency projects.

Examples of large-scale Clean Energy projects include solar farms and wind generation, while smaller scale projects include residential installation of solar panels and HVAC heat pumps and geothermal systems.

Our quantitative and qualitative analysis lead us to make the following overarching observations and recommendations.

Theme #1: The Finger Lakes region is not capitalizing on the chance to promote and increase understanding of employment opportunities in the Clean Energy ecosystem.

From 2013-23, regional job growth in these industries (0.3%) lagged the state (9%) and nation (19%). But in the next 10 years, the region's growth rate (10%) is projected to match the nation and fall a bit behind the state (14%). Our overall lack of understanding of the variety of job opportunities, needed skills and career pathways would seem to endanger this projected growth.

Further, we are missing opportunities to promote Clean Energy as a way to potentially increase interest in the trades. We know from many studies of younger workers that they value employment with purpose and positive societal impact and that they tend to be more concerned about the environment and climate change than many older employees. Yet, we did not hear much about educators, workforce developers or service providers working with job seekers making this connection.

One of our employer interviewees had a great example, having used a generic posting for an electrician that got no response. When it changed the title to “Clean Energy installation technician,” it received 100 applications.

Suggestions:

- Skilled trade and other educational programs could market their relevance and connections to Clean Energy jobs as a selling point.
- Workforce developers and service providers could include more information about Clean Energy-related opportunities in their work with job seekers.
- Broader region-serving entities including Climate Solutions Accelerator, Greater Rochester Chamber of Commerce and the Finger Lakes Regional Economic Development Council could promote Clean Energy employment opportunities through formal marketing campaigns and informal information-sharing.

Theme #2: Our region lacks a shared understanding of employer needs, the variety of Clean Energy jobs, needed skills and career pathways.

Both workforce developers and service providers frequently state that Clean Energy career pathways have not been adequately defined by individual employers and the industry as a whole, leaving them unsure of how to focus on and support these, and some mistakenly believe all the jobs require a high level of education.

Education institutions are, to varying degrees, incorporating some Clean Energy education and training, but some seem to need a boost through government incentives. Our interviews indicated that many education institutions do not have a full understanding of the career paths that exist in some Clean Energy occupations.

For their part, educational entities say that the Clean Energy industry has not been organized in presenting a cohesive set of demands and defined skill lists, which would become the basis of specialized Clean Energy-related career pathways, to educators. They state that industry experts must provide more input about the core skills needed for Clean Energy jobs and whether specialized Clean Energy programs or courses are needed, or whether generalized training is sufficient.

This is complicated by the fact that many Clean Energy-related jobs require general skills that are not specific to Clean Energy and could be used either inside or outside the Clean Energy industry. For example, most workers involved with heat pump installation or solar installation do those tasks as one part of a wider skillset – HVAC skills, electrician skills, or general

construction skills – and are just as willing to work on fossil fuel-related projects, if that’s where the work and money is.

Suggestions:

- A regional information-sharing effort could promote a shared understanding across the various stakeholder groups. As one idea, the Accelerator could package information from this report into smaller, digestible briefs on specific topics (such as types and numbers of jobs, needed skills, training opportunities, etc.) and distribute to key audiences.
- MCC, through the FWD Center, plays a regional role that may expand into a workforce development hub. The Accelerator could join the FWD Center’s advisory board to ensure that Clean Energy training and opportunities are recognized and integrated.
- In particular, increasing communication between educational entities and employers, so that educational entities understand employer needs and can train and prepare students, seems important. It might make sense for the Accelerator to test the willingness of key partners on both sides to participate in convenings and then design either a short-term or longer-term approach.
- Based on the demand for Genesee Community College’s solar panel program, creation of more solar panel installation training programs seems warranted, as well as ensuring that students are trained in both commercial and residential installation processes.

Theme #3: Barriers to employment within CE include those common across the economy and some specific to the Clean Energy ecosystem.

Common barriers include the low appeal of the trades for many job seekers and students, as well as challenges around transportation and childcare. In Clean Energy-related workplaces, these can be heightened, especially since work sites are often dispersed (homes) and outside urban areas (solar farms, for example).

Accessing state support for projects was named as a limiting factor for growth in Clean Energy jobs. While employers praised NYSEDA training programs, paperwork and other requirements to access state funding for home energy efficiency and renewable energy installations were discussed as a deterrent to participation.

Suggestions:

- The appeal of working in renewable energy could be used to counteract the negative perception of work in the trades.
- YAMTEP is a workforce developer now running a transportation service to ensure trainees can get to jobs. The region might need to explore similar, targeted solutions to ensure that workers without a car can reach the dispersed sites of many CE jobs.
- NYS could review its requirements for home energy efficiency and renewable energy projects and look for opportunities to streamline. In addition, the state could ramp up or expand training programs to contractors to ensure they understand how to access the funding or even pair experienced and new contractors to transfer knowledge.

Theme #4: Lack of diversity within many Clean Energy-related workplaces will limit the growth of the ecosystem and prohibit equitable access to opportunity if not addressed.

Development and communication of clear pathways is a key strategy to diversifying workplaces and promoting equity, but there are other important steps companies and other stakeholders can take, including:

- Partnering with community-based organizations trusted by Black, Latino and other marginalized groups.
- Creating welcoming environments for people from other countries and non-English speakers, including making information available in other languages.
- Tapping different networks and examining job requirements and hiring processes to increase effectiveness in hiring groups that are not currently in the workplace. Women, Black workers, Latinos and others may not feel comfortable in workplaces dominated by white men. Drawing in at least a few of these workers can be critical in getting the ball rolling toward a more diverse and equitable workplace.
- Ensuring equitable access to promotions and leadership positions through use of clear and documented performance standards and commitments to develop staff.

Theme #5: A “skepticism gap” holds the potential to prevent the region from realizing maximum gains from the transition to Clean Energy.

Aside from companies/employers currently working in Clean Energy-related fields, many stakeholders across the sectors are taking a “wait-and-see” approach, looking for more widespread adoption and demand for Clean Energy technologies and a clear need for more CE-specific workers before they take steps like personally reskilling, or – for educational entities – before investing in creating additional, focused Clean Energy training programs.

Likewise, many interviewees are skeptical of timelines/mandates from the state and federal governments on when transition will be accomplished, and doubt that some technologies, like electric vehicles, are fully mature or have the necessary infrastructural support to realistically meet transition deadlines.

The one group that expressed reservations about a Clean Energy transition were the just transition workers. While some think it could hurt future job prospects, most believed that its lack of likelihood in the near term meant that they would not be personally impacted, and a continuation of legacy/fossil fuel energy sources would provide them with more than enough work until retirement.

Suggestions:

- The Accelerator (and others) could work to ensure that Clean Energy incentives are broadly understood by all who can benefit from them, and advocate for NYS streamlining of requirements to access incentives.
- The Accelerator could develop educational events and/or materials to help skeptical stakeholders better understand state and federal Clean Energy mandates and what is

necessary and feasible in order to meet them. This could be done for specific stakeholder groups and topics (examples: auto dealers/mechanics, gas workers like the plumbers and pipefitters) and potentially done in partnership with a more neutrally positioned organization if helpful. Engagement sessions could be used to gather questions and feedback from attendees that the Accelerator could feed back to policymakers including NYS, with the focus not on *whether* to transition to Clean Energy but *how* to address obstacles.

- Partnerships with labor unions might be particularly helpful in addressing this issue for some specific groups.

Acknowledgements

CGR is grateful to Climate Solutions Accelerator for the opportunity to contribute to our region's knowledge about the Clean Energy transition and workforce needs and for their partnership in identifying contacts and organizations to interview. In particular, Kristen Van Hooreweghe and Omar Aponte were helpful partners. We would also like to thank each of the interviewees for their time. MRB Group and especially Alyson Slack provided tremendous time and expertise for the quantitative analysis in this report.

Staff Team

Donna Harris, Ph.D., Kieran Bezila, Ph.D., Deon Willis and Alina Santiago conducted interviews and analysis. Kieran Bezila assisted in authoring this report, and Alina Santiago drafted our quantitative summary.

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Introduction

The transition to more renewable and less pollution-generating forms of energy is one of the most profound changes our society will make. How the Finger Lakes region can prepare its workforce to not only weather this transition, but gain the most from it, is the subject of this report.

CGR was engaged by the Climate Solutions Accelerator of the Genesee/Finger Lakes (the Accelerator) to better understand the region's Clean Energy economy, with a particular focus on the employment trends, educational needs, and hiring demands of the industry, and to identify regional assets and barriers to meeting the needs in an equitable manner. The Accelerator is designated by the New York State Energy Research and Development Authority as the Clean Energy hub for this region.

This research has two main components: a qualitative engagement with Finger Lakes regional stakeholders, through interviews and focus groups; and a quantitative analysis of employment statistics and trends, including both core Clean Energy fields and related occupations, and "just transition" industries – those involving fossil-fuel energy sources – that are subject to reduction during a transition to Clean Energy. CGR engaged MRB Group as our partner to complete the quantitative analysis, which is summarized below and provided in full in the Appendix.

"Clean energy" is a broad term that may inspire different understandings, so to keep this research focused, CGR and the Accelerator developed a set of definitions that we used during engagements with stakeholders and for selecting sectors for the quantitative analysis.

Definitions for Context

- I. **Clean energy** refers to energy that comes from renewable resources (like wind, solar, and hydro) that are naturally replenished and/or from sources that do not produce any kind of pollution, notably greenhouse gases.
- II. **Clean energy workforce** refers to the group of workers whose tasks and responsibilities help to increase energy efficiency, reduce greenhouse gas emissions, reduce environmental impact, reduce the extraction of resources, and combat climate change as well as the organizations providing education and training to these workers.
- III. **Clean energy economy** refers to all of the economic activity (like job creation and the manufacturing and selling of environmentally friendly products and services) that is generated when communities transition to Clean Energy systems and low-carbon growth strategies.
- IV. **Just transition workers** are workers currently employed in a field likely affected by downsizing as New York State transitions to a Clean Energy economy. Examples include fields related to fossil fuel use, such as energy generation or home heating from natural gas, or workers at gas stations. As Clean Energy infrastructure grows and

replaces fossil fuel use, workers in those fields will need to be provided with a fair, equitable pathway – one that is “just” – to new employment in other industries.

In this report, Clean Energy and Clean Energy-related are abbreviated in places as “CE” and “CE-related.”

The Clean Energy ecosystem as defined for this study³ encompasses industries and occupations with varying levels of connection to Clean Energy:

- Core – involving engineering, technician, scientific, production, installation and repair roles that are needed for the design and deployment of Clean Energy-related systems, goods, and technologies.
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Stakeholder Groups

CGR and the Accelerator identified seven groups of regional stakeholders to engage with to discover the breadth of potential impacts of an increasing transition to a Clean Energy economy. These were:

- Employers
- Workforce developers
- Educational entities
- Labor unions
- Social service providers
- Current job seekers
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The Accelerator worked with CGR to develop a list of organizations and potential contacts in each of the above stakeholder areas. For employers, this included the main local utility in the Rochester area (**Rochester Gas & Electric – RG&E**), the **Regional Transit Service (RTS)** that

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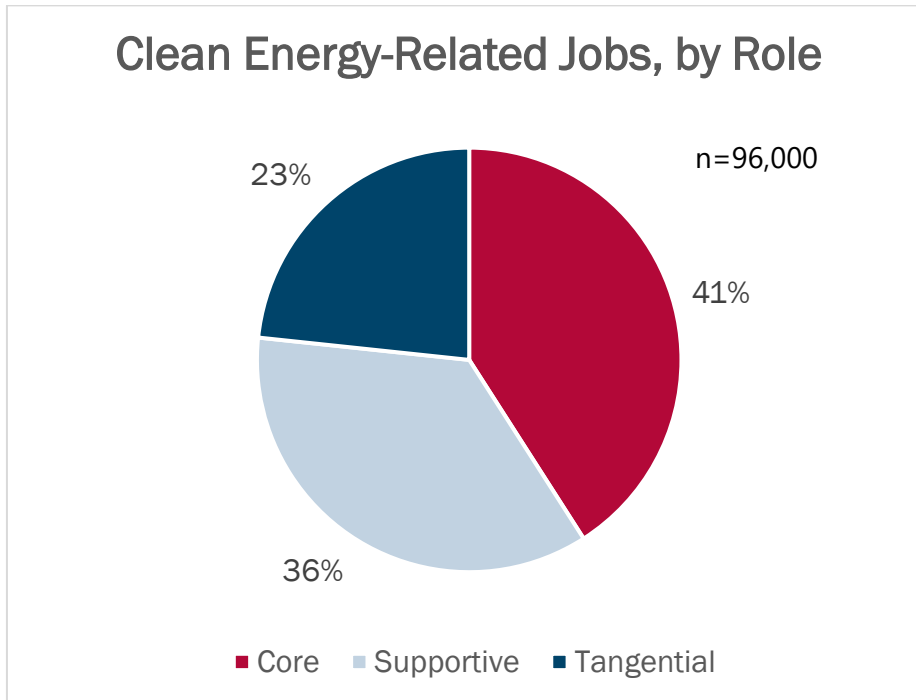
provides public mass (bus) transit in our area, and a variety of companies working on large- and small-scale Clean Energy and energy efficiency projects.

Examples of large-scale Clean Energy projects include solar farms and wind generation, while smaller scale projects include residential installation of solar panels and HVAC heat pumps and geothermal systems.

The interest in building Clean Energy workforce capacity is not just a local and state concern, as the federal Department of Energy is currently advertising for its [RAMP \(Community Workforce Readiness Accelerator for Major Projects\) fellowship](#), which includes the Finger Lakes area and “seeks to catalyze effective, inclusive workforce strategies to prepare and connect local workers to good jobs on large Clean Energy infrastructure and supply chain projects funded in the Invest in America suite of laws (Bipartisan Infrastructure Law, Inflation Reduction Act, and CHIPS and Science Act).”

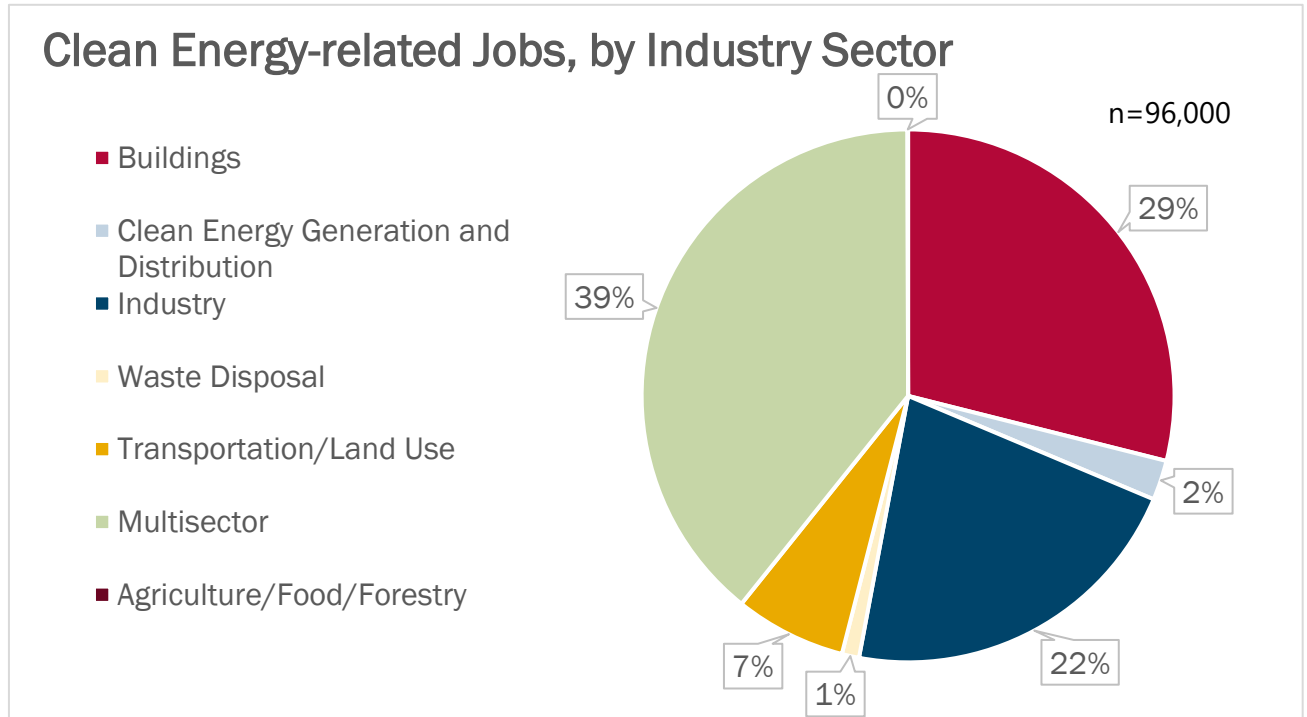
Current State of Clean Energy Ecosystem

The Clean Energy ecosystem in 2023 employed an estimated 96,000 people,⁴ or 16% of the regional workforce, including core, supportive and tangential connections to CE, as described above.

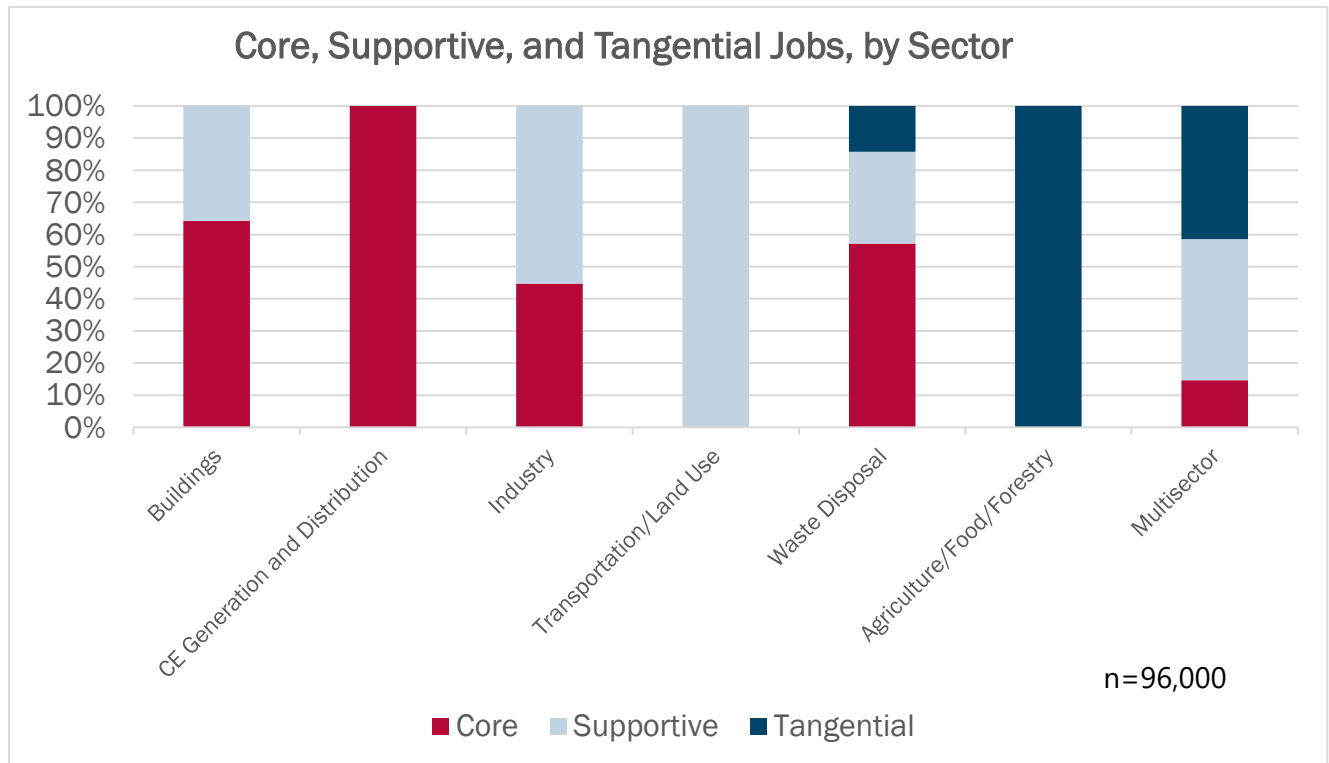


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This workforce has increased just 0.3% in the last 10 years but is expected to grow 10% in the next 10 years. Among the 7 sectors included, most of the jobs are in a Multisector category and in the Buildings sector, while the smallest sector is Agriculture, Food and Forestry, with just 36 jobs.



The share of jobs in core, supportive and tangential roles to Clean Energy varies by sector, as shown below.



The Clean Energy Generation and Distribution sector is expected to grow the fastest, 30%, and it currently has the highest average earnings at \$126,000.

However, the sector is currently one of the smallest in the ecosystem, with just 2,300 jobs, or 2% of the total. Also projected to have strong growth are the Transportation/Land Use sector, at 18%, and the Buildings sector, at 15%.

Overall, average earnings in the CE ecosystem are 33% above the regional average at more than \$80,000, showing the opportunities available for workers.

- The Multisector segment accounts for 39% of CE ecosystem jobs, and includes services related to infrastructure and utilities, professional and technical services, various types of not-for-profit organizations, and selected government industries whose counted jobs include a small portion related to the regulation and administration of housing and transportation programs.

- The industries studied as part of the Buildings sector, important to integrating lower-carbon materials, energy-efficiency technologies, and clean heating and cooling systems into the built environment, employ nearly 28,000 people in the region.
- The Industry sector, a collection of manufacturing industries whose goods have a particular role to play in the energy transition, employs nearly 21,000 people in the region.
- About 6,500 people are employed in Transportation and Land Use industries that primarily represent service industries that will be customers of or otherwise engaged with electric, alternative fuel, and energy efficient vehicles.

Among industries included in the 7 sectors, the top 4 growing industries between 2013 and 2023 were all considered to have a core role in the Clean Energy economy:

- Buildings – Plumbing, Heating and Air-Conditioning Contractors (1,222 jobs added)
- Multisector – Engineering Services (1,134 jobs added)
- Buildings – Residential Remodelers (776 jobs added)
- Buildings – Electrical Contractors and Other Wiring Installation Contractors (686 jobs added)

These 4 industries are projected to have strong growth in the next 10 years as well:

- Buildings - Plumbing, Heating, and Air-Conditioning Contractors, 984 jobs (20% growth rate)
- Multisector - Engineering Services, 804 (20%)
- Buildings - Residential Remodelers, 722 (27%)
- Buildings - Electrical Contractors and Other Wiring Installation Contractors, 681 (18%)

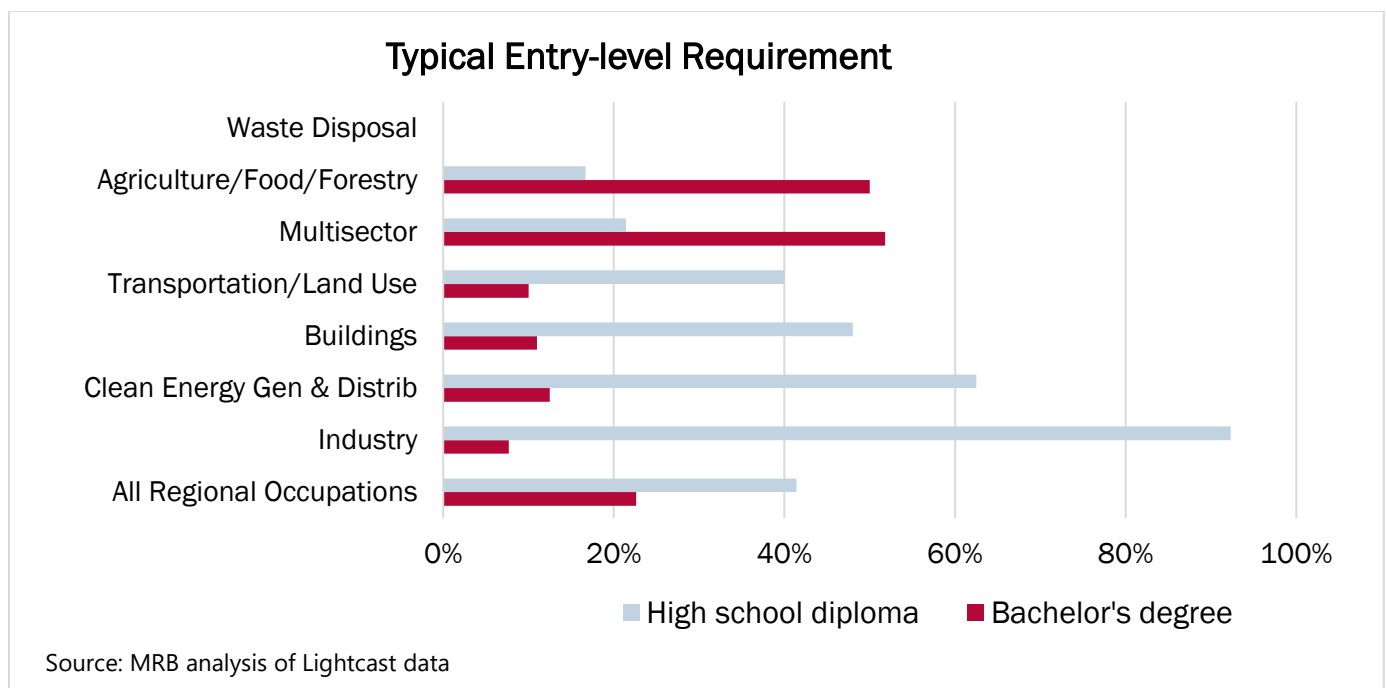
Just Transition Jobs

Key fossil fuel-derived industries represent an estimated 8,700 jobs in the Finger Lakes, including substantial employment linked to plastics and polystyrene foam manufacturing — jobs that may be at risk as markets shift away from plastics and as the Finger Lakes pursues an equitable transition from an economy dependent on extraction to one characterized by sustainability. The second largest category of just transition industries are gas station convenience stores, numbering about 2,700 of the jobs.

Needed Skills and Qualifications

What skills and education will workers need to benefit from these growth areas? The answer is it depends on which part of the CE ecosystem we are considering.

Since the ecosystem encompasses many different kinds of jobs, it is subject to many of the trends affecting the broader economy, including shortages in trades workers and technicians. Our quantitative analysis found most of the Clean Energy-related sectors are comprised of occupations that are less likely to require a bachelor's degree than the average occupation in the region. Two exceptions are occupations in the Multisector and Agriculture/Food/Forestry grouping, which have higher education requirements than the average occupation. Note that typical entry-level jobs in Waste Disposal jobs do not require either a diploma or degree.



Our interviews with employers found they are seeking a variety of types of workers with different levels and types of skills. In general, the positions available tended to segment into three tiers:

- Entry-level and fieldwork positions, which often involve skilled trades and construction-related knowledge;
- Back-office administrative support jobs, which typically require generalized, but not specialized, office skills;
- Advanced-credential positions, such as engineering and project management positions, which typically require specific degrees and/or previous experience in the field.

As the set of positions likely to require some specialized skills while employing the largest number of workers in new areas, CGR's focus was primarily on entry-level and skilled trades

positions. Many employers that require specific skills do some level of on-the-job training in the specifics of their work.

Much CE work is construction-related, and often, some general construction skills or adjacent skilled-trades skills are useful.

For instance, general construction skills are needed to help construct solar farms, while general plumbing and HVAC skills are required for the installation of heat pumps and general electrician skills are required as part of home solar installation. Conversely, none of these general skill sets are CE-specific, as all could also be used to service and install fossil fuel-powered systems.

Frequently, what employers stated they were searching for was basic soft skills and eagerness to learn.

For example, one employer stated that what was important was “not the skillset, but the orientation to learning and growth. Adaptability, drive, and ambition to learn new skills is important.” Another employer stated that they were looking for people with “soft skills, mechanical aptitude, and a good worker.”

Employers in Clean Energy companies and agencies primarily spoke of needing more electricians, equipment installers, technicians and, generally speaking, skilled trades workers. Although several companies said they are able to find the workers they need, many discussed shortages and a few are struggling with severe shortfalls. Electricians were frequently named as a shortage area, with larger companies involved in solar installation, large-scale wind and solar projects discussing a wide range of workforce needs including:

- solar technicians
- electrical foreman
- site supervisors/construction managers
- heavy equipment operators
- educators who can provide training on job sites
- project managers
- electrical estimators
- administrative support staff
- warehouse technicians
- and electrical, mechanical and civil engineers.

Among contractors focused on home energy efficiency and clean energy projects, most report having at least some trouble finding sufficient electricians, technicians and installers. Several

said they look for general mechanical aptitude and then provide on-the-job training. This was true for smaller and mid-sized firms as well as large companies.

Worker Interest and Readiness

Key to filling these needs and positioning the region to benefit from the Clean Energy transition is knowledge, interest and readiness on the part of workers to pursue and attain CE jobs. As discussed above, CGR sought input from job seekers, as well as workers in fossil fuel-related industries, to understand their perspectives on Clean Energy job opportunities.

Job Seekers

Working with local nonprofit service providers, CGR held focus groups with two sets of job seekers, aiming to reach traditionally marginalized populations and explore what they knew and how they might benefit from a transition to Clean Energy. The first focus group featured nine Black men who are in a workforce development/skills-building program to help them reenter the workforce after release from prison. The second focus group, focused on the Latino/Spanish-speaking community, and featured both men and women, most of whom were bilingual.

In both focus groups, CGR discovered little concrete knowledge about the Clean Energy transition, the elements of a Clean Energy economy, or what skills/abilities a Clean Energy workforce would need to participate in this economy.

Most participants had heard generally about concerns about the climate and new technologies such as electric vehicles (EVs) and wind and solar power generation, the latter both on solar farms and on residential installations.

In general, across both groups, there was skepticism that major shifts in the economy or technology were coming soon.

This was especially evident on the topic of EVs, where members discussed pros and cons, offered anecdotes about problems with range and reliability, cited stagnant or declining sales of EVs, and gave their opinions that gas-powered vehicles would not be replaced anytime soon.

Due to this skepticism, participants in both focus groups expressed reservations about whether they would themselves seek or recommend that younger people they knew seek training in CE-specific skills, such as automotive technician skills for EV maintenance. Some believed fossil fuel-related jobs were never going away, so that was a safe investment in training, while others believed that CE-related technology and skills represented an inevitable wave of the future, and it was smart to start learning about them now.

Just Transition Workers

CGR conducted interviews and focus groups with workers in Just Transition industries – those primarily based around fossil-fuel energy sources, that might be affected or diminished as the state progresses with a Clean Energy transition. This included workers connected with automotive repair – representing auto mechanics and automobile dealerships; service station owners – including gas station owners; and plumbers and HVAC technicians who work with gas heating and gas line installation.

Members of these groups had a mix of opinions about the desirability and necessity of a Clean Energy transition and the state's mandates and incentives to encourage this. As a whole, these workers were not particularly concerned about the transition.

First, most expressed doubt that there would be a significant shift in the near future to a primarily Clean Energy economy. This included substantial doubt that state and federal timelines for things like zero-emissions vehicle sales (100% of light-duty vehicles by 2035 in NYS), and a ban on gas lines in new construction (NYS bans starting in 2026 and 2029) were realistic or would actually happen. Notably, interviewees and focus group participants were not very well informed about the specific details or timelines for these events. (For example, at least one gas line worker repeated the common misinformation that Gov. Hochul was going to “take away New Yorkers’ gas stoves”.) We also heard concerns from some interviewees about whether certain CE technologies such as EV batteries, heat pumps and geothermal heating operate efficiently in cold temperatures.

Second, most believed that even if a shift were imminent, there would still be more than enough demand for their legacy fossil fuel-centered skills that they would not need to transition to a new set of skills. For example, auto mechanics and shop owners expressed the belief that EV adoption is happening slowly, and there will still be plenty of gas-powered cars on the roads for decades. Likewise, gas line/gas heating workers believe natural gas will continue to be needed in order to generate the steam needed for industrial processes, though this conflicts with the state’s mandate for a carbon-free grid by 2040.

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Third, even if new training or investments were required for their jobs or business operations, most expressed confidence that this was achievable – that they could find the needed training and would be able to shift relatively easily into new roles or working with new equipment, as required.

A commonly expressed attitude was that some Just Transition workers were agnostic or indifferent to whether energy sources were clean or not. Many expressed that they are perfectly happy to work on CE projects if they get the required training and it pays just as well. They “will do whatever they’re assigned to,” as long as they are paid properly.

Automobile Dealers

CGR interviewed a representative of an automobile dealer trade group. He expressed that auto dealers have no opposition to electric cars: “They’re willing to see anything the customer wants, but it has to be something the customer wants.” But he sees hesitation in customers, and dealers will readily sell gas/ICE cars, instead. He believes that public adoption of EVs turns on continuation of good incentives, to combat their overall higher price point, and installation of public charging infrastructure, to combat “range anxiety.”

He believes that training of mechanics/technicians for EV servicing is not an issue for franchise auto dealers – they receive training and equipment directly from the manufacturers they are representing, and their mechanics/techs participate in this as a regular part of their work, so they are ready and able to service any electric vehicles in their brand family. A larger problem is simply finding and hiring qualified mechanics/techs, in general. MCC was mentioned as one local institution training automotive techs. Some educational institutions partner with manufacturers and train workers to work on specific brands of cars.

Automotive Mechanics/Technicians

Independent auto mechanics/technicians and independent repair shops/service stations face a different set of challenges from a coming EV transition. CGR interviewed a Rochester-area auto mechanic and an owner of another independent repair shop/gas station.

These mechanics generally expressed confidence that they will have plenty of demand for gas vehicle maintenance for the foreseeable future, so most do not see a transition seriously affecting them before their anticipated retirements.

They both note that they currently perform a limited set of maintenance tasks on electric vehicles, including brakes, tires, suspension and alignment, and assume that any more serious maintenance and engine maintenance is performed by the dealers of that brand.

Interviewees note that servicing EVs beyond these basic tasks requires specialized and expensive equipment. This potentially includes: new car lifts, because EVs can weigh substantially more than conventional cars due to their battery packs; new training and safety gear, such as insulated high-voltage-resistant gloves; and new electronic equipment for diagnosing and programming repairs to EVs. Because cars are increasingly automated and contain complex computer equipment, programming skills or comfort with performing software updates may be an increasing part of car service work.

There is an open question concerning whether auto manufacturers will have openly available standards and equipment for repairs, such that independent repair shops can diagnose and repair their vehicles, or whether they will have proprietary systems that oblige vehicle owners to only use the manufacturer’s own franchise/dealer repair services for any complex repairs. We also heard a concern about the ability to service large fleets of EVs in the local government setting. The question was whether fleet service could be performed in-house, or

would require dealer servicing for all needed maintenance, which could result in unacceptable turnaround times when handling a large fleet, defeating the very purpose of local government having fleet mechanics.

Gas Stations

CGR spoke with one **owner of several Rochester-area gas station/convenience store combinations**, and one co-owner of a **combined independent repair shop & gas station**.

The installation of charging stations, which would be integral to adaptation to a Clean Energy transition, was not viewed as favorable or feasible by our two interviewees.

The **owner of multiple gas stations** does not see a big impact on himself or his workforce in the next 25 years or so. He believes that gas cars will still be around and need gas. He has explored installing electric chargers, but was quoted a price of roughly \$40,000 per Level-3 charging station, which is beyond what he is currently willing to spend. Available grants would not do enough to defray this cost, and federal subsidies are only available to larger operations. He believes that to accommodate any large number of vehicles for the time required to fast-charge them (which he estimates at 30 minutes), would require a larger parking lot, with 15-20 spaces. However, if this eventuality comes, he has considered how to reconfigure his store to make it more of a destination spot/waiting area, with food available, and more of a coffee shop feel.

His staff would not require retraining, because currently they do not handle the gas fueling side of the business. The gas pumps are self-service and their operation, maintenance and refueling is all handled by a separate local company that he contracts with. He assumes a similar arrangement would come with any installed electric chargers, so none of the station employees would need new skills.

The **owner of the combined independent repair shop and gas station** only has two full-service gas pumps and has light traffic for gas. It is not a substantial part of business income, which mainly comes from repairs, so he indicated that he could do without the pumps, if necessary. But he had no plans to replace them with charging stations as he felt it would take too long for vehicles to charge and the parking spaces are otherwise used for vehicles awaiting repairs.

Local 13 Plumbers and Pipefitters

CGR conducted a focus group with 9 members of this union, including project managers, estimators and service technicians. They work on plumbing and pipefitting connected to larger construction projects, not residential. Some worked on large commercial/industrial projects and some for more mid-sized projects/customers, like school districts and municipalities.

They indicated they did not see the Clean Energy transition as a threat to their work, as the high temperatures needed to make

steam used in manufacturing processes require fossil fuels. So, they see an ongoing role for natural gas, which is most of their work is connected to.

The members are open to doing more Clean Energy work, including geothermal and biogas (such as methane), and would not necessarily need a lot of retraining as the plumbing/pipefitting is the same. They noted that about 10 members of their local had recently worked on a methane recovery project in Newark to extract methane gas from cow manure and sell it to a transmission company. They expect more of these projects in the future.

The group also described working on co-generation projects where natural gas combustion produces electricity and steam which is used to power turbines resulting in higher efficiency use of the fossil fuel.

They also criticized state mandates and timelines, including a move to end the use of freons with a “global warming potential” number higher than 200. They say there isn’t enough supply of the freons with lower numbers and some of the substances used in the replacement freons are hazardous to the health of technicians.

Just Transition Worker Training Needs

Overall, the Just Transition workers that CGR interviewed were not well informed about specifics and timelines for transition mandates and new regulations. Beyond that, they did not see a major transition in the near future as likely or technically realistic.

Many workers who were interviewed were middle-aged, with substantial experience in their current jobs, and thought that even if a transition did start accelerating, enough legacy fossil fuel systems would remain in place that they would have demand for their current skills until they retired.

While workers did tend to express confidence that they could be retrained and acquire new skills if they needed to, since they broadly believed they would not need to, none had specific plans about retraining, acquiring new skills, or otherwise making career pivots, and none spoke about specific new skills they would need to acquire, except in the broadest of terms (e.g., gas car auto mechanics/technicians would say that, to work on EVs, “you’ve got to learn all the electrical stuff, like about batteries.”)

Training and Education Gaps, Needs and Barriers

Employer Perspectives

Broadly speaking, as discussed above, employers did not identify large gaps or lacks in specific CE-related training. Rather, they are interested in more workers with a general set of trade skills, such as electrician, plumbing or HVAC training, and then they will often provide for additional specialized training in the area they are working in.

Therefore, much of the discussion with employers was about the need to get more people involved with learning the trades. Several of the interviewed employers have partnerships with Career & Technical Education (CTE) programs, such as **BOCES** and **MCC**.

Employers mentioned several educational/training programs that they draw workers from, including **Genesee Community College's** solar program, **BOCES** programs, **Monroe Community College's** HVAC and other trades programs and **NYSERDA's On-the-Job Training program**. We also heard from many employers that they look primarily for soft skills and mechanical aptitude in candidates and then provide their own training. Some will send employees for training through resources like **Isaac Training and Education Center (ITEC)** and **NY Weatherization Directions Association** once they demonstrate basic skills and a good work ethic.

The strongest theme from employers was the need to increase awareness among students about Clean Energy employment opportunities starting at younger ages, even elementary school age, and to change the predominantly negative image many still hold of the skilled trades.

Specific gaps mentioned include:

- **GCC's** solar program is small (one employer said only 9 students were recently enrolled) and focused on residential installations. Suggested expansion to provide skills needed for **utility-scale projects**.
- Some union training programs may need to adjust programs to ensure the workers get the needed skills – installation of panels for grid-scale solar was mentioned as a gap, along with the experience and skills to wire large-scale high energy utility installations, which differ from residential electrical work.
- **RTS** representatives mentioned the possibility of a maintenance technician program for electric buses, perhaps at **MCC**. As more of the overall fleet of vehicles becomes electric, there will need to be more educational options for training maintenance technicians. **RTS**, which provides bus service throughout seven Finger Lakes counties, is working to meet a

mandate of a zero-emission fleet by 2040. To do this, the agency has purchased 20 electric battery buses and now is shifting to purchasing hydrogen fuel cell powered buses that provide more range and perform better in cold weather. The main impact on the workforce is via the maintenance workers who service the vehicles, and the agency is providing training on the electric buses via a dedicated trainer and support from manufacturers.

- **RG&E** representatives stated that a broad renewable energy education program could be helpful in sparking student interest and creating a pipeline of workers for the industry.

Labor Union Perspectives

Labor unions play a critical role in training workers for a variety of roles important to the Clean Energy transition. Electricians and pipefitters/plumbers are in high demand for some Clean Energy projects, and while unions do not represent or produce all of these workers, they train and represent a significant segment of highly skilled workers in these fields. Electricians will be essential for every step of “beneficial electrification,” the generation, transmission and distribution of Clean Energy, from beginning to end. Plumbers and pipefitters are essential to technologies like geothermal, heat pumps, and other efficient HVAC technologies.

In general, we heard a little about unions working to ensure that Clean Energy-related skills are incorporated into their training. This seems to be an area that could be strengthened.

Electricians

IBEW Local 86 represents a workforce of 1,200 commercial and industrial electricians spanning the nine counties of the Finger Lakes region. They have substantial involvement in the Clean Energy sector, with their most direct connection being through regional solar projects. At the time of interview, IBEW 86 had 55 members working at the Morris Ridge Solar Project and expects that number to increase to 100 members.

There are limits on the number of unionized positions available. IBEW Local 86 accepts the top 10% of applicants annually who completed an entrance exam and interview with leadership to be accepted. Once accepted, individuals go through a 5-year apprenticeship program that includes on-the-training and classroom instruction. This year, IBEW Local 86 has admitted 54 apprentices. IBEW 86 also has a collaboration with Alfred State College for the advanced placement of apprentices. In addition, the IBEW Local 86 houses a “Train the Trainer Program” to ensure that their members are continuously building their skillsets.

Plumbers & Pipefitters

UA Local 13 Plumbers and Pipefitters represents HVAC service technicians and pipefitters. This population of workers are integral to maintaining and installing heating, ventilation, air conditioning and piping systems. As described above, members did not see much need for

specific Clean Energy retraining, as their work in installing and maintaining systems is not a lot different depending on the energy source.

Construction

LiUNA Local 435 represents workers involved with construction projects. The union is affiliated with the Upstate New York Laborers' District Council, a subsidiary of LiUNA (Laborers' International Union of North America). It is also affiliated with the local, state, and national building trades, as well as the local, state, and national AFL-CIO. LiUNA members are or have been involved with wind and solar power projects, including the Mt. Morris solar project.

LiUNA states that little training is required for their entry-level Clean Energy jobs beyond the ability to use tools. Additional skills are developed on the job. LiUNA has recently started to provide in-house training for tasks involved in solar projects, including building racking and pounding posts. LiUNA is working to include new practices to keep workers up to date.

Regional Clean Energy projects as well as other labor jobs provide a career pathway to well-paying positions with solid benefits to support families. They believe there will be continuing demand for such work and are bringing on younger members to replace Baby Boomer members as they retire. LiUNA collaborates with community groups, BOCES, GLOW and local high schools to recruit members. Recruitment through social networks is also an avenue to bring in new members. They also target people who work on farms or those who prefer to work with their hands.

Auto Workers

The **Rochester-Genesee Valley Area Labor Federation** is an umbrella organization of regional labor unions, spanning the skilled trades, public-sector, health care, and service sector union members. While many of the affiliated unions are not directly related to CE fields and potential Just Transition fields, the Federation includes United Auto Workers union members who work for the local General Motors plant in Rochester. The Rochester plant was instrumental in the development of fuel injection systems and is now reportedly transitioning into electric vehicle (EV) work on coolant systems for batteries. GM also helped develop hydrogen fuel cell technology.

Workforce Developer Perspectives

Workforce developers are typically funded in whole or part by federal, state and local governments, and are expected to be producing a stream of workers to meet the demands of local employers. As Clean Energy employers face challenges securing the workers they need, it is important to understand what bottlenecks may exist at the workforce development level.

Themes from the interviews with workforce development programs were:

- Most workforce developers see a lack of demand for Clean Energy-related training.

- A few highly focused programs have a strong level of demand for CE-related training but lack a sufficient flow of candidates with the right set of preliminary skills and previous training necessary to make best use of those programs.
- A small number of workforce developers are providing specialized CE-related training.

Lack of Demand for Clean Energy-Related Training

Most workforce development programs are broadly focused, providing worker support, training, or service connections to a variety of career possibilities and skill sets. Most of these programs stated that they see a lack of demand for specific Clean Energy-related training from employers and the labor market. Some simply stated that the topic had never come up: they see demand for healthcare jobs and generic construction jobs, but nothing related exclusively to Clean Energy, per se.

Generally, there is a lack of awareness among workforce development organizations, employers and workers on what Clean Energy career paths are or what training would be needed.

For example, one interviewee stated: “We don’t know what New York State expects us to do on this.”

One of our interviewees was a nonprofit providing apprenticeships to train workers for manufacturing jobs that has not heard much from its member companies about Clean Energy jobs. In general, the training it provides is in machining, welding, technician work, and optics. The organization has only heard about solar installers as a discrete field of local Clean Energy work, and is aware that there is no DOL state-certified apprenticeship program related to solar.

In general, workforce developers are vaguely aware of state mandates for a Clean Energy transition and the potential for future demand. They are aware of challenges with getting Clean Energy initiatives off the ground, but there is a general lack of knowledge among members of the public, employers, and workforce development trainers about what state mandates actually entail, and how they concretely translate into demand for specific career pathways or specific types of job training.

Some interviewees state that workforce development organizations are not specifically looking at Clean Energy as a distinct workforce/business sector yet, in the way that, say, “healthcare” is clearly recognized as a distinct sector with specific skills and career pathways. Likewise, other interviewees stated they have not received requests for specialized training from specific companies, or for specific career paths that are exclusively focused on Clean Energy. Even in a rural county with significant construction of solar farms, a workforce developer stated the farms do not appear to use local labor and he has had no training requests from these companies for additional workers or skill pathways related to these jobs.

Some Clean Energy companies train in-house, so there are no specific roles/demand for workforce development organizations to develop the skills they require.

We heard that educators and employers do not have Clean Energy-specific tracks, because they are training for many different job skills that partially touch on Clean Energy, while encompassing other, broader, skill sets. Examples are electricians, HVAC installers and automotive technicians - each has potential Clean Energy aspects and each can also go into jobs that end up having no Clean Energy aspects.

Specialized CE jobs are trained at a higher level than most workforce development training provides. For instance, many more advanced, specialized CE jobs require engineering degrees. In addition, “sustainability coordinator” is a new position/career path we heard about which tends to require a specialized college degree.

One gap we heard about was in the area of weatherization. A Weatherization Energy Auditing Certification is only available through attending the Building Performance Institute program in Syracuse, with the only local alternative being enrolling in a multi-year HVAC training program, such as offered by MCC or internally by some local commercial companies. Some in workforce development have been considering whether it would make sense to stand up a local certification program.

We also interviewed one workforce development program developing specific clean energy training programs in partnership with companies to train people in positions including Electrolyzer Automator, Fuel Cell Automator and solar panel manufacturing.

Educational Entities

Educational entities interviewed include **Monroe 2-Orleans BOCES**, the **Building Performance Institute**, **BEST Center Genesee Community College**, **Monroe Community College**, **RIT’s Golisano Institute of Sustainability**, **Isaac Training and Education Center (ITEC)** and **Edison Career and Technology High School**.

Interviewees from several higher education institutions reported either an interest in Clean Energy programming or plans for new Clean Energy initiatives. However, our interviews also point to a need for educators to better understand and capitalize on the opportunities within the CE ecosystem.

Overview of Related Programs and Activities

Monroe 2-Orleans BOCES provides Career and Technical Education programs to students from 9 districts and adult learners in Monroe County. The K-12 BOCES population includes students diagnosed with a disability. Sixteen CTE career clusters including architecture and construction, manufacturing and transportation are offered by BOCES.

Building Performance Institute (BPI) is a non-profit association that provides 16 certifications for the home performance industry (e.g., weatherization). BPI sets national standards for improving comfort and energy efficiency and for creating and maintaining safe and healthy home environments. From these standards, BPI develops professional certifications for home contractors to ensure quality service and workmanship. BPI certifications are offered from entry level to advanced designations and cover building science with an emphasis on health and safety. BPI certification offerings include Building Science Principles (BSP), Healthy Housing Principles (HHP), Site Supervisor, and Total Building Performance (TBP). As well, BPI is currently developing a Residential Electrification Energy Audit Professional Certificate of Knowledge (REEAP), and a Cold Climate Air Source Heat Pump (ccASHP) Certificate of Knowledge.

Monroe Community College's Finger Lakes Workforce Development (FWD) Center serves as a central hub for in-demand industries to collaborate and help with training. The FWD Center focuses on advanced manufacturing with an emphasis on optics and agribusiness and is interested in potentially developing more programs related to clean/renewable energy. The FWD Center has an apprenticeship program that includes coursework in plumbing, pipefitting and electrical (residential and commercial).⁵ The Center aspires to create new programs related to agribusiness and clean/renewable energy. These programs are not credit-bearing. MCC also offers a solar thermal technology certificate and associate degree programs in heating, ventilation and air conditioning and construction technologies.

Genesee Community College offers a two-year solar technician program; however, many students do not complete it because employers hire them before completion. The college is expanding its HVAC program to include Clean Energy training/topics and is considering an electric vehicle maintenance program for the future. Also, in consortium with **RIT** and **Plug Power**, GCC is working on a grant proposal to develop a hydrogen fuel cell training program.

Other institutions, such as **Monroe 2-Orleans BOCES**, infuse Clean Energy topics within existing building and construction trade programs. The electrical program exposes students to solar panel installation and electric vehicles charging. The HVAC program exposes students to geothermal. Autobody students are taught how to repair electric vehicles. Our interviews also suggest that programs such as computer technology could support the monitoring of Clean Energy through the collection of data.

RIT's Golisano Institute of Sustainability has academic and research programs focusing on environmental impact but not Clean Energy. There are graduate programs in sustainability science and an architecture program with a sustainability component. Faculty research includes systemic studies of energy systems with new energy technology. One faculty member works in Africa and rural/tribal community with renewable energy. This project extracts food waste and converts it into cleaner energy.

⁵ <https://workforceforward.com/wp-content/uploads/2024/03/2024-Skilled-Trades-and-Construction-Technologies.pdf>

Isaac Training and Education Center (ITEC) is a for-profit open training program spun off from the in-house training program of Isaac Heating & Cooling, an area HVAC specialist company. They train workers for more than 30 HVAC-related companies across the state. ITEC received a 2-year grant from NYSERDA to teach clean tech, including heat pump installation, high-efficiency A/C systems, and geothermal technologies, but report that their client companies – the contractors who send workers to ITEC for training in these technologies – are only interested in heat pump training. Among the reasons for this: geothermal systems are very expensive, so only a few contractors specialize in this, and they already have their crews trained and ready to their standards; the standard to install high-efficiency A/C systems that qualify for state rebates is so high and expensive that most customers opt for heat pump systems, instead. Likewise, ITEC reported that it is losing money by offering NYSERDA-qualified classes, because the number of workers attending is insufficient to offset the cost of offering the classes, leading to uncertainty about renewing the contract with NYSERDA after it lapses in August. ITEC’s NYSERDA-sponsored Heat Pump class is a 30-hour, 4-day class that costs \$95 to attend. The next scheduled class, which begins next week, still has all 12 of 12 spots open. Trainee workers have to provide their own tools in some cases, which can be a personal investment of up to \$2,000.

Edison Career and Technology High School is a CTE-focused public school in Rochester known locally as “**Edison Tech**”. It does not provide programs related to Clean Energy, but students are exposed to the topic in environmental science. The school offers programs in the trades and advanced automotive technician training. Exposure to electric vehicles occurs in the advanced automotive program.

Limits to Clean Energy Training Programs

Interviewees reported mixed demand for Clean Energy-related training. For example, while **BPI** reported that contractors are concerned about the lack of skilled individuals to do the work that is needed to make a difference in the housing stock, a few sources at **BOCES 2** did not see a high demand for Clean Energy workers and did not hear about any such demand in their professional circles.

Likewise, there seems to be a lack of consensus regarding whether there is a need or value proposition to offering a broader Clean Energy academic program.

“We don’t think there is a need, or it has not been clearly articulated,” one interviewee said. The development of such a program would need to come from NYSERDA. **BOCES 2** determines its curriculum based on industry needs. The interviewees suggested that if there was an incentive for education institutions to teach about heat pumps, such as sufficient consumer demand that drove a higher demand for specifically trained workers, then it would incorporate related content into their courses. Interviewees reported that it would be difficult to offer a standalone Clean Energy program.

As noted above, a number of educational entities – such as the **Golisano Institute of Sustainability** and **Edison Tech**’s automotive training programs – do not identify themselves as having Clean Energy programs or tracks, per se, but feature some training, education or research that closely relates to various aspects of the Clean Energy economy.

Some interviewees stated that employers are in the strongest position to provide their workers with the training needed for Clean Energy jobs. This training can happen on the job or in collaboration with an educational institution. **BOCES** was working with **Li-Cycle** regarding lithium batteries.

Educational entities broadly reported that they organize trainings, classes and career paths based on demand for specific skills from employers and students, and likely career prospects for graduates. Some educational entities alluded that they had previous experience training students in specific skill areas of supposed employer demand, only to find that there was not high demand for these students when they graduated. Therefore, educational entities would rather train students in broad sets of skills that might be marketable to many employers.

Some educational entities stated that if specific CE-related training is desired, additional focused funding needs to be made available specifically for those trainings/classes.

For example, **REOC** had a solar training program that ended when funding ran out.

Enhancing the Appeal of Clean Energy Training Programs

Interviewees discussed a need to lessen/eliminate the stigma regarding enrolling students in trades versus attending college. Families need exposure to the range of opportunities in trade and industry jobs. Some interviewees suggested incorporating discussion about trades in elementary school in order to reframe Clean Energy jobs as attractive and to attract more students to trades and technician programs. One interviewee stated “Start very early in schools to introduce these concepts to students who can then see them as a viable career for the future. You must include families so they will be supportive of trades as an option. Many parents feel the scrutiny of being judged if they have a child who is not considering college so there is a need to get them on board.” This interviewee also recommended bringing in trades workers to schools or career fairs to talk about green jobs to expand awareness.

Improved outreach, wraparound support, food equity and access to basic equipment were mentioned as elements needed to ensure racial, ethnic and gender diversity. Basic skills, soft skills, transportation, internet and cell phones were also mentioned as needed supports.

Among the specific needs or steps mentioned in interviews to enhance appeal:

- Early communication with students and parents is needed about Clean Energy and other opportunities in the trades. Exposure to Clean Energy training can occur at community

events. Students need hands-on experience and opportunities with contractors who show what it is like to do their jobs.

- Employers and education institutions should educate teachers and counselors about Clean Energy opportunities, including required skills and available training.
- Clean Energy employers should identify the specific training and skills needed for the workforce.
- Improved Clean Energy marketing materials are needed to include images of women in male dominated jobs and people of color in majority white trades.
- The availability of free or low-cost training is needed in the Clean Energy sector to limit debt accumulation since cost may be a barrier to Clean Energy training programs.
- Access to wraparound services (transportation, childcare and food insecurity) is a barrier to workforce training programs related to Clean Energy.
- Training locations should be accessible to facilitate participation.
- Qualified trainers and instructors on the certification side would include those who are bilingual and those who have cultural competency in relating to marginalized groups.

In general, some educators stated their belief that there was a lack of coordination among entities involved with Clean Energy to clearly articulate a collective set of demands and needs that could lead to creating training programs and well-defined jobs pipelines.

Barriers to Employment in Clean Energy Jobs

In our conversations across stakeholder groups, we heard about employment barriers common across the economy, as well as challenges more specific to Clean Energy jobs, which are summarized below. We also provide an overview of the work that community service providers are engaged in to address barriers and help their clients benefit from Clean Energy job opportunities.

Key Barriers

General Job Barriers Common across Industries

Most frequently mentioned were the low appeal of the trades for many job seekers and students, as well as challenges around transportation and child care.

Some Clean Energy job sites, including utility-scale solar installations are inaccessible for many workers, especially those without cars. Other jobs in Clean Energy contracting require workers to have personal vehicles and be able to independently travel to homes and work on a variety of sites.

Lack of Knowledge of Clean Energy Opportunities

Several employers also expressed that they think job seekers, and young people, in particular, do not understand the opportunities in the industry and the potential for high earnings.

Relatedly, stakeholders shared that the career pathways in CE jobs are either not well understood or, in some cases, non-existent. A contractors' association discussed that rather than a defined pathway, energy efficiency has more of a "web" of opportunities and many different directions that can be taken. Contractors need a career plan to help determine a specific pathway and the needed certifications to pursue that pathway, out of the variety of options available (for example, whether to become an "energy auditor"). This interviewee feels that educational entities have not done a good job of defining and structuring these pathways.

Barriers for Specific Populations

There are various requirements to be part of apprenticeship programs which may pose barriers for some individuals/populations. The NY Department of Labor requires that workers are at least 18 and hold a valid driver's license, which is a barrier to some low-income individuals. Most unions require that applicants have basic construction knowledge and fundamental reading and math skills. While this is understandable, it can pose a barrier to those who did not complete their basic education for a variety of reasons. The requirements for Clean Energy jobs include the ability to use tools and workers can develop additional skills on the job. Individuals with disabilities can face barriers to participation, depending on the nature of their disability.

In addition, ensuring job seekers have the necessary soft skills and enough education/literacy to comprehend material such as technical manuals can be challenging for some hard-to-employ populations that may have been out of the job market and school for some time.

As well, there is a significant language barrier in the industry for those not fluent in English. Most trainings and all certification exams are available only in English, according to **BPCA**.

Complexity and Bureaucracy of Some State Funding Streams

A variety of stakeholders discussed challenges in accessing state support for projects. This has the effect of limiting growth in Clean Energy jobs, which reduces the need for workers but also the potential benefits of growth to this ecosystem for our region.

Employers discussed that NYSEERDA programs are helpful for training (the OJT program was mentioned by several employers), and for providing incentives to customers for home energy efficiency and renewable energy installations, but paperwork requirements serve as a deterrent for some employers. Individual contractors and smaller HVAC companies find the paperwork required complex and difficult and reportedly will try to avoid it, if possible. Because of this, some contractors reportedly aim for moderate income and higher income homeowners, so they can avoid the paperwork and requirements for installing systems for low-income homeowners.

One interviewee stated that, in its estimation, “87% of NY contractors don’t want to work with NYSEERDA” programs for home energy efficiency because of the huge administrative burden of working with the state. This includes the challenge of getting contractors appropriately certified.

MWBE requirements are also slowing some installations. Organizations receiving state grant funding for low-income home projects must have a percentage of their work go to state-certified MWBE workers/contractors, and there are sometimes not enough of these available. Commercial installers dealing with other homeowners paying for service do not have the same requirements, so they tend to help those customers first. And some companies sometimes will not do the paperwork needed to shepherd low-income households through the process of eligibility and reimbursement.

Apprenticeship-Related Challenges

Interviewees mentioned a few different challenges related to apprenticeships and their role in Clean Energy jobs.

One discussed that funding for DOL-registered apprenticeships in energy efficiency was put on hold or eliminated because of pushback from labor unions, because large portions of the energy efficiency workforce in the state is non-union and the unions objected to funding programs for non-union workers.

We also heard that the breadth of job task requirements to complete some NYS apprenticeships, such as electrician or heavy equipment operator, do not always fit well with the more limited job tasks that are regularly required in Clean Energy fields such as solar

installation. This means solar workers cannot fulfill all of the apprenticeship requirements just by working in the solar industry, as they will not gain experience in some of the job tasks required.

Resistance to Clean Energy Projects

Union leaders discussed resistance from local communities to the solar industry and solar projects. Union leaders have attended meetings and people do not want these projects, but these communities do not recognize the potential economic benefits associated with these projects. As projects come to small towns, workers are spending pay checks within the community. Union leaders believe that additional marketing about the job and local financial benefits of Clean Energy projects is needed to help convince communities of their benefits.

Overview of Service Provider Programs and Feedback

Service providers work to meet a range of needs for their clients. CGR interviewed several providing services to both general and specific populations to learn about their offerings, challenges and perspectives on preparing clients for jobs in Clean Energy. Specific populations served include veterans, Latinos, Spanish speakers, and people exiting incarceration. All provide services to clients who may benefit from Clean Energy job opportunities. They are willing to provide information and support to clients about Clean Energy opportunities but said they do not know enough about the opportunities nor have sufficient connections to resources.

Each organization has its own menu of service offerings, with some providing help in areas spanning legal, health, education, housing, case management and navigation services. Some provide job training and career support, such as assistance with creating resumes and preparing for job interviews.

In summary, service providers see the potential for job creation and sustainable economic growth through Clean Energy initiatives, but stakeholders must coordinate to get the most out of the transition.

One of the providers connects community members to connected providers via an online platform. A representative said staff members need more awareness and education of what Clean Energy jobs are, how you get them and how much schooling it takes. This organization aims to overcome community members barriers to employment and financial security by working to ensure that they receive coordinated care addressing all their needs, rather than receiving services from disconnected providers who may perhaps only address one or a limited set of needs.

An organization focused on reuse of donated items including clothing and furniture sees growth in industries in our region that will focus on turning used materials into new materials, with the potential for a lot of new jobs in remanufacturing and recycling. These jobs are more accessible to a broader workforce – sorting, building machines, helping with recycling – than highly specialized clean tech jobs. This organization also runs the 211 phone and internet-based referral program which connects residents with a variety of needs to community agencies.

Another interviewee organization serves veterans and provides a range of services, including behavioral health, fitness, legal assistance, housing and bus passes as well as training for a range of specific but nothing in Clean Energy currently. A representative expressed openness to adding a Clean Energy training program.

An organization serving re-entry clients exiting incarceration provides career support services including assistance with job searching, resumes and interview preparation. Some clients enter the trades, including electrical training and solar-related jobs. Representatives said job seekers need more education about Clean Energy jobs and pathways and indicated that most Clean Energy-specific jobs require special training and are at a higher level than the common worker – jobs such as engineer and sustainability coordinator.

While the biggest gap seemed to be adequate knowledge of Clean Energy jobs and needed skills, other top barriers we heard about were:

- Transportation
- Language access for Spanish speakers
- Jobs that require high levels of skill or training

To help clients overcome the transportation barrier, some organizations provide bus passes or try to make other arrangements for transportation.

Just Transition Workers & Job Seekers

The main barrier for Just Transition Workers and Job Seekers was similar: a lack of concrete knowledge about Clean Energy jobs, potential career paths and earnings potential for these jobs, and an understanding of how their current skillsets could be translated into CE fields in a way that would make good use of their previous experience in prior non-CE jobs.

For Job Seekers in particular, an expressed area of concern/barrier was whether CE jobs would be accessible/welcoming to them as people of color. This concern is discussed in more detail in the following section on Improving DEI.

Diversity, Equity, and Inclusion in Clean Energy Workplaces

Many Clean Energy jobs are in fields, for example, skilled trades, that have long been dominated by males and by whites, which compounds and complicates the task of diversifying the workforce and ensuring equitable access to good opportunities. Homogenous workplaces are often self-reinforcing – managers tend to hire those who are like them or seem to fit in, workplace culture becomes centered around a gender or racial and ethnic group, and existing employees might lack diverse networks that would help them reach potential employees from other groups.

Many of the employers acknowledged their workforces lack diversity and several – mostly larger employers – described efforts to improve. The most common strategy mentioned was working with community organizations to educate their clients about Clean Energy opportunities and skills needed.

RTS is seeking funding and planning an internal apprenticeship program to provide training and mentors to workers to become senior maintenance technicians.

RG&E partners with the **Multi-craft Apprenticeship Preparation Program (MAPP)**, Charles Settlement House, and MCC on applications for funding for resiliency projects in disadvantaged communities. If funded, these programs benefit the communities and can provide training and job opportunities for residents, youth, and other community members.

A large solar provider partners with community programs, such as YouthBuild in Catholic Charities Family and Community Services and **Urban League of Rochester**, to provide students with training, exposure to job sites, and hands on demonstrations in classrooms.

One local company described striving to create an accepting and welcoming environment. Part of the strategy involves career pathways, discussed in the next section. The company's efforts have paid off and it has people of color in top leadership positions, as well as an employee who underwent a gender transition.

One of the community agencies we talked to employs workers from typically disadvantaged populations like the re-entry population exiting prisons or jails, youth, and people without established work histories in home weatherization and energy efficiency programs.

Other employers also mentioned cultivating a positive and inclusive culture, providing good pay and benefits, and providing support for education and career development as important strategies for diversifying the workforce. A few discussed changing their hiring process to mitigate bias, but this was not a frequently mentioned strategy.

The Role Unions Play

Unions have been working hard to diversify their membership and build inclusive coalitions of workers for some time. Most unions seek to recruit diverse populations through word of mouth and outreach to targeted populations. Recently, many unions have shifted their focus to recruiting high schoolers who do not want to go to college.

Although many union fields are seen as primarily dominated by white males, not all unionized workplaces are predominantly white. For instance, Rochester's General Motors plant has a majority minority workforce. Other organizations are working to empower people of color in unions: the **Coalition of Black Trade Unionists (CBTU)** represents Black workers across 14 industries within the AFL-CIO, emphasizing leadership development and political advocacy for Black labor within the broader labor movement. While CBTU is not directly involved in Clean Energy projects, it plays a crucial role in supporting its members at unions involved with Clean Energy to transition to new roles within the Clean Energy economy through educational initiatives and leadership training. The organization focuses on empowering its members to take on leadership positions and advocating for policies that promote sustainable and equitable workforce development. Although CBTU does not have direct connections to Clean Energy projects, its efforts in political engagement and education are essential in preparing Black and Brown workers to participate in the evolving Clean Energy workforce.

LIUNA and Rochester-Genesee Valley Area Labor Federation work to recruit members in the City of Rochester, and their membership includes adults of all ethnicities. LiUNA work with newcomers to the United States and uses Google translate to support non-English speakers. LiUNA collaborates with local high schools and partners with the Training Rochester Adults in Construction Skills (TRACS) program, Monroe County's pre-apprenticeship program for people ages 18-30. TRACS is an eight-week program and participants receive a stipend of \$300 per week, a laptop and hands-on training. For gender diversity, LiUNA aims to attract women to solar jobs through word of mouth and working to combat the perception that construction is "dirty" work. It reports that its efforts have been successful in increasing the number of women working in construction.

All union organizations interviewed except the **CBTU** reported facing challenges to recruiting diverse populations in a white male dominated industry. IBEW Local 86 discussed a history of exclusivity (needing to know someone in the union to get into it) and a need to do more outreach to diverse populations. UA Local 13 mentioned barriers such as workers needing cars and driver's licenses, high turnover rates, and gender stereotypes that discourage women from entering the field. LIUNA Local 435 contends with the perception of construction work as "dirty" and language barriers for non-English speakers.

Job Seeker Concerns

As described above, the two job seeker focus groups represented two distinct constituencies of people of color: one comprised of previously incarcerated Black men, and another composed of Latino Spanish speakers.

Discrimination and Exclusion

Both focus groups expressed concern about the potential for discrimination and exclusion from a new Clean Energy economy or CE jobs based on their racial/ethnic identity. The **Ibero focus group** was most explicit about this topic, noting that they do not think many people of color (POC) are employed in CE fields, currently, and that historically, both the Latino and Black communities have experiences of being excluded from new economic opportunities and growing segments of the economy. The Ibero focus group asked specifically whether Latinos have opportunities for ownership and leadership in the creation of new CE-related businesses, and also stated that they felt that when the Clean Energy Economy was created, “Latinos were not at the table” and “Latinos are the last to be told about opportunities, just like the Black community.”

Looking for Connections and DEI Commitment

Both focus groups were looking for signs they would be welcomed in new fields and industries. The focus group of Latino job seekers identified a number of signs, including:

- Whether employers and/or government programs were welcoming to people from different countries and speaking different languages.
- Whether necessary information and training materials were readily available in languages other than English.
- Whether Latinos were already employed at the relevant companies – a sign that more Latinos would be welcomed there.

Our focus group with Black job seekers stated that their comfort would turn on whether they felt respected and welcomed in the workplace, or whether employers would abuse their authority or be distrustful of them because they had previous criminal records. Notably, several members specifically referred to training opportunities and job connections that were facilitated by the Urban League of Rochester. This indicated that they trust an organization with a Black identity that has a mission to provide opportunities for the Black community. This may suggest that they find organizations and employers without a connection to the Black community or a commitment to diversity harder to trust. Therefore, relying on a trusted organization to facilitate connections can create positive links of trust between both the workers and employers. Ibero might play a similar role.

Educational Entities Seek to Improve DEI

Many of our educational interviewees indicated that they have diverse populations. BOCES 2, for example, serves students with disabilities and works to ensure female students enroll in the construction and manufacturing trades. (BOCES does not determine which students enroll since this happens within individual school districts.) BOCES also provides support for English Language Learners enrolled in K-12 and adult programs.

Interviewees discussed the importance of inclusive language related to trades. For example, gender references are predominantly male during discussions or presentations. Likewise,

photos included on program and recruitment materials must reflect the student diversity they have and want to attract, including women and students of color.

Several additional themes emerged:

- The lack of diverse staff within some educational entities was a concern for a few interviewees.
- The availability of counselors and staff from community-based organizations can help individuals access resources to address food insecurity or provide English language supports.
- Availability of grant money can be used by program participants for wraparound services related to childcare, food services and transportation.
- It is also important to make sure that program participants have access to basic equipment for training and employment including a cell phone, internet and clothing.
- Wraparound services are needed to reach underserved and marginalized communities.

Career Pathways

Career pathways can be critical to recruiting and retaining a qualified workforce. While we heard about specific career pathways in parts of the Clean Energy ecosystem, our main takeaway is that pathways in Clean Energy are not understood by the audiences who need to know about them – including job seekers and workforce developers.

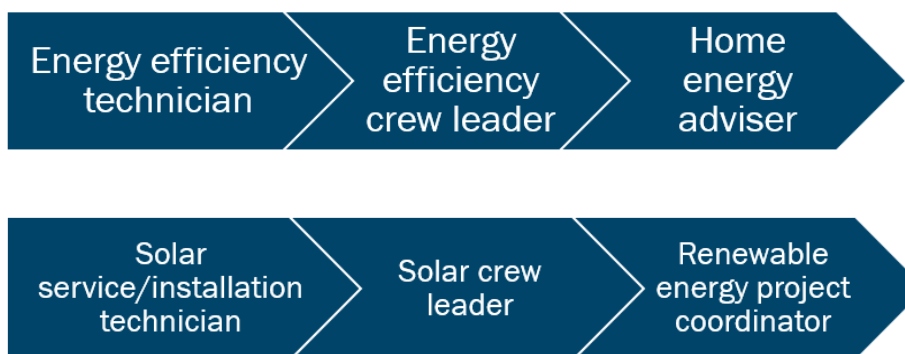
Employers Have Pathways for Workers

For some employers, pathways are a key part of the package for recruiting and retaining workers, along with increasing pay, providing bonuses and creating attractive workplaces and work routines.

One company credits its commitment to supporting employees' development with the success it has had in recruitment and retention. It hires entry-level workers through BOCES or NYS' On-the-Job Training program and supports them through NYS Department of Labor apprenticeship programs. High school students start at \$20/hour, earn \$22-25/hour out of high school and can make \$40-50/hour after having completed apprenticeships. Those who become project managers/energy advisors can earn six figures and as much as \$400,000/year (this was the highest pay we heard about, though other companies did report six-figure earnings for energy advisors including bonuses).

Several employers articulated career paths that can bring workers from entry level through a series of steps potentially leading to high salaries. We often heard of entry-level pay at about \$20-\$25 an hour for technician or installer roles, with opportunities to grow through steps like HVAC 1, 2, and 3, to crew leaders and then to positions like energy advisors with the potential to make six figures.

Example Pathways



At **RG&E**, unions provide solid career paths, but the company has begun offering new paths, as well, including internships that begin in high school. Five schools in Rochester participate, and there are options to pursue an electrician career, as well as to rotate through various

parts of the company to learn more about a variety of options. The company also provides up to \$10,000 in tuition reimbursement, which can help workers move along in career pathways.

Union-Based Pathways

One of the main benefits of joining the trade unions is access to a pathway from entry-level to higher-level positions with good compensation. For example, for **LiUNA** members, solar projects offer entry-level positions and allow for professional and financial growth with the opportunity to grow to positions paying \$57 per hour with \$31 as take-home. Union benefits include prevailing wages with benefits, including pension and annuity.

Little Knowledge Among Other Groups

Just Transition Workers & Job Seekers

As noted elsewhere in discussion of just transition workers and job seekers, both groups had little knowledge of specific career pathways in Clean Energy jobs, or what such careers or related positions were likely to pay. However, both groups often stated that: 1) they expected CE jobs to pay more, based on new and specialized skills they assumed would be needed; 2) they believed a pay premium was necessary to draw workers into these fields; 3) they expressed willingness to go with whatever work paid better, so they were happy to work in CE jobs and fields, and learn any new required skills, in return for this expected pay premium.

Educational Entities and Workforce Developers

From the educational perspective, there is no current career pathway for Clean Energy as a whole. Interviews suggest that there is a lack of consensus about whether a standalone Clean Energy program of study could or should be offered. A few interviewees suggested the possibility of Clean Energy certification within one of the trades (e.g., solar).

Educational entities say that the Clean Energy industry has not been organized in presenting a cohesive set of demands and defined skill lists, which would become the basis of specialized Clean Energy-related career pathways, to educators. They state that industry experts must provide more input about the core skills needed for Clean Energy jobs and whether specialized Clean Energy programs or courses are needed, or whether generalized training is sufficient.

As discussed earlier in the report, workforce developers are also lacking specific knowledge about jobs, needed skills and career pathways in Clean Energy.

Overarching Themes and Suggestions

Our quantitative and qualitative analysis lead us to make the following overarching observations and recommendations.

Theme #1: The Finger Lakes region is not capitalizing on the chance to promote and increase understanding of employment opportunities in the Clean Energy ecosystem.

From 2013-23, regional job growth in these industries (0.3%) lagged the state (9%) and nation (19%). But in the next 10 years, the region's growth rate (10%) is projected to match the nation and fall a bit behind the state (14%). Our overall lack of understanding of the variety of job opportunities, needed skills and career pathways would seem to endanger this projected growth.

Further, we are missing opportunities to promote Clean Energy as a way to potentially increase interest in the trades. We know from many studies of younger workers that they value employment with purpose and positive societal impact and that they tend to be more concerned about the environment and climate change than many older employees. Yet, we did not hear much about educators, workforce developers or service providers working with job seekers making this connection.

One of our employer interviewees had a generic posting for an electrician that got no response, but when the company changed the title to "Clean Energy installation technician," it received 100 applications.

Suggestions:

- Skilled trade and other educational programs could market their relevance and connections to Clean Energy jobs as a selling point.
- Workforce developers and service providers could include more information about Clean Energy-related opportunities in their work with job seekers.
- Broader region-serving entities including Climate Solutions Accelerator, Greater Rochester Chamber of Commerce and the Finger Lakes Regional Economic Development Council could promote Clean Energy employment opportunities through formal marketing campaigns and informal information-sharing.

Theme #2: Our region lacks a shared understanding of employer needs, the variety of Clean Energy jobs, needed skills and career pathways.

Both workforce developers and service providers frequently state that Clean Energy career pathways have not been adequately defined by individual employers and the industry as a whole, leaving them unsure of how to focus on and support these, and some mistakenly believe all the jobs require a high level of education.

Education institutions are, to varying degrees, incorporating some Clean Energy education and training, but some seem to need a boost through government incentives. Our interviews

indicated that many education institutions do not have a full understanding of the career paths that exist in some Clean Energy occupations.

For their part, educational entities say that the Clean Energy industry has not been organized in presenting a cohesive set of demands and defined skill lists, which would become the basis of specialized Clean Energy-related career pathways, to educators. They state that industry experts must provide more input about the core skills needed for Clean Energy jobs and whether specialized Clean Energy programs or courses are needed, or whether generalized training is sufficient.

This is complicated by the fact that many Clean Energy-related jobs require general skills that are not specific to Clean Energy and could be used either inside or outside the Clean Energy industry. For example, most workers involved with heat pump installation or solar installation do those tasks as one part of a wider skillset – HVAC skills, electrician skills, or general construction skills – and are just as willing to work on fossil fuel-related projects, if that's where the work and money is.

Suggestions:

- A regional information-sharing effort could promote a shared understanding across the various stakeholder groups. As one idea, the Accelerator could package information from this report into smaller, digestible briefs on specific topics (such as types and numbers of jobs, needed skills, training opportunities, etc.) and distribute to key audiences.
- MCC, through the FWD Center, plays a regional role that may expand into a workforce development hub. The Accelerator could join the FWD Center's advisory board to ensure that Clean Energy training and opportunities are recognized and integrated.
- In particular, increasing communication between educational entities and employers, so that educational entities understand employer needs and can train and prepare students, seems important. It might make sense for the Accelerator to test the willingness of key partners on both sides to participate in convenings and then design either a short-term or longer-term approach.
- Based on the demand for Genesee Community College's solar panel program, creation of more solar panel installation training programs seems warranted, as well as ensuring that students are trained in both commercial and residential installation processes.

Theme #3: Barriers to employment within CE include those common across the economy and some specific to the Clean Energy ecosystem.

Common barriers include the low appeal of the trades for many job seekers and students, as well as challenges around transportation and child care. In Clean Energy-related workplaces, these can be heightened, especially since work sites are often dispersed (homes) and outside urban areas (solar farms, for example).

Accessing state support for projects was named as a limiting factor for growth in Clean Energy jobs. While employers praised NYSERDA training programs, paperwork and other

requirements to access state funding for home energy efficiency and renewable energy installations were discussed as a deterrent to participation.

Suggestions:

- The appeal of working in renewable energy could be used to counteract the negative perception of work in the trades.
- YAMTEP is a workforce developer now running a transportation service to ensure trainees can get to jobs. The region might need to explore similar, targeted solutions to ensure that workers without a car can reach the dispersed sites of many CE jobs.
- NYS could review its requirements for home energy efficiency and renewable energy projects and look for opportunities to streamline. In addition, the state could offer training programs to contractors to ensure they understand how to access the funding or even pair experienced and new contractors to transfer knowledge.

Theme #4: Lack of diversity within many Clean Energy-related workplaces will limit the growth of the ecosystem and prohibit equitable access to opportunity if not addressed.

Development and communication of clear pathways is a key strategy to diversifying workplaces and promoting equity, but there are other important steps companies and other stakeholders can take, including:

- Partnering with community-based organizations trusted by Black, Latino and other marginalized groups.
- Creating welcoming environments for people from other countries and non-English speakers, including making information available in other languages.
- Tapping different networks and examining job requirements and hiring processes to increase effectiveness in hiring groups that are not currently in the workplace. Women, Black workers, Latinos and others may not feel comfortable in workplaces dominated by white men. Drawing in at least a few of the “other” types of workers can be critical in getting the ball rolling toward a more diverse and equitable workplace.
- Ensuring equitable access to promotions and leadership positions through use of clear and documented performance standards and commitments to develop staff.

Theme #5: A “skepticism gap” holds the potential to prevent the region from realizing maximum gains from the transition to Clean Energy.

Aside from companies/employers currently working in Clean Energy-related fields, many stakeholders across the sectors are taking a “wait-and-see” approach, looking for more widespread adoption and demand for Clean Energy technologies and a clear need for more CE-specific workers before they take steps like personally reskilling, or – for educational entities – before investing in creating additional, focused Clean Energy training programs.

Likewise, many interviewees are skeptical of timelines/mandates from the state and federal governments on when transition will be accomplished, and doubt that some technologies, like

electric vehicles, are fully mature or have the necessary infrastructural support to realistically meet transition deadlines.

The one group that expressed reservations about a Clean Energy transition was the just transition workers. While some think it could hurt future job prospects, most believed that its lack of likelihood in the near term meant that they would not be personally impacted, and a continuation of legacy/fossil fuel energy sources would provide them with more than enough work until retirement.

Suggestions:

- The Accelerator (and others) could work to ensure that Clean Energy incentives are broadly understood by all who can benefit from them, and advocate for NYS streamlining of requirements to access incentives.
- The Accelerator could develop educational events and/or materials to help skeptical stakeholders better understand state and federal Clean Energy mandates and what is necessary and feasible in order to meet them. This could be done for specific stakeholder groups and topics (examples: auto dealers/mechanics, gas workers like the plumbers and pipefitters) and potentially done in partnership with a more neutrally positioned organization if helpful. Engagement sessions could be used to gather questions and feedback from attendees that the Accelerator could feed back to policymakers including NYS, with the focus not on *whether* to transition to Clean Energy but *how* to address obstacles.
- Partnerships with labor unions might be particularly helpful in addressing this issue for some specific groups.

Appendix A: Quantitative Analysis

Analysis of Finger Lakes Industries and Occupations Relevant to the Clean Energy Transition

Prepared by:



July 2024

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Introduction and Methodology

MRB Group, as part of a team led by the Center for Governmental Research, was engaged by the Climate Solutions Accelerator to study clean energy-related industry and occupation trends in the Finger Lakes Region.¹ This analysis is part of a broader Finger Lakes Clean Energy Workforce Assessment undertaken to support a better understanding of the Region's clean energy economy and inform the workforce development efforts of the Accelerator and its partners as they seek to support an equitable clean energy transition.

The "Industry Analysis" portion of this document considers industries whose businesses may currently, or in the future, be active in or supportive of the clean energy economy and the supply chains for clean energy products and services. The "Occupation Analysis" provides a complementary lens, as there are many occupations that are important to the clean energy transition, even where these workers are not directly employed in a clean energy industry business. Collectively, these analyses provide insight into the workforce needs associated with expanding the Finger Lakes' clean energy economy and undertaking the clean energy transition.

With input from the Accelerator, MRB Group approached this analysis by considering the clean energy economy to involve the seven "sectors" below, which are designed to align with the categorizations in the 2022 Genesee-FLX Climate Action Strategy.

- Buildings
- Clean Energy Generation and Distribution
- Industry (manufacturing)
- Transportation/Land Use
- Waste Disposal
- Agriculture/Food/Forestry
- Multisector (industries broadly supportive of multiple of the sectors above)

Each sector above is composed of a list of industries and occupations as defined in the appendices, using the standard classifications of official government economic statistics (NAICS codes and Standard Occupational Codes), with no duplication of industry or occupational codes across sectors. We note that for this study, the Accelerator sought to take a broad lens in defining these sectors, which are therefore inclusive of industries with significantly varying degrees of potential involvement in the clean energy economy. This study does not measure

¹ The Finger Lakes Region is the nine New York counties of Genesee, Livingston, Monroe, Ontario, Orleans, Seneca, Wayne, Wyoming, and Yates.

the Region's clean energy economy, but rather analyzes the size and trends of industries and occupations that play or will play core, supportive, and tangential roles in the transition to a clean energy economy.

Separately, MRB Group analyzed occupation trends in industries directly associated with fossil fuels ("Just Transition Industries"), to support the Accelerator's understanding of businesses and jobs that will be disrupted by the transition to a clean energy economy. This industry set is not included in the quantitative measurements of the Region's clean energy economy.

Data in this report is from Lightcast except where otherwise noted. Lightcast is a global leader in labor market analytics. It gathers and integrates economic, labor market, demographic, education, profile, and job posting data from dozens of government and private-sector sources, creating a comprehensive and current dataset that includes both published data and detailed estimates. Core Lightcast data sources include the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (BLS' QCEW), the BLS's Occupational Employment Statistics (OES), the Census's County Business Patterns (CBP), the American Community Survey (ACS), and over 65,000 job posting websites. In creating industry projections, three historical trendlines (last 5 years, last 10 years, last 15 years) are projected forward 10 years and averaged, yielding a raw projected trendline. Lightcast then adjusts this trendline by taking into account the BLS's National Industry-Occupation Employment Matrix (NIOEM) dataset, which contains national-level employment projections. Lightcast then adjusts the trendlines to state-level projections published by state LMI offices, yielding Lightcast final industry projections data. Occupation employment data projections are generated by applying projected staffing patterns to Lightcast's projected industry employment data.

Key Findings

- The industries studied as part of the Buildings sector, important to integrating lower-carbon materials, energy-efficiency technologies, and clean heating and cooling systems into the built environment, employ nearly 28,000 people in the Region. The sector has grown rapidly in the Region over the past decade, led by new contractor and remodeler jobs. It is projected to add over 4,000 jobs in the next ten years, with occupations like laborers, electricians, carpenters, mechanics, installers, and repairers in high demand.
- The Clean Energy Generation and Distribution sector employs about 2,300 people in the Finger Lakes, mostly in distribution and power line construction, having added a few hundred jobs over the past decade. The sector is expected to add nearly 700 jobs in the next decade, led by a need for occupations like power line installers and repairers and solar installers.
- The Industry sector, a collection of manufacturing industries whose goods have a particular role to play in the energy transition, employs nearly 21,000 people in the Region, having contracted by about 16% over the past ten years. Yet industries in this sector exhibited some of the fastest job growth *rates* over the past decade, with many doubling their employment (such as Other Motor Vehicle Parts Manufacturing and Air and Gas Compressor Manufacturing). The Industry sector is projected to expand slightly in the next ten years, driven by new jobs in industries such as Electronic Component Manufacturing, Relay and Industrial Control Manufacturing, and Semiconductor Machinery Manufacturing, and requiring occupations like assemblers and fabricators, inspectors, electronic assemblers, operating workers and machinists.
- About 6,500 people are employed in Finger Lakes Transportation and Land Use industries that primarily represent service industries that will be customers of or otherwise engaged with electric, alternative fuel, and energy efficient vehicles. These tend to be low paying jobs. The sector has added a few hundred jobs over the past decade, and is projected to grow more rapidly in the next ten years, requiring more truck and tractor-trailer drivers.
- The Waste Disposal sector, relevant to the collection, management, and processing of waste streams in ways that can involve energy generation, greenhouse gas reduction, or recycling of carbon-intensive materials, employs about 1,000 people in the Region. The sector contracted slightly over the past decade but is expected to add about 100 net new jobs over the next ten years. (Many of these are likely to be in heavy truck driving occupations; however, please note that in the Occupation Analysis section, data for truck drivers is analyzed as part of the Transportation and Land Use sector.)

- The Agriculture/Food/Forestry sector represents a very low share of Regional employment with no observable trends of note. Named as such for alignment with the 2022 Genesee-FLX Climate Action Strategy, this sector consists of just one industry for purposes of this analysis, included to address the Accelerator's interest in its potential role with respect to emissions, energy generation, and other sustainability matters.
- The Multisector segment accounts for nearly 38,000 jobs, being comprised of many service industries whose primary function is not specifically clean energy work, but that nonetheless may have supportive or tangential roles in the energy transition. For example, this "Multisector" sector includes services related to infrastructure and utilities, professional and technical services, various types of not-for-profit organizations, and selected government industries whose counted jobs include a small portion related to the regulation and administration of housing and transportation programs. On the whole, the sector's job counts have stayed roughly even over the past decade, but certain industries have grown rapidly, including Engineering Services. The sector is projected to add over 3,000 jobs in the next ten years, again driven by Engineering services but also general management jobs and government jobs. Maintenance and repair occupations are the subject of significant recruitment efforts.
- The industries studied face challenges associated with an aging workforce. Overall, "retirement risk" across the studied industries is slightly higher in the Finger Lakes compared to the national average for an area of its size.
- Key fossil fuel-derived industries represent an estimated 8,664 jobs in the Finger Lakes, including substantial employment linked to plastics and polystyrene foam manufacturing—jobs that may be at risk as markets shift away from plastics and as the Finger Lakes pursues an equitable transition from an economy dependent on extraction to one characterized by sustainability.
- The Industry Analysis portion of this study considered industries that employ over 96,000 people in the Finger Lakes (16% of the Region's workforce). About 39,000 of these jobs are in industries that MRB Group considers to be "core" to the clean energy economy; about 34,000 in "supportive" industries; and about 22,000 in "tangential" industries. See Appendix A for the list of industries studied and their role categorizations.
- The Occupation Analysis portion of this study considered occupations that employ nearly 119,000 people in the Finger Lakes (20% of the Region's workforce). Of those 119,000 jobs, about 64,000 are in occupations that MRB Group considers "core" to the clean energy economy; about 5,500 are in "supportive" occupations; and about 49,000 are in "tangential" occupations. See Appendix B for the list of occupations studied and their role categorizations.

Industry Analysis

Overview

Distribution of Regional Jobs Across the Studied Sectors

The set of industries that MRB Group studied employ over 96,000 people in the Finger Lakes, or 16% of the Region's total workforce—that is, one out of every six jobs.² (The list of industries studied is provided in Appendix A.) About 39,000 of these jobs are in industries that MRB Group considers to be “core” to the clean energy economy; about 34,000 in “supportive” industries; and about 22,000 in “tangential” industries.

- The Multisector segment accounts for 39% of those jobs, being comprised of many service industries whose primary function is not specifically clean energy work, but that nonetheless may have supportive or tangential roles in the energy transition. For example, the “Multisector” sector, further defined in Appendix A, includes services related to infrastructure and utilities, professional and technical services, various types of not-for-profit organizations, and selected government industries whose counted jobs include a small portion related to the regulation and administration of housing and transportation programs.

Distribution of Finger Lakes Jobs Across Studied Industry Sectors

Sector	2023 Finger Lakes Jobs	% of Jobs Studied	% of Total FL Jobs
Buildings	27,854	29%	5%
Clean Energy Generation and Distribution	2,327	2%	0%
Industry	20,805	22%	4%
Transportation/Land Use	6,503	7%	1%
Waste Disposal	1,009	1%	0%
Agriculture/Food/Forestry	36	0%	0%
Multisector	37,753	39%	6%
Finger Lakes Total	96,287		16%

Source: Lightcast

Job Breakdown (2023) by Industries' Role in Clean Energy Economy	
Core	39,414
Supportive	34,420
Tangential	22,454

Source: Lightcast, MRB Group “Role” designations

² These should not be referred to as “clean energy jobs,” and instead the figures should be referred to in accordance with the Methodology section, that is, jobs with varying degrees of potential relevance to supporting a clean energy economy.

- The industries studied as part of the Buildings sector, important to integrating lower-carbon materials, energy-efficiency technologies, and clean heating and cooling systems into the built environment, employ nearly 28,000 people in the Region.
- The Industry sector, a collection of manufacturing industries whose goods have a particular role to play in the energy transition, employs nearly 21,000 people in the Region.
- About 6,500 people are employed in Finger Lakes Transportation and Land Use industries that primarily represent service industries that will be customers of or otherwise engaged with electric, alternative fuel, and energy efficient vehicles.
- The Clean Energy Generation and Distribution sector employs about 2,300 people in the Finger Lakes.
- The Waste Disposal sector, relevant to the collection, management, and processing of waste streams in ways that can involve energy generation, greenhouse gas reduction, or recycling of carbon-intensive materials, employs about 1,000 people in the Region.
- The Agriculture/Food/Forestry sector represents a very low share of Regional employment. Named as such for alignment with the 2022 Genesee-FLX Climate Action Strategy, this sector consists of just one industry for purposes of this analysis: NAICS 115112: Soil Preparation, Planting, and Cultivating. This sector was included to address the Accelerator's interest in its potential role with respect to emissions, energy generation, and other sustainability matters.

Appendix A provides a list of industries (NAICS codes) studied as part of each of the seven sectors, noting whether each industry potentially plays a core, supportive, or tangential role in the clean energy economy and transition.

Top 15 Industries by Job Count

The table below displays the fifteen studied industries with the highest job counts in the Finger Lakes. Six of these industries belong to the Buildings sector, and another six are Multisector industries. A state government industry code, included to capture jobs related to the regulation and administration of housing and transportation programs, tops the list at nearly 9,600 jobs. That is followed by Plumbing, Heating, and Air-Conditioning Contractors and Engineering Services. The Commercial and Service Industry Machinery Manufacturing industry has a notably high concentration of Regional jobs (location quotient/LQ of 10.8)³ relative to national patterns, owing to the presence of Kodak, Xerox, and others.

Top 15 Studied Industries by Finger Lakes Employment

Sector	NAICS	Description	2023 Jobs	LQ	Payrolled Business Locations	Role in Clean Energy Economy
Multisector	902999	State Government, Excluding Education and Hospitals	9,592	1.3	371	Tangential
Buildings	238220	Plumbing, Heating, and Air-Conditioning Contractors	4,814	1.0	334	Core
Multisector	541330	Engineering Services	4,047	1.0	183	Core
Buildings	238210	Electrical Contractors and Other Wiring Installation Contractors	3,775	1.0	256	Core
Multisector	541110	Offices of Lawyers	3,617	0.8	390	Tangential
Industry	333310	Commercial and Service Industry Machinery Manufacturing	3,398	10.8	39	Core
Multisector	901199	Federal Government, Civilian, Excluding Postal Service	3,104	0.4	73	Tangential
Buildings	236220	Commercial and Institutional Building Construction	2,855	1.1	126	Core
Multisector	541511	Custom Computer Programming Services	2,757	0.7	283	Supportive
Buildings	236118	Residential Remodelers	2,661	1.0	560	Core
Buildings	444110	Home Centers	2,659	1.0	39	Supportive
Multisector	541512	Computer Systems Design Services	2,420	0.6	248	Supportive
Transportation/Land Use	485410	School and Employee Bus Transportation	2,059	3.2	20	Supportive
Transportation/Land Use	811111	General Automotive Repair	1,992	1.1	416	Supportive
Buildings	238910	Site Preparation Contractors	1,818	0.9	149	Supportive

Source: Lightcast

³ A location quotient (LQ) compares the concentration of a particular industry relative to its concentration at a national level. A LQ of 10.8 indicates an industry is 10.8 times more concentrated in the Region than at a national level, suggesting a high level of specialization in that industry.

Earnings and Establishments

With average earnings of \$80,490, jobs in the studied industries earn workers \$20,000 more (33% more) than the average job in the Region (\$60,494). This is influenced significantly by the high Multisector earnings, given that sector's high relative share of jobs studied in this analysis—although many of these jobs are in industries that should be considered “tangential” to the clean energy economy.

The smaller Clean Energy Generation and Distribution sector has the highest average earnings of \$126,391. Jobs in the Industry sector (manufacturing) also pay notably more than the average Finger Lakes job. The Transportation/Land Use sector had the lowest earnings within the sectors studied, at \$43,999.

Across the seven sectors studied, there are 6,926 businesses in the Finger Lakes, the majority of which are part of the Multisector and Buildings sectors. 2,736 of these business locations are in industries considered “core” to the clean energy economy.

Worker Age

Regarding the age distribution of Finger Lakes workers employed in the industries studied, the largest age group by far is 35-55 years of age, accounting for nearly half (42%) of that workforce. There are more workers aged 55+ than younger workers aged 25-34. Overall, “retirement risk” across the studied industries is slightly higher in the Finger Lakes (28,085 employees aged 55+) compared to the national average for an area of its size (25,213 employees aged 55+).

Wages and Establishments (2023)

Sector	Wages, Salaries, & Proprietor Earnings	Payrolled Business Locations
Buildings	\$64,235	2,688
Clean Energy Generation and Distribution	\$126,391	70
Industry	\$79,617	537
Transportation/Land Use	\$43,999	641
Waste Disposal	\$59,813	50
Agriculture/Food/Forestry	\$52,647	9
Multisector	\$97,000	2,932
Finger Lakes Studied Industries Average (Weighted)	\$80,490	6,926
Finger Lakes Overall Economy Average	\$60,494	

Source: Lightcast

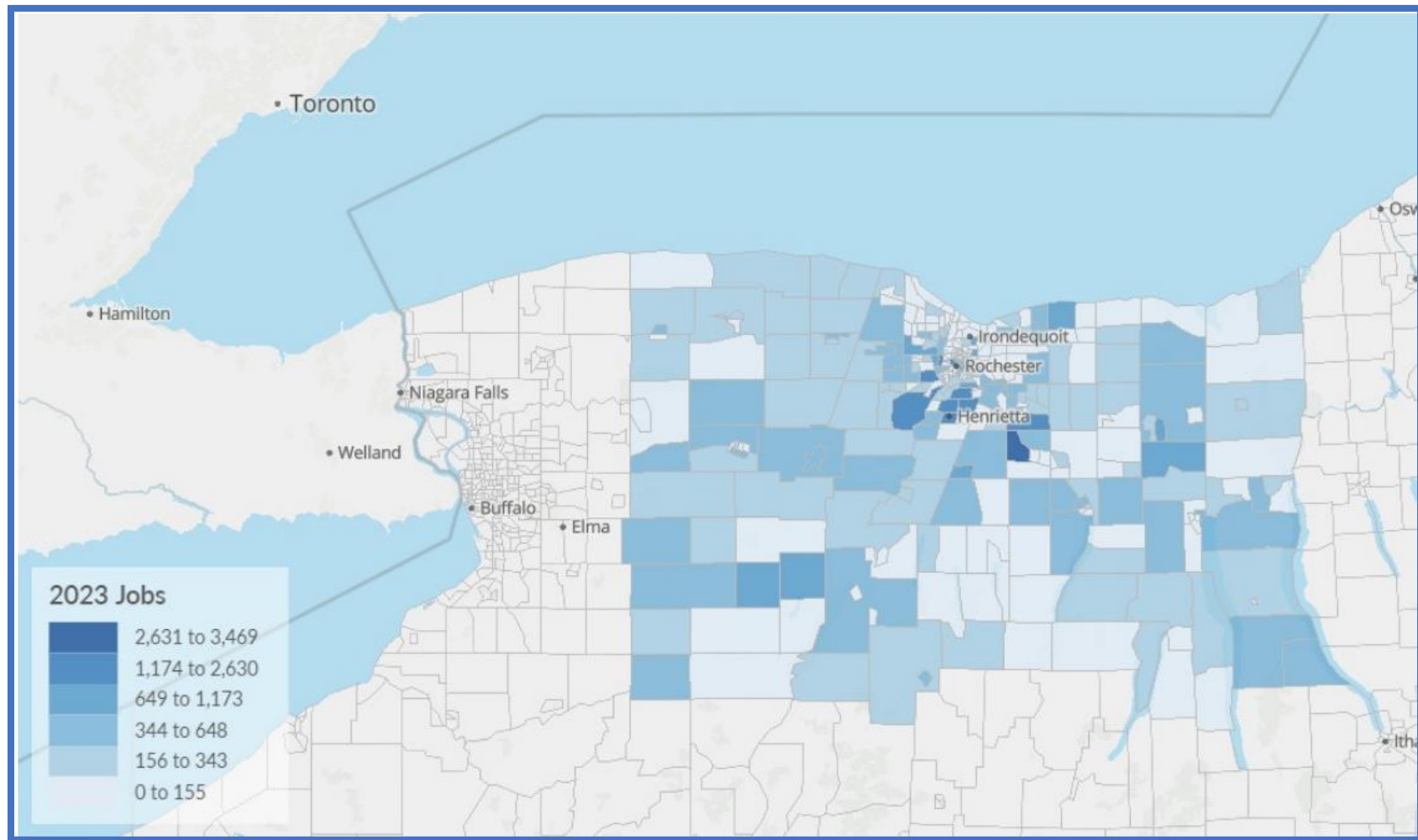
Wages and Establishments by Industries' Role in Clean Energy Economy (2023)

Role	Wages, Salaries, & Proprietor Earnings	Payrolled Business Locations
Core	\$80,340	2,736
Supportive	\$67,800	2,586
Tangential	\$100,206	1,604

Source: Lightcast, MRB Group “Role” designations

Job Distribution Across Region

The map below illustrates the distribution of Finger Lakes jobs in the studied industries at the census tract level in 2023. These jobs are relatively evenly distributed across the Region, with some notable concentrations in areas of Monroe County.



Historical Job Trends (2013-2023)

The table below displays the job growth in the studied sectors over the past decade in the Region, New York State, and the U.S. In the Finger Lakes, these sectors collectively grew by 0.3% during that period, an addition of 316 jobs, a much slower pace than the statewide growth of 9.3% and national growth of 19.4% (but faster than the Region's overall job growth of -1.1%). Across all these geographies, the Buildings and Clean Energy Distribution sectors have generally seen the most employment growth in percentage terms. The Waste Disposal sector saw contraction in all geographies, particularly at the State level.

In the Region, the studied sectors that added jobs over the past ten years are Buildings, Clean Energy Distribution, and Transportation/Land Use. The Region lost jobs in the Industry, Waste Disposal, and Agriculture/Food/Forestry sectors; Multisector employment stayed even.

Historical Job Growth by Sector

Sector	Finger Lakes				New York State				USA			
	2013 Jobs	2023 Jobs	Change (#)	Change (%)	2013 Jobs	2023 Jobs	Change (#)	Change (%)	2013 Jobs	2023 Jobs	Change (#)	Change (%)
Buildings	24,147	27,854	3,707	15.4%	408,939	458,259	49,320	12.1%	7,110,780	9,073,973	1,963,193	27.6%
Clean Energy Generation and Distribution	2,004	2,327	323	16.1%	31,252	37,461	6,209	19.9%	457,024	563,526	106,502	23.3%
Industry	24,770	20,805	(3,965)	(16.0%)	151,718	140,086	(11,633)	(7.7%)	4,055,395	4,486,027	430,633	10.6%
Transportation/Land Use	6,164	6,503	339	5.5%	107,979	110,305	2,326	2.2%	1,228,137	1,364,870	136,733	11.1%
Waste Disposal	1,045	1,009	(35)	(3.4%)	11,445	9,520	(1,925)	(16.8%)	228,804	218,931	(9,873)	(4.3%)
Agriculture/Food/Forestry	74	36	(38)	(50.8%)	413	262	(151)	(36.6%)	32,872	34,888	2,016	6.1%
Multisector	37,767	37,753	(14)	(0.0%)	789,308	885,462	96,154	12.2%	12,551,250	14,901,244	2,349,994	18.7%
Total	95,971	96,287	316	0.3%	1,501,055	1,641,354	140,299	9.3%	25,664,262	30,643,459	4,979,197	19.4%

Source: Lightcast

Top 15 Industries by Past Job Growth (#)

The table below displays the fifteen studied industries that have added the most jobs in the Finger Lakes over the past ten years. Plumbing, Heating, and Air-Conditioning Contractors and Engineering Services both added over 1,100 jobs during this period.

Top 15 Studied Finger Lakes Industries by Past Job Growth (2013-2023)

Sector	NAICS	Description	2013 Jobs	2023 Jobs	Change (#)	Change (%)	LQ	Role in Clean Energy Economy
Buildings	238220	Plumbing, Heating, and Air-Conditioning Contractors	3,592	4,814	1,222	34.0%	1.0	Core
Multisector	541330	Engineering Services	2,913	4,047	1,134	38.9%	1.0	Core
Buildings	236118	Residential Remodelers	1,885	2,661	776	41.2%	1.0	Core
Buildings	238210	Electrical Contractors and Other Wiring Installation Contractors	3,089	3,775	686	22.2%	1.0	Core
Multisector	541611	Administrative Management & General Management Consulting Services	1,038	1,710	672	64.7%	0.5	Tangential
Industry	332912	Fluid Power Valve and Hose Fitting Manufacturing	58	573	516	895.5%	4.6	Supportive
Buildings	238910	Site Preparation Contractors	1,331	1,818	487	36.6%	0.9	Supportive
Multisector	541512	Computer Systems Design Services	2,015	2,420	405	20.1%	0.6	Supportive
Multisector	901199	Federal Government, Civilian, Excluding Postal Service	2,715	3,104	389	14.3%	0.4	Tangential
Multisector	541380	Testing Laboratories	167	546	379	226.7%	0.9	Tangential
Transportation/Land Use	485410	School and Employee Bus Transportation	1,693	2,059	366	21.6%	3.2	Supportive
Industry	333912	Air and Gas Compressor Manufacturing	61	399	338	554.7%	6.0	Core
Transportation/Land Use	485310	Taxi Service	80	374	294	365.5%	1.1	Supportive
Buildings	238160	Roofing Contractors	600	870	270	45.1%	0.9	Core
Transportation/Land Use	811111	General Automotive Repair	1,731	1,992	261	15.1%	1.1	Supportive

Source: Lightcast

Top 15 Industries by Past Job Growth (%)

The table below displays the fifteen studied industries that have expanded the most over the past ten years in the Finger Lakes, as measured by job growth rates. Of the seven sectors studied, Industry has been the dominant sector in terms of percentage growth, accounting for nine out of the top fifteen fastest-growing industries, with particularly fast growth in Other Motor Vehicle Parts Manufacturing and Fluid Power Valve and Hose Fitting Manufacturing.

Nearly all industries listed here have more than doubled their employment—some expanding closer to tenfold. However, as expected when measuring growth in terms of percentages, most of those industries are characterized by modest job counts. Additionally, several comprise only a small number of companies, which can make them less resilient to negative market forces.

Top 15 Studied Industries by Past Finger Lakes Job Growth Rate (2013-2023)

Sector	NAICS	Description	2013 Jobs	2023 Jobs	Change (#)	Change (%)	LQ	Role in Clean Energy Economy
Industry	336390	Other Motor Vehicle Parts Manufacturing	14	171	157	1146%	0.3	Core
Industry	332912	Fluid Power Valve and Hose Fitting Manufacturing	58	573	516	896%	4.6	Supportive
Industry	333912	Air and Gas Compressor Manufacturing	61	399	338	555%	6.0	Core
Industry	331511	Iron Foundries	14	70	56	391%	0.6	Supportive
Industry	331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	35	165	130	369%	1.8	Supportive
Transportation/Land Use	485310	Taxi and Ridesharing Services	80	374	294	366%	1.1	Supportive
Multisector	541713	Research and Development in Nanotechnology	26	116	89	339%	1.3	Core
Clean Energy Generation and Distribution	221115	Wind Electric Power Generation	13	54	41	323%	1.7	Core
Industry	332996	Fabricated Pipe and Pipe Fitting Manufacturing	10	35	25	236%	0.3	Supportive
Multisector	541380	Testing Laboratories	167	546	379	227%	0.9	Tangential
Waste Disposal	562920	Materials Recovery Facilities	83	242	159	191%	2.7	Core
Industry	333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	16	46	29	180%	1.0	Core
Buildings	236116	New Multifamily Housing Construction (except For-Sale Builders)	32	69	38	118%	0.4	Core
Industry	327390	Other Concrete Product Manufacturing	153	324	172	112%	1.6	Supportive
Industry	332313	Plate Work Manufacturing	101	193	92	91%	1.2	Supportive

Source: Lightcast

Projected Job Trends (2023-2033)

The table below displays the projected job growth by each of the studied sectors over the next decade in the Region, New York State, and the U.S. These studied sectors are projected to grow much more rapidly in the Finger Lakes (10.0%) than they did in the preceding decade (0.3%), potentially adding over 9,600 jobs, driven by growth in the Buildings sector and the Multisector segment. Of those 9,600 new jobs, MRB Group considers about 4,600 of them to be in industries that play a “core” role in the clean energy economy. Apart from the Regional Agriculture/Food/Forestry sector, all other sectors are projected to add jobs in each geography. In percentage terms, the Finger Lakes Region is projected to outpace state and national growth in the Clean Energy Generation and Distribution, Transportation/Land Use, Buildings, and Waste Disposal sectors. The Region’s Industry and Multisector sectors are expected to grow more slowly than statewide and national rates.

Projected Job Growth by Sector

Sector	Finger Lakes				New York State				USA			
	2023 Jobs	2033 Jobs	Change (#)	Change (%)	2023 Jobs	2033 Jobs	Change (#)	Change (%)	2023 Jobs	2033 Jobs	Change (#)	Change (%)
Buildings	27,854	31,952	4,099	14.7%	458,259	499,971	41,713	9.1%	9,073,973	9,742,189	668,216	7.4%
Clean Energy Generation and Distribution	2,327	3,013	686	29.5%	37,461	46,426	8,965	23.9%	563,526	633,077	69,551	12.3%
Industry	20,805	21,166	362	1.7%	140,086	153,501	13,416	9.6%	4,486,027	4,808,242	322,214	7.2%
Transportation/Land Use	6,503	7,684	1,180	18.1%	110,305	121,796	11,492	10.4%	1,364,870	1,464,954	100,084	7.3%
Waste Disposal	1,009	1,107	97	9.6%	9,520	10,100	580	6.1%	218,931	233,801	14,870	6.8%
Agriculture/Food/Forestry	36	34	(3)	(6.9%)	262	321	59	22.6%	34,888	38,615	3,727	10.7%
Multisector	37,753	40,941	3,188	8.4%	885,462	1,041,873	156,410	17.7%	14,901,244	16,767,095	1,865,851	12.5%
Total	96,287	105,896	9,610	10.0%	1,641,354	1,873,989	232,635	14.2%	30,643,459	33,687,972	3,044,513	9.9%

Source: Lightcast

Projected Job Growth by Industries' Role in Clean Energy Economy

Role	Finger Lakes			
	2023 Jobs	2033 Jobs	Change (#)	Change (%)
Core	39,414	44,009	4,595	12%
Supportive	34,420	37,908	3,488	10%
Tangential	22,454	23,979	1,525	7%

Source: Lightcast, MRB Group “Role” designations

Top 15 Industries by Projected Growth (#)

The table below displays the fifteen studied industries that are expected to add the most jobs in the Finger Lakes over the next ten years. Eleven of these high-growth industries belong to the Buildings and Multisector sectors. All industries listed here are expected to add over 280 jobs each. Plumbing, Heating, and Air-Conditioning Contractors are expected to add nearly 1,000 jobs. Other industries projected to add more than 500 jobs are Engineering Services; School and Employee Bus Transportation; Residential Remodelers; and Electrical Contractors and Other Wiring Installation Contractors.

Top 15 Industries by Projected Finger Lakes Job Growth (2023-2033)

Sector	NAICS	Description	2013 Jobs	2023 Jobs	Change (#)	Change (%)	LQ	Role in Clean Energy Economy
Buildings	238220	Plumbing, Heating, and Air-Conditioning Contractors	4,814	5,798	984	20%	1.1	Core
Multisector	541330	Engineering Services	4,047	4,851	804	20%	1.1	Core
Transportation/Land Use	485410	School and Employee Bus Transportation	2,059	2,824	765	37%	3.9	Supportive
Buildings	236118	Residential Remodelers	2,661	3,383	722	27%	1.1	Core
Buildings	238210	Electrical Contractors and Other Wiring Installation Contractors	3,775	4,456	681	18%	1.0	Core
Multisector	541611	Administrative Management & General Management Consulting Services	1,710	2,192	482	28%	0.5	Tangential
Multisector	901199	Federal Government, Civilian, Excluding Postal Service	3,104	3,553	449	14%	0.4	Tangential
Multisector	541380	Testing Laboratories	546	979	433	79%	1.4	Tangential
Industry	334419	Other Electronic Component Manufacturing	471	852	382	81%	3.2	Core
Transportation/Land Use	811111	General Automotive Repair	1,992	2,360	368	18%	1.2	Supportive
Buildings	444110	Home Centers	2,659	3,020	361	14%	1.1	Supportive
Buildings	236220	Commercial and Institutional Building Construction	2,855	3,194	338	12%	1.1	Core
Buildings	238160	Roofing Contractors	870	1,187	317	36%	1.1	Core
Multisector	523940	Portfolio Management and Investment Advice	1,518	1,831	313	21%	0.8	Tangential
Clean Energy Generation and Distribution	221122	Electric Power Distribution	1,119	1,408	288	26%	1.6	Core

Source: Lightcast

Top 15 Industries by Projected Growth (%)

The table below displays the fifteen industries in the Finger Lakes that, of those studied, are projected to experience the largest expansions over the next ten years, as measured by job growth rates. The Industry sector dominates this list, with several manufacturing industries expected to grow by 80% or more. The Wind Electric Power Generation industry is expected to double in size over the next ten years. Despite modest job counts, it is already twice as concentrated Regionally in comparison to national patterns (LQ of 2.1).

As expected when measuring growth in terms of percentages, several of these industries are characterized by smaller job counts. Additionally, several comprise only a few companies, which can make them less resilient to negative market forces.

Top 15 Industries by Projected Finger Lakes Job Growth Rate (2023-2033)

Sector	NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	2023 LQ	Role in Clean Energy Economy
Clean Energy Generation and Distribution	221115	Wind Electric Power Generation	54	112	57	106%	2.1	Core
Industry	332312	Fabricated Structural Metal Manufacturing	197	381	185	94%	1.1	Supportive
Multisector	541713	Research and Development in Nanotechnology	116	214	98	85%	2.0	Core
Industry	335999	All Other Miscellaneous Electrical Equipment & Component Manufacturing	104	191	87	84%	1.0	Core
Industry	333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	46	84	38	82%	1.7	Core
Industry	334419	Other Electronic Component Manufacturing	471	852	382	81%	3.2	Core
Multisector	541380	Testing Laboratories	546	979	433	79%	1.4	Tangential
Clean Energy Generation and Distribution	221111	Hydroelectric Power Generation	10	18	8	80%	0.6	Core
Buildings	236116	New Multifamily Housing Construction (except For-Sale Builders)	69	117	48	69%	0.5	Core
Waste Disposal	562119	Other Waste Collection	36	60	24	67%	0.8	Supportive
Industry	331511	Iron Foundries	70	117	47	67%	1.1	Supportive
Industry	332323	Ornamental and Architectural Metal Work Manufacturing	118	188	70	59%	1.1	Supportive
Industry	335312	Motor and Generator Manufacturing	62	97	35	57%	0.7	Core
Waste Disposal	562920	Materials Recovery Facilities	242	374	132	55%	3.2	Core
Transportation/Land Use	485113	Bus and Other Motor Vehicle Transit Systems	117	179	62	53%	1.3	Supportive

Source: Lightcast

Industry Job Growth Projections by Sector

The tables in this section list the industries that are projected to add the most jobs in the Finger Lakes over the next ten years for each of the seven sectors studied. Three out of the seven sectors—Buildings, Industry, and Multisector—have more than fifteen industries that are projected to grow; in those cases, only the top fifteen are presented.

Buildings Sector

The table below displays the fifteen Buildings sector industries that are expected to add the most jobs over the next ten years. Eight of these industries are expected to add over 200 jobs each through 2033.

Top 15 Industries by Projected Job Growth in the Buildings Sector (2023-2033)

NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in Clean Energy Economy
238220	Plumbing, Heating, and Air-Conditioning Contractors	4,814	5,798	984	20.4%	Core
236118	Residential Remodelers	2,661	3,383	722	27.1%	Core
238210	Electrical Contractors and Other Wiring Installation Contractors	3,775	4,456	681	18.0%	Core
444110	Home Centers	2,659	3,020	361	13.6%	Supportive
236220	Commercial and Institutional Building Construction	2,855	3,194	338	11.9%	Core
238160	Roofing Contractors	870	1,187	317	36.4%	Core
238910	Site Preparation Contractors	1,818	2,072	254	14.0%	Supportive
238310	Drywall and Insulation Contractors	986	1,188	202	20.5%	Core
238320	Painting and Wall Covering Contractors	932	1,013	80	8.6%	Supportive
238150	Glass and Glazing Contractors	381	460	79	20.6%	Core
238140	Masonry Contractors	623	691	68	10.9%	Core
238990	All Other Specialty Trade Contractors	1,329	1,391	62	4.6%	Core
238290	Other Building Equipment Contractors	510	565	56	10.9%	Core
238170	Siding Contractors	324	376	52	16.2%	Core
236116	New Multifamily Housing Construction (except For-Sale Builders)	69	117	48	68.8%	Core

Source: Lightcast

Clean Energy Generation and Distribution Sector

There are five Clean Energy Generation and Distribution industries that are expected to add jobs over the next ten years in the Finger Lakes. The Electric Power Distribution, Power and Communication Line and Related Structures Construction, and Nuclear Electric Power Generation industries are each projected to add over 100 jobs.

Top Industries by Projected Job Growth in the Clean Energy Generation and Distribution Sector (2023-2033)

	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in Clean Energy Economy
221122	Electric Power Distribution	1,119	1,408	288	26%	Core
237130	Power and Communication Line and Related Structures Construction	730	961	231	32%	Core
221113	Nuclear Electric Power Generation	411	514	103	25%	Core
221115	Wind Electric Power Generation	54	112	57	106%	Core
221111	Hydroelectric Power Generation	10	18	7	70%	Core

Source: Lightcast

Industry Sector (Manufacturing)

The table below displays the fifteen Industry sector industries (generally, manufacturing employers) that are expected to add the most jobs over the next ten years. Seven of these industries are expected to add over 100 jobs each.

Top Industries by Projected Job Growth in the "Industry" Sector (2023-2033)

NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in Clean Energy Economy
334419	Other Electronic Component Manufacturing	471	852	382	81%	Core
332912	Fluid Power Valve and Hose Fitting Manufacturing	573	857	284	49%	Supportive
335314	Relay and Industrial Control Manufacturing	435	652	217	50%	Core
333242	Semiconductor Machinery Manufacturing	444	657	212	48%	Core
332312	Fabricated Structural Metal Manufacturing	197	381	185	94%	Supportive
334519	Other Measuring and Controlling Device Manufacturing	690	820	130	19%	Supportive
333912	Air and Gas Compressor Manufacturing	399	522	123	31%	Core
423840	Industrial Supplies Merchant Wholesalers	528	622	94	18%	Supportive
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	104	191	87	84%	Core
336390	Other Motor Vehicle Parts Manufacturing	171	249	78	46%	Core
332510	Hardware Manufacturing	209	280	70	34%	Supportive
332323	Ornamental and Architectural Metal Work Manufacturing	118	188	70	59%	Supportive
327390	Other Concrete Product Manufacturing	324	390	66	20%	Supportive
333998	All Other Miscellaneous General Purpose Machinery Manufacturing	333	394	61	18%	Core
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	314	373	59	19%	Supportive

Source: Lightcast

Transportation/Land Use Sector

Seven of the Transportation/Land Use industries are projected to add jobs in the Finger Lakes over the next ten years, and three of them are expected to add over 100 jobs: School and Employee Bus Transportation, General Automotive Repair, and Taxi Service. These industries play a supporting role in the clean energy economy, as they primarily represent service industries that will be customers of or otherwise engaged with electric, alternative fuel, and energy efficient vehicles.

Top Industries by Projected Job Growth in the Transportation/Land Use Sector (2023-2033)

NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in Clean Energy Economy
485410	School and Employee Bus Transportation	2,059	2,824	765	37%	Supportive
811111	General Automotive Repair	1,992	2,360	368	18%	Supportive
485310	Taxi Service	374	488	114	30%	Supportive
485113	Bus and Other Motor Vehicle Transit Systems	117	179	62	53%	Supportive
423110	Automobile and Other Motor Vehicle Merchant Wholesalers	486	517	31	6%	Supportive
811198	All Other Automotive Repair and Maintenance	142	171	30	21%	Supportive
423140	Motor Vehicle Parts (Used) Merchant Wholesalers	103	117	14	14%	Supportive

Source: Lightcast

Waste Disposal Sector

Over the next ten years, two industries in the Waste Disposal sector are projected to add jobs in the Finger Lakes: Materials Recovery Facilities and Other Waste Collection.

Top Industries by Projected Job Growth in the Waste Disposal Sector (2023-2033)

ICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in Clean Energy Economy
562920	Materials Recovery Facilities	242	374	132	55%	Core
562119	Other Waste Collection	36	60	24	67%	Supportive

Source: Lightcast

Agriculture/Food/Forestry Sector

The Agriculture/Food/Forestry sector contains only one industry for purposes of this study—Soil Preparation, Planting, and Cultivating—for which employment is projected to stay even over the next ten years. (This sector and industry was included in this study to support the Accelerator’s interest in its potential role with respect to emissions, energy generation, and other sustainability matters.)

Top Industries by Projected Job Growth in the Agriculture/Food/Forestry Sector (2023-2033)

NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in the Clean Energy Economy
115112	Soil Preparation, Planting, and Cultivating	36	34	(3)	(7%)	Tangential

Source: Lightcast

Multisector

The table below displays the fifteen Multisector industries that are expected to add the most jobs over the next ten years. Eleven of these are expected to add over 100 jobs, although several of these play tangential roles in the clean energy economy. The Engineering Services industry is expected to add over 800 jobs over the next ten years.

Top Industries by Projected Job Growth in the Multisector Category (2023-2033)

NAICS	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Role in the Clean Energy Economy
541330	Engineering Services	4,047	4,851	804	20%	Core
541611	Administrative Management and General Management Consulting Services	1,710	2,192	482	28%	Tangential
901199	Federal Government, Civilian, Excluding Postal Service	3,104	3,553	449	14%	Tangential
541380	Testing Laboratories	546	979	433	79%	Tangential
523940	Portfolio Management and Investment Advice	1,518	1,831	313	21%	Tangential
541511	Custom Computer Programming Services	2,757	2,986	229	8%	Supportive
541512	Computer Systems Design Services	2,420	2,619	199	8%	Supportive
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	784	932	147	19%	Core
444180	Other Building Material Dealers	1,278	1,410	132	10%	Supportive
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	577	703	125	22%	Supportive
541110	Offices of Lawyers	3,617	3,731	114	3%	Tangential
541713	Research and Development in Nanotechnology	116	214	98	85%	Core
237110	Water and Sewer Line and Related Structures Construction	386	465	79	21%	Supportive
541618	Other Management Consulting Services	206	261	55	27%	Tangential
541370	Surveying and Mapping (except Geophysical) Services	171	221	50	30%	Tangential

Source: Lightcast

Occupation Analysis

This portion of the study analyzes occupations that are needed to support the clean energy economy, either in core, supportive, or tangential roles. It redefines the seven sectors to each consist of a list of occupations rather than industries. Finger Lakes workers employed in these occupations may not be directly employed in a clean energy industry business, but this data helps illuminate the Region's relevant existing workforce capabilities and current and projected occupational openings and skill needs.

Overview

Distribution of Regional Occupations Across Studied Sectors

The set of occupations that MRB Group analyzed, listed in full in Appendix B by each of the seven sectors studied, together employ about 119,000 people in the Finger Lakes. That represents 20% of total Regional employment, slightly below the national rate of 22%, but higher than the New York State rate of 17%, which is significantly influenced by the composition of downstate employment.

Of those 119,000 jobs, about 64,000 are in occupations that MRB Group considers "core" to the clean energy economy; about 5,500 are in "supportive" occupations; and about 49,000 are in "tangential" occupations. See Appendix B for the list of occupations studied and their role categorization.

Distribution of Finger Lakes Jobs in Studied Occupations, by Studied Sector

Sector	2023 Finger Lakes Jobs in Studied Occupations	% of Jobs within Occupations Studied	% of Total Regional Jobs
Buildings	28,728	24.2%	4.9%
Clean Energy Generation and Distribution	632	0.5%	0.1%
Industry	18,820	15.8%	3.2%
Transportation/Land Use	16,589	13.9%	2.8%
Waste Disposal	266	0.2%	0.0%
Agriculture/Food/Forestry	4,275	3.6%	0.7%
Multisector	49,642	41.7%	8.5%
Finger Lakes Total	118,952	100.0%	20.4%
New York Total	1,782,801		17.1%
United States Total	37,065,702		21.7%

Source: Lightcast

Finger Lakes Job Breakdown (2023) by Occupations' Role in Clean Energy Economy	
Core	64,150
Supportive	5,524
Tangential	49,278

Source: Lightcast, MRB Group "Role" designations.

- The Multisector segment accounts for 42% of those jobs, or nearly 50,000 jobs. Some would be considered “core” to the clean energy economy, involving engineering, technician, scientific, production, installation, and repair roles that are needed for the design and deployment of clean energy-related systems, goods, and technologies. Many other occupations studied as part of this cluster would play more supportive or tangential roles.
- The occupations studied as part of the Buildings sector, important to integrating lower-carbon materials, energy-efficiency technologies, and clean heating and cooling systems into the built environment, employ over 28,000 people in the Region.
- The Industry sector, a collection of production occupations critical to making goods relevant to the energy transition, employs over 18,000 people in the Region.
- Just over 16,500 people are employed in Finger Lakes Transportation and Land Use occupations, primarily as operators of various types of vehicles whose fleets may be electrified in the future. We consider most of these occupations to be tangential to the clean energy economy, as users and operators of clean energy-related goods.
- Occupations involved in the Clean Energy Generation and Distribution sector employ 632 people in the Finger Lakes, primarily as engineers, technicians, installers, operators, and repairers of renewable power infrastructure—core roles in a clean energy economy.
- Occupations in the Waste Disposal sector employ about 266 people in the Finger Lakes, playing a role in the collection of waste streams that could potentially be involved in energy generation, greenhouse gas reduction, or recycling of carbon-intensive materials. Of note, the heavy truck driver occupation was studied as part of the Transportation and Land Use sector, so those jobs are not counted in this total even though a portion of such drivers work in waste disposal.
- Occupations studied as part of the Agriculture/Food/Forestry sector employ over 4,200 people in the Finger Lakes, and include roles that are tangential to the clean energy economy (farm workers) as well as food and agricultural scientists and engineers who could potentially play a more direct role in activities related to emissions reduction, energy generation, and other sustainability matters.

Earnings and Openings

The table to the right shows the average annual earnings of the occupation sets studied for each of the seven sectors, as well as the average annual openings projected over the next ten years. In terms of job openings, the studied occupations account for 18% of projected annual job openings in the Region over the coming ten-year period. Clean Energy Generation and Distribution occupations earn the most, on average, at \$97,057, but have the fewest projected average annual openings (81). The Multisector occupations, projected to have the most projected openings annually, have the second-highest annual earnings (\$85,381). Occupations studied as part of the Buildings and Industry sectors are expected to have a few thousand annual openings each, but these occupations do not pay as highly as the Region's economy-wide average.

Of the 13,357 average annual job openings projected for the occupations studied, about 6,800 annual openings are expected to be for occupations considered "core" to the clean energy economy, with the remainder being in "supportive" or "tangential" occupations.

Earnings and Openings

Sector	2023 Average Annual Earnings	2023-2033 Average Annual Openings
Buildings	\$58,599	3,393
Clean Energy Generation and Distribution	\$97,057	81
Industry	\$52,704	2,092
Transportation/Land Use	\$47,295	2,435
Waste Disposal	\$45,731	34
Agriculture/Food/Forestry	\$51,529	460
Multisector	\$85,381	4,862
Finger Lakes Clean Energy Total		13,357
Finger Lakes Total Occupations	\$60,121	75,119

Source: Lightcast

Projected Openings by Occupations' Role in Clean Energy Economy

Role	2023-2033 Average Annual Openings
Core	6,769
Supportive	549
Tangential	6,040

Source: Lightcast, MRB Group "Role" designations

Education Requirements

Education requirements for the typical entry-level position of each studied sector are shown in the table to the right. Most of the studied sectors are comprised of occupations that are less likely to require a bachelor's degree than the average Regional occupation. But the sets of occupations studied as part of the Agriculture/Food/Forestry and Multisector sectors have higher education requirements than the average Regional occupation.

Typical Entry-Level Education Requirement

Sector	High School Diploma	Bachelor's Degree
Buildings	48.1%	11.1%
Clean Energy Generation and Distribution	62.5%	12.5%
Industry	92.3%	7.7%
Transportation/Land Use	40.0%	10.0%
Waste Disposal	0.0%	0.0%
Agriculture/Food/Forestry	16.7%	50.0%
Multisector	21.4%	51.8%
Finger Lakes All Occupations	41.4%	22.6%

Source: Lightcast

Past Occupation Growth

The table below shows the change in job counts over the past decade for the occupations comprising each of the seven sectors studied. Taken as a whole, these occupations grew by 8.4% over the past ten years in the Region, adding about 9,200 jobs, while the Region's overall economy contracted by 1%. That growth was driven by job creation in the Multisector, Buildings, and Transportation/Land Use sectors, each of which added over 1,100 jobs from 2013-2023. Meanwhile, there were Regional net job losses in occupations associated with the Agriculture/Food/Forestry, Industry, Waste Disposal, and Clean Energy Generation and Distribution sectors.

Looking at all sectors together, the studied occupations did not grow as quickly in the Finger Lakes (8.4%) as they did in the state (15.3%) and country (26.1%).

Past Occupation Growth by Sector

Sector	Finger Lakes				New York State				USA			
	2013 Jobs	2023 Jobs	Change (#)	Change (%)	2013 Jobs	2023 Jobs	Change (#)	Change (%)	2013 Jobs	2023 Jobs	Change (#)	Change (%)
Buildings	26,333	28,728	2,394	9.1%	465,625	465,027	(597)	(0.1%)	8,550,755	10,665,571	2,114,816	24.7%
Clean Energy Generation and Distribution	660	632	(28)	(4.2%)	9,054	9,010	(43)	(0.5%)	218,753	251,317	32,564	14.9%
Industry	19,655	18,820	(835)	(4.2%)	143,026	137,632	(5,394)	(3.8%)	3,905,289	4,375,170	469,881	12.0%
Transportation/Land Use	14,973	16,589	1,616	10.8%	231,017	274,735	43,718	18.9%	4,203,831	5,115,282	911,451	21.7%
Waste Disposal	338	266	(72)	(21.3%)	72,819	83,436	10,618	14.6%	1,990,272	2,492,693	502,421	25.2%
Agriculture/Food/Forestry	4,887	4,275	(612)	(12.5%)	18,696	19,342	645	3.5%	660,468	648,908	(11,560)	(1.8%)
Multisector	42,905	49,642	6,738	15.7%	670,418	868,504	198,085	29.5%	11,721,530	15,861,929	4,140,399	35.3%
Total	109,751	118,952	9,201	8.4%	1,610,655	1,857,687	247,032	15.3%	31,250,896	39,410,869	8,159,972	26.1%

Source: Lightcast

Job Postings and Projected Openings by Sector

The tables in this section take each sector in turn and show 1) the occupations that are the subject of the most Regional job posting activity over the past year, and 2) the occupations that are projected to have the most job openings in the Finger Lakes over the next ten years.

Buildings Sector Job Postings

The table below displays the five Buildings sector occupations that were the subject of the most unique job postings in the Finger Lakes from February 2023 to February 2024. Among these five occupations, the top specialized skills sought after by employers are warehousing, construction, forklift operation, and project management. The top qualifications for these jobs include valid driver's license, commercial driver's license (CDL), forklift certification, and 30-Hour OSHA General Industry Card.

Top 5 Occupations by Job Postings in the Buildings Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	137	673	\$37,859
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	52	89	\$70,995
47-2061	Construction Laborers	50	215	\$50,922
11-9021	Construction Managers	40	25	\$91,954
11-9141	Property, Real Estate, and Community Association Managers	34	23	\$103,377

Source: Lightcast

Buildings Sector Occupation Openings (Projections)

The table below displays the fifteen occupations in the Buildings sector that are projected to have the most average annual openings over the next ten years in the Finger Lakes. Nine of these occupations are expected to have at least 100 openings per year, including occupations that are clearly critical to making buildings greener and more energy efficient (such as electricians, HVAC installers, and their supervisors).

Top 15 Occupations by Average Annual Openings in the Buildings Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	6,479	7,460	981	15.1%	999	\$37,859
47-2061	Construction Laborers	3,620	4,160	539	14.9%	395	\$50,922
47-2111	Electricians	2,749	3,292	542	19.7%	319	\$64,549
47-2031	Carpenters	3,254	3,521	267	8.2%	317	\$54,864
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	2,347	2,622	275	11.7%	231	\$70,995
47-2152	Plumbers, Pipefitters, and Steamfitters	1,799	2,117	318	17.7%	200	\$65,677
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1,650	1,993	344	20.8%	187	\$59,592
47-2073	Operating Engineers and Other Construction Equipment Operators	1,017	1,201	183	18.0%	112	\$67,271
47-4011	Construction and Building Inspectors	799	857	58	7.3%	100	\$66,994
47-2211	Sheet Metal Workers	705	802	96	13.7%	79	\$55,718
11-9021	Construction Managers	844	962	119	14.1%	78	\$91,954
47-2181	Roofers	532	702	171	32.1%	66	\$54,229
11-9141	Property, Real Estate, and Community Association Managers	609	704	94	15.5%	62	\$103,377
11-9041	Architectural and Engineering Managers	548	648	99	18.1%	47	\$152,245
47-2051	Cement Masons and Concrete Finishers	360	410	49	13.7%	35	\$60,327

Source: Lightcast

Clean Energy Generation and Distribution Job Postings

The table below displays the five Clean Energy Generation and Distribution occupations (of the eight studied) that were the subject of the most unique job postings over the last twelve months in the Finger Lakes, however none of these posting counts exceeded an average of seven per month. Employers posting job advertisements for the occupations listed below are most interested in specialized skills including Hand Tools, Environment Health and Safety, Machinery, Oil and Gas, and Changing Oil. The top sought-after certifications for the occupations listed below include Valid Driver's License, 10-Hour OSHA General Industry Card, CDL, Reactor Operator License, and Professional Engineer License.

Top 5 Occupations by Job Postings in the Clean Energy Generation and Distribution Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
49-9051	Electrical Power-Line Installers and Repairers	5	9	\$98,800
51-8011	Nuclear Power Reactor Operators	1	1	\$133,969
19-4051	Nuclear Technicians	1	2	\$104,842
49-9081	Wind Turbine Service Technicians	1	3	\$64,430
47-2231	Solar Photovoltaic Installers	0	6	\$42,908

Source: Lightcast

Clean Energy Generation and Distribution Occupation Openings (Projections)

The table below displays the fifteen occupations in the Clean Energy Generation and Distribution sector that are projected to have the most average annual openings in the Finger Lakes over the next ten years, topped by a need for power line installers and repairers. This sector is expected to have significantly fewer annual openings compared to the other sectors studied, but it features high average annual earnings.

Top Occupations by Average Annual Openings in the Clean Energy Generation and Distribution Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
49-9051	Electrical Power-Line Installers and Repairers	264	363	99	37%	34	98,800
51-8011	Nuclear Power Reactor Operators	93	110	17	19%	10	\$133,969
47-2231	Solar Photovoltaic Installers	73	97	25	34%	10	\$42,908
51-8013	Power Plant Operators	93	103	10	11%	9	\$85,260
19-4051	Nuclear Technicians	41	51	10	25%	6	\$104,842
49-9081	Wind Turbine Service Technicians	16	43	27	172%	5	\$64,430
17-2161	Nuclear Engineers	31	40	10	32%	3	\$120,339
51-8012	Power Distributors and Dispatchers	22	27	5	23%	3	\$125,663

Source: Lightcast

Industry Sector Job Postings

Over the last twelve months in the Finger Lakes' Industry sector, the five occupations shown below had the highest average job postings. For the top three occupations, the average monthly hires far exceeded the average monthly postings. The top specialized skills sought after for these occupations were Auditing, Machining, Good Manufacturing Practices, Quality Management Systems, and Machinery. The top qualifications for the occupations below were Valid Driver's License, American Society for Quality (ASQ) Certification, Certified International Property Specialist, Forklift Certification, and Security Clearance.

Top 5 Occupations by Job Postings in the Industry Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	64	139	\$47,094
51-1011	First-Line Supervisors of Production and Operating Workers	54	84	\$70,916
11-3051	Industrial Production Managers	40	20	\$124,214
51-2098	Miscellaneous Assemblers and Fabricators	30	296	\$40,932
51-4041	Machinists	19	63	\$47,450

Source: Lightcast

Industry Sector Occupation Openings (Projections)

The table below shows the projected Finger Lakes job growth and average annual openings of all thirteen Industry sector occupations studied. Nine of those production occupations are projected to add jobs over the next ten years, and six are projected to have hundreds of annual openings. Although Miscellaneous Assemblers and Fabricators are projected to lose a net of 29 jobs through 2033, the occupation is estimated to have an average of 469 annual openings, suggesting a high turnover rate.

Top Occupations by Average Annual Openings in the Industry Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
51-2098	Miscellaneous Assemblers and Fabricators	4,269	4,240	(29)	(1%)	469	\$40,932
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	3,262	3,413	151	5%	397	\$47,094
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	2,518	2,789	272	11%	306	\$39,432
51-1011	First-Line Supervisors of Production and Operating Workers	2,709	2,953	245	9%	285	\$70,916
51-4041	Machinists	2,507	2,732	225	9%	276	\$47,450
49-9041	Industrial Machinery Mechanics	1,566	1,882	316	20%	165	\$59,872
11-3051	Industrial Production Managers	827	906	79	10%	66	\$124,214
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	462	460	(2)	(0%)	49	\$47,378
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	381	416	36	9%	41	\$48,958
51-2031	Engine and Other Machine Assemblers	105	101	(4)	(4%)	13	\$55,557
51-2041	Structural Metal Fabricators and Fitters	116	118	2	2%	13	\$46,601
51-2021	Coil Winders, Tapers, and Finishers	77	71	(6)	(7%)	8	\$41,509
47-2011	Boilermakers	22	27	5	22%	3	\$79,545

Source: Lightcast

Transportation/Land Use Sector Job Postings

The table below displays the five Transportation/Land Use sector occupations that were the subject of the most Regional job postings from February 2023 to February 2024, showing high recent demand for drivers of heavy trucks and tractor-trailers.

The top five specialized skills sought after in job postings for occupations below are Truck Driving, Pre-trip and Post-trip Vehicle Inspectors, Warehousing, Merchandising, and Vehicle Inspection. The top five qualifications for these occupations are Valid Driver's License, CDL Class A License, CDL, CDL Class B License, and Passenger Endorsement.

Top 5 Occupations by Job Postings in the Transportation/Land Use Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
53-3032	Heavy and Tractor-Trailer Truck Drivers	177	264	\$53,305
53-3031	Driver/Sales Workers	60	77	\$39,322
53-3052	Bus Drivers, Transit and Intercity	20	36	\$52,260
53-3051	Bus Drivers, School	10	145	\$45,531
53-3053	Shuttle Drivers and Chauffeurs	8	61	\$33,775

Source: Lightcast

Transportation/Land Use Sector Occupation Openings (Projections)

Projected trends in the Region's Transportation/Land Use sectors are displayed in the table below. Each of the ten occupations in the Transportation/Land Use sector are expected to add jobs over the next ten years. Heavy and Tractor-Trailer Truck Drivers, School Bus Drivers, Light Truck Drivers, and Driver/Sales Workers are all expected to average more than 170 jobs openings each year.

Top Occupations by Average Annual Openings in the Transportation/Land Use Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
53-3032	Heavy and Tractor-Trailer Truck Drivers	5,411	6,337	926	17%	707	\$53,305
53-3051	Bus Drivers, School	3,240	3,923	683	21%	614	\$45,637
53-3033	Light Truck Drivers	4,046	4,871	825	20%	547	\$42,186
53-3031	Driver/Sales Workers	1,271	1,542	271	21%	173	\$39,322
53-3053	Shuttle Drivers and Chauffeurs	988	1,075	88	9%	150	\$34,427
53-3052	Bus Drivers, Transit and Intercity	658	730	72	11%	96	\$52,407
53-3054	Taxi Drivers	518	653	135	26%	72	\$48,561
53-3099	Motor Vehicle Operators, All Other	370	423	53	14%	63	\$35,960
53-3011	Ambulance Drivers and Attendants, Except EMTs	48	50	2	4%	7	\$38,651
17-2011	Aerospace Engineers	38	61	23	61%	5	\$123,985

Source: Lightcast

Waste Disposal Sector Job Postings

The table below reveals that there was no significant job posting activity over the last twelve months for Refuse and Recyclable Materials Collectors, the only occupation studied for the Waste Disposal sector. When such jobs are advertised, they sometimes call for specialized waste management skills, operations skills, and lifting ability.

Occupations by Job Postings in the Waste Disposal Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
53-7081	Refuse and Recyclable Material Collectors	0	13	\$45,731

Source: Lightcast

Waste Disposal Sector Occupation Openings (Projections)

The table below displays projected trends for the Refuse and Recyclable Materials Collectors occupation in the Finger Lakes. No net job change is projected for this occupation in the coming decade, but overturn is expected to generate 34 average annual openings.

Occupations by Average Annual Openings in the Waste Disposal Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
53-7081	Refuse and Recyclable Material Collectors	266	266	0	0%	34	\$45,731

Source: Lightcast

Agriculture/Food/Forestry Sector Job Postings

The table below displays the five Agriculture/Food/Forestry sector occupations that were the subject of the most Regional job postings from February 2023 to February 2024. The top five specialized job skills for the occupations below are Agriculture, Agronomy, Fertilizers, Food Safety and Sanitation, and Occupational Safety and Health Administration (OSHA). The top five qualifications for these occupations are Valid Driver's License, CDL, Forklift certification, CDL Class B and Pesticide Applicator License.

Top 5 Occupations by Job Postings in the Agriculture/Food/Forestry Sector (Feb 2023 - Feb 2024)

SOC	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
19-4012	Agricultural Technicians	8	3	\$42,046
11-9013	Farmers, Ranchers, and Other Agricultural Managers	8	94	\$50,887
19-4013	Food Science Technicians	2	2	\$61,578
19-1012	Food Scientists and Technologists	1	3	\$76,670
45-2011	Agricultural Inspectors	0	7	\$60,762

Source: Lightcast

Agriculture/Food/Forestry Sector Occupation Openings (Projections)

Projected trends in the Region's seven studied Agriculture/Food/Forestry occupations are shown in the table below. Farmers, Ranchers, and Other Agricultural Managers, despite being an occupation with projected job loss, are expected to be the subject of 413 average annual job openings.

Top Occupations by Projected Job Growth in the Agriculture/Food/Forestry Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
11-9013	Farmers, Ranchers, and Other Agricultural Managers	3,976	3,578	(398)	(10%)	413	\$50,887
19-4013	Food Science Technicians	98	118	20	20%	16	\$61,578
19-4012	Agricultural Technicians	71	86	15	22%	12	\$42,046
45-2011	Agricultural Inspectors	64	71	7	10%	11	\$60,762
19-1012	Food Scientists and Technologists	65	79	14	21%	7	\$76,670
17-2021	Agricultural Engineers	0	0	0	0%	0	-

Source: Lightcast

Multisector Job Postings

The table below displays the five occupations in the “Multisector” sector that were the subject of the most Regional job postings from February 2023 to February 2024. Maintenance and Repair workers have been the subject of the most significant recruitment.

The top five specialized skills sought after by employers hiring these occupations include Project Management, Plumbing, Auditing, HVAC, and Process Improvement. The top five qualifications required by the occupations below include Valid Driver’s License, Security Clearance, Professional Engineer (PE) License, Master of Business Administration (MBA) and Engineer in Training.

Top 5 Occupations by Job Postings in the Multisector Sector (Feb 2023 - Feb 2024)

	Description	Avg Monthly Postings	Avg Monthly Hires	Avg. Annual Earnings
49-9071	Maintenance and Repair Workers, General	156	320	\$47,608
11-1021	General and Operations Managers	121	408	\$124,120
15-1299	Computer Occupations, All Other	93	19	\$85,286
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	64	33	\$116,261
43-5061	Production, Planning, and Expediting Clerks	50	109	\$52,675

Source: Lightcast

Multisector Occupation Openings (Projections)

The table below displays the fifteen occupations in the Multisector segment that are projected to have the most average annual openings over the next ten years in the Finger Lakes. Each of the top 15 occupations are expected to add jobs through 2033.

Top Occupations by Projected Job Growth in the Multisector Sector (2023-2033)

SOC	Description	2023 Jobs	2033 Jobs	Change (#)	Change (%)	Avg. Annual Openings	Avg. Annual Earnings
11-1021	General and Operations Managers	11,193	12,633	1,440	13%	1,084	\$124,120
49-9071	Maintenance and Repair Workers, General	7,823	8,583	760	10%	815	\$47,608
43-5061	Production, Planning, and Expediting Clerks	2,654	2,849	195	7%	298	\$52,675
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	2,277	2,667	390	17%	239	\$76,532
13-1199	Business Operations Specialists, All Other	1,795	2,157	362	20%	204	\$77,255
13-1028	Buyers and Purchasing Agents	1,708	1,742	34	2%	161	\$70,883
11-9199	Managers, All Other	1,737	1,955	217	13%	154	\$92,468
17-2112	Industrial Engineers	2,027	2,337	310	15%	151	\$93,236
13-1151	Training and Development Specialists	1,341	1,526	185	14%	137	\$67,584
51-4121	Welders, Cutters, Solderers, and Brazers	1,105	1,248	144	13%	130	\$49,125
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	1,187	1,323	136	11%	124	\$116,261
13-1041	Compliance Officers	1,341	1,492	152	11%	123	\$69,601
17-2141	Mechanical Engineers	1,274	1,500	225	18%	97	\$95,105
13-2051	Financial and Investment Analysts	1,086	1,224	138	13%	87	\$105,862
17-2051	Civil Engineers	936	1,105	168	18%	76	\$91,986

Source: Lightcast

Just Transition Analysis

MRB Group analyzed a set of industries most closely tied to fossil fuels. The Finger Lakes economic activity and jobs associated with these industries would contract in the course of the clean energy transition, but in some cases, they may represent infrastructure and skill sets that can be leveraged to support the clean energy economy.

The next table shows the composition of this “Just Transition” sector, so named because of the importance of working to ensure a just and equitable transition from an economy dependent on extraction to one characterized by sustainability. Together these industries employ 8,664 people in the Finger Lakes. There is substantial employment linked to plastics and polystyrene foam manufacturing industries that may be at risk as markets shift away from plastics.

Finger Lakes Just Transition Industries with Past Job Growth (2013-2023)

NAICS	Description	2013 Jobs	2023 Jobs	Change (#)	Change (%)	LQ	Payrolled Business Locations
326199	All Other Plastics Product Manufacturing	2,895	3,277	381	13.2%	3.0	34
457110	Gasoline Stations with Convenience Stores	2,634	2,695	60	2.3%	0.9	353
326140	Polystyrene Foam Product Manufacturing	826	843	17	2.0%	8.1	4
237120	Oil and Gas Pipeline and Related Structures Construction	84	472	388	462.8%	1.0	9
457210	Fuel Dealers	379	374	(5)	(1.3%)	1.4	36
457120	Other Gasoline Stations	522	318	(204)	(39.1%)	1.0	32
325199	All Other Basic Organic Chemical Manufacturing	292	248	(45)	(15.3%)	1.7	7
221210	Natural Gas Distribution	79	78	(1)	(1.4%)	0.2	8
113310	Logging	107	72	(35)	(32.8%)	0.3	8
325193	Ethyl Alcohol Manufacturing	41	55	14	34.6%	1.6	1
324191	Petroleum Lubricating Oil and Grease Manufacturing	79	51	(28)	(34.9%)	1.4	4
211130	Natural Gas Extraction	11	37	26	230.5%	0.3	3
486210	Pipeline Transportation of Natural Gas	33	35	2	5.6%	0.3	5
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)	81	32	(48)	(59.9%)	0.1	11
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	73	27	(46)	(63.3%)	0.2	2
324121	Asphalt Paving Mixture and Block Manufacturing	61	25	(36)	(58.8%)	0.4	3
486910	Pipeline Transportation of Refined Petroleum Products	<10	15	-	-	0.6	5
221112	Fossil Fuel Electric Power Generation	83	10	(73)	(87.9%)	0.0	6
Just Transition Total		8,289	8,664	387	4.7%		1,026

Source: Lightcast

Just Transition Sector Occupations

This displays the top twenty occupations, by 2023 job count, of the Finger Lakes' Just Transition industries collectively. Cashiers top the list, employed largely by gasoline stations; many of those positions might be retained in the convenience store industry generally, or in the transition from fueling stations to electric charging stations. Many other of the occupations on this list are associated with the plastics and polystyrene foam manufacturing industries, and in many cases may represent skillsets applicable to other manufacturing industries that do not use fossil fuel-derived material inputs.

Top 20 Occupations in the Finger Lakes Just Transition Sector (2023)

SOC	Description	Jobs (2023)
41-2011	Cashiers	1,966
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	405
51-2098	Miscellaneous Assemblers and Fabricators	333
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	296
41-1011	First-Line Supervisors of Retail Sales Workers	259
11-1021	General and Operations Managers	230
51-1011	First-Line Supervisors of Production and Operating Workers	218
49-9071	Maintenance and Repair Workers, General	198
35-3023	Fast Food and Counter Workers	177
53-7064	Packers and Packagers, Hand	156
53-3032	Heavy and Tractor-Trailer Truck Drivers	151
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	149
51-9111	Packaging and Filling Machine Operators and Tenders	137
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	134
49-9041	Industrial Machinery Mechanics	133
47-2061	Construction Laborers	121
17-2112	Industrial Engineers	119
43-5061	Production, Planning, and Expediting Clerks	106
43-5071	Shipping, Receiving, and Inventory Clerks	104
43-4051	Customer Service Representatives	103

Source: Lightcast

Compatible Occupations for Just Transition Workers

The following set of tables displays the top ten occupations in the in the Finger Lakes' Just Transition sector, along with the top three occupations that are considered compatible. This data is derived from Lightcast's Compatibility Index, a measure of the compatibility of two occupations in terms of the knowledge, skills, and abilities that they require. A compatibility index value of 100 indicates two occupations are completely compatible.

Each of the Finger Lakes' top ten Just Transition occupations have at least three occupations that are highly compatible (Compatibility Index >95) and have at least 50 jobs in the Region as of 2023. Lower-skill service industry occupations like Cashiers and Fast Food & Counter Workers would find their skill sets in demand by any convenience stores retained as gas stations give way to electric charging stations, or transferable to available jobs in other hospitality, entertainment, and retail industries. Most of the production occupations maintained by Just Transition industries have very high compatibility with at least several other manufacturing occupations, highlighting the transferability of skill sets across manufacturing industries and the applicability of the incumbent workforce's capabilities to products and processes associated with a clean energy economy.

Top Compatible Occupations for the Top 10 Finger Lakes Just Transition Sector Occupations (2023)

SOC	Description	Jobs (2023)	Compatibility Index	Avg. Annual Openings (2023-2033)
41-2011	Cashiers	1,966		
39-3011	Gambling Dealers	159	97	31
31-9095	Pharmacy Aides	428	97	71
35-9031	Hosts and Hostesses, Restaurants, Lounge, and Coffee Shop	953	96	256
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	405		
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	663	98	68
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	102	97	11
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	347	97	40
51-2098	Miscellaneous Assemblers and Fabricators	333		
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	3,262	96	397
51-9111	Packaging and Filling Machine Operators and Tenders	2,354	96	289
51-4193	Plating Machine Setters, Operators, and Tenders, Metal and Plastic	134	96	15
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	296		
51-2092	Team Assemblers	4,269	96	469
43-5111	Weighers, Measurers, Checkers, and Samplers, Record Keeping	137	96	18
51-4193	Plating Machine Setters, Operators, and Tenders, Metal and Plastic	134	96	15
41-1011	First-Line Supervisors of Retail Sales Workers	259		
43-1011	First-Line Supervisors of Office and Administrative Support Workers	4,583	96	469
11-9179	Spa Managers / Personal Service Managers	77	95	8
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	4,079	95	695

(Continued)				
SOC	Description	Jobs (2023)	Compatibility Index	Avg. Annual Openings (2023-2033)
11-1021	General and Operations Managers	230		
13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	1,708	96	161
41-1012	First-Line Supervisors of Non-Retail Sales Workers	973	96	85
11-3012	Administrative Services Manager	490	96	50
51-1011	First-Line Supervisors of Production and Operating Workers	218		
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	2,347	95	231
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	2,277	94	239
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	582	94	73
49-9071	Maintenance and Repair Workers, General	198		
47-2231	Solar Photovoltaic Installers	73	96	10
49-3092	Recreational Vehicle Service Technicians	87	96	13
49-3021	Automotive Body and Related Repairers	496	96	53
35-3023	Fast Food and Counter Workers	177		
35-3041	Food Servers, Nonrestaurant	1,465	97	270
39-3031	Ushers, Lobby Attendants, and Ticket Takers	240	97	78
35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	953	96	256
53-7064	Packers and Packagers, Hand	156		
45-2041	Graders and Sorters, Agricultural Products	112	96	19
51-6021	Pressers, Textile, Garment, and Related Materials	132	95	17
35-3041	Food Servers, Nonrestaurant	1,465	95	270

Source: Lightcast

Appendix A: Industries Studied, by Sector

NAICS	Industry Description	Role in Clean Energy Economy
Sector: Buildings		
221330	Steam and Air-Conditioning Supply	Core
236115	New Single-Family Housing Construction (except For-Sale Builders)	Core
236116	New Multifamily Housing Construction (except For-Sale Builders)	Core
236117	New Housing For-Sale Builders	Core
236118	Residential Remodelers	Core
236210	Industrial Building Construction	Core
236220	Commercial and Institutional Building Construction	Core
238140	Masonry Contractors	Core
238150	Glass and Glazing Contractors	Core
238160	Roofing Contractors	Core
238170	Siding Contractors	Core
238210	Electrical Contractors and Other Wiring Installation Contractors	Core
238220	Plumbing, Heating, and Air-Conditioning Contractors	Core
238290	Other Building Equipment Contractors	Core
238310	Drywall and Insulation Contractors	Core
238320	Painting and Wall Covering Contractors	Supportive
238330	Flooring Contractors	Core
238350	Finish Carpentry Contractors	Core
238390	Other Building Finishing Contractors	Supportive
238910	Site Preparation Contractors	Supportive
238990	All Other Specialty Trade Contractors	Supportive
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers	Supportive
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	Supportive
423390	Other Construction Material Merchant Wholesalers	Supportive
423440	Other Commercial Equipment Merchant Wholesalers	Supportive
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers	Supportive
444110	Home Centers	Supportive
811412	Appliance Repair and Maintenance	Core

NAICS	Industry Description	Role in Clean Energy Economy
Sector: Clean Energy Generation and Distribution		
221111	Hydroelectric Power Generation	Core
221113	Nuclear Electric Power Generation	Core
221114	Solar Electric Power Generation	Core
221115	Wind Electric Power Generation	Core
221116	Geothermal Electric Power Generation	Core
221117	Biomass Electric Power Generation	Core
221121	Electric Bulk Power Transmission and Control	Core
221122	Electric Power Distribution	Core
237130	Power and Communication Line and Related Structures Construction	Core
Sector: Industry		
321114	Wood Preservation	Supportive
321219	Reconstituted Wood Product Manufacturing	Core
321911	Wood Window and Door Manufacturing	Supportive
321918	Other Millwork (including Flooring)	Supportive
321991	Manufactured Home (Mobile Home) Manufacturing	Core
321992	Prefabricated Wood Building Manufacturing	Core
322299	All Other Converted Paper Product Manufacturing	Supportive
324122	Asphalt Shingle and Coating Materials Manufacturing	Supportive
327120	Clay Building Material and Refractories Manufacturing	Supportive
327211	Flat Glass Manufacturing	Supportive
327331	Concrete Block and Brick Manufacturing	Supportive
327332	Concrete Pipe Manufacturing	Supportive
327390	Other Concrete Product Manufacturing	Supportive
327992	Ground or Treated Mineral and Earth Manufacturing	Supportive
327993	Mineral Wool Manufacturing	Supportive
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	Supportive
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	Supportive
331221	Rolled Steel Shape Manufacturing	Supportive
331222	Steel Wire Drawing	Supportive

331313	Alumina Refining and Primary Aluminum Production	Supportive
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	Supportive
331420	Copper Rolling, Drawing, Extruding, and Alloying	Supportive
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	Supportive
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	Supportive
331511	Iron Foundries	Supportive
331512	Steel Investment Foundries	Supportive
331513	Steel Foundries (except Investment)	Supportive
331523	Nonferrous Metal Die-Casting Foundries	Supportive
331524	Aluminum Foundries (except Die-Casting)	Supportive
331529	Other Nonferrous Metal Foundries (except Die-Casting)	Supportive
332111	Iron and Steel Forging	Supportive
332112	Nonferrous Forging	Supportive
332114	Custom Roll Forming	Supportive
332117	Powder Metallurgy Part Manufacturing	Supportive
332311	Prefabricated Metal Building and Component Manufacturing	Supportive
332312	Fabricated Structural Metal Manufacturing	Supportive
332313	Plate Work Manufacturing	Supportive
332321	Metal Window and Door Manufacturing	Supportive
332322	Sheet Metal Work Manufacturing	Supportive
332323	Ornamental and Architectural Metal Work Manufacturing	Supportive
332410	Power Boiler and Heat Exchanger Manufacturing	Supportive
332420	Metal Tank (Heavy Gauge) Manufacturing	Supportive
332510	Hardware Manufacturing	Supportive
332618	Other Fabricated Wire Product Manufacturing	Supportive
332721	Precision Turned Product Manufacturing	Supportive
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	Supportive
332911	Industrial Valve Manufacturing	Supportive
332912	Fluid Power Valve and Hose Fitting Manufacturing	Supportive
332919	Other Metal Valve and Pipe Fitting Manufacturing	Supportive
332991	Ball and Roller Bearing Manufacturing	Supportive
332996	Fabricated Pipe and Pipe Fitting Manufacturing	Supportive

333120	Construction Machinery Manufacturing	Core
333241	Food Product Machinery Manufacturing	Core
333242	Semiconductor Machinery Manufacturing	Core
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	Core
333248	All Other Industrial Machinery Manufacturing	Core
333310	Commercial and Service Industry Machinery Manufacturing	Core
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	Core
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	Core
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	Core
333511	Industrial Mold Manufacturing	Supportive
333517	Machine Tool Manufacturing	Supportive
333611	Turbine and Turbine Generator Set Units Manufacturing	Core
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing	Core
333613	Mechanical Power Transmission Equipment Manufacturing	Core
333618	Other Engine Equipment Manufacturing	Core
333912	Air and Gas Compressor Manufacturing	Core
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing	Core
333991	Power-Driven Handtool Manufacturing	Supportive
333993	Packaging Machinery Manufacturing	Core
333994	Industrial Process Furnace and Oven Manufacturing	Core
333995	Fluid Power Cylinder and Actuator Manufacturing	Core
333996	Fluid Power Pump and Motor Manufacturing	Core
333998	All Other Miscellaneous General Purpose Machinery Manufacturing	Core
334111	Electronic Computer Manufacturing	Core
334413	Semiconductor and Related Device Manufacturing	Core
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	Core
334417	Electronic Connector Manufacturing	Core
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	Core
334419	Other Electronic Component Manufacturing	Core
334514	Totalizing Fluid Meter and Counting Device Manufacturing	Supportive
334516	Analytical Laboratory Instrument Manufacturing	Supportive
334517	Irradiation Apparatus Manufacturing	Supportive

334519	Other Measuring and Controlling Device Manufacturing	Supportive
335139	Electric Lamp Bulb and Other Lighting Equipment Manufacturing	Core
335131	Residential Electric Lighting Fixture Manufacturing	Core
335132	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	Core
335210	Small Electrical Appliance Manufacturing	Core
335311	Power, Distribution, and Specialty Transformer Manufacturing	Core
335312	Motor and Generator Manufacturing	Core
335313	Switchgear and Switchboard Apparatus Manufacturing	Core
335314	Relay and Industrial Control Manufacturing	Core
335910	Battery Manufacturing	Core
335921	Fiber Optic Cable Manufacturing	Core
335929	Other Communication and Energy Wire Manufacturing	Core
335931	Current-Carrying Wiring Device Manufacturing	Core
335932	Noncurrent-Carrying Wiring Device Manufacturing	Supportive
335991	Carbon and Graphite Product Manufacturing	Supportive
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	Core
336110	Automobile Manufacturing	Core
336120	Heavy Duty Truck Manufacturing	Core
336211	Motor Vehicle Body Manufacturing	Supportive
336213	Motor Home Manufacturing	Core
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	Supportive
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	Core
336340	Motor Vehicle Brake System Manufacturing	Supportive
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	Core
336370	Motor Vehicle Metal Stamping	Supportive
336390	Other Motor Vehicle Parts Manufacturing	Core
336510	Railroad Rolling Stock Manufacturing	Core
336991	Motorcycle, Bicycle, and Parts Manufacturing	Core
336999	All Other Transportation Equipment Manufacturing	Core
423830	Industrial Machinery and Equipment Merchant Wholesalers	Supportive
423840	Industrial Supplies Merchant Wholesalers	Supportive

NAICS	Industry Description	Role in Clean Energy Economy
Sector: Transportation/Land Use		
423110	Automobile and Other Motor Vehicle Merchant Wholesalers	Supportive
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers	Supportive
423140	Motor Vehicle Parts (Used) Merchant Wholesalers	Supportive
485111	Mixed Mode Transit Systems	Supportive
485113	Bus and Other Motor Vehicle Transit Systems	Supportive
485310	Taxi and Ridesharing Services	Supportive
485410	School and Employee Bus Transportation	Supportive
485991	Special Needs Transportation	Supportive
811111	General Automotive Repair	Supportive
811114	Specialized Automotive Repair	Supportive
811198	All Other Automotive Repair and Maintenance	Supportive
Sector: Waste Disposal		
325315	Compost Manufacturing	Core
423930	Recyclable Material Merchant Wholesalers	Core
562119	Other Waste Collection	Supportive
562212	Solid Waste Landfill	Tangential
562213	Solid Waste Combustors and Incinerators	Core
562219	Other Nonhazardous Waste Treatment and Disposal	Supportive
562920	Materials Recovery Facilities	Core
Sector: Agriculture/Food/Forestry		
115112	Soil Preparation, Planting, and Cultivating	Tangential

NAICS	Industry Description	Role in Clean Energy Economy
Sector: Multisector		
221310	Water Supply and Irrigation Systems	Tangential
237110	Water and Sewer Line and Related Structures Construction	Supportive
237210	Land Subdivision	Tangential
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	Supportive
423690	Other Electronic Parts and Equipment Merchant Wholesalers	Supportive
423710	Hardware Merchant Wholesalers	Supportive
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	Supportive
423740	Refrigeration Equipment and Supplies Merchant Wholesalers	Supportive
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	Supportive
444180	Other Building Material Dealers	Supportive
523940	Portfolio Management and Investment Advice	Tangential
541110	Offices of Lawyers	Tangential
541199	All Other Legal Services	Tangential
541310	Architectural Services	Core
541320	Landscape Architectural Services	Supportive
541330	Engineering Services	Core
541340	Drafting Services	Supportive
541350	Building Inspection Services	Supportive
541360	Geophysical Surveying and Mapping Services	Tangential
541370	Surveying and Mapping (except Geophysical) Services	Tangential
541380	Testing Laboratories	Tangential
541410	Interior Design Services	Tangential
541420	Industrial Design Services	Supportive
541490	Other Specialized Design Services	Tangential
541511	Custom Computer Programming Services	Supportive
541512	Computer Systems Design Services	Supportive
541611	Administrative Management and General Management Consulting Services	Tangential
541614	Process, Physical Distribution, and Logistics Consulting Services	Supportive
541618	Other Management Consulting Services	Tangential

541620	Environmental Consulting Services	Supportive
541713	Research and Development in Nanotechnology	Core
541714	Research and Development in Biotechnology (except Nanobiotechnology)	Core
811210	Electronic and Precision Equipment Repair and Maintenance	Core
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	Core
813211	Grantmaking Foundations	Tangential
813219	Other Grantmaking and Giving Services	Tangential
813312	Environment, Conservation and Wildlife Organizations	Supportive
813319	Other Social Advocacy Organizations	Supportive
813410	Civic and Social Organizations	Tangential
901199	Federal Government, Civilian, Excluding Post Office	Tangential
902999	State Government, Excluding Education and Hospitals	Tangential

Appendix B: Occupations Studied, by Sector

SOC	Occupation Description	Role in Clean Energy Economy
Sector: Buildings		
11-9021	Construction Managers	Core
11-9041	Architectural and Engineering Managers	Core
11-9141	Property, Real Estate, and Community Association Managers	Supportive
17-1012	Landscape Architects	Supportive
17-3011	Architectural and Civil Drafters	Supportive
47-2031	Carpenters	Core
47-2051	Cement Masons and Concrete Finishers	Core
47-2061	Construction Laborers	Core
47-2073	Operating Engineers and Other Construction Equipment Operators	Core
47-2111	Electricians	Core
47-2121	Glaziers	Core
47-2131	Insulation Workers, Floor, Ceiling, and Wall	Core
47-2151	Pipelayers	Core
47-2152	Plumbers, Pipefitters, and Steamfitters	Core
47-2181	Roofers	Core
47-2211	Sheet Metal Workers	Core
47-2221	Structural Iron and Steel Workers	Core
47-3012	Helpers--Carpenters	Core
47-3013	Helpers--Electricians	Core
47-3019	Helpers, Construction Trades, All Other	Core
47-4011	Construction and Building Inspectors	Core
47-4098	Miscellaneous Construction and Related Workers	Core
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	Core
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Core
53-7021	Crane and Tower Operators	Core
53-7041	Hoist and Winch Operators	Core
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	Tangential

SOC	Occupation Description	Role in Clean Energy Economy
Sector: Clean Energy Generation and Distribution		
17-2161	Nuclear Engineers	Core
19-4051	Nuclear Technicians	Core
47-2231	Solar Photovoltaic Installers	Core
49-9051	Electrical Power-Line Installers and Repairers	Core
49-9081	Wind Turbine Service Technicians	Core
51-8011	Nuclear Power Reactor Operators	Core
51-8012	Power Distributors and Dispatchers	Core
51-8013	Power Plant Operators	Core
Sector: Industry		
11-3051	Industrial Production Managers	Core
47-2011	Boilermakers	Core
49-9041	Industrial Machinery Mechanics	Core
51-1011	First-Line Supervisors of Production and Operating Workers	Core
51-2021	Coil Winders, Tapers, and Finishers	Core
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	Core
51-2031	Engine and Other Machine Assemblers	Core
51-2041	Structural Metal Fabricators and Fitters	Core
51-2098	Miscellaneous Assemblers and Fabricators	Core
51-4041	Machinists	Core
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	Core
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	Core
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	Core

SOC	Occupation Description	Role in Clean Energy Economy
17-2011	Aerospace Engineers	Core
53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	Tangential
53-3051	Bus Drivers, School	Tangential
53-3052	Bus Drivers, Transit and Intercity	Tangential
53-3053	Shuttle Drivers and Chauffeurs	Tangential
53-3054	Taxi Drivers	Tangential
53-3031	Driver/Sales Workers	Tangential
53-3032	Truck Drivers, Heavy and Tractor-Trailer	Tangential
53-3033	Truck Drivers, Light or Delivery Services	Tangential
53-3099	Motor Vehicle Operators, All Other	Tangential
Sector: Waste Disposal		
53-7081	Refuse and Recyclable Material Collectors	Core
Sector: Agriculture/Food/Forestry		
11-9013	Farmers, Ranchers, and Other Agricultural Managers	Tangential
17-2021	Agricultural Engineers	Core
19-1012	Food Scientists and Technologists	Core
19-4012	Agricultural Technicians	Core
19-4013	Food Science Technicians	Core
45-2011	Agricultural Inspectors	Tangential

SOC	Occupation Description	Role in Clean Energy Economy
Sector: Multisector		
11-3071	Transportation, Storage, and Distribution Managers	Supportive
11-9121	Natural Sciences Managers	Core
11-9199	Managers, All Other	Tangential
11-1011	Chief Executives	Tangential
11-1021	General and Operations Managers	Tangential
13-1028	Buyers and Purchasing Agents	Tangential
13-1041	Compliance Officers	Supportive
13-1081	Logisticians	Supportive
13-1151	Training and Development Specialists	Supportive
13-1199	Business Operations Specialists, All Other	Tangential
13-2051	Financial and Investment Analysts	Tangential
15-1221	Computer and Information Research Scientists	Core
15-1299	Computer Occupations, All Other	Supportive
17-1011	Architects, Except Landscape and Naval	Supportive
17-2031	Bioengineers and Biomedical Engineers	Core
17-2041	Chemical Engineers	Core
17-2051	Civil Engineers	Core
17-2071	Electrical Engineers	Core
17-2072	Electronics Engineers, Except Computer	Core
17-2081	Environmental Engineers	Core
17-2112	Industrial Engineers	Core
17-2141	Mechanical Engineers	Core
17-2199	Engineers, All Other	Core
17-3022	Civil Engineering Technologists and Technicians	Core
17-3023	Electrical and Electronic Engineering Technologists and Technicians	Core
17-3024	Electro-Mechanical and Mechatronics Technologists and Technicians	Core
17-3025	Environmental Engineering Technologists and Technicians	Core
17-3026	Industrial Engineering Technologists and Technicians	Core
17-3027	Mechanical Engineering Technologists and Technicians	Core
17-3029	Engineering Technologists and Technicians, Except Drafters, All Other	Core

19-1021	Biochemists and Biophysicists	Core
19-2021	Atmospheric and Space Scientists	Core
19-2031	Chemists	Core
19-2032	Materials Scientists	Core
19-2041	Environmental Scientists and Specialists, Including Health	Core
19-3011	Economists	Tangential
19-3051	Urban and Regional Planners	Supportive
19-3094	Political Scientists	Tangential
19-3099	Social Scientists and Related Workers, All Other	Tangential
19-4031	Chemical Technicians	Core
19-4099	Life, Physical, and Social Science Technicians, All Other	Core
27-1021	Commercial and Industrial Designers	Core
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	Tangential
41-9031	Sales Engineers	Tangential
43-5061	Production, Planning, and Expediting Clerks	Tangential
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	Core
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	Core
49-9043	Maintenance Workers, Machinery	Core
49-9044	Millwrights	Core
49-9071	Maintenance and Repair Workers, General	Core
49-9098	Helpers--Installation, Maintenance, and Repair Workers	Core
49-9099	Installation, Maintenance, and Repair Workers, All Other	Core
51-4121	Welders, Cutters, Solderers, and Brazers	Core
51-8021	Stationary Engineers and Boiler Operators	Core
51-8099	Plant and System Operators, All Other	Core
51-9011	Chemical Equipment Operators and Tenders	Core

Appendix B: Organizations & Individuals Interviewed

Employers

- ACES Energy (Alternative Carbon Energy Systems, Inc.)
- AES Clean Energy
- Building Performance Contractors' Association (BCPA)
- EDF Renewables
- Geotherm Inc.
- GreenSpark Solar
- Halco Energy
- Hughesco of Rochester & Buffalo Energy
- Monroe County Department of Environmental Services/Eco Park
- RTS (Regional Transit Service)
- Renewable Rochester
- RG&E (Rochester Gas & Electric)
- Wise Home Energy

Education Entities

- Building Performance Contractors Association
- Building Performance Institute
- Edison Tech (Edison Career and Technology High School)
 - Career & Technical Education
 - Information Technology
- Genesee Community College
- ITEC (Isaac Technical Education Center)
- Monroe 2 BOCES, Center for Workforce Development
- Monroe Community College
- REOC (Rochester Educational Opportunities Center) – SUNY Brockport
- RIT Golisano Institute for Sustainability

Job Seekers

- Ibero American Action League Latino workers Focus Group
- RAWNY (Reentry Association of Western NY) Black re-entry workers Focus Group

Just Transition Workers

- Gas Station Owners
 - Mohammed Khan
 - Hollywood Service Center
- Automotive mechanics/technicians
 - Anonymous mechanic interview (unwilling to have name on record)
 - Hollywood Service Center
- ITEC Gas Heating trainee workers
- Monroe County Department of Environmental Services Fleet Mechanics
- Rochester Automobile Dealers Association
- UA Local 13 Plumbers & Pipefitters Focus Group

Labor Unions

- CBTU (Coalition of Black Trade Unionists)
- IBEW (International Brotherhood of Electrical Workers) 86
- LiUNA Local 435
- Rochester-Genesee Valley Area Labor Federation
- UA Local 13, Plumbers and Pipefitters

Service Providers

- Goodwill of the Finger Lakes
- Ibero American Action League
- RAWNY – Re-entry Association of Western NY, Inc./Opportunity ROCs
- Rochester Area Community Foundation – Rochester ENergy Efficiency and Weatherization (RENEW)
- TogetherNow
- Urban League of Rochester
- Veteran’s Outreach Center

Workforce Developers

- Action for a Better Community
- City of Rochester, Workforce Development Initiatives Ibero American Action League
- Finger Lakes Works
- Livingston County
- Monroe County, Planning & Development/COMIDA
- MAPP (Multi-craft Apprenticeship Preparation Program)

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- RTMA (Rochester Technology & Manufacturing Association)
 - RochesterWorks!
 - Workforce Development Institute
 - YAMTEP (Young Adult Manufacturing Training Employment Program)