

# Building and Energy Systems Professional

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*Inland Empire/Desert Region (Riverside and San Bernardino counties combined)*

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*This workforce demand report uses state and federal job projection data developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.*

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## Summary

- Two community college programs related to building and energy systems professionals provide the knowledge, skills, and abilities that lead to three middle-skill occupations collectively referred to as the building and energy systems professionals occupational group in this report. These occupations are **essential critical infrastructure occupations**.
- The building and energy systems professionals occupational group employment is expected to **increase by 14% between 2019 and 2024**. A total of **760 annual job openings** will be available each year over the five-year timeframe.
- The **median-level, 50<sup>th</sup> percentile, hourly wages** for these occupations is between **\$15.65 and \$20.30 per hour, below the \$21.78 per hour self-sustainable standard** for a single adult with one child.
- Regional community colleges conferred an annual average of **106 awards** in programs related to building and energy systems professionals over the last three academic years. Other postsecondary institutions in the region conferred an annual average of 255 awards in related programs.
- The **COE recommends expanding the environmental control technology training program** due to the high number of annual job openings for *heating, air conditioning, and refrigeration mechanics* and the potential training gap.
- The **COE recommends expanding energy systems technology programs** focused on the *solar photovoltaic installers* occupation due to the high annual job openings and the potential training gap.

## Introduction

This report provides data on programs and occupations related to building and energy systems professionals; the related California Community College programs are:

- Environmental Control Technology (HVAC) (TOP 0946.00)
- Energy Systems Technology (TOP 0946.10)

The **environmental control technology (HVAC)** (TOP 0946.00) programs prepare students for employment through the instruction of the assembly, installation, operation, maintenance, and repair of air conditioning, heating, and refrigeration systems. This program's training leads directly to the *heating, air conditioning, and refrigeration mechanics* occupation.

- Heating, Air Conditioning, and Refrigeration Mechanics and Installers (SOC 49-9021)

The **energy systems technology** (TOP 0946.10) programs prepare students for employment through the instruction of the theory and methods of energy conservation applied to heating, cooling, and related systems, including the measurement and assessment of energy consumption, diagnosis, and prescription. These programs include alternative energy systems (Taxonomy of Programs, 2012). The knowledge, skills, and abilities trained by building and energy systems professionals programs lead to the following occupations:

- Solar Photovoltaic Installers (SOC 47-2231)
- Miscellaneous Construction and Related Workers (47-4099)
  - Weatherization Installers and Technicians (47-4099.03)\*
  - Solar Thermal Installers and Technicians (47-2152.04)\*
  - Energy Auditors (47-4011.01)\*

\*These are emerging O\*Net occupations embedded within the broader Standard Occupational Classifications (SOC) system. Traditional labor market information (LMI) is not available at the emerging O\*Net occupation level. Employer demand for the emerging occupations included in this report is available in the job advertisement section.

These programs' combined occupations are collectively referred to as the building and energy systems professionals occupational group in this report. Each occupation in this report (except the \*O\*Net occupations) are considered essential critical infrastructure occupations, as identified by the Public Policy Institute of California. This classification of occupations is vital in supporting California's basic health, safety, and economic needs or may have the ability to social distance (Bohn et al.).

## Job Opportunities

In 2019, there were 5,542 building and energy systems professional jobs in the Inland Empire/Desert Region (IEDR). The building and energy systems professional occupational group is projected to have 760 annual job openings to fill new jobs and backfill jobs that workers are permanently vacating (includes occupational transfers and retirements). This occupational group is expected to increase employment by

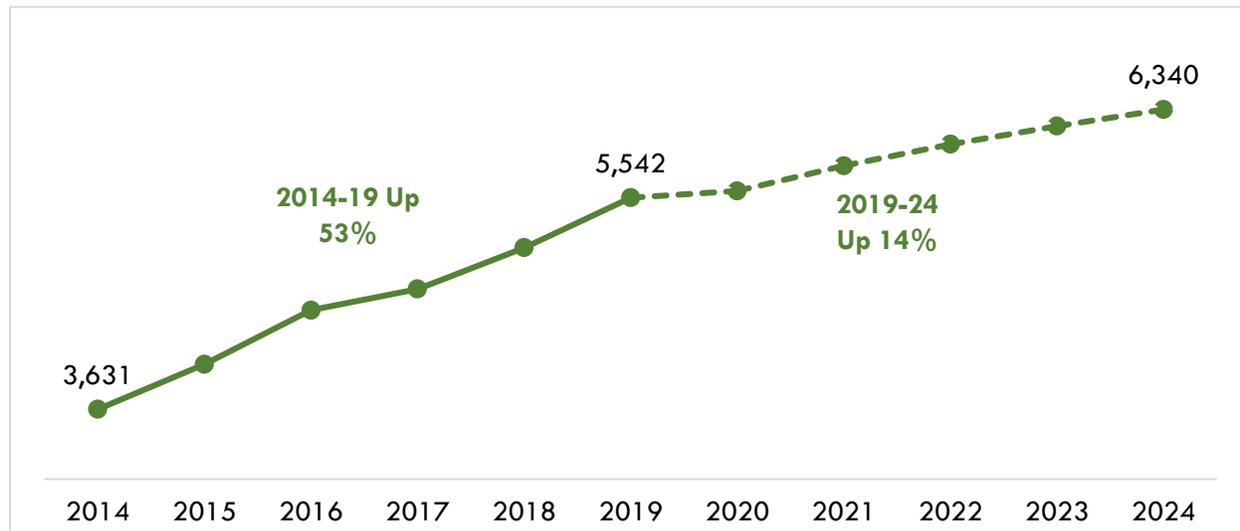
14% through 2024. Looking at each occupation in this group, *heating, air conditioning, and refrigeration mechanics* will have approximately four times more annual job openings (603 annual job openings) than *solar photovoltaic installers* (152 annual job openings) and 14 times more annual job openings than *miscellaneous construction and related workers* (42 annual job openings). Exhibit 1 displays five-year projected job growth, and Exhibit 2 displays historical (2014 to 2019) and projected (2019-2024) jobs for the building and energy systems occupational group.

Exhibit 1: Five-year job projections, 2019-2024

| Occupation  | 2019 Jobs    | 2024 Jobs    | 5-Yr % Change (New Jobs) | 5-Yr Openings (New + Replacement Jobs) | Annual Openings (New + Replacement Jobs) | % of workers age 55+ |
|---|--------------|--------------|--------------------------|--|--|----------------------|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 4,466        | 5,069        | 14%                      | 3,467                                  | 578                                      | 18%                  |
| Solar Photovoltaic Installers   | 598          | 750          | 25%                      | 677                                    | 113                                      | 12%                  |
| Miscellaneous Construction and Related Workers                        | 479          | 521          | 9%                       | 419                                    | 70                                       | 19%                  |
| <b>Total</b>  | <b>5,542</b> | <b>6,340</b> | <b>14%</b>               | <b>4,562</b>                           | <b>760</b>                               | <b>18%</b>           |

Source: Emsi 2020.4

Exhibit 2: Historical and projected jobs for the building and energy systems professionals occupational group, 2014 – 2024



Source: Emsi 2020.4

## Job Advertisements

Exhibit 3 displays the number of online job ads posted during the last 12 months, along with the regional and statewide average time to fill for the building and energy systems professionals occupational group.

The following advertisement search includes advertisement information for the emerging occupations, *solar thermal installers and technicians, energy auditors, and weatherization installers and technicians*. There were only 56 combined advertisements for these three emerging occupations in the region over this period. This search was expanded to include all advertisements in California to ensure generalizable job advertisements data was available for analysis. There were 542 advertisements posted over the last 12 months for these three emerging occupations in the state.

Regional average time to fill data was only available for the *heating, air conditioning, and refrigeration mechanics and installers* occupation. On average, local and state employers fill online job advertisements for this occupation within 43 days, indicating that local employers may face similar challenges filling open positions as other employers in California as a whole.

*Exhibit 3: Job ads and time to fill*

| Occupation  | Job Ads      | Regional Average Time to Fill (Days) | California Average Time to Fill (Days) |
|---|--------------|--------------------------------------|--|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 865          | 43                                   | 43                                     |
| Solar Photovoltaic Installers   | 223          | -                                    | 57                                     |
| Energy Auditors*  | 491          | -                                    | 49                                     |
| Weatherization Installers and Technicians*                            | 51           | -                                    | -                                      |
| Solar Thermal Installers and Technicians*                             | 0            | -                                    | -                                      |
| <b>Total</b>  | <b>1,630</b> | <b>-</b>                             | <b>45</b>                              |

Source: Burning Glass – Labor Insights

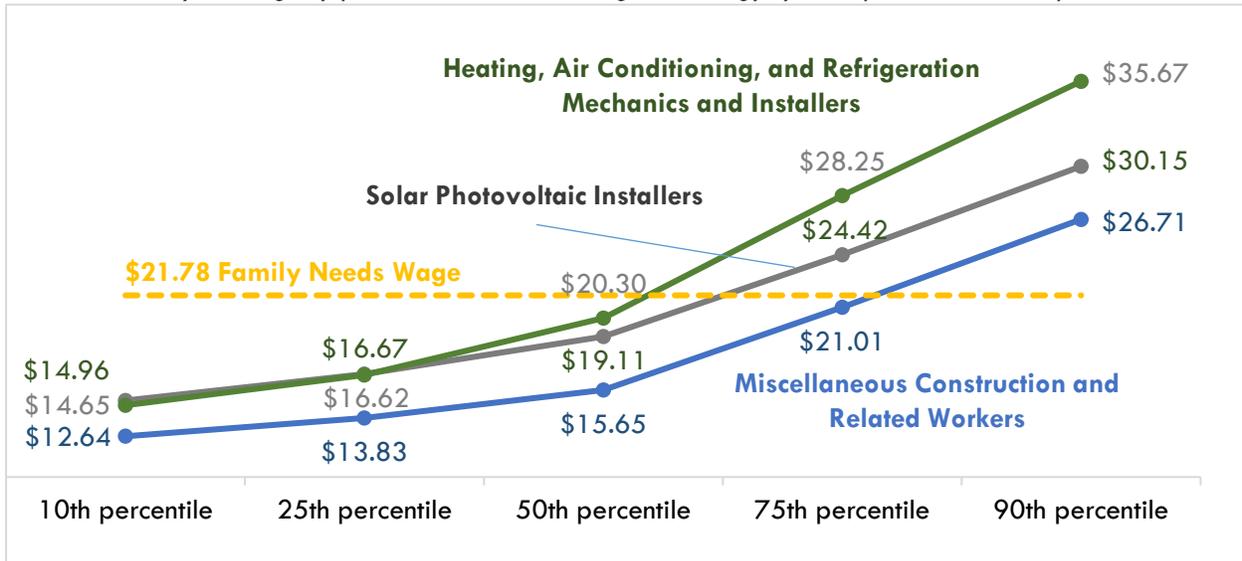
\*Includes job posting data for California

## Earnings and Benefits

Community colleges should ensure their training programs lead to employment opportunities that provide a self-sustainable income level. The Family Needs Calculator estimates that a self-sustainable wage for a single adult with one school-age child is \$21.78 per hour or \$45,992 annually in Riverside County, \$21.24 per hour or \$44,867 annually in San Bernardino County (Pearce, 2020). For this study, the higher hourly wage requirement in Riverside County is adopted as the self-sufficiently standard for the two-county region.

The wages for *heating, air conditioning, and refrigeration mechanics and installers* and *solar photovoltaic installers* exceed the Family Needs Calculator self-sustainability rate at the 75<sup>th</sup> percentile. Wages for *miscellaneous construction and related workers* do not exceed the self-sustainability rate until the 90<sup>th</sup> percentile, indicating that only approximately the top 10% of workers in this occupation earn self-sufficient hourly wages. Exhibit 4 displays the hourly earnings for the region.

Exhibit 4: Hourly earnings by percentile for the building and energy systems professional occupations



Source: Emsi 2020.4

Benefits for the building and energy systems professional occupational group vary by occupation and is not available for *miscellaneous construction and related workers*. According to occupational guides developed by the California Labor Market Information Division, *heating, air conditioning, and refrigeration mechanics and installers* may receive benefits that include health and dental insurance, vacation, and retirement plans. Benefits for *solar photovoltaic installers* may only be offered by larger companies, including medical, dental, life, vision insurance, vacation, sick leave, and retirement plans (Detailed Occupational Guides, 2020).

## Employers, Skills, Education, and Work Experience

Exhibit 5 displays the employers posting the most online job advertisements (ads) for building and energy systems professionals occupational group during the last 12 months. Reviewing online job ads allow some insight into the demand for O\*Net emerging occupations that is not otherwise available from traditional occupational data. There were too few online job advertisements for *solar thermal installers and technicians* to obtain reliable employer information.

Exhibit 5: Employers posting the most job ads

| Occupation  | Employers   |
|---|---|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers (n=865) | <ul style="list-style-type: none"> <li>• Sears</li> <li>• Alliance Residential Company</li> <li>• Lennox</li> </ul> |

| Occupation  | Employers   |
|---|---|
| Solar Photovoltaic Installers (n=223)             | <ul style="list-style-type: none"> <li>Sunsystem Technology</li> <li>Freedom Forever</li> <li>Myers Electric Company</li> <li>Vivint Solar</li> <li>EmPower Solar</li> </ul>                      |
| Energy Auditors* (n=491)                          | <ul style="list-style-type: none"> <li>DNV GL</li> <li>Edison International</li> <li>Staples</li> <li>Pacific Gas and Electric Company</li> <li>California Public Utilities Commission</li> </ul> |
| Weatherization Installers and Technicians* (n=51) | <ul style="list-style-type: none"> <li>Synergy Companies</li> <li>Metropolitan Area Advisory Committee (MAAC)</li> <li>Highlands Energy Services</li> <li>Community Action Partnership</li> </ul> |
| Solar Thermal Installers and Technicians* (n=0)   | <ul style="list-style-type: none"> <li>N/A</li> </ul>   |

Source: Burning Glass – Labor Insights

\*Includes job advertisement data for California

Exhibit 6 displays a sample of specialized and employability skills employers seek when looking for workers to fill building and energy systems professional positions. Specialized skills are occupation-specific skills that employers are requesting for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is often referred to as "soft skills." The skills requested in job postings may be utilized to guide curriculum development. There were too few online job advertisements for *solar thermal installers and technicians* to gather reliable skills data.

*Exhibit 6: Sample of in-demand skills from employer online job ads*

| Occupation  | Specialized Skills   | Employability Skills   |
|---|--|--|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers (n=788) | <ul style="list-style-type: none"> <li>Repair</li> <li>Plumbing</li> <li>Predictive/Preventative Maintenance</li> <li>Ventilation</li> </ul> | <ul style="list-style-type: none"> <li>Physical Abilities</li> <li>Troubleshooting</li> <li>Communication Skills</li> <li>Problem Solving</li> </ul>   |
| Solar Photovoltaic Installers (n=199)   | <ul style="list-style-type: none"> <li>Customer Service</li> <li>Roofing</li> <li>Photovoltaic (PV) Systems</li> <li>Inverters</li> </ul>    | <ul style="list-style-type: none"> <li>Detailed-Oriented</li> <li>Communication Skills</li> <li>Physical Abilities</li> <li>Troubleshooting</li> </ul> |

| Occupation  | Specialized Skills  | Employability Skills   |
|---|---|--|
| Energy Auditors*<br>(n=467)                       | <ul style="list-style-type: none"> <li>• Energy Efficiency</li> <li>• Sales</li> <li>• Customer Service</li> <li>• Energy Consulting</li> </ul> | <ul style="list-style-type: none"> <li>• Communication Skills</li> <li>• Teamwork/Collaboration</li> <li>• Detail-Oriented</li> <li>• Writing</li> </ul> |
| Weatherization Installers and Technicians* (n=49) | <ul style="list-style-type: none"> <li>• Repair</li> <li>• Water Heaters</li> <li>• Insulation</li> <li>• Energy Conservation</li> </ul>        | <ul style="list-style-type: none"> <li>• Physical Abilities</li> <li>• Communication Skills</li> <li>• Detail-Oriented</li> <li>• Writing</li> </ul>     |
| Solar Thermal Installers and Technicians* (n=0)   | <ul style="list-style-type: none"> <li>• N/A</li> </ul>   | <ul style="list-style-type: none"> <li>• N/A</li> </ul>  |

Source: Burning Glass – Labor Insights

\*Includes job advertisement data for California

Exhibit 7 displays the entry-level education typically required to gain employment in the building and energy systems professionals occupational group according to the Bureau of Labor Statistics (BLS), educational attainment for incumbent workers with "some college, no degree" and an "associate degree" according to the U.S. Census (2016-17) and the real-time minimum advertised education requirement from employer job ads. N/A indicates that either traditional LMI is not available for detailed-emerging occupations or too few job advertisements to yield minimum advertised education requirements. Traditional labor market information, including typical entry-level education and educational attainment, is not available for *energy auditors*, *weatherization installers and technicians*, and *solar thermal installers and technicians*. There were also too few online job postings for *solar thermal installers and technicians* to gather reliable education data.

*Exhibit 7: Typical entry-level education, educational attainment, and minimum advertised education requirements*

| Occupation  | Typical Entry-Level Education Requirement | CC-Level Educational Attainment* | Real-Time Minimum Advertised Education Requirement |  |                  |                             |
|---|---|----------------------------------|--|--|------------------|-----------------------------|
|   |   |                                  | # of Job Ads                                       | High school diploma or vocational training | Associate degree | Bachelor's degree or higher |
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | Postsecondary nondegree award             | 42%                              | 419  | 95%  | 5%               | -                           |
| Solar Photovoltaic Installers   | High school diploma or equivalent         | 30%                              | 80   | 98%  | 2%               | -                           |
| Energy Auditors**   | N/A                                       | N/A                              | 250  | 24%  | 2%               | 74%                         |
| Weatherization Installers and Technicians**                           | N/A                                       | N/A                              | 21   | 100%                                       | -                | -                           |
| Solar Thermal Installers and Technicians**                            | N/A                                       | N/A                              | 0  | N/A  | N/A              | N/A                         |

Source: Emsi 2020.4, Burning Glass – Labor Insights

\*Percentage of incumbent workers with a Community College Award or Some Postsecondary Coursework

\*\*Includes job advertisement data for California

Exhibit 8 displays the work experience typically required for building and energy systems professionals occupational group and the real-time work experience requirements from employer job ads.

*Exhibit 8: Work experience required and real-time work experience requirements*

| Occupation  | Work Experience Typically Required | Real-Time Work Experience |             |             |          |
|---|------------------------------------|---------------------------|-------------|-------------|----------|
|   |                                    | Number of Job Ads         | 0 – 2 years | 3 – 5 years | 6+ years |
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | None                               | 553                       | 44%         | 52%         | 4%       |
| Solar Photovoltaic Installers   | None                               | 121                       | 82%         | 18%         | -        |
| Energy Auditors*  | -                                  | 461                       | 51%         | 33%         | 16%      |
| Weatherization Installers and Technicians*                            | -                                  | 20                        | 70%         | 30%         | -        |
| Solar Thermal Installers and Technicians*                             | -                                  | 0                         | N/A         | N/A         | N/A      |

Source: Emsi 2020.4, Burning Glass – Labor Insights \*Includes job advertisement data for California

## Advertised Salary

Exhibit 9 displays advertised salary data from building and energy systems professional online job ads over the last 12 months. Consider the salary information with caution since only 42% (682 out of 1,630) online job postings for these occupations provided salary information. The salary figures are prorated to reflect full-time, annual wage status.

*Exhibit 9: Advertised salary information*

| Job Title   | Number of job postings | Real-Time Salary Information |                      |                      |                    | Average Annual Salary |
|---|------------------------|------------------------------|----------------------|----------------------|--------------------|-----------------------|
|   |                        | Less than \$35,000           | \$35,000 to \$49,999 | \$50,000 to \$74,999 | More than \$75,000 |                       |
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers | 274                    | 7%                           | 33%                  | 47%                  | 13%                | \$57,000              |
| Solar Photovoltaic Installers   | 159                    | 10%                          | 51%                  | 33%                  | 6%                 | \$49,000              |
| Energy Auditors*  | 219                    | 7%                           | 16%                  | 21%                  | 56%                | \$83,000              |
| Weatherization Installers and Technicians*                            | 30                     | 13%                          | 70%                  | 17%                  | -                  | \$43,000              |
| Solar Thermal Installers and Technicians*                             | 0                      | N/A                          | N/A                  | N/A                  | N/A                | N/A                   |

Source: Burning Glass – Labor Insights

\*Includes job advertisement data for California

## Student Completions and Program Outcomes

Exhibits 10 and 13 display the annual average awards for environmental control technology (TOP 0946.00) and energy systems technology (TOP 0946.10) programs in the region. These programs have collectively awarded an annual average of 106 associate degrees and certificates over the last three academic years. Chaffey College offers two environmental control technology programs, heating, ventilation, air conditioning, and refrigeration levels 1 & 2, which have not issued awards over the last three academic years.

California program outcome data may provide a useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP codes and region is provided in Exhibits 11 & 13. The outcome methodology is available in the appendix section of this report. Dashes indicate there were too few students to obtain program outcome information.

*Exhibit 10: 2016-19, Annual average community college awards for the environmental control technology programs in the IEDR*

| 0946.00 – Environmental Control Technology | Associate degree | Certificate requiring 30 to <60 semester units | Certificate requiring 18 to <30 semester units | Certificate requiring 6 to <18 semester units | Total CC Annual Average Awards, Academic Years 2016-19 |
|--|------------------|--|--|---|--|
| Chaffey College                            | -                | -  | -  | -   | 0  |
| College of the Desert                      | 3                | -  | 38   | 7   | 49   |
| Riverside City College                     | 5                | -  | 37   | -   | 42   |
| San Bernardino Valley College              | 2                | 13   | -  | -   | 15   |
| <b>Total</b>                               | <b>10</b>        | <b>13</b>                                      | <b>75</b>                                      | <b>7</b>                                      | <b>105</b>   |

Source: MIS Data Mart

*Exhibit 11: 0946.00 – Environmental control technology strong workforce program outcomes*

| Strong Workforce Program Metrics:<br>0946.00 – Environmental Control Technology<br>Academic Year 2017-18, unless noted otherwise | Inland Empire/Desert Region | California |
|--|-----------------------------|------------|
| Unduplicated count of enrolled students (2018-19)  | 634                         | 4,198      |
| Completed 9+ career education units in one year (2018-19)  | 42%                         | 43%        |
| Perkins Economically disadvantaged students (2018-19)  | 79%                         | 75%        |
| Students who attained a noncredit workforce milestone in a year (2018-19)  | -                           | 66%        |
| Students who earned a degree, certificate, or attained apprenticeship (2018-19)  | 76                          | 660        |
| Transferred to a four-year institution (transfers)   | -                           | 22         |
| Job closely related to the field of study (2016-17)  | 58%                         | 74%        |
| Median annual earnings (all exiters)   | \$31,880                    | \$41,826   |
| Median change in earnings (all exiters)  | 29%                         | 32%        |
| Attained a living wage (completers and skills-builders)  | 66%                         | 68%        |

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Please note that College of the Desert issued one award for their energy systems technology program in the 2016-17 academic year

*Exhibit 12: 2016-19, Annual average community college awards for the energy systems technology programs in the IEDR*

| <b>0946.10 – Energy Systems Technology</b> | <b>Certificate requiring 18 to &lt;30 semester units</b> | <b>Total CC Annual Average Awards, Academic Years 2016-19</b> |
|--|--|---|
| Desert                                     | 0  | 0   |
| <b>Total</b>                               | <b>0</b>   | <b>0</b>  |

Source: MIS Data Mart

*Exhibit 13: 0946.10 – Energy systems technology strong workforce program outcomes*

| <b>Strong Workforce Program Metrics:<br/>0946.10 – Energy Systems Technology<br/>Academic Year 2017-18, unless noted otherwise</b> | <b>Inland Empire/Desert Region</b> | <b>California</b> |
|--|------------------------------------|-------------------|
| Unduplicated count of enrolled students (2018-19)  | 29                                 | 961               |
| Completed 9+ career education units in one year (2018-19)  | 38%                                | 32%               |
| Perkins Economically disadvantaged students (2018-19)  | 90%                                | 69%               |
| Students who attained a noncredit workforce milestone in a year (2018-19)  | -                                  | 66%               |
| Students who earned a degree, certificate, or attained apprenticeship (2018-19)  | -                                  | 45                |
| Transferred to a four-year institution (transfers)   | -                                  | 38                |
| Job closely related to the field of study (2016-17)  | -                                  | 67%               |
| Median annual earnings (all exiters)   | \$28,522                           | \$34,768          |
| Median change in earnings (all exiters)  | -                                  | 15%               |
| Attained a living wage (completers and skills-builders)  | -                                  | 58%               |

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Credentials granted from other educational providers are displayed in Exhibit 14, along with the relevant CIP code. This is the final release data compiled from the Integrated Postsecondary Education Data System (IPEDS) for the most recent three years available.

*Exhibit 14: Annual average other educational providers awards issued for heating, air conditioning, ventilation and refrigeration maintenance technology/technician (HAC,HACR,HVAC,HVACR) programs*

| 47.0201 – Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician (HAC, HACR, HVAC,HVACR) | Associate degree | Award 1<2 academic years | Award <1 academic year | Other Educational Providers Annual Average Credentials, Academic Years 2014-17 |
|--|------------------|--------------------------|------------------------|--|
| Baldy View Regional Occupational Program   | -                | -                        | 5                      | 5  |
| CET-Coachella  | -                | 36                       | -                      | 36   |
| CET-Colton   | -                | 26                       | -                      | 26   |
| InterCoast Colleges-Riverside  | -                | 27                       | -                      | 27   |
| Mayfield College   | 1                | -                        | 78                     | 79   |
| Summit College   | -                | -                        | 82                     | 82   |
| <b>Total Annual Average Awards, Academic Years 2014-17</b>   | <b>1</b>         | <b>89</b>                | <b>165</b>             | <b>255</b>   |

Source: IPEDS

## Recommendation

Both community college program introduced in this workforce demand report will be examined independently. First, the community college **environmental control technology (HVAC)** (TOP 0946.00) program leads to the *heating, air conditioning, and refrigeration mechanics* occupation. This occupation is expected to have 578 annual job openings, increasing employment by 14% over the next five years, 2019 to 2024. The median hourly earnings are \$20.30 per hour, below the estimated self-sustainable rate for a single adult with one school-age child at \$21.78 per hour in the region. This occupation typically requires a postsecondary nondegree award to enter employment, a certificate for example.

Four community colleges offer environmental control technology training programs and reported 105 combined annual average awards over the last three years; 10 associate degrees and 95 certificates. Other educational providers reported 255 annual average awards in a comparable program (CIP 47.0201).

The **COE recommends expanding the environmental control technology training program** due to the high number of annual job openings and the region's potential training gap. The median hourly wages of

\$20.30 per hour for the *heating, air conditioning, and refrigeration mechanics and installers* occupation is below the self-sustainability standard of \$21.78 per hour. Years of on-the-job work experience may be required to achieve the self-sustainability standard. Colleges considering this program should partner with local employers to document the skills and certifications needed to close the self-sustainable wage gap shortly after entering employment in this field.

**Energy systems technology** (TOP 0946.10) is the second program in this analysis and leads to two traditional occupations; *solar photovoltaic installers* and *miscellaneous construction and related workers*. These occupations combined are expected to have 180 annual job openings over the next five years. The median hourly earnings are \$15.65 per hour for *miscellaneous construction and related workers* and \$19.11 per hour for *solar photovoltaic installers*. The median hourly earnings for both occupations is below the self-sustainable estimate for a single adult with one school-age child is \$21.78 per hour in the region. Both occupations typically require a high school diploma to enter employment.

One regional community college offers the energy system technology program and has not issued any awards over the last three years.

The **COE recommends expanding energy systems technology programs** focused on the *solar photovoltaic installers* occupation due to the high annual job openings and the potential training gap. The median hourly earnings of \$19.11 per hour for the *solar photovoltaic installers* occupation is below the self-sustainability standard of \$21.78 per hour. Years of on-the-job work experience may be required to achieve the self-sustainability standard. Colleges considering this program should partner with local employers to document the skills and certifications needed to close the self-sustainable wage gap shortly after entering employment in this field. Expanding training that leads to the *miscellaneous construction and related workers* occupation is not recommended because hourly earnings are below the self-sufficiency standard at nearly every earnings percentile.

### Contact

Michael Goss & Paul Vaccher  
Centers of Excellence, Inland Empire/Desert Region  
[michael.goss@chaffey.edu](mailto:michael.goss@chaffey.edu)  
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## Appendix: Occupation definitions, sample job titles, five-year projections for building and energy systems professionals occupations

### **Energy Auditors (47-4011.01)**

Conduct energy audits of buildings, building systems, or process systems. May also conduct investment grade audits of buildings or systems.

**Sample job titles:** Building Energy Consultant, Building Performance Consultant, Building Performance Specialist, Energy Auditor, Energy Consultant, Energy Rater, Home Energy Rater, Home Performance Consultant, Quality Assurance Supervisor, Residential Energy Auditor

### **Solar Photovoltaic Installers (47-2231)**

Assemble, install, or maintain solar photovoltaic (PV) systems on roofs or other structures in compliance with site assessment and schematics. May include measuring, cutting, assembling, and bolting structural framing and solar modules. May perform minor electrical work such as current checks.

**Sample job titles:** Installer, Photovoltaic Installer (PV Installer), PV Design and Installation Technician, Solar Designer/Installer, Solar Installer, Solar Installer Technician, Solar Photovoltaic Installer (Solar PV Installer), Solar Technician

*Entry-Level Educational Requirement: High school diploma or equivalent*

*Training Requirement: Between one and twelve months of on-the-job training*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 30%*

### **Miscellaneous Construction and Related Workers (47-4098)**

All construction and related workers not listed separately.

*Entry-Level Educational Requirement: High school diploma or equivalent*

*Training Requirement: Between one and twelve months of on-the-job training*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 34%*

### **Solar Thermal Installers and Technicians (47-2152.04)**

Install or repair solar energy systems designed to collect, store, and circulate solar-heated water for residential, commercial, or industrial use.

**Sample job titles:** Installer, Solar Energy Technician, Solar Hot Water Installer (SHW Installer), Solar Installer, Solar Maintenance Technician, Solar System Installer, Solar Technician, Solar Thermal Installer

### **Weatherization Installers and Technicians (47-4099.03)**

Perform a variety of activities to weatherize homes and make them more energy efficient. Duties include repairing windows, insulating ducts, and performing heating, ventilating, and air-conditioning (HVAC) work. May perform energy audits and advise clients on energy conservation measures.

**Sample job titles:** Energy Administrator, Field Technician, Weatherization and Housing Inspector, Weatherization Installer, Weatherization Technician, Weatherization Worker

### **Heating, Air Conditioning, and Refrigeration Mechanics and Installers (49-9021)**

Install or repair heating, central air conditioning, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.

**Sample job titles:** A/C Tech (Air Conditioning Technician); HVAC Installer (Heating, Ventilation, Air Conditioning Installer); HVAC Mechanic (Heating, Ventilation, Air Conditioning Mechanic); HVAC Service Tech (Heating, Ventilation, Air Conditioning Service Technician); HVAC Service Technician (Heating, Ventilation, Air Conditioning Service Technician); HVAC Specialist (Heating, Ventilation, and Air Conditioning Specialist); HVAC Technician (Heating, Ventilation, Air Conditioning Technician); HVAC Technician (Heating, Ventilation, and Air Conditioning Technician); Service Technician; Systems Mechanic

*Entry-Level Educational Requirement: Postsecondary nondegree award*

*Training Requirement: More than twelve months of on-the-job training*

*Incumbent workers with a Community College Award or Some Postsecondary Coursework: 42%*

## Appendix: Program Completion and Outcome Methodology

Exhibits 10 and 11 display the average annual California Community College (CCC) awards conferred during the three academic years between 2016 and 2019, from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart. Awards are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variation that might be present in a single year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from records provided by California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2020a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2020a).

Job postings data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job postings often do not reveal the hiring intentions of employers; it is unknown if employers plan to hire one or multiple workers from a single online job posting, or if they are collecting resumes for future hiring needs. A closed job posting may not be the result of a hired worker.

Table 1: 2019 to 2024 job growth, wages, education, training, and work experience required, IEDR

| Occupation (SOC)  | 2019 Jobs    | 5-Yr Change | 5-Yr % Change | Annual Openings (New + Replacement Jobs) | Entry-Experienced Hourly Wage Range (10 <sup>th</sup> to 90 <sup>th</sup> percentile) | Median Hourly Wage (50 <sup>th</sup> percentile) | Average Annual Earnings | Typical Entry-Level Education & On-The-Job Training Required | Work Experience Required |
|---|--------------|-------------|---------------|--|---|--|-------------------------|--|--------------------------|
| Heating, Air Conditioning, and Refrigeration Mechanics and Installers (49-9021) | 4,466        | 603         | 14%           | 578                                      | \$14.65 to \$35.67  | \$20.30  | \$49,300                | Postsecondary nondegree award & More than 12 months          | None                     |
| Solar Photovoltaic Installers (47-2231)   | 598          | 152         | 25%           | 113                                      | \$14.96 to \$30.15  | \$19.11  | \$43,900                | High school diploma or equivalent & 1-12 months              | None                     |
| Miscellaneous Construction and Related Workers (47-4099)                        | 479          | 42          | 9%            | 70                                       | \$12.64 to \$26.71  | \$15.65  | \$40,000                | High school diploma or equivalent & 1-12 months              | None                     |
| <b>Total</b>  | <b>5,542</b> | <b>798</b>  | <b>14%</b>    | <b>760</b>                               | -   | -  | -                       | -  | -                        |

Source: Emsi 2020.4