

ELECTRIFYING NEW YORK: ECONOMIC POTENTIAL OF GROWING ELECTRIC TRANSPORTATION

COMPANIES, JOBS, GROWTH RATES, AND
OPPORTUNITIES AS ELECTRIFICATION ACCELERATES

Prepared by BW Research Partnership

April 2021

*Electric vehicles are powering New York's economic engine. **That's** the power of now.*

**The Power
of Now** 



ACKNOWLEDGMENTS

This report was prepared for Advanced Energy Economy by BW Research Partnership. BW Research is a full-service consulting and research firm specializing in workforce and economic development for public entities, including workforce investment boards, economic development agencies, cities, counties, and educational institutions.

BW Research has substantial experience developing customized research projects and a deep understanding of the clean energy sector and its employers, workforce, and supply chain dynamics. BW Research has designed and conducted more than 500 studies for public, private, and not-for-profit organizations globally, and our projects have directly impacted federal, state, and local initiatives. Our research, employer engagement, ideation services, and facilitation have produced tangible results across the world.

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About Advanced Energy Economy

Advanced Energy Economy (AEE) is a national association of businesses that are making the energy we use secure, clean, and affordable. AEE is the only industry association in the U.S. that represents the full range of advanced energy technologies and services, both grid-scale and distributed. Advanced energy includes energy efficiency, demand response, energy storage, wind, solar, hydro, nuclear, electric vehicles, and more. AEE's mission is to transform public policy to enable rapid growth of advanced energy businesses. Engaged at the federal level and in more than a dozen states around the country, AEE represents more than 100 companies in the \$240 billion U.S. advanced energy industry, which employs 3.6 million U.S. workers. Learn more at www.aee.net and follow the latest industry news @AEEet.



EXECUTIVE SUMMARY

Advanced Energy Economy engaged BW Research Partnership to examine the economic and job potential for development of the Electric Transportation (ET) industry in New York state, focusing on opportunities for businesses and workers to become involved in the automotive supply chain as the industry goes electric. New York's ET economy has two notable elements—a substantial electric component manufacturing sector and numerous corporate headquarters in New York City. This diversity in ET activity means there are already a wide range of workers involved in the ET economy in New York state, and by enacting policies that support broader ET growth, new jobs will be created for a variety of workers across the state.

This study begins with an overview of the current ET supply chain, including the current number of jobs and businesses involved in ET, historical growth rates, and projections of near-term growth. The research then discusses “Adjacent Industries and Occupations,” which are firms and workers that are generally not currently involved with ET goods or services but have characteristics similar to those that are. Examining Adjacent Industries is useful for identifying existing companies and workers that could transition from one industry to another with relative ease. This analysis is also useful in highlighting some industries that may benefit from increased demand for their products driven by the rise in ET.

For the purposes of this research, the ET supply chain includes any firm involved in the manufacturing, wholesale distribution, retail sale, installation, research and development, and maintenance of ET vehicles and equipment (including automobiles, light and heavy-duty trucks, buses, industrial equipment, agricultural equipment, rail, recreational vehicles, and other ET) component parts (including battery, motor controller, electric engine, regenerative braking, and drive system components), and the infrastructure necessary for ET (including charging stations and associated storage and component parts).

BW Research developed a database of 16,300 New York businesses potentially involved in the ET supply chain. BW Research then closely examined 4,600 companies within the database to determine if they were involved in ET-related activity.



Manufacturing operations were prioritized, as manufacturing is often much more labor-intensive per measure of output, possesses greater overall economic impact than most other sectors, and has the greatest potential to create net new jobs by giving existing manufacturers of inputs and components an opportunity to expand their product lines.

Key Findings

In 2019 there were an estimated 882 businesses with 4,200 workers involved in ET-related activity statewide. By 2024, there are projected to be 5,500 workers involved in ET activities, representing a 32% increase over five years.

ET-related jobs can be found in 61 of the 62 counties in New York state. While ET employment is relatively concentrated among five counties, more than 2,200 ET workers can be found across the remaining 56 counties.

The Gross State Product (GSP) contribution of ET activity in New York state is estimated to be \$487 million. This is about equivalent to the GSP contributions of Rail Transportation, Motion Picture Theatres, and Hardware Stores across the state.

ET-related jobs in New York state are diverse and can be found across the value chain. Professional and Business Services represents the largest section of the value chain, with 25% of all ET-related workers.

Annual EV sales and market share have increased substantially across the state, but EV adoption remains lower than many other states. Although statewide EV sales more than doubled between 2016 and 2018, EV market share in New York state is 16th nationally. EV adoption must increase if the state hopes to meet its goal of having 850,000 zero-emission vehicles (ZEVs) deployed by 2025.

In order to spur the EV market and fully capitalize on ET employment opportunities, New York must take regulatory and legislative action now. This includes enacting policies that increase EV adoption, such as creating more financial incentives for consumers to purchase EVs, establishing a tax credit for ET supply chain companies that relocate to New York, establishing financial incentives



for electric school buses, reforming electric rates to support EVs and increasing the number of relevant workforce training programs.

ET growth offers opportunities across the value chain in New York. One-fourth of ET-related jobs, accounting for a little over 1,000 jobs across the state, are in Professional and Business Services. Repair & Maintenance, Manufacturing, while Wholesale Trade, Distribution, & Transportation accounted for more than 15% each of the ET-related workforce. Another 48,000 workers are in Immediate Adjacent and Secondary Adjacent Manufacturing Industries and have skill sets that would allow them and the companies they work for to transition to ET-related work with relatively little training or upskilling required. ET-related jobs could offer a lifeline in particular to workers in Secondary Adjacent Manufacturing Industries, which shed over 1,000 jobs across the state between 2014 and 2019.

Workers in Adjacent and Support Industries are generally representative of the overall New York state workforce. However, women are severely underrepresented among Adjacent Industries.

New York state is a national leader in climate change mitigation policies, but more must be done to address the transportation sector. With the passage of the Climate Leadership and Community Protection Act (CLCPA) in 2019, New York set ambitious emissions reduction targets. Given that transportation is the largest source of greenhouse gas emissions in the state, electrifying the state's transportation sector is critical to meeting the goals outlined in the CLCPA.



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INTRODUCTION

Advanced Energy Economy commissioned BW Research Partnership to examine the characteristics of the Electric Transportation (ET) supply chain in New York. The research in this report quantifies existing companies involved in ET and the workforce that support them. This report also includes a forward-looking section focused on adjacent industries that could benefit from increased ET activity in the state. For the purposes of this study, the ET sector is defined as any firms involved in the manufacturing, wholesale distribution, retail sale, installation, research and development, maintenance and repair of electric vehicles (EVs) and equipment (including automobiles, light and heavy-duty trucks, buses, industrial equipment, agricultural equipment, rail, recreational vehicles, and other ET), component parts (including battery, motor controller, electric engine, regenerative braking, and drive system components), and the infrastructure necessary for ET (including charging stations and associated storage and their component parts).

To develop the data for this report, BW Research developed a comprehensive database of 16,300 firms potentially involved in ET work. BW Research closely examined 4,600 companies within this dataset, prioritizing manufacturing operations. BW Research confirmed 142 firms with 177 unique locations with current involvement in the ET sector in New York. Based on this sample, BW Research estimates that there are 882 businesses involved in some form of ET-related activity across New York.

The ET sector in New York is multifaceted and can be found across a range of industries. The broad nature of the ET sector emphasizes the importance of

Sample of ET Companies in New York

- A. All Circuit Electric
- B. Analog Devices, Inc.
- C. BAE Systems
- D. Beta Transformer Technology Corporation
- E. Dana
- F. Emco Electric
- G. Leviton
- H. World Class Cycles LLC
- I. Oshkosh
- J. RATP DEV America
- K. Rochester Industrial Controls, Inc.
- L. Standard Motor Products, Inc.
- M. TTI, Inc.
- N. Veeco

understanding the current scale, workforce, and opportunities for continued growth and development. To capture some of this potential for growth, this report identifies the industries, companies, and workers that could readily transition to and benefit from an expanding ET market. Throughout this report, these areas of opportunity are referred to as “Adjacent” Industries and Occupations. Adjacent Industries provide similar goods or services and have workers who, along with Adjacent Occupations, often have overlapping knowledge, skills, and abilities to those currently involved in ET.

As the New York ET sector continues to expand, much of the growth is expected to primarily transition, rather than expand, the demand for transportation workers, goods, and services. For example, among service centers, dealerships, and some parts wholesalers and distributors, non-ET employment is expected to transition to ET-related employment rather than generate new and additional roles. However, a substantial opportunity for new jobs and business creation exists among the design and manufacturing of ET products. New York state has a robust electrical and other component part manufacturing sector. Many of these products are needed in higher rates in EVs than their combustion counterparts. This means that increased ET activity would likely drive an increase in demand for these products.

There are three types of Adjacent Industries identified in this report:

Immediate Adjacent Manufacturing Industries include companies that are very similar to those identified as ET companies. They are so similar that they share a federal industry classification code (six-digit NAICS). Transition to ET-related work would be most rapid for companies in Immediate Adjacent Manufacturing Industries. Examples of Immediate Adjacent Manufacturing include General Automobile Manufacturing¹, Motor and Generator Manufacturing, and Other Electronic Component Manufacturing.

Secondary Adjacent Manufacturing Industries include companies that are similar to existing ET companies, but less so than Immediate Adjacent Manufacturing Industries. These companies engage in the same general family of activities, but their transition to ET work would take more investment and time than for the Immediate Adjacent Manufacturing

¹ Throughout this report, industries and occupations that are capitalized refer to specific titles in the North American Industry Classification System (NAICS) and Standard Occupational Classification (SOC), respectively. For definitions of these industries and occupations, please see the Glossary in Appendix D.



Industries. Examples of Secondary Adjacent Manufacturing Industries include Relay and Industrial Control Manufacturing; Semiconductor and Related Device Manufacturing; and Power, Distribution, and Specialty Transformer Manufacturing.

Support Industries include companies that are upstream suppliers to companies in Adjacent Industries.² These include manufacturers as well as distributors and wholesalers. Growth in the ET market might require changes in operations, but as these firms tend to focus on raw materials and upstream components, those changes are likely to be minimal. These Support Industries are expected to strongly benefit from the growth of the New York ET supply chain. Examples include Plate Work Manufacturing, Iron and Steel Mills and Ferroalloy Manufacturing, and Machine Shops.

² Support industries do provide some raw materials to existing ET firms, but the small size of the current market has minimal relative impact.



ELECTRIC TRANSPORTATION AND NEW YORK

New York has long recognized the benefits that EVs can provide to New Yorkers and society at large. The state has pursued a series of initiatives to encourage substantial deployment of EVs, including the state's commitment to put more than 850,000 zero-emission vehicles (ZEVs) on the road by 2025 and the approval by the Public Service Commission of the "Make Ready" initiative in July 2020, which will provide up to \$701 million in support for the rollout of electric vehicle charging infrastructure. The state will also apply \$48.8 million from the Volkswagen diesel emissions settlement towards electrified school busses and public transportation³ and \$11 million towards building out the state's network of fast charging stations. The state also has among the most ambitious climate change mitigation policies of any state in the U.S. The Climate Leadership and Community Protection Act (CLCPA) commits New York to a 40-percent economy-wide reduction in GHG emissions from 1990 levels by 2030 and an 85% reduction by 2050. Given that transportation is the largest emissions sector in New York State, accounting for nearly one-third of the state's greenhouse gas (GHG) emissions, transportation electrification is critical to achieving these ambitious goals.

There are also a handful of incentives offered by the state. The Heavy-Duty Alternative Fuel and Advanced Vehicle Purchase Vouchers program offers up to 80% of incremental cost, up to \$150,000 per vehicle for Class 3 Electric Trucks and Class 3-8 Electric Buses. The Alternative Fueling Infrastructure Tax Credit offers an income tax credit worth up to 50% of the cost of electric vehicle infrastructure, up to \$5,000. Other statewide incentives include High Occupancy Vehicle lane exemptions and rebates for Plug-in Electric Vehicles.⁴ These policies will help support EV adoption and develop a more robust ET economy throughout the state, but more is still needed.

³ <https://www.governor.ny.gov/news/governor-cuomo-announces-nation-leading-initiatives-expand-electric-vehicle-use-combat-climate>

⁴ Alternative Fuels Data Center. Energy Efficiency & Renewable Energy | U.S. Department of Energy. <https://afdc.energy.gov/fuels/laws/ELEC?state=ny>



Against this backdrop, EV sales are rising in the Empire State, but arguably not fast enough to meet the goals set by the state. Fewer than 15,000 battery-electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs) were sold in New York in 2019,⁵ a rate that is unlikely to meet the goal of 850,000 ZEVs on the road by 2025. Charging infrastructure deployment is also behind where it needs to be to meet the indicated targets, although the Make-Ready program should help close the gap.

New York's nation-leading climate mitigation policies could be improved to reap significantly more economic benefit from the activities they spur. Enacting policies that reinforce New York's ability to manufacture and distribute component parts for EVs offer the greatest potential to create new jobs for New York residents by ensuring a greater share of the economic activity generated from its EV deployment goals accrue to the state's economy and residents. As the findings in this report demonstrate, the existing New York workforce is already trained and well-positioned to increase manufacturing of component parts for EVs. Policies that incentivize New York firms to manufacture a greater share of EV components would provide the double benefit of helping the state meet its climate goals while also generating new, stable, well-paying jobs for New York residents.

⁵ Data from: Alliance of Automobile Manufacturers (2019). Advanced Technology Vehicle Sales Dashboard. Data compiled by the Alliance of Automobile Manufacturers using information provided by HIS Markit (2011-0218) and Hedges & Co. (2019). Data last updated 2/3/2021. Data retrieved March 23, 2021 from <https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/>



POLICY RECOMMENDATIONS

In order to spur the EV market and fully capitalize on ET employment opportunities, New York must take regulatory and legislative action now. EVs are still an emerging technology and continue to face some barriers to adoption, such as higher upfront cost, a lack of public charging infrastructure, equity issues, and a general lack of consumer awareness.

Supportive policies can address these barriers head-on and provide the sector the support it needs for New York to fully realize the range of benefits that these vehicles provide. In addition to the employment and economic development opportunities provided by the ET supply chain, EVs can provide cost savings for all electric ratepayers, regardless of whether they own an EV. They also provide operational and maintenance cost savings for their owners and increased energy security as they shift transportation energy use from petroleum fuels to clean electricity generation, most of which will come from in-state resources.

These benefits create a clear need for thoughtful policy that cuts across multiple areas of concern, including electric utility regulation, transportation policy, and workforce development. To that end, New York should consider the following policies to support its burgeoning ET supply chain:

Increase the adoption of EVs in the state to meet the goal of 850,000 zero-emission vehicles by 2025 and beyond. New York must substantially increase the number of ZEVs currently on the road if the state hopes to meet its 850,000 ZEVs by 2025 deployment goal. As of February 2021, there were just over 65,000 EVs on the road in New York. Increasing the number of ZEVs on the road will not just help New York meet its existing goals for ZEV deployment and emissions reduction. Electrifying the state's transportation sector can also be a critical economic development driver for the Empire State—putting people back to work to overcome the COVID-19 pandemic and offering a lifeline to companies that have seen job declines over the past decade. The state should also look to pursue a requirement, beyond the ZEV deployment goal, that 100% of in-state sales of new passenger cars and trucks be zero-emissions by 2035, 100% of medium-duty and heavy-duty vehicles by 2045, and 100% of off-road vehicles and equipment by 2035. To enable it to meet these goals, the state must enact policies that encourage adoption, such as increasing consumer choice by opening up the state to direct sales and addressing upfront cost barriers by providing consumers with more financial incentives.



Establish a tax credit for EV supply chain companies that relocate to New York or that locate in disproportionately impacted areas or designated Regional Economic Development Council (REDC) areas. New York can further encourage EV manufacturing by creating a friendlier business environment for supply chain companies that are already growing quickly to meet global EV demand. Often the EV supply chain includes diversified manufacturing companies that serve more than one sector, so creating tax incentives that can be scaled based on location would be a critical tool for attracting significant new private investment to the state.

Expand the availability of the Electric Vehicle Infrastructure Training Program (EVITP) curricula across New York, with an emphasis on broad geographic reach. The EVITP is an important training tool that helps expedite the development of skills needed to work on construction and maintenance related to EV charging infrastructure. There are a few examples already in place in New York, but by partnering with junior colleges, trade schools, and labor organizations such as the International Brotherhood of Electrical Workers (IBEW), the state can create a steady pipeline to develop its EV workforce.

Increase the State's Fleet of Electric School Buses by Providing Incentives. Presently, financial barriers impede the adoption of electric school buses in New York State. By offering financial incentives to schools for the purchase of electric school buses and the associated charging equipment, the state could capitalize on the many benefits of electric school buses, including improved air quality within communities across the state and cost savings for school districts. Incentives should be based on the level of financial aid that a school district received in the previous fiscal year, with higher incentives going to higher-needs school districts.

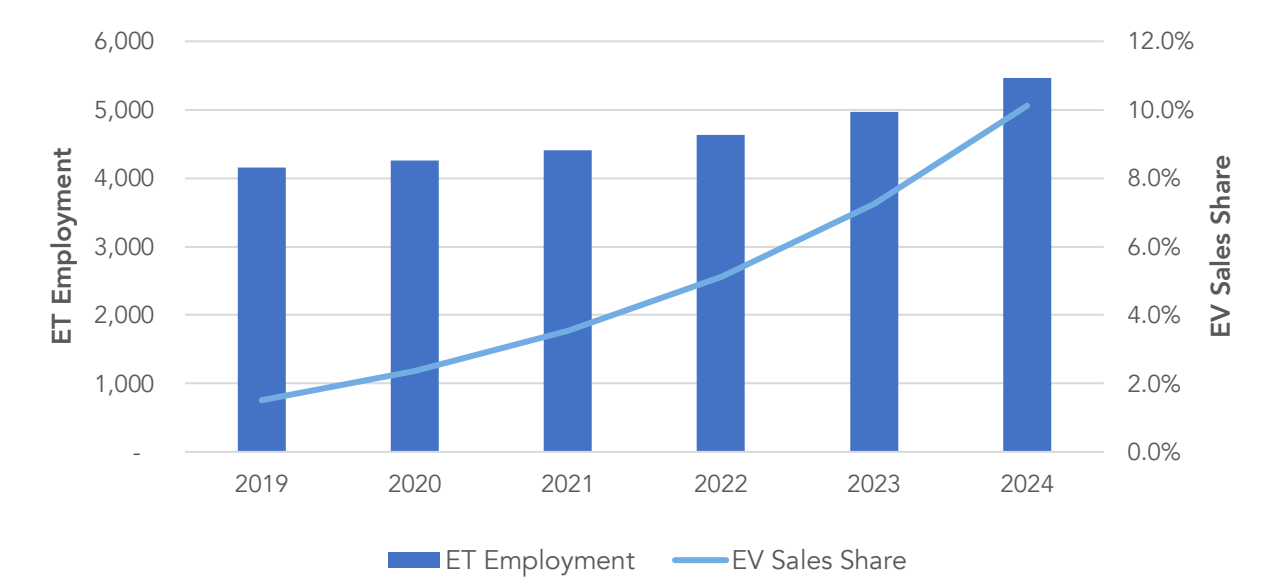
Reform Electric Rates to Support Electric Vehicles. EVs must be able to charge at rates that are competitive with gasoline and diesel prices. This will allow the penetration of EVs to grow as envisioned under New York's ZEV deployment goal. Addressing operational cost barriers through rate design for commercial EV charging is an essential step forward. Without rate reform, New York will struggle to meet its ZEV deployment goal. Existing tariff structures are presently the most significant operating cost barrier to faster-charging infrastructure deployment for both the light-duty and medium- and heavy-duty sectors, including buses and trucks, which have tangible air quality benefits in New York's higher-needs communities.



THE NEW YORK ELECTRIC TRANSPORTATION WORKFORCE

ET-related employment in New York is projected to grow 32% between 2019 and 2024,⁶ representing an additional 1,300 jobs. During this time, EV sales in New York state are projected to see a four-fold increase (Figure 1).⁷ While the projected four-fold increase in the share of EV sales is substantial, this increase would still not be sufficient to meet the state’s 2025 ZEV targets. If New York is able to accelerate EV adoption beyond these projections, the state will witness even greater growth and new job creation among its ET-related workforce.

Figure 1: Projected ET Employment and Share of Electric Vehicles (EVs) Sales^{8 9}



⁶ This definition is based on a worker spending any time on electric transportation goods or services.

⁷ Projected share of EV sales is from Benefit-Cost Analysis of Electric Vehicle Deployment in New York State, NYSERDA February 2019

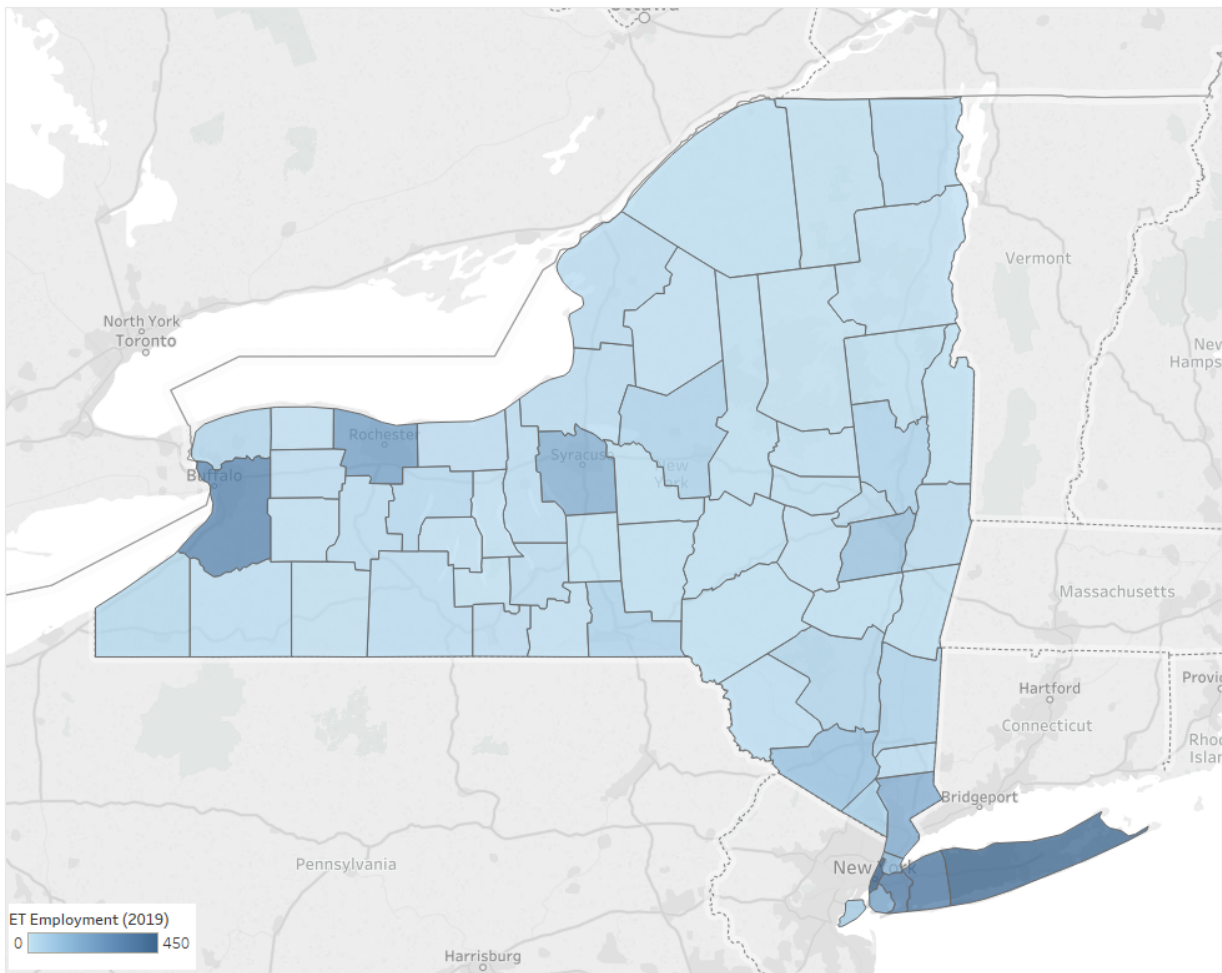
⁸ This definition includes Battery-Electric Vehicles (BEVs) and Plug-in-Hybrid Electric Vehicles (PHEVs).

⁹ Projected share of EV sales is from Benefit-Cost Analysis of Electric Vehicle Deployment in New York State, NYSERDA February 2019



ET-related jobs can be found in all but one of the 62 counties in New York state. New York, Suffolk, Nassau, Queens, and Erie Counties have the greatest number of ET-related workers – about 2,000 in total. More than 2,200 ET-related workers can be found in the other 56 counties across New York with ET-related employment (Figure 2).

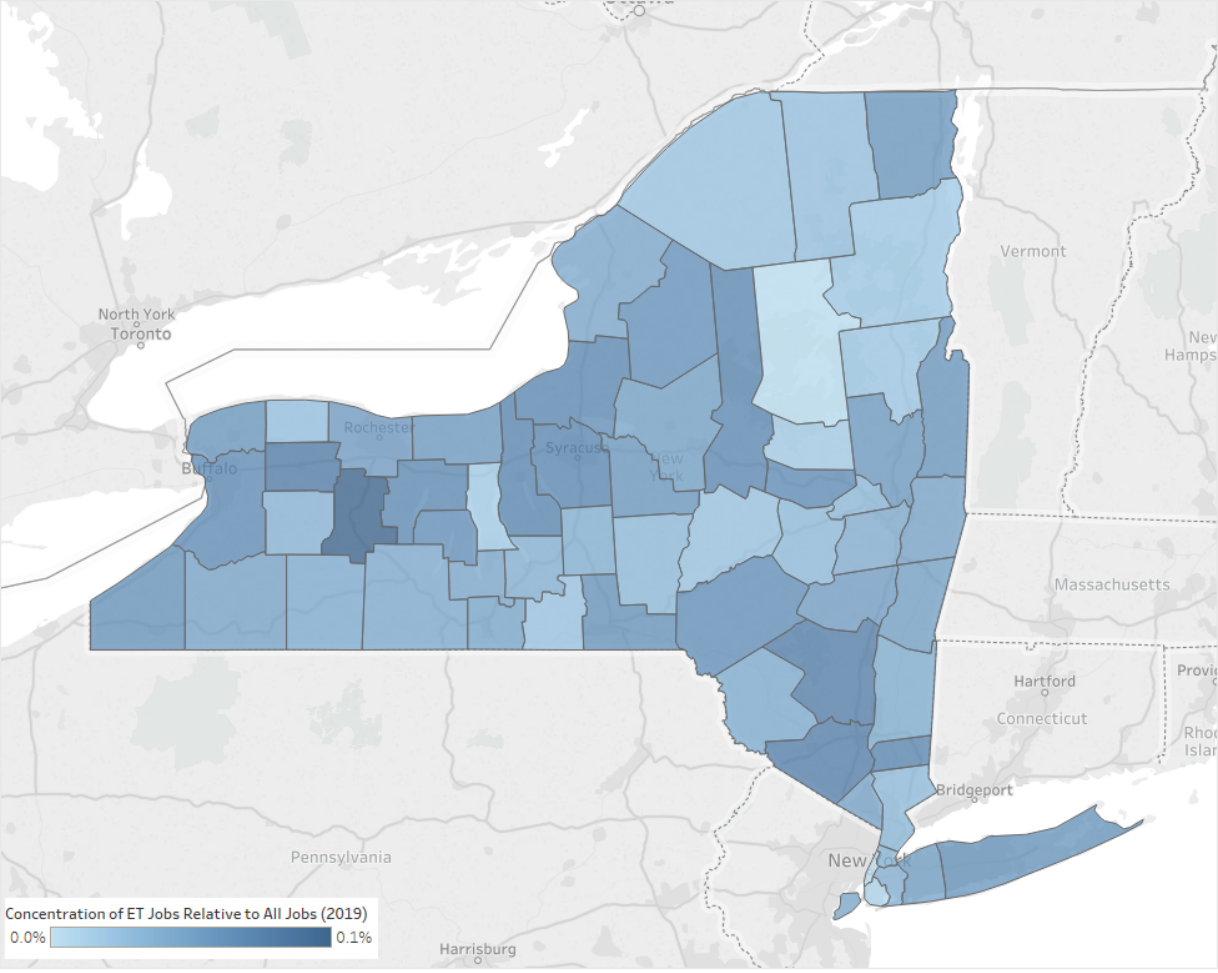
Figure 2: ET-Related Employment, 2019



High proportions of ET-related jobs can be found in many counties across New York. Livingston, Genesee, Orange, and Ulster Counties have the greatest proportion of ET-workers relative to the number of overall workers in the county, with roughly 0.08% of workers in each of these counties involved in ET (Figure 3).



Figure 3. Share of ET-Related Employment Relative to All Jobs



ET-related activity in New York state is estimated to have generated \$487 million in Gross State Product (GSP) in 2019. This amount is roughly equivalent to the GSP contribution of Pension Funds, Motion Picture Theaters, and Hardware Stores.



ET activity in New York is spread across the value chain. Workers involved in Professional and Business Services accounted for the greatest share of ET-related jobs at 25%. Repair & Maintenance, Manufacturing, and Wholesale Trade, Distribution, & Transportation also accounted for more than 15% each of the ET-related workforce (Table 1).

Table 1: ET-Related Employment by Value Chain

	Employment	Share of Employment
Professional and Business Services	1,041	25%
Repair & Maintenance	771	18%
Manufacturing	678	16%
Wholesale Trade, Distribution, & Transport	652	16%
Installation	638	15%
Retail Trade	409	10%

Team Assemblers, Electricians, and Autobody and Related Repairers are among the most common key ET-related occupations. Five of the eight occupations highlighted in Table 2 are greater than the state median hourly wage for all occupations in New York State, \$22.44.¹⁰

¹⁰ Occupational Employment Statistics. U.S. Bureau of Labor Statistics. May 2019 State Occupational Employment and Wage Estimates New York.



Table 2: Key ET Occupations

Key Occupations ¹¹	2019 ET Jobs	Projected 2024 ET Jobs ¹²	Median Hourly Wage
Team Assemblers	347	443	\$24.52
Electricians	145	190	\$38.22
Automotive Body and Related Repairers	123	160	\$25.00
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	115	149	\$32.55
Light Truck Drivers	104	136	\$15.14
Laborers and Freight, Stock, and Material Movers, Hand	76	99	\$18.27
Parts Salespersons	68	88	\$21.59
Assemblers and Fabricators, All Other	45	58	\$22.93

It is important to note that ET-related growth creates net new jobs in some segments of the economy while minimally impacting others. Manufacturing makes up a substantial part of the ET-related workforce in New York state and is most likely to generate additional employment through increased demand for products. New York state is well positioned for the rise in ET because of the state’s relatively high concentration in the manufacturing of input goods, such as semiconductors, capacitors, resistors, and printed circuits. These inputs are needed in higher rates in electric vehicles than in combustion vehicles, meaning that jobs in these industries will likely benefit from increased demand for these products. Among occupations in sales, service, and other downstream jobs, new ET activity is more likely to replace work currently focused on non-ET activities rather than creating new jobs. This results in fewer net new jobs created in downstream roles than in manufacturing.

¹¹ Key occupations were identified based on total current employment within ET.

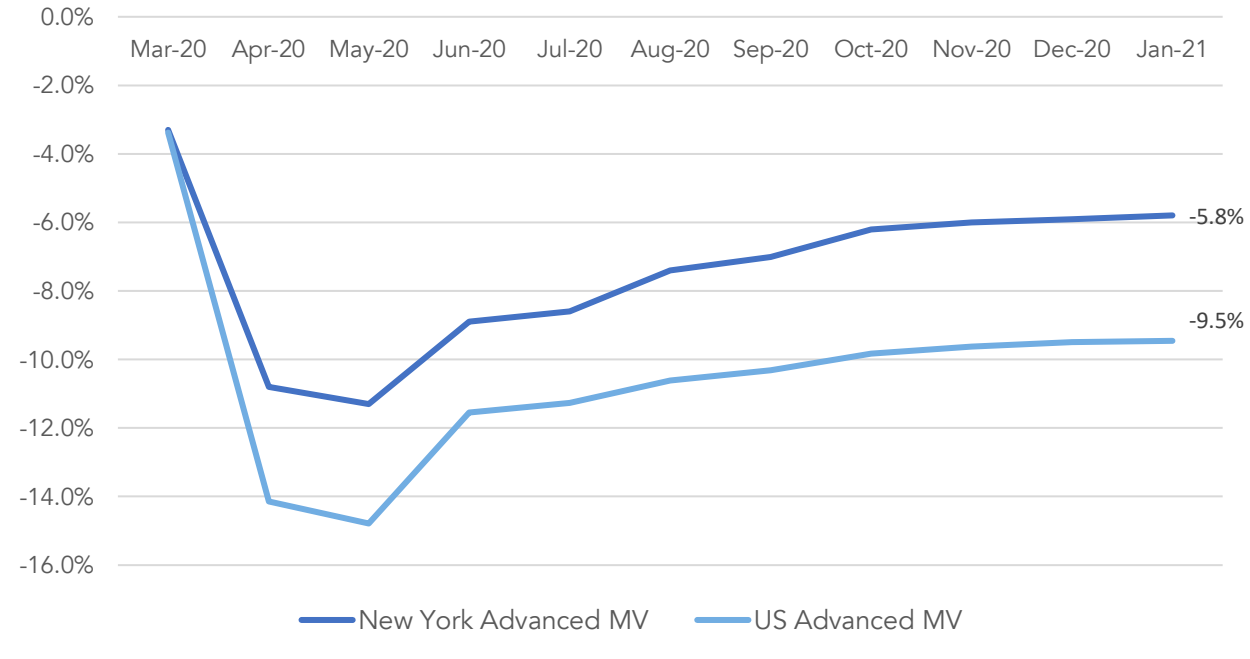
¹² Projected jobs are extrapolated from BLS OES occupational projections through 2024 and ET industry projections developed using data from the 2019 United States Energy and Employment Report, BLS QCEW, and EVAdoption.



IMPACTS OF COVID-19

New York Advanced Vehicle employment declined 6% between the start of the COVID-19 pandemic and January 2021. Since the early days of the pandemic, BW Research has been tracking the changes in advanced energy employment across the United States.¹³ The models developed by BW Research suggest that New York employment in advanced motor vehicles,¹⁴ which includes EVs, declined by nearly 6%. The decline in Advanced Vehicle employment in New York was less severe than the nationwide decline of 9.5% (Figure 4).

Figure 4. COVID-19-Related Employment Losses in Advanced Motor Vehicles¹⁵



¹³ https://www.bwresearch.com/covid/docs/BWResearch_CleanEnergyJobsCOVID-19Memo_Dec2020.pdf

¹⁴ This definition includes hybrid electric vehicles, plug-in hybrid vehicles, electric vehicles, natural gas vehicles, hydrogen vehicles, and fuel cell vehicles.

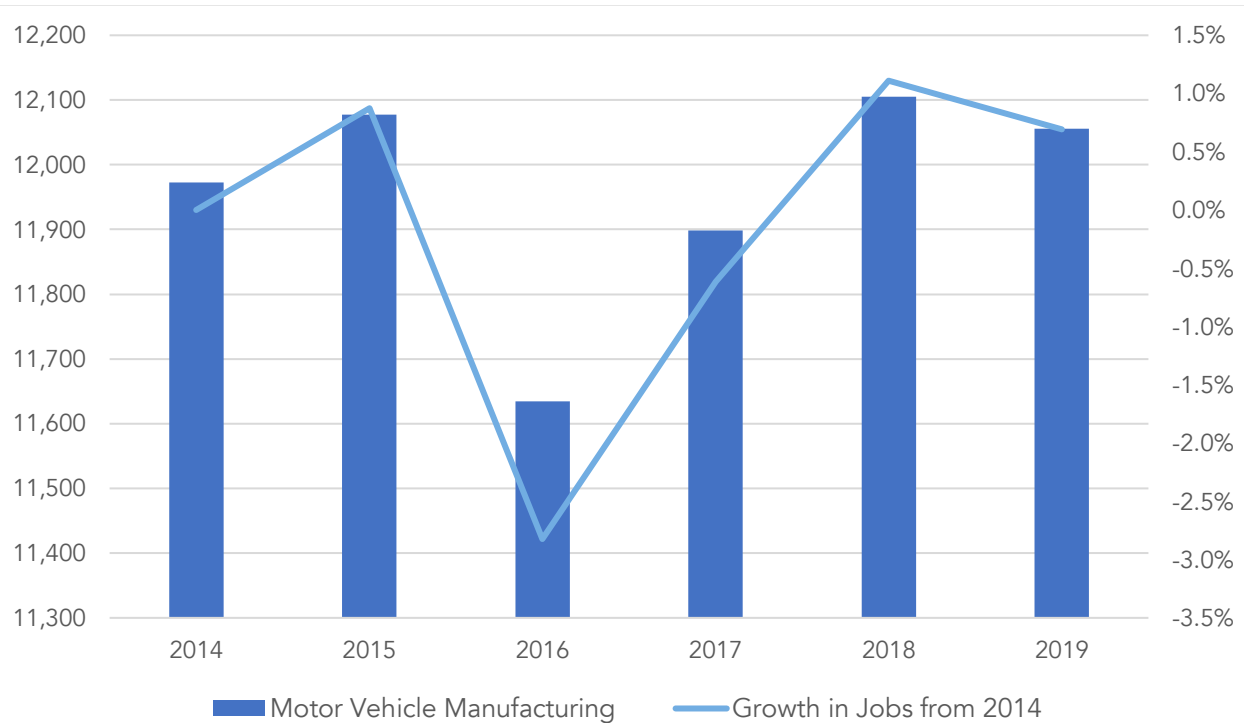
¹⁵ https://www.bwresearch.com/covid/docs/BWResearch_CleanEnergyJobsCOVID-19Memo_Dec2020.pdf



KEY TRENDS IN NEW YORK

Motor Vehicle Manufacturing¹⁶ jobs in New York have experienced modest fluctuation and mild growth over the recent past. Between 2014 and 2019, a net of only 83 Motor Vehicle Manufacturing jobs (0.7%) were added in New York (Figure 5). Other Motor Vehicle Parts Manufacturing and Motor Vehicle Electrical and Electronic Equipment Manufacturing are the largest specific industries, employing 2,600 and 2,100 people, respectively (Figure 6). While the Motor Vehicle Manufacturing workforce in New York is substantial in number, growth has been relatively stagnant in recent years, suggesting that growth in these industries would be well-received and easily met through existing talent pipelines.

Figure 5. Motor Vehicle Manufacturing Employment in New York¹⁷

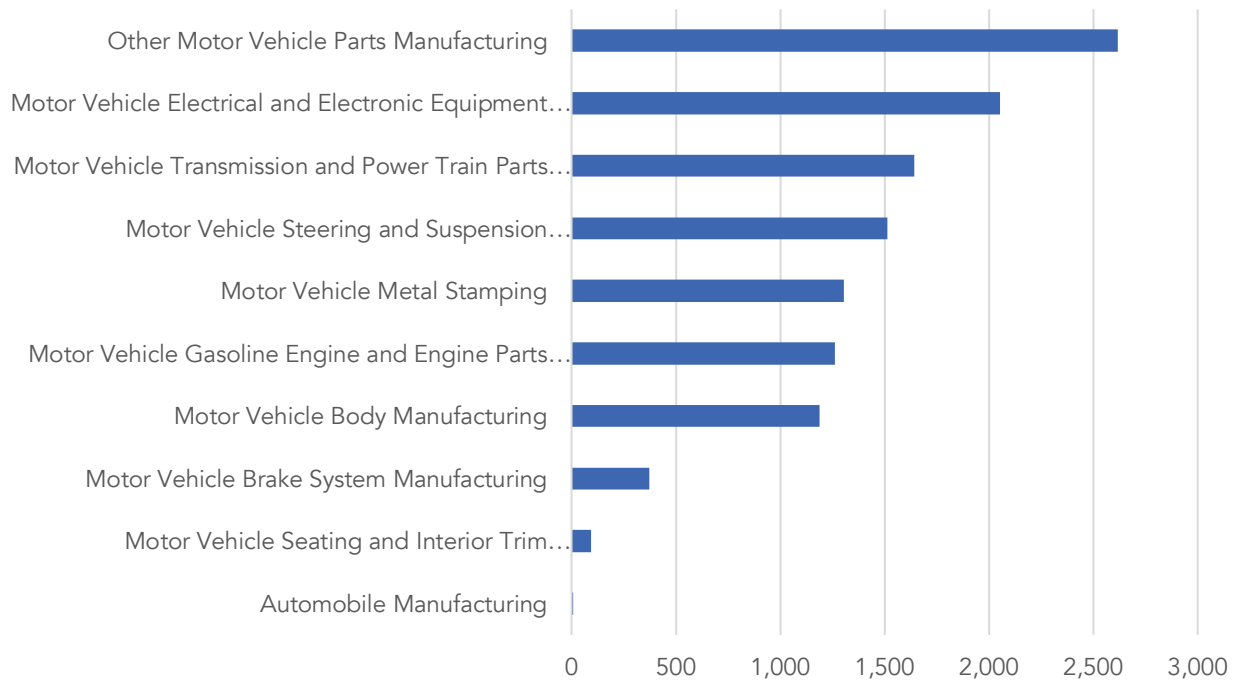


¹⁶ This includes 10 NAICS centered around traditional automobile manufacturing. These NAICS codes are: 336111, 336211, 336310, 336320, 336330, 336340, 336350, 336360, 336370, and 336390.

¹⁷ Ibid.



Figure 6. Motor Vehicle Manufacturing Jobs by Specific Industry, 2019¹⁸



The market share of battery-electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs) in New York has seen strong growth in recent years, but the state lags behind more than a dozen other states. EVs¹⁹ accounted for 1.56% of all cars sold in New York in 2018, making New York 15th among states with the greatest share of EVs sold that year.²⁰ EV sales have increased, more than doubling between 2016 and 2018, but the overall relative rate remains low (Figure 7). Governor Cuomo has set the goal of 850,000 Zero Emissions Vehicles²¹ on

¹⁸ Sub-industry by six-digit NAICS code. JobsEQ

¹⁹ Including Battery-Electric Vehicles (BEVs) and Plug-in-Hybrid Electric Vehicles (PHEVs).

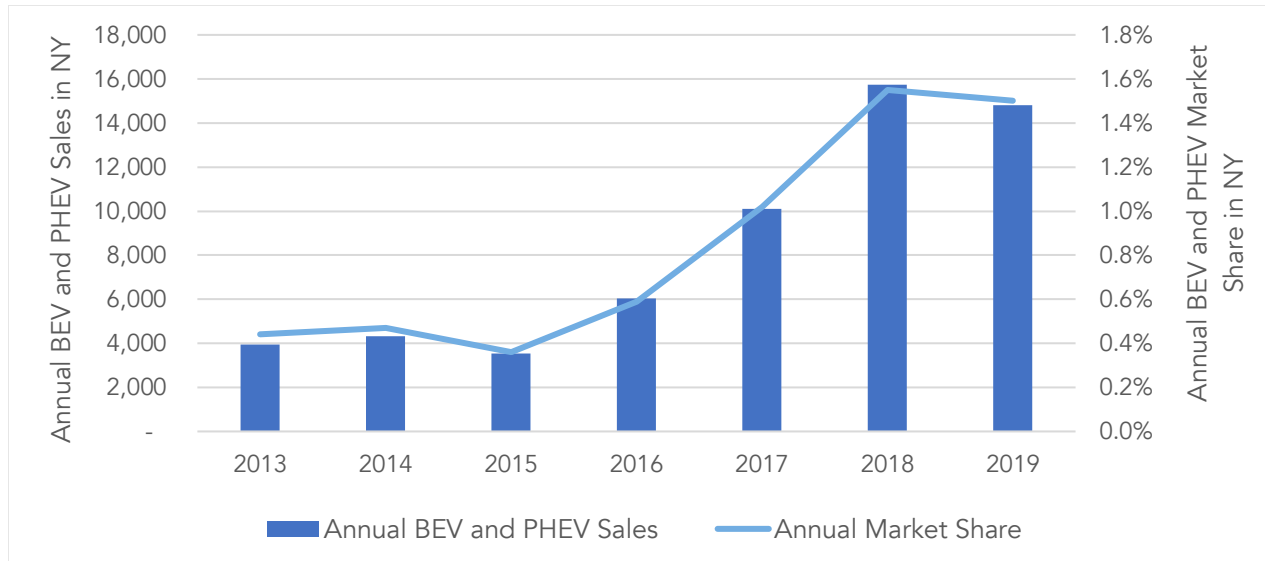
²⁰ <https://evadoption.com/ev-market-share/ev-market-share-state/>

²¹ Zero Emission Vehicles (ZEVs) include BEVs, PHEVs, and Hydrogen Fuel Cell Electric vehicles (FCEVs).



New York roads by 2025.²² To accelerate EV sales, and meet this goal, supportive policies must be put into place.

Figure 7. Annual Sales and Annual Market Share of EVs in New York²³



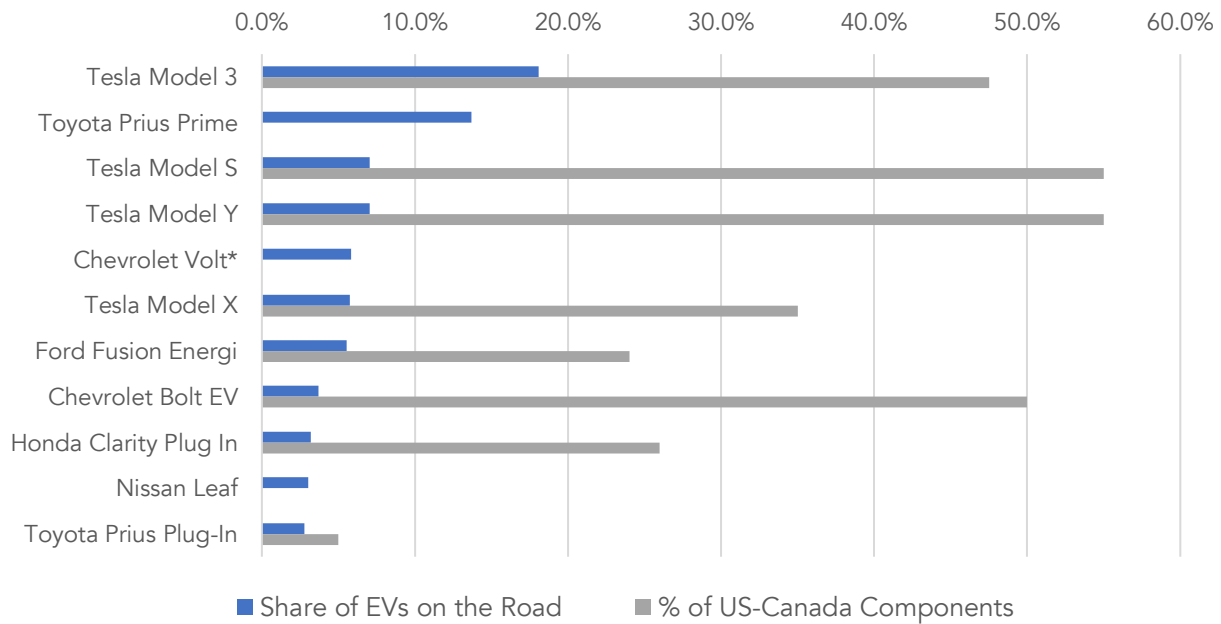
Many of the EVs on the road in New York state have a notable percentage of component parts from the United States or Canada. Tesla vehicles, accounting for three of the five most common EVs in the state, have between 35% to 55% US-Canada component parts (Figure 8).

²² <https://www.governor.ny.gov/news/governor-cuomo-announces-nation-leading-initiatives-expand-electric-vehicle-use-combat-climate>

²³ Includes BEV (Battery electric vehicles, which run exclusively on electric fuel) and PHEV (Plug-in hybrid electric vehicles, which run on either or both gasoline and electric fuel). Data from: Alliance of Automobile Manufacturers (2019). Advanced Technology Vehicle Sales Dashboard. Data compiled by the Alliance of Automobile Manufacturers using information provided by HIS Markit (2011-0218) and Hedges & Co. (2019). Data last updated 2/3/2021. Data retrieved March 23, 2021 from <https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard>



Figure 8. New York EVs²⁴ and Percentage of US-Canada Content²⁵



ADJACENT INDUSTRY ANALYSIS

ET activity can be found across numerous industries in New York. To best understand the scope and scale of some of the greatest opportunities in ET as the sector continues to grow, the research team identified “Adjacent Industries” that have similar workforce competencies, supply chains, and activities to current ET firms. Adjacent Industry and Occupational analyses help identify talent with similar or complementary skillsets that could easily transition to ET work from non-ET industries.

The Adjacent Industries identified in this report currently have little to no involvement in ET activities. Their importance lies in the workers, who have skill sets that would allow them to move into the ET supply chain with relatively little training and transition with relative ease.

²⁴ Data from Atlas Public Policy’s EV Hub. <https://www.atlasevhub.com/materials/state-ev-registration-data/>. Definition includes Battery Electric Vehicles (BEVs) and Plug-in Hybrid Vehicles (PHEVs).

²⁵ Data from American University’s Made in America 2020 Auto Index. U.S. and Canada components reported jointly. <https://www.american.edu/kogod/research/autoindex/2020-auto-index.cfm>

* No component source data for Chevrolet Volt.



Identifying these industries and their workers highlights a potential workforce that could easily support and grow with increased ET demand.

Adjacent Industries include three distinct categories: Immediate Adjacent Manufacturing Industries; Secondary Adjacent Manufacturing Industries; and Support Industries. For more information on these industry categories, see Appendix C.

- **Immediate Adjacent Manufacturing Industries.** This category includes the industries that share a federal industry classification code (six-digit NAICS) with ET manufacturing companies. Transition to ET-related work would be most rapid for companies in this category. Examples include Automobile Manufacturing, Motor and Generator Manufacturing, and Other Electronic Component Manufacturing.
- **Secondary Adjacent Manufacturing Industries.** This category includes industries in the same general industry classifications (four-digit NAICS codes) but differs at the more granular level (six-digit NAICS codes). These industries conduct the same family of activities as ET manufacturing firms, but their transition to ET work would take more investment and time than Immediate Adjacent Manufacturing Industries. Examples include: Semiconductor and Related Device Manufacturing, Other Aircraft Parts and Auxiliary Equipment Manufacturing, and Guided Missile and Space Vehicle Manufacturing.
- **Support Industries.** This category includes industries that are upstream of Immediate Adjacent Manufacturing Industries. They are typically industries that involve raw materials extraction and manufacturing. Growth in the ET market might require changes in operations, but since these companies tend to focus on raw materials and upstream components, those changes are likely to be minimal. Examples include: Plate Work Manufacturing, Iron and Steel Mills and Ferroalloy Manufacturing, and Bolt and Machine Shops.

An Adjacent Occupational analysis is somewhat different from an Adjacent Industry analysis. Adjacent Occupational analyses focus on the types of workers that are most common within Adjacent Industries. This is a way of looking at Adjacent Industries through a workforce lens. Such an analysis identifies occupations with similar knowledge, skills, abilities, tasks, and other work activities, regardless of the industry in which the workers are currently in. The result is a



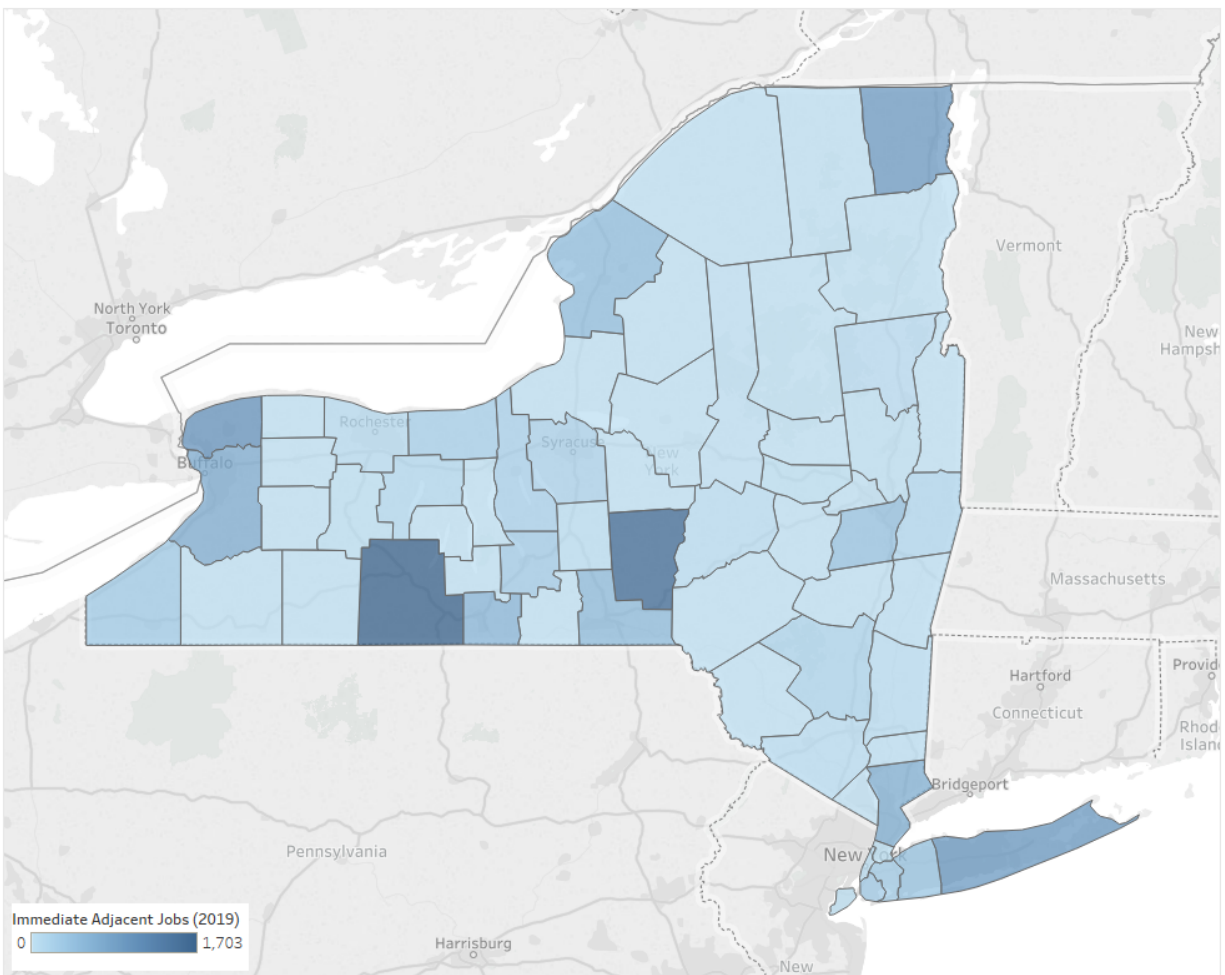
list of occupations that share enough similarities such that the required workforce or on-the-job training to transition to an ET job would be minimal.

Immediate Adjacent Manufacturing Industries

Industry Analysis

There are 12,600 workers across New York State in Immediate Adjacent Manufacturing Industries (IAMI). Steuben, Chenango, and Niagara Counties each have 1,000 or more workers in IAMI. Forty-seven other counties have at least one IAMI employee (Figure 9).

Figure 9: Immediate Adjacent Manufacturing Industry Employment, 2019



Occupation Analysis

The ten -most common occupations in Immediate Adjacent Industries represent 80,400 jobs in the entire New York economy. This means that there is a substantial workforce that could transition to Adjacent Industries. All but two of these occupations also have a typical entry-level education requirement of a high school diploma or equivalent, meaning that these occupations do not require extensive education (Table 3).

Table 3. Key Immediate Adjacent Manufacturing Occupations

Key Occupations	2014 Jobs	2019 Jobs	Projected 2024 Jobs ²⁶	Typical Entry-Level Education	Median Annual Earnings ²⁷
Laborers and Freight, Stock, and Material Movers, Hand	29,575	34,261	53,068	None	\$31,500
Production, Planning, and Expediting Clerks	8,827	10,415	12,205	High school diploma or equivalent	\$50,200
Team Assemblers	9,203	9,584	8,613	High school diploma or equivalent	\$31,600
First-Line Supervisors of Production and Operating Workers	6,759	6,575	6,364	High school diploma or equivalent	\$65,800
Inspectors, Testers, Sorters, Samplers, and Weighers	5,190	5,831	5,665	High school diploma or equivalent	\$40,300
Machinists	3,681	3,457	3,492	High school diploma or equivalent	\$45,800
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	3,114	3,212	3,659	High school diploma or equivalent	\$32,600

²⁶ These projections are from JobsEQ and based on occupation-specific growth across the state. They are not based on ET growth estimates.

²⁷ Earnings include wages as well as benefits, such as healthcare or dental insurance.



Welders, Cutters, Solderers, and Brazers	2,897	3,048	3,478	High school diploma or equivalent	\$44,200
Industrial Engineers	2,494	2,841	2,258	Bachelor's degree	\$89,100
Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	887	1,128	1,180	High school diploma or equivalent	\$37,000

Secondary Adjacent Manufacturing Industries

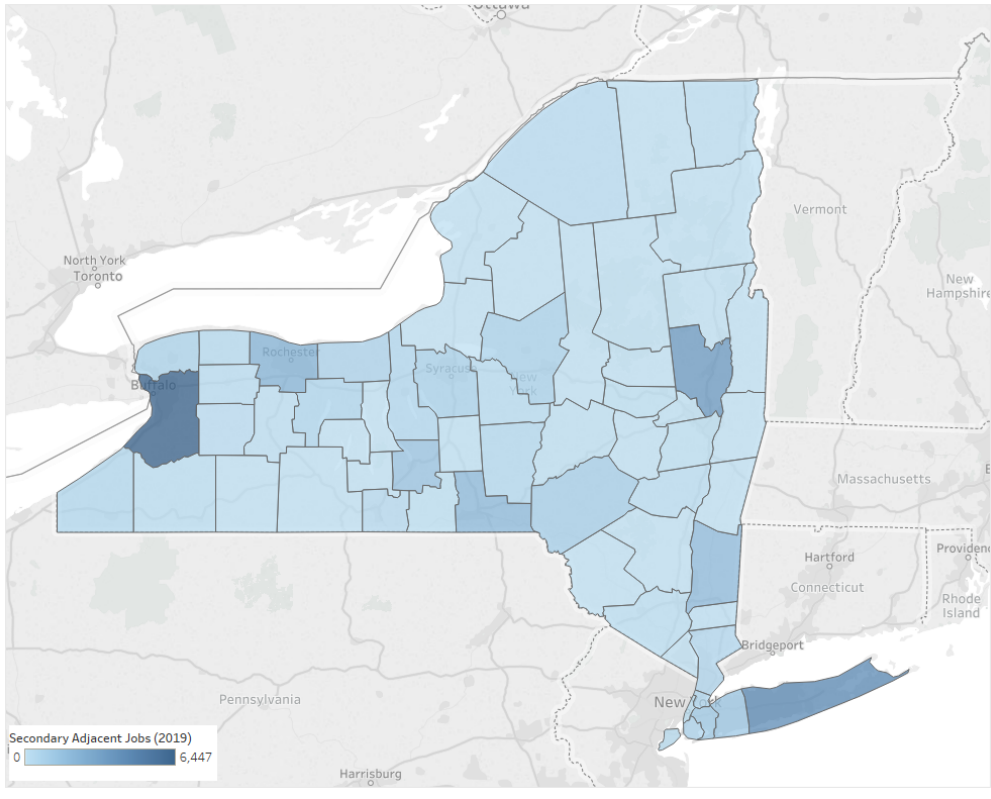
Industry Analysis

There were 35,800 workers in Secondary Adjacent Manufacturing Industries (SAMI) in New York in 2019. Erie (6,400 jobs), Suffolk (4,300), and Saratoga (3,500) Counties have the greatest number of SAMI jobs, though 57 other counties across the state also have at least one SAMI worker (

Figure 11).

Figure 11: Secondary Adjacent Manufacturing Industry Employment, 2019





The number of SAMI jobs declined by 1,100 workers statewide between 2014 and 2019. Thirty-five counties in New York saw SAMI employment decline, most notably Dutchess (-1,600 jobs), Tioga (-1,100), and Nassau (-700) Counties (Figure 12). Growth in ET-related work offers a possibility to return jobs with similar skillsets to these counties. While workers in SAMI industries may require some additional training or upskilling to participate in ET-activity, the commonalities between SAMI industries and ET-related activity make these transition opportunities viable for displaced workers.



Occupational Analysis

The ten-most common Secondary Adjacent Occupations account for 65,500 jobs across all industries in the state. While three of these occupations typically require a Bachelor’s degree for entry-level positions, the most of the most-common occupations require only a high school diploma or equivalent (Table 4). This means these occupations are accessible to a wide range of New York residents with varying educational backgrounds. Furthermore, eight out of ten of these occupations offer median annual earnings for \$40,000 or more, which is higher than the living wage in the state of New York.²⁸

Table 4: Key Secondary Adjacent Occupations

Key Occupations	2014 Jobs	2019 Jobs	Projected 2024 Jobs ²⁹	Typical Entry-Level Education	Median Annual Earnings ³⁰
Software Developers and Software Quality Assurance Analysts and Testers	16,348	20,826	22,589	Bachelor's degree	\$115,000
Production, Planning, and Expediting Clerks	8,827	10,415	12,205	High school diploma or equivalent	\$50,200
Team Assemblers	9,203	9,584	8,613	High school diploma or equivalent	\$31,600
First-Line Supervisors of Production and Operating Workers	6,759	6,575	6,364	High school diploma or equivalent	\$65,800
Inspectors, Testers, Sorters, Samplers, and Weighers	5,190	5,831	5,665	High school diploma or equivalent	\$40,300
Machinists	3,681	3,457	3,492	High school diploma or equivalent	\$45,800

²⁸ The living wage of a single adult with no dependent in New York state is \$18.62 per hour, or just under \$39,000 per year. Living wages according to the MIT Living Wage Calculator. <https://livingwage.mit.edu/states/36>

²⁹ These projections are from JobsEQ and based on occupation-specific growth across the state. They are not based on ET growth estimates.

³⁰ Earnings include wages as well as benefits, such as healthcare or dental insurance.



Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	3,114	3,212	3,659	High school diploma or equivalent	\$32,600
Industrial Engineers	2,494	2,841	2,258	Bachelor's degree	\$89,100
Electrical Engineers	2,117	2,379	1,680	Bachelor's degree	\$103,100
Semiconductor Processing Technicians	375	352	405	High school diploma or equivalent	\$40,500

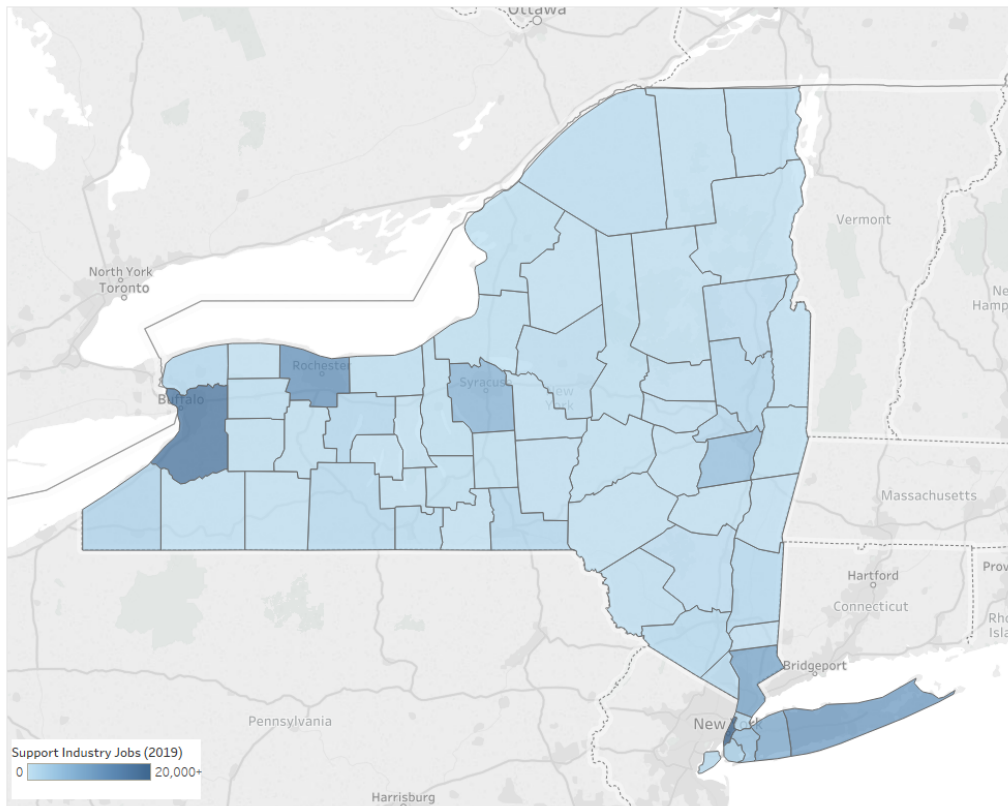
Support Industries

Industry Analysis

The Support Industries (SI) employed more than 177,000 people in New York in 2019. New York County (62,500 jobs) accounts for the largest portion of SI jobs in the state, but SI jobs can be found in all 62 counties across the state (Figure 14). While Corporate, Subsidiary, and Regional Managing Offices make up a majority of this employment, Motor Vehicle Supplies and New Parts Merchant Wholesalers and Machine Shops account for a significant number of jobs as well.



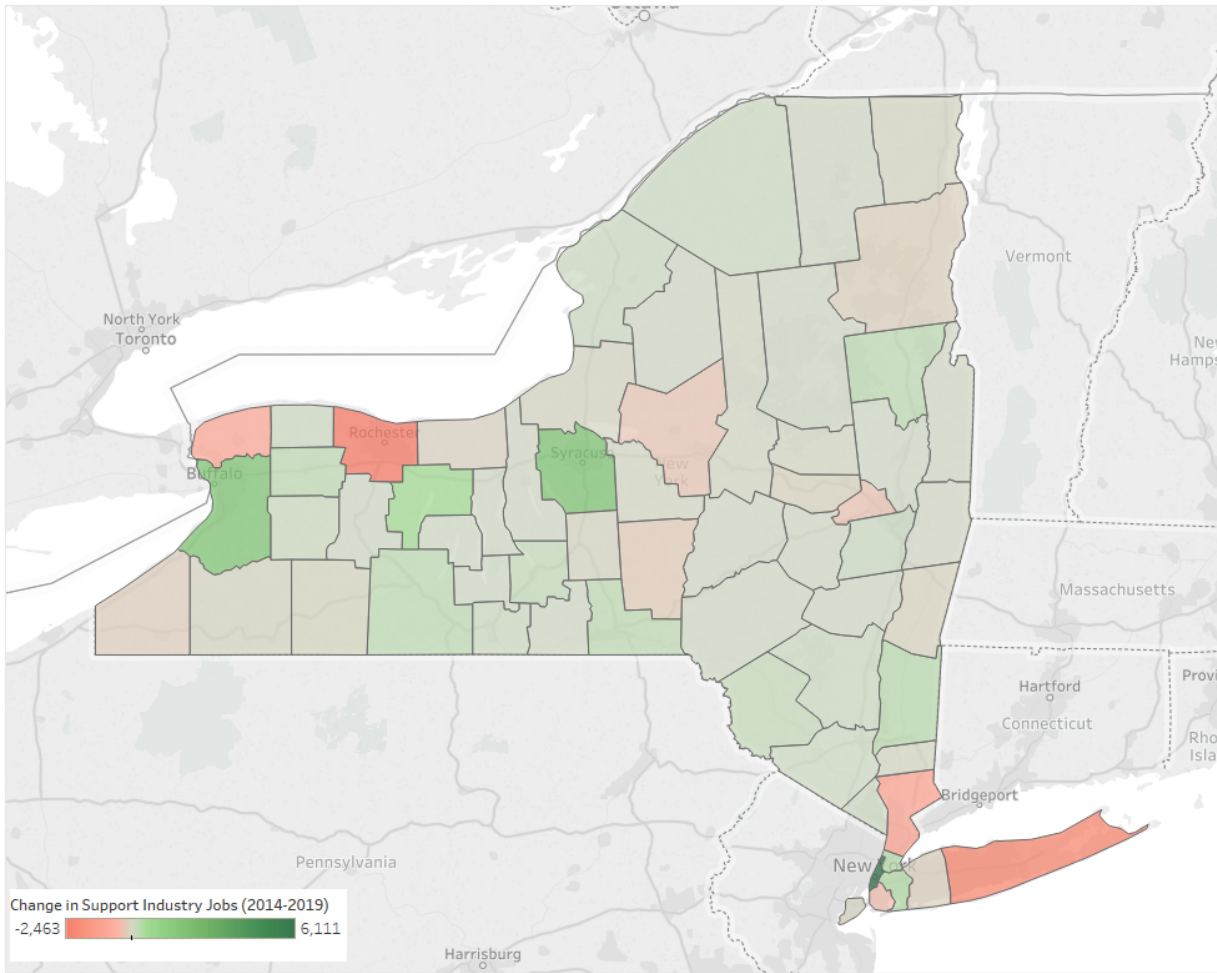
Figure 13. Support Industry Employment, 2019



Support Industry jobs increased by 4,400 jobs between 2014 and 2019. Most of this growth was seen in New York (6,100 jobs), Onondaga (1,800), and Erie (1,700) Counties. Half (31) of the 62 counties statewide saw declines in SI employment during this time (Figure 14). Growth in ET activity across New York may help increase demand for services provided by Support Industries.



Figure 14: Change in Support Industries Employment, 2014-2019



Occupational Analysis

The ten-most common occupations found within Support Industries account for a quarter of a million (246,000) jobs across the entire New York economy. These occupations span a range of skill sets and educational requirements, ranging from high school diplomas or equivalent to Bachelor’s degrees (Table 5). This suggests that growth in Support Industries driven by ET activity could increase demand for a wide range of workers across the state.



Table 5: Key Support Industry Occupations

Key Occupation	2014 Jobs	2019 Jobs	Projected 2024 Jobs ³¹	Typical Entry-Level Education	Median Annual Earnings ³²
Customer Service Representatives	36,450	40,683	56,764	High school diploma or equivalent	\$38,900
General and Operations Managers	34,102	40,371	40,435	Bachelor's degree	\$132,000
Bookkeeping, Accounting, and Auditing Clerks	29,093	28,225	31,046	Some college, no degree	\$45,700
Accountants and Auditors	25,726	28,166	29,943	Bachelor's degree	\$86,600
Executive Secretaries and Executive Administrative Assistants	39,652	27,161	18,543	High school diploma or equivalent	\$72,200
Software Developers and Software Quality Assurance Analysts and Testers	16,348	20,525	22,589	Bachelor's degree	\$115,000
Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	20,881	19,533	20,132	High school diploma or equivalent	\$60,500
Market Research Analysts and Marketing Specialists	10,920	15,606	22,764	Bachelor's degree	\$72,800
Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other	12,493	13,771	13,710	Bachelor's degree	\$107,000
Financial Managers	10,487	11,972	12,706	Bachelor's degree	\$197,100

³¹ These projections are from JobsEQ and based on occupation-specific growth across the state. They are not based on ET growth estimates.

³² Earnings include wages as well as benefits, such as healthcare or dental insurance.



WORKFORCE DEMOGRAPHICS

The workers in Adjacent and Support industries are similar in their demographics to the overall New York workforce, though women tend to be relatively underrepresented. Black or African-American worker representation is generally in line with statewide workforce averages and slightly higher among Primary Adjacent Industries. This strong representation is likely reflective of the broader U.S. automotive manufacturing industry, which has historically employed a high rate of Black or African-American workers. In 2020, 18.2% of automotive manufacturing workers were Black or African American, a rate 50% greater than the share of working age Black or African Americans.³³

Tracking the demographics of workers is one important way to ensure that the significant economic benefits from the growth of the ET sector are accessible and distributed equitably. Lessons learned from the traditional automobile sector, as well as expanding outreach, awareness, and education and training opportunities to underrepresented communities can ensure that meaningful career opportunities are accessible to all.

Immediate Adjacent Industry Workforce Demographics

The Immediate Adjacent workforce is generally representative of the overall workforce in New York with some exceptions. Women and Asian workers are relatively underrepresented in IAMI jobs; nearly half as many women work in IAMI jobs compared to the broader overall workforce (Figure 15). IAMI workers mirror the age demographics of the overall workforce (Figure 16).

³³ 2020 Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Labor Force Statistics from the Current Population Survey. U.S. Bureau of Labor Statistics.



Figure 15. Immediate Adjacent Workforce Demographics

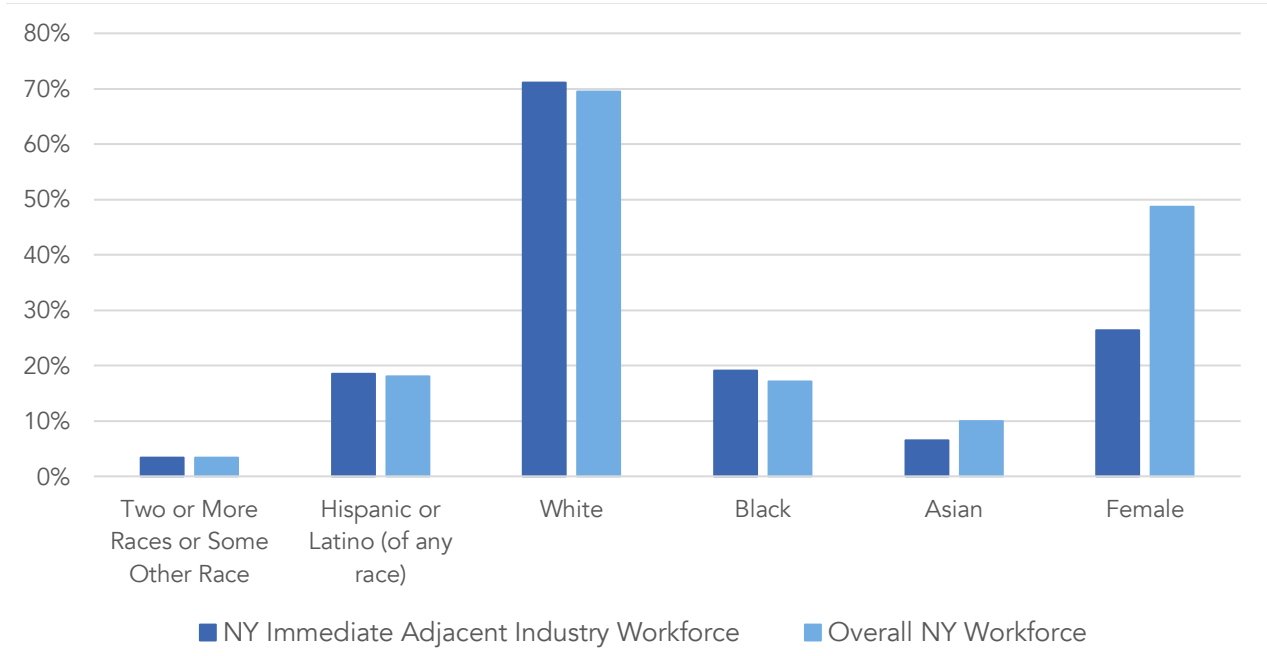
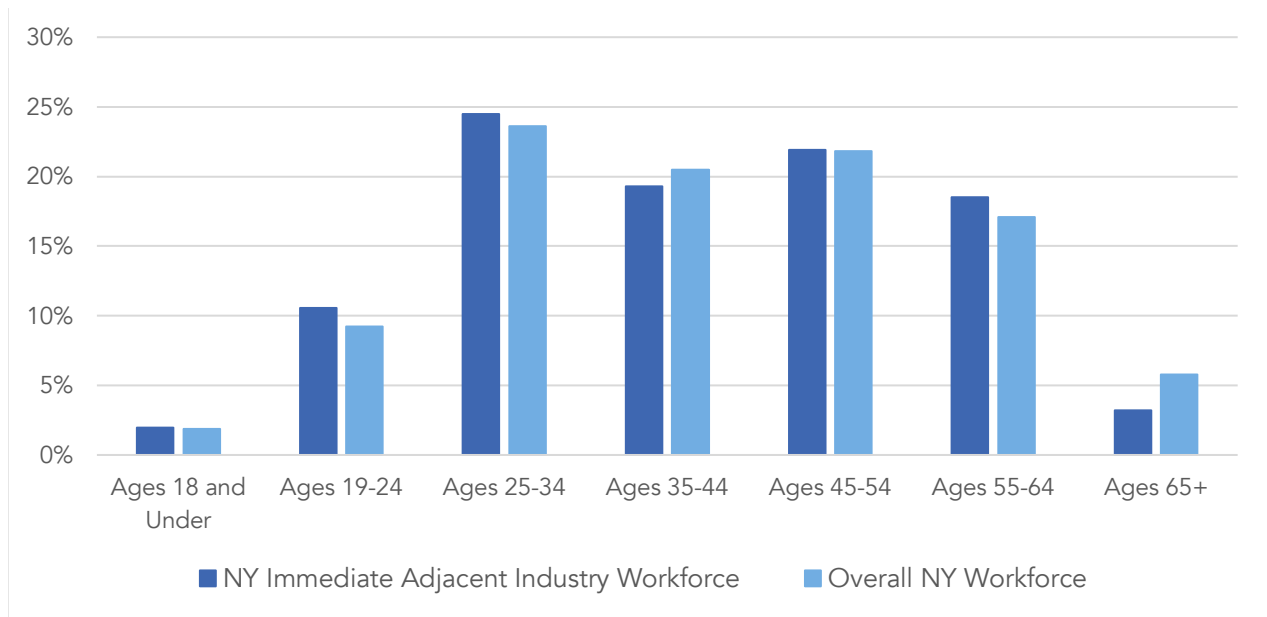


Figure 16. Age Distribution of Immediate Adjacent Workforce



Secondary Adjacent Workforce Demographics

The Secondary Adjacent Industry workforce has relatively fewer Female, Black, and Hispanic or Latino workers. Similar to the IAMI workforce, the SAMI workforce has nearly half the proportion of women workers as the overall New York workforce (Figure 17). The SAMI workforce is similar to the broader workforce statewide, though there is a slightly higher proportion of prime-aged workers (between the ages of 25 and 64) (Figure 18).

Figure 17. Secondary Adjacent Workforce Demographics

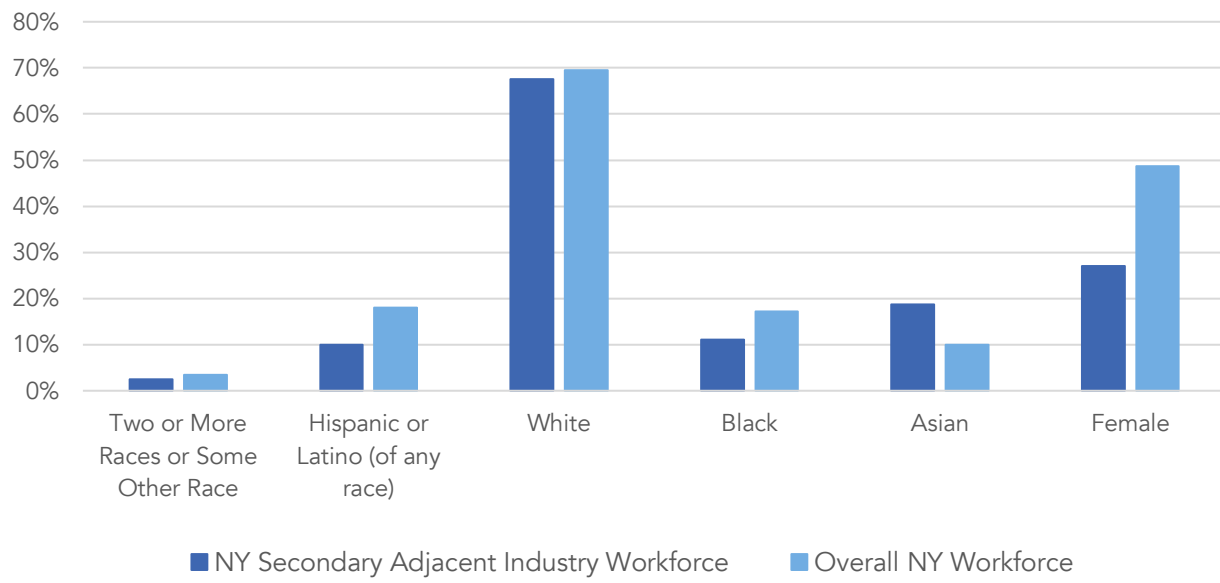
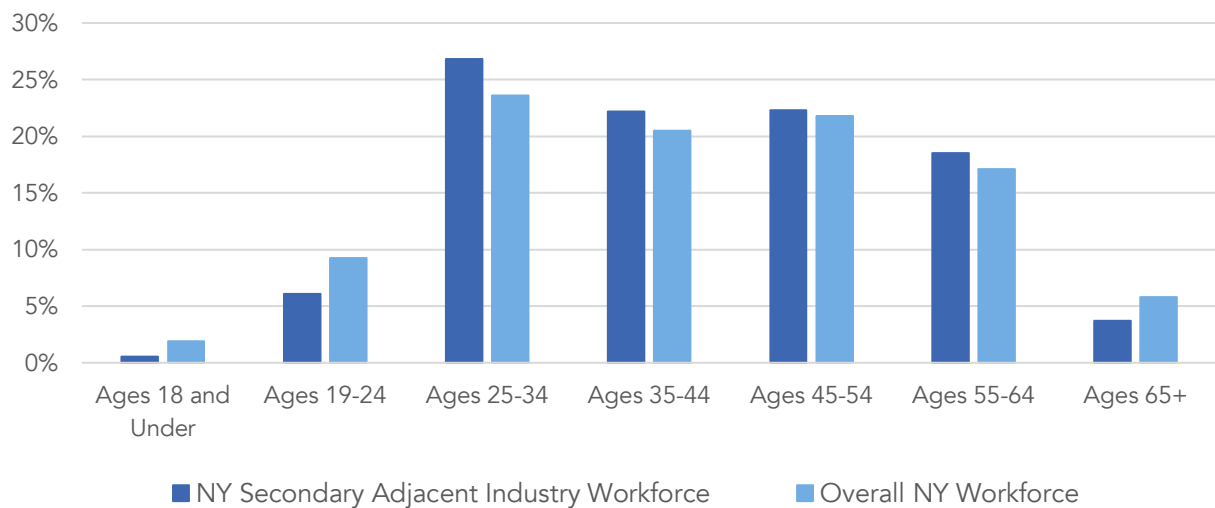


Figure 18. Age Distribution of Secondary Adjacent Workforce



Support Industry Workforce Demographics

The Support Industry workforce has a slightly lower share of Black and Hispanic or Latino workers than the overall New York workforce (Figure 19). The age of workers in the Support Industries trends closely with that of the broader workforce (Figure 20).

Figure 19. Support Industry Workforce Demographics

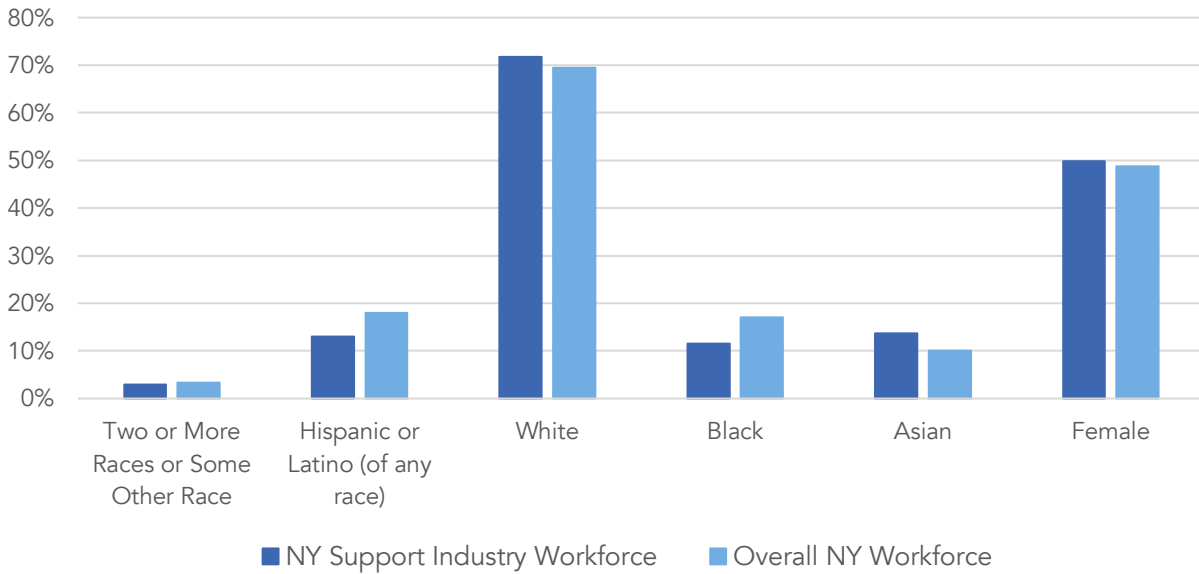
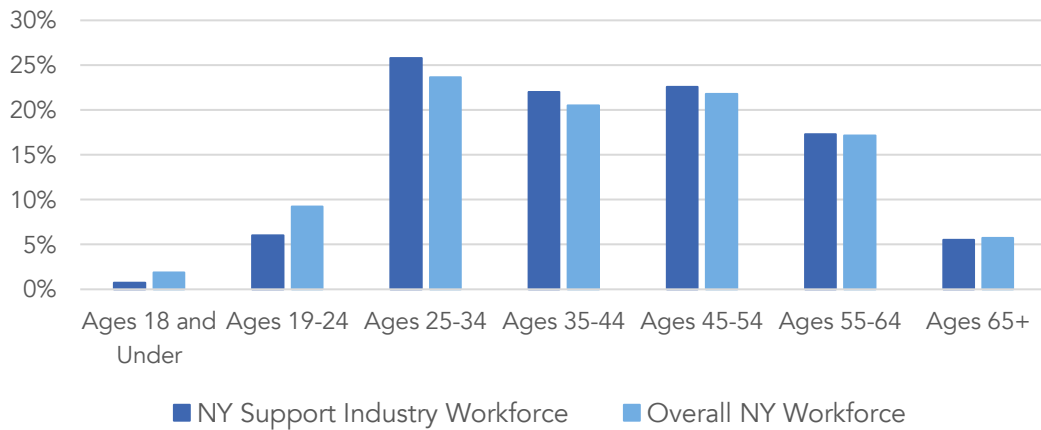


Figure 20. Age Distribution of Support Industry Workforce



Company Snapshot

National Grid

Various Counties

National Grid is an electric and gas utility that services New York, Massachusetts, and Rhode Island. In New York, the utility offers incentives to support EV charging station-related infrastructure work for commercial, industrial, and fleet customers in line with a statewide Public Service Commission order issued in July 2020 that supports New York’s ambitious EV goals. As part of this initiative, National Grid is aiming to support the installation of 16,000 charging ports by 2025. Combined with incentives from the New York State Energy Research and Development Authority (NYSERDA), customers can substantially reduce the cost of chargers and infrastructure upgrades needed to install EV charging equipment. There are roughly 15 National Grid team members who spend a substantial portion of their time implementing charging infrastructure initiatives in New York alone, and as many as 30+ transportation employees in the company’s three states combined. National Grid also works with a network of approved regional



TRAINING INVENTORY

The research team examined the training and education opportunities available to New York residents interested in joining the ET workforce. Because many potential training opportunities can lead to ET careers, only programs that are specifically geared towards ET activity are included in this inventory, while programs that include some ET-related curricula, but are not wholly ET-focused, were left out. To see a list of the trainings identified, please see Appendix B.

Nineteen community colleges and vocational schools across New York currently offer vehicle maintenance and repair programs. These programs increasingly contain modules on hybrid and EVs, but this material often makes up a small portion of the overall curriculum. For this reason, automotive technician and maintenance programs are not included in this inventory, but a list of programs is available in Appendix F: Automotive Maintenance and Repair Training Programs. Manufacturing roles, such as Machinists and Assemblers, are also a crucial component of the ET economy in New York. Training for these roles is rarely ET-specific, and workers are typically developed through New York's Community College system or union-affiliated work experience. There are 14 community colleges and vocational schools currently offering precision metal working programs in the state, as do other private and non-profit training providers.

Across New York, only four training programs were found to be geared specifically towards ET-related activities. Two training opportunities are centered on engineering, one is focused on electrical installation and hosts Electric Vehicle Infrastructure Training Program (EVITP) curricula,³⁴ and one program broadly touches on engineering, management, and policy making.

The two engineering programs are hosted by universities affiliated through the University of New York educational system. The State University of New York (SUNY) Buffalo teaches 'Power Electronics,' a course which studies power converter circuits and their applications in various methods of transportation including electric vehicles. SUNY Binghamton divides their senior Mechanical Engineering students among a variety of labs for their capstone research, including the Electric Vehicle

³⁴ The EVITP is a national program developed by a broad coalition of EV stakeholders and has certified more than 4,000 electricians across the United States and Canada. The nationally developed program is hosted locally, often through local education providers, unions, or industry associations. The EVITP program in New York is hosted by the State Group.

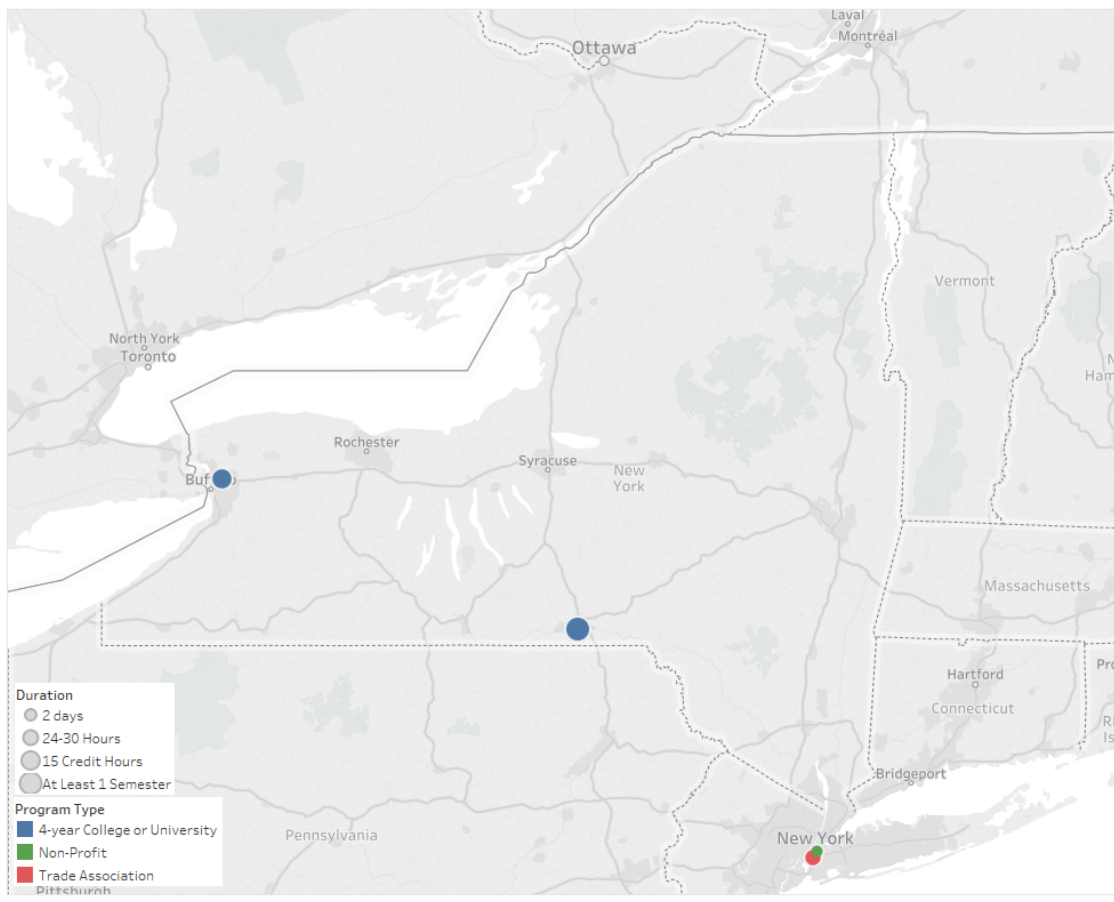


Lab. The Electric Vehicle Lab works on the development and testing of a SAE (Society of Automotive Engineers) Formula EV which participates in the global Formula SAE races.

The Renewable Energy Institute (REI) hosts a course on EVs in Manhattan, NY. The course covers a variety of subject areas including EV sustainability, technology, charging infrastructure, issues limiting the adoption of EVs, and EV financing and development. The Renewable Energy Institute has worked with organizations like the United Nations Environmental Program (UNEP) to host conferences and produce publications for renewable energy and energy efficiency practitioners around the world.

Figure 21 highlights the geographic distribution of the four ET-specific training programs. Two programs are in person and, although the others are offered online, programs are often only advertised through their local sponsors meaning that geography remains a factor in accessibility to these trainings.

Figure 21. ET-Specific Training Programs in New York



CONCLUSION

There were 4,200 ET jobs which could be found across an estimated 882 businesses in 61 counties in New York in 2019. By 2024, ET employment in the Empire State is projected to account for 5,400 jobs, representing an 83% increase over the five-year span.

New York's ET economy can be found across a range of industries and segments of the supply chain. There are two areas where New York's ET economy is particularly well positioned. First, New York—and particularly New York City—have a high concentration of corporate headquarters and offices. In the case of ET activity, these are often multinational corporations with production and distribution that span the globe. While the expansion of ET will help drive ET-related activities within these headquarters, most of this activity will likely transition existing jobs and rather than create new jobs.

The other advantage of New York's ET economy—and the advantage most likely to create new jobs in the New York economy—is its robust electronic and circuitry manufacturing sector. This includes Semiconductor and Related Device Manufacturing and Printed Circuit Assembly Manufacturing, along with other industries like Electronic Connector Manufacturing and Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing. As the demand for ET goods increases, so will the demand for the goods these industries produce. This is because EVs and other ET goods typically require more of this componentry than traditional combustion transportation.

Growth in such component manufacturing possesses two potential opportunities for the New York economy and its workers. First, the growth of demand for these goods will drive demand for the workers who produce these goods. This could help offset some of the recent job losses in Adjacent and Support Industries. Second, ET growth provides the creation of new jobs, which displaced workers in Adjacent and Support industries could transition to with relative ease, since many of these workers already have similar knowledge and skillsets.

As the ET economy continues to grow nation- and statewide, New York and its workers are well positioned to reap economic benefit. New York's recent electric transportation policy initiatives will further catalyze economic and employment growth statewide, promoting a more robust and diverse economy.



APPENDIX A: METHODOLOGY

Employment and GSP

Employment and GSP extrapolations were performed using data collected for this report, as well as data from the 2019 United States Energy Employment Report (USEER) and JobsEQ. The methodology used for the 2019 USEER meets the highest statistical and methodological standards and has been reviewed by the Bureau of Labor Statistics (BLS) and the Department of Energy (DOE). More details about the methodology can be found here: [usenergyjobs.org](https://www.usenergyjobs.org).

Data Collection

The research team utilized desktop research, phone calls, email, and other forms of outreach to generate a database of companies known to be active in ET. Firms from the potential database (this database was comprised of companies from industries which were believed to be involved in ET) were first examined through desktop research to determine if they were related to ET activity. Any firms that were confirmed or identified as potentially involved in ET were called via telephone up to two times. Once phone contact was established, BW staff would confirm involvement in ET, and ask supplementary questions confirming employment counts and asking about in-state suppliers and customers. If phone contact could not be established, voicemails were left and, when possible, emails sent.

BW Research employed a number of strategies to maximize the data collection effort given the considerable size of the potential database. These approaches are outlined below:

- Prioritization of manufacturing NAICS codes. Manufacturing roles present the greatest opportunity for job creation, as manufacturing is generally more labor intensive and has substantial downstream supply chains and workforces that support them.
- “Snowball” methodology. Once a firm confirmed that they were involved in ET in some capacity, researchers followed up by asking about any relevant in-state suppliers and customers. This allowed the research team to develop a more complete picture of the supply chain.



- Among industries which the research team did not exhaust via phone interviews, staff conducted desktop research to identify relevant firms that advertised ET-related products or services.

Of the 16,300 firms in the assembled potential database, 4,600 firms were examined closely by the research team. Of these, 768 were contacted via telephone at least once. Of the 11,725 firms that remain unexamined, 91% fall under five industry codes: 29% are electrical contracting firms, 25% are urban transit systems, 17% are other electronic parts and equipment merchant wholesalers, 12% are industrial machinery and equipment wholesalers, and 8% are miscellaneous rental and leasing facilities.



Some of the industry definitions of electric transportation used in this report are not included and reported in the USEER motor vehicles section. These industries include:

- Automobile Retail (NAICS 4411)
- Rail Transportation (NAICS 4281)
- Farm and Garden Machinery and Equipment Merchant Wholesalers (NAICS 42382)
- Agricultural Implement Manufacturing (NAICS 33311)
- Railroad Rolling Stock Manufacturing (NAICS 33651)
- Industrial Machinery and Equipment Merchant Wholesalers (NAICS 42383)
- Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers (NAICS 42361)
- Engineering Services (NAICS 54133)
- Electrical Contractors and Other Wireless Installation Contractors (NAICS 23821)
- Power and Communication Line and Related Structures (NAICS 33451)
- Navigational, Measuring, Electromedical, and Control Instruments Manufacturing (NAICS 33451)
- Electrical Equipment Manufacturing (NAICS 33531)
- Plate Work and Fabricated Structural Product Manufacturing (NAICS 33231)

Having confidently determined the involvement of 4,600 firms out of the BLS estimated 23,047 firms in industries that were identified as potentially involved in ET, the margin of error is among these industries is approximately 1.84% for incidence.



APPENDIX B: ET TRAINING INVENTORY

Provider	Program	Program Type	Occupational Focus	City	Zip Code	Duration
EU Energy Center, Renewable Energy Institute	Electric Vehicles Course	Non-Profit	Engineering, Management, Policy Making	New York	10017	Certificate (GMC)
University of Buffalo	EE 467LEC Power Electronics	4-year College or University	Engineering	Buffalo	14260	Course Credit
Binghamton University	Senior Design	4-year College or University	Engineering	Binghamton	13902	Course Credit
The State Group	Electric Vehicle Infrastructure Training Program (EVITP)	Trade Association	Installation (electrical)	New York	10007	Certificate



APPENDIX C: INDUSTRY GROUP DEFINITIONS

Below are the NAICS code definitions for the immediate Adjacent, secondary Adjacent, and Support Industries described in this report.

Table 6: Immediate Adjacent Manufacturing Industries

NAICS Code	Description
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
334419	Other Electronic Component Manufacturing
335312	Motor and Generator Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
336111	Automobile Manufacturing
336120	Heavy Duty Truck Manufacturing
336390	Other Motor Vehicle Parts Manufacturing
336510	Railroad Rolling Stock Manufacturing
336991	Motorcycle, Bicycle, and Parts Manufacturing
336999	All Other Transportation Equipment Manufacturing

Table 7: Secondary Adjacent Industries

NAICS Code	Description
333921	Elevator and Moving Stairway Manufacturing
333922	Conveyor and Conveying Equipment Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
334310	Audio and Video Equipment Manufacturing
334412	Bare Printed Circuit Board Manufacturing



334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
335313	Switchgear and Switchboard Apparatus Manufacturing
335314	Relay and Industrial Control Manufacturing
335991	Carbon and Graphite Product Manufacturing
336112	Light Truck and Utility Vehicle Manufacturing
336212	Truck Trailer Manufacturing
336213	Motor Home Manufacturing
336214	Travel Trailer and Camper Manufacturing
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
336340	Motor Vehicle Brake System Manufacturing
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing
336360	Motor Vehicle Seating and Interior Trim Manufacturing
336370	Motor Vehicle Metal Stamping
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing
336611	Ship Building and Repairing



336612	Boat Building
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing

Table 8: Support Industries

NAICS Code	Description
331110	Iron and Steel Mills and Ferroalloy Manufacturing
331511	Iron Foundries
332312	Fabricated Structural Metal Manufacturing
332313	Plate Work Manufacturing
332710	Machine Shops
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
423110	Automobile and Other Motor Vehicle Merchant Wholesalers
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers
423830	Industrial Machinery and Equipment Merchant Wholesalers
551114	Corporate, Subsidiary, and Regional Managing Offices



APPENDIX D: GLOSSARY OF TERMS

Below is a glossary of terms used throughout this report. Additional information on some key occupations can be found in Appendix A.

Aircraft Parts and Auxiliary Equipment Manufacturing: This U.S. industry comprises establishment primarily engaged in (1) manufacturing aircraft parts or auxiliary equipment (except engines and aircraft fluid power subassemblies) and/or (2) developing and making prototypes of aircraft parts and auxiliary equipment. Auxiliary equipment includes such items as crop dusting apparatus, armament racks, inflight refueling equipment, and external fuel tanks.

Assemblers and Fabricators (All Other, Including Team Assemblers): Work as part of a team having responsibility for assembling an entire product or component of a product. Team assemblers can perform all tasks conducted by the team in the assembly process and rotate through all or most of them rather than being assigned to a specific task on a permanent basis. May participate in making management decisions affecting the work. Includes team leaders who work as part of the team.

Automobile Merchant Wholesalers: This industry comprises establishments primarily engaged in the merchant wholesale distribution of new and used passenger automobiles, trucks, trailers, and other motor vehicles, such as motorcycles, motor homes, and snowmobiles.

Automotive Service Technicians and Mechanics: Diagnose, adjust, repair, or overhaul automotive vehicles.

Boat Building Manufacturing: Establishments primarily engaged in building boats. Boats are defined as watercraft not built-in shipyards and typically of the type suitable or intended for



personal use. Included in this industry are establishments that manufacture heavy-duty inflatable rubber or inflatable plastic boats (RIBs).

Computer-Controlled Machine Tool Operators, Metal and Plastic: Operate computer-controlled machines or robots to perform one or more machine functions on metal or plastic work pieces.

Cutting, Punching, and Press Machine Setters, Operators, and Tenders: Set up, operate, or tend machines to saw, cut, shear, slit, punch, crimp, notch, bend, or straighten metal or plastic material.

Electrical, Electronic, and Electromechanical Assemblers (Except Coil Winders, Tapers, and Finishers): Assemble or modify electromechanical equipment or devices, such as servomechanisms, gyros, dynamometers, magnetic drums, tape drives, brakes, control linkage, actuators, and appliances.

Electrical and Electronic Goods Merchant Wholesalers: This industry comprises establishments primarily engaged in the merchant wholesale distribution of electrical construction materials; wiring supplies; electric light fixtures; light bulbs; and/or electrical power equipment for the generation, transmission, distribution, or control of electric energy.

Fabricated Structural Metal Manufacturing: This industry comprises establishments primarily engaged in fabricating structural metal products, such as assemblies of concrete reinforcing bars and fabricated bar joists.

First-Line Supervisors of Production and Operating Workers: Directly supervise and coordinate the activities of production and operating workers, such as inspectors, precision workers, machine setters and operators, assemblers, fabricators, and plant and system operators.

Heavy Duty Truck Manufacturing: industry comprises establishments primarily engaged in (1) manufacturing heavy duty truck chassis and assembling complete heavy duty trucks, buses, heavy duty motor homes, and other special purpose heavy duty motor vehicles for highway use or (2) manufacturing heavy duty truck chassis only.



Industrial Machinery and Equipment Merchant Wholesalers: This industry comprises establishments primarily engaged in the merchant wholesale distribution of specialized machinery, equipment, and related parts generally used in manufacturing, oil well, and warehousing activities.

Inspectors, Testers, Sorters, Samplers, and Weighers: Inspect, test, sort, sample, or weigh nonagricultural raw materials or processed, machined, fabricated, or assembled parts or products for defects, wear, and deviations from specifications. May use precision measuring instruments and complex test equipment.

Iron and Steel Mills and Ferroalloy Manufacturing: This industry comprises establishments primarily engaged in one or more of the following: (1) direct reduction of iron ore; (2) manufacturing pig iron in molten or solid form; (3) converting pig iron into steel; (4) making steel; (5) making steel and manufacturing shapes (e.g., bar, plate, rod, sheet, strip, wire); (6) making steel and forming pipe and tube; and (7) manufacturing electrometallurgical ferroalloys. Ferroalloys add critical elements, such as silicon and manganese for carbon steel and chromium, vanadium, tungsten, titanium, and molybdenum for low- and high-alloy metals. Ferroalloys include iron-rich alloys and more pure forms of elements added during the steel manufacturing process that alter or improve the characteristics of the metal.

Laborers and Freight, Stock, and Material Movers (Hand): Manually move freight, stock, or other materials or perform other general labor. Includes all manual laborers not elsewhere classified.

Machine Shops: Machine shops primarily engaged in machining metal and plastic parts and parts of other composite materials on a job or order basis. Generally machine shop jobs are low volume using machine tools, such as lathes (including computer numerically controlled); automatic screw machines; and machines for boring, grinding, milling, and additive manufacturing.

Machinists: Set up and operate a variety of machine tools to produce precision parts and instruments. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain



industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

Mechanical Engineers: Perform engineering duties in planning and designing tools, engines, machines, and other mechanically functioning equipment. Oversee installation, operation, maintenance, and repair of equipment such as centralized heat, gas, water, and steam systems.

Motor and Generator Manufacturing: This U.S. industry comprises establishments primarily engaged in manufacturing electric motors (except internal combustion engine starting motors), power generators (except battery charging alternators for internal combustion engines), and motor generator sets (except turbine generator set units).

Motor Home Manufacturing: Type of self-propelled recreational vehicle (RV) which offers living accommodation combined with a vehicle engine.

Motor Vehicle Manufacturing: The motor vehicles manufactured in this industry include automobiles, sport-utility vehicles (SUVs), vans and pickup trucks, heavy duty trucks, buses, truck trailers, and motor homes. It also includes the manufacturing of the parts that go into these vehicles, such as the engine, seats, brakes, and electrical systems.

Multiple Machine Tool Setters, Operators, and Tenders (Metal and Plastic): Set up, operate, or tend more than one type of cutting or forming machine tool or robot.

Non-Ferrous Metal Foundries: Establishments primarily engaged in manufacturing nonferrous metal castings (including alloys), except all die-castings and other castings of aluminum or copper.

Other Electronic Component Manufacturing: Manufacturing electronic components (except bare printed circuit boards; semiconductors and related devices; electronic capacitors; electronic resistors; coils, transformers and other inductors; connectors; and loaded printed circuit boards).



Other Motor Vehicle Parts Manufacturing: Primarily engaged in manufacturing and/or rebuilding motor vehicle parts and accessories (except motor vehicle gasoline engines and engine parts, motor vehicle electrical and electronic equipment, motor vehicle steering and suspension components, motor vehicle brake systems, motor vehicle transmissions and power train parts, motor vehicle seating and interior trim, and motor vehicle stampings).

Plate Work Manufacturing: Industry comprises establishments primarily engaged in manufacturing fabricated metal plate work by cutting, punching, bending, shaping, and welding purchased metal plate.

Power, Distribution, and Specialty Transformer Manufacturing: Engaged in manufacturing power, distribution, and specialty transformers (except electronic components). Industrial-type and consumer-type transformers in this industry vary (e.g., step up or step down) voltage but do not convert alternating to direct or direct to alternating current.

Railroad Rolling Stock Manufacturing: This industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing and/or rebuilding locomotives, locomotive frames and parts; (2) manufacturing railroad, street, and rapid transit cars and car equipment for operation on rails for freight and passenger service; and (3) manufacturing rail layers, ballast distributors, rail tamping equipment and other railway track maintenance equipment.

Relay and Industrial Control Manufacturing: Establishments primarily engaged in manufacturing relays, motor starters and controllers, and other industrial controls and control accessories.

Sales Representatives, Wholesale and Manufacturing (except Technical and Scientific Products): Inspect, test, sort, sample, or weigh nonagricultural raw materials or processed, machined, fabricated, or assembled parts or products for defects, wear, and deviations from specifications. May use precision measuring instruments and complex test equipment.

Semiconductor Manufacturing: A semiconductor chip is an electric circuit with many components such as transistors and wiring formed on a semiconductor wafer. An electronic device comprising numerous these components is called "integrated circuit (IC)". The layout



of the components is patterned on a photomask (reticle) by computer and projected onto a semiconductor wafer in the manufacturing processes

Switchgear and Switch Board Apparatus Manufacturing: The switchgear and switchboard apparatus manufacturing industry comprise establishments manufacturing switchgear and switchboard apparatus. Switchgear is the combination of electrical disconnect switches and circuit breakers used in electricity transmission to interrupt or reestablish the flow of electricity.

Truck Trailer Manufacturing: This U.S. industry comprises establishments primarily engaged in manufacturing truck trailers, truck trailer chassis, cargo container chassis, detachable trailer bodies, and detachable trailer chassis for sale separately.

Welders, Cutters, Solderers, and Brazers: Use hand-welding, flame-cutting, hand soldering, or brazing equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products.

Wholesale and Manufacturing Sales Representatives: Sell goods for wholesalers or manufacturers to businesses or groups of individuals. Work requires substantial knowledge of items sold.



APPENDIX E: ET-EMPLOYMENT BY CONGRESSIONAL DISTRICT

The table below provides estimates for ET-related employment by congressional districts in New York.

Congressional District	2019 ET Employment
1	149
2	274
3	392
4	125
5	243
6	118
7	342
8	188
9	70
10	225
11	92
12	342
13	206
14	169
15	51
16	113
17	87
18	129
19	92
20	81



21	58
22	64
23	59
24	83
25	78
26	125
27	234



APPENDIX F: AUTOMOTIVE MAINTENANCE AND REPAIR TRAINING PROGRAMS

Education & Training Provider	2018-2019 Completions
Lincoln Technical Institute-Whitestone	270
New York Automotive and Diesel Institute	116
SUNY Morrisville	61
Apex Technical School	60
Erie Community College	59
Suffolk County Community College	52
SUNY College of Technology at Delhi	52
Hudson Valley Community College	33
CUNY Bronx Community College	32
Monroe Community College	32
SUNY College of Technology at Alfred	32
Rockland Community College	30
SUNY Corning Community College	17
Onondaga Cortland Madison BOCES	15
Columbia-Greene Community College	11
Western Suffolk BOCES	11
Onondaga Community College	6
SUNY College of Technology at Canton	3
Oswego County BOCES	2

