

LABOR MARKET ANALYSIS

FOR PROGRAM EXPLORATION



C·O·E

CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

ELECTRICAL TECHNOLOGY IN THE GREATER SACRAMENTO REGION

North (Greater Sacramento)
Center of Excellence

NOVEMBER 2022

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SUMMARY

The North (Greater Sacramento) of Excellence for Labor Market Research prepared this report to provide a labor market analysis of educational supply and occupational demand for middle-skilled career pathways in the North (Greater Sacramento) subregion. This report aims to determine if demand in the local labor market is unmet by the supply from existing community college programs and other postsecondary training providers.

This report primarily focuses on training that leads to jobs in middle-skilled occupations - jobs that typically require education beyond a high school diploma but less than a bachelor's degree - but may include higher-skilled occupations for training pathways that lead to a bachelor's degree. Lowered skilled occupations are rarely considered in this analysis due to the lessened barriers for entry-level work, such as no formal education and on-the-job training requirements.

Key findings include:

- The North (Greater Sacramento) subregion held 8,237 electrical workforce jobs in 2021. These jobs are projected to increase by 19% over the next five years, adding more than 1,500 new jobs to the subregion by 2026.
- Over the next five years, electrical jobs are projected to have 1,225 annual openings across the North (Greater Sacramento) subregion.
- Analysis of wage data shows that all four electrical occupations have entry-level wages greater than the single adult living wage of \$14.53 per hour. Three occupations (excluding electrician helpers) have median wages higher than the living wage needed to sustain a small family.
- One North (Greater Sacramento) community college offers degrees and certificates in programs related to electricians. American River conferred an average of 19 awards in its electrical programs over the last three academic years (2018-19 through 2020-21).

Recommendations include:

- The North (Greater Sacramento) Center of Excellence recommends additional studies to understand the region's capacity for training more electricians and the size of the training pipeline in apprenticeship programs.

INTRODUCTION

The North (Greater Sacramento) Center of Excellence (COE) was asked to provide labor market information to explore offering new training programs for electrical workforce occupations at a local community college.

The report focuses on jobs involved in installing, operating, and maintaining residential and commercial electrical systems. It includes electricians, security and fire alarm system installers, electrical and electronics drafters, and electrician helpers.

How do these occupations differ?

Electricians are responsible for installing new electrical systems in residential and commercial settings and maintaining or repairing those systems. Electricians typically use blueprints or technical drawings to determine the location of wiring or electrical systems and ensure that their work is done in compliance with building and safety codes. Electricians inspect electrical components, such as transformers and circuit breakers, identify electrical problems using testing devices, and repair or replace wiring, equipment, or fixtures.

Electricians are licensed and apprenticed occupations in the State of California.

While the following occupations perform work adjacent to or like that of electricians, they are distinct. Workers in these roles require other specific skills and knowledge to perform the related job duties.

- Security and Fire Alarm System Installers
 - Workers in these jobs are tasked to install, program, maintain, and repair security and fire alarm wiring and equipment. They also ensure that their work is done in accordance with the relevant codes, like NFPA 72.
 - Security and fire alarm system installers must be able to follow blueprints of electrical layouts. They must know electrical wiring to manage fire and security alarms.
 - While most security and fire alarm system installers work with electrical systems, electricians are licensed to deal with a broader range of electrical problems and to work with high voltage.
- Electrical and Electronics Drafters
 - Electrical drafters prepare wiring diagrams, circuit board assembly diagrams, and layout drawings used for manufacturing or installing, and repairing electrical equipment. Drafters often work with engineers to create blueprints and other diagrams used to install products.
 - Electrical drafters must understand how electrical systems work to draft detailed assembly drawings of the systems and their components.
 - Electricians often use blueprints to know where wires, lighting fixtures, and other electrical components and systems should be installed.

- Helpers - Electricians
 - Electrician helpers support electricians by performing duties adjacent to an electrician's work. Electrician helpers carry materials and tools, cut and bend wire and conduit, use tools to repair and maintain wiring, and clean work areas.

The following Standard Occupational Classification (SOC) occupations and codes are included in this report:

These middle-skill occupations require more education and training beyond a high school diploma but less than a four-year degree:

- Electricians (47-2111)
- Security and Fire Alarm System Installers (49-2098)
- Electrical and Electronics Drafters (17-3012)

The following occupations are considered below-middle-skill. Below-middle-skill occupations typically do not require education or training beyond a high school diploma. Still, these occupations require some electrical skills and knowledge and may serve as a bridge to middle-skilled electrical jobs:

- Helpers - Electricians (47-3013)

A review of related programs revealed the following Taxonomy of Programs (TOP) title(s) and code(s) are appropriate for inclusion in this report:

- Electrical (0952.20)
- Electrical, Electronic, and Electro-Mechanical Drafting (0953.30)

The corresponding Classification of Instructional Program (CIP) title(s) and code(s) are:

- Electrician (46.0302)
- Electrical/Electronics Drafting and Electrical/Electronics CAD/CADD (15.1305)

OCCUPATIONAL DEMAND

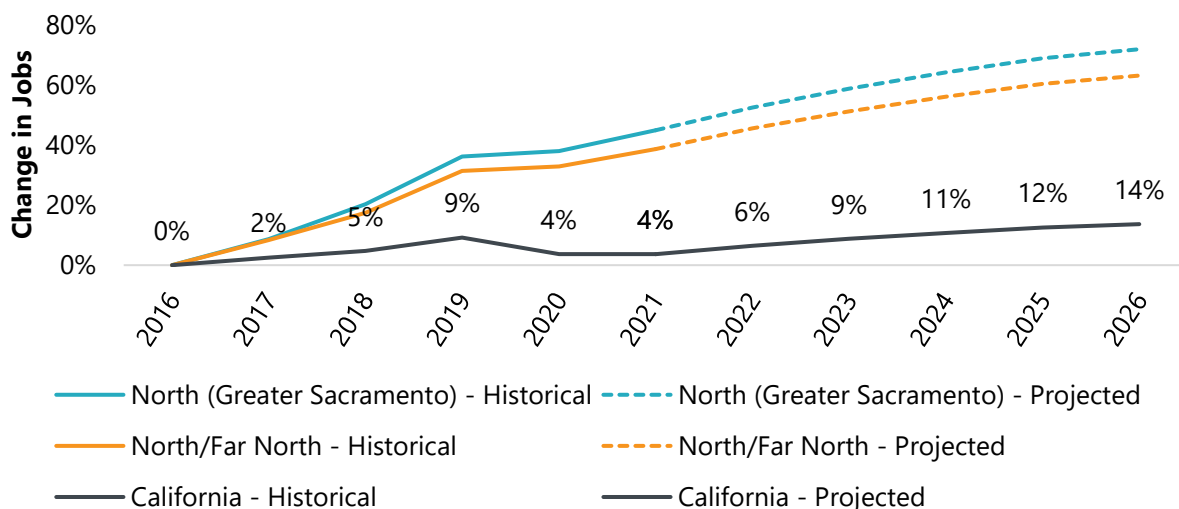
Exhibit 1 summarizes the five-year projected job growth for middle-skill and high-skill occupations in the North, North/Far North, and California.

Exhibit 1. Employment and projected demand, 2021-2026

Occupation	2021 Jobs	2026 Jobs	2021-2026 Change	2021-2026 % Change	2021-2026 Annual Openings
Electricians	6,915	8,236	1,321	19%	1,034
Security and Fire Alarm Systems Installers	694	791	97	14%	95
Helpers--Electricians	347	451	103	30%	67
Electrical and Electronics Drafters	280	292	11	4%	29
North (Greater Sacramento)	8,237	9,769	1,533	19%	1,225
Electricians	8,235	9,722	1,488	18%	1,211
Security and Fire Alarm Systems Installers	863	977	114	13%	116
Helpers--Electricians	367	480	113	31%	72
Electrical and Electronics Drafters	308	319	11	3%	32
North/Far North	9,773	11,498	1,725	18%	1,431
Electricians	76,702	84,315	7,613	10%	9,729
Security and Fire Alarm Systems Installers	11,226	12,293	1,067	10%	1,396
Helpers--Electricians	3,381	3,825	443	13%	513
Electrical and Electronics Drafters	3,367	3,371	3	0%	333
California	94,676	103,803	9,127	10%	11,971

Exhibit 2 compares the percent change in jobs between 2016 through 2021 and the projected changes through 2026. The rate of change is indexed to the total number of jobs in 2016.

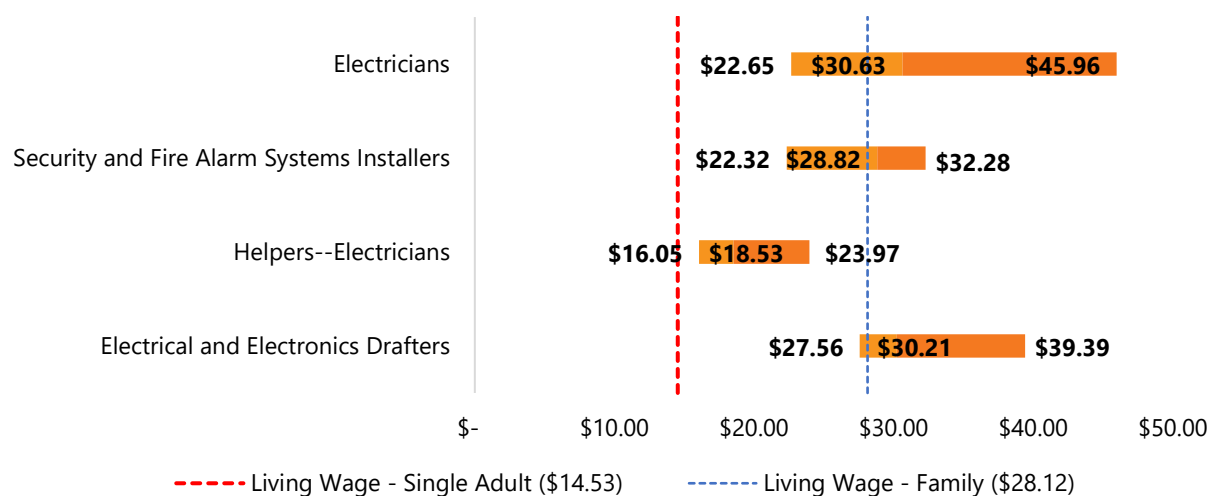
Exhibit 2. Changes in employment, 2016-2026



WAGES

Exhibit 3 compares the entry-level, median, and experienced wages for the selected occupations to the North (Greater Sacramento) living wage for a single adult (\$14.53 per hour) and a small family (\$28.12 per hour).^{1,2}

Exhibit 3. Comparison of wages by occupation, 2021



¹ A small family is defined as a single adult and one school aged child (between the ages of 5 and 12 years).

² Living wage is defined as the level of income a single adult with no children must earn to meet basic needs, including food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs. Please note that the 25th-percentile and 75th-percentile hourly wages are used as proxy for entry-level and experienced-level wages.

JOB POSTINGS

This section analyzes recent data from online job postings (real-time LMI). Online job postings may provide additional insight into recent changes in the labor market that are not captured by historical trends.

The North COE identified 970 online job postings for the selected occupations in the Greater Sacramento subregion. Job posting data comes from Burning Glass Labor Insights and represents new listings posted online within the last year, from October 1, 2021, to September 30, 2022.

Occupations and Job Titles

Exhibit 4 details the number of online job postings for the selected occupations.

Exhibit 4. Number of job postings by occupation

Occupation	Job Postings	Share of Job Postings
Electricians	523	54%
Electrical and Electronics Drafters	220	23%
Security and Fire Alarm Systems Installers	214	22%
Helpers--Electricians	13	1%
Total Job Postings	970	100%

Exhibit 5 shows the top 10 job titles for each occupation. All job postings included a job title.

Exhibit 5. Top jobs titles by occupation

Electricians	Job Postings (n = 523)	Electrical and Electronics Drafters	Job Postings (n = 220)
Electricians	122	Electrical Designers	32
Journeyman Electricians	81	Designers	14
Journeyman Linemen	24	Electrical CAD Designers	14
Residential Electricians	23	Embedded Hardware Engineers	12
Service Electricians	23	Analog Design Engineers	10

Solar Electricians	19	CAD Drafters	8
Solar Analysts	13	Distribution Designers	8
Certified Electricians	12	Logic Designers	8
Electrical Journeymen	11	PCB Designers	8
Electrical Trainees	11	Mask Designers	7
Security and Fire Alarm Systems Installers	Job Postings (n = 214)	Helpers—Electricians	Job Postings (n = 13)
Alarm Technicians	32	Solar Electricians	7
Fire Alarm Technicians	26	Skilled Trades Workers	3
Surveillance Technicians	22	Electrical Helpers	1
Fire Alarm Installers	13	Electrician Helpers	1
Security Service Technicians	10	Electricians/Helpers	1
Low Voltage Technicians	9		
Alarm Installation Technicians	8		
Fire Alarm Service Technicians	7		
Fire Alarm Systems Technicians	7		
Installers	6		

Employers

Exhibit 6 shows the top 10 employers with the most job postings for the selected occupations.

Exhibit 6. Employers with the most job postings by occupation

Electricians	Job Postings (n = 523)	Electrical and Electronics Drafters	Job Postings (n = 220)
PG&E	17	Intel	58
State of California	15	Cupertino Electric	14
SunPower Corp.	13	Rex Moore	14

University of California	10	Jobot	10
Tradesmen International	7	Tesco Controls	9
Bergelectric	6	Rex Moore Group	6
Sunnova	6	Zbeta Consulting	5
Tesla	6	Actalent	4
Liberty	5	Encore Semi	4
Pacific Coast Producers	5	Nor-Cal Controls Es	4
Security and Fire Alarm Systems Installers	Job Postings (n =214)	Helpers—Electricians	Job Postings (n = 13)
Johnson Controls	10	Sunnova	7
TEKsystems	10	Myers Electric	1
Precision West Technologies	7	Rayne Staffing	1
Sierra Fire Alarm	7	Solid Personnel	1
Hard Rock International	6		
Western States Fire Protection	6		
Foothill Fire Protection	5		
SunPower Corp.	5		
Integrated Fire Systems	4		
Quest Management	4		

Certifications, Skills, and Experience

Exhibit 7 shows the top 10 specialized skills across the five studied occupations. Skills that are shared across the occupations are marked with a superscript value.

Exhibit 7. Most in-demand specialized skills by occupation

Electricians	Electrical and Electronics Drafters	Security and Fire Alarm Systems Installers	Helpers—Electricians
Electrical Wiring ¹	AutoCAD	Alarm Devices	Solar Systems
Electrical Systems ²	Electrical Engineering	Fire Alarm Systems	Blueprinting ³
Blueprinting ³	Computer-Aided Design	Security Systems	Workflow Management
Hand Tools ⁴	Autodesk Revit	Access Controls	Bilingual (Spanish/English)
Electrical Equipment	Computer Engineering	Electrical Wiring ¹	Wiring Diagram
Power Tool Operation	Computer Science	Low Voltage	Control Systems
Construction	Debugging	Fire And Life Safety	Electrical Equipment
Network Switches	Simulations	Blueprinting ³	Electrical Wiring ¹
Roofing	Electronic Components	Hand Tools ⁴	Hand Tools ⁴
Electrical Codes	Electrical Systems ²	Power Tool Operation	Power Tool Operation

Exhibit 8 shows the most relevant certifications requested by employers for the selected occupations.

Exhibit 8. Most in-demand certifications

Certification	Job Postings	Share of Job Postings
Journeyman Electrician	34	3%
Journeyman Lineman	25	3%
30-Hour OSHA General Industry Card	20	2%
NICET Certification (National Institute for Certification in Engineering Technologies)	20	2%
NICET Level II Certification	20	2%
10-Hour OSHA General Industry Card	17	2%

Exhibit 9 shows employers' minimum level of education for job postings for the selected occupations.

Exhibit 9. Employer-preferred minimum education levels

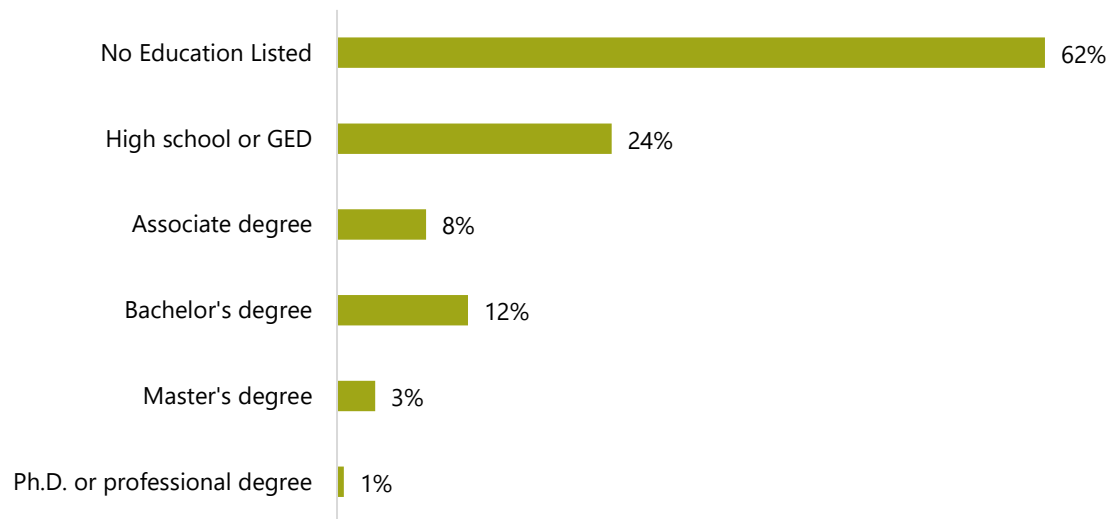
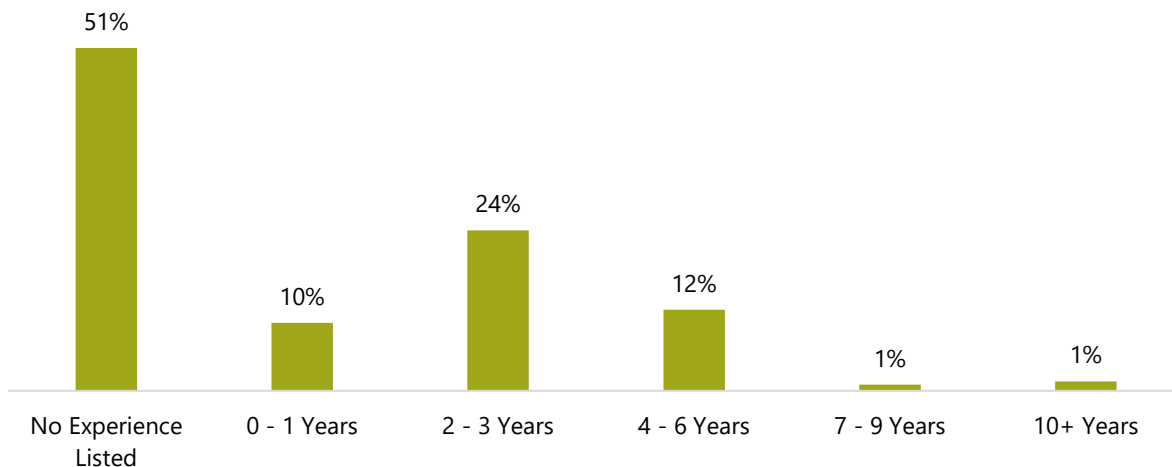


Exhibit 10 shows the experience levels required by employers for job postings for the selected occupations.

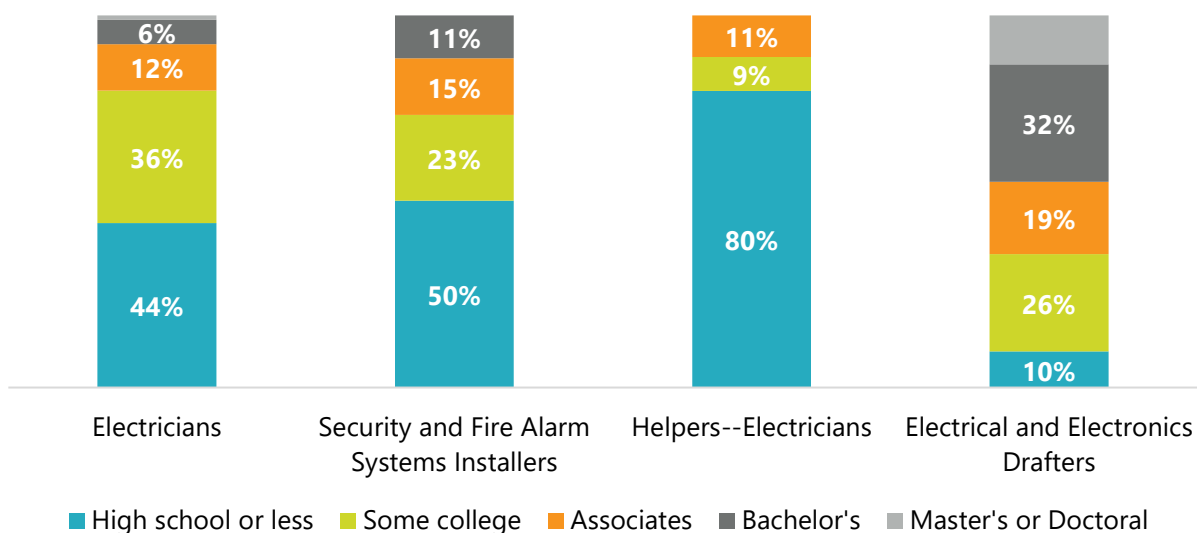
Exhibit 10. Employer-preferred experience levels



EDUCATION AND TRAINING

The U.S. Census Bureau collects education data from workers employed in occupations. Exhibit 11 shows the state-level educational attainment of the current workforce in the selected occupations.

Exhibit 11. California worker educational attainment for selected occupations, 2019



The Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which the BLS publishes projections data. Exhibit 12 shows the selected occupations' entry-level job requirements.

Exhibit 12. Typical education, work experience, and on-the-job training requirements

Occupation	Typical Entry-level Education	Work Experience Required	On-the-job Training Required
Electricians	High school diploma or equivalent	None	Apprenticeship
Security and Fire Alarm Systems Installers	High school diploma or equivalent	None	Moderate-term on-the-job training
Helpers--Electricians	High school diploma or equivalent	None	Short-term on-the-job training
Electrical and Electronics Drafters	Associate degree	None	None

How to become an Electrician in California

Electricians are licensed and apprenticed occupations in California. For an individual to perform electrical work in California, they must:

- Have the required work experience hours and have passed the State Electrician Certification exam (job title: "electrician"), or
- Be enrolled in a State-approved Electrician Trainee (ET) program AND be registered as an Electrical Trainee with the State (job title: "electrical trainee"), or
- Be apprenticed in a State or Federal approved electrical apprenticeship program (job title: "electrical apprentice").

The first step for an individual without the required experience to become an electrician is to become an electrician trainee (ET). Electrical trainees are eligible to work on job sites to gain the requisite hours needed for a professional electrician certification. To qualify as an electrical trainee, an individual must:³

- Be enrolled in a state-recognized Electrician Trainee school or program or,

³ Source: State of California Department of Industrial Relations, "General Electrician."
<https://www.dir.ca.gov/dlse/ecu/4a.html>

- Work directly supervised by a licensed and certified electrical contractor.
- Individuals must also register with the State of California as an Electrician Trainee.

To become a general electrician, electrical trainees must complete at least 720 hours of related classroom instruction from a state-recognized school or apprenticeship program and acquire 8,000 hours of on-the-job experience (with a licensed and certificated electrical contractor).⁴ These 8,000 hours can also be part of an apprenticeship program. After completing the education and training requirements, an electrician trainee is eligible to take the State Electrician Certification Exam, which they must pass to work as a general electrician.

Types of Electricians

There are five classifications of electricians, including the general electrician (Exhibit 13).⁵ The State of California requires electrical trainees to renew their application annually until they have completed the required work experience hours needed for the level of license they are obtaining. Electrical trainees must also apply for and pass the State Electrical Certification exam before working as an electrician.

Exhibit 13. Classification of Electrical Licenses in California

Electrician License Type	Description	Required Work Experience
General Electrician	Work on residential, commercial, and industrial electrical projects	8,000 hours
Residential Electrician	Work on residential electrical projects only	4,800 hours
Fire/Life Safety Electrician	Work on safety, such as nurse call systems, integrated security systems, fire alarms, and fire suppression systems involving electricity	4,000 hours
Voice Data Video Technician	Work on electrical for communication devices, access controls, and network systems	4,000 hours
Non-residential Lighting Technician	Work on indoor and outdoor electrical lighting systems	2,000 hours

⁴ Ibid.

⁵ Source: <https://www.dir.ca.gov/DLSE/ECU/ElCat.html#1>

EDUCATIONAL SUPPLY

Educational supply for occupations can be estimated by analyzing the number of awards issued in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes. Exhibit 14 shows the TOP and CIP codes for educational programs related to the selected occupations.

Exhibit 14. TOP and CIP codes for training programs related to the selected occupations

Occupation	TOP Programs and Codes	Aligned CIP Programs and Codes
<ul style="list-style-type: none"> Electricians (47-2111) Security and Fire Alarm System Installers (49-2098) 	<ul style="list-style-type: none"> Electrical (0952.20) 	<ul style="list-style-type: none"> Electrician (46.0302)
<ul style="list-style-type: none"> Electrical and Electronics Drafters (17-3012) 	<ul style="list-style-type: none"> Computer Electronics (0934.10) Drafting Technology (0953.00) Electro-Mechanical Technology (0935.00) Electrical, Electronic, and Electro-Mechanical Drafting (0953.30) 	<ul style="list-style-type: none"> Integrated Circuit Design Technology/Technician. (15.0306) CAD/CADD Drafting and/or Design Technology/Technician (15.1302) Drafting and Design Technology/Technician, General (15.1301) Electromechanical/Electromechanical Engineering Technology/Technician (15.0403) Electrical/Electronics Drafting and Electrical/Electronics CAD/CADD (15.1305) 3-D Modeling and Design Technology/Technician (15.1307)
<ul style="list-style-type: none"> Helpers - Electricians (47-3013) 	<ul style="list-style-type: none"> No aligned TOP code programs 	<ul style="list-style-type: none"> No aligned CIP code programs

Community College Supply

Exhibit 15 lists the community college training programs in the Greater Sacramento area. These programs are sourced from The Chancellor's Office Curriculum Inventory System (COCI) and are active as of October 5, 2022.

Exhibit 15. Greater Sacramento's Community College Programs (COCI) by TOP Code

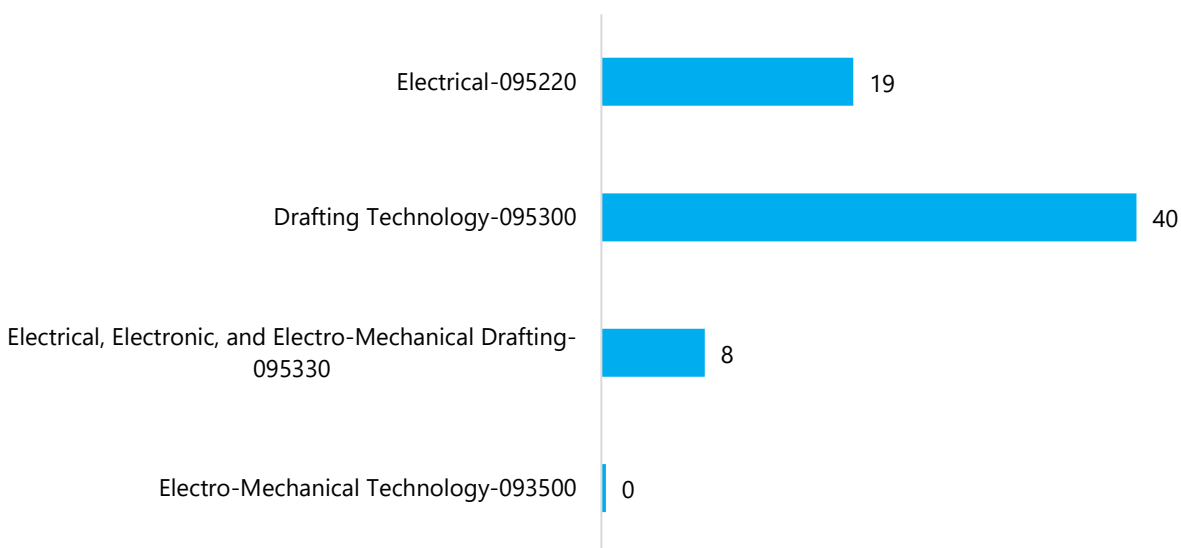
TOP Code	College	Program Title	Awards Offered
Electrical (0952.20)	American River	Residential/Commercial Electrician Trainee	Certificate
		Electrical Apprenticeship	Certificate A.A. Degree
		Electrical Apprenticeship Level I	Certificate
		Electrical Apprenticeship Level II	Certificate
		Electrical Apprenticeship Level III	Certificate
		Electrical Apprenticeship Level IV	Certificate
Drafting Technology (0953.00)	American River	Design Technology	Certificate A.A. Degree
	Sacramento City	Architectural/Structural Design	Certificate
		CAD Technology	Certificate
		Engineering Design Technology	Certificate A.S. Degree
		Mechanical (HVAC/Piping/Plumbing Systems)	Certificate
Electrical, Electronic, and Electro-Mechanical Drafting (0953.30)	Sacramento City	Electric (Power-Lighting Systems)	Certificate A.S. Degree

Exhibits 16 and 17 compare the average number of certificates and degrees from selected community college programs over the last three academic years.

Exhibit 16. Annual average community college awards by program, 2018-19 through 2020-21

Program - TOP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
Electrical (0952.20)	American River	11	39	6	19
	Subtotal	11	39	6	19
Drafting Technology (0953.00)	American River	25	11	13	16
	Sacramento City	5	3	21	10
	Sierra	21	13	7	14
	Subtotal	51	27	41	40
Electrical, Electronic, and Electro-Mechanical Drafting (0953.30)	Sacramento City	7	6	10	8
	Subtotal	7	6	10	8
Electro-Mechanical Technology (0935.00)	American River	1	0	0	<1
	Subtotal	1	0	0	<1
	Grand Total	70	72	57	67

Exhibit 17. Annual average community college awards by program, 2018-19 through 2020-21



Other Postsecondary Supply

California's Bureau for Private Postsecondary Education (BPPE) oversees private postsecondary educational institutions operating in the State. Approved institutions must file an annual report, including a performance fact sheet and the school's catalog, with the Bureau. Exhibit 18 summarizes the most recent awards from private postsecondary electrical programs in the Greater Sacramento area. Additional program performance information can be found by visiting the [BPPE website](#).

These programs are primarily focused on training individuals to become Electrical Trainees (or ETs). Please note that other postsecondary data lags behind community college data by one year.

Exhibit 18. Other postsecondary awards by program, 2017-18 through 2019-20

Program - CIP Code	Training Provider	Award Level	Annual Awards 2017-18	Annual Awards 2018-19	Annual Awards 2019-20	3-Yr Annual Awards Average
Electrician (46.0302)	National Career Education	1<2 academic yrs.	114	101	154	123

Program - CIP Code	Training Provider	Award Level	Annual Awards 2017-18	Annual Awards 2018-19	Annual Awards 2019-20	3-Yr Annual Awards Average
	Independent Training & Apprenticeship Program (iTAP)	1<2 academic yrs.	31	41	71	48
	InterCoast Colleges – Rancho Cordova	1<2 academic yrs.	76	49	55	60
		Grand Total	221	191	280	231

Beyond the above programs, which focus on training individuals to become electrical trainees, there are several State approved apprenticeship programs in the Greater Sacramento area. Exhibit 19 summarizes these apprenticeships by the provider.⁶ Educational supply data is not available for these programs.

Exhibit 19. State-approved electrical apprenticeships in Greater Sacramento

Apprenticeship Provider	Trade or Occupation Apprenticeship
Associated Builders & Contractors, Northern California Chapter (ABC NorCal) Electrical UAC	Electrician
Northern Nevada Electrical J.A.T.C.	Electrician
Sacramento Area Electrical (Transportation) J.A.T.C.	Local Transportation Systems Technician
Sacramento Area Electrical Joint Apprenticeship and Training Committee	Inside Wireman (Electrician) Residential Wireman
Western Electrical Contractors Assoc., Inc. (W.E.C.A.) Apprenticeship and Training Committee	Electrician Construction Residential Wireman

The State approved electrical trainee (ET) programs that serve the Greater Sacramento region

⁶ Source: State of California Department of Industrial Relations, "Find an apprenticeship program," <https://www.dir.ca.gov/databases/das/aigstart.asp>. List is current as of 11/17/2022.

are listed in Exhibit 20. These programs are open to members of the public. Educational supply data is not available for these programs.

Exhibit 20. State-approved electrician trainee programs in Greater Sacramento

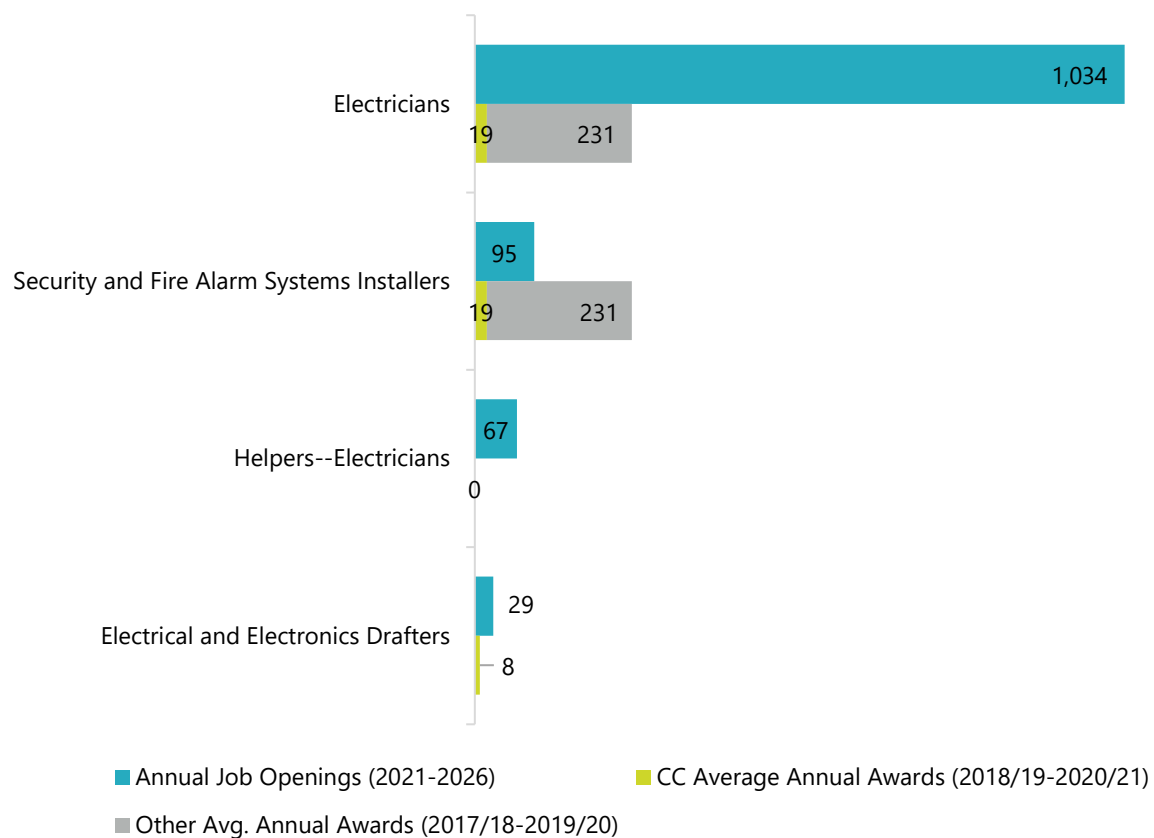
Training Provider	Location
Western Electrical Contractors Association (WECA)	Sacramento Region Office and Training Facility 3695 Bleckley Street Rancho Cordova, CA 95655
I-TAP	Sacramento County 9856 Business Park Drive Sacramento, CA 95827
National Career Education	6249 Sunrise Blvd. Citrus Heights, CA 95610
InterCoast College - Rancho Cordova	Sacramento County 9738 Lincoln Village Dr., Suite 120 Rancho Cordova, CA 95827
UEI College	Sacramento Campus 4424 Florin Road, Suite D & E Sacramento, CA 95823
American River College	Sacramento County American River College 4700 College Oak Drive Sacramento, CA 95841

SUPPLY GAP ANALYSIS

Exhibit 21 estimates the supply gap between electrical worker job demand and educational supply. Community colleges, private postsecondary training providers, and State approved electrical training (including apprenticeships) all contribute to the supply of workers in the electrical workforce. However, much of the data about the supply is limited to publicly available

data, and supply data from some private and membership-based entities is often unavailable. As a result, the supply gap shown in exhibit 20 may be underestimated.

Exhibit 21. Supply Gap of Greater Sacramento's Electrical Workforce



Notes: 1) Supply is the same for electricians and security and fire alarm system installers due to shared TOP codes, 2) since there are no training programs for electrician helpers, there are no awards; and 3) only the closely related drafting programs are included in the supply for electrical and electronics drafters.

FINDINGS

- This report focuses on four occupations in Greater Sacramento's electrical workforce: electricians, security and fire alarm system installers, electrical and electronics drafters, and electrician helpers.
 - Please note that electrical jobs related to utilities and manufacturing were excluded from this report. For information about electrical jobs in the utility and manufacturing sectors, please contact the North (Greater Sacramento) Center of Excellence.
- The North (Greater Sacramento) subregion held 8,237 electrical workforce jobs in 2021. These jobs are projected to increase by 19% over the next five years, adding more than 1,500 new jobs to the subregion by 2026.
 - In 2021, more than 80% (or 6,915 jobs) of Greater Sacramento's electrical jobs were held by electricians.
 - A majority of the subregion's electric job growth – more than 80% - can be attributed to an increase in jobs for electricians. More than 1,300 new electrical jobs added to Greater Sacramento by 2026 will be for electricians.
- Electrical workforce jobs are projected to grow faster in the North (Greater Sacramento) subregion than in California.
- Over the next five years, electrical jobs are projected to have 1,225 annual openings across the North (Greater Sacramento) subregion.
 - More than 1,000 of these job openings will be for electricians.
- Analysis of wage data shows that all four electrical occupations have entry-level wages greater than the single adult living wage of \$14.53 per hour. Three occupations (excluding electrician helpers) have median wages greater than the living wage needed to sustain a small family.
- According to real-time labor market information, there were about 970 online job postings for the four electrical occupations between October 1, 2021, and September 30, 2022. Fifty-four percent (or 523) of the job postings were for electricians. Electrician helpers had the fewest job postings (n = 13) over the last 12 months.
- Among the top 10 specialized skills, security and fire alarm system installers and electrician helpers had more skills in common with electricians than did electrical and electronics drafters. These occupations shared electrical wiring, blueprints, and hand tools as the most in-demand skills in common with electricians.
- Between 20% and 48% of incumbent workers in the studied electrical occupations have educational attainment levels consistent with community college offerings (some college or associate degrees).

- The proportion is highest with incumbent electricians – 48% of working electricians have either attended some college (36%) or obtained an associate degree (12%). Electricians are also a licensed and apprenticed occupation in California; formalized educational pathways play a significant role in training future workers for this occupation.
- Analysis of educational attainment data also revealed that 80% of incumbent electrician helpers have, at most, a high school diploma. This finding suggests postsecondary training potentially plays a less significant role in job preparation for electrician helpers than (perhaps) on-the-job training.
- Forty-five percent of incumbent electrical and electronics drafters have an educational background consistent with community college offerings, while another 32% of workers hold a bachelor's degree.
- Three of the four occupations – electricians, security and fire alarm system installers, and electrical and electronics drafters - can be linked to several distinct educational pathways in the community college system using California Community Colleges Taxonomy of Programs (TOP) codes. There are no training pathways for electrician helpers.
 - The Electrical TOP code (0952.20) provides training focused on installing, operating, maintaining, and repairing electrical systems in commercial, industrial, and residential buildings. These programs are aligned with training requirements for individuals entering the electrician trainee pathway and those pursuing a career as a security and fire alarm system installer.
 - The COE identified four TOP code programs aligned to electrical and electronics drafters. The most representative TOP codes are Drafting Technology (0953.00) and Electrical, Electronic, and Electro-Mechanical Drafting (0953.30).
- One North (Greater Sacramento) community college offers degrees and certificates in programs related to electricians. American River conferred an average of 19 awards in its electrical programs over the last three academic years (2018-19 through 2020-21).
- Three North (Greater Sacramento) community colleges offer programs aligned with electrical and electronics drafters. These colleges conferred an average of 48 awards in their drafting programs between the 2018-19 and 2020-21 academic years. Training for electrical and electronic drafters seems exclusive to the community college system.
- Local private postsecondary training providers also offer training for electricians, though none offer training for electrical and electronic drafters. Between 2018-19 and 2020-21, private postsecondary training providers conferred an average of 231 awards in electrician programs over the last three years. Many of these awards (n = 123) come from National Career Education's electrical program in Citrus Heights, CA.
- In addition to community colleges and private postsecondary education providers, there are State approved electrician trainee (ET) programs and electrician apprenticeships offered through local Joint Apprenticeship and Training Committees (JATC). Educational supply data is not available for these programs.

CONCLUSIONS

- Comparing occupational demand to educational supply reveals an undersupply of workers for the studied electrical jobs. The gap appears to be most significant for certificated electricians and most minor for electrical and electronics drafters.
- Drafting programs seem to be exclusive to community colleges. The North (Greater Sacramento) COE could not find electrical drafting programs hosted by private training providers in the Greater Sacramento region.
 - However, several programs exist for training electrical drafters in the community college system, so the supply gap isn't as prominent here as it is for electrician training.
- Currently, there is no training aligned to Helper-Electricians, which could be due to fewer barriers to employment. Electrician helpers typically require no more than an HS diploma and short-term OTJ training, which can likely be met in a work setting.
 - However, the skills analysis suggests a slight overlap with electricians. Electrician helpers need skills in hand tools, electrical wiring, and blueprints - skills that electricians share. But remember that these skills' complexity most likely varies, too.
 - Additionally, through the analysis of job postings, it seems that the most prevalent employers of electrician helpers were solar panel companies. Sunnova, a residential solar panel company, posted online job ads for solar electricians, which were linked to the electrician helper occupation. A finding like this suggests that electrician helpers may be better served through an existing solar photovoltaic installation program.
- Though there seems to be an undersupply of electricians in the area, the whole supply picture is incomplete. North (Greater Sacramento) Center of Excellence recommends additional studies to understand the size of the training pipeline in apprenticeship programs and the region's capacity for additional electrician training.

APPENDIX A. METHODOLOGY AND SOURCES

This report identified Occupations using the Center of Excellence TOP-to-CIP-to-SOC crosswalk and O*Net OnLine. This report's findings were determined using labor market data from the Bureau of Labor Statistics (BLS), U.S. Census Bureau data from Emsi, and jobs posting data from Burning Glass.

Lightcast (Formerly EMSI/Burning Glass) 2022.3; QCEW Employees, Non-QCEW Employees, and Self-Employed. <https://www.economicmodeling.com/>. *Note: EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors).*

Integrated Postsecondary Education Data System (IPEDS). National Center for Education Statistics. U.S. Department of Education. <https://nces.ed.gov/ipeds/>.

Labor Market Information Division. California Employment Development Department. <https://labormarketinfo.edd.ca.gov/>.

Management Information Systems (MIS) Data Mart. California Community Colleges Chancellor's Office. <https://datamart.cccco.edu/>.

O*NET OnLine. U.S. Department of Labor/Employment and Training Administration (DOL ETA). <https://www.onetonline.org/>.

Public Use Microdata Sample (PUMS). U.S. Census Bureau American Community Survey (ACS). <https://www.census.gov/programs-surveys/acs/microdata.html>

Self-Sufficiency Standard Tool for California. The University of Washington. <http://www.selfsufficiencystandard.org/>

"Taxonomy of Programs." California Community Colleges Chancellor's Office. June 2012, 6th Edition. <https://www.cccco.edu/-/media/CCCCO-Website/About-Us/Divisions/Educational-Services-and-Support/Academic-Affairs/What-we-do/Curriculum-and-Instruction-Unit/Files/TOPmanual6200909corrected12513pdf.ashx>

"TOP-CIP-SOC Crosswalk." Centers of Excellence for Labor Market Research. June 2021 Edition. <http://coecc.net/>

APPENDIX B. GLOSSARY OF KEY TERMS

Key Terms	Definition
Occupation	Occupation refers to professions, or careers, in the workforce. Occupations differ from jobs in that jobs show the number of positions held in a given occupation.
Jobs	<p>A job is any position where a worker provides labor for monetary compensation.</p> <p>Job numbers include employees (those who work for businesses) and proprietors (those who work for themselves). Full- and part-time jobs are included and counted equally (i.e., not adjusted to full-time equivalents). Data for jobs, or employment, are annual averages.</p>
Job Change	Job change is the net increase or decrease of jobs over a given timeframe.
Job Openings	<p>Job openings are the projected number of positions available for workers entering an occupation.</p> <p>Openings include growth and replacement jobs. Growth jobs are the positive change in the total number of workers employed. Replacement jobs are the estimates of new workers needed to replace workers permanently leaving the occupation.</p>
Wages	Wages, or compensation, show workers' percentile and average earnings in a given occupation. The 25th-percentile and 75th-percentile hourly wages are used as a proxy for entry-level and experienced-level wages.
Living Wage	The living wage is the level of income a single adult with no children must earn to meet basic needs. The living wage is calculated using basic levels of allowances for food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs.
Educational Attainment	Educational attainment is the level of education achieved by workers in a given occupation. The data includes workers aged 25 years and older.
Typical Entry-level Education	The education level generally required for employment in an occupation. It may differ from the actual educational levels attained by workers in any given occupation.
Work Experience Required	The level of prior experience a worker needs to enter a job in a given occupation.
On-the-job Training Required	The level of on-the-job training a worker needs to obtain competency in a given occupation.
Awards	Awards are the number of certificates and degrees conferred for a specific course of study in a given year. Awards counts "papers" and, as a result, may be greater than the actual number of students who complete a program.

APPENDIX C. CERTIFICATED ELECTRICIANS IN THE GREATER SACRAMENTO SUBREGION

The State of California Department of Industrial Relation's Electrician Certification Unit maintains lists of currently certified electricians and electrician trainees throughout the State.⁷ The lists are updated biweekly. As of January 2022, 33,215 certified electricians are active in the State; 29,619 are general electricians, while another 750 are residential electricians.⁸

Exhibit C summarizes the number of electricians and electrician trainees in the seven-county Greater Sacramento subregion with certifications active as of November 14, 2022. An estimated 2,481 certified electricians and 1,353 certified electrician trainees are in the Greater Sacramento area.

Exhibit C. Supply Gap of Greater Sacramento's Electrical Workforce

County	Number of Electricians	Number of ETs
El Dorado	243	54
Nevada	60	16
Placer	448	149
Sacramento	1,432	964
Sutter	63	23
Yolo	145	113
Yuba	90	34
Greater Sacramento Subregion	2,481	1,353

⁷ Source: State of California Department of Industrial Relations Electrician certification program, https://www.dir.ca.gov/dlse/ecu/ECU_stats.htm

⁸ Ibid.

COVID-19 Statement: This report includes employment projection data by EMSI. EMSI's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

Important Disclaimer: All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges, or their representatives based upon components or recommendations contained in this study.

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