

The Regional Economic Development Institute (REDI)
@ Los Angeles Trade-Technical College

Industry Sector Report

Utility Industry Sector Report: Los Angeles July, 2008





Acknowledgments

The Utility Industry sector report is made possible through grants from the **Bank of America Foundation**, the **City of Los Angeles Community Development Department**, and the **Los Angeles Department of Water and Power**.

Contributions to the report were provided by numerous individuals working in the utility industry sector and from education and training organizations. Their support is greatly appreciated. In particular we would like to recognize the following individuals for their specific contributions to the report.

- Eddie Barnes, State Building and Construction Trades Council of California AFL CIO
- Marcus Castain, The Infrastructure Academy
- Alexandra Galancid Torres, Women In Non Traditional Employment Roles, Inc.; Rosie the Riveter Charter High School
- Darrell Hebert, The Southern California Gas Company (a Sempra Energy utility)
- Pamela Porter, Los Angeles Department of Water and Power
- Susana Reyes, IBEW, Local 18-LADWP Joint Training Institute
- Jane Templin, Eletrical Training Institute/IBEW

Report Author

This report was authored by Marcy Drummond, Vice President of Academic Affairs, Los Angeles Trade-Technical College

Executive Summary

With a limited number of employers and stable and nearly “no new growth” employment projections (1%) through 2013, one should question why it is recommended to focus on the utility industry cluster in the Los Angeles region for targeted workforce development efforts. However, there are several mitigating factors that compel further examination as follows. First, although employment growth due to “new” jobs may be limited, it is anticipated that employment shortages in this sector will occur due to the large number of incumbent workers projected to retire over the next five to ten years. Second, the education and training requirements for workers in the utility sector mirrors that of the construction sector--a large and growing industry sector--leaving both sectors competing for a limited prepared/trained workforce. Third, economic and employment forecasts for this industry should be reconsidered given public demand for alternative energy sources and the scope and scale of California’s and Los Angeles’ policy incentives to promote renewable energy and energy efficiency. As a result, the current economic and political environment foretells of expanded growth in this industry sector in the Los Angeles region.

Another compelling reason to focus workforce development strategies on the utility industry sector is because of the myriad of workforce challenges that contribute to insufficient workforce, in terms of individuals with adequate skills and competencies. These challenges include:

- aging incumbent workforce,
- difficulty recruiting entry-level workforce due to lack of career awareness and exposure to the industry sector,
- disjointed education and training systems,
- lack of basic work skills of entry level workers,
- entry-level hiring barriers by utility companies,
- availability of incumbent worker training, and the
- challenges related to the “greening” of the industry.

Given the multitude of workforce development challenges in this industry sector means that government, industry, labor, and education and training providers all must be collectively involved in crafting solutions that address these challenges and that maximize limited funding by aligning and leveraging both public and private sector funding.

The remainder of this report provides a more detailed overview of the utility industry sector, occupations, and workforce development challenges.

Nature of the Utility Industry - U.S.

This entire section is excerpted from the Bureau of Labor Statistics, U.S. Department of Labor, *Career Guide to Industries, 2008-09 Edition, Utilities*, available on the Internet at <http://www.bls.gov/oco/cg/cgs018.htm>.

Because the section is excerpted from the Career Guide to Industries, Utilities, this entire section will be italicized.

The utilities sector is comprised of three distinctly different industries.

Electric power generation, transmission, and distribution. This segment includes firms engaged in the generation, transmission, and distribution of electric power. Electric plants harness highly pressurized steam, flowing water, or some force of nature to spin the blades of a turbine, which is attached to an electric generator. Coal is the dominant fuel used to generate steam in electric power plants, followed by nuclear power, natural gas, petroleum, and other energy sources. Hydroelectric generators are powered by the release of the tremendous pressure of water existing at the bottom of a dam or near a waterfall. Renewable sources of electric power—including geothermal, wind, and solar energy—are expanding rapidly, but only make up a small percentage of total generation.

Legislative changes and industry competition have created new classes of firms that generate and sell electricity. Some industrial plants have their own electricity-generating facilities, capable of producing more power than they require. Those that sell their excess power to utilities or to other industrial plants are called non-utility generators (NUGs). Independent power producers are a type of NUG that are electricity-generating plants designed to take advantage of both industry deregulation and the latest generating technology to compete directly with utilities for industrial and other wholesale customers.

Transmission lines supported by huge towers connect generating plants with industrial customers and substations. At substations, the electricity's voltage is reduced and made available for household and small business use via distribution lines, which usually are carried by telephone poles.

Natural gas distribution. Natural gas, a clear odorless gas, is found underground, often near or associated with crude oil reserves. Exploration and extraction of natural gas is part of the oil and gas extraction industry. Once found and brought to the surface, it is transported throughout the United States, Canada, and Mexico by gas transmission companies using pressurized pipelines. Local distribution companies take natural gas from the pipeline, depressurize it, add its odor, and operate the system that delivers the gas from transmission pipelines to industrial, residential, and commercial customers. Industrial customers, such as chemical and paper manufacturing firms, account for almost a third of natural gas consumption. Electric power plants, residential customers who use gas for heating and cooking, and commercial businesses—such as hospitals and restaurants—account for most of the remaining consumption.

Water, sewage, and other systems. Water utilities treat and distribute nearly 34 billion gallons per day to customers nationwide. Water is collected from various sources such as rivers, lakes, and wells. After collection, water is treated, and sold for residential, industrial, agricultural, commercial, and public use. Depending on the population served by the water system, the utility may be a small plant in a rural area that requires the occasional monitoring of a single operator or a huge system of reservoirs, dams, pipelines, and treatment plants requiring the coordinated efforts of hundreds of people. Sewage treatment facilities operate sewer systems or plants that collect, treat, and dispose of waste from homes and industries. Other utilities include steam and air-conditioning supply utilities, which produce and sell steam, heated air, and cooled air.

Recent developments. Utilities and the services they provide are so vital to everyday life that they are considered public goods and are typically heavily regulated. Most utility companies that distribute to consumers operate as regulated monopolies because utility distribution tends to require a large investment in plant and equipment and it is generally not desirable to have several competing systems of pipes or power lines in most areas. Since these companies do not face competition, they are regulated by public utility commissions that ensure that companies act in the public interest and set the rates that are charged. However, legislative changes in recent years have established and promoted competition in some parts of the utilities industry. Wholesale providers of electricity now face competition from a number of non-utility generators.

Many utility companies are municipally owned. In the natural gas industry, for example, a majority of the distribution companies in the United States are municipally owned. However, they serve just a fraction of the nationwide customers. Historically, utilities serving large cities had sufficient numbers of customers to justify the large investment in infrastructure needed to run a utility, and so private, investor-owned companies established utility service. In rural areas, where the small number of customers in need of services did not provide an adequate return for private investors, the State or local government, or rural cooperative associations, established utility service.

The various segments of the utilities industry vary in the degree to which their workers are involved in production activities, administration and management, or research and development. Industries such as water supply, that employ relatively few workers, employ more production workers and plant operators. On the other hand, electric utilities generally operate larger plants using very expensive, high technology equipment, and thus employ more professional and technical personnel.

The utilities industry is unique in that urban areas with many inhabitants generally have relatively few utility companies. For example, there were about 52,349 community water systems in the United States in 2006 serving more than 281 million people. The 48,275 smallest water systems served only 52 million people while the 4,074 largest systems served more than 229 million. This shows that economies of scale in the utilities industry allow a few large companies to serve large numbers of customers in metropolitan areas more efficiently than many smaller companies. In fact, some utility companies, predominately serving large metropolitan areas, offer more than one type of utility service to their customers.

Unlike most industries, the utilities industry imports and exports only a small portion of its product. To some degree, this is because of the great difficulty in transporting electricity, freshwater, and natural gas. It is also the result of a national policy that utilities should be self-sufficient, without dependence on imports for the basic services our country requires. However, easing trade restrictions, increased pipeline capacity, and shipping natural gas in liquefied form have made international trade in utilities more feasible, especially with Canada and Mexico.

In 2005, Congress passed a new Energy Policy Act, which is the first major legislation on energy since 1992. This will be a major force in the industry through 2016. It was designed to promote conservation and use of cleaner technologies in energy production through higher efficiency standards and tax credits. It is expected that several new power plants will be built as a result of this legislation, including new clean-burning coal and nuclear facilities.

Approximately 41 percent of all wage and salary jobs in the utilities industry are in production or installation, maintenance, and repair, or "trade", occupations.

Occupations in the Industry

Approximately 41 percent of all wage and salary jobs in the utilities industry are in production or installation, maintenance, and repair occupations. About 21 percent of jobs are in office and administrative support occupations; 14 percent are in professional and related occupations; and 12 percent are in management, business, and financial occupations. The remaining jobs are in construction, transportation, sales, and service occupations.

Production and installation, maintenance, and repair occupations. Workers in these occupations install and maintain pipelines and powerlines, operate and fix plant machinery, and monitor treatment processes. For example, electrical powerline installers and repairers install and repair cables or wires used in electrical power or distribution systems. They install insulators, wooden poles, transformers, and light- or heavy-duty transmission towers. First-line supervisors and managers directly supervise and coordinate the activities of production and repair workers.

These supervisors coordinate workload and work assignments and help to ensure a safe and productive work environment.

Production occupations include power plant operators, power distributors and dispatchers, and water and liquid waste treatment plant operators. Power plant operators control or operate machinery, such as stream-driven turbine generators, to generate electric power, often using control boards or semi-automatic equipment. Power distributors and dispatchers coordinate, regulate, or distribute electricity or steam in generating stations, over transmission lines to substations, and over electric power lines. Water and liquid waste treatment plant and system operators control the process of treating water or wastewater, take samples of water for testing, and may perform maintenance of treatment plants.

Industrial machinery mechanics install, repair, and maintain machinery in power generating stations, gas plants, and water treatment plants. They repair and maintain the mechanical components of generators, waterwheels, water-inlet controls, and piping in generating stations; steam boilers, condensers, pumps, compressors, and similar equipment in gas manufacturing plants; and equipment used to process and distribute water for public and industrial uses.

General maintenance and repair workers perform work involving a variety of maintenance skills to keep machines, mechanical equipment, and the structure of an establishment in repair. Generally found in small establishments, these workers have duties that may involve pipefitting, boilermaking, electrical work, carpentry, welding, and installing new equipment.

Office and administrative support occupations. *These occupations account for about a quarter of jobs in the utilities industry. Customer service representatives interview applicants for water, gas, and electric service. They talk with customers by phone or in person and receive orders for installation, activation, discontinuance, or change in service. General office clerks may do bookkeeping, typing, office machine operation, and filing. Utilities meter readers read electric, gas, water, or steam consumption meters visually or remotely using radio transmitters and record the volume used by residential and industrial customers. Financial clerks, such as bookkeeping, accounting, and auditing clerks, compute, classify, and record numerical data to keep financial records complete. They perform any combination of routine calculating, posting, and verifying duties to obtain primary financial data for use in maintaining accounting records.*

Professional and managerial occupations. *Professional and related occupations in this industry include engineers and computer specialists. Engineers develop technologies that allow, for example, utilities to produce and transmit gas and electricity more efficiently and water more cleanly. They also may develop improved methods of landfill or wastewater treatment operations in order to maintain compliance with government regulations. Computer specialists develop computer systems to automate utility processes; provide plant simulators for operator training; and improve operator decision making. Engineering technicians assist engineers in research activities and may conduct some research independently.*

Managers and administrators in the utilities industry plan, organize, direct, and coordinate management activities. They often are responsible for maintaining an adequate supply of electricity, gas, water, steam, or sanitation service.

Training and Advancement

Utilities provide career opportunities for persons with varying levels of experience and education. However, because the utilities industry consists of many different companies and products, skills developed in one segment of the industry may not be transferable to other segments.

High school graduates qualify for many entry-level production jobs. In some cases, however, safety and security regulations require higher standards for employment, such as documented proof of the skills and abilities necessary to complete the work. As a result, a degree from a college, university, or technical school may be required.

High school graduates qualify for many entry-level production jobs. In some cases, however, safety and security regulations require higher standards for employment, such as documented proof of the skills and abilities necessary to complete the work. As a result, a degree from a college, university, or technical school may be required. Production workers may start as laborers or in other unskilled jobs and, by going through an apprenticeship program and gaining on-the-job experience, advance into better-paying positions that require greater skills or have greater responsibility.

Substantial advancement is possible even within a single occupation. For example, power plant operators may move up through several levels of responsibility until they reach the highest paying operator jobs. Advancement in production occupations generally requires mastery of advanced skills on the job, usually with some formal training provided by the employer or through additional vocational training at a 2-year technical college or trade school.

Most computer, engineering, and technician jobs require technical education after high school, although opportunities exist for persons with degrees ranging from an associate degree to a doctorate. These workers are usually familiar with company objectives and production methods which, combined with college education, equip them with many of the tools necessary for advancement to management positions. Graduates of 2-year technical institutes usually fill technician positions. Sometimes, graduates of engineering programs will start as technicians until an opportunity to advance into an engineering position arises.

Managerial jobs generally require a 4-year college degree, although a 2-year technical degree may be sufficient in smaller plants. Managers usually can advance into higher level management jobs without additional formal training outside the workplace.

Reorganization of electric utilities has increased competition and provided incentives for improved efficiency. This has resulted in extensive cost-cutting and a number of mergers, which have led to a decline in employment over the past several years. This has been accomplished by a combination of layoffs and hiring freezes, which have resulted in an older workforce than in most other industries. Because electric utilities tend to be particularly labor intensive and require technically-minded people who are in high demand in other industries, they will have the most difficulty recruiting enough replacements. Worker attrition will be managed by further automation of systems and more responsibility for workers.

Because electric utilities tend to be particularly labor intensive and require technically-minded people who are in high demand in other industries, they will have the most difficulty recruiting enough replacements for vacancies.

In the gas transmission and distribution industry, regulatory changes have made it possible for wholesale and even some retail buyers to choose their own natural gas providers. While distributors still maintain local monopolies, they are highly regulated and are not allowed to mark up the wholesale price of natural gas. Their revenues are based on distribution fees, which vary based on infrastructure needs rather than actual use of natural gas. These regulatory changes have resulted in several mergers and an emphasis on cost-cutting. As in the area of electric power, this has led to hiring freezes which have resulted in an older workforce. As these people retire, there will not be enough applicants to replace them, forcing the industry to find new ways to fill its needs.

In the water and sewage systems industries, regulatory changes have had the opposite impact. While most water systems remain locally-operated and fairly small in scale, water quality standards for both drinking water and disposal of wastewater have been increased for public health and environmental reasons. While hiring freezes have been less common in water than in other parts of the

Job prospects in the utilities industry are expected to be excellent primarily due to anticipated retirements--about 55 percent of the utilities industry workforce, nationwide, is over the age of 45 and will either retire or prepare to retire within the next 10 years.

industry, much of the water workforce is nearing retirement age. Water and sewage systems services are projected to grow slightly, as water systems are expanding rapidly despite the difficulty in securing workers. Employment is projected to increase 18.7 percent from 2006 to 2016.

Job prospects. Job prospects for qualified applicants entering the utilities industry are expected to be excellent during the next 10 years. As of 2006, about 55 percent of the utilities industry workforce, nationwide, is over the age of 45 (see below). Many of these workers will either retire or prepare to retire within the next 10 years. Because on-the-job training is very intensive in many utilities industry occupations, preparing a new workforce will be one of the industry's highest priorities during the next decade.

Percent Distribution of Employment (US), by Age Group, 2006		
Age group	Utilities	All Industries
Total	100.0%	100.0%
16-19	0.4	4.3
20-24	3.3	9.6
25-34	15.5	21.5
35-44	26.1	23.9
45-54	38.2	23.6
55-64	15.3	13.4
65 and older	1.2	3.7

In general, persons with college training in advanced technology will have the best opportunities in the utilities industry. Computer systems analysts and network systems and data communications analysts are expected to be among the fastest growing occupations in the professional and related occupations group, as plants emphasize automation and productivity. Some office and administrative support workers, such as utilities meter readers and bookkeeping, accounting, and auditing clerks, are among those adversely affected by increasing automation and outsourcing. Technologies including radio-transmitted meter reading and computerized billing procedures are expected to decrease employment.

Because on-the-job training is very intensive in many utilities industry occupations, preparing a new workforce will be one of the industry's highest priorities during the next decade.

New and continuing energy policies also provide investment tax credits for research and development of renewable sources of energy and ways to improve the efficiency of equipment used in electric utilities. As a result, electric utilities will continue to increase the productivity of their plants and workers, resulting in a slowdown in new employment. This slowdown will lead to keen competition for some jobs in the industry. However, at the same time, these new technologies will create jobs for highly skilled technical personnel with the education and experience to take advantage of these developments in electric utilities.

Utility Industry Outlook – Los Angeles

The primary data source for this section comes from the economic modeling databases provided by Economic Modeling Specialists, Inc. (EMSI). Secondary data sources were also used and are provided at the end of this report and/or are footnoted within the report.

In order to identify the economic and employment potential of the utility industry in Los Angeles, a comparative analysis was carried out to explore:

- The regional specialization of the utility industry locally compared to the state and national economy, to provide an indication of the concentration of the utility industry sector in Los Angeles;
- Employment forecasts between 2008 and 2013 to provide an indication of the growth potential; and
- Median hourly earnings and/or earnings per worker for the primary occupational categories in the utility industry, to provide an indication of sustainable wage opportunities in Los Angeles.

Utility Industry Regional Specialization

Utility Industry Economic Indicators	
2008 Location Quotient	0.77
2013 Location Quotient	0.81
Shift Share ¹ : Regional Competitiveness Effect	1,080
Shift Share: Industrial Mix Effect	-1,434
Shift Share: National Effect	1,063

Overall, location quotients and shift share indicators reveal that employment growth in the utility industry in the Los Angeles region is only slightly attributable to regional specialization but is more likely attributable to the economic vitality of the utility industry nationally.

More specifically, the utility industry currently has a location quotient of .77 in the Los Angeles region. The location quotient is calculated by comparing the industry's share of regional employment with its share of national employment. This means that the Los Angeles region has a lower than average concentration of utility employment than the national average.

Shift share is similar to location quotient in that it highlights the uniqueness of the utility industry in the Los Angeles regional economy, but it does so in terms of job growth rather than total jobs. Shift share is a function of three indicators: regional competitiveness, industrial mix, and national effect.

The regional competitiveness effect is the most important of the three shift share indicators, as it explains how much of the change in the utility industry is due to some unique competitive advantage that the region possesses, because the growth cannot be explained by national trends or because of the economy as whole. A positive regional competitiveness effect of 1,080, above, indicates the utility industry, in Los Angeles, is outperforming national trends (both overall national employment trends and national employment trends in the industry itself).

The industrial mix effect represents the share of regional utility industry growth explained by the growth of the industry at the national level. A negative industrial mix effect of 1,434, above, indicates that utility industry growth in Los Angeles is attributable to strength of the industry in the regional economy.

And, the national growth effect explains how much of the regional industry's growth is explained by the overall health of the national economy. A national growth effect of 1,063, above, means that growth in the utility industry in Los Angeles is not only fueled by regional economic factors but also by national economic factors.

Employment in the utility industry sector in the Los Angeles region is expected to remain relatively stable, with essentially no "new" growth, but many job openings will arise because large numbers of workers in the industry are approaching retirement age and will need to be replaced. It is estimated that 8,000 trades-related jobs will need to be filled in the next 5 years due to retirements.

¹ Shift share is the expected number of change in jobs in the utility industry in the region as compared to the national average.

Utility Industry Employment Breakdown

2008 Industry Jobs	13,727
2013 Industry Jobs	14,435
Total Change	708
Total % Change	5.16%
2007 Average Earnings/Worker	\$137,900

NAICS Code	Name	2008 Jobs	2007 EPW	2008 LQ
221210	Natural gas distribution	4,229	\$130,701	4.20
221310	Water supply and irrigation systems	215	\$83,321	0.59
221112	Fossil fuel electric power generation	140	\$158,469	0.11
221119	Other electric power generation	114	\$152,572	1.27
221122	Electric power distribution	33	\$130,137	0.03
221121	Electric bulk power transmission and control	19	\$80,765	0.07
221330	Steam and air-conditioning supply	17	\$54,783	1.04
221320	Sewage treatment facilities	<10	--	--
221111	Hydroelectric power generation	0	\$0	0.00
		4,775	\$129,361	

Employment in the utility industry sector in the Los Angeles region is expected to remain relatively stable, with essentially no "new" growth, but many job openings will arise because large numbers of workers in the industry are approaching retirement age and will need to be replaced.

Employment change. Wage and salary employment is expected to only increase slightly, 5.16 percent, between 2008 and 2013. Projected employment change varies by industry segment, as shown in the tables on the following pages. Although electric power, natural gas, and water continue to be essential to everyday life, employment stability will result from the retirement of much of the industry's workforce. It is estimated that nearly 8,000 trades-related jobs in this industry sector will need to be filled in the next 5 years due to retirements. While utilities are doing what they can to replace these workers, the wide variety of careers open to people with technical skills will make it difficult for companies to find enough applicants to fill these openings.

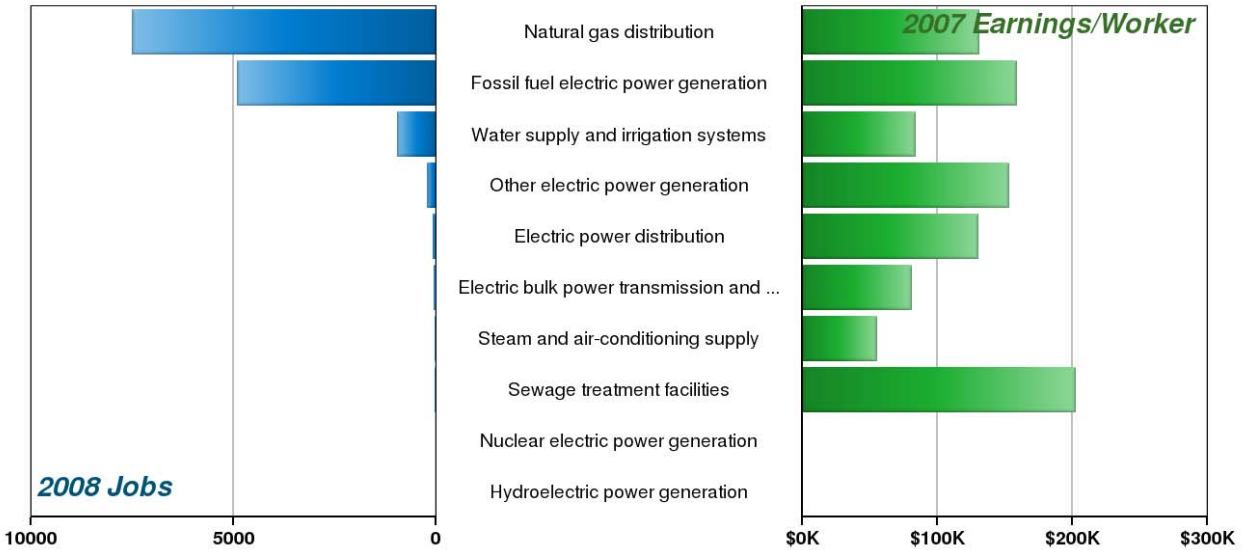
While utilities are doing what they can to replace retiring workers, the wide variety of careers open to people with technical skills will make it difficult for companies to find enough applicants to fill these openings.

Further, while natural gas employment in "Los Angeles" is substantially less than other utility sector employment, Southern California Gas Company (the largest natural gas employer in Los Angeles) often recruits and employs individuals in Los Angeles County for their entire service territory which spans from San Diego to Visalia to San Louis Obispo. As such, employment projections for Los Angeles will only partially capture the employment potential in the natural gas subsector.

Highest Employment - Ranked ZIP Codes

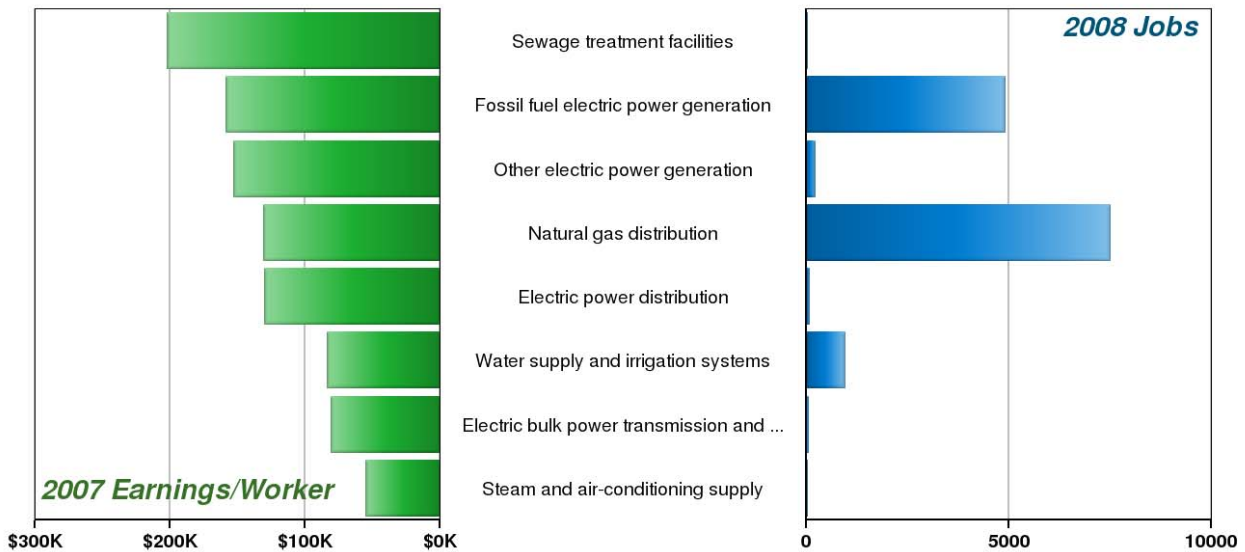
ZIP Code	2008 Jobs	2007 EPW	2008 LQ
90013 (in Los Angeles county, CA)	1,745	\$130,701	34.49
91754 (in Los Angeles county, CA)	383	\$130,699	3.36
91406 (in Los Angeles county, CA)	269	\$130,355	2.55
90039 (in Los Angeles county, CA)	267	\$130,701	6.26
90046 (in Los Angeles county, CA)	267	\$130,701	4.01
90255 (in Los Angeles county, CA)	125	\$127,880	2.63
91331 (in Los Angeles county, CA)	124	\$126,398	2.26
90018 (in Los Angeles county, CA)	118	\$130,701	5.50
90022 (in Los Angeles county, CA)	118	\$130,701	2.35
91304 (in Los Angeles county, CA)	116	\$129,899	1.46

Largest Industries



NAICS Code	Description	2008 Jobs	2013 Jobs	Change	% Change	2007 EPW	2007 Establishments
221210	Natural gas distribution	7,506	9,142	1,636	22%	\$130,701	68
221112	Fossil fuel electric power generation	4,901	4,153	-748	-15%	\$158,469	67
221310	Water supply and irrigation systems	949	846	-103	-11%	\$83,321	78
221119	Other electric power generation	220	154	-66	-30%	\$152,570	10
221122	Electric power distribution	60	52	-8	-13%	\$130,134	11
221121	Electric bulk power transmission and control	37	21	-16	-43%	\$80,774	6
221330	Steam and air-conditioning supply	35	25	-10	-29%	\$54,782	1
221320	Sewage treatment facilities	19	42	23	120%	\$202,161	4

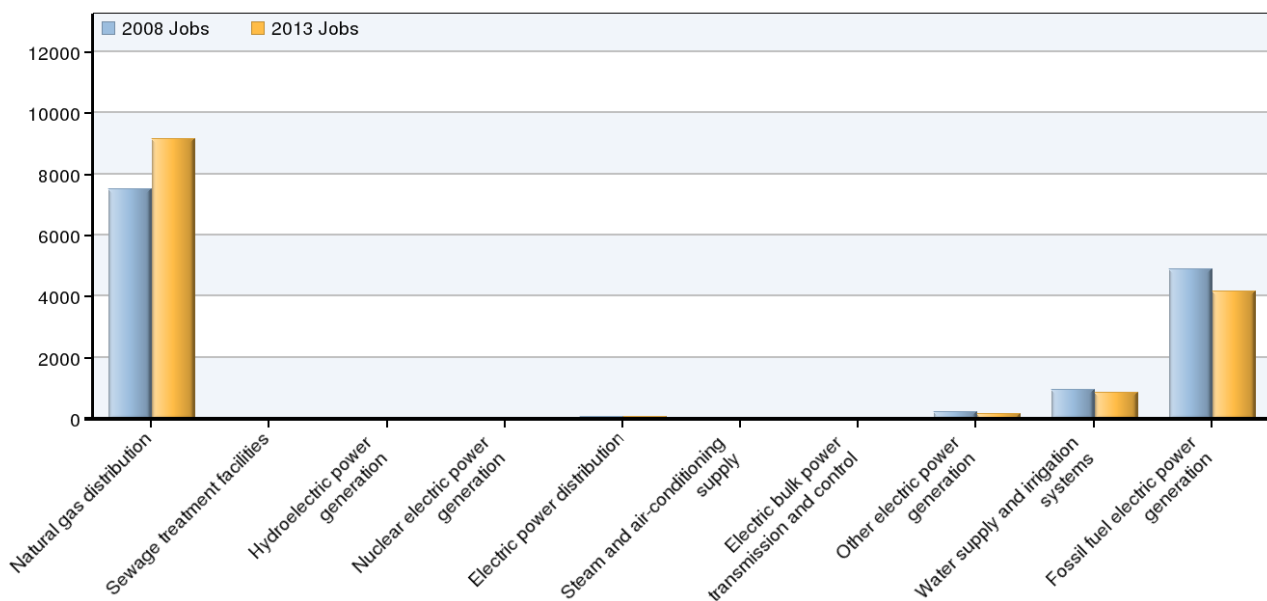
Highest Paying Industries



NAICS Code	Description	2008 Jobs	2013 Jobs	Change	% Change	2007 EPW
221320	Sewage treatment facilities	19	42	23	120%	\$202,161
221112	Fossil fuel electric power generation	4,901	4,153	-748	-15%	\$158,469
221119	Other electric power generation	220	154	-66	-30%	\$152,570
221210	Natural gas distribution	7,506	9,142	1,636	22%	\$130,701
221122	Electric power distribution	60	52	-8	-13%	\$130,134
221310	Water supply and irrigation systems	949	846	-103	-11%	\$83,321
221121	Electric bulk power transmission and control	37	21	-16	-43%	\$80,774
221330	Steam and air-conditioning supply	35	25	-10	-29%	\$54,782

*Note: Industries with fewer than 10 employees are not shown.

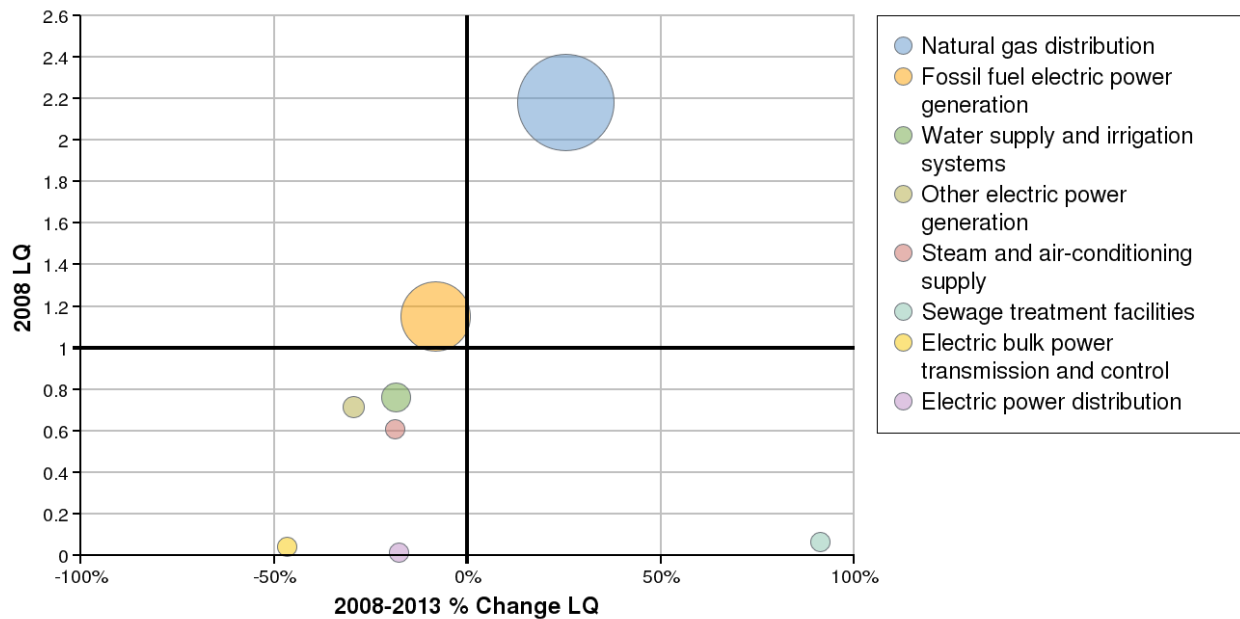
Fastest Growing Industries



NAICS Code	Description	2008 Jobs	2013 Jobs	Change	Change %	2007 EPW
221210	Natural gas distribution	7,506	9,142	1,636	22%	\$130,701
221320	Sewage treatment facilities	19	42	23	120%	\$202,161
221111	Hydroelectric power generation	0	0	0	0%	\$0
221113	Nuclear electric power generation	0	0	0	0%	\$0
221122	Electric power distribution	60	52	-8	-13%	\$130,134
221330	Steam and air-conditioning supply	35	25	-10	-29%	\$54,782
221121	Electric bulk power transmission and control	37	21	-16	-43%	\$80,774
221119	Other electric power generation	220	154	-66	-30%	\$152,570
221310	Water supply and irrigation systems	949	846	-103	-11%	\$83,321
221112	Fossil fuel electric power generation	4,901	4,153	-748	-15%	\$158,469

Source: EMSI Complete Employment - March 2008

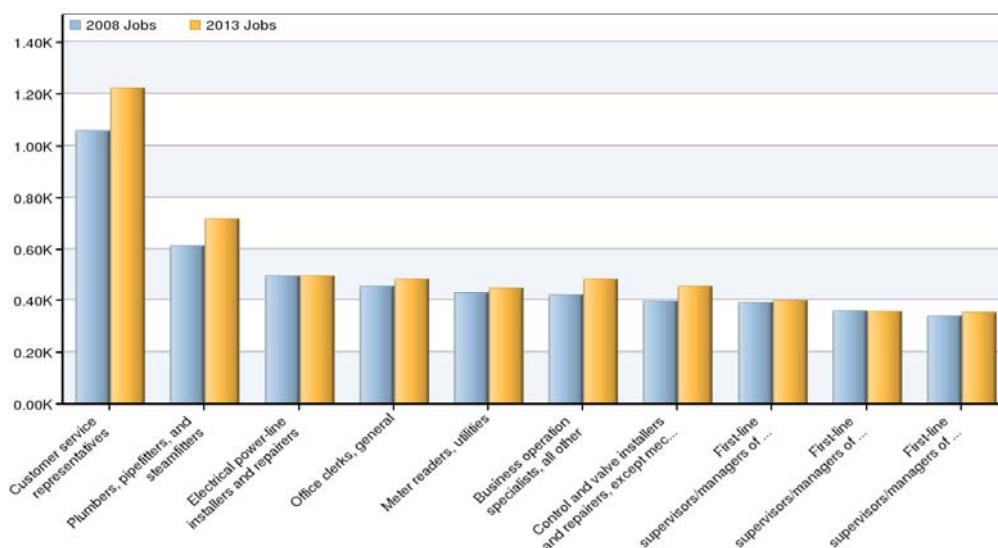
Top Industry Location Quotients



NAICS Code	Description	2008 Jobs	2013 Jobs	% Change	2008 LQ	2013 LQ	% Change LQ	2007 EPW
221210	Natural gas distribution	7,506	9,142	22%	2.18	2.74	25%	\$130,701
221112	Fossil fuel electric power generation	4,901	4,153	-15%	1.15	1.05	-8%	\$158,469
221310	Water supply and irrigation systems	949	846	-11%	0.76	0.62	-18%	\$83,321
221119	Other electric power generation	220	154	-30%	0.71	0.50	-29%	\$152,570
221330	Steam and air-conditioning supply	35	25	-28%	0.61	0.50	-19%	\$54,782
221320	Sewage treatment facilities	19	42	120%	0.07	0.13	91%	\$202,161
221121	Electric bulk power transmission and control	37	21	-43%	0.04	0.02	-47%	\$80,774
221122	Electric power distribution	60	52	-13%	0.01	0.01	-18%	\$130,134

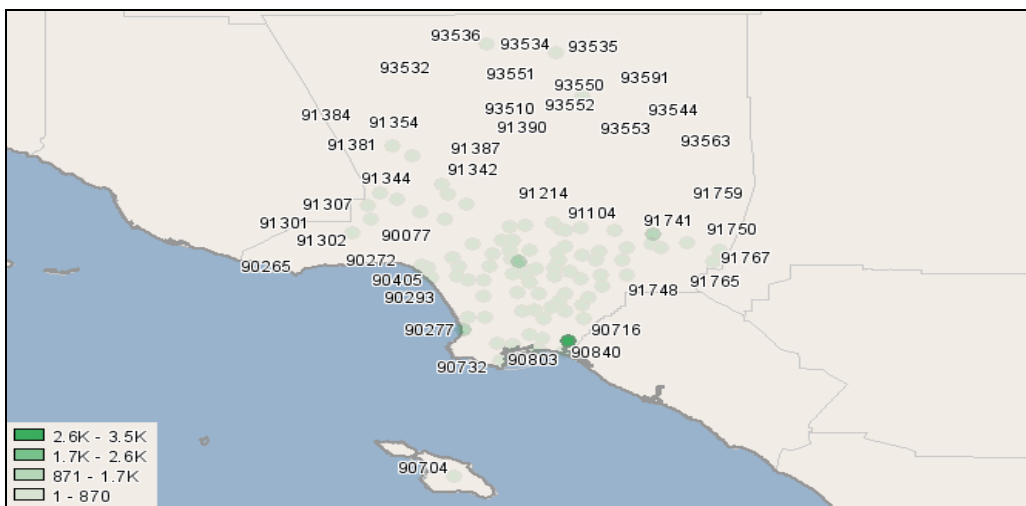
Source: EMSI Complete Employment - March 2008

Top Occupations in Utility Industry Sector - All Occupations



SOC Code	Description	2008 Jobs	2013 Jobs	Change	% Change	% of Industry
43-4051	Customer service representatives	1,058	1,223	165	16%	8%
47-2152	Plumbers, pipefitters, and steamfitters	613	718	105	17%	4%
49-9051	Electrical power-line installers and repairers	498	497	-1	-0%	4%
43-9061	Office clerks, general	458	486	28	6%	3%
43-5041	Meter readers, utilities	428	449	21	5%	3%
13-1199	Business operation specialists, all other	420	484	64	15%	3%
49-9012	Control and valve installers and repairers, except mechanical door	396	458	62	16%	3%
51-1011	First-line supervisors/managers of production and operating workers	390	398	8	2%	3%
49-1011	First-line supervisors/managers of mechanics, installers, and repairers	358	356	-2	-1%	3%
43-1011	First-line supervisors/managers of office and administrative support workers	340	352	12	4%	2%

Employment Distribution in Los Angeles – Top Occupations in Utility Industry Sector



Source: EMSI Complete Employment - September 2007

Industry Breakdown – Construction-Related Trade Occupations

NAICS Code	Description	2008 Jobs	2013 Jobs	EPW*
23711	Water and sewer system construction	2,206	1,827	\$67,661
23712	Oil and gas pipeline construction	2,034	1,650	\$67,397
23713	Power and communication system construction	1,149	1,035	\$83,901
		5,389	4,512	

Source: EMSI Complete Employment - September 2007 *EPW – "Earnings Per Worker" which is the total wage, salary, bonuses, and other compensation paid in the industry divided by the number of workers.

Occupational Overview – Electrical Trade Occupations

Program
Electrician (CIP 46.0302)
Lineworker (CIP 46.0303)
Electrical and Power Transmission Installers, Other (CIP 46.0399)

Program Occupations
First-line supervisors/managers of construction trades and extraction workers (SOC 47-1011)
Electricians (SOC 47-2111)
Helpers, electricians (SOC 47-3013)

Program Occupations	
Electrical and electronics repairers, powerhouse, substation, and relay (SOC 49-2095)	
Security and fire alarm systems installers (SOC 49-2098)	
Signal and track switch repairers (SOC 49-9097)	
Electrical power-line installers and repairers (SOC 49-9051)	

Occupational Summary	
2008 Occupational Jobs	46,190
2013 Occupational Jobs	46,871
Total Change	681
Total % Change	1%
2006 Median Hourly Earnings/Worker	\$25.15
Annual Openings	1,202
Total Replacement Jobs	5,327

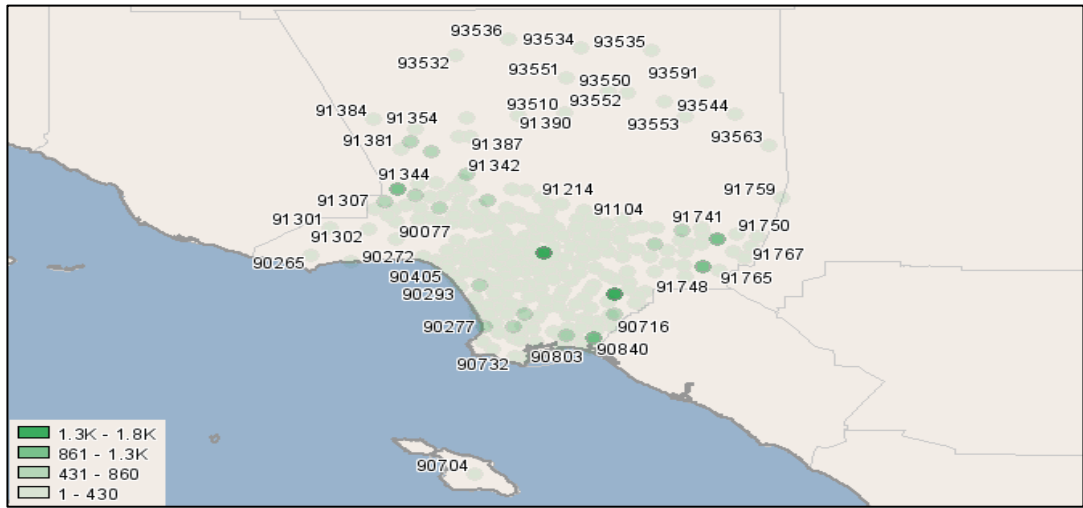
Source: EMSI Complete Employment - September 2007

Occupational Breakdown – Electrical Trade Occupations

SOC Code	Description	2008 Jobs	2013 Jobs	Annual Openings	Replacement Jobs	Hourly \$	Education Level
49-9097	Signal and track switch repairers	1,456	1,636	48	60	\$22.44	Moderate-term on-the-job training
49-9051	Electrical power-line installers and repairers	2,488	2,471	75	390	\$29.87	Long-term on-the-job training
49-2098	Security and fire alarm systems installers	2,060	2,047	58	304	\$18.04	Postsecondary vocational award
49-2095	Electrical and electronics repairers, powerhouse, substation, and relay	488	484	9	50	\$31.14	Postsecondary vocational award
47-2111	Electricians	14,417	14,453	405	1,987	\$23.13	Long-term on-the-job training
47-3013	Helpers, electricians	1,446	1,371	46	307	\$12.36	Short-term on-the-job training
47-1011	First-line supervisors/managers of construction trades and extraction workers	23,835	24,408	561	2,230	\$27.35	Work experience in a related field
	Total	46,190	46,871	1,202	5,327	\$25.15	

Source: EMSI Complete Employment - September 2007

**Occupation Distribution in Los Angeles – Electrical Trade Occupations
Education and Training of Utility Workers – Electrical Trade Occupations**



Education and Training of Utility Workers – Electrical Trade Occupations

Entrance into the trades that support the utility industry is usually through apprenticeship or short-term training programs that cover the fundamentals of entry-level occupations for specific industry employers or on-the-job training (for non-union members). Candidates must be at least 18 years old and have a high school diploma, although a GED may be acceptable. Completion of two semesters of algebra with a passing grade is highly desirable but one semester is usually required. Candidates are carefully screened and must achieve a passing score on qualifying examinations. Applicants must be in good physical condition. They must have normal vision, and good color perception to distinguish between various colored wires. Finger and manual dexterity is needed for using hand and power tools. Many employers require applicants to pass a physical examination as a condition of employment.

Entrance into the trades that support the utility industry is usually through apprenticeship or short-term training programs that cover the fundamentals of entry-level occupations for specific industry employers or on-the-job training.

In California a joint apprenticeship program is set up by the International Brotherhood of Electrical Workers (IBEW) and the National Electrical Contractors Association. An apprenticeship program consists of 7,200 to 8,000 hours of on-the-job and 1,000 to 1,200 hours of classroom training. Upon completion of the program, apprentices receive a "Certificate of Completion" from the California Division of Apprenticeship Standards. Applicants for apprenticeships usually must be at least 18 years old and have a high school diploma or a G.E.D. They also may have to pass a test and meet other requirements.

In Los Angeles, IBEW Local 11 offers an electrical workers' apprenticeship program in partnership with the Electrical Training Institute (ETI). Applicants take a written exam and, upon passing the exam, participate in an oral interview. The exam is offered ten times a year--once per month from February to November. The apprenticeship program consists of a minimum of 160 hours of classroom training (at night) each year for five years. Classroom training is coupled with at least 8,000 on-the-job training hours which is necessary to reach journey level Electrician.

Another method of entry into this occupation is completion of an electrical construction and maintenance program at career and technical schools and community colleges.

A combination apprenticeship/college program is available in Los Angeles through ETI and IBEW Local 11. Students who complete an electrical certificate or degree program from Los Angeles Trade-Technical College, Pasadena City College, or Long Beach City College (with grades averaging C or better and meeting all other application requirements) are waived from taking the required written entrance exam and once accepted into the program begin at 45% wages of a journey level worker.

Once employed, most large employers provide on-the-job training through local labor and/or joint labor-management training programs. An excellent example of a joint labor-management training program is the **IBEW, Local 18-Los Angeles Department of Water and Power (LADWP) Joint Training Institute**.

The following is a list of apprenticeship preparation, apprenticeship, college, and K12 training and education programs for electrical-related occupations.

Apprenticeship Preparation Programs – Los Angeles and Orange Counties

Name	City
Los Angeles Trade-Technical College, Utility and Construction Prep Program	Los Angeles
Women in Non-Traditional Employment Roles (WINTER)	Los Angeles
Century Community Training Program	Inglewood
Playa Vista Jobs	Los Angeles
Pasadena Community Education Center, Pasadena City College	Pasadena
Abram Friedman Occupational Center: Construction Worker Pre-Apprenticeship Program	Los Angeles

Electrical Apprenticeship Training Programs – Los Angeles and Orange Counties

Name	City
IBEW Local 18	Los Angeles
Electrical Training Institute (ETI)	City of Commerce
IBEW Local 11 Approved to offer whole general electrical curriculum by the California Division of Apprenticeship Standards	Pasadena, City of Commerce in Partnership with ETI
IBEW Local 40	North Hollywood

College Electrical Education Programs – Los Angeles and Orange Counties

Name	City
Los Angeles Trade-Technical College Approved to offer whole general electrical, residential electrician, and fire/life safety curriculum by the California Division of Apprenticeship Standards	Los Angeles
Pierce College Approved to offer partial general electrical curriculum by the California Division of Apprenticeship Standards	Woodland Hills
Pasadena City College Approved to offer whole general electrical curriculum by the California Division of Apprenticeship Standards	Pasadena
Mt. San Antonio College Approved to offer partial general electrical curriculum by the California Division of Apprenticeship Standards	Walnut
National Institute of Technology	Long Beach
Santiago Canyon College	Orange

Name	City
Long Beach City College Approved to offer whole general electrical curriculum by the California Division of Apprenticeship Standards	Long Beach

K12 Apprenticeship Programs – Los Angeles and Orange Counties

Los Angeles County Office of Education
Program Sponsor
Los Angeles County Electrical JAC
Associated Builders and Contractors, Los Angeles/Ventura Chapter ABC Electrical UAC

Los Angeles Unified School District
Program Sponsor
Abram Friedman Occupational Center: Construction Worker Pre-Apprenticeship Program
Los Angeles County Electrical JAC
Associated Builders and Contractors, Los Angeles/Ventura Chapter ABC Electrical UAC

K12 Career-Technical Programs – Los Angeles and Orange Counties

Name	Course/Program
Los Angeles County Office Regional Occupation Programs	Building Construction (includes 1009 hours of electrical instruction and training)
Abram Friedman Occupational Center (LAUSD)	Electrician Fundamentals Construction Worker Fundamentals (includes hours of electrical instruction and training)
East Los Angeles Skills Center (LAUSD)	Electrical Powerline Mechanic Electrical Powerline Mechanic Trainee Photovoltaic Installer
East Los Angeles Occupational Center (LAUSD)	Electrician – Wiring Techniques
Harbor Occupational Center (LAUSD)	Electrician – Fundamentals Electrician – Wiring Techniques
North Valley Occupational Center (LAUSD)	Electrician – Fundamentals Electrician – Technician Electrician – Wiring Codes Construction Worker – Fundamentals Power Plant Technician Trainee

Licensure

California and the city of Los Angeles requires electricians to be licensed. Although licensing requirements vary, electricians usually must pass an examination that tests their knowledge of electrical theory, the National Electrical Code, and local electric and building codes. Experienced

electricians periodically take courses offered by their employer, union, trade school, or community college to learn about changes in the National Electrical Code.

Advancement

Experienced Electricians may advance to Foreman, General Foreman, Supervisor, Chief Electrician, or Superintendent. Many Electricians enter the utility business as independent electrical contractors. Others work as instructors, building supply sales representatives, electrical inspectors or estimators. Experienced electricians can advance to jobs as supervisors. In construction, they also may become project managers or construction superintendents. Those with sufficient capital and management skills can start their own contracting business, although this often requires a special electrical contractor's license. Supervisors and contractors should be able to identify and estimate costs and prices and the time and materials needed to complete a job. Many electricians also become electrical inspectors.

For those who seek to advance, it is increasingly important to be able to communicate in both English and Spanish in order to relay instructions and safety precautions to workers with limited understanding of English; Spanish-speaking workers make up a large part of the construction workforce in many areas. Spanish-speaking workers who want to advance in this occupation need very good English skills to understand electrician classes and installation instructions, which are usually written in English and are highly technical.

Occupational Overview – Plumbing Trade Occupations

Program
Pipefitting/Pipefitter and Sprinkler Fitter (CIP 46.0502)
Plumbing Technology/Plumber (CIP 46.0503)
Plumbing and Related Water Supply Services, Other (CIP 46.0599)

Program Occupations
Plumbers, pipefitters, and steamfitters (SOC 47-2152)
First-line supervisors/managers of construction trades and extraction workers (SOC 47-1011)
Pipelayers (SOC 47-2151)
Helpers, pipelayers, plumbers, pipefitters, and steamfitters (SOC 47-3015)
Septic tank servicers and sewer pipe cleaners (SOC 47-4071)

Occupational Summary	
2008 Occupational Jobs	41,632
2013 Occupational Jobs	42,687
Total Change	1,055
Total % Change	3%
2006 Median Hourly Earnings/Worker	\$23.54
Annual Openings	1,286
Total Replacement Jobs	5,376

Source: EMSI Complete Employment - September 2007

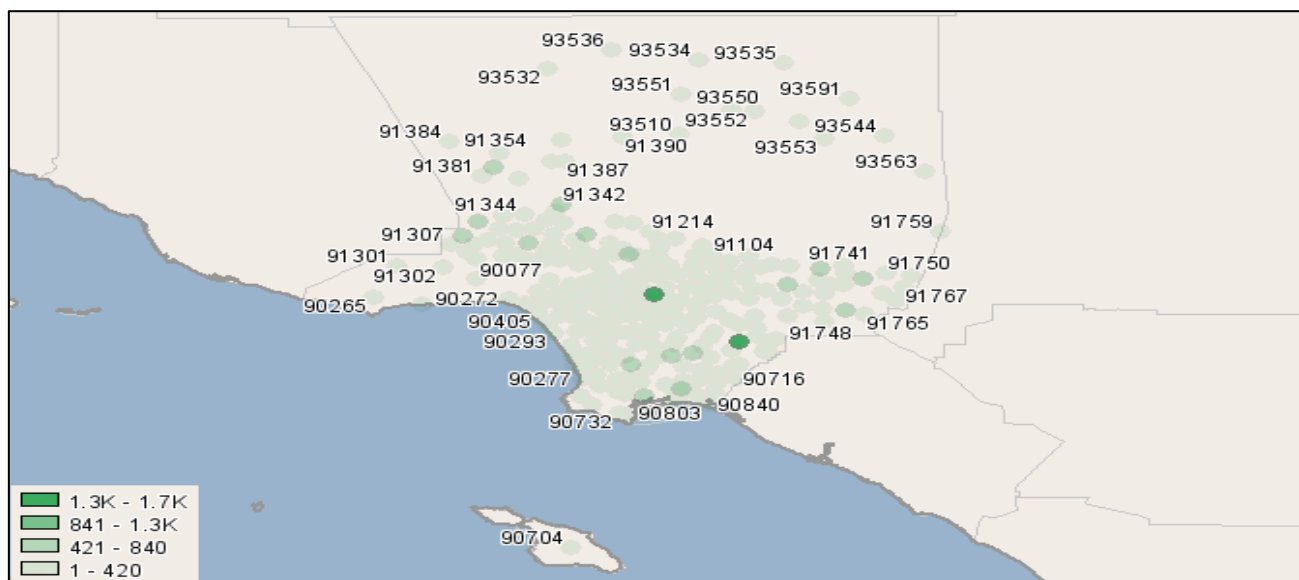
Occupational Breakdown – Plumbing Trade Occupations

SOC Code	Description	2008 Jobs	2013 Jobs	Annual Openings	Replacement Jobs	Hourly \$	Education Level
47-4071	Septic tank servicers and sewer pipe cleaners	672	698	27	110	\$21.20	Moderate-term on-the-job training
47-3015	Helpers, pipelayers, plumbers, pipefitters, and steamfitters	2,240	2,300	123	555	\$12.31	Short-term on-the-job training

SOC Code	Description	2008 Jobs	2013 Jobs	Annual Openings	Replacement Jobs	Hourly \$	Education Level
47-2151	Pipelayers	2,835	2,851	53	248	\$25.20	Moderate-term on-the-job training
47-1011	First-line supervisors/managers of construction trades and extraction workers	23,835	24,408	561	2,230	\$27.35	Work experience in a related field
47-2152	Plumbers, pipefitters, and steamfitters	12,050	12,431	523	2,232	\$27.25	Long-term on-the-job training
	Total	41,632	42,687	1,286	5,376	\$23.54	

Source: EMSI Complete Employment - September 2007

Occupation Distribution – Plumbing Trade Occupations



Source: EMSI Complete Employment - September 2007

Education and Training of Utility Workers – Plumbing Trade Occupations

Pipelayers, plumbers, pipefitters, and steamfitters enter into the occupation in a variety of ways. Most residential and industrial plumbers get their training in career and technical schools and community colleges and from on-the-job training. Pipelayers, plumbers, pipefitters, and steamfitters who work for nonresidential enterprises are usually trained through formal apprenticeship programs.

Pipelayers, plumbers, pipefitters, and steamfitters who work for nonresidential enterprises are usually trained through formal apprenticeship programs.

Apprenticeship programs vary but generally last four to five years. Apprenticeships—both union and nonunion—consist of 4 or 5 years of paid on-the-job training and at least 144 hours of related classroom instruction per year. Classroom subjects include drafting and blueprint reading, mathematics, applied physics and chemistry, safety, and local plumbing codes and regulations. Upon completion of the program, apprentices must pass a union-administered trade test and a city licensing test regulated by the California State Division of Apprenticeship Standards. Candidates for the apprenticeship program must possess a high school diploma or its equivalent, and must

pass aptitude tests. Some programs require candidates to have some related experience, mechanical interests, and a stable school record and work history.

Usually, unions accept applications for apprenticeship programs each spring. When program enrollment is sufficient to fill job openings, unions may not accept applications until occupational demand is up. On the job, apprentices first learn basic skills, such as identifying grades and types of pipe, using the tools of the trade, and safely unloading materials. As apprentices gain experience, they learn how to work with various types of pipe and how to install different piping systems and plumbing fixtures. Apprenticeship gives trainees a thorough knowledge of all aspects of the trade. Although most pipelayers, plumbers, pipefitters, and steamfitters are trained through apprenticeship, some still learn their skills informally on the job.

The following is a list of apprenticeship preparation, apprenticeship, college, and K12 training and education programs for plumbing-related occupations.

Apprenticeship Preparation Programs – Los Angeles and Orange Counties

Name	City
Los Angeles Trade-Technical College, Utility and Construction Prep Program	Los Angeles
Women in Non-Traditional Employment Roles	Long Beach
Century Community Training Program	Inglewood
Playa Vista Jobs	Los Angeles
Pasadena Community Education Center, Pasadena City College	Pasadena
Abram Friedman Occupational Center: Construction Worker Pre-Apprenticeship Program	Los Angeles

Plumbing Apprenticeship Training Programs – Los Angeles and Orange Counties

Name	City
UA Plumbers Local 78	Los Angeles
Steamfitter and Industrial Pipefitter Apprenticeship Program	Gardena

College Plumbing Programs – Los Angeles and Orange Counties

Name	City
Los Angeles Trade-Technical College	Los Angeles
National Institute of Technology	Long Beach
Rio Hondo College	Whittier

K12 Apprenticeship Programs – Los Angeles and Orange Counties

Los Angeles Unified School District
Program Sponsor
Los Angeles Metropolitan Plumbers JAC

K12 Career-Technical Programs – Los Angeles and Orange Counties

Name	Course/Program
Los Angeles County Office Regional Occupation Programs	Building Construction (includes 1009 hours of plumbing instruction and training)
Abram Friedman Occupational Center (LAUSD)	Construction Worker Fundamentals (includes hours of plumbing instruction and training)
East Los Angeles Occupational Center (LAUSD)	Plumber – Fundamentals
Harbor Occupational Center (LAUSD)	Plumber – Plumbing Codes Electrician – Wiring Techniques

Licensure - Plumbers. Although there are no uniform national licensing requirements, most communities require plumbers to be licensed. Licensing requirements vary, but most localities require workers to have 2 to 5 years of experience and to pass an examination that tests their knowledge of the trade and of local plumbing codes before working independently. Several municipalities require a special license to work on gas lines.

Other Qualifications - Plumbers. Applicants for union or nonunion apprentice jobs must be at least 18 years old and in good physical condition. A drug test may be required. Apprenticeship committees may require applicants to have a high school diploma or its equivalent. Armed Forces training in pipelaying, plumbing, and pipefitting is considered very good preparation. In fact, people with this background may be given credit for previous experience when entering a civilian apprenticeship program. High school or postsecondary courses in plumbing, general mathematics, drafting, blueprint reading, computers, and physics also are good preparation.

Highlighted Utility Education and Training Programs

The following are examples of education and training programs in Los Angeles that have been designed to specifically address the unique workforce development needs of the utilities industry.

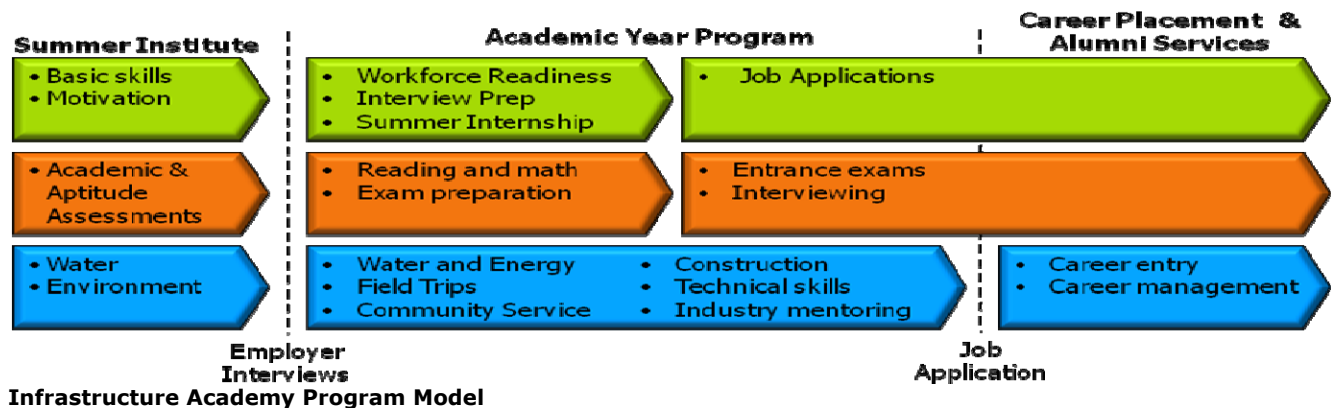
The Utilities and Construction Prep Program (at the Bridges to Success Center at Los Angeles Trade-Technical College) is a short-term, seven week education program aimed at preparing historically underserved adults and disconnected youth (e.g., out-of-school and out-of-work) for entry-level positions in the utilities and construction trades. The program includes industry orientation and career planning, workplace fitness and conditioning, employer exam and interview preparation, applied building skills (including electrical and plumbing), and job search and placement assistance. The program was developed in collaboration with industry, labor, government, and Worksource Center partners including the Los Angeles Department of Water and Power; Southern California Gas Company (a Sempra Energy Utility); the Metropolitan Water District; IBEW Local 18; UWUA Local 132; California Building and Construction Trades; the City of Los Angeles, and Southeast Los Angeles-Crenshaw/Work Source Center. Upon completion of the

program, participants may continue on one or more work- or education-related pathways such as enter a union apprenticeship program, obtain employment as a meter reader at the Southern California Gas Company, take another course at Los Angeles Trade-Technical College to obtain employment as an Electrical Craft Helper with Los Angeles Department of Water and Power, and/or take further courses in the Construction Technologies programs at Los Angeles Trade-Technical College. This program has been funded by a Career Advancement Academy grant from the California Community Colleges Chancellor's Office. For more information on the program visit: <http://www.lattc.edu/dept/lattc/acaaffairs/UtilityPrep.html>.

In January 2008, the **Infrastructure Academy** was launched as a means for expanding the workforce education opportunities for the industry sector. The Infrastructure Academy, an independent, non-profit organization, is a public-private partnership that was initiated by Los Angeles Mayor Antonio Villaraigosa and the Los Angeles Department of Water and Power. This partnership has grown to include industry, labor, education, and community partners including:

- Southern California Gas Company (a Sempra Utilities company)
- Los Angeles County Federation of Labor
- College of Engineering, Computer Science, and Technology at CSU, Los Angeles
- Los Angeles Community College District
- Los Angeles Unified School District
- City of Los Angeles Board of Public Works

The mission of the Infrastructure Academy is to build a pipeline of diverse, well-qualified young people for the skilled trades and engineering. The one-year program (depicted in the diagram below) is designed for high school juniors, seniors, and recent graduates and is delivered on college campuses. Students meet all-day for two days per week during the summer, twice a week after-school during the school year, and occasional Saturdays and weekends. The curriculum, which was designed in close collaboration with industry and labor partners, emphasizes the three areas that students need to secure entry into a good job: workforce readiness, academic preparation, and industry exposure. The program utilizes project-based learning activities, teamwork, and technology. As a part of learning about careers in the utilities and building trades, students learn about the water cycle and water conservation, the impact of the utilities on the environment, and renewable sources of energy (solar, wind, and hydro). For more information visit the Infrastructure Academy website at: <http://www.renewcalifornia.org/>.



Women In Non-Traditional Employment Roles, Inc. (WINTER) is a non-profit agency and a national leader in diversity workforce development and alternative education for inner-city youth, young adults, and women and is currently the only tradeswomen agency in Southern California serving the County of Los Angeles since 1996. WINTER's two main divisions, the adult program and the youth program, strive to provide meaningful and effective education, job training and work

and community learning service opportunities for women while addressing and improving equal access to living wage employment for all. WINTER's comprehensive programs work with 15 years and older youth and adult women who have dropped out of school, have no work experience, are long time Calworks/ TANF recipients and live in abject poverty with little hope for the future. WINTER provides intensive work soft skills, construction trades training, environmental remediation training and certification, mentoring and other non-traditional careers training, and an opportunity to earn a high school diploma in their Rosie the Riveter Charter High School. In addition, WINTER offers supportive services, community education and outreach, facilitates entrance into apprenticeship programs, technical careers, higher education in math, science, engineering and assistance transitioning into a living wage job or further education once participants have completed their programs. For more information on WINTER visit their website at: <http://www.winterwomen.org/>.

Rosie the Riveter Charter High School's (RRCHS), a charter school with an emphasis on construction and building trades' education, mission is to develop the personal, social, and academic potential of all students, while providing training for careers in the building trades and other non traditional careers. RRCHS accomplishes this through a standards-based curriculum that is integrated into a construction and building trades' curriculum. Rosie the Riveter Charter High School captures "at-promise" students who have not succeeded in traditional public schools and helps them turn their lives around and become socially successful while achieving high academic levels necessary to enter registered apprenticeship programs or college. The program decreases youth crime in Long Beach and surrounding areas by providing comprehensive resources for youth and families at-risk for gang, drug, pregnancy, and other unsafe activities. The program is committed to community transformation through education, employment training, life skills training, community service, violence prevention strategies, and family advocacy.

The Utilities Partnership is a collaborative effort including Southern California Edison, Santa Monica College, Rio Hondo College, El Camino College, Los Angeles Trade-Technical College, East Los Angeles Skills Center, the Power Line Industry and Collaborative Alliance, Marina del Rey-Mar Vista WorkSource Center/Career Planning Center, and JVS West Hollywood WorkSource Center. The partnership is currently developing an outreach, education/training, and placement program for underserved populations in the utility industry, particularly related to electrical (line) distribution occupations.

Workforce Development Challenges for the Utilities Industry Sector

There are several workforce development challenges that impact employment potential in the utilities industry sector as follows.

Aging Incumbent Workforce. As of 2006, about 55 percent of the utilities industry workforce, nationwide, is over the age of 45. Many of these workers will either retire or prepare to retire within the next 10 years. It is estimated that by 2010, as many as 60 percent of today's experienced utility workers will retire. A survey conducted last fall by the Carnegie Mellon University Electricity Industry Center² found that utility human resources executives overwhelmingly listed the aging work force as their number one concern. Eighty percent of those surveyed placed the aging work force as their biggest worry, far above the other listed concerns, which included cost of benefits and a skilled work force. The managers represented more than 200,000 workers

A survey conducted by the Carnegie Mellon University Electricity Industry Center found that utility human resources executives overwhelmingly listed the aging work force as their number one concern.

² Lave, L.B., Ashworth, M. & Gellings, C. (2007). The Aging Workforce: Electricity Industry Challenges and Solutions. Carnegie Mellon University Electricity Industry Center.

from utilities across the country. In a recent survey by BW Research³ of utility industry employers in Los Angeles and Orange counties, 73.3% of respondents indicated that replacing retired workers with qualified workers is with somewhat (50%) to great difficulty (23.3%).

Because on-the-job training is very intensive in many utilities industry occupations, keeping pace with preparing a new workforce will be one of the industry's highest priorities during the next decade. And because many of the aging incumbent workers occupy positions at the top of the career ladder within the utility industry, it will take years for newly entering workers to receive the training and experience necessary to fulfill these specific occupations. Furthermore, any shortages in the entry-level workforce will confound shortages in occupations up the career ladder.

A US Department of Energy report indicates building interest in energy-related careers as a key workforce development challenge for the utility industry.

Recruitment of Entry-Level Workforce. A US Department of Energy⁴ report (August, 2006) entitled "Workforce Trends in the Electric Utility Industry" cited building interest in energy-related careers as a key workforce development challenge. The report found that there is a lack of career awareness and/or interest amongst young adults of the utility industry and occupations. This is exacerbated by the limited vocational career exposure within high schools to this industry sector and to apprenticeship programs. And, there are outdated misconceptions about utility careers. However, there are significant opportunities for creativity and innovation to meet the challenges of the 21st century. Furthermore, not all positions in this sector require advanced degrees, so individuals of varying educational backgrounds can find rewarding jobs and build successful careers.

Further, a challenge for the utility industry in recruiting a new workforce is increasing awareness about rewarding career opportunities in the sector. To recruit the desired workforce, utility companies will have to change their public image from one which is static to one which is more dynamic, offering challenging careers in an exciting industry. Young, potential workers must understand the industry produces a commodity that is essential to society and to our quality of living. They also must be taught that those who work in the industry are environmentally responsible and that the jobs are stimulating and pay well. Education and training programs will also have to incorporate new marketing and outreach practices and new curriculum in beginning courses to change students' perceptions of the industry.

Lack of Understanding of Training and Education Needs of Utility Industry. Workforce development education and training providers have very limited understanding of the entry-level and incumbent occupational pathways and education and training programs necessary to meet the needs of the utility industry. Further research and opportunities for educational providers and industry members to meet and discuss occupational pathways, knowledge/skill requirements, and current and projected vacancies is fundamental to ensuring that education and training programs adequately prepare a skilled workforce for this industry. Further, utility companies need to continuously update and convey to education and training providers information about workforce needs (in terms of current and projected jobs) and the specific competencies and technical skills these jobs require.

Entry-Level Hiring Barriers. There are several hiring barriers, primarily derived from the policies and practices of utility employers, for entry-level workers including: requirement for drivers license; clean driving record; a personal owned vehicle that is safe, reliable, and insured; no active legal record; standardized testing; physical agility; high school diploma or equivalency; and a

³ BW Research (2007). The Economic and Workforce Development Opportunities of Green Technology. PowerPoint presentation at the LA Infrastructure and Sustainable Jobs Industry and Education Forum. October, 2007.

⁴ US Department of Energy (August, 2006). Workforce Trends in the Electric Utility Industry. A Report to the United States Congress Pursuant to Section 1101 of the Energy Policy Act of 2005.

limited number of occupational entry-points such as part-time meter reader for gas utility and electrical craft helper for the electric utility. Utility companies need to continuously re-examine hiring barriers as to their necessity and relevance to occupational requirements. In addition, education and training programs need to address these barriers in their programs and services.

Disjointed Education and Training System. As the education and training sections in this report reveal, there are education and training programs available. However, collaboration and alignment amongst education and training providers is non-existent leaving potential students/consumers unsure of options and career/occupational pathways. Furthermore, many educational programs are more tailored for the construction industry sector and not specialized to meet the unique and specific needs of the utility industry. Further research and opportunities for education and training providers to meet and discuss means for collaboration and alignment of programs and services is much needed.

Availability of Incumbent Worker Training. Entrance into the trades that support the utility industry is usually through apprenticeship preparation or short-term training programs that cover the fundamentals of entry-level occupations for specific industry employers. However, once employed, most large employers provide on-the-job training through local labor and/or joint labor-management training programs. Many of these “in-house” training programs may not be able to keep pace with the large numbers of anticipated vacancies due to retirements. In addition, there may not be a sufficient pool of incumbent employees at the lower-levels of the career ladder available to train. As a result, utility companies will more likely have to rely on other, external employers/providers to supply the requisite workforce for occupations that were once filled from its internal, incumbent workforce.

Greening of the Industry. Here again, workforce development education and training providers have very limited understanding of emerging occupations and education and training programs necessary as a result of the “greening” of the industry. Further/continuous research and opportunities for education and training providers to meet and discuss traditional and emerging green occupations and the required competencies and skills for these occupations is important.

Lack of Basic Work Competencies and Skills. Many entry-level workers lack the fundamental basic skills to enter the workforce such as job readiness skills, basic math and English skills, or knowledge of the process for obtaining employment in civil service and/or large utility companies. Entry-level workers also lack basic work skills unique to the utility sector such as strength and physical agility; knowledge of basic hand tools; safety procedures; understanding of the physical demands or nature of the work in the utilities industry; and reading maps and diagrams with an understanding of symbols, scales, keys and legends (e.g., an ability to read gas layouts, company maps, blueprints, etc.). Because the lack of basic work competencies and skills is a critical workforce development issue and challenge, the following section provides more detailed information on requisite basic skills for the utility industry.

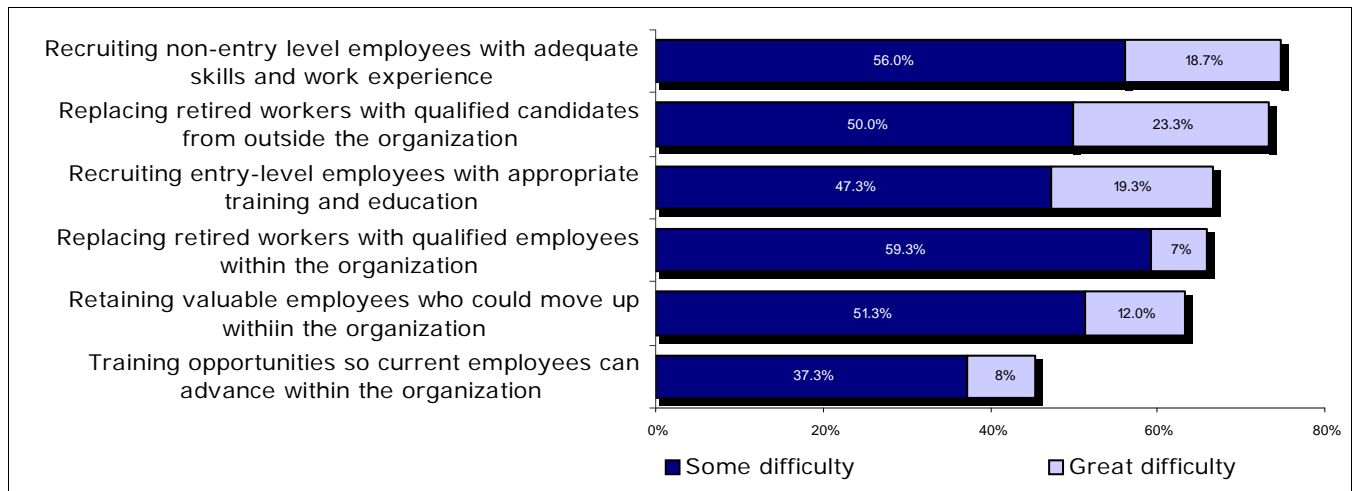
Many entry-level workers lack the fundamental basic skills to enter the workforce such as job readiness skills, basic math and English skills, or knowledge of the process for obtaining employment in civil service and/or large utility companies.

Recently, (November, 2007), BW Research⁵ conducted a survey of public administration and public utility employers in Los Angeles and Orange counties to ascertain the most common workforce challenges and competency/skill deficiencies of entering workers. The findings mirror several of

⁵ BW Research (2007). The Economic and Workforce Development Opportunities of Green Technology. PowerPoint presentation at the LA Infrastructure and Sustainable Jobs Industry and Education Forum. October, 2007.

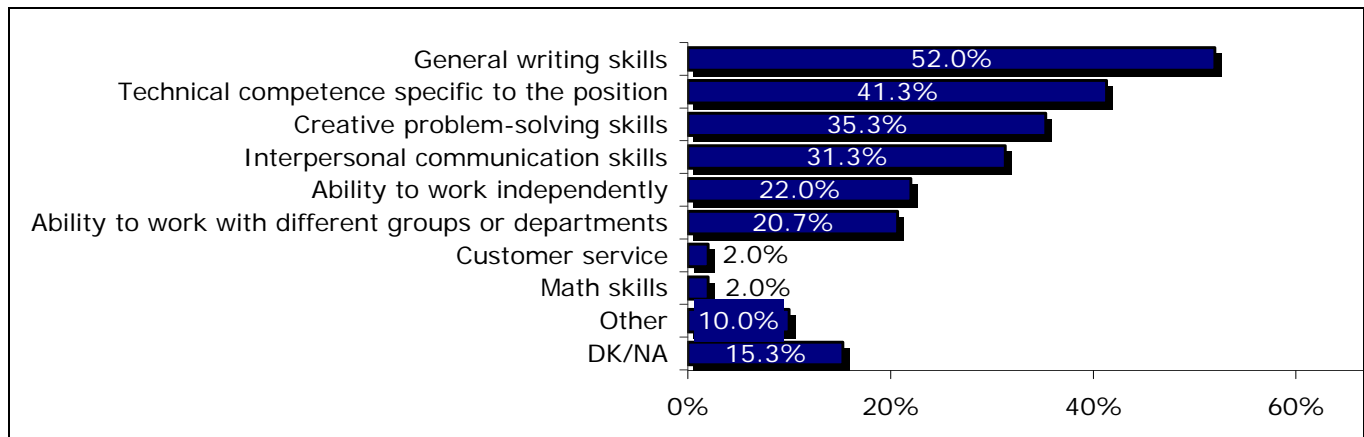
the workforce challenges described above and are summarized in the following tables.

Workforce Challenges – Public and Utility Industry



Source: BW Research

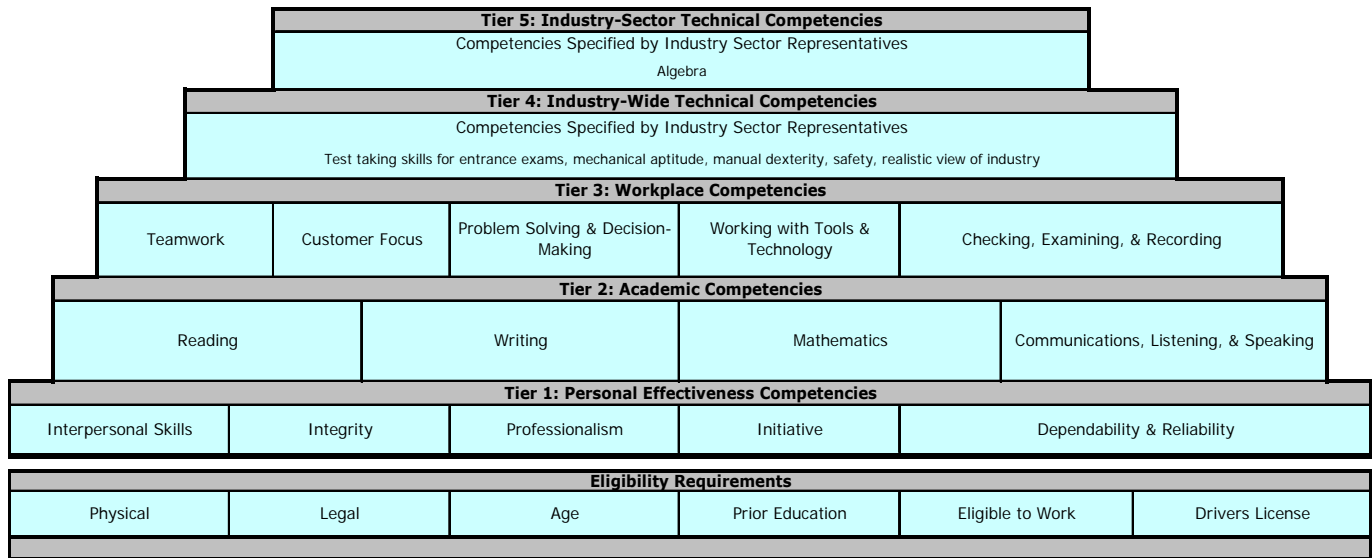
Competency/Skill Deficiencies of Entry Workers – Public and Utility Industry



Source: BW Research

Furthermore, several meetings over a six month period (October 2007 - March 2008) were conducted with utility industry companies in the Los Angeles region, specifically with individuals most closely responsible for training and employment. The following eligibility requirements and competencies for entry-level occupations are a synthesis of findings from these meetings and are organized using the US Employment and Training Administration's (ETA) comprehensive competency model framework.

Building Blocks for Entry Level Trade Careers in the Utility Industry – Los Angeles



Note: On the following pages several workplace competencies/skills are signified with the ^{21^c} symbol. The ^{21^c} symbol indicates these workplace competencies are reflective of 21st Century skills--skills necessary for succeeding in the 21st Century workplace such as thinking, reasoning, teamwork skills, and proficiency in using technology.

Eligibility Requirements

Physical

- *Lifting capacity (50 lbs)* – Has physical capacity to lift 50 lbs above head
- *Stooping, crawling, squatting* – has physical capacity to stoop, crawl, squat, and maneuver on hands and knees
- *Working in small/confined spaces* – Has capacity to work and maneuver in small and confined spaces.
- *Walking and standing* – Has physical capacity to walk 5 to 7 miles per day and stand for extended periods of time
- *Agility* – able to climb ladders (no fear of heights)

Legal

- *Legal record* – Has no or expunged legal record, or no pending legal record

Age

- *Age* – must be of age to have valid driver's license and high school diploma or equivalency

Prior Education

- *High school diploma* – Meets minimum educational requirements of a high school diploma, GED, or equivalency

Eligible to Work

- *Minimum employment eligibility* – Proof of identity and the legal right to work in the United States

Drivers License

- *Drivers license, driving record, transportation* – valid driver's license with an acceptable driving record, a personal owned vehicle that is safe and reliable, proof of automobile insurance

Tier 1 - Personal Effectiveness Competencies

Interpersonal Skills

- *Respecting diversity* – Demonstrates sensitivity and respect for the opinions, perspectives, customs and individual differences of others; promotes and strives to create a workforce and environment that represents and values diversity of people and ideas
- *Working with diverse people, social, and cross-cultural skills^{21c}* – Is flexible and open-minded when dealing with a wide range of people; listens to and considers others' viewpoints and alters opinion when it is appropriate to do so; works well and develops effective relationships with highly diverse personalities

Professionalism

- *Professional appearance* – Maintains a professional demeanor; dresses appropriately for work requirements; maintains appropriate personal hygiene
- *Substance abuse* – is free from substance abuse
- *Maintains a positive attitude* – Projects a professional image of oneself and the organization; demonstrates a positive attitude towards work; takes pride in one's work and the work of the organization

Initiative

- *Persisting* – Pursues work with energy, drive, and a strong accomplishment orientation; persists and expends extra effort to accomplish tasks even when conditions are difficult or deadlines are tight; persists at a task or problem despite interruptions, obstacles, or setbacks
- *Achievement motivation* – Intrinsically driven to succeed and excel; strives to exceed standards and expectations; exhibits confidence in capabilities and an expectation to succeed in future activities

Dependability & Reliability

- *Fulfilling obligations* – Behaves consistently and predictably; is reliable, responsible and dependable in fulfilling obligations; diligently follows through on commitments and consistently meets deadlines
- *Productivity and accountability^{21c}* – Demonstrates sense of accountability for producing products/services to required standards and beyond

- *Showing up on time* – Demonstrates regular and punctual attendance; rarely is late for work, meetings, or appointments
- *Complying with policies* – Follows written and verbal directions; complies with organizational rules, policies and procedures, ability to take and follow directions

Tier 2 - Academic Competencies

Reading

- *Comprehension* – Locates, understands, and interprets written information in documents such as manuals, reports, memos, letters, forms, graphs, charts, tables, calendars, schedules, signs, safety notices, applications and directions
- *Application* – Integrates what is learned from written materials with prior knowledge; applies what is learned from written material to follow instructions and complete specific tasks

Writing

- *Organization and development* – Creates documents such as reports and other written information, which may contain technical material, in a logical, organized and coherent manner
- *Mechanics* – Uses standard syntax and sentence structure; uses correct spelling, punctuation, and capitalization; uses appropriate grammar (e.g., correct tense, subject-verb agreement, no missing words)

Mathematics

- *Quantification* – Reads and writes numbers; counts and places numbers in sequence; recognizes whether one number is larger than another
- *Computation* – Adds, subtracts, multiplies, and divides with whole numbers, fractions, decimals, and percents; calculates averages, ratios, proportions and rates; converts decimals to fractions; converts fractions to percents; solves basic algebraic equations
- *Measurement and estimation* – Takes measurements of time, temperature, distances, length, width, height, perimeter, area, volume, weight, velocity, and speed; uses and reports measurements correctly; converts from one measurement to another (e.g., from English to metric), reads maps and diagrams with an understanding of symbols, scales, keys and legends (e.g., an ability to read gas layouts, company maps, blueprints, etc.)
- *Application* – Performs basic math computations accurately; translates practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques

Communication^{21c} – Listening & Speaking

- *Listening* – Receives, attends to, interprets, understands, and responds to verbal messages and other cues; picks out important information in verbal messages

Critical/Analytic Thinking^{21c}

- *Reasoning* – Possesses sufficient inductive and deductive reasoning ability to perform job successfully; critically reviews, analyzes, synthesizes, compares and interprets information; draws conclusions from relevant and/or missing information; understands the principles underlying the relationship among facts and applies this understanding when solving problems

Basic Computer Skills and Information Literacy^{21c}

- *Entering data* – Ability to fill out forms online (e.g. safety data sheets and benefit packages), ability to type at least 30 words per minute
- *Information literacy* – Ability to read/interpret maps

Tier 3 - Workplace Competencies

Teamwork and Collaboration^{21c}

- *Acknowledging team membership and role* – Accepts membership in the team; shows loyalty to the team

Customer Focus

- *Understanding customer needs* – Demonstrates a desire to understand customer needs; listens to what customers are saying and asks questions as appropriate; demonstrates awareness of client goals
- *Providing personalized service* – Provides prompt, efficient and personalized assistance to meet the requirements, requests, and concerns of customers; provides thorough, accurate information to answer customers' questions and inform them of commitment times or performance guarantees; actively looks for ways to help customers by identifying and proposing appropriate solutions and/or services; establishes boundaries as appropriate for unreasonable customer demands
- *Acting professionally* – Is pleasant, courteous and professional when dealing with internal or external customers; develops constructive and cooperative working relationships with customers, and displays a good-natured, cooperative attitude; is calm and empathetic when dealing with hostile customers

Problem Solving^{21c} & Decision-Making

- *Identifying the problem* – Anticipates or recognizes the existence of a problem; identifies the true nature of the problem by analyzing its component parts; uses all available reference systems to locate and obtain information relevant to the problem; recalls previously learned information that is relevant to the problem
- *Locating, gathering, and organizing relevant information* – Effectively uses internal resources to locate and gather information

Working with Tools & Technology

- *Selecting tools* – Basic understanding and use of hand/portable power tools, selects and applies appropriate tools to frequently encountered problems; carefully considers which tools are

appropriate for a given job, and consistently chooses the best tool for the problem at hand, understand use of tools, understanding of the clockwise and counter-clockwise principles (e.g., righty-tighty, lefty-loosy)

Checking, Examining & Recording

- *Completing forms* – Selects and completes appropriate forms quickly and completely; attends to and follows through on important information in paperwork
- *Maintaining logs* – Keeps logs, records, and files that are up-to-date and readily accessible; updates logs, files, and records

Tier 4 - Industry-Wide Technical Competencies

Mechanical Aptitude

- *Knowledge of machines and tools*, including their designs, uses, repair, and maintenance; ability to manipulate machines and tools

Safety

- *Knowledge of relevant equipment, policies, procedures, and strategies for safe operations*

Test-Taking

- *Ability to pass exams for entry level and incumbent positions*

Realistic View of Industry

- *Understanding of physical demands and nature of work in the utilities industry*

Tier 5 - Industry-Specific Technical Competencies

Mathematics

- *Knowledge of algebra*

Greening of the Utility/Infrastructure Industry

As stated several times throughout this report, the “greening” of the utility industry sector will have a significant impact on both the new and incumbent workforce. As traditional occupations are “greened” incumbent workers will need to be retrained on the new technologies/processes at the same time that education/training providers must adjust or add new programs to train the incoming workforce. In addition, education/training providers must also develop and implement new programs for new occupations that arise as a result of the “greening” of the industry. Because this may become a significant workforce challenge for the utility industry, the remainder of this report provides a brief synopsis of the “greening” of utilities.

California presents a model for how synergistic state and city policies can create markets for renewable energy, and opportunities – for policymakers, practitioners and advocates – to drive green job and workforce development that addresses issues of economic and racial equity.

California has long been in the national forefront of state efforts to incentivize the transition to a new energy economy. In 2002 California passed an RPS -- the nation's most stringent at the time -- requiring California to generate 20 percent of its electricity from renewable energy no later than 2017. In 2006, the state passed the landmark Global Warming Solutions Act (AB 32), setting an emissions cap on greenhouse gases to be met by 2020, and the Million Solar Roofs Initiative (SB1), which combines policy mechanisms ranging from tax credits and rebates to homebuilding guidelines in an effort to enable the construction of a million solar roofs in California over a ten-year period.

Los Angeles, California's biggest city and the center of its largest economic region, has taken advantage of its own policy levers, adopting LEED standards for all Department of Public Works building projects 7,500 square feet or larger, which went into effect in mid-2003. The city is also in the process of expanding its solar incentive program to align with the state Million Solar Roofs Initiative, having committed \$150 million to the effort. In June of 2007, the City Council established a City Retrofit Jobs Task Force that includes council members, city agencies, and Los Angeles Apollo Alliance representatives to coordinate and lead the city's energy efficiency efforts, which include identifying financing mechanisms for the retrofit work.

Recently, the Regional Economic Development Institute @ Los Angeles Trade-Technical College (in conjunction with the Los Angeles Infrastructure and Sustainability Jobs Collaborative) commissioned research in an effort to forecast the workforce needs of the emerging green economy in Los Angeles. This research included a written, web, and telephone survey of construction companies, an environmental scan of industry projections, a review of secondary literature/studies, and a two-day industry/education forum. As a result of this research, the following are identified as traditional and emerging occupations related to the greening of the utilities/energy sectors and the most promising "green" occupations (in terms of job growth) in the Los Angeles region.

Traditional and Emerging Energy Occupations

Power Generation

- *Instrument/Control Technician and Process Operator* – Monitors operation and maintenance of generator for optimization of energy production
- *Energy Specialist* – Performs energy audits and assists in making recommendations for power producer/ generation customers
- *Green Power Technician* – Installs, operates, and maintains green power/ renewable energy systems (i.e., solar, wind, biomass)

Transmission and Distribution

- *Equipment Operator/ Controls Operator* – Operates equipment and process controls

Buying and Selling of Energy

- *Purchasing Agent* – Analyzes and optimizes energy purchases
- *Energy Broker/Power Marketer* – Buys and sells energy for customers
- *Billing Analyst/Rate Analyst* – Analyzes utility bills and selects optimal rate structures for customers

Energy Assessment

- *Energy Auditor* – Conducts energy audits (including investment grade audits) of buildings, as well as building and process systems
- *Energy Analyst* – Analyzes energy and building data, researches energy saving opportunities, and recommends a prioritized list of energy conservation and renewable energy options

- *Industrial Process Specialist* – Analyzes industrial processes to identify opportunities for reduction of energy consumption and environmental impact

Engineering and Implementation

- *Systems Technician* – Integrates energy efficiency, energy management, and alternative energies into the operation and maintenance of facilities
- *Measurement and Verification Technician* – Installs, maintains, and troubleshoots HVAC, electrical, and energy management instrumentation
- *Testing/Commission Technician* – Ensures proper operation of the energy system by verifying system is working properly and teaching operators how to use the system

Operations and Maintenance

- *Building Control Operator* – Operates building systems and controls (HVAC, lighting systems, etc.)
- *Building Control Technician* – Installs, maintains, and troubleshoots complex building systems and controls
- *Building Operator/Building Technician* – Manages all building operations
- *Resource Conservation/ Efficiency Manager* – Plans, recommends and supervises implementation of resource efficiency and conservation projects
- *Maintenance Technician* – Performs preventative and predictive maintenance to keep building running smoothly while reducing energy consumption and environmental impact
- *Industrial Process Equipment Maintenance and Operations Specialist* – Plans, recommends, and supervises implementation of energy and resource efficiency and conservation projects in an industrial setting

Resource Management

- *Energy Manager/ Specialist/Consultant* – Formulates recommendations for energy efficiency, alternative energy improvements, improved cost effectiveness and lower environmental impact by conducting complex analyses of HVAC, lighting, and building systems, energy and environmental data, and rate structures
- *Program/Project Coordinator* – Manages implementation of specific programs and projects.
- *Energy Cost Analyst* Analyzes rate structures and energy purchase possibilities and recommends optimum selection of energy sources
- *Resource Conservation/ Efficiency Manager* – Analyzes energy and waste streams in order to identify and implement cost-effective energy conservation measures that could minimize environmental impact
- *Waste Management Technician* – Evaluates and analyzes processes and waste streams, identifying and implementing opportunities for lowering environmental impact and improving cost effectiveness

Other Related Occupations

- *Building Controls Installer* – Installs building controls, including computer, control wiring, sensors, and other monitoring equipment
- *Maintenance Planner* – Designs preventative maintenance program for the building owner or for the automated buildings company
- *Lineperson* – Maintains electrical distribution system
- *Legislative Research Technician* – Researches applicable laws and regulations, including current bills and lobbying efforts

Most Promising Traditional and Emerging Energy Occupations in Los Angeles. Finally, the following are the most promising traditional and emerging occupations for employment growth in the Los Angeles region related to the greening of the utilities/energy sectors that should be considered in developing workforce training and education programs.

- Systems technician
- Renewable energy technician
- Energy auditor
- Compliance specialist
- Resource conservation/efficiency manager
- Energy analyst
- Solar installer technician
- Energy and indoor air quality auditor
- Deconstruction worker (currently conducting research on this emerging occupation)
- HVAC and PV operations and maintenance technicians
- Diesel and auto technicians with alternative fuels and emissions controls training - to service green fleets of large utility and infrastructure employers
- Water supply, distribution and treatment technicians/operators

References

Bureau of Labor Statistics, U.S. Department of Labor, *Career Guide to Industries, 2008-09 Edition, Utilities*, available on the Internet at <http://www.bls.gov/oco/cg/cgs018.htm>.

BW Research (2007). The Economic and Workforce Development Opportunities of Green Technology. PowerPoint presentation at the LA Infrastructure and Sustainable Jobs Industry and Education Forum. October, 2007.

Lave, L.B., Ashworth, M. & Gellings, C. (2007). The Aging Workforce: Electricity Industry Challenges and Solutions. Carnegie Mellon University Electricity Industry Center.

US Department of Energy (August, 2006). Workforce Trends in the Electric Utility Industry. A Report to the United States Congress Pursuant to Section 1101 of the Energy Policy Act of 2005.

Data Sources

The primary data source for this section comes from the economic modeling databases provided by Economic Modeling Specialists, Inc. (EMSI).

Industry Data

Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA), augmented with County Business Patterns (CBP) and Nonemployer Statistics (NES) published by the U.S. Census Bureau. Projections are based on the latest available industry data combined with past trends in each industry and the industry growth rates in national projections (Bureau of Labor Statistics) and states' own projections, where available.

Occupation Data

Organizing regional employment information by occupation provides a workforce-oriented view of the regional economy. Occupation data are based on industry data and regional staffing patterns taken from the Occupational Employment Statistics program (U.S. Bureau of Labor Statistics). Wage information is partially derived from the American Community Survey. The occupation-to-program (SOC-to-CIP) crosswalk is from the U.S. Department of Education.

Federal and State Data Sources

This report uses state data from the following agencies: U.S. Department of Labor and California Labor Market Information Department.