SOUTH CAROLINA DEPARTMENT OF
Employment and Workforce

South Carolina Electric Vehicle Activity

Evaluation and Analysis of the Electric Vehicle Workforce in South Carolina

Dr. Bryan Grady, AED Labor Market Information

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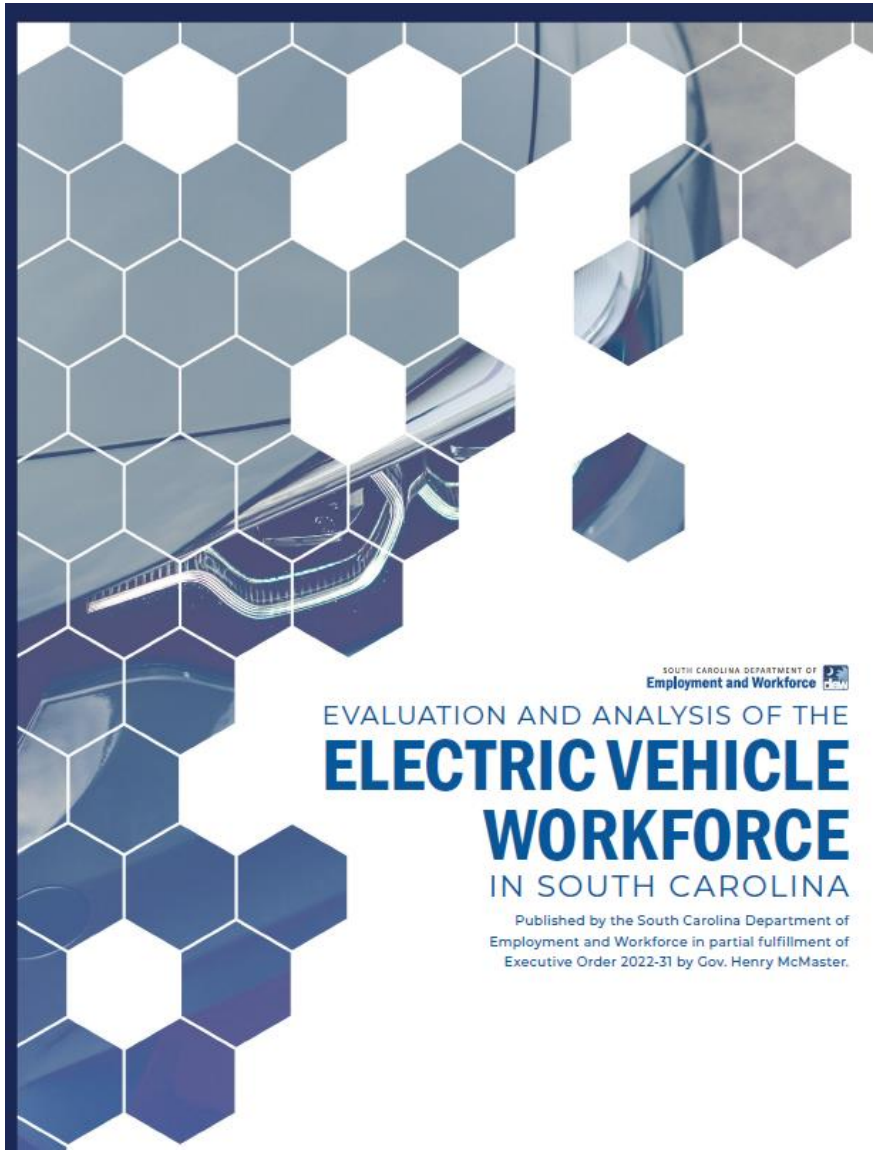


Evaluation and Analysis of the Electric Vehicle Workforce

Findings of the EV Workforce Study

- Highlights industries that currently support the EV ecosystem
- Lists EV-related occupations, current job openings, and the number of program completions
- Identifies several key occupations projected to have an undersupply of labor:
  - Software developers
  - Automotive service technicians and mechanics
  - Logisticians
- Provides recommended workforce development strategies

EV Labor Market Information

Dr. Bryan Grady

SOUTH CAROLINA DEPARTMENT OF
Employment and Workforce

Defining the Industry

- There is no standard definition of the EV industry.
  - As such, there is limited data available.
  - EV data is intermixed with other traditional sectors.

- In general, the EV workforce is likely to engage in four areas:
  1. Vehicle manufacturing
  2. Battery manufacturing
  3. Service/maintenance work
  4. Infrastructure
     - Charging stations
     - Utility work associated with increased electricity demand

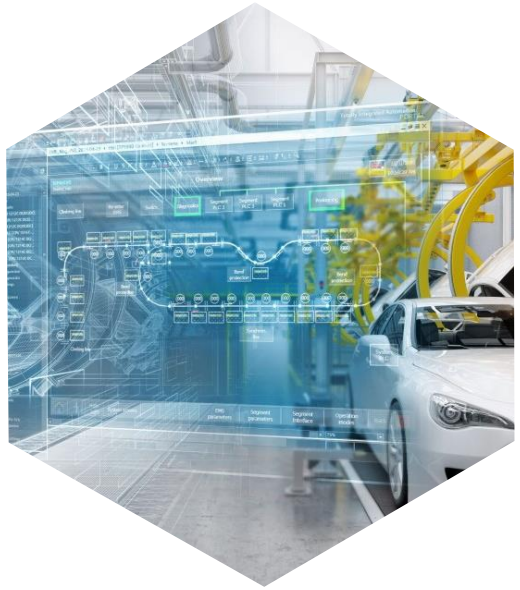
SC Private Employment by EV-Related Industry

	Motor Vehicle Manufacturing (NAICS 3361)	Battery Manufacturing (33591)	Specialized Auto. Repair (811118)	Infrastructure (335999 & 221122)	Total
2011 Annual	4,784	805	1,027	2,819	9,435+
2021 Annual	12,783	1,618	936	4,534	19,871+
2022 Annual	13,585	743	1,005	4,749	20,082+
2023 Annual	14,422	691	1,045	4,967	21,125+

Note: EV activity is contained within these sectors. For example, the production of Volvo and BMW internal combustion engine (ICE) vehicles currently appears in Vehicle Manufacturing. There is currently no way to differentiate EV and ICE in the Bureau of Labor Statistics (BLS) data. Similarly, 33591 contains all Battery Manufacturing employment, which could include plants making batteries for non-EV purposes.

Source: JobsEQ

SC Private Employment Compensation



Industry	Average Annual Pay			
	2011	2021	2022	2023
Motor vehicle manufacturing	$73,064	$72,370	$75,422	$80,689
Battery manufacturing	$53,387	$75,474	$76,407	$81,482
Specialized auto. repair	$32,248	$44,212	$47,380	$49,322
Infrastructure	$51,410	$63,329	$66,403	$66,417
Total, all industries	$37,519	$50,971	$54,142	$56,478

Source: JobsEQ

Labor Demand by Occupation

What positions have existing EV-related facilities in other states been hiring for over the last 12 months?

SOC	Description	Job Openings
49-9071	Maintenance and Repair Workers, General	1,376
17-2112	Industrial Engineers	1,263
15-1252	Software Developers	903
49-3023	Automotive Service Technicians and Mechanics	712
17-2071	Electrical Engineers	511
15-1299	Computer Occupations, All Other	352
17-2041	Chemical Engineers	51
17-3029	Engineering Technicians, Except Drafters, All Other	49

Source: JobsEQ job posting data for Tesla; Lucid; and Rivian

Skills Required: EV Job Posting Characteristics

Minimum Education Requirements

Educational Degree	Postings
High school diploma or equivalent	2,264
Associate's degree	636
Bachelor's degree	7,650
Master's degree	287
Doctoral or professional degree	114

Most Common Programs of Study Requirements

Program of Study	Postings
Engineering	2,352
Mechanical Engineering	2,083
Computer Science	1,581
Electrical Engineering	1,214
Business	623
Electrical	623

Source: Lightcast/Help Wanted OnLine job posting data for Tesla (CA, NV, and TX); Lucid (AZ); and Rivian (IL)

EV Supply Gap Analysis for Occupations Requiring a Postsecondary Credential

Occupation	SOC	Entry Education	Current SC Employment	Median Wage	Postsecondary Job Openings	Projected Annual Job Openings	Job Postings (10/22-9/23)	Program Completions	Supply-Gap
Design and Development									
Chemical Engineers	172041	Bachelor's degree	371	$45.03	36	37	818	34	2
Computer Occupations, All Other	151299	Bachelor's degree	4,023	$45.78	388	415	4,280	484	-96
Electrical Engineers	172071	Bachelor's degree	2,432	$40.32	210	216	1,835	74	136
Engineering Technologists and Technicians, Except Drafters, All Other	173029	Associate's degree	868	$37.41	78	112	710	47	31
Industrial Engineers	172112	Bachelor's degree	6,769	$40.65	555	600	2,536	405	150
Materials Engineers	172131	Bachelor's degree	591	$39.03	50	52	85	49	1
Mechanical Drafters	173013	Associate's degree	664	$29.40	60	66	222	42	18
Environmental Engineers	172081	Bachelor's degree	646	$42.20	54	58	274	105	-51
Mechanical Engineers	172141	Bachelor's degree	4,764	$39.71	381	398	1,817	320	61
Software Developers	151252	Bachelor's degree	12,106	$47.42	1,480	1,539	5,508	419	1,061
Electric Vehicle Maintenance									
Automotive Service Technicians and Mechanics	493023	Postsecondary nondegree award	13,618	$21.01	675	1,187	4,841	116	559
Infrastructure Development									
Urban and Regional Planners	193051	Master's degree	424	$29.84	42	46	109	41	1
Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	492095	Postsecondary nondegree award	335	$33.18	37	44	17	7	30
Manufacturing									
Electrical and Electronic Engineering Technologists and Technicians	173023	Associate's degree	2,042	$30.17	136	253	1,011	52	84
Electro-Mechanical and Mechatronics Technologists and Technicians	173024	Associate's degree	174	$31.58	21	26	389	4	17
Industrial Engineering Technologists and Technicians	173026	Associate's degree	1,834	$29.36	85	232	4,439	73	12
Mechanical Engineering Technologists and Technicians	173027	Associate's degree	1,015	$28.29	108	125	194	17	91
Industrial Production Managers	113051	Bachelor's degree	3,004	$51.53		574	1,535	Requires Experience	Requires Experience
Logisticians	131081	Bachelor's degree	4,725	$34.82	491	569	1,167	70	421
Scientific Research									
Chemists	192031	Bachelor's degree	1,379	$28.49	140	144	327	96	44
Materials Scientists	192032	Bachelor's degree	46	$46.72	7	7	18	7	0
Totals			**61,830**					**2,462**	

Source: Lightcast, IPEDS, and SC Department of Employment and Workforce.

SOUTH CAROLINA DEPARTMENT OF Employment and Workforce

EV Occupations Not Requiring a Postsecondary Credential

Occupation	SOC	Entry Education	Current SC Employment (1Q 2024)	Median Wage (Hourly)	Job Openings (last 30 days)	2023 Total Job Openings	Projected Annual Openings (2032)
Infratstructure Development							
Electrical Power-Line Installers and Repairers	49-9051	High School Diploma	2,888	$37.70	87	387	266
Electricians	47-2111	High School Diploma	9,614	$27.40	483	1,721	868
Tire Repairers and Changers	49-3093	High School Diploma	1,916	$18.40	107	333	211
Maintenance Workers, Machinery	49-9043	High School Diploma	1,194	$27.65	2	9	121
Manufacturing							
Helpers -- Installation, Maintenance, and Repair Workers	49-9098	High School Diploma	1,655	$18.60	15	64	210
Computer Numerically Controlled Tool Operators	51-9161	High School Diploma	3,266	$24.95	141	648	273
Electrical, Electronic, and Electromechanical Equipment Assemblers, Except Coil Winders, Tapers, and Finishers	51-2028	High School Diploma	4,674	$21.20	70	391	643
Engine and Other Machine Assemblers	51-2031	High School Diploma	1,381	$25.65	7	34	144
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	High School Diploma	14,825	$22.70	601	2,000	1,864
Laborers and Freight, Stock, and Material Movers, Hand	53-7062	High School Diploma	60,075	$18.75	1,399	7,714	10,180
Machinists	51-4041	High School Diploma	6,833	$26.00	227	744	813
Maintenance and Repair Workers, General	49-9071	High School Diploma	29,319	$24.05	3,880	13,627	3,103
Structural Metal Fabricators and Fitters	51-2041	High School Diploma	919	$23.85	38	167	73
Miscellaneous Assemblers and Fabricators	51-2098	High School Diploma	36,568	$21.15	126	671	5,697
Transportation Inspectors	53-6051	High School Diploma	172	$41.60	12	45	12
Totals			**175,299**		**7,195**	**28,555**	**24,478**

800+ occupations in South Carolina

Where does the state focus?

Step A
Separate by typical education required for entry into occupation

397 of these occupations typically require for entry:
higher education credential
(e.g., certificate, associates degree, bachelor's degree, etc.)[1]

435 of these occupations typically require for entry:
high school diploma or less

Step B
Separate based on Supply Gap Analysis

71 of these occupations have **medium (100-250) or high (250+) supply shortage**

241 of these occupations exceed demand, meet demand, or have a low shortage[2]

Supply Gap is unavailable for occupations requiring a high school degree or less.

Step C
Separate based on SC Priority Occupation Calculation

62 of these occupations scored above the median in the S.C. calculation of **priority occupations**

168 priority occupations

106 of these occupations scored above the median in the S.C. calculation of **priority occupations**

[1] Supply Gap Analysis includes 312 occupations. The other 85 were either (a) collapsed together, such as postsecondary teacher history and postsecondary teacher English were collapsed into postsecondary teacher; or (b) dropped because they required 5+ years experience, etc. [2] 50 meet or exceed demand; 190 have shortage of less than 100

S.C. Priority Occupation Calculation

	Step 1: For all S.C. occupations, obtain the number for each variable	Step 2: Objectively rank occupations from highest to lowest, then assign a percentile	Step 3: Multiply the percentile in Step Two by a subjective weight	Step 4: Obtain raw score for each variable	Step 5: Add together the raw scores for each variable to determine if it is above the median score of 50
Current Demand	Number of online job ads in S.C. for the prior calendar year	Example: Highest number of current job openings in S.C. is 99.9 percentile	40%		Any score above 50 = Priority Occupation
Future Growth	Projected number of future openings in S.C. over next ten years divided by current number employed in S.C.	Example: Highest number of future openings in S.C. is 99.9 percentile	20%		(96 occupations scored 75-100) (291 occupations scored 50-75) (347 occupations scored 25-50) (106 occupations scored 0-25)
Viability	Mean annual wage in S.C. for the occupation	Example: Highest wage in S.C. is 99.9 percentile	20%		*Note: Occupations typically requiring a higher education credential for entry must have a medium (100-250) or high (250+) supply gap shortage and score above 50 to be considered a priority occupation
Retention	Annual turnover in S.C. for each occupation as percent of total employment in S.C. for that occupation	Example: Lowest turnover in S.C. is 99.9 percentile	20%		

Priority Occupations

Information Technology Example

Software Developer

	Step 1	Percentile Step 2	x Weight Step 3	= Raw Score Step 4	Total Score Step 5
Current Demand	3,215 job postings	95.5%	40%	38.20	Do scores in Step 4 total 50 or more? Yes (94.84) So, this is a Priority Occupation
Future Growth	38.48%	99.29%	20%	19.86	
Viability	$114,900 mean wage	93.40%	20%	18.68	
Retention	5.96% turnover	90.50%	20%	18.10	

High Value Credentials

Architecture & Construction Example

Electricians

	Step 1	Percentile Step 2	x Weight Step 3	= Raw Score Step 4	Total Score Step 5
Current Demand	1,241 job postings	88.10%	40%	35.24	**Do scores in Step 4 total 50 or more?** **Yes** (72.65) **So, this is a Priority Occupation**
Future Growth	14.50%	80.95%	20%	16.19	
Viability	$55,300 mean wage	53.20%	20%	10.64	
Retention	9.13% turnover	52.90%	20%	10.58	

Priority Occupations

Number of Priority Occupations

(by career cluster[1] and education typically required to enter the occupation)

Career Cluster	Occupation typically requires the following for entry: High School diploma or less	Higher Education Credential
Agriculture, Food & Natural Resources	2	0
Architecture & Construction	20	4
Arts, Audio/Video Technology & Communications	3	1
Business Management & Administration	7	5
Education & Training	1	5
Finance	3	6
Government & Public Administration	2	1
Health Science	6	18
Hospitality & Tourism	11	0
Human Services	4	4
Information Technology	0	7
Law, Public Safety, Corrections & Security	9	3
Manufacturing	15	0
Marketing	9	2
Science, Technology, Engineering & Mathematics	0	3
Transportation, Distribution & Logistics	11	3

[1] The 16 career clusters are utilized by the S.C. Department of Education in K-12 schools. The clusters originate from the U.S. Department of Education's Office of Vocational and Adult Education (OVAE) and National Association for State Directors of Career Technical Education Consortium (NASDCTEc).

EV Workforce Development Strategies

Nina Staggers

SOUTH CAROLINA DEPARTMENT OF
Employment and Workforce

Potential Workforce Strategies

- Cooperation, collaboration, and communication with partners
- Increase awareness of EV occupations
- Identify education and training programs to prepare workers
- Develop clear and comprehensive pathways/tools
- Promote work-based learning opportunities
- Expand reentry programs and efforts to reintegrate ex-offenders
- Recruit transitioning military
- Invest in upskilling through Incumbent Worker Training
- Invest in transportation and childcare assistance
- Prioritize digital literacy and soft skills

Alignment with Unified State Plan (USP)

Vision Achieve and sustain South Carolina's workforce potential.

Mission Through collaboration and coordination, align and enhance South Carolina's education and workforce system so that is readily accessible, highly effective, and easily understandable.

Awareness

Skills

Obstacles

Awareness

Goal:

Increase understanding about the top industries in S.C., diverse array of occupations within them, and services available to assist employers and individuals prosper.

Strategies:

1. Increase the understanding about top industries in S.C. and pathways to the diverse array of occupations within them for students at all levels and their guardians, as well as those not in the labor force or underemployed.

2. Increase S.C. employers' understanding of services available to assist them in hiring/retaining South Carolinians.

3. Decrease the number of contacts a S.C. employer must make within state government to address issues related to education and workforce.

EV Aligned Objectives:

- Increase awareness of EV occupations
- Cooperation, collaboration, and communication with partners
- Recruit transitioning military
- Develop clear and comprehensive pathways/tools

Skills

Goal:

Increase skills and experiences, of South Carolinians at all ages, to ensure they can progress through the career path of their choice.

Strategies:

1. Increase participation in work-based learning experiences for students at all levels and adults reentering the workforce.
2. Increase the percentage of the S.C. labor force holding a high value credential.
3. Increase the percentage of individuals who, after attaining a credential in S.C., are employed in S.C., participating in a year of service in S.C., or enrolled in additional education.

EV Aligned Objectives:

- Identify education and training programs to prepare workers
- Invest in upskilling through Incumbent Worker Training
- Expand reentry programs and efforts to reintegrate ex-offenders
- Prioritize digital literacy and soft skills
- Promote work-based learning opportunities

Obstacles

Goal:

Increase options overcome barriers South Carolinians face when attempting to access education and enter the workforce.

Strategies:

1. Increase the number of available and affordable childcare options for guardians entering the workforce or obtaining education.

2. Increase the number of eligible workers living within a close proximity drive, or bus/bike ride, of the largest employment center in each county.

3. Increase the number of transit options for individuals without vehicles to get to work.

EV Aligned Objectives:

- Invest in transportation assistance
- Invest in childcare assistance

Statewide Efforts to Build EV Talent Pipeline

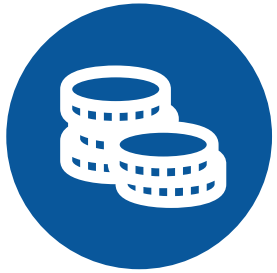
SC Unified State Plan for Education and Workforce

ExploreSC@Work Campaign

SC Career Readiness Program

K-12 and Postsecondary Education and Training Programs

Funding to Local Workforce Development Boards



SC WINS Funding

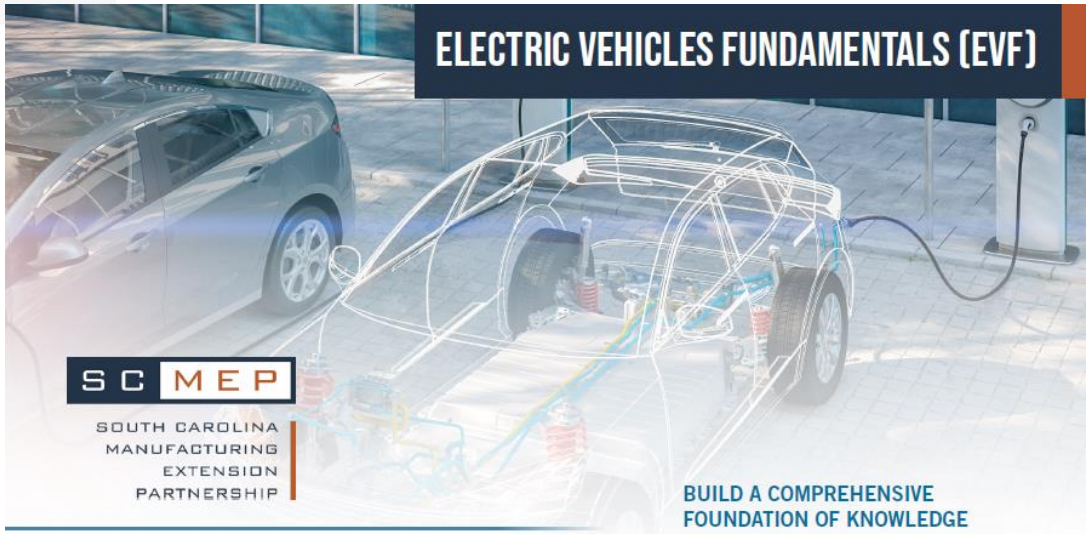
SOLAR UNITED NATIONAL

HOME EV CHARGING SOLAR AND STORAGE **WORKFORCE DEVELOPMENT** ABOUT CONTACT

SUN WORKFORCE DEVELOPMENT

TRAINING SITES

Sun is creating 10 workforce development training centers access South Carolina, with the goal of offering future training sites across the country. With multiple committed centers, we are working towards our towards our goals. Each center will focus on the unique heritage offered by the community. Every site doubles as a resiliency hub providing services during disasters.



CERTIFICATION

AS OF 2022, THERE WERE NEARLY 20 MILLION ELECTRIC VEHICLES (EV) ON THE ROAD AROUND THE WORLD*

To help meet the growing demand for EVs and battery-operated devices, SME is introducing its first Electrification Certification, Electric Vehicles Fundamentals, to increase talent in the EV industry. This credential is designed for entry-level positions in the areas of automotive assembly and production for electric vehicles. The EV Fundamentals will also provide the necessary skills for individuals with no background in vehicle production and assembly or for individuals who have experience in this area but need to tailor their knowledge to the EV market. The credential is ideal for high school and college students, dislocated workers, under-employed individuals, veterans, at-risk youth, and others who are seeking new employment in a new, fast-growing industry.

SHORT-TERM, COMPREHENSIVE TRAINING

The online classes from Tooling U-SME cover topics agreed upon by manufacturing experts as being relevant for foundational EV

BUILD A COMPREHENSIVE FOUNDATION OF KNOWLEDGE

This program focuses on the fundamentals of electric vehicles required as a starting point for any career pathway a candidate may pursue in the field of EV:

- EV Production and Assembly
- Safety
- Quality
- Measurement
- Math Fundamentals
- Blueprint Reading
- Robotics
- Electrical Units
- Power Sources and Variables
- Battery Components and Management
- Fundamentals of Electric Mobility

EARN A NATIONALLY RECOGNIZED CERTIFICATION

The SME Electric Vehicles Fundamentals (EVF) is focused on the fundamentals of Electric vehicles. The credential can help individuals begin a lifelong career in a growing industry where there is opportunity for advancement and good-paying jobs.

sme.org/EVF

SOUTH CAROLINA DEPARTMENT OF
Employment and Workforce

ELECTRIC VEHICLE FUNDAMENTALS
COURSE CODE: TBD

COURSE DESCRIPTION: In the EV Fundamentals course, students will build on their foundational knowledge of circuits, electricity, and power from Clean Energy Systems in order to explore electric vehicles (EV), high voltage batteries, and the impact of emerging technologies on EV manufacturing and the charging infrastructure.

Students will engage in a variety of hands-on design projects to demonstrate principles using advanced technology hardware and software, including the assembly, testing, and improvement of an electric vehicle/trainer. This course will also prepare students for the ASE xEV Electrical Safety Awareness (Level 1) certification.

OBJECTIVE: Given the necessary equipment, materials, and instruction, students, on completion of the prescribed course of study, will be able to successfully accomplish the following core competencies.

CREDIT:	1 (120 hours) Carnegie unit
PREREQUISITE:	Clean Energy Systems (SREB)
GRADE:	11 - 12
COMPUTER ACCESS:	1 computer w/ internet access per student
MAXIMUM ENROLLMENT:	16 – 20 per instructor

STUDENT ORGANIZATIONS

Proficient professionals know the academic subject matter, including professional development, required for proficiency within their area. The following accountability criteria are considered essential for students in any program of study.

1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.
3. Explain the benefits and responsibilities of being a member of a CTSO.
4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.
5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.

TECHNOLOGY KNOWLEDGE

Proficient professionals know the academic subject matter, including digital citizenship and the ethical use of technology. The following accountability criteria are considered essential for students in any program of study.

Florence's battery plant will create 2,700 jobs. Here's how F1 schools plans to fill them.

BY G.E. HINSON GHINSON@POSTANDCOURIER.COM
APR 9, 2024

Florence 1 Schools partnered with AESC to create a mechatronics program.
G.E. HINSON/STAFF

FLORENCE — Florence 1 Schools is reviving a program to prepare students for jobs at Florence County's AESC electric vehicle battery plant.

, Computing and Applied Sciences; University News

University to launch nation's elor of Science program in ve engineering

aunching the nation's first undergraduate Bachelor of Science engineering to meet the rapidly changing needs of an industry that is ternal combustion engine for batteries and human drivers for self-

ifies Clemson's position as the premier University for automotive nd education in the Southeast and beyond and adds to the offerings reenville campus, the Clemson University International Center for (CU-ICAR).

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of Engineering, Computing and Applied Sciences; Research

consortium to create the next-generation of innovation and talent for the electric vehicle industry

Clemson News

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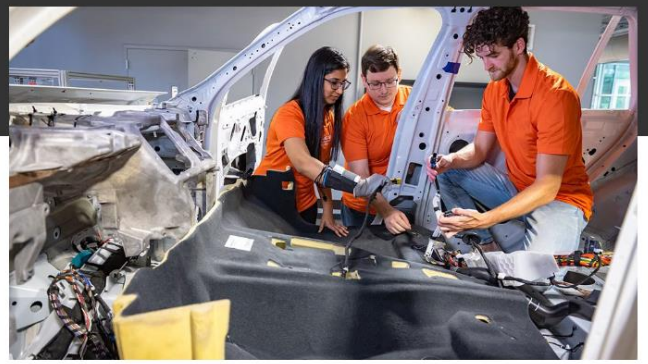

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April 27, 2022

The unprecedented need to develop a workforce that can build and service electric and autonomous vehicles and develop the cybersecurity to protect them is the driving force behind a new consortium based in South Carolina.

The consortium, named "Collaborative Research: REVVED," short for Revolutionizing Electric Vehicle Education, is receiving $2.83 million from the National Science Foundation to fund the project.

Trident Technical College is working in partnership with Greenville Technical College, Spartanburg Community College and Clemson University as part of the consortium. Several workforce development centers and industry partners are also involved.

The consortium will conduct evidence-based research studies to

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South Carolina Daily Gazette

CRIMINAL JUSTICE ECONOMY + WORKFORCE EDUCATION ELECTION 2024 HEALTH STATEHOUSE

ECONOMY + WORKFORCE

SC readying training for EV workers across the state. Here's what job seekers can expect.

BY: JESSICA HOLDMAN - FEBRUARY 26, 2024 7:00 AM

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UNIVERSITY OF South Carolina

SEARCH SC.EDU

STUDY EXPERIENCE VISIT ADMISSIONS RESEARCH ABOUT NEWS & EVENTS ATHLETICS

Charged an
to go

Phalanx of USC researchers

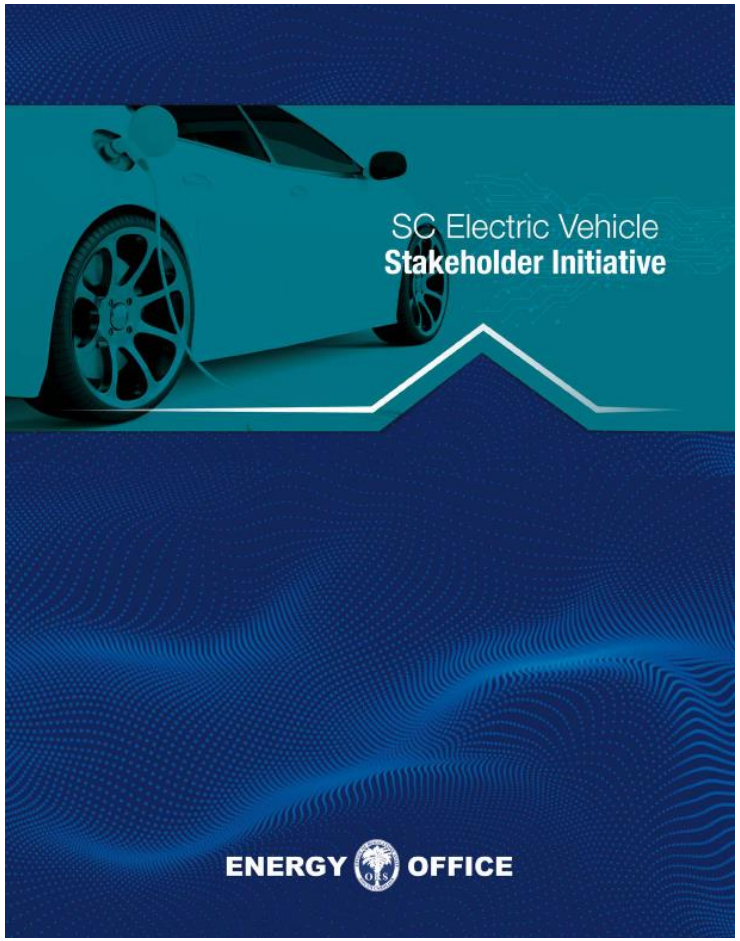
How to Plug in to EV Activity

- SC Electric Transportation Network
- Southeast Electric Transportation Regional Initiative (SETRI)
- SC Electric Vehicle Interagency Work Group

Southeastern Electric Vehicle Collaborative

- Started in 2022
- Eight states in DOL Region 3
- Facilitated by Education Strategy Group
- Focused on supporting the regional electric vehicle cluster through:
  - Outreach
  - Skill/credential attainment
  - Employer engagement
- November meeting hosted in SC

EV Tools and Resources



[EV Stakeholder Initiative]

[SC 2023 NEVI Plan]

[Building an EV Workforce]

Q&A

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