



SOUTH CAROLINA DEPARTMENT OF
Employment and Workforce 

EVALUATION AND ANALYSIS OF THE
ELECTRIC VEHICLE
WORKFORCE
IN SOUTH CAROLINA

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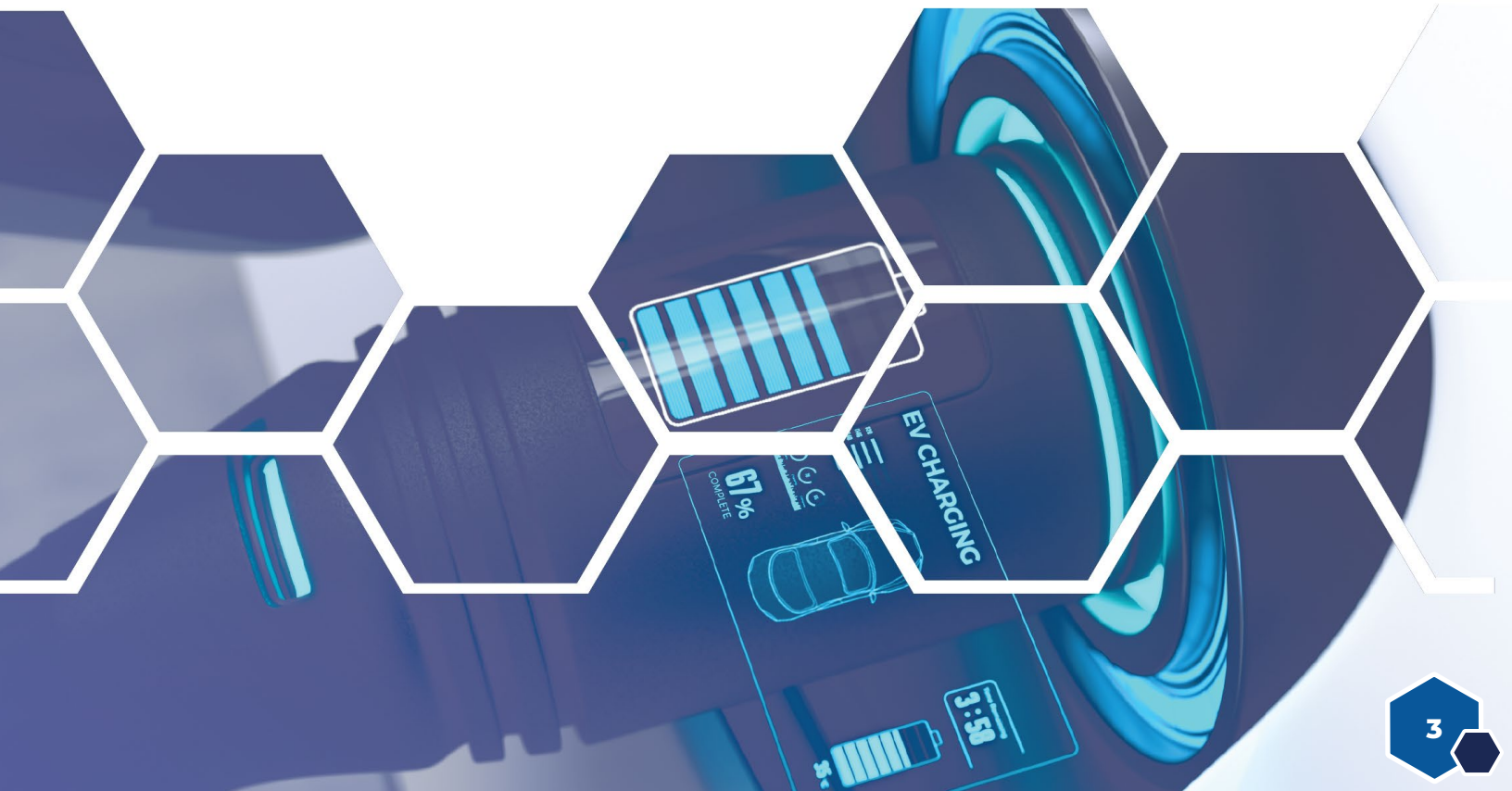
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PURPOSE OF THIS REPORT

South Carolina has been strategic and successful in its efforts to encourage further investment and economic development in the electric vehicle (EV) industry, bringing thousands of jobs and billions of dollars in investment. BMW, Mercedes Benz Vans, and Volvo are expanding their existing facilities in the state as they convert a portion of their automobile assembly activities from traditional, internal combustion engine (ICE) to electric cars and SUVs. Two smaller electric vehicle companies, Oshkosh and Proterra, have established operations in the Upstate, with the former building electric trucks for the U.S. Postal Service. Scout Motors, backed by Volkswagen, recently announced plans to build a new plant in Richland County. And EV battery companies are coming to our state, with manufacturer AESC setting up shop near Florence, Pomega Energy Storage Technologies building a lithium-ion battery factory in Colleton County, and recyclers Redwood Materials and Cirba Solutions building their battery reclamation operations Berkeley and Richland Counties, respectively.

The emergence of the modern EV industry, given South Carolina's current standing as the nation's top exporter of cars, has the potential to be transformative and disruptive to our state. Part of responding to this challenge and opportunity means ensuring that we have a workforce that appeals to existing and emerging employers as the EV transition gathers pace. This report, as directed in Executive Order 2022-31, seeks to do the following:

- Evaluate the State's existing and anticipated EV-related workforce availability and capacity needs and explore opportunities to enhance the State's existing workforce development policies or mechanisms so as to advance the competitive standing of South Carolina's EV ecosystem and automotive sector relative to other States and position South Carolina as a center of growth and global leader with respect to EV-related research, development, and production;
- Conduct a comprehensive and detailed supply gap analysis of the EV ecosystem, in consultation with the business community, industry stakeholders, education providers, and other state agencies and departments, to evaluate EV-specific occupations and the projected demand for any relevant training, credentials, or certifications; and
- Identify and report to the undersigned and the General Assembly any recommended statutory or regulatory changes or enhancements related to the State's existing workforce development mechanisms that may be necessary or appropriate to facilitate new business and industry investment or expansion in the EV sector.



EXECUTIVE SUMMARY

There are over 18,000 South Carolinians currently employed in the four areas that will be relevant to building the EV ecosystem.

- These four industries include automotive electrical repair, motor vehicle manufacturing, battery manufacturing, and charging infrastructure.
- South Carolina has outsized capacity in most of these spaces, and many jobs housed within them offer competitive salaries.

The supply gap analysis compares the number of people receiving a degree or credential annually in a given field from a South Carolina institution, according to data collected by the U.S. Department of Education, with the number of annual job openings in the corresponding occupation relevant to the EV industry.

- The analysis found four jobs in which there is a substantial deficit between the supply and demand for labor. These are software developers, industrial engineers, automotive service technicians and mechanics, and logisticians.
- Each of these areas represents a field in which our state's workers may not have the necessary skills to support the development of the EV industry.

As a result, it is necessary for South Carolina to identify ways in which this supply gap can be mitigated. This means doing the following:

- Leveraging existing partnerships between our educational and workforce system, business community, and industry stakeholders.
- Identifying appropriate curriculum and outlining clear and comprehensive career pathways.
- Promoting work-based learning opportunities in order to give jobseekers the opportunity to experience occupations.
- Recruiting an inclusive workforce including veterans and military retirees and offenders with transferrable skills.
- Investing in upskilling and retooling existing workers to prepare for changing skill requirements and new product lines.
- Continuing to support existing industry to ensure growth and expansion within South Carolina.
- Addressing barriers that prevent or make it difficult for individuals to access education and training resources and participate in the workforce.

TODAY'S EV WORKFORCE

In considering the electric vehicle industry, it is important to note that there is no data for such an industry in any official source produced by LMI or the federal government. First, the categorization structure used by the government – the North American Industrial Classification System (NAICS) – does not distinguish between assembly of industrial combustion engine vehicles and electric vehicles. Further, firms in the electric vehicle supply chain, as well as those that build infrastructure such as charging stations, fall in different NAICS categories than the assemblers. However, it's certainly possible to get a handle on what these elements of the EV ecosystem look like today in South Carolina.

MOTOR VEHICLE MANUFACTURING (NAICS 3361)

In terms of the actual assembly of vehicles (including cars, light-duty trucks like pickups and SUVs, and heavy-duty trucks), factories in South Carolina held 12,783 jobs across 31 firms in 2021, according to Quarterly Census of Employment and Wages (QCEW) data produced by LMI. This is a dramatic increase from 4,503 jobs in 2010, the first year in which figures are available. These jobs pay relatively well, with an average annual salary of \$72,378 in 2021. The location quotient for this industry was 3.46, meaning that South Carolina had 3.46 times as many workers in this industry, as a percentage of the total workforce, than the national average. Projected 10-year employment growth in the industry is 16 percent. Key top occupations in employment in the industry include Miscellaneous Assemblers, Mechanical Engineers, and Industrial Production Managers with an average annual wage of \$97,290. (Unless otherwise noted, all dollar amounts in this report are average annual wages.)

BATTERY MANUFACTURING (NAICS 33591)

As with motor vehicle manufacturing, this industry includes lots of activity well outside of electric vehicles, such as the production of household batteries and smaller-scale lithium-ion products in personal electronics. This area is small enough, consisting of only 15 firms statewide in 2021, that official government data are suppressed to avoid revealing business information about specific companies. However, Lightcast, a private data subscription service, estimates there are 1,394 jobs in this industry paying \$99,255 on average, and that South Carolina's location quotient in this industry is 2.22.

Projected 10-year industry employment growth is 69 percent. Electrical, Electronic, Electromechanical (\$40,090) and Miscellaneous Assemblers (\$43,430) compose nearly 26 percent of the larger industry group of Other Electrical Equipment and Component Manufacturing (NAICS 335900). In addition, these are other top occupations in employment: Machinists (\$38,790), Industrial Engineers (\$86,820) and Laborers and Freight, Stock, and Material Movers, Hand (\$34,880).

CHARGING INFRASTRUCTURE

Currently, there is not a specific code for charger production, with this activity falling within the broader industry of "all other miscellaneous electric equipment and component manufacturing" (NAICS 335999). According to QCEW, this industry had 57 firms statewide with 722 jobs in 2021. The average annual salary was \$63,753, and the location quotient was 1.67. Projected 10-year industry employment growth is 38 percent. In addition, Pomega's (Colleton County) 3GWh capacity will exclusively target the grid-scale energy storage market.

In addition to deploying the chargers themselves, there will need to be upgrades to electrical infrastructure to support high-voltage facilities by electricity providers, i.e., the "electric power distribution" industry (NAICS 221122). QCEW data report that there are 118 South Carolina firms with 2,750 positions in this industry; those jobs pay \$85,857 on average, and the location quotient is 0.89. Projected 10-year employment growth is nine percent.

AUTOMOTIVE ELECTRICAL REPAIR (NAICS 811118)

Finally, there will need to be service technicians who can repair automotive parts and systems specific to electric vehicles. This industry, officially called “other automotive mechanical and electrical repair,” includes 99 firms with 532 jobs in South Carolina. Average annual pay is \$44,119, and the state’s location quotient is 1.62. Projected 10-year industry employment growth is 17 percent. Notably, beyond people maintaining these systems directly, it is expected that the increased weight of EVs (due to the heavy battery) will increase wear on tires, meaning that there may need to be additional workers to handle tire installation, rotation, etc. Automotive Service Technicians and Mechanics (\$39,490) compose 46 percent of this larger repair industry, Automotive Mechanical and Electrical Repair and Maintenance (NAICS 811110). Others include Automotive Body and Related Repairers, Supervisors of Mechanics, Installers and Repairers, and General and Operations Managers.

SUPPLY GAP ANALYSIS

To conduct a supply gap analysis, it was necessary to identify key occupations from which the EV industry would be hiring. To do this, data were collected from the U.S. Bureau of Labor Statistics, a review of job postings from existing EV factories in other states, and input from private sector partners in South Carolina. It is worth emphasizing that this work assumes status quo labor market conditions; these are backward-looking measures that cannot possibly reflect future changes to these occupations, including hiring by the companies that will be investing in South Carolina in the years to come.



OCCUPATIONS REQUIRING A POSTSECONDARY CREDENTIAL

Of the EV-related occupations identified, 21 required some form of postsecondary education, ranging from a certificate to a graduate degree. In each case, supply of workers (number of program completers) was compared to demand for workers (number of job openings). If demand exceeds supply, there is a gap in the available workforce. There were four instances where this gap consisted of more than 300 people per year. Those are highlighted in yellow in **Table 1** below, which summarizes the findings.

EV Supply Gap Analysis for Occupations Requiring a Postsecondary Credential

Occupation	SOC	Entry Education	Current SC Employment	Median Wage (Hourly)	Job Openings	2020 Openings	Projected Annual Job Openings (2030)	Program Completions	Supply-Gap
Design and Development									
Chemical Engineers	17-2041	Bachelor's Degree	397	\$42.05	33	78	28	16	(17)
Computer Occupations, All Other	15-1299	Bachelor's Degree	2,732	\$47.64	309	454	281	605	296
Electrical Engineers	17-2071	Bachelor's Degree	2,166	\$40.69	196	294	164	63	(133)
Engineering Technologists and Technicians, Except Drafters, All Other	17-3029	Associate Degree	971	\$34.52	116	178	106	24	(92)
Industrial Engineers	17-2112	Bachelor's Degree	6,654	\$41.71	626	629	531	149	(477)
Materials Engineers	17-2131	Bachelor's Degree	652	\$38.10	60	93	50	3	(57)
Mechanical Drafters	17-3013	Associate Degree	654	\$28.06	75	108	62	85	10
Environmental Engineers	17-2081	Bachelor's Degree	918	\$31.33	81	109	70	7	(74)
Mechanical Engineers	17-2141	Bachelor's Degree	5,539	\$39.66	465	602	381	257	(208)
Software Developers	15-1252	Bachelor's Degree	8,735	\$47.05	1,235	1,476	1,106	391	(844)
Electric Vehicle Maintenance									
Automotive Service Technicians and Mechanics	49-3023	Postsec. Non-Degree	10,366	\$17.69	1,167	1,275	1,105	298	(869)
Infrastructure Development									
Urban and Regional Planners	19-3051	Master's Degree	394	\$28.69	38	104	38	6	(32)
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	49-2095	Postsec. Non-Degree	393	\$35.34	41	98	36	11	(30)
Manufacturing									
Electrical and Electronic Engineering Technologists and Technicians	17-3023	Associate Degree	1,663	\$29.47	212	316	198	154	(58)
Electro-Mechanical and Mechatronics Technologists and Technicians	17-3024	Associate Degree	136	\$27.03	16	57	14	574	558
Industrial Engineering Technologists and Technicians	17-3026	Associate Degree	1,751	\$24.99	220	308	193	43	(177)
Mechanical Engineering Technologists and Technicians	17-3027	Associate Degree	704	\$29.47	85	102	77	19	(66)
Industrial Production Managers	11-3051	Bachelor's Degree	3,342	\$53.30	335	730	284	202	(133)
Logisticians	13-1081	Bachelor's Degree	3,352	\$33.69	455	628	445	92	(363)
Scientific Research									
Chemists	19-2031	Bachelor's Degree	1,495	\$29.98	180	235	160	19	(161)
Materials Scientists	19-2032	Bachelor's Degree	27	\$44.01	<10	<10	<10	0	Insufficient Data
Total			53,041					3,017	

Source: Lightcast Job Openings Data; NCES and IPEDS, 2021 Completions

The largest shortfalls occur in the Design and Development sector with **Software Developers** having 844 more open jobs than graduates to fill them, followed by **Industrial Engineers** with a 477-position supply shortfall. The Electric Vehicle Maintenance sector has a shortfall of an estimated 869 **Automotive Technicians and Mechanics** and the Manufacturing sector has a shortage of 363 **Logisticians**.

Software Developers work on software system development including battery management, motor control, user interfaces, and charging systems in electric vehicles. The average annual wage in this occupation is \$102,627, with the number of workers projected to grow by 61 percent in South Carolina by 2031. Seven college instructional programs located at several of the state's major colleges and other educational providers prepared the graduates for software development jobs in 2021.

Those programs, preceded by their Classification of Instructional Programs code, include:

- 110103 Information Technology
- 110104 Informatics
- 110201 Computer Programming, General
- 110401 Information Science/Studies
- 110701 Computer Science
- 140901 Computer Engineering, General
- 140903 Computer Software Engineering

Educational providers include:

- Benedict College
- Bob Jones University
- Charleston Southern University
- Claflin University
- Clemson University
- Coastal Carolina University
- College of Charleston
- Furman University
- Greenville Technical College
- Limestone University
- Presbyterian College
- South University-Columbia
- Strayer University-South Carolina
- Trident Technical College
- University of South Carolina Beaufort
- University of South Carolina-Columbia
- University of South Carolina-Upstate
- Wofford College

These programs produce graduates for several related occupations, including Computer Systems Analysts, Computer and Information System Managers, and Computer Network Architects, among others.

Industrial Engineers ensure that the production process of electric vehicles runs efficiently and smoothly. They organize quality control and assembly systems to improve workflow and productivity. They have an average annual wage of \$91,270, with jobs projected to grow by 20 percent by 2031. Seven college instructional programs located at several of the state's colleges prepared the graduates for industrial engineering jobs in 2021.

These programs include:

- 142701 Systems Engineering
- 143501 Industrial Engineering
- 143601 Manufacturing Engineering
- 151501 Engineering/Industrial Management
- 151503 Packaging Science

Educational providers include:

- Clemson University
- Francis Marion University
- South Carolina State University
- The Citadel
- University of South Carolina-Aiken
- University of South Carolina-Columbia
- University of South Carolina-Upstate

These programs produce graduates for several related occupations, including Architectural and Engineering Managers, Industrial Production Managers, and Postsecondary Engineering Teachers.

In the Maintenance sector, **Automotive Service Technicians and Mechanics** service and repair electric vehicles including batteries, motors and charging systems. They perform their work in manufacturing facilities, automotive dealerships and at other locations. They have an average annual wage of \$41,912, with seven percent growth projected by 2031. One college instructional program located at several of the state's colleges prepared the graduates for automotive service technicians and mechanics jobs in 2021, and in addition, automobile dealers may offer training programs for specific models or manufacturers.

The corresponding program code is 470604-Automobile/Automotive Mechanics Technology/Technician.

Educational providers include:

- Central Carolina Technical College
- Florence-Darlington Technical College
- Greenville Technical College
- Midlands Technical College
- Orangeburg Calhoun Technical College
- Piedmont Technical College
- Spartanburg Community College
- Tri-County Technical College
- Trident Technical College
- Williamsburg Technical College
- York Technical College

Other programs (which had no completers in 2021) produce graduates for several related occupations, including Transportation Equipment Electrical and Electronics Installers and Repairers, Mechanical Engineering Technologists, and First-Line Supervisors of Mechanics, Installers, and Repairers Technicians.

Logisticians coordinate the movement of materials and supplies into the production process and finished goods to the customers. They develop logistics plans that maintain inventory levels and coordinate with suppliers and internal production systems. They have an average annual wage of \$72,717, with employment projected to grow by 34 percent by 2031. Three college instructional programs located at numerous educational providers prepared the graduates for logistician jobs in 2021.

These programs include:

- 520201 Business Administration and Management, General
- 520203 Logistics, Materials, and Supply Chain Management
- 520205 Operations Management and Supervision

Educational providers include:

- Aiken Technical College
- Allen University
- Anderson University
- Benedict College
- Bob Jones University
- Central Carolina Technical College
- Charleston Southern University
- Claflin University
- Clemson University
- Clinton College
- Coastal Carolina University
- Coker University
- College of Charleston
- Columbia College
- Columbia International University
- Converse University
- Erskine College
- Florence-Darlington Technical College
- Francis Marion University
- Furman University
- Greenville Technical College
- Lander University
- Limestone University
- Midlands Technical College
- Miller-Motte College-Charleston
- Miller-Motte College-Conway
- Morris College
- Newberry College
- North Greenville University
- Northeastern Technical College
- Orangeburg Calhoun Technical College
- Presbyterian College
- South Carolina State University
- South University-Columbia
- Southern Wesleyan University
- Spartanburg Community College
- Spartanburg Methodist College
- Strayer University-South Carolina
- The Citadel
- Tri-County Technical College
- Trident Technical College
- University of South Carolina Aiken
- University of South Carolina Beaufort
- University of South Carolina-Columbia
- University of South Carolina-Upstate
- Voorhees College
- Winthrop University
- York Technical College

These programs produce graduates for several related occupations, including General and Operations Managers, Business Operations Specialists, and Industrial Production Managers.

Engineers in the Design and Development sector present a shortfall of graduates to meet demand. However, the general Computer Occupations position has more than sufficient graduates. In Manufacturing, the economy is short on completers for technicians and technologists. The lone bright spot was for Electro-Mechanical and Mechatronics Technologists and Technicians, where seven institutions produced more than enough graduates from a single program of instruction for that occupation.

OCCUPATIONS REQUIRING LESS THAN A POSTSECONDARY CREDENTIAL

The EV industry includes a number of occupations that may require some education or training, but less than a postsecondary credential. Because there are no postsecondary educational requirements, the available supply is more difficult to quantify. Theoretically, anyone with a High School Diploma can enter the occupations listed in **Table 2**; however, employers may require specific training or provide on-the-job training to prepare individuals for employment versus requiring a two-year or four-year degree.

EV Supply Gap Analysis for Occupations Not Requiring a Postsecondary Credential

Occupation	SOC	Entry Education	Current SC Employment	Median Wage (Hourly)	Job Openings	2020 Openings	Projected Annual Job Openings (2030)	Program Completions	Supply-Gap
Infrastructure Development									
Electrical Power-Line Installers and Repairers	49-9051	High School Diploma	2,886	\$30.21	300	571	251	23	(277)
Electricians	47-2111	High School Diploma	9,552	\$22.56	1,102	1,199	1,017	18	(1084)
Tire Repairers and Changers	49-3093	High school Diploma	1,360	\$14.05	179	212	176	0	(179)
Maintenance Workers, Machinery	49-9043	High School Diploma	1,117	\$28.55	154	180	146	22	(132)
Helpers—Installation, Maintenance, and Repair Workers	49-9098	High School Diploma	1,422	\$14.88	198	305	186	0	(198)
Manufacturing									
Computer Numerically Controlled Tool Operators	51-9161	High School Diploma	2,066	\$22.92	267	511	235	29	(238)
Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	51-2028	High School Diploma	4,778	\$18.25	773	870	720	No Data Available	No Data Available
Engine and Other Machine Assemblers	51-2031	High School Diploma	1,856	\$19.54	315	516	275	0	(315)
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	High School Diploma	11,904	\$17.61	1,715	1,748	1,574	16	(1699)
Laborers and Freight, Stock, and Material Movers, Hand	53-7062	No Formal Education	69,886	\$14.34	11,424	13,435	10,717	No Data Available	No Data Available
Machinists	51-4041	High School Diploma	10,232	\$16.61	1,291	1,369	1,187	70	(1221)
Maintenance and Repair Workers, General	49-9071	High School Diploma	26,641	\$18.35	3,061	4,494	2,888	0	(3061)
Structural Metal Fabricators and Fitters	51-2041	High School Diploma	1,013	\$18.79	115	261	95	1	(114)
Miscellaneous Assemblers and Fabricators	51-2098	High School Diploma	37,448	\$16.24	5,247	5,821	4,610	No Data Available	No Data Available
Transportation Inspectors	53-6051	High School Diploma	146	\$40.18	19	26	19	No Data Available	No Data Available
Total			182,308		26,160	31,518	24,096		

Source: Lightcast Job Openings Data; NCES and IPEDS, 2021 Completions

WORKFORCE AVAILABILITY AND OPPORTUNITIES TO ENHANCE THE STATE'S EXISTING WORKFORCE

Since August 2022, nine new projects have been announced, investing \$10B and bringing 8,400 new jobs to the state. The number of new EV-related jobs is expected to increase as new announcements are made. Building a workforce will be a top concern among the firms expanding or starting operations in South Carolina. Recruitment efforts will need to be multifaceted to attract and retain top talent, targeting the emerging workforce, existing workforce, incumbent workers, and dislocated workers or unemployed individuals. The EV industry offers a wide range of employment opportunities with the minimum educational requirements ranging from High School Diploma to Master's Degree. Some positions may require certifications and licensure and extensive on the job training that is not quantified in **Tables 1** or **2**. Average wages for these positions are competitive, ranging from \$17 per hour to \$50 per hour. Growth is projected across a majority of occupations, with Software Developers and Automotive Service Technicians and Mechanics growing the fastest.

WORKFORCE AVAILABILITY

Workforce availability is a key consideration as South Carolina prepares for EV expansion. South Carolina has approximately 75,629 unemployed residents who are looking for work. This number includes recent graduates, individuals released from prison, and individuals moving to the state. Further, South Carolina had 50,900 workers in 2022, according to the Bureau of Labor Statistics, who were employed part time for economic reasons, slack work, or business conditions, who could potentially fill the supply void.

Another source of labor supply are people not in the labor force but willing and able to work. This is a population that has been the interest of the Labor Force Participation Task Force commissioned by DEW. Survey results suggested that, of those who were employed prior to the pandemic, claimed unemployment benefits in 2020, and did not return to DEW wage records thereafter, 28 percent would be willing to reenter the labor force. The survey also showed that individuals face multiple barriers when considering a return to the workforce including transportation and child care. Opportunities to enhance the EV workforce should include strategies targeting each of these groups and address barriers to labor participation.

OPPORTUNITIES TO ENHANCE THE STATE'S EXISTING WORKFORCE

Cooperation, Collaboration, and Communication with Partners

South Carolina has a robust education and workforce system, consisting of multiple partners offering education, training, and job placement assistance, among other resources and services. A coordinated and collaborative approach will remove the risk of duplication and ensure that partner resources are appropriately leveraged. DEW will convene education and workforce partners to further develop and implement the strategies listed below.

Increase Awareness of EV Occupations

The emergence of e-mobility will create and expand high-growth, high-demand employment opportunities. A concerted effort should be made to educate the public about these jobs and the education and skills required, and to help individuals access employment preparation assistance.

Identify Education and Training Programs to Prepare Workers

Currently, there are no EV-specific two-year or four-year training programs available in South Carolina. However, there are several institutions of higher education that offer relevant credentials. See **pages 8-10** for a list of relevant programs and the institutions at which the programs are offered. The SC Technical College System (SCTCS), consisting of 16 technical and community colleges across South Carolina, offers Associate Degree programs relevant to 21 of the occupations listed in the supply-gap analysis on **page 7** of the report. SCTCS is currently evaluating EV curriculum options. Part of the evaluation will assess whether existing curriculum can be adapted to meet employer and industry skill requirements.

Customized workforce training solutions are available through partners like readySC, a division of the SC Technical College System, that works with companies to discover the skills, knowledge, and abilities needed at their facility and to design and deliver customized training solutions to prepare a workforce for the company. AESC and Scout will have on-site training facilities where this type of customized training can occur.

Clemson University is launching the nation's first undergraduate Bachelor of Science program in automotive engineering to meet the rapidly changing needs of the automotive industry. The new program, expected to start in fall 2023, adds to the offerings at its Greenville, SC CU-ICAR (Clemson University International Center for Automotive Research) campus. Clemson also received a National Science Foundation (NSF) grant to develop training for EV manufacturing and EV automotive service technician occupations. The curriculum will be available for use nationwide, for secondary and postsecondary instruction, and is expected to launch in 2025.

Secondary education also offers opportunities for high school students to enter EV-related education and career pathways. The Department of Education and the Office of Career and Technical Education, is reviewing state standards to ensure alignment with occupational skill requirements and industry needs. For example, Automotive Service Technician programs are being modified to incorporate instruction on servicing EV and hybrid vehicles. The Department is also identifying schools or career centers to become sites for new or modified programs and providing EV professional development. New standards are expected by fall 2023.

Original Equipment Manufacturers (OEMs) each have their own unique training programs for service and maintenance of the equipment. This is true for automotive OEMs as well as charging equipment manufacturers. For example, Thomasville, the manufacturer of the electric school buses procured by the Department of Education, will provide training to the Department's service technicians on the specific service and maintenance requirements for the school buses. Ford, Volvo, and Kia are among the passenger vehicle OEMs that have developed service technician training. The Automotive Service Excellence (ASE) Education Foundation has developed and is testing EV standards and certification for automotive service technicians. Similarly, ABB Mobility and ChargePoint, two of the major manufacturers of charging equipment, also provide OEM-specific training for the maintenance of their charging equipment.

Develop Clear and Comprehensive Career Pathways

The development of clear and comprehensive career pathways will help to organize the available education and training options into a succinct map, helping individuals, especially students, parents, and counselors understand the education, certifications or licensures required to progress from entry level to advanced occupations within the EV industry. Effort should also be made to assist employers with developing employer-specific pathways to facilitate worker recruitment and retention strategies.

Promote Work-Based Learning Opportunities and Continue Expansion of Apprenticeship Programs

Work-based learning programs provide individuals an opportunity to explore different types of jobs and careers. Career exploration is especially important for youth or individuals who have limited work experience. Employers should be encouraged to work with educators to offer tours, job shadowing, internship, and externship opportunities. Pre-apprenticeship and apprenticeship programs are a primary form of work-based learning. The BMW Scholars Program is an example of an apprenticeship program that allows students to attend class full-time at a local technical or community college while working part-time at BMW. The Scholars Program will serve as a critical pathway for hiring new employees. Create Opportunity's partnership with Midlands Technical College is another great example of an apprenticeship program creating pathways into critical software developer occupations, which are expected to be in high demand in the coming years. No prior knowledge, educational background, or experience is required for the Create Opportunity program. Individuals engage in an intense, six-month training following by a two-year, paid software development apprenticeship with local employers.

Overall, South Carolina has done an exceptional job at expanding registered apprenticeship programs in the state. Effort should be made to register apprenticeship programs at each of the facilities announced recently and develop an apprenticeship job board where individuals can learn about and apply for these apprenticeship offerings.

Expand Prison Reentry Programs and Efforts to Reintegrate Offenders

Approximately 5,000 inmates are released each year in South Carolina. Programs at the Manning and Camille Griffin Graham Correctional Facilities help inmates prepare for employment post-release by providing soft skills and employability instruction, assisting with the development of a resume, and connecting inmates to employers. Expanding these programs to other state and county facilities could increase the number of inmates prepared to enter the workforce upon release. Additional policy considerations may include removing the box from job applications, allowing ex-offenders to gain critical certifications and licensures, and encouraging employers to revisit hiring policies that create barriers to hiring ex-offenders.

Recruit Retiring Military with Transferrable Skills

Military retirees are a major asset to South Carolina's workforce. There are 397,649 military veterans in South Carolina and the state has the 8th highest total of military retirees in the nation. In 2022, the governor signed the Workforce Enhancement and Military Recognition Act, which exempts all military retirement pay that is included in South Carolina taxable income from the state's Income Tax, no matter the taxpayer's age. This deduction also can be claimed by a surviving spouse receiving military retirement income from their deceased spouse. This incentive will help to retain retirees and attract new retirees and their families to the state. Military retirees have a diverse skill set and add value to the state's workforce. Currently, Military veterans have a higher concentration than non-Veterans in the following occupations: management, business, and financial operations, construction and extraction, installation, maintenance, and repair, production, and transportation and material moving, some of which are critical to the EV ecosystem. A concerted effort should be made to recruit transitioning military to high-demand occupations and those with critical shortages and to provide training and upskilling opportunities to address any skill gaps.

Invest in Upskilling Existing Workforce through Incumbent Worker Training Programs

Many workers will need to reskill as their employers transition and ramp up EV production. Reskilling will also help with employee retention. Funding should be identified and strategically deployed to offset the cost of reskilling to employers.

Continue Support of Existing Industry to Ensure Growth and Expansion

South Carolina's automotive manufacturers will continue to produce Internal Combustion Engine or ICE vehicles, and the evolution of manufacturing in general, requires a highly skilled workforce. While we pivot to create talent pipelines for the EV industry and assist new companies with recruiting and hiring, we must continue to support the needs of existing industry to ensure continued growth and expansion in South Carolina.

Invest in Transportation and Child Care Assistance

Access to transportation and availability of child care can prevent individuals from entering the workforce. Access to transportation is a key barrier in rural areas of the state where public transit services are limited. Investments in transportation and child care must be made so that more options are available. Funding could be used to expand public transit, or introduce new modalities such as ride sharing programs, and to either subsidize child care costs or incentivize the creation of new child care options. For example, Scout will provide child care stipends to eligible employees and provide access to an on-site child care facility.

RECOMMENDED STATUTORY OR REGULATORY CHANGES

Growth of the EV ecosystem is moving fast. Workforce demand currently outpaces supply in several key occupations. We expect this trend to continue as the industry expands even further. A coordinated and collaborative approach is needed to further develop and implement the workforce strategies outlined in this report. DEW will serve as the convener of the workforce system to ensure that partner resources and expertise are leveraged and to avoid duplication in responding to the needs of new and current employers.

South Carolina has a robust education and workforce system including assets like Career and Technical Education programs at local high schools, 33 institutions of higher learning, including technical and community colleges, four-year comprehensive institutions, research institutions, ReadySC, Apprenticeship Carolina, SC Works, and much more. Act 67, the Statewide Education and Workforce Development Act, signed into law on May 19, 2023, is a critical step toward coordinating these resources into a well-organized and responsive education and workforce system. Act 67 expands the Coordinating Council for Workforce Development (CCWD), names the Director of the Department of Employment and Workforce as the Chair of the CCWD, and creates the Office of Statewide Workforce Development. The Act creates the environment and expectation for collaboration, which are vital ingredients for carrying out the strategies identified in this report.

At this time, there are no recommended statutory or regulatory changes or enhancements related to the state's existing workforce development mechanisms.

CONCLUSION

The development of a workforce plan for the EV industry is an iterative process and this report is just the beginning. South Carolina will undertake a deeper, intentional workforce planning process to identify short and long-term initiatives and action items to prepare a skilled workforce for the EV economy.



APPENDIX: METHODOLOGY AND STAKEHOLDER CONSULTATION

Data Gathering and Analysis

The federal data programs on which this analysis is based does not have explicit coding for EV industries or occupations; they are part of existing industry (North American Industry Classification System (NAICS)) and occupational (Standard Occupational Classification (SOC)) coding structures. The analysis highlights the occupations involved in the electric vehicle workforce but also encompasses the employment statistics in other industries in which they work. Identification of the EV economy comes from a variety of sources, including:

- U.S. Bureau of Labor Statistics, https://www.bls.gov/green/electric_vehicles/
- Labor Insight (Burning Glass Technologies), The Conference Board, Help Wanted Online®
- Lightcast™ /EMSI, Employment and Openings data
- National Center for Education Statistics (NCES), Integrated Postsecondary Education Data System (IPEDS) for 2021 S.C. postsecondary program completers, instructional program to occupational crosswalk connections (CIP-SOC)
- U.S. Bureau of Labor Statistics, Occupational Employment to allocate completers to occupations

The EV occupation listing was developed from examination of data from U.S. Bureau of Labor Statistics Green jobs information, Labor Insight/The Conference Board, Help Wanted Online® job postings data analysis for companies and states with an EV workforce, and occupational staffing patterns of industries involved in the EV economy. Additionally, companies in the state involved in EV provided input. The final listing of EV occupations was divided into functional sectors as shown in **Table 1**.

From sources listed above, Lightcast™/EMSI annual job openings by occupation served as labor demand. This data originates from DEW's Occupational Employment Projections program, where annual job openings are a key data element computed. Determining labor supply was a bit more complex. The source came from recent graduates from postsecondary instructional programs in the state. The process to match the graduates to occupations involved two steps. First, the NCES CIP-SOC crosswalk file was used as a connection from instructional program (CIP) to occupations (SOC) which the programs prepared graduates to fill. Many of the programs can prepare students for several occupations, and many occupations have several programs from which come graduates for work.

The Integrated Postsecondary Education Data System (IPEDS) provides the number of postsecondary program completers, delineated by CIP. For step two, when a CIP matched to multiple occupations, the number of completers would be prorated to the occupations by the level of employment in the occupations.

Therefore, occupations with higher levels of employment would receive higher shares of completers. For one-to-one matches all completers would be allocated to the occupation. The final product is a listing of the number of program completers by occupation, representing labor supply. For each occupation, the number of program completers is subtracted from the number of job openings to reveal the labor supply gap as shown in **Table 1**.

Stakeholder Consultation

The EV Workforce Study was presented to business, industry, education providers, and other state agencies and departments as required in the Executive Order. Additionally, the report was distributed to select partners for review and comment before submission. Feedback was collected and incorporated into the report. Stakeholder engagement will continue as partners work together to further develop and implement the strategies aligned in the report.



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