

# Central Texas Green Jobs: Employer Occupational Demand Survey Results



For Austin Workforce Solutions – Capital Area Workforce Board

May 2009

# Executive Summary

Central Texas is quickly emerging as a top national region for the renewable energy and energy efficiency industry. The region's aggressive greenhouse gas emission plans and energy efficiency ordinances augment the state's strong RPS goals (5,880 MW of electricity from renewable sources by 2015) and effective market creation efforts for renewable energy companies – and provide important support structures to continue to encourage industry growth.

Key regional stakeholders – from city officials to local utility companies to business groups to economic and workforce developers to higher education institutions – are beginning to formally collaborate to strengthen the region's competitiveness in attracting and growing specific subsectors like green construction and weatherization, distributed renewable electricity generation, and solar panel and wind turbine manufacturing and installation. In addition, other emerging efforts, like the Pecan Street Project and UT's Clean Energy Incubator are providing strategic thinking and resources for capitalizing on future industry technology – including the design of a regional infrastructure to generate and distribute electricity from renewable sources.

These efforts are likely to position the industry to become a job creation engine of the regional economy – with some predicting it could lead to thousands of new jobs over the next several years.

# Executive Summary

Critical to capitalizing on this growing industry opportunity will be the region's ability to build the regional renewable energy and energy efficiency workforce to ensure that qualified workers can meet new job demand. As the report, *Growing the New Energy Economy in Texas: Renewable Energy Industry and Workforce Development Assessment* revealed, the renewable energy and energy efficiency industry's workforce development requirements run the gamut from highly-educated engineers researching breakthroughs in energy storage technologies to more technically-skilled construction and machine operators constructing green buildings and manufacturing and installing solar panels. In addition, despite the high-tech nature of the technologies powering the industry virtually none of the new jobs being created in the industry require entirely new occupations. However, many of these occupations will likely require some additional training to fully transition their skills to the new industry opportunities.

While occupational supply and general renewable energy and energy efficiency industry workforce requirements are relatively well-understood in central Texas, occupational demand (understanding employer's specific hiring and training expectations and needs) is not.

# Executive Summary

To better prepare the regional workforce development system for meeting employer needs, AngelouEconomics, on behalf of Workforce Solutions - Capital Area Workforce Board and the Texas Foundation for Innovative Communities, conducted an employer survey. The survey was designed to analyze which renewable energy and energy efficiency jobs will be in demand in the near future and which types of training opportunities will be the most critical.

The survey results provide a valuable snapshot of employer occupational demand – which should help to inform a coordinated regional workforce development strategy that ensures:

- The right mix of short- and long-term job training/certification programs;
- More efficient use of financial & educational resources; and
- A central Texas workforce system that is able to meet current and emerging hiring and training needs.

# Executive Summary

The targeted survey was administered to renewable energy and energy efficiency businesses within the central Texas region. The sample included those companies that fall within the following broad subsectors of the industry:

- “Renewable Energy” – primary energy (solar, wind, biofuels, geothermal, hydroelectric/wave & ocean energy) generation, production, installation, general operations, and R&D companies.
- “Energy Efficiency” – energy conversion and conservation companies that provide a wide variety of “energy management” services related to the industry, with an emphasis on researching, testing, and installing smart technologies, green building, renewable energy project development, energy conservation auditing, and energy finance.

The survey included 119 total respondents.

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The employer survey identified occupational demand that was classified into three primary areas:

- Occupations **“In Demand”** – those where employers are expecting the most hiring to occur;
- Occupations **“Most Difficult to Fill”** – those for which employers have the most difficulty finding qualified workers; and
- Occupations that **“Need Retraining”** – incumbent workers for which employers are expecting most training to be needed.

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- **Priority occupation areas** – those that met all three criteria – were revealed and represent an important set of general occupations to which the region’s workforce system should be aligned.
- These occupations include a mix of highly educated engineers as well as technically-skilled equipment operators, technicians, and tradesmen and is very much reflective of where the industry appears to be heading regionally.

## 8 Priority Occupation Areas

- |                                       |                                 |
|---------------------------------------|---------------------------------|
| • Electricians                        | • Solar Installers              |
| • Energy Auditors                     | • Computer Software Engineers   |
| • Insulation & Weatherization Workers | • Construction/Project Managers |
| • Sales & Marketing                   | • Heating/AC Technicians        |

## 6 Secondary Occupation Areas

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| • Building/Energy Systems Inspectors | • Manufacturing Technicians           |
| • Electrical Engineers               | • Mechanical Engineers                |
| • Maintenance & Repair Workers       | • Smart Energy & Controls Technicians |

- Because most priority occupations have ties to existing occupations, only small changes in training may be required regionally.

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- Survey respondents also identified specific training requirements anticipated for priority occupational areas.
- These include general educational levels and specific industry certifications
- Through the University of Texas, Austin Community College, regional apprenticeship programs, and other job training initiatives, many of these specific programs exist.
- Future efforts may be focused upon expanding these programs and helping to build additional capacity to ensure qualified workers with the appropriate knowledge and certifications are available.

OCCUPATION	TRAINING OPPORTUNITIES
Building/Energy Systems Inspectors	LEED; Certified Energy Manager; Home Energy Rating System training
Solar Installers	Journeyman electrician; NABCEP
Heating/AC Technicians	6-month to 2-year programs in heating, air-conditioning, and refrigeration (often through apprenticeship programs); NATE
Computer Software Engineers	Professional engineer/bachelors degree with specific industry training in controls system design for "smart" and other renewable energy technologies
Electrical Engineers	BS degree; optional certified energy manager (CEM); Certified Lighting Efficiency Professional training
Electricians	Journeyman electrician; building trades apprenticeship programs; state licensing'; LEED
Energy Auditors	LEED; Certified Energy Manager; Home Energy Rating System training; BPI certification

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# Survey Background

To better prepare the regional workforce development system for meeting employer needs, AngelouEconomics, on behalf of Workforce Solutions - Capital Area Workforce Board and the Texas Foundation for Innovative Communities, conducted an employer survey. The survey was designed to analyze which renewable energy and energy efficiency jobs will be in demand in the near future and which types of training opportunities will be the most critical.

The survey results provide a valuable snapshot of employer occupational demand – which should help to inform a coordinated regional workforce development strategy that ensures:

- The right mix of short- and long-term job training/certification programs;
- More efficient use of financial & educational resources; and
- A central Texas workforce system that is able to meet current and emerging hiring and training needs.

# Methodology

- The targeted online survey was administered to renewable energy and energy efficiency businesses\* within the Central Texas region.\*\*
- The sample included those companies that fall within the following broad subsectors of the industry
  - “Renewable Energy” – primary energy (solar, wind, biofuels, geothermal, hydroelectric/wave & ocean energy) generation, production, installation, general operations, and R&D companies.
  - “Energy Efficiency” – energy conversion and conservation companies that provide a wide variety of “energy management” services related to the industry, with an emphasis on researching, testing, and installing smart technologies, green building, renewable energy project development, energy conservation auditing, and energy finance.
- Total Respondents: 119.

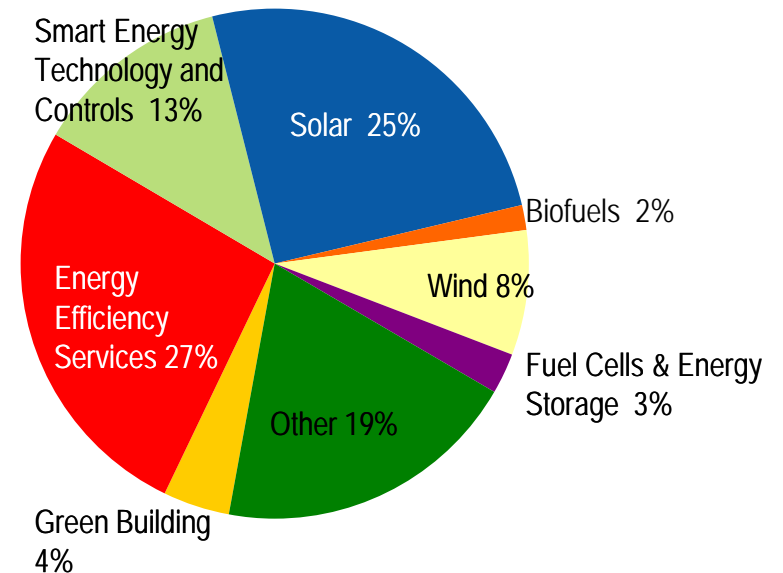
*\*As identified by a combination of quantitative and qualitative research and existing contacts from Workforce Solutions – Capital Area; AngelouEconomics; and the Texas Foundation for Innovative Communities*

*\*\*Generally consisting of the I-35 corridor area from San Antonio to Austin (including Bastrop, Bexar, Caldwell, Comal, Guadalupe, Hays, Travis, and Williamson counties)*

# Survey Respondents: By Industry

- Respondents covered the entire industry although Energy Efficiency Services (energy auditing, weatherization, and retrofitting firms) and Solar manufacturing, sales and installation companies make up of just over half of the respondents.
- This mix of respondents is consistent with the existing industry strengths of central Texas (with its significant existing assets in research and development through UT, Austin Clean Tech Incubator, and established VC networks):
  - Energy Efficiency Services** – green building and weatherization
  - Solar** (and to a lesser extent, wind) – generation, design, manufacturing, and installation
  - Energy consulting services** and/or firms considering themselves “one-stop shops” that conduct a variety of services within different sectors (identified as “Other”)\*
  - Smart Energy Technology and Controls** – exploration of new grid technologies and demand response programs and installation

Survey Respondents by Industry

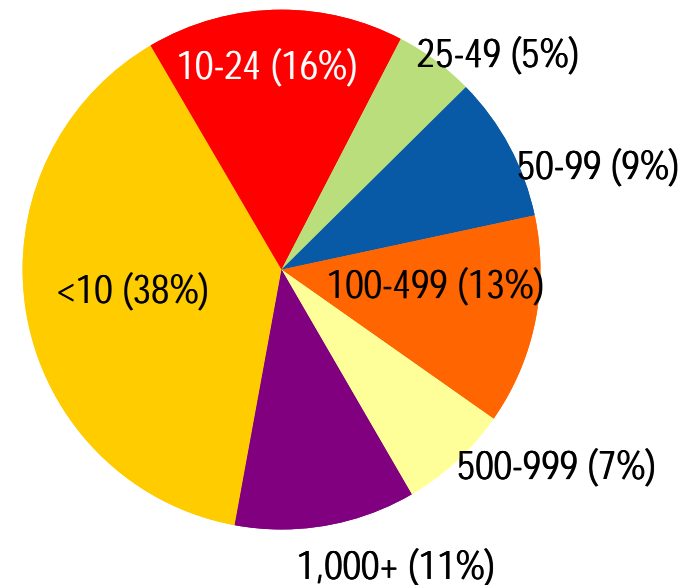


\*Also includes Austin utility companies

# Survey Respondents: By Business Size

- Survey respondent business sizes are reflective of typical renewable energy and energy efficiency firms which are very small, averaging fewer than 10 employees.
- However, the respondents also included regional power companies as well as solar and energy conservation technology and component manufacturing and installation companies, which are much larger in size.

Survey Respondents by Business Size

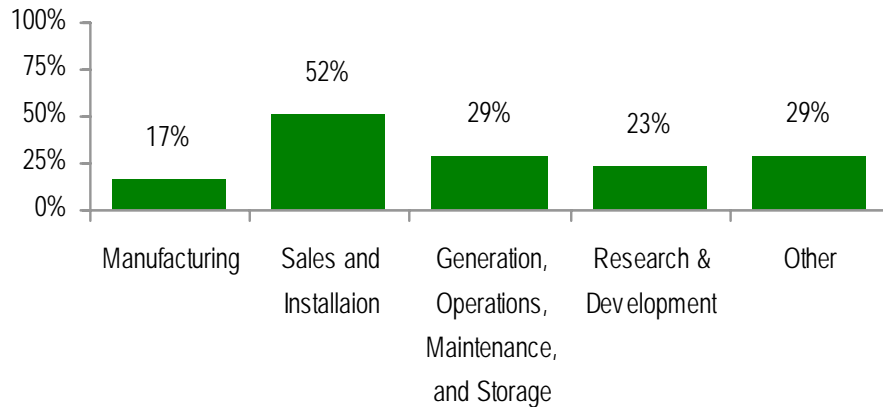


# Survey Respondents: By Value Chain and Market

- More than half of respondents describe their value chain focus as primarily focused on “Sales and Installation” services.
- However, with its strong public electric utilities and university/technology assets, it is not surprising that other parts of the industry value chain (namely research and development and energy generation and operations) are represented as well.
- Most companies provide services across industry markets from residential to commercial, and, to a lesser extent, industrial.

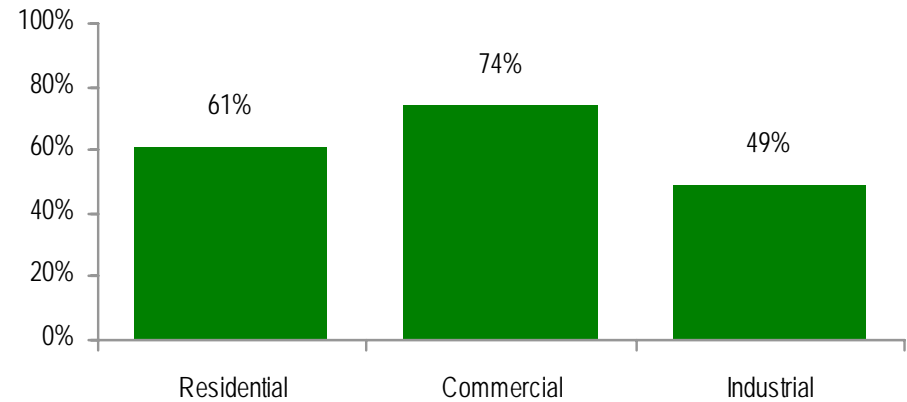
## Survey Respondents by Value Chain

Which best describes the value chain focus of your company? (Select all that apply)



## Survey Respondents by Market

Which best describes the industry market in which your company provides clean energy products or services? (Select all that apply)



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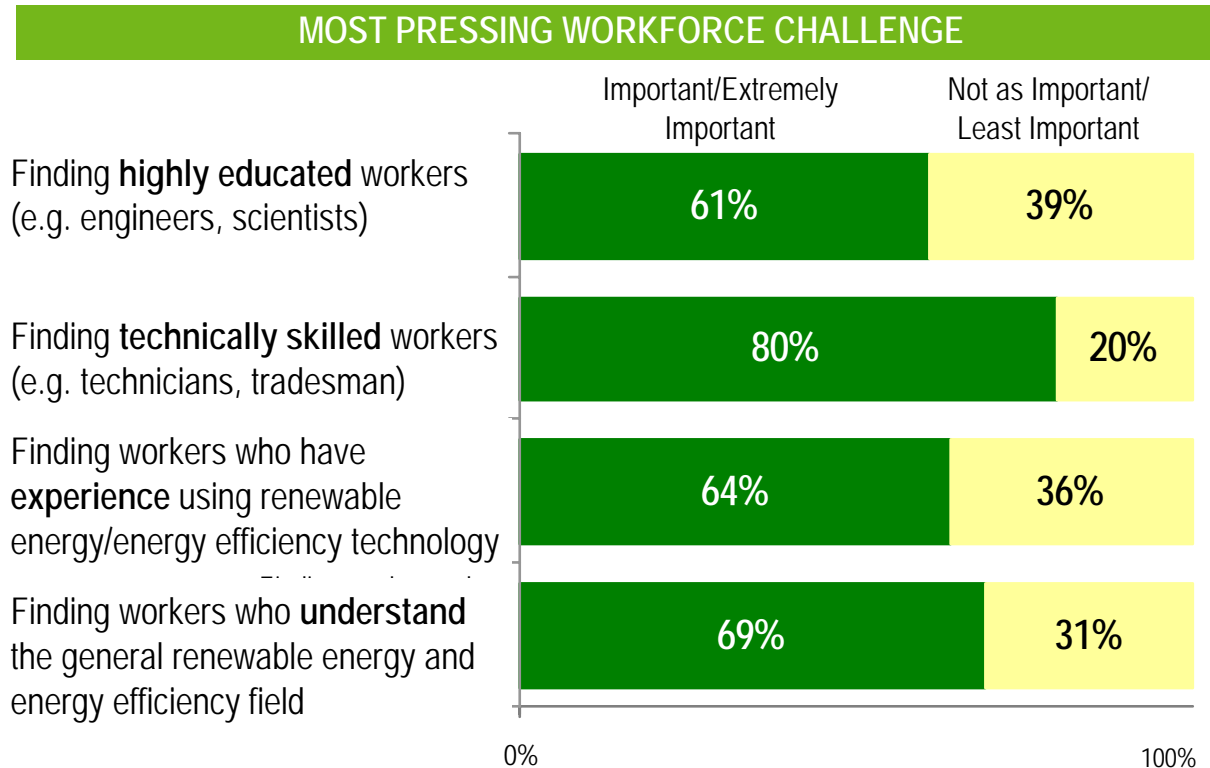
# Introduction to Workforce Development Issues

- The convergence of the current economic downturn and the increased federal investment in the renewable energy and energy efficiency industry is creating an uncertain time for industry firms.
- Interestingly, employers across industry sub-sectors see strong employment growth in both the immediate (next 1-2 years) as well as in the longer-term (3-5 years).
- However, as expected, employers anticipate more robust hiring in the longer term, driven most likely by an eventual reestablishment of broader consumer demand, investments from the American Recovery and Reinvestment Act, and city policies incentivizing/regulating renewable product and services use (e.g. home weatherization services, solar panel, etc).



# Most Pressing Workforce Challenge

- Respondents were asked their current most pressing workforce challenge and were provided four responses designed to broadly identify the *type* of workers who may be most critical to future firm growth.
- While respondents clearly see all types as very important, finding **technically skilled workers** was deemed most important, indicating a current need to support manufacturing, energy efficiency services, and installation and maintenance opportunities.



# Occupations

- Respondents were asked to identify specific hiring needs across a set of 24 industry occupations.\*
- These 24 occupations were identified through previously-conducted qualitative and quantitative research, as well as knowledge of the industry and recent trends.
- Occupations cut across the both the “renewable energy” sector (wind, solar, geothermal, biofuels) and value chains (e.g. generation, manufacturing, sales/operations, and R&D) – as well as “energy efficiency” (green building, energy management) sector.

## Industry Occupations\*\*+

Architects	Electrical Engineers	Manufacturing Technicians
Building Commissioners	Electrical Power Line Installers	Mechanical Engineers
Building/Energy Systems Inspectors	Electricians	Meter Installers
Carpenter’s/Carpenter’s Helpers	Energy Auditors	Plumbers
Chemical Engineers	Environmental Engineers	Roofers
Chemical Technicians	Heating/AC Technicians	Sales & Marketing
Computer Software Engineers	Insulation & Weatherization Workers	Smart Energy & Controls Technicians
Construction/ Project Managers	Maintenance & Repair Workers	Solar Installers

\*Occupations are not necessarily distinct (e.g. insulation and weatherization workers can include roofers and carpenters for example) but were broken out as a means to identify specific employer needs

\*\*Respondents were also provided the opportunity to identify “other” occupations not included as part of this list

+ See Appendix B for a description of each occupation

# Occupations

The employer survey identified occupational demand that was classified into three primary areas:

- Occupations **“In Demand”** – those where employers are expecting the most hiring to occur;
- Occupations **“Most Difficult to Fill”** – those for which employers have the most difficulty finding qualified workers; and
- Occupations that **“Need Retraining”** – incumbent workers for which employers are expecting most training to be needed.

# Top “In-Demand” Occupations

- For each occupation, respondents were asked to identify how many employees they are expecting to hire over the next 3 years.
- Top “In Demand” occupations include those occupations where:
  - At least 50% of respondents indicated hiring between 1-25 workers; or
  - At least 4% of respondents indicated hiring more than 25 workers; or
  - At least 1 respondent indicated hiring more than 100 workers

# Top "In-Demand" Occupations

OCCUPATION	Expected Hires		
	None	1-25	26+
Architects	86%	14%	0%
Building Commissioners	83%	17%	0%
Building/Energy Systems Inspectors	53%	42%	5%
Carpenter's/Carpenter's Helpers	91%	9%	0%
Chemical Engineers	82%	18%	0%
Chemical Technicians	91%	9%	0%
Computer Software Engineers	47%	53%	0%
Construction/ Project Managers	39%	59%	2%
Electrical Engineers	30%	64%	6%
Electrical Power Line Installers	81%	16%	3%
Electricians	30%	63%	7%
Energy Auditors	24%	73%	2%
Environmental Engineers	72%	28%	0%
Heating/AC Technicians	58%	40%	8%
Insulation & Weatherization Workers	57%	37%	6%
Maintenance & Repair Workers	50%	48%	3%
Manufacturing Technicians	77%	17%	6%
Mechanical Engineers	51%	49%	3%
Meter Installers	85%	15%	0%
Plumbers	74%	26%	0%
Roofers	81%	19%	0%
Sales & Marketing	11%	89%	0%
Smart Energy & Controls Technicians	40%	60%	0%
Solar Installers	40%	58%	2%
Other	46%	42%	3%

## Top "In Demand" Occupations

*Occupations which firms across the industry most frequently expect to hire*

- Sales and Marketing (89%)
- Energy Auditors (73%)
- **Electrical Engineers (64%)**
- **Electricians (63%)**
- Smart Energy & Controls Technicians (60%)
- Construction/Project Managers (58%)
- Solar Installers (58%)
- Computer Software Engineers (53%)

*Occupations where large numbers of workers may be hired, even if by a small # of firms*

- **Electricians (7%)**
- **Electrical Engineers (6%)**
- Insulation & Weatherization Workers (6%)
- Manufacturing Technicians (6%)
- Building/Energy Systems Inspectors (5%)
- Manufacturing & Repair Workers (3%)\*
- Heating/AC Technicians (3%)\*

**Bold typeface: occupations that appear in both sub-categories**

\*1 respondent identified a need for 100+ workers

# Top “In Demand” Occupations: Analysis

- The top “In Demand” occupations (**sales and marketing; energy auditors, electrical engineers; electricians; insulation and weatherization; manufacturing technicians; and solar installers**) are reflective of key regional industry growth drivers: emerging solar cluster; new federal investment in energy efficiency services (close to \$7 million for Austin); and local Austin home auditing policies that will increase demand for weatherization services and new renewable installation.
- These positions include both **technically skilled workers** who understand building sciences and trades, and have experience with electronic parts and equipment, as well as **highly educated engineers** involved in the design and testing of renewable and smart grid technologies.
- Almost all employers indicated a need for **sales and marketing professionals** with specific industry knowledge and experience who can help to sell products such as residential solar systems, home area networks, etc. Given the small/start up nature of many of these firms, experienced business development professionals who can secure investment and financing for renewable development projects will be critical.
- Not surprisingly, **electricians (journeymen, licensed)** who connect energy generation technologies to the grid and install energy efficiency devices for weatherization/retrofitting initiatives, **and electrical engineers** who can serve as energy systems designers/managers, energy auditors, etc. are both expected to be hired by a large number of industry firms and in some cases, in large numbers.

# Occupations Most Difficult to Fill

Respondents were asked to identify which occupations were currently (and anticipated to continue to be) the most difficult to fill. This question was open-ended.

## TOP 10 MOST DIFFICULT TO FILL POSITIONS

- 1) **Engineers** (electrical, mechanical, environmental computer software)
- 2) **Sales & Marketing**
- 3) **Technicians** (manufacturing, repair)
- 4) **Project/Program Managers & Administrators** (construction and other)
- 5) **Installers** (solar, meter)
- 6) **Electricians**
- 7) **Skilled Manual Tradesmen** (outside of electricians): carpenters, roofers, plumbers
- 8) **HVAC Technicians**
- 9) **Energy Auditors**
- 10) **Operations/Management** (e.g. COOs, CFOs with understanding of industry trends and technologies)

# Occupations Most Difficult to Fill: Analysis

- “Most Difficult to Fill” positions include those occupations that are difficult to locate within the region. These jobs may or may not be needed in large numbers necessarily but they are often jobs where employers look outside the region to secure needed qualified talent.
- These positions include a mix of technically skilled workers who are required in primary energy production subsectors (**manufacturing technicians**) as well as the installation and maintenance value chain locations (**solar installers, HVAC technicians, and other skilled tradesmen**). Also crucial are the **construction/project managers** who plan and direct these projects.
- They also include an array of engineers who employers are relying upon to position the region for advances in technological innovation and overseeing production:
  - **Electrical**
  - **Mechanical** – primarily involved in the R&D efforts to create new clean energy technologies, determine process improvements for energy efficiency systems, while overseeing both production and installation
  - **Computer software engineers** – identified largely by energy efficiency and smart technology firms developing programs such as demand response
  - **Controls and systems engineers** – involved in the design and construction of new energy control systems for industrial, residential, and commercial buildings
- While a smaller number of engineers may be required for operations than technicians, these positions are frequently more difficult to fill.

# Existing Worker Training Needs

- For each occupation, respondents were asked to identify how many of their current workers were expected to need new training over the next three years to keep in line with industry changes.
- Top “Retraining Need” occupations include those occupations where:
  - At least 50% of respondents indicated between 1-25 of their workers will need new training; or
  - At least 3% of respondents indicated that more than 25 of current workers will need new training

# Existing Worker Training Needs

OCCUPATION	Current Workers Needing New Training		
	None	1-25	26+
Architects	88%	12%	0%
Building Commissioners	82%	14%	4%
Building/Energy Systems Inspectors	63%	37%	0%
Carpenter's/Carpenter's Helpers	84%	16%	0%
Chemical Engineers	81%	19%	0%
Chemical Technicians	84%	16%	0%
Computer Software Engineers	62%	34%	3%
Construction/ Project Managers	52%	45%	3%
Electrical Engineers	51%	49%	0%
Electrical Power Line Installers	92%	4%	4%
Electricians	43%	51%	5%
Energy Auditors	36%	64%	0%
Environmental Engineers	79%	21%	0%
Heating/AC Technicians	52%	45%	3%
Insulation & Weatherization Workers	63%	33%	4%
Maintenance & Repair Workers	57%	43%	0%
Manufacturing Technicians	73%	23%	3%
Mechanical Engineers	50%	50%	0%
Meter Installers	88%	12%	0%
Plumbers	88%	12%	0%
Roofers	84%	16%	0%
Sales & Marketing	32%	66%	2%
Smart Energy & Controls Technicians	55%	42%	3%
Solar Installers	49%	51%	0%
Other	70%	30%	0%

## Top "Retraining Need" Occupations

*Occupations most frequently expected to need new training (identified by the highest percentage of firms)*

- Sales & marketing (66%)
- Energy Auditors (64%)
- **Electricians (51%)**
- Solar Installers (51%)
- Mechanical Engineers (50%)

*Occupations where large numbers of workers may need new training (even if identified by a small # of firms)*

- **Electricians (5%)\*\***
- Building/Energy Systems Inspectors (5%)
- Insulation & Weatherization Workers (4%)\*
- Electrical Power Line Installers (4%)
- Heating/AC Technicians (3%)\*
- Construction/Project Managers (3%)\*
- Computer Software Engineers (3%)
- Smart Energy & Controls Technicians (3%)

**Bold typeface: occupations that appear in both categories**

\*2 respondents identified a need to train 100+ workers

\*\*1 respondent identified a need to train 100+ workers

# Existing Worker Training Needs: Analysis

- As was identified in a previous study, despite the high-tech nature of the technologies powering the industry, virtually none of the new jobs being created in the industry require entirely new occupations.
- Many traditional trade occupations like electricians and plumbers, mechanical and electrical engineering and engineering technicians, manufacturing technicians and construction laborers will be required to build the renewable energy and energy efficiency industry – however, many of these occupations will require some additional training to fully transition their skills to the new industry opportunities.
- Survey respondents indicate retraining requirements\* for several occupations including: **energy auditors, electricians, solar installers, and sales & marketing professionals** (all identified by more than 50% of respondents).
- In some cases companies indicated a need for significant numbers of incumbent workers who will need new and/or updated skills\*: **electricians; building/energy systems inspectors; insulation & weatherization workers; and HVAC technicians** who may need short term training around ensuring carpentry, roofing, air conditioning installation practices, for example, meet new energy efficiency standards.

\* Specific training information is included in a subsequent section of this report

# Occupational Priority Areas

- The survey findings help to identify potential priority occupational areas for the region's workforce development system (occupations where job training resources may be targeted).
- In identifying these priority areas, the following criteria was applied:
  - Occupations of which respondents are expecting to hire a significant amount (Top In-Demand);
  - Occupations that respondents identified as "Difficult-to-fill"; and
  - Occupations (existing workers) that respondents identified most often will need retraining.
- Primary Occupation Areas are those occupations that meet all three criteria; Secondary Occupation Areas are those occupations that meet at least two of these criteria.

# Occupation Priority Areas

OCCUPATION	NEW WORKERS		EXISTING WORKERS
	Top "In-Demand"	Difficult-to-fill	Top Retraining Needs
Architects			
Building Commissioners			
Building/Energy Systems Inspectors	✓		✓
Carpenter's/ Carpenter's Helpers		✓	
Chemical Engineers			
Chemical Technicians			
Computer Software Engineers	✓	✓	✓
Construction/ Project Managers	✓	✓	✓
Electrical Engineers	✓	✓	
Electrical Power Line Installers			✓
Electricians	✓	✓	✓
Energy Auditors	✓	✓	✓
Environmental Engineers		✓	

OCCUPATION	NEW WORKERS		EXISTING WORKERS
	Top "In-Demand"	Difficult-to-fill?	Top Retraining Needs
Heating/AC Technicians	✓	✓	✓
Insulation & Weatherization Workers	✓	✓	✓
Maintenance & Repair Workers	✓	✓	
Manufacturing Technicians	✓	✓	
Mechanical Engineers		✓	✓
Meter Installers		✓	
Plumbers		✓	
Roofers		✓	
Sales & Marketing	✓	✓	✓
Smart Energy & Controls Technicians	✓		✓
Solar Installers	✓	✓	✓
Other (Operations/Mngmnt)		✓	

# Occupation Priority Areas

## 8 Priority Occupation Areas

- Electricians
- Energy Auditors
- Insulation & Weatherization Workers
- Sales & Marketing
- Solar Installers
- Computer Software Engineers
- Construction/Project Managers
- Heating/AC Technicians

## 6 Secondary Occupation Areas

- Building/Energy Systems Inspectors
- Electrical Engineers
- Maintenance & Repair Workers
- Manufacturing Technicians
- Mechanical Engineers
- Smart Energy & Controls Technicians

## Education and Training Requests: Identified by Survey Respondents

Respondents were also asked the type of specific certifications and technical training programs they anticipated both new and current workers would need to meet changing industry requirements. Responses (in order of frequency) include:

- Solar PV installation training and certification (e.g. North American Board of Certified Energy Practitioners training)
- Energy auditor/rating certifications (e.g. Certified Energy Manager; Home Energy Rating System (HERS) training)
- LEED certifications across energy efficiency occupations
- Expanded professional engineering programs (BS degrees) primarily in electrical and mechanical
- Expanded associates-degree programs for engineering technicians
- Other specific certification/training programs identified (from multiple survey respondents):
  - Light Commercial HVAC Training
  - Certified Lighting Efficiency Professional (CLEP)
  - Electrical licenses
  - EMS (energy management)
  - North American Technician Excellence (NATE) for HVAC technicians

# Education and Training Opportunities by “Priority” Occupation

OCCUPATION	TRAINING OPPORTUNITIES
Insulation & Weatherization Workers	Journeyman electrician; on-the-job training; building trades apprenticeship programs; LEED
Sales and Marketing	Bachelor's/associates degree with specific industry training; on-the-job training
Building/Energy Systems Inspectors	LEED; Certified Energy Manager; Home Energy Rating System training
Solar Installers	Journeyman electrician; NABCEP
Heating/AC Technicians	6-month to 2-year programs in heating, air-conditioning, and refrigeration (often through apprenticeship programs); NATE
Smart Technology & Controls Technicians	AAS; experience in electrical trades and/or computer systems integration
Computer Software Engineers	Professional engineer/bachelors degree with specific industry training in controls system design for “smart” and other renewable energy technologies
Construction/ Project Managers	Bachelors/Associates degree
Electrical Engineers	BS degree; optional certified energy manager (CEM); Certified Lighting Efficiency Professional training
Maintenance & Repair Workers	Wind energy technician training; building trades apprenticeship programs; on-the-job training
Electricians	Journeyman electrician; building trades apprenticeship programs; state licensing; LEED
Energy Auditors	LEED; Certified Energy Manager; Home Energy Rating System training; BPI certification
Manufacturing Technicians	AAS; on-the-job training; apprenticeship programs
Mechanical Engineers	BS degrees

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## Findings: Introduction

- The renewable energy industry in central Texas poses a unique workforce development challenge. Because of the changing industry requirements, emerging niche sectors, and value chain focuses, there is **no single solution for workforce needs**.
- The **priority occupation areas** identified here represent an important set of general occupations to which the region's workforce system should be aligned – and is very much reflective of where the industry appears to be heading regionally. Because most priority occupations have ties to existing occupations, only small changes in training may be required.
- **Technically-skilled occupations** (e.g. tradesmen; machine operators) are where **job growth** will likely occur in the short-term regionally (in aggregate) but generating electrical and mechanical **engineering talent** with specific industry knowledge, will be critical to capturing the high value technology, research and design jobs that Austin covets.
- Given the mix of specific occupational levels required by the industry a **combination of shorter-term certificate/continuing education (and apprenticeship training programs) as well as longer term academic programs based in key engineering disciplines** will be critical.
- Not surprisingly, therefore, the survey findings have significant implications for all levels of education service providers including **Austin Community College, University of Texas, regional K-12 school districts, etc** in meeting expected industry demand.

# Sector-Specific Findings

## Renewable Energy

- Specifically, given the emerging solar generation, manufacturing, PV and solar hot water installation presence in the region, **electricians and plumbers with electronics assembly and machine operating skills will continue to be in high demand**. Training tradesmen (carpenters, electricians and plumbers) will also be important, recognizing that most of these positions require the basic skill sets associated with those occupations with perhaps some additional practical training with solar specifics.
- Expanded training programs **for solar PV installers and electricians** (preparing students for certification exams), will be important to the region, as will increased focus on professional engineering programs that produce engineers and technicians who can design and test clean energy systems.
- In time, as demand for wind turbines and solar panels and systems rises, product **repair and maintenance** occupations will become more important. The capacity of specific technician training (e.g. wind technician programs) and apprenticeship programs, therefore, will need to be built.
- Although other industry subsectors (e.g. **wind, hydroelectric**) may not be primary focuses within the region, generation, manufacturing and installation (of wind turbines, for example) companies have a presence in the central Texas region (and elsewhere throughout the state) and will require a similar set of occupations with specialized technician training.

# Sector-Specific Findings

## Energy Efficiency

- With the City of Austin's requirement that all residential, multi-family, and commercial buildings receive energy audits either upon sale or on a predetermined schedule, energy efficiency services has emerged as a large unmet need in the renewable energy workforce.
- In addition, with the current economic slowdown (and fewer new construction projects) weatherizing and retrofitting existing/old residential\* and commercial buildings will, in the short term, likely provide the greatest number of jobs in the central Texas region. Properly trained **electricians, carpenters, heating/AC technicians, construction and project managers, and building inspectors/auditors** will all be in demand and, according to employers, difficult to find.
- As green building, weatherization, and retrofitting become more commonplace within commercial and industrial buildings, **systems monitoring** ('continuous commissioning' monitoring performance over time) will likely become a more prevalent activity spurring an increase in demand for building commissioner, auditor, rater, and inspector services.
- Technician training programs will need to be expanded and AAS, BS, and specific home energy rating and building performance/commissioning training programs\*\* will likely become increasingly important to the region.

\*Some estimates indicate 80% of the existing housing stock in central Texas needs some sort of retrofitting

\*\*See Texas A&M's building commissioning program; and Cedar Valley College's Energy Efficiency Green Building Institute

# Sector-Specific Findings

## Smart Technology and Controls (and cross-industry R&D)

- Given the existing regional R&D assets, venture capital networks, and grid technology advances that could stem from the Pecan Street Project, many services and research oriented firms are emerging within central Texas with workforce needs including **highly-educated mechanical, electrical, and computer software engineers**.
- Respondents identified a need for **engineers and architects to be exposed to clean energy theory** and emerging technologies during academic course work.
- In addition, **controls technicians, systems administrators, and data managers** (with 2- and 4-year degrees), who can install smart meters and home area networks that interface with smart grid technology – and analyze and interpret data – will continue to be in demand by utilities and technology firms.
- While specific occupational demand for this subsector will continue to transform as new technologies surface, this may be an area to begin building job training efforts, where there is currently **limited specialized programs**.

# Additional Findings

Survey respondents identified a series of additional cross-sector workforce-related challenges

- Given the changing nature of the industry, flexible training programs will be important – with the integration of industry certification programs into core curricula for area workers which provides employers with confidence that trainees have the required hard and soft skills for various occupations.
- In the longer-term, the region will need to ensure that a pipeline of young talent is primed for the career opportunities in high-value science and technology-based careers within the industry. Career exposure and experiential learning opportunities within STEM careers will help this effort and continue to position the region as a renewable energy and energy efficiency R&D hub – and allay fears from industry firms that they need to look elsewhere for specialized engineering talent.
- Employers need confirmation of appropriate accrediting organizations and institutions that are at an international standard of quality – and ensuring teachers are accredited appropriately as well.
- Due to the start-up nature of the industry, firms are searching for employees who are adept at a variety of industry-specific and technical skills with strong business acumen. Relatedly, other respondents requested a need for technical and financing expertise to support company growth and hiring needs.
- “TWC doesn’t have a website dedicated to green jobs – how can they find us/we find them???” *[as described by one employer]*

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# Appendix A: Individual Sector Breakouts

- Because the Solar, Energy Efficiency Services, and Smart Technology & Controls industry sub-sectors represent the primary areas of survey respondents each subsector is broken out on the following pages...

# Appendix A: Solar Breakout

<b>Industry Info</b>	Typical Value Chain	Sales and Installation (66%) and Generation, Operations, and Maintenance (28%)		
	Typical Size of Business	<10 employees (72%)		
<b>Workforce Needs</b>	Top In-Demand	Difficult-to-Fill	Top Retraining Needs	Training
	<ul style="list-style-type: none"> <li>▣ Electricians</li> <li>▣ Construction/Project Managers</li> <li>▣ Energy Auditors</li> <li>▣ Electrical Engineers</li> <li>▣ Solar Installers</li> <li>▣ Sales &amp; Marketing</li> <li>▣ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▣ Solar Installers</li> <li>▣ Sales &amp; Marketing</li> <li>▣ Electricians</li> <li>▣ Project Managers</li> </ul>	<ul style="list-style-type: none"> <li>▣ Electricians</li> <li>▣ Construction/Project Managers</li> <li>▣ Energy Auditors</li> <li>▣ Electrical Engineers</li> <li>▣ Solar Installers</li> <li>▣ Maintenance &amp; Repair Workers</li> <li>▣ Sales &amp; Marketing</li> <li>▣ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▣ NABCEP/ Solar Installation</li> <li>▣ LEED Certifications</li> <li>▣ Electrical licenses</li> </ul>

# Appendix A: Smart Energy Technology and Controls Breakout

<b>Industry Info</b>	<b>Primary Value Chain</b>	Generation, Operations, and Maintenance (43%) and R&D (43%)		
	<b>Size of Business</b>	Primarily larger firms (100+ employees)		
<b>Workforce Needs</b>	<b>Top In-Demand</b>	<b>Difficult-to-Fill</b>	<b>Top Retraining Needs</b>	<b>Training</b>
	<ul style="list-style-type: none"> <li>▫ Building/Energy Inspectors</li> <li>▫ Energy Auditors</li> <li>▫ Electrical Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Computer Software</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ Technicians (Instrument, Smart Energy)</li> <li>▫ Production workers (Manufacturing Technicians)</li> <li>▫ Project Managers</li> <li>▫ Electrical Engineers</li> </ul>	<ul style="list-style-type: none"> <li>▫ Electrical Engineers</li> <li>▫ Mechanical Engineers</li> <li>▫ Computer Software Engineers</li> <li>▫ Sales &amp; Marketing</li> </ul>	<ul style="list-style-type: none"> <li>▫ Basic Electrical, Energy Management Systems and Controls Installation Training</li> <li>▫ NERC/ERCOT System Operator</li> <li>▫ Two years technical degrees in electronics or electrical technology</li> <li>▫ Professional Engineers, FERC&amp;NERC certification.</li> </ul>

# Appendix A: Energy Efficiency Services Breakout

<b>Industry Info</b>	<b>Primary Value Chain</b>	Sales & Installation (79%) and Consulting Services (21%)		
	<b>Size of Business</b>	All sizes		
<b>Workforce Needs</b>	<b>Top In-Demand</b>	<b>Difficult-to-Fill</b>	<b>Top Retraining Needs</b>	<b>Training</b>
	<ul style="list-style-type: none"> <li>▫ Insulation &amp; Weatherization Workers</li> <li>▫ Energy Auditors</li> <li>▫ Computer Software Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ HVAC Technicians</li> <li>▫ Mechanical Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Energy Auditors</li> </ul>	<ul style="list-style-type: none"> <li>▫ HVAC Technicians</li> <li>▫ Insulation &amp; Weatherization Workers</li> <li>▫ Energy Auditors</li> <li>▫ Sales &amp; Marketing</li> </ul>	<ul style="list-style-type: none"> <li>▫ CEM</li> <li>▫ LEED</li> <li>▫ HVAC Controls</li> <li>▫ HERs</li> <li>▫ CLEM</li> <li>▫ CLEP</li> </ul>

# Appendix A: Subsector Summary

INDUSTRY	Top In-Demand	Difficult-to-Fill	Top Retraining Needs	Training
Solar	<ul style="list-style-type: none"> <li>▫ Electricians</li> <li>▫ Construction/Project Managers</li> <li>▫ Energy Auditors</li> <li>▫ Electrical Engineers</li> <li>▫ Solar Installers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ Solar Installers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Electricians</li> <li>▫ Project Managers</li> </ul>	<ul style="list-style-type: none"> <li>▫ Electricians</li> <li>▫ Construction/Project Managers</li> <li>▫ Energy Auditors</li> <li>▫ Electrical Engineers</li> <li>▫ Solar Installers</li> <li>▫ Maintenance &amp; Repair Workers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ NABCEP/ Solar Installation</li> <li>▫ LEED Certifications</li> <li>▫ Electrical licenses</li> </ul>
Energy Efficiency	<ul style="list-style-type: none"> <li>▫ Insulation &amp; Weatherization Workers</li> <li>▫ Energy Auditors</li> <li>▫ Computer Software Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ HVAC Technicians</li> <li>▫ Mechanical Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Energy Auditors</li> </ul>	<ul style="list-style-type: none"> <li>▫ HVAC Technicians</li> <li>▫ Insulation &amp; Weatherization Workers</li> <li>▫ Energy Auditors</li> <li>▫ Sales &amp; Marketing</li> </ul>	<ul style="list-style-type: none"> <li>▫ CEM</li> <li>▫ LEED</li> <li>▫ HVAC Controls</li> <li>▫ HERs</li> <li>▫ CLEM</li> <li>▫ CLEP</li> </ul>
Smart Technology	<ul style="list-style-type: none"> <li>▫ Building/Energy Inspectors</li> <li>▫ Energy Auditors</li> <li>▫ Electrical Engineers</li> <li>▫ Sales &amp; Marketing</li> <li>▫ Computer Software</li> <li>▫ Smart Energy &amp; Controls</li> </ul>	<ul style="list-style-type: none"> <li>▫ Technicians (Instrument, Smart Energy)</li> <li>▫ Production workers (Manufacturing Technicians)</li> <li>▫ Project Managers</li> <li>▫ Electrical Engineers</li> </ul>	<ul style="list-style-type: none"> <li>▫ Electrical Engineers</li> <li>▫ Mechanical Engineers</li> <li>▫ Computer Software Engineers</li> <li>▫ Sales &amp; Marketing</li> </ul>	<ul style="list-style-type: none"> <li>▫ Basic Electrical, Energy Management Systems and Controls Installation Training</li> <li>▫ NERC/ERCOT System Operator</li> <li>▫ Two years technical degrees in electronics or electrical technology</li> <li>▫ Professional Engineers, FERC&amp;NERC certification.</li> </ul>

# Appendix B: Occupational Descriptions

OCCUPATION	DESCRIPTION
Architects	Licensed professionals trained in the art and science of (green) building design who develop the concepts for structures and turn those concepts into images and plans.
Building Commissioners	Third party inspectors of new buildings to ensure lights, plumbing, and heating and ventilation systems work effectively alone and in concert with one another in all seasons. Consultation can occur either during the design or post-construction phases of new buildings. Also includes retro-commissioning for older buildings.
Building/Energy Systems Inspectors	Similar to building commissioners, they evaluate residential or commercial code compliance for energy efficiency including residential energy audits to evaluate existing homes for meeting energy efficiency incentive programs and advanced building technologies.
Carpenter's/ Carpenter's Helpers	Construct, erect, install, and repair structures and fixtures made from wood and other materials within the context of weatherizing or retrofitting buildings for energy efficiency purposes.
Chemical Engineers	Apply the principles of chemistry in designing equipment and processes for large-scale chemical manufacturing, plan and test methods of manufacturing products and treating byproducts, and supervise production. Occupation ties directly to positions within biofuels companies.
Chemical Technicians	Use the principles and theories of science, engineering, and mathematics to solve technical problems in research and development, manufacturing, sales, construction, inspection, and maintenance. Work is more narrowly focused and application-oriented than that of scientists and engineers.
Computer Software Engineers	Involved in the design and development of software including controls system design for "smart" and many other renewable energy technologies often used to minimize building energy use.
Construction/ Project Managers	Plan, direct, coordinate, and budget activities concerned with the construction and maintenance of structures, facilities, and systems. Oversee the organization, scheduling, and implementation of construction projects, particularly in the renewable energy sectors of green building and energy services, which rely heavily on residential and commercial construction workers to reduce energy consumption.
Electrical Engineers	Design, develop, test and supervise the manufacturing and design of electrical equipment, components, and systems for commercial, industrial, and scientific use. Are required across the value chain of the renewable energy industry and in most subsectors (e.g wind, solar, smart grid technologies, etc).
Electrical Power Line Installers	Install or repair cables or wires used in electrical power or distribution systems; may have transferable skills to erect, maintain wind turbines.

# Appendix B: Occupational Descriptions

OCCUPATION	DESCRIPTION
Electricians	Like other tradesmen, work in the installation and maintenance of building and industrial systems. Electricians install, maintain, and repair electrical wiring, equipment, and fixtures. In the renewable energy industry, electricians are important for connecting energy generation technologies to the grid, and in installing energy efficiency devices and techniques in green building and energy services companies.
Energy Auditors	Energy and building auditors and commissioners have the most in common with building inspectors, with an emphasis on discovering energy leaks and inefficiencies that can be rectified to conserve energy.
Environmental Engineers	Using the principles of biology and chemistry, develop solutions for water and air pollution and waste disposal. Tied to clean energy occupations often found within the biofuels subsector.
Heating/AC Technicians	Trained in installation and/or maintenance of heating and air-conditioning systems control the temperature, humidity, and the total air quality in residential, commercial, industrial, and other buildings.
Insulation & Weatherization Workers	Includes an array of weatherization, pipe fitters, sheet metal workers, etc., electricians, window glaziers, general contractors, carpenters, plumbers, and construction workers who are trained in protecting buildings and increasing energy efficiency.
Maintenance & Repair Workers	Workers performing tasks involving physical labor at building, projects and demolition sites. In the renewable energy industry, maintenance and repair workers have important roles to play in installing wind and solar energy, constructing green buildings and retrofitting buildings for energy services companies, and in manufacturing components for wave energy machines, green building supplies, and energy services devices.
Manufacturing Technicians	Install, inspect, test, maintain, or repair green power and renewable energy systems such as hydro/tidal, geothermal, wind, solar, or biomass systems. Also includes machine operators who use hand-welding or flame-cutting equipment to weld or join metal components or to fill holes, indentations, or seams of fabricated metal products – and, within the clean energy industry, are often employed in manufacturing components for renewable energy generation equipment such as wind turbine towers and solar panel support structures.
Mechanical Engineers	Plan and design tools, engines, and machines, and oversee installation, operation, maintenance, and repair of heat, gas, water, and steam systems. Are particularly in demand for research and design jobs in creating new technologies in renewable energy production and in manufacturing renewable energy production systems.

# Appendix B: Occupational Descriptions

OCCUPATION	DESCRIPTION
Meter Installers	Install, repair, and maintain mechanical regulating and controlling devices, such as electric meters, gas regulators, thermostats, safety and flow valves, and smart meters that are capable of two-way communication, exchanging information with a utility and between devices in a residence.
Plumbers	Assemble, install, and repair pipes, fittings, and fixtures of heating, water, and drainage systems. These occupations are important across the installation and generation, operations, and maintenance value chain locations, and in particular in installation and maintenance of solar thermal and concentrating solar, installation and maintenance of biofuels and geothermal production plants, and in water conservation for green building.
Roofers	Repair and install roofs made of tar or asphalt and gravel; rubber or thermoplastic; metal; or shingles to protect buildings and their contents from water damage. Repair and reroofing—replacing old roofs on existing buildings – will make up the majority of work within green building and energy efficiency services.
Sales & Marketing	Coordinate their companies' market research, marketing strategy, sales, advertising, promotion, pricing, product development, and public relations activities.
Smart Energy & Controls Technicians	Required across energy services subsector to help construct and install new energy control systems for industrial, residential, and commercial buildings. Share occupational requirements similar to electricians and engineers.
Solar Installers	Construct, attach, mount and seal solar thermal or photovoltaic systems and solar panel support structures. Programs focused on developing a workforce in this area have successfully combined existing training in building techniques, safety, electricity, and other related areas with new modules in solar-specific topics such as solar panel safety, installation, wiring, and system design.

## Appendix C: Average Wages for Priority Occupation Areas

OCCUPATION	AVERAGE WAGES Austin/Round Rock; San Antonio MSAs
Insulation & Weatherization Workers	\$20,860,150-\$33,270
Computer Software Engineers	\$92,340
Construction/ Project Managers	\$65,420
Electrical Engineers	\$93,120
Maintenance & Repair Workers; Solar Installers	\$20,860-\$33,270
Electricians	\$36,390
Manufacturing & Heating/AC Technicians	\$33,270- \$35,800
Mechanical Engineers	\$75,530

Source: BLS Occupational Statistics