

Occupations and Training Programs

As part of the City of Shasta Lake's study on the feasibility of developing a green tech business park and marketing plan, funded through the Community Development Block Grant (CDBG) program, the consulting firm provided statistical data on the job potential and skill set requirements of the occupations within the industries identified for recruitment.

A priority of the CDBG program is to identify and address the needs of low and moderate income persons, i.e. those who earn less than 80 percent of the area median income. This group is referred to as the Target Income Group (TIG).

To ensure that local workers, particularly those in the Targeted Income Group, are adequately trained for the clean tech target industries and that area colleges and training agencies are offering programs that meet the needs of current and future employers, this document presents research findings and documents:

- The critical occupations for the target industries identified previously
- A description of the Standard Occupational Classifications for the critical occupations
- The jobs, career paths, skill sets, knowledge, and educational requirements associated with the critical occupations
- Specific skills, for these occupations
- Sample programs and curriculum
- A strategy to prepare and train TIG individuals for these jobs



Target Industry Sectors

In the “Clean Tech Market Analysis” report prepared for the City of Shasta Lake in November 2010, the following industry sectors were identified as a potential good-match for the proposed green technology business park and are the basis for the occupations and skill sets discussed in this report.

Industry Targets	Sector
Energy Generation	<ul style="list-style-type: none"> Tier II component parts for small hydro, solar, biomass and co-generation
Energy Efficiency	<ul style="list-style-type: none"> Building efficiency products and services Energy efficiency meters and measuring devices Energy conservation and consulting
Energy Storage	<ul style="list-style-type: none"> Battery components and accessories
Air and Environment	<ul style="list-style-type: none"> Environmental consulting and engineering, sustainable business consulting Environmental remediation
Recycling & Waste	<ul style="list-style-type: none"> Recycling (paper, metal, plastic, rubber, bottle, automotive, electronic waste/scrap)
Water and Wastewater	<ul style="list-style-type: none"> Water conservation (control systems, meters and measuring devices) Development and manufacturing of pump technology Water treatment and purification products/services
Agricultural Support	<ul style="list-style-type: none"> Sustainable land management and business consulting services Sustainable aquaculture
Green Building	<ul style="list-style-type: none"> Building materials
Energy Infrastructure	<ul style="list-style-type: none"> Consulting and management services Cable and equipment
Consumers Products	<ul style="list-style-type: none"> Companies that desire to produce a green product to address consumer demands, close to West Coast markets, without the high cost penalties of other parts of California

Critical Occupations

We determined the critical occupations for the industries identified as recruitment targets for the City of Shasta Lake’s green technology business park by (1) consulting the O-NET Resource Center¹; (2) considering the production and/or non-scientific occupations; and (3) verifying the critical occupations by reviewing a variety of existing research documents related to the “green economy” (see Data Sources at the end of this report).

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
Management Occupations											
11-1011.03	Chief Sustainability Officers		■								
11-1021	General and Operations Managers		■					■			
11-2011.01	Green Marketers					■			■		■
11-2021	Marketing Managers					■			■		■
11-3051	Industrial Production Managers	■	■	■	■		■	■	■		■
11-3051.02	Geothermal Production Managers	■									

¹ The Occupational Information Network (O*NET) was developed with the sponsorship of the US Department of Labor/Employment and Training Administration (USDOL/ETA). It is a database of information on hundreds of occupations which is collected and updated by surveying a broad range of workers from each occupation.

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
11-3051.03	Biofuels Production Managers	■									
11-3051.05	Methane/Landfill Gas Collection System Operators	■									
11-3051.06	Hydroelectric Production Managers	■									
11-3071.02	Storage and Distribution Managers	■		■							
11-9021	Construction Managers					■			■		
11-9041	Engineering Managers			■		■			■		■
11-9041.01	Biofuels/Biodiesel Technology and Product Development Managers	■									
11-9121.02	Water Resource Specialists					■					
11-9199.02	Compliance Managers		■								
11-9199.04	Supply Chain Managers					■			■		■
11-9199.06	Logistics Managers	■	■		■	■	■	■	■		■
11-9199.09	Wind Energy Operations Managers	■									
11-9199.10	Wind Energy Project Managers	■									
Business and Financial Operations Occupations											
13-1021	Purchasing Agents and Buyers, Farm Products							■			
13-1081.02	Logistics Analysts	■	■		■	■	■	■	■		■
13-1199.01	Energy Auditors		■			■			■		

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
13-1199.05	Sustainability Specialists		■								
13-2099.02	Risk Management Specialists					■			■		■
Computer and Mathematical Occupations											
15-1099.07	Geographic Information Systems Technicians					■			■		■
Architecture and Engineering Occupations											
17-1011	Architects, Except Landscape and Naval								■		
17-2051	Civil Engineers	■									
17-2071	Electrical Engineers	■	■	■		■			■		■
17-2072	Electronics Engineers, Except Compute			■		■			■		■
17-2111.01	Industrial Safety and Health Engineers	■	■	■	■	■	■	■	■		■
17-2112	Industrial Engineers			■		■			■		■
17-2141	Mechanical Engineers	■	■	■					■		
17-2199.03	Energy Engineers		■	■		■			■		■
17-2199.10	Wind Energy Engineers	■									
17-2199.11	Solar Energy Systems Engineers	■									
17-3011.01	Architectural Drafters								■		
17-3023.03	Electrical Engineering Technicians	■	■	■	■		■	■	■		■
17-3024	Electro-Mechanical Technicians	■	■	■	■		■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
17-3024.01	Robotics Technicians	■	■	■	■	■	■	■	■		■
17-3025	Environmental Engineering Technicians					■					
17-3026	Industrial Engineering Technicians	■	■	■	■		■	■	■		■
17-3029.02	Electrical Engineering Technologists	■	■	■	■	■	■	■	■		■
17-3029.03	Electromechanical Engineering Technologists			■		■			■		■
17-3029.04	Electronics Engineering Technologists					■			■		■
17-3029.05	Industrial Engineering Technologists	■	■	■	■	■	■	■	■		■
17-3029.06	Manufacturing Engineering Technologists	■	■		■	■	■	■	■		■
17-3029.07	Mechanical Engineering Technologists	■	■	■	■	■	■	■	■		■
17-3029.08	Photonics Technicians	■	■		■	■	■	■	■		■
17-3029.09	Manufacturing Production Technicians	■	■	■	■	■	■	■	■		■
17-3029.11	Nanotechnology Engineering Technologists	■	■		■		■	■	■		■
Life, Physical and Social Science Occupations											
19-2041.02	Environmental Restoration Planners					■					
19-2041.03	Industrial Ecologists					■					
19-2043	Hydrologists					■			■		■
19-2099.01	Remote Sensing Scientists and Technologists					■			■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
19-3099.01	Transportation Planners		■			■			■		■
19-4011	Agricultural Technicians							■			
19-4031	Chemical Technicians	■	■		■		■	■	■		■
19-4041.01	Geophysical Data Technicians					■			■		■
19-4041.02	Geological Sample Test Technicians	■				■			■		■
19-4093	Forest and Conservation Technicians					■					
19-4099.02	Precision Agriculture Technicians					■		■	■		■
19-4099.03	Remote Sensing Technicians					■			■		■
Arts, Design and Media Occupations											
27-1021	Commercial and Industrial Designers					■			■		■
27-3022	Reporters and Correspondents					■			■		■
27-3031	Public Relations Specialists					■			■		■
Healthcare Practitioners, Technical Occupations											
29-9012	Occupational Health and Safety Technicians	■	■		■		■	■	■		■
Sales and Related Occupations											
41-4011.07	Solar Sales Representatives and Assessors	■				■			■		■
Office and Administrative Support Occupations											
43-5061	Production, Planning, and Expediting Clerks	■	■		■		■	■	■		■
43-5071	Shipping, Receiving, and Traffic Clerks	■	■		■	■	■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
Farming, Fishing, Forestry Occupations											
45-1011	First-Line Supervisors/Managers of Ag Crop and Horticultural Workers							■			
45-2011	Agricultural Inspectors		■					■			
45-4011	Forest and Conservation Workers					■					
Construction and Extraction Occupations											
47-1011.03	Solar Energy Installation Managers	■									
47-2011	Boilermakers		■						■		
47-2031.01	Construction Carpenters		■						■	■	
47-2031.02	Rough Carpenters		■						■	■	
47-2051	Cement Masons and Concrete Finishers								■		
47-2061	Construction Laborers		■						■	■	
47-2073	Operating Engineers, Other Construction Equip Ops		■						■	■	
47-2111	Electricians		■						■	■	
47-2131	Insulation Workers, Floor, Ceiling, and Wall		■						■		
47-2152.01	Pipe Fitters and Steamfitters		■						■	■	
47-2152.02	Plumbers		■						■	■	
47-2181	Roofers								■		
47-2211	Sheet Metal Workers	■	■		■		■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
47-2221	Structural Iron and Steel Workers	■	■		■		■	■	■		■
47-3012	Helpers--Carpenters		■						■	■	
47-4011	Construction and Building Inspectors								■		
47-4041	Hazardous Materials Removal Workers					■	■		■		
47-4099.01	Solar Photovoltaic Installers	■	■						■	■	
47-4099.02	Solar Thermal Installers and Technicians	■	■						■	■	
47-4099.03	Weatherization Installers and Technicians		■						■	■	
47-5013	Service Unit Operators, Oil, Gas, and Mining	■									
47-5041	Continuous Mining Machine Operators	■									
Installation, Maintenance, Repair Occupations											
49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	■	■		■		■	■	■		■
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	■	■	■	■	■	■	■	■		■
49-9021.01	Heating & Air Conditioning Mechanics, Installers		■						■	■	■
49-9021.02	Refrigeration Mechanics and Installers		■						■		
49-9041	Industrial Machinery Mechanics	■	■	■	■		■	■	■		■
49-9042	Maintenance and Repair Workers, General	■	■	■	■	■	■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
49-9044	Millwrights	■	■		■		■	■	■		■
49-9051	Electrical Power Line Installers and Repairers		■								
49-9098	Helpers-Installation, Maintenance, Repair Workers								■		
49-9099.01	Geothermal Technicians	■									
49-9099.02	Wind Turbine Service Technicians	■									
Production Occupations											
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	■	■		■		■	■	■		■
51-2011	Aircraft Structure, Surfaces, Rigging, Systems Assemblers	■	■		■		■	■	■		■
51-2022	Electrical and Electronic Equipment Assemblers	■	■	■	■		■	■	■		■
51-2031	Engine and Other Machine Assemblers	■	■		■		■	■	■		■
51-2041	Structural Metal Fabricators and Fitters	■	■		■		■	■	■		■
51-2092	Team Assemblers	■	■		■		■	■	■		■
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	■	■	■	■		■	■	■		■
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal	■	■		■		■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
	and Plastic										
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	■	■		■		■	■	■		■
51-4041	Machinists	■	■	■	■		■	■	■		■
51-4121.06	Welders, Cutters, and Welder Fitters	■	■	■	■		■	■	■		■
51-4121.07	Solderers and Brazers	■	■		■		■	■	■		■
51-8012	Power Distributors and Dispatchers	■									
51-8013	Power Plant Operators	■									
51-8021	Stationary Engineers and Boiler Operators		■								
51-8091	Chemical Plant and System Operators	■	■		■		■	■	■		■
51-8099.01	Biofuels Processing Technicians	■									
51-8099.02	Methane/Landfill Gas Generation System Techs	■									
51-8099.03	Biomass Plant Technicians	■									
51-8099.04	Hydroelectric Plant Technicians	■									
51-9011	Chemical Equipment Operators and Tenders	■	■	■	■		■	■	■		■
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	■	■		■		■	■	■		■
51-9023	Mixing/Blending Machine Setters, Ops,	■	■		■		■	■	■		■

Table 1 - Occupations for Targeted Recruitment Industries

SOC	Occupation Title	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
	Tenders										
51-9061	Inspectors, Testers, Sorters, Samplers, Weighers	■	■		■		■	■	■		■
51-9199.01	Recycling and Reclamation Workers					■	■	■			■
Transportation, Materials Moving Occupations											
53-1021.01	Recycling Coordinators					■	■	■			
53-6051.07	Transportation Vehicle Equip/Systems Inspectors		■								
53-7051	Industrial Truck and Tractor Operators								■		
53-7062	Laborer & Freight, Stock, Material Mover, Hand	■	■		■		■	■	■		■
53-7081	Refuse and Recyclable Material Collectors					■	■				

Refining the Demand for Occupations

To determine the level of demand for these occupations overall, we looked at the 2008-2018 growth and employment projections as determined by the U.S. Department of Labor, Employment and Training Administration. These projections are based on (1) estimated change in total employment over the projection period (2008-2018) and (2) projected job openings due to growth and replacement. Projected employment growth is presented at three levels:

- **Rapid** – occupations are expected to grow much faster than average (employment increase of 20 percent or more) over the 2008-2018 period; will have larger numbers of job openings or are new and emerging occupations.
- **Growing** – occupations are projected to have 100,000 or more job openings 2008-2018
- **Emerging** – new occupations and/or occupations in high growth industries

We then narrowed the list to those occupations:

- that are primarily production-oriented (non-scientific)
- have “pathway potential” i.e. ability to advance workers to higher skilled and higher paying occupations;
- have anticipated employment growth;
- pertain to three or more of the targeted industries.

The resulting 45 occupations, presented in Table 2, are those determined to be in highest demand and most critical to the Shasta Lake target industries. Of the 45 critical occupations, 20 are management, technical and/or professional occupations requiring four or more years of higher education. Twenty-five occupations are manufacturing, production, skilled or semi-skilled occupations that would be immediately relevant and attractive to the Shasta Lake and Shasta County Targeted Income Group. Estimated wages for Shasta County for each of the 25 occupations is presented in Table 3. The remainder of this report addresses the skill sets and education level for the 25 manufacturing and production-oriented occupations.

Table 2 - Occupations in Greatest Demand by Target Industries

SOC	Occupation Title	Growth Projection	TIG Relevant	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
Management Occupations													
11-2011.01	Green Marketers	Emerging						■			■		■
11-9199.04	Supply Chain Managers	Growing						■			■		■
11-9199.06	Logistics Managers	Growing		■	■		■	■	■	■	■		■
Business and Financial Operations Occupations													
13-1081.02	Logistics Analysts	Rapid		■	■		■	■	■	■	■		■
13-1199.01	Energy Auditors	Growing	✓		■			■			■		
13-2099.02	Risk Management Specialists	Emerging						■			■		■
Computer and Mathematical Occupations													
15-1099.07	Geographic Information Systems Technicians	Emerging						■			■		■
Architecture and Engineering Occupations													
17-2199.03	Energy Engineers	Emerging			■			■			■		■
17-3024.01	Robotics Technicians	Emerging		■	■	■	■	■	■	■	■		■
17-3029.02	Electrical Engineering Technologists	Emerging		■	■	■	■	■	■	■	■		■
17-3029.03	Electromechanical Engineering Technologists	Emerging				■		■			■		■
17-3029.04	Electronics Engineering Technologists	Emerging						■			■		■
17-3029.05	Industrial Engineering Technologists	Emerging		■	■	■	■	■	■	■	■		■

Table 2 - Occupations in Greatest Demand by Target Industries

SOC	Occupation Title	Growth Projection	TIG Relevant	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
17-3029.06	Manufacturing Engineering Technologists	Emerging		■	■		■	■	■	■	■		■
17-3029.07	Mechanical Engineering Technologists	Emerging		■	■	■	■	■	■	■	■		■
17-3029.08	Photonics Technicians	Emerging		■	■		■	■	■	■	■		■
17-3029.09	Manufacturing Production Technicians	Emerging	✓	■	■	■	■	■	■	■	■		■
17-3029.11	Nanotechnology Engineering Technologists	Emerging		■	■		■		■	■	■		■
Life, Physical and Social Science Occupations													
19-2099.01	Remote Sensing Scientists and Technologists	Emerging						■			■		■
19-3099.01	Transportation Planners	Rapid			■			■			■		■
19-4099.02	Precision Agriculture Technicians	Emerging						■		■	■		■
19-4099.03	Remote Sensing Technicians	Emerging	✓					■			■		■
Arts, Design and Media Occupations													
27-3031	Public Relations Specialists	Rapid						■			■		■
Sales and Related Occupations													
41-4011.07	Solar Sales Representatives and Assessors	Growing	✓	■				■			■		■
Office and Administrative Support Occupations													
43-5071	Shipping, Receiving, and Traffic Clerks	Growing	✓	■	■		■	■	■	■	■		■

Table 2 - Occupations in Greatest Demand by Target Industries

SOC	Occupation Title	Growth Projection	TIG Relevant	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
Construction and Extraction Occupations													
47-2031.01	Construction Carpenters	Growing	✓		■						■	■	
47-2031.02	Rough Carpenters	Growing	✓		■						■	■	
47-2061	Construction Laborers	Rapid	✓		■						■	■	
47-2073	Op Engineers, Other Construction Equipment Operators	Growing	✓		■						■	■	
47-2111	Electricians	Growing	✓		■						■	■	
47-2152.01	Pipe Fitters and Steamfitters	Growing	✓		■						■	■	
47-2152.02	Plumbers	Growing	✓		■						■	■	
47-3012	Helpers-Carpenters	Rapid	✓		■						■	■	
47-4099.01	Solar Photovoltaic Installers	Emerging	✓	■	■						■	■	
47-4099.02	Solar Thermal Installers and Technicians	Emerging	✓	■	■						■	■	
47-4099.03	Weatherization Installers and Technicians	Emerging	✓		■						■	■	
Installation, Maintenance, Repair Occupations													
49-1011	1 st Line Super Mechanics, Installers, Repairers	Growing	✓	■	■		■		■	■	■		■
49-9021.01	Heating & Air Conditioning Mechanic, Installers	Rapid	✓		■						■	■	■
49-9042	Maintenance and Repair Workers, General	Growing	✓	■	■	■	■	■	■	■	■		■

Table 2 - Occupations in Greatest Demand by Target Industries

SOC	Occupation Title	Growth Projection	TIG Relevant	Energy Generation	Energy Efficiency	Energy Storage	Air & Environment	Recycling & Waste	Water & Wastewater	Agricultural Support	Green Building	Energy Infrastructure	Consumer Products
Production Occupations													
51-2092	Team Assemblers	Growing	✓	■	■		■		■	■	■		■
51-4121.06	Welders, Cutters, and Welder Fitters	Growing	✓	■	■	■	■		■	■	■		■
51-4121.07	Solderers and Brazers	Growing	✓	■	■		■		■	■	■		■
51-9199.01	Recycling and Reclamation Workers	Emerging	✓					■	■	■			■
Transportation, Materials Moving Occupations													
53-1021.01	Recycling Coordinators	Emerging	✓					■	■	■			
53-7062	Laborer & Freight, Stock, Material Mover, Hand	Growing	✓	■	■		■		■	■	■		■

Description of Top 25 Manufacturing, Production, Skilled Occupations

The Occupational Information Network (O*NET) provides the following occupational descriptions

Business and Financial Operations

13-1199.01 Energy Auditors — Conduct energy audits of buildings, building systems and process systems. May also conduct investment grade audits of buildings or systems.

Architecture and Engineering

17-3029.09 Manufacturing Production Technicians — Set up, test, and adjust manufacturing machinery and equipment, using any combination of electrical, electronic, mechanical, hydraulic, pneumatic and computer technologies.

Life, Physical and Social Science

19-4099.03 Remote Sensing Technicians — Apply remote sensing technologies to assist scientists in areas such as natural resources, urban planning, and homeland security.

Sales and Related

41-4011.07 Solar Sales Representatives and Assessors — Contact new or existing customers to determine their solar equipment needs, suggest systems or equipment, or estimate costs.

Office and Administrative Support

43-5071 Shipping, Receiving, and Traffic Clerks — Verify and keep records on incoming and outgoing shipments. Prepare items for shipment. Assemble, address, stamp, and ship merchandise or

material. Receive, unpack, verify and record incoming merchandise or material. Arrange for the transportation of products.

Construction and Extraction

47-2031.01 Construction Carpenters — Construct, erect, install, and repair structures and fixtures of wood, plywood, and wallboard, using carpenter's hand tools and power tools.

47-2031.02 Rough Carpenters — Build rough wooden structures, such as concrete forms, scaffolds, tunnel, bridge, or sewer supports, billboard signs, and temporary frame shelters, according to sketches, blueprints, or oral instructions.

47-2061 Construction Laborers — Operate hand and power tools, air hammers, earth tampers, cement mixers, small mechanical hoists, surveying and measuring equipment, etc. Clean and prepare sites, erect scaffolding, remove hazardous waste materials.

47-2073 Operating Engineers, Other Construction Equipment Operators — Operate power construction equipment, such as motor graders, bulldozers, scrapers, compressors, pumps, derricks, shovels, tractors, or front-end loaders to excavate, move, and grade earth, erect structures, or pour concrete or other hard surface pavement. May also repair and maintain equipment.

47-2111 Electricians — Install, maintain, and repair electrical wiring, equipment, and fixtures. Ensure that work is in accordance with relevant codes. May install or service street lights, intercom systems, or electrical control systems.

47-2152.01 Pipe Fitters and Steamfitters — Assemble, install, maintain pipe systems, supports, related hydraulic and pneumatic equipment for industrial production and processing systems.

47-2152.02 Plumbers — Assemble, install, and repair pipes, fittings, and fixtures of heating, water, and drainage systems, according to specifications and plumbing codes.

47-3012 Helpers-Carpenters — Help carpenters by performing duties of lesser skill including: using, supplying or holding materials or tools, and cleaning work area and equipment.

47-4099.01 Solar Photovoltaic Installers — Assemble, install, or maintain solar photovoltaic (PV) systems on roofs, other structures. May include measuring, cutting, assembling, bolting structural framing and solar modules, minor electrical work (current checks).

47-4099.02 Solar Thermal Installers and Technicians — Install or repair solar energy systems designed to collect, store, and circulate solar-heated water for residential, commercial or industrial use.

47-4099.03 Weatherization Installers and Technicians — Variety of activities to weatherize homes and make them more energy efficient including: repairing windows, insulating ducts, and performing HVAC work. May perform energy audits and advise clients on energy conservation measures.

Installation, Maintenance, and Repair

49-1011 First Line Supervisor Mechanics, Installers, Repairers — Supervise and coordinate activities of mechanics, installers, repairers

49-9021.01 Heating & Air Conditioning Mechanic, Installers — Install, service, and repair heating and air conditioning systems in residences and commercial establishments.

49-9042 Maintenance and Repair Workers, General — Keep machines, mechanical equipment, or structures in repair. Duties may involve pipe fitting; boiler making; insulating; welding; machining; carpentry; repairing electrical or mechanical equipment; installing, aligning, equipment

Production

51-2092 Team Assemblers — Work as part of a team assembling a product or component of a product. Team assemblers perform all tasks conducted by the team in the assembly process rather than being assigned to a specific task on a permanent basis. May participate in making management decisions affecting the work. Team leaders who work as part of the team are included.

51-4121.06 Welders, Cutters, and Welder Fitters — Use hand-welding or flame-cutting equipment to join metal components or to fill holes, indentations, or seams of fabricated metal products

51-4121.07 Solderers and Brazers — Braze or solder together components to assemble fabricated metal parts, using soldering iron, torch, or welding machine and flux

51-9199.01 Recycling and Reclamation Workers — Prepare and sort materials or products for recycling. Identify and remove hazardous substances. Dismantle components of products such as appliances.

Transportation and Materials Moving

53-1021.01 Recycling Coordinators — Supervise curbside and drop-off recycling programs for municipal governments or private firms.

53-7062 Laborer & Freight, Stock, Material Mover, Hand — Manually move freight, stock, or other materials; perform other unskilled general labor.

Estimated Local Wages for Top 25 Manufacturing, Production, Skilled Occupations

The following hourly wage estimates are from the California Employment Development Department’s 2010 Occupational Employment Statistics (OES) survey. EDD has applied the US Department of Labor’s Employment Cost Index to update estimates for the first quarter 2011.

Table 3 - Estimated Wages for TIG Relevant Occupations

SOC	Occupation Title	Starting	Experienced	Median
Business and Financial Operations				
13-1199.01	Energy Auditors	\$19.49	\$33.40	\$26.75
Architecture and Engineering				
17-3029.09	Manufacturing Production Technicians	\$24.59	\$33.59	\$28.53
Life, Physical and Social Science				
19-4099.03	Remote Sensing Technicians	\$18.90	\$22.06	\$19.69
Sales and Related				
41-4011.07	Solar Sales Representatives and Assessors	\$18.52	\$48.41	\$41.18
Office and Administrative Support				
43-5071	Shipping, Receiving, and Traffic Clerks	\$9.44	\$14.55	\$11.33
Construction and Extraction				
47-2031.01	Construction Carpenters	\$15.82	\$23.19	\$18.81
47-2031.02	Rough Carpenters	\$15.82	\$23.19	\$18.81
47-2061	Construction Laborers	\$12.57	\$23.95	\$15.59
47-2073	Operating Engineers, Other Construction Equip Op	\$19.95	\$32.63	\$24.55
47-2111	Electricians	\$21.78	\$38.63	\$28.77
47-2152.01	Pipe Fitters and Steamfitters	\$16.96	\$26.54	\$20.36
47-2152.02	Plumbers	\$16.96	\$26.54	\$20.36

SOC	Occupation Title	Starting	Experienced	Median
47-3012	Helpers-Carpenters	\$10.07	\$11.97	\$10.95
47-4099.01 *	Solar Photovoltaic Installers	\$12.70	\$22.27	\$17.16
47-4099.02 *	Solar Thermal Installers and Technicians	\$12.70	\$22.27	\$17.16
47-4099.03 *	Weatherization Installers and Technicians	\$12.70	\$22.27	\$17.16
Installation, Maintenance, and Repair				
49-1011	First Line Supervisor Mechanics, Installers, Repairers	\$22.18	\$33.75	\$27.97
49-9021.01	Heating & Air Conditioning Mechanic, Installers	\$15.65	\$23.55	\$18.29
49-9042	Maintenance and Repair Workers, General	\$13.18	\$21.50	\$16.99
Production				
51-2092	Team Assemblers	\$10.85	\$14.57	\$12.79
51-4121.06	Welders, Cutters, and Welder Fitters	\$10.80	\$17.93	\$13.19
51-4121.07	Solderers and Brazers	\$10.80	\$17.93	\$13.19
51-9199.01	Recycling and Reclamation Workers	\$9.20	\$11.72	\$10.33
Transportation and Moving				
53-1021.01	Recycling Coordinators	\$13.25	\$17.81	\$14.57
53-7062	Laborer & Freight, Stock, Material Mover, Hand	\$9.35	\$12.56	\$11.26

Source: State of California Employment Development Department; estimated occupational wages for First Quarter 2011 for Shasta County.

* Wages for solar Installer occupations (47-4099.01, 02, and 03) are 2009 estimates from the U.S. Department of Labor for the State of California; no EDD estimates are available for these occupations.

Educational Requirements and Skill Sets

The following table presents a summary of the educational level and work experience generally required (according to the U.S. Department of Labor Employment and Training Administration, O-Net) for the top 25 occupations critical to the Shasta Lake targeted industries.

Table 4 - Level of Education, Training, and Work Experience Required

SOC	Occupation Title	Education Requirements ²					Work Experience Requirements				
		High School	On the Job	Vocational	Two Year	Four Year	0-3 Months	3-12 Months	1-2 Years	2-4 Years	4+ Years
13-1199.01	Energy Auditors			■	■					■	
17-3029.09	Manufacturing Production Technicians			■					■		
19-4099.03	Remote Sensing Technicians		■	■				■			
41-4011.07	Solar Sales Representatives and Assessors				■	■			■		
43-5071	Shipping, Receiving, and Traffic Clerks	■	■					■			
47-2031.01	Construction Carpenters	■	■					■			
47-2031.02	Rough Carpenters	■	■					■			
47-2061	Construction Laborers	■	■				■				
47-2073	Operating Engineers, Other Construc Equip Ops			■	■				■		
47-2111	Electricians				■				■		
47-2152.01	Pipe Fitters and Steamfitters			■	■				■		
47-2152.02	Plumbers			■	■				■		
47-3012	Helpers-Carpenters	■	■					■			

² Some may also require an apprenticeship and/or licensing

Table 4 - Level of Education, Training, and Work Experience Required

SOC	Occupation Title	Education Requirements ²					Work Experience Requirements				
		High School	On the Job	Vocational	Two Year	Four Year	0-3 Months	3-12 Months	1-2 Years	2-4 Years	4+ Years
47-4099.01	Solar Photovoltaic Installers			■	■				■		
47-4099.02	Solar Thermal Installers and Technicians		■	■					■		
47-4099.03	Weatherization Installers and Technicians		■	■					■		
49-1011	1 st Line Super Mechanics, Installers, Repairers			■	■				■		
49-9021.01	Heating & Air Conditioning Mechanic, Installers			■	■				■		
49-9042	Maintenance and Repair Workers, General			■	■				■		
51-2092	Team Assemblers	■	■					■			
51-4121.06	Welders, Cutters, and Welder Fitters	■	■					■			
51-4121.07	Solderers and Brazers	■	■					■			
51-9199.01	Recycling and Reclamation Workers	■	■				■	■			
53-1021.01	Recycling Coordinators			■	■				■		
53-7062	Laborer & Freight, Stock, Material Mover, Hand	■	■					■			

Tools and Technologies

Following are the primary tools, technologies, and software used in these key occupations. The next section presents an overview of the relevant programs and curriculum currently available in Shasta County to train for these occupations and strategies to fill any gaps.

Table 5 – Tools and Technology Training Requirements for Key Occupations

	Energy Auditor	Mfg Production Technician	Remote Sensing Technician	Solar Sales Rep and Assessor	Ship/Receive and Traffic Clerk	Construction Carpenter	Rough Carpenter	Construction Laborer	Operating Engineer	Electrician	Pipe / Steam Fitter	Plumber	Carpenter Helper	Solar PV Installer	Solar Thermal Installer, Tech	Weatherization Installer, Tech	First Line Super	Heating, AC Mechanic, Installer	Maintenance and Repair Worker	Team Assembler	Welder, Cutter, Fitter	Solderer, Brazer	Recycling, Reclamation Wrkr	Recycling Coordinator	Laborer, Freight Stock Mover	
Tools Requirements																										
Bar code readers, Scanners, Scales					■																		■		■	
Calipers, Squares, Levels, Gages, Measuring Devices		■				■	■	■			■	■	■	■	■			■		■						
Current/voltage meters; Ohmmeters, Circuit testers	■	■								■				■	■			■								
Flow sensors; Moisture meters; Leak testing equipment, Air velocity & temp monitor	■		■							■		■		■		■		■								
Forklift, Trucks, Graders, Hoists, Loaders, Crushers					■			■	■													■	■	■	■	■
Hand Tools, Power Tools		■			■	■	■	■	■		■	■	■	■	■	■		■	■	■	■	■	■	■	■	

Table 5 – Tools and Technology Training Requirements for Key Occupations

	Energy Auditor	Mfg Production Technician	Remote Sensing Technician	Solar Sales Rep and Assessor	Ship/Receive and Traffic Clerk	Construction Carpenter	Rough Carpenter	Construction Laborer	Operating Engineer	Electrician	Pipe / Steam Fitter	Plumber	Carpenter Helper	Solar PV Installer	Solar Thermal Installer, Tech	Weatherization Installer, Tech	First Line Super	Heating, AC Mechanic, Installer	Maintenance and Repair Worker	Team Assembler	Welder, Cutter, Fitter	Solderer, Brazer	Recycling, Reclamation Wrkr	Recycling Coordinator	Laborer, Freight Stock Mover	
Multi gas monitors	■	■																								
Technology Requirements																										
Analytical or Scientific, Mapping, Computer Aided Design (CAD) Software	■	■	■				■			■	■	■	■					■		■	■	■				
Customer Relationship Management (CRM) Software				■					■																	
Database User Interface and Query Software	■		■	■						■						■	■	■	■	■				■	■	
Graphics or Photo Imaging Software	■	■				■												■								
Materials & Inventory Management, OCT Scanning, Procurement Software					■	■			■								■		■						■	
Office Suite, Browser, Accounting software	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	
Resource or Project Planning/Maintenance Software		■			■	■	■		■	■	■	■	■	■	■	■	■								■	

Table 5 – Tools and Technology Training Requirements for Key Occupations

	Energy Auditor	Mfg Production Technician	Remote Sensing Technician	Solar Sales Rep and Assessor	Ship/Receive and Traffic Clerk	Construction Carpenter	Rough Carpenter	Construction Laborer	Operating Engineer	Electrician	Pipe / Steam Fitter	Plumber	Carpenter Helper	Solar PV Installer	Solar Thermal Installer, Tech	Weatherization Installer, Tech	First Line Super	Heating, AC Mechanic, Installer	Maintenance and Repair Worker	Team Assembler	Welder, Cutter, Fitter	Solderer, Brazer	Recycling, Reclamation Wrkr	Recycling Coordinator	Laborer, Freight Stock Mover	
Knowledge Requirements																										
Building & Construction materials, methods, tools	■		■			■	■	■	■	■	■	■	■			■		■	■							
Business/Management principles, Resource Planning						■			■	■	■						■									
Computers and Electronics	■	■	■	■	■				■	■									■					■	■	
Design (technical plans, blueprints, drawings, models)		■				■	■	■		■	■	■						■			■					
Engineering (practical applications, principles, techniques)		■	■			■		■		■	■						■	■								
English (composition, grammar, spelling, public speaking)		■		■	■		■	■	■	■	■	■					■	■	■					■	■	
Math (algebra, geometry, calculus, statistics, etc.)	■	■	■			■	■	■		■	■						■	■	■							
Mechanical (use, repair, maintenance of machines and tools)	■	■	■		■	■	■	■	■	■	■	■				■	■	■	■		■					■

Table 5 – Tools and Technology Training Requirements for Key Occupations

	Energy Auditor	Mfg Production Technician	Remote Sensing Technician	Solar Sales Rep and Assessor	Ship/Receive and Traffic Clerk	Construction Carpenter	Rough Carpenter	Construction Laborer	Operating Engineer	Electrician	Pipe / Steam Fitter	Plumber	Carpenter Helper	Solar PV Installer	Solar Thermal Installer, Tech	Weatherization Installer, Tech	First Line Super	Heating, AC Mechanic, Installer	Maintenance and Repair Worker	Team Assembler	Welder, Cutter, Fitter	Solderer, Brazer	Recycling, Reclamation Wrkr	Recycling Coordinator	Laborer, Freight Stock Mover
Physics (principles, laws, applications)	■		■							■		■						■							
Production Processes (raw materials, quality control)		■		■	■	■	■										■			■					
Public Safety and Security						■	■	■	■	■	■						■	■	■						■
Reading Comprehension	■			■	■				■	■	■						■							■	
Sales, Marketing, Presentation, Demonstration				■																				■	

Preparing and Training TIG Individuals

Shasta Lake area training organizations are doing well providing the basic skills and knowledge education. There are a variety of both certificate and degreed programs offered including accounting specific to construction that includes preparing estimates. Skilled trades, technical and professional programs offered consist of:

- Accounting (general business and specific to construction accounting and estimating)
- Computer Sciences
- Energy Efficiency evaluation and performance testing
- Engineering Technology and Programming
- Green Building Principles (introduction and concepts of LEED)
- Heating, ventilation and air conditioning (installation, service, maintenance of commercial and residential units)
- Math and Construction Math
- Product Development (i.e. outsourcing, environmental regulations, etc.)
- Reading Construction Drawings
- Safety (basic safety, hand tools, power tools)
- Sales and Marketing (customer service, communications, office suite and presentation software programs)

Training providers are also offering courses in a variety of settings including:

- Formal Classroom
- Workshops and Seminars
- Journey Track (On-Site)
- e-Training
- Boot Camp (a highly regarded two-week course offered by Shasta Builders Exchange's Training Center for construction trades)

Strategies to Expand Training Opportunities

There is a process and cost to establishing training programs. Decisions to establish and present programs require there be a corresponding demand by the local industry and/or workforce to fill the classrooms. The strategies presented here are designed to help training organizations in the Shasta Lake area provide a broader range of skills training programs to a wider clientele more cost-effectively and efficiently.

- **Identify funding sources** to support the Shasta Builders' Exchange Boot Camp — Previously this intensive, two-week program was available four times a year. It is a highly regarded program whose graduates were sought after by contractors and companies. Because of financial constraints, it is now an on-demand program funded by companies or grant funds when available. The infrastructure is in place to ramp-up when needed.
- **Facilitate local partnerships** — Rather than establish new or expanded programs to meet training needs, facilitate partnerships among colleges and training organizations to package programs or portions of programs into “Course Tracks” or “Learning Pathways” which would combine key elements of required skills and/or knowledge training from various different courses currently being offered.
- **Facilitate state and national partnerships** — Particularly for the Renewable Energy-related occupations. Many training programs (workshops or courses) are offered by various nonprofit and for-profit organizations, colleges, and/or industry associations that may be willing to bring the training to Shasta Lake. For example:
 - Northern American Board of Certified Energy Practitioners (NABCEP) is a panel of solar industry experts that offers entry-level training and certification in solar system installations. Training has been offered by (but is not restricted to) Diablo Valley College (Bay Area) and East Los Angeles Skills Center
 - Solar Energy International (SEI) (www.solarenergy.org) offers a series of workshops providing hands-on instruction for photovoltaic (PV) installations.
 - Solar Living Institute (www.solarliving.org) offers short workshops and beginner PV courses.
- **Provide and equip classrooms** — For the online courses (local, state and national) establish classroom space equipped with the computers and/or video equipment necessary to accommodate courses. Have proctors available to assist students.

- **Establish flexibility in training programs** — Complement classroom/on-site training with online training courses for some of the less-technical requirements that don't require hands-on training (e.g. language, reading comprehension, etc). Offer courses, workshops, during daytime and evening hours to accommodate work and school schedules.
- **Include training for transferable skills in each course or track** — Often transferable skills, those that span all industries and occupations, (reading comprehension, listening, speaking, writing, math, problem solving, critical thinking, etc.) are considered by employers to be more important than specific technical skills. These are also the most important skills for successful job performance and for moving up and through career pathways.
- **Coordinate** — Work closely with Shasta SMART and the Shasta EDC on outreach to local businesses to ensure business training needs are being met.
- **Package grants and programs for employers** — Work with training partners, business and industry groups to develop “ready to go” grant applications. For example, have scopes of work drafted and dedicated to specific industries, types of business operations, skill sets, etc. to be prepared to quickly respond to a local business' training needs.
- **Monitor programs** — In partnership with training organizations, actively monitor state and federal programs and budgets for funding, de-funding, shifts in program availability, etc.; relay appropriate and relevant information to local businesses.

Data Sources

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