

CONNECTICUT ENERGY WORKFORCE ASSESSMENT June 2015

Building the Future Energy Workforce



Thomas F. Burns
Workforce Development Solutions
Thomas.burns@snet.net

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Executive Summary

Connecticut's Department of Energy and Environmental Protection (DEEP) issued a Comprehensive Energy Strategy in February of 2013. The strategy contained a series of policy proposals aimed at expanding energy choices, lowering utility bills for Connecticut residents and businesses, improving environmental conditions, creating clean energy jobs, and enhancing the quality of life in the state. The Strategy offers recommendations in five major priority areas:

- Energy efficiency
- Industrial energy needs
- Electricity supply including renewable power
- Natural gas
- Transportation

The strategy indicates that for Connecticut businesses to fully implement this plan, the state has to have a well-trained force. The report notes in several sections that an alignment between the educational providers and the workforce system is necessary to support the businesses implementing the five strategic components of the plan.

DEEP, working with the Connecticut Business and Industry Association (CBIA) and the Connecticut Energy Workforce Consortium (CTEWDC), which is sponsored by CBIA, conducted an assessment of the energy workforce readiness to implement the Governor's energy strategy beginning in the fall of 2014. This assessment aligned with past initiatives to promote and create a "green jobs" in Connecticut going back to Governor Rell's Executive Order No. 23 issued in 2009, Office of Research Report 2011-R-0313, State Initiatives to Promote Green Jobs issued on September 2, 2011 and an additional report, Connecticut Green Job Workforce Report and Recommendations prepared for the Connecticut Green Job Partnership by the Regional Plan Association issued August of 2012.

DEEP's assessment priorities focused on four elements of energy workforce development:

- 1) Inventory existing certifications, training and degree programs in the energy related fields including energy efficiency, renewable energy and energy installations.
- 2) Define the energy sector by using North American Industry Classification System codes.
- 3) Develop recommendations for aligning existing educational programs with industry demand.
- 4) Provide guidance for collaboration between the CTEWDC and the Board of Regents, the Board of Regents Community College Council of Continuing Education and the Board of Regents Community College of Academic programs.

CBIA and the CTEWDC issued a survey to energy related businesses in December of 2014. The survey focused on businesses in three sectors of the energy field: companies that install energy efficient and renewable energy equipment and provide energy related services; companies that generate, distribute and transmit energy; and manufacturers of energy related products. The survey requested information on job titles, skills, training and education requirements for job titles, wages and experience for energy job titles, current and future hiring predictions, employee recruitment, difficulty in filling positions, and strategies that companies use to improve employee performance. Fifty-eight companies responded to the survey.

The data from the survey was combined with over forty interviews to follow-up on survey data. All the NAICS codes associated with the energy industry sector were identified as part of this project. Seventy-nine NAICS codes were identified as associated with the energy industry. Sixty-four NAICS codes were used to analyze the energy sector by Capital Workforce Partners and the Department of Labor. This information is critical since the energy industry sector is not well defined. This information was used to measure the number of businesses and the number of employees in the energy sector and the anticipated and actual hiring.

A comprehensive list was compiled of all the educational and training programs in Connecticut that support the energy sector. This includes public and private universities, community college programs, technical high school programs, private educational providers of technical training, training sponsored by utility companies and union/apprentice training programs. This list was used to evaluate the alignment of the educational and training programs with the energy sector businesses and identify any gaps between the hiring in the energy field and educational programs.

Key Findings:

Table 1: NAICS Code Energy Sector

Data analysis of the NAICS codes indicated that there are approximately 63,000 energy jobs at 5,600 business in Connecticut.

SECTOR	2006	2007	2008	2009	2010	2011	2012	2013	2014	Change 2010 to 2014
Total - All Sectors	1,670,067	1,686,954	1,688,974	1,615,395	1,595,775	1,612,264	1,627,754	1,640,240	1,653,517	57,742
ENERGY										
Utilities	1,661	1,639	1,717	1,677	1,841	1,763	1,563	1,526	1,552	-289
Construction	24,167	25,680	25,319	21,798	20,014	20,583	20,592	21,611	22,914	2,900
Manufacturing	16,402	16,008	16,240	14,957	14,413	14,733	14,803	14,482	14,261	-151
Wholesale Trade	7,842	7,818	7,508	6,728	6,389	6,359	6,300	6,374	6,435	47
Retail Trade	4,884	4,675	4,519	4,516	4,413	4,410	4,294	4,287	4,354	-58
Prof., Scientific & Tech. Services	8,658	8,766	8,837	8,421	8,508	8,616	8,936	9,562	10,048	1,541
Administrative & Support Svces.	2,863	2,975	3,007	2,756	2,762	2,847	2,907	3,058	3,184	423
Health Care & Social Assistance	332	330	342	347	360	326	312	305	369	9
Total ENERGY	66,811	67,892	67,489	61,199	58,699	59,637	59,706	61,205	63,118	4,420
Source: Connecticut Department of Labor Quarterly Census of Employment and Wages (QCEW) (pjf) May 8, 2015										

The data from the DOL indicates that primary hiring is in the construction and professional, scientific and technical services energy field. The professional, scientific and technical services includes companies that perform building inspection services and other consulting and engineering services. The energy construction sector includes companies that do energy related work but may also work outside the energy sector.

The Connecticut Green Bank formerly the Clean Energy Finance and Investment Authority (CEFIA) indicated that projects related to energy efficiency and renewable energy continue to expand. The Commercial Property Assessed Clean Energy (C-PACE) program has 110 towns and cities onboard with \$68.7 million in transactions. The Lead by Example (LBE) Energy Saving Performance Contracting program continues to expand by providing state and municipal governments the ability to implement comprehensive energy savings measures with no upfront capital. These programs and the expansion of solar installations, continued expansion of energy efficiency programs, gas expansion and business/residential continued focus on reducing energy cost indicate that hiring in the energy workforce will continue to grow. In many cases the energy industry is competing for the same workforce employed in manufacturing and construction sectors.

Although the survey data and the NAICS analysis indicates continued hiring in the energy field, survey data and interviews indicate gaps in the hiring process. Businesses noted there is no one location that workers interested in the energy field can find information on energy related jobs, the education needed to obtain employment in the energy sector or career paths in the energy sector. Employers interested in hiring qualified applicants do not have a single resource that they can use to find qualified applicants. The survey data indicated that 73% of the entry level positions were filled through employee referral or by word-of-mouth. The next highest recruiting methods through 2 year and 4 year colleges (38% each) and through company websites (38%).

The survey data also indicated that hands-on experience is valued by the businesses. Even for entry level positions, businesses indicated that some work experience is critical. This work experience includes both technical knowledge and work readiness skills such as working safely, showing up on time, following instructions and the ability to communicate with management and customers. Interviews conducted with individuals in engineering positions, educational providers and businesses hiring entry level employees noted the need for additional hands-on and work related experiences.

The analysis of the educational programs that support the energy field indicates multiple 4-year degree programs related to engineering services at both public and private universities. Although there are several 2-year degree programs in the engineering and technical services field, the programs are not universal across the community college system and in most cases are in regions that have business support and potential hiring for graduates. Entry level programs are also regionally located and support regional hiring. Continuing educational programs exist at private providers, some community colleges and educational providers that support apprenticeship programs. The technical high school system offers excellent programs aligned with business needs. The technical high schools and entry level programs for unemployed and under-employed individuals conducted by the workforce boards continue to support energy related contractor positions. Both the survey data and interviews indicated that employers value hands-on experience during the hiring process. Although the technical high schools, private educational providers and workforce boards offer programs with hands-on experience, expanding work-related and hands-on training is needed to support future hiring.

Meetings with the Community College Deans of Continuing Education and Ms. Estela Lopez, the Academic Provost, noted that the Community Colleges previously had additional technical programs that were supported by grants and business partners. Without the financial support of grants or guaranteed hiring by business partners, the Community Colleges have reduced the number of energy related programs. Programs similar to the current manufacturing certificate programs containing “stackable credentials” could be developed with a high level of business support and data from DOL indicating where current hiring is occurring. There is a potential for the community college system to develop continuing education programs for individuals who are currently employed. The survey data indicated that there is no supervisor training offered in the state; this need could be addressed by the community college continuing education programs. Also, continuing education such as Norwalk Community College’s Energy Management Program could support other regions of the state since there is an ongoing need for Facility Manager and Building Operation certification.

Although the analysis on the educational programs indicated there should be sufficient programs in Connecticut to support the current hiring, there were regional gaps identified and gaps related to the changing environment in the energy field. One utility company noted a gap in home energy raters since there is now a requirement to perform a home energy rating during energy audits. There was also limited use of online learning so individuals in regions that did not have access to classroom learning could still take training programs.

Recommendations:

1) Evaluate the need for a “clearinghouse” of energy related job opportunities and educational programs. Websites such as CBIA’s “Get into Energy” could be used to support the job posting function and provide information to individuals looking for careers in the energy field. The DOL’s website has almost all the required information for

energy careers and should be evaluated as the career clearinghouse of energy related occupations. A communication plan needs to be developed in order to communicate with potential employees and individuals looking for training.

2) Expand the business involvement in the consortium. The consortium should include representatives from the Home Performance Alliance, The Solar Association, representatives of the Community College BOR, CC Deans of Continuing Education, the CTHSS system, Connecticut's Clean Energy Finance and Investment Authority (CEFIA), DEEP and other energy sector business associations. Standard agendas could be developed including presentations from DEEP, CEFIA detailing trends in the energy sector.

3) Expand the hands-on opportunities for technical high school students. Students currently obtain 720 hours of related instruction and upwards of 1500 hours of hands-on experience towards their apprenticeships. CTHSS has a process/application that allows 16 & 17 year old students to work at hazardous sites. Consider adding additional classroom and hands-on training and certification for energy workforce positions. Logistical issues such as transportation and drivers licenses currently hinder the students from obtaining additional hands-on hours.

4) Develop a set of proactive and lagging metrics for the energy sector. Metrics such as job postings, stable hiring, and graduates from technical high schools going into the field, number of individuals working on their apprenticeships, actual expenditures for energy efficiency program and entry level programs being offered by state workforce boards are lagging indicators. Proactive metrics should include: predictive funding related to solar installations; energy efficiency funding and rebates; performance-based contracting, C-PACE programs; individuals entering technical high school trade programs; and individuals entering apprentice programs. Trends in funding to implement energy efficiency programs could be used to predict future employment.

5) Evaluate providing financial incentives to energy efficiency companies that send their employees to continuing training similar to the Mass Saves program. Currently business pay for training for BPI and other training but the certification belongs to the individual. Individuals can take their certification with them if they leave and the business has to pay for additional training for a replacement. Mass Save reimburses the company one-half the cost of training up to \$1,000.00.

6) Expand partnerships between businesses, workforce boards and technical high schools to develop entry level and continuing training programs in the energy efficiency field. The state technical high schools regional locations and strong energy sector programs could support businesses in all regions of the state. The CTHSS is considering expanding partnerships in New Britain, Bridgeport and Waterbury in order to conduct programs similar to the one conducted by Capital Workforce Partners in Hartford. Use the technical high schools as regional training centers to close the gap in regional energy efficiency training programs similar to the regional manufacturing programs.

7) Evaluate the development of continuing training programs at the community colleges including entry level programs and programs that support employees currently employed. The CC Deans of Continuing Training expressed a concern about developing new programs or reinvigorating other programs based on the lack of hiring. However, there is a demand for some programs such as supervisor training, BPI training, home energy rater training, and facility operations training. The creation of business related advisory boards, such as the advisory board at Norwalk Community College or using the Connecticut Energy Workforce Development Consortium, could provide guidance to the Community College system or other educational providers. The consortium or business advisory board would be responsible for identifying educational gaps, and recommending, reviewing and approving curriculum.

8) Expand funding for entry level programs conducted by the workforce boards. The workforce boards work closely with regional businesses developing training programs in the energy sector such as solar, carpentry, gas technicians and entry level union positions. These programs are critical for under and unemployed individuals that come through the American Job Centers. This expansion should include hands-on learning as part of the program.

Even with these programs, logistical challenges such as getting to the training and work and providing for family support during the training impacts the ability of the graduates to obtain entry level positions.

9) Consider the development of standard curriculum for the energy efficiency businesses. Although some curriculum such as BPI is well established, other curriculum used to train entry level workers and continuing training for workforce development is underdeveloped or inconsistent. Most companies noted that they provide training for the level of the workforce they are hiring. Some companies also noted they had developed their own curriculum for their employees. Consistent curriculum would provide transparency related to employee training and potentially reduce the cost for businesses when hiring previously employed workers and employees for entry level positions. The training could be evaluated for continuing educational units (CEU), which are not currently available when companies do their own training. Thirty CEU's over a 3-year period eliminates the need for BPI recertification.

10) Consider an expansion of online learning for the knowledge portion of some of the classroom learning offered in the state educational institutions. An entry level program for gas workers is currently offered through Charter Oak. Other programs that have statewide need but limited classroom availability should be identified.

11) Communicate the benefits of the "Home Energy Rating System" (HERS) to home owners and potential home buyers. Continued implementation of the HERS will stimulate the energy efficiency industry. Utility companies are encouraging the energy efficiency vendors to provide a broader assessment of homes and businesses. Combining energy efficiency assessments/improvements with recommendations for heating and ventilation system upgrades tied to improving a home energy rating score will benefit both the homeowners and the energy efficiency businesses.

12) Develop a consistent curriculum for "21st Century Skills". Businesses noted that many entry level hires have a gap in their basic skills and in work ethic. Problem solving, following directions, communication, collaboration, basic literacy, basic math, initiative and attendance were some of the gaps noted by the businesses. Although some of these skills are taught during entry level programs, businesses still report gaps in new hires related to the categories noted above.

13) Develop a training plan for the state. Currently there is no consolidated plan that details all the training programs statewide. The plan should be updated as programs are added or put on hold. The plan should also be reviewed in conjunction with changes proposed to energy efficiency programs and energy policies, and should be published and updated annually. The plan should also include descriptions of career pathways similar to the material published by CBIA for use on the "Get into Energy Connecticut" website. Feedback should be collected from a business advisory group at least annually on the quality and quantity of the training programs offered in the state.

Although Connecticut continues to make excellent progress implementing the different strategies in the Comprehensive Energy Strategy plan, continued availability of an educated energy workforce is critical as energy programs evolve. Educating the workforce requires a close partnership between the businesses, the educational providers and government agencies. Changing policies, adding additional requirements on businesses, eliminating educational programs and reducing funding for workforce training initiatives impacts the viability of businesses to implement the energy strategy and limits the opportunity for individuals to obtain education/training necessary to enter the workforce. The lack of any energy workforce metrics and an integrated training plan leaves the stakeholders in the energy workforce guessing when to create, modify or conduct educational programs. This lack of an integrated plan creates additional cost for businesses and impacts the ability of the utility companies and their contractors to meet the annual plan goals and fully implement the Comprehensive Energy Strategy.

Workforce Survey Assessment Summary

Report Background and Objectives

The energy sector, in many cases, is a blend of occupations that work in three categories within the sector. The Connecticut Energy Workforce Consortium, working with the Department of Energy and Environmental Protection and the Connecticut Employment and Training Commission defined the following three energy workforce sectors:

- Installation of energy products
- Generation and distribution of electricity
- Manufacturing of energy products

The definition of each of the sectors are listed below:

Table 3: Energy Industry Sectors and Job Titles

Sectors	Sector Descriptions
Installation of Energy products	Installation of energy efficient products including conservation materials installation, solar, wind, geothermal, energy efficient systems, fuel cells, home and business energy efficient solutions,
Generation and Distribution of electricity	Generation of energy including electricity and steam via gas, oil, hydro, solar, wind and nuclear. Distribution of energy via electrical transmission and distribution systems.
Manufacturing of energy related products	Manufacturing of energy related products include manufacturing of electrical components, manufacturing of alternative energy products, manufacturing of home and business energy efficient systems and components.

The Energy Workforce Consortium and the Connecticut Business and Industry Association conducted a survey of energy related businesses in the three workforce sectors. The survey's intent was to identify current and future hiring needs in each sector, skills required to work within the sectors, salary ranges within the sectors and the difficulty of hiring a skilled workforce in the sectors.

II. Survey Process and Results

Target Company Sectors

The online survey, starting in December 2014 and concluding in February 2015, was completed by 58 organizations representing the three energy sectors. The survey focused on the three energy sectors, energy efficiency and services, energy manufacturing and energy generation and distribution.

Table 4: Survey Response Rate

Descriptions of Companies Responding to Survey	# of Responses
Company provides/installs energy-related products or services	42
Company manufactures energy related products	3
Company generates or distributes energy to residential, commercial or institutional customers	13

Target Jobs in Company Sectors

Companies responding to the survey were in some cases multi-disciplined. As an example, companies that do residential energy efficiency also do commercial energy efficiency. Additional information on the companies in the energy sector is provided with the NAICS details.

Table 5: Survey Data by Energy Sector

Target Energy Sectors	# of Responses	% of Total
Hydro	4	7
Fuel Cells	3	5
Natural Gas	17	28
Geothermal	4	7
Oil	10	17
Propane	6	10
Solar	23	38
Transmission and Distribution	9	15
Wind	3	5
Residential Energy Efficiency	31	52
Commercial Energy Efficiency	21	35
Other renewable energy (Biodiesel, CHP)	3	5

The survey identified target jobs that aligned with the energy sectors. In several cases, such as engineering positions, target jobs overlapped into all three of the sectors.

Table 6: Survey Data – Job Titles

TARGET JOBS	JOB TITLES
Energy Efficient Target Jobs	
Technicians—Installation, Maintenance, and Repair Workers	Technician (Electrical, Plumbing, HVAC, Home Energy Solution,), Maintenance Mechanic, Maintenance Helper, Trades Helper, Apprentices/Pre-Apprentices, Mechanic Helper, General Labor, Roofing Technicians, PV Installer, Weatherization Installer
Engineers	Engineer (Energy, Electrical and Mechanical)
Inspectors	Auditors, Quality Inspector, Quality Technician, Home Performance with Energy Star, Inspector
Supervisors of Construction Trades and Energy Installers	Construction Supervisor, Construction Foreman, Construction Superintendent, Project Manager, Field Supervisor, Project Superintendent, Job Foreman, Field Operations Supervisor, General Foreman
Sales	Sales Manager, Sales Supervisor, Sales Representative
System Installation and Design	Architect, System Designer, Commissioning Agent, Consultant, Site Surveyor
Manufacturing	
Technician	Electromechanical, engineering, fuel cell, quality control, procurement
Engineer	Biochemical, chemical, environmental, facility, fuel cell, mechanical
Generation/Distribution	
Utility Line Worker	Line worker, apprentice, pre-apprentice
Engineer	Corrosion, Electrical, Energy, Environmental
Technician	Field Service Technician
Inspector	Gas and Electric Inspector

Target Job: Current and Future Hiring Predictions

Each of the companies was asked to provide a projection of their current hiring needs, planned hiring by the end of 2015 and projected hiring by the end of 2016. Although projected hiring is dependent on several factors such as the economy, energy and energy efficiency funding, incentives and the consumers’ willingness to spend on energy related products, the projected hiring from the survey indicates consistent hiring in the 3 targeted areas. Of the 58 companies sampled (of approximately 5,600 businesses in the energy sector), job creation will exceed over 484 new positions in the 2015 and 2016 time period. The analysis indicates the bulk of the hiring will occur in the energy efficiency sector, with over 386 new positions.

Table 7: Survey Data – Hiring Predictions

Current Vacancies – Hiring prediction	Current Vacancies	Hiring end of 2015	Hiring in 2016
Energy Efficiency			
Architect/System Designer	0	5	7
Apprentice	13	15	17
Commissioning Agent	0	1	3
Consultant (Remediation, Energy Efficiency)	5	4	3
Energy Auditor	14	20	11
Engineer (Energy, Electrical, Mechanical)	0	1	4
Field Supervisor/Crew Chief/Lead	6	10	12
Helper/Pre-Apprentice	7	12	6
HERS (Home Energy Rating System) Rater	1	1	1
Maintenance/Repair Worker, General Labor	0	1	1
Manager (Construction, Installation, Project)	4	6	8
Site Surveyor	1	1	2
Technical Sales Representative/Marketing/Outreach	11	17	14
Technician	3	2	7
Home Energy Solution Technician	16	14	10
HVAC Technician	1	1	0
Electrical Technician	4	6	5
Plumbing Technician	0	0	0
Roof Technician	0	1	0
Pipefitter/Steam Fitter Technician	0	0	0
Home Performance with Energy Star	2	3	1
Solar PV Installer	11	11	17
Weatherization Installer	11	13	1
Total	110	146	130
Manufacturing Category			

Engineer (Biochemical, Chemical, Environmental, Facility, Fuel Cell, Mechanical)	5	6	4
Procurement Specialist	1	0	0
Electromechanical Technician	0	1	2
Engineering Technician	0	1	2
Fuel Cell Technician	2	0	0
Quality Control Technician	2	0	0
Total	10	8	8
Generation/Distribution Category			
Utility Line Worker	12	6	5
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)	20	11	8
Pre-apprentice/Apprentice	0	1	1
Field Service Technician	0	1	0
Inspector	3	2	2
Total	35	21	16
Total Hiring All Categories	155	175	154

The survey data indicates several job categories where current and proposed hiring is over 66% of all new positions. Entry level apprentice positions (45), energy auditors (45), supervisor/manager positions (46), sales positions (42), home energy solution technicians (40) and solar PV installers (39) are positions that are in demand.

Target Jobs: Confidence in Hiring Data

Employers also expressed a great deal of confidence in their hiring projections with 76% of the employers indicating they were confident or very confident in their hiring projections.

Table 8: Survey Data – Hiring Confidence

Confidence in Hiring Projections next 24 months.	# of Responses	% of Total
Very Confident	5	15
Confident	20	61
Not Very Confident	7	21
Unsure	1	3

Target Jobs: Skill/Training/Education Requirements to Meet Job Qualification

Companies were asked to indicate the skills, abilities, educational requirements and certifications that their organizations require for each position. Although not every company had a consistent requirement for the positions, there was agreement on the requirements for most companies.

Table 9: Survey Data – Job Qualification Knowledge, Skills and Abilities

Skill/Training/Education requirements to meet job Qualifications	Soft Skills	Physical Skills	Job-specific	Technical Skills	HS Diploma/GED	Certification	Associate Degree	Bachelor Degree	Other
Energy Efficiency									
Architect/System Designer	4	0	3	3	2	2	2	2	1
Apprentice	9	9	10	10	7	4	2	2	1
Commissioning Agent	2	0	2	2	0	1	0	0	1
Consultant (Remediation, Energy Efficiency)	1	1	1	1	1	0	1	1	0
Energy Auditor	7	3	4	9	5	8	3	0	0
Engineer (Energy, Electrical, Mechanical)	1	0	1	1	0	1	0	1	0
Field Supervisor/Crew Chief/Lead	5	5	5	5	3	3	1	1	0
Helper/Pre-Apprentice	5	6	3	3	3	2	0	0	1
HERS (Home Energy Rating System) Rater	0	0	1	0	0	1	1	0	0
Maintenance/Repair Worker, General Labor	1	1	1	1	0	1	0	0	1
Manager (Construction, Installation, Project)	5	5	6	6	4	5	3	3	1
Site Surveyor	3	3	2	3	2	1	0	0	1
Technical Sales Representative/Marketing/Outreach	6	3	6	6	4	1	6	4	1
Technician	2	2	2	2	2	2	0	0	0
Home Energy Solution Technician	8	5	7	7	5	6	0	1	0

HVAC Technician	2	2	2	2	2	2	0	0	0
Electrical Technician	1	2	2	2	1	0	0	0	0
Plumbing Technician	1	1	1	1	1	1	0	0	0
Roof Technician	1	1	1	1	1	0	0	0	0
Home Performance with Energy Star	2	1	1	2	2	2	0	0	0
Pipefitter/Steam Fitter Technician	1	1	1	1	1	1	0	0	0
Solar PV Installer	7	7	7	7	6	7	2	1	1
Weatherization Installer	5	5	3	4	3	2	0	0	0
Total	79	63	72	79	53	53	21	16	9
Percent of Responses	18	14	16	17	12	12	5	4	2
Manufacturing Category									
Engineer (Biochemical, Chemical, Environmental, Facility, Fuel Cell, Mechanical)	2	1	2	2	0	0	0	3	1
Manager (Maintenance, Material, Operations, Production)	0	0	0	0	0	0	1	0	1
Procurement Specialist	0	0	0	0	0	0	0	0	0
Electromechanical Technician	0	0	1	1	0	1	0	0	4
Engineering Technician	1	0	1	1	0	0	1	0	0
Fuel Cell Technician	0	0	0	0	1	0	0	0	0
Quality Control Technician	0	0	0	0	1	0	0	0	0
Total	3	1	4	4	2	1	2	3	6
Percent of Responses	12	4	15	15	8	4	8	12	23
Generation/Distribution Category									
Utility Line Worker	1	1	0	0	1	0	0	0	0
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)	2	1	2	2	0	1	0	2	0
Field Supervisor/Crew Chief/Project Manager	1	1	1	1	0	0	1	0	0

Pre-apprentice/Apprentice	1	1	1	1	1	0	0	0	0
Field Service Technician	1	1	1	1	1	0	0	0	0
Total	6	5	5	5	3	1	1	2	0
Total Percent of Responses	21	18	18	18	11	4	4	7	0
Total Percent of Responses All Organizations	17	12	16	17	10	7	6	8	8

The companies also indicated some specific hiring requirements beyond those listed in the survey such as training on computers, tablets, and return-on-investment calculations.

Additional job-specific skills, requirements, certifications or licenses to fill job vacancies
BPI certifications for technicians
Energy auditor training for energy auditors
Need additional NABCEP certified installers and experienced solar technicians
BPI analysis and envelope certifications
Computer training in tablets, Excel, Word, and email
Customer service skills, sales and return-on-investment basics
Additional licensed PV installers
Building controls integration, configuration, energy system design
CEM knowledge of Energy Efficiency
Utility rates, demand response
DOE Home Energy Assessor
EPA Lead RRP Certification

Soft skills and job/technical skills were indicated as the most important training/education areas. This doesn't take away from the importance of having a HS diploma, additional secondary and post-secondary education and additional certifications. As indicated by the comments, technical skills and specific certifications were critical educational programs for the businesses responding to the survey.

Target Jobs: Recruiting of Applicants

Based on the identified skills, abilities, education and certifications, the companies were asked to indicate where they focused their recruiting for open positions. Again not every company has the same hiring requirements so not every company would recruit from the same workforce or educational demographic. Survey data related to recruiting of applicants indicated 72% of the total responses find employees through referrals by other employees. The next highest recruiting sources were the 2 and 4 year colleges (38%), company web sites (38%) and the internet in general (31%). These numbers will vary depending on the company and the positions being filled. Entry level positions are more likely to be filled by employee referral and internet sites.

Table 10: Survey Data – Recruiting Methods

Recruiting of Applicants	# of Responses	% of Total
CT.Job.com	9	28
Job Funnel Initiative	4	13
Employee Referral	23	72
Internet – General	11	34
Monster.com	3	9
CareerBuilder.com	5	16
Craigslist.com	10	31
Indeed.com	9	28
Company Website	12	38
Career Fairs	7	22
Technical High Schools	10	31
2 Year Community Colleges	12	38
4 Year Colleges/Universities	12	38
Temp Agencies	7	22
Other	9	28

Additional recruiting focus areas.

Company website, colleges and specific niche websites specific to the industry. It depends on the position
Employee Referral
Fairly successful with Career Builder
Workplace and Craigslist
Referrals
UConn
Technical Schools
Job funnel is our biggest supplier of people
Employees and Technical Schools
Have not found one yet
Entry level NABCEP training

Job Funnel
LinkedIn
Local and National Associations

Target Jobs: Wages and Experience

Companies were asked to provide expected experience levels for hiring, pay for the positions and if the pay was hourly or annual. The data was different for some of the companies with several indicating they only wanted to hire experienced individuals and the pay did vary with experience. Other than the apprentice positions, every position required at least one year of on-the-job experience.

Table 11: Survey Data – Wages and Experience

TARGET JOBS	Salary	Pay Period
Installation Job Types/Years of Experience		
Architect/System Designers (2)	35 – 50 K	Annual
Apprentice (0 to 4)	10 – 20	Hourly
	25 – 35 K	Annual
Consultant (3)	60 K	Annual
Energy Auditor (2 to 5)	40 to 54 K	Annual
	18 to 25	Hourly
Field Supervisors (1 to 10)	30 to 55 K	Annual
	28 to 25	Hourly
HERS Raters (2)	20	Hourly
	50K	Annual
Managers (3 to 10)	35 to 75 K	Annual
Site Surveyor (1)	30 to 40 K	Annual
Technical sales (2 to 5) (* Commissions)	40 to 100 K*	Annual
	25	Hourly
Home Energy Solution Technician (1 to 3)	45 to 50 K	Annual
	18 to 23	Hourly
HVAC Technician (4 to 10)	30	Hourly
Technician (1 to 10)	30 to 40 K	Annual

Building Automation Technician	70 to 90 K	Annual
	22 to 25	Hourly
Electrical Technician (2 to 5)	60 K	Annual
	20 to 30	Hourly
Roofing Technician (2)	25	Hourly
Home Performance/Energy STAR Technician (1)	18 to 23	Hourly
Solar PV Installer (1 to 5)	35 to 50 K	Annual
	20 to 30	Hourly
Weatherization Installer (1)	24 K	Annual
	15 to 18	Hourly
Manufacturing Jobs		
Engineer (1 to 10)	60 to 100 K	Annual
Engineering Technician (1 to 10)	20 to 30	Hourly
Fuel Cell Technician (3)	No data	
Quality Control Technician (3)	No data	
Generation/Distribution Jobs		
Utility Line Worker (4 to 5)	36	Hourly
Engineer (0 to 5)	62 to 115 K	Annual
Field Supervisor (3)	76 to 115 K	Annual
Pre-Apprentice/Apprentice (1)	40 to 45 K	Annual
Field Service Technician (2)	53 to 80 K	Annual

Target Jobs: Difficulty in Filling Positions

Interviews with specific companies provided an insight to some of the challenges with finding qualified employees to fill the current and expected job openings through 2016. This data aligned with posting data provided by Capital Workforce Partners and Stable Hiring data provided by the Department of Labor, which indicates an increase in the need to fill positions that provide services to buildings and contractors working in the installation and construction industry.

Table 12: Survey Data – Difficulty in Filling Positions

On a scale of 1 (very easy) to 5 (very difficult) of challenging is it to fill these positions	Very Easy	Easy	Neutral	Difficult	Very Difficult
Energy Efficiency					
Architect/System Designer	1	1	2	0	1

Apprentice	2	3	2	1	1
Commissioning Agent	0	1	0	2	1
Consultant (Remediation, Energy Efficiency)	0	1	0	0	2
Energy Auditor	0	0	2	3	4
Engineer (Energy, Electrical, Mechanical)	0	0	1	1	2
Field Supervisor/Crew Chief/Lead	0	0	2	1	2
Helper/Pre-Apprentice	1	1	0	0	1
HERS (Home Energy Rating System) Rater	0	0	1	1	2
Maintenance/Repair Worker, General Labor	0	0	0	0	1
Manager (Construction, Installation, Project)	0	0	0	1	3
Quality Control Inspector	0	0	0	0	1
Site Surveyor	0	0	2	0	1
Technical Sales Representative/Marketing/Outreach	2	0	0	4	2
Technician	0	0	2	1	2
Home Energy Solution Technician	0	1	0	1	4
Building Automation	0	0	0	2	1
HVAC Technician	0	0	0	0	2
Electrical Technician	0	1	0	0	2
Plumbing Technician	0	0	0	0	1
Roof Technician	0	1	0	0	1
Pipefitter/Steam Fitter Technician	0	0	0	0	1
Home Performance with Energy Star	0	0	0	0	1
Solar PV Installer	0	1	0	1	4
Weatherization Installer	0	2	1	1	1
Manufacturing Category					

Engineer (Biochemical, Chemical, Environmental, Facility, Fuel Cell, Mechanical)	0	0	1	0	2
Manager (Maintenance, Material, Operations, Production)	0	0	0	1	0
Engineering Technician	0	0	1	0	0
Fuel Cell Technician	0	1	0	0	0
Quality Control Technician	0	1	0	0	0
Generation/Distribution Category					
Utility Line Worker	0	0	1	0	1
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)	0	0	0	1	3
Field Supervisor/Crew Chief/Project Manager	0	0	0	2	0
Pre-apprentice/Apprentice	0	1	0	0	0
Field Service Technician	0	1	0	0	0

Data for the most difficult jobs to fill aligned with the data from the current and future hiring data table. The data indicates that filling the current positions for energy auditors, supervisor/managers, sales representatives, home energy solution technicians and solar PV installers is difficult. Filling these positions will be increasingly difficult as hiring accelerates in the remainder of 2015 and into 2016.

Target Jobs: Strategies for Improving Employee Skills

The data indicates that employers are investing in on-the-job training in order to ensure they have a qualified workforce and are developing their employees. Many employers noted that they do their own training. One employer noted in their interview that the cost to the business for training was approximately \$7,000/employee. Some employers were utilizing programs developed in conjunction with the utility companies, private educational providers, workforce boards and the technical high schools.

Table 13: Survey Data – Training Methods for Improving Employee Knowledge, Skills and Abilities

Strategies for improving employee skills	# of Responses	% of Total
On-the-job training	30	97
In-house certification	10	32
Vendor-provided certification training	22	71
Classroom education during work hours	16	52

Classroom education outside of work hours	12	39
Online education during work hours	11	35
Online education outside of work hours	12	39

III. Interviews and Focus Groups Data Analysis

Interviews were conducted with several companies, educational providers and workforce boards to gain additional insight into the survey results.

Table 14: Interviewee List

Company/Educational Institution	Number of interviews
Energy Efficiency Companies	8 (one focus group of 6 companies)
Solar Companies	3
Workforce Boards	2
Technical High Schools	2 (additional visit to e-house at Prince Tech, and visits to Goodwin Tech and Platt)
Community College	2 (Norwalk and BOR Office)
Eastern CT State University	1
Siemens	1
CEFIA/CT Green Bank	1
BOR CC Council of Continuing Education Dean	12
Academic Provost	1
Utility Company	3
Energy Workforce Employees	Several conversations with energy workforce individuals
Private educational providers	1

The interview questions were formatted to align with the interviewee’s involvement in the energy workforce system and to gather additional data related to hiring and educational programs that support the sector. In general all the businesses noted that they were in the hiring mode ranging from one or two open positions up to twenty at one energy efficiency company.

Company hiring could be viewed in different categories from entry level individuals in businesses such as solar installation and energy efficiency to degreed individuals in businesses such as large companies doing extensive modifications of commercial and industrial customers. The majority of the hiring was at the entry level positions. Companies also indicated that most individuals being hired needed on-the-job training and prior work experience to successfully perform the work.

Educational providers, such as the Workforce Boards, indicated that programs are being run to support entry level positions but it is difficult to find entry level candidates who could pass entry level math test, background checks, fitness-for-duty screening and have transportation to travel to potential jobs. The technical high schools indicated that their students are moving into the trades but lack the extensive hands-on experience due to limited work-based learning, internships or pre-apprentice opportunities. The community colleges noted that several of the educational programs developed as part of the Sustainable Operations: Alternative and Renewable Energy (SOAR) grant or the Energy Sector Partnership grant have been put on hold due to limited enrollment, limited hiring or lack of funding. The BOR of Continuing Education Deans indicated they are concerned about restarting or developing programs without strong business support and open positions for the graduating students.

Another topic that came up during the interviews was funding: the Workforce Boards had limited funding for training for entry level positions; community colleges had limited funding for restarting programs or developing new curriculum; and businesses particularly in the energy efficiency and solar industry were concerned about the incentives available and the limited amount of funds available for attending established and newly created programs. This concern is creating a hesitancy in hiring new employees and reducing the amount and availability of training.

Interviews with utility representatives indicated gaps in entry-level employee work related 21st century skills and knowledge. The representatives also noted gaps in home energy raters, customer service training, energy sales and building/facility manager certifications.

Although over forty individuals/companies were interviewed, this is just a small sampling of the number of companies involved in the energy industry. In many cases programs are being considered, developed and conducted on a continuing basis, which could impact some of the interview responses. Forming an industry advisory group to provide continuous feedback would keep the interview information current.

IV. North American Industry Code System Data

The North American Industry Classification System was developed as the standard for use by Federal statistical agencies in classifying business establishments for the collection, analysis, and publication of statistical data related to the business economy. The energy industry sector in Connecticut is not well defined, thus limiting the economic and workforce data that can be collected. The Connecticut Energy Workforce Consortium viewed the industry in three areas: energy efficiency/renewables, energy companies that generate, transmit and distribute energy and companies that manufacture energy related products. The NAICS codes for the Connecticut energy sector were developed as part of this project and were used to define Connecticut’s energy sector. Seventy-nine energy related NAICS codes were originally identified. Sixty-four NAICS codes were used to analyze the energy sector. The difference between the original 79 codes and the 64 used to analyze the energy sector is related to industries that do not exist in Connecticut’s energy sector.

Table 15: Energy Sector NAICS Codes – Major Energy Sectors

Code	Description
221111	Hydroelectric Power Generation
221112	Fossil Fuel Electric Power Generation
221113	Nuclear Electric Power Generation
221114	Solar Electric Power Generation
221115	Wind Electric Power Generation
221116	Geothermal Electric Power Generation
221117	Biomass Electric Power Generation
221118	Other Electric Power Generation
221330	Steam and Air-Conditioning Supply
236220	Commercial and Institutional Building Construction
237110	Water and Sewer Line and Related Structures Construction

Table 16: North American Industry Code System for Energy Sector

Renewable Energy Industry Areas (NAICS codes in parenthesis)					
Solar	Wind	Fuel Cells	Biomass	Water	Geothermal
<ul style="list-style-type: none"> -Solar PV -Solar Hot Water -Concentrating -Solar Power 	<ul style="list-style-type: none"> -On Shore -Off Shore 	<ul style="list-style-type: none"> -PEM -Solid Oxide (SOFC) -PAFC -MCFC 	<ul style="list-style-type: none"> -Direct Combustion -Gasification -Co-Firing -Anaerobic Digester Gas (ADG) -LFG -Waste-to-Energy 	<ul style="list-style-type: none"> -Hydro (< 5 MW) -Tidal -Wave 	<ul style="list-style-type: none"> -Heat Pumps -Deep Wells -Horizontal -Direct Exchange
Other Electric Power Generation (221119)	Other Electric Power Generation (221119)	Other Electric Power Generation (221119)	Other Electric Power Generation (221119)	Other Electric Power Generation (221119)	Plumbing, Heating, AC Contractors (238220)
Plumbing, Heating, AC Contractors (238220)	Plumbing, Heating, AC Contractors (238220)	Surface-Coated Paperboard Manufacturing (322226)	Other Waste Collection (562119)	Motors and Generators (335312)	Power Boiler and Heat Exchanger Manufacturing (332410)
Semiconductor and Related Device Manufacturing (334413)	Motors and Generators (335312)	Printed circuits and electronic assemblies (334418)	Logging (113310)	Power Transmission Equipment (333613)	Heat pumps manuf. + Heating & air conditioning combo units manuf. (333415)
All Other Miscellaneous Electrical Equipment and Component Manufacturing (335999)	Speed Changer, Industrial (333612)	All Other Miscellaneous Electrical Equipment and Component Manufacturing (335999)	Combustors, nonhazardous solid waste (562213)	All Other Miscellaneous Electrical Equipment and Component Manufacturing (335999)	Heat pumps merchant wholesalers + Heating equipment, warm air (i.e., forced air) merchant wholesalers (423730)
Computer and Computer Peripheral Equipment and Software Merchant Wholesalers (423430)	Power Transmission Equipment (333613)	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers (423430)	Digesters, industrial-type, heavy gauge metal, manufacturing (332420)	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers (423430)	Drilling water wells (except water intake wells in oil and gas fields) (237110)
Batteries (except automotive) merchant wholesalers (423610)	All Other Miscellaneous Electrical Equipment and Component Manufacturing	Hydrogen manufacturing (325120)		Alkaline cell storage batteries (i.e., nickel-cadmium, nickel-iron, silver oxide-zinc)	

	(335999)			manufacturing (335911)	
Alkaline cell storage batteries (i.e., nickel-cadmium, nickel-iron, silver oxide-zinc) manufacturing (335911)	Turbine& Turbine Generator Set Units Manuf. (333611)			Alkaline cell primary batteries manufacturing (335912)	
Alkaline cell primary batteries manufacturing (335912)	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers (423430)			Batteries (except automotive) merchant wholesalers (423610)	
	Batteries (except automotive) merchant wholesalers (423610)				
	Alkaline cell storage batteries (i.e., nickel-cadmium, nickel-iron, silver oxide-zinc) manufacturing (335911)				
	Alkaline cell primary batteries manufacturing (335912)				

Hybrid Systems				
CHP	Smart Grid	Energy Storage	Demand Response	Organic Cycle (WHR)
-Small distributed -Large central	-AMI -Home Area Networks (HAN) -Data management -Communication and controls (sensors and actuators)	-Advanced batteries -Compressed Air Energy Storage (CAES) -Vehicle to grid (e.g. PHEVs)	-Control and monitoring devices	-Waste heat recovery generators
Other Electric Power Generation (221119)	Cabin environment indicators, transmitters, and sensors manufacturing (334511)	Alkaline cell storage batteries (i.e., nickel-cadmium, nickel-iron, silver oxide-zinc) manufacturing (335911)	Temperature controls, automatic, residential and commercial-types, manufacturing + Building services monitoring controls, automatic, manufacturing (334512)	
		Alkaline cell primary batteries manufacturing (335912)	Relay and Industrial Control Mnf. (335314)	
		Batteries (except automotive) merchant wholesalers (423610)		

Energy Efficiency				
Building Envelope	Heating	Cooling	Lighting	Appliances and Other
-Duct sealing and insulation -Building and window insulation	-Condensing gas furnaces, boilers, and water heaters -Tankless and heat pump water heaters -Programmable thermostats	-Energy star ceiling fans -Energy Star AC units	-Lighting motion sensors -Specialty fluorescent bulbs and fixtures -CFLs -LEDs -Day lighting design	-Faucet aerators -Low flow showerheads -Energy Star qualified ovens, TVs, refrigerators, washers and dryers, and other appliances. -Efficient commercial dishwashers
Roofing Contractors (238160)	Power Boiler and Heat Exchanger Manufacturing (332410)	Attic fans manufacturing (333412)	Electric Lamp Bulb/Parts Mnf (335110)	Household Cooking Appliance Manufacturing (335221)
Drywall and Insulation contractors (238310)	Air Purification Equipment Manufacturing (333411)	Bath fans with integral lighting fixture, residential, manufacturing (335211)	Batteries (except automotive) merchant wholesalers (423610)	Appliance stores, household-type (443111)
Urethane and Other Foam Product (except Polystyrene) Manufacturing (326150)	Heating boilers, steam and hot water, merchant wholesalers (423720)	Temperature controls, automatic, residential and commercial-types, manufacturing + Building services monitoring controls, automatic, manufacturing (334512)	Temperature controls, automatic, residential and commercial-types, manufacturing + Building services monitoring controls, automatic, manufacturing (334512)	Appliance stores, household-type, used (453310)
Glass Products Made From Purchased Glass (327215)	Heating equipment, hot water, (except hot water heaters) manuf. (333414)	Fans, household-type, merchant wholesalers (423620)		Faucets, plumbing, manufacturing (332913)
Insulation materials (except wood) merchant wholesalers (423330)	Ovens, commercial-type, manufacturing (333319)	Ceiling fan stores (444190)		Dishwashers, household-type, manufacturing (335228)
Wood window &	Ovens, commercial-			Household Refrigerator

Door manufacturing (321911)	type, merchant wholesalers (423440)			and Home Freezer Manufacturing (335222)
Mineral Wool Manufacturing (327993)	Cabin environment indicators, transmitters, and sensors manufacturing (334511)			Household Laundry Equipment Manufacturing (335224)

The analysis of these energy industries was done by Capital Workforce Partners (CWP) using EMSI labor market data for total employment in the companies with the selected NAICS code (p. 103). The data analysis indicates that there are approximately 68,000 jobs in Connecticut companies associated with these energy related NAICS codes working at approximately 5,600 businesses. It is difficult to ascertain exactly how many of these jobs are actually energy positions. As an example, companies noted as roofing contractors could be replacing roofs or doing energy related roof work such as installing solar panels or insulating roofs. The table below shows the titles of the occupations with the greatest number of employees from the businesses identified by the NAICS codes.

Table 17: Occupations Employed by these Industries

Description	Employed in Industry Group (2014)	% of Total Jobs in Industry Group (2014)
General and Operations Managers	2,229	3.2%
Carpenters	2,675	3.8%
Construction Laborers	2,335	3.3%
Plumbers, Pipefitters, and Steamfitters	3,097	4.4%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2,798	4.0%

Using the NAICS codes to identify the Connecticut energy industries CWP used the EMSI software to identify electronic postings related to the energy businesses. The scan of the posted jobs resulted in 144 postings related to businesses in the energy industry. Again this data has limitations. As noted by the survey responders and one-on-one interviews, many companies find their employees by word of mouth. This is particularly true in entry level

positions in the energy efficiency, the solar businesses and union positions. The posting data does not include open union positions such as carpenters, who could be working in the energy field such as replacing windows or in the non-energy field building new homes, or jobs not normally posted to a web site.

The EMSI software produced a list of twenty-nine energy related positions that show potential growth with positive trends over the 2001 to 2018 timeframe with net positive increases predicted from 2013 to 2018. Several of these categories were identified as part of the survey and in one-on-one interviews as businesses that are growing and are having some difficulty in hiring for open positions. Categories that indicate hiring include building inspection services, plumbing, heating, and air-conditioning contractors, drywall and insulation contractors, and related engineering consulting services.

Table 18: Energy Industry Growth Trends

Industry Code	Description	2015 Jobs	2016 Jobs	2017 Jobs	2018 Jobs	2001-18 Trendlines	2013-2018 Change	2013-2018 % Change	2014Q1 Postings
541350	Building Inspection Services	428	448	467	484		113	30%	0
562910	Remediation Services	1,915	1,966	2,016	2,064		429	26%	1
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	469	484	498	512		100	24%	4
541690	Other Scientific and Technical Consulting Services	1,799	1,872	1,937	1,995		376	23%	170
562213	Solid Waste Combustors and Incinerators	410	422	434	445		83	23%	1
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	558	594	626	657		120	22%	5
541614	Process, Physical Distribution, and Logistics Consulting Services	736	758	778	795		126	19%	2
221330	Steam and Air-Conditioning Supply	16	17	17	18		3	17%	0
423930	Recyclable Material Merchant Wholesalers	1,168	1,194	1,218	1,241		178	17%	4
238310	Drywall and Insulation Contractors	3,313	3,341	3,386	3,443		431	14%	32
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers	515	525	536	546		66	14%	30
238220	Plumbing, Heating, and Air-Conditioning Contractors	11,848	11,915	12,009	12,122		1,440	13%	297
237130	Power and Communication Line and Related Structures Construction	1,313	1,380	1,435	1,483		175	13%	3
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	1,516	1,537	1,559	1,583		165	12%	62
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers	611	612	615	619		47	8%	28
237120	Oil and Gas Pipeline and Related Structures Construction	348	360	370	379		28	8%	2
454310	Fuel Dealers	4,796	4,748	4,714	4,691		293	7%	0
326140	Polystyrene Foam Product Manufacturing	181	181	181	182		10	6%	0
541330	Engineering Services	8,832	8,914	8,991	9,066		465	5%	563
561790	Other Services to Buildings and Dwellings	1,567	1,589	1,609	1,627		83	5%	3
424710	Petroleum Bulk Stations and Terminals	155	157	159	162		8	5%	2
624229	Other Community Housing Services	337	336	336	337		16	5%	0
236220	Commercial and Institutional Building Construction	5,381	5,477	5,579	5,686		216	4%	70
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	117	119	120	122		3	2%	89
238160	Roofing Contractors	2,013	1,993	1,977	1,966		44	2%	18
314999	All Other Miscellaneous Textile Product Mills	226	224	223	223		5	2%	13
238390	Other Building Finishing Contractors	1,040	1,025	1,013	1,004		16	2%	8
238290	Other Building Equipment Contractors	1,209	1,185	1,166	1,151		18	2%	36
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	2,124	2,152	2,179	2,206		31	1%	46

Industries showing limited growth or missing from the data are job categories that are growing in Connecticut such as solar and positions filled by employee referral. This gap in the data is related to the lack of job postings within the industry. The Department of Labor provided input on the energy job sector average annual employment. Since 2010 the energy sector has added over 4,000 jobs or approximately 7.6% of all the jobs added in all sectors in Connecticut.

Table 19: Average Annual Energy Sector Employment 2006 to 2014

Average Annual Employment										
SECTOR	2006	2007	2008	2009	2010	2011	2012	2013	2014	Change 2010 to 2014
Total - All Sectors	1,670,067	1,686,954	1,688,974	1,615,395	1,595,775	1,612,264	1,627,754	1,640,240	1,653,517	57,742
ENERGY										
Utilities	1,661	1,639	1,717	1,677	1,841	1,763	1,563	1,526	1,552	-289
Construction	24,167	25,680	25,319	21,798	20,014	20,583	20,592	21,611	22,914	2,900
Manufacturing	16,402	16,008	16,240	14,957	14,413	14,733	14,803	14,482	14,261	-151
Wholesale Trade	7,842	7,818	7,508	6,728	6,389	6,359	6,300	6,374	6,435	47
Retail Trade	4,884	4,675	4,519	4,516	4,413	4,410	4,294	4,287	4,354	-58
Prof., Scientific & Tech. Services	8,658	8,766	8,837	8,421	8,508	8,616	8,936	9,562	10,048	1,541
Administrative & Support Svces.	2,863	2,975	3,007	2,756	2,762	2,847	2,907	3,058	3,184	423
Health Care & Social Assistance	332	330	342	347	360	326	312	305	369	9
Total ENERGY	66,811	67,892	67,489	61,199	58,699	59,637	59,706	61,205	63,118	4,420
Source: Connecticut Department of Labor Quarterly Census of Employment and Wages (QCEW) (pjf) May 8, 2015										

V. Connecticut Educational System Data

The Connecticut educational system is broad and provides specific energy workforce education starting at the high school level through the university system and includes education/training provided by state workforce boards, private providers, utility companies and labor unions.

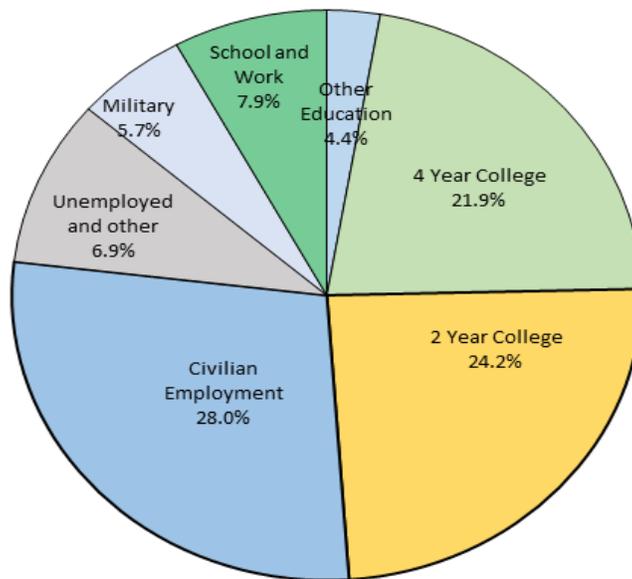
At the university level there appears to be sufficient programs in all aspects of energy related work including electrical engineering, environmental/sustainability programs, civil engineering and architectural engineering. Different programs exist at the regional and at private universities. There was some information provided by graduates of the university system that additional hands-on experience would have facilitated the transition from the educational system to the workforce. This information aligned with data provided by companies in the survey.

The community college programs vary based on regions and businesses' involvement in program development. There are both credit bearing classes, certificates and professional development courses in energy efficiency, sustainability, electrical technology, renewable energy and building technology in multiple community colleges. Although these courses are in line with industry's needs, the courses are not widespread across the community college system. Over the past several years the community college system has developed programs in response to businesses or based on receiving grants. Several of these programs are no longer running due to limited enrollment, lack of hiring or reduced funding. Only two of the seven programs developed as part of the Sustainable Operations: Alternative and Renewable Energy (SOAR) grant remain active. This is the same case for programs developed as part of the Energy Sector Partnership grant. Although many of the programs developed as part of the energy sector grant were implemented by the local workforce boards with their educational partners. The Connecticut Technical High Schools have robust programs aligned with the needs of the energy industry. Programs include:

Sustainable Architecture
 Carpentry
 Electrical
 Heating Ventilation and Air Conditioning (HVAC)
 Masonry
 Plumbing and Heating
 Plumbing, Heating and Cooling
 Pre-Electrical Engineering and Applied Electronics Technology
 Electronic Technology

The high schools have also developed E-houses which incorporate solar PV, solar thermal, weatherization and an energy efficiency lab. The E-houses are funded through the Connecticut Clean Energy Fund (CCEF) and the Connecticut Energy Efficiency Fund (CEEF). The programs also include training and professional development for the technical high school instructors. In addition to the students gaining an understanding of the needs of industry many of the students are enrolled in the state apprentice programs earning hours and credit towards state license requirements. Most employers want employees with some level of work experience. The level of experience differs by positions but the survey and interviews indicated that some level of real-world field experience was desirable. The representative from the technical high schools indicated that work based learning programs, internships or pre-apprenticeship opportunities were critical for successful employment after high school. Twenty-four percent of the Technical High School students continue onto Community College certificate or associate degree programs, although it was noted during the interviews that the Community College system has reduced technical certificate and technical degree programs in favor of academic degrees that articulate with the state university system.

Table 20: CTTHS Graduate Tracking



The workforce boards provide training for several entry level positions for individuals who meet the screening criteria. All five of the workforce boards (including New Haven Works program) provide entry level training for

the energy construction industry. As an example, the Northwest Regional American Works Center recently completed a 3-week program for the solar industry. The program included instruction in solar panel installation, safety rules and basic electricity. Capital Workforce Partners recently completed a 5-week program for entry level employment in the gas industry. The boards have also completed weatherization training, pre-apprentice programs for carpenters and welding training. These programs align with industries needs and typically are conducted in conjunction with union hiring or direct contact with energy businesses. In most cases successful completion of the training provide immediate employment opportunities for the graduates. The boards indicated that there is limited funding for these programs and that applicants and graduates faced challenges that in many cases were beyond the capabilities of the boards. Challenges such as transportation, prior criminal convictions, substance dependency and limited math and English skills impacted graduate placement. These programs are limited to individuals who meet certain entry level requirements such as income guidelines or under/unemployed and are not typically available to the general public.

Private training programs continue to support all aspects of the energy industry. Private educational providers such as Industrial Management Training Institute (IMTI) work with the workforce boards to provide training and also conduct training for the general population. The private training industry supports apprentice program continuing education and specific industry training requirements through training provided by industry associations. Other private educational providers have ongoing programs that support individuals who many want to enter a specific energy field. These providers are not funded by state or association contributions and it is the individual’s responsibility to provide their own tuition. In general since most private educational providers work closely with organizations such as the state workforce boards or industry associations such as the Home Performance Institute, the Independent Connecticut Petroleum Institute and the Electrical Contracts of New England the programs directly align with business needs and support continuing education for apprentice programs, certifications and continuing training CEUs. Organizations such as Capital Region Education Council and EastConn can provide training to support entry level workers overcoming barriers to employment.

In addition to the private educational providers, the state labor unions provide entry level and ongoing training directly tied to hiring in the energy field. The Labor’s training center in Pomfret provide all aspects of laborer training and is providing a significant amount of training related to the gas expansion. The Northeast Joint Apprenticeship recently issued an open application for individuals interested in becoming overhead line workers. The local unions support all aspects of the energy industry and have well established and thorough educational and on-the-job training programs.

Table 21: Apprentice Trades

Trade	Total Current Registration	New Registrations since 6/23/2014	Completions since 6/23/2014
Electricians			
E-2 Electricians	1666	665	123
L-6 Low Voltage Electricians	67	26	12
C-6 Low Voltage Electricians (work schedule A)	56	32	12
PV-2 Photovoltaic Electricians	7	7	1
Total Electricians	1796	738	152
Carpenters	418	209	27
Piping Trades			
S-2 Heating and Cooling Mechanic	524	270	57
S-10 Limited Heating and Cooling Mechanic	57	28	7
S-4 Heating Mechanic	35	9	4
S-6 Limited Heating Mechanic	2	2	0
S-8 Limited Heating Mechanic	15	6	1

B-2 Oil Burner Servicer/Installer (residential/light commercial)	84	69	22
B-4 Oil Burner Servicer/installer (unlimited)	3	2	0
D-2 Warm Air Heating/Cooling Mechanic	308	176	50
Total Piping Trades	1028	562	141

There are no solar mechanics registered now or in the past year. Energy efficiency technician, although listed on the DOL Apprentice website, is not an approved apprentice trade at this time. The number of completions is lower than it should be since in the licensed trades an apprentice is not complete until they pass an occupational license exam. This is not always reported to DOL in a timely fashion and apprentices drop off the list without showing as completed. Based on employment demands in the heating and ventilation and carpenter trades it is difficult to determine if a sufficient number of individuals are entering the apprentice programs to keep up with the expected increase in energy related programs. The survey results and data from employers indicates there already is a gap in these trades which will only worsen as employment demand increases.

The final category of educational programs are on demand programs initiated at the request of companies or regulatory requirements of businesses in the energy field. These programs are typically not run on a continuous basis and in some cases are an event based class or if a business identifies a gap in the knowledge of their new hires or incumbent workforce. Programs such as “Small Energy Opportunity” program training or programs for municipal officials are available through independent contractors or organizations such as the Clean Energy Finance and Investment Authority or the Institute for Sustainable Energy at Eastern CT State University. The utility companies also sponsor training programs on an as needed basis. Programs include GPRO Building programs for municipal officials and programs such as Certified Energy Manager programs provide CEUs and are associated with organizations such as the Association of Energy Managers. The listing of the energy related education and training programs in Connecticut begins on page 79.

Although there appears to be sufficient training and educational programs in the state to support all the business in the energy sector, there are gaps in the programs. Many of the programs are regionally located which restrict individuals from attending programs. Community colleges have regional based programs such as Goodwin’s solar program. The workforce boards programs tied to industry demand are also regionally based. The workforce board regional programs are based on the constituents the boards serve, are restricted by the ability of the trainees to travel to the educational programs and have restrictive entry requirements. Utility managers noted gaps in training for Home Energy Auditors, customer service training, Building Operation Certification and facility manager training. These programs could be addressed by the Community College system. The regional locations of these training programs is causing gaps in the availability of training for local businesses and their workers. Expanding programs to different regions of the state, similar to the manufacturing programs which are located in four strategic locations in the state, would significantly close the gaps in the educational program availability.

VI. Key Stakeholder Meetings

Several key stakeholder meeting were conducted as part of this project. Meetings were held with the Community College Deans of Continuing Education, the Academic Provost for the college system, Department of Labor, Eversource Energy and United Illuminating. In each case a summary of the project scope was discussed including key messages for each of the stakeholders.

The Community College Deans of Continuing Education noted that programs in the energy sector have been established in the past but due to the lack of enrollment the programs in many cases have been discontinued. The Deans were concerned about establishing new programs or revitalizing discontinued programs. Past problems such as a weak industry presence and the lack of guaranteed employment resulted in discontinued programs and

disappointed students. There was some discussion related to the Community Colleges establishing education programs that would serve as “continuing education” for currently employed individuals. The survey indicated a gap in the educational system for supervisor training. These individuals are currently employed and the businesses are interested in creating additional supervisory positions as their businesses continue to grow. This type of training could be generic in nature and be offered at any of the Community Colleges. It was also noted that established business advisory boards, such as Norwalk Community College Sustainable Building and Design program, lead to training programs aligned with business needs in areas where hiring is occurring. The Community Colleges could also provide ongoing certification training such as BPI and training related to changes in the industry.

The meeting with Ms. Estela Lopez, the Academic Provost, resulted in a similar conversation to the Community College Deans. Ms. Estela Lopez expressed similar concerns about the creation of new programs without strong industry involvement and future hiring potential. Ms. Estela Lopez noted that stackable credentials were an important part of creating any new programs. Ms. Estela Lopez noted that programs that have credit bearing credentials, aligned with associate degree programs, were highly desirable. Both the Community College Deans and Ms. Estela Lopez noted the financial challenges the community college system is facing and the impact that may have when responding to industry needs.

The DOL meeting focused on defining the energy industry. Using the NAICS codes developed during the project, the DOL developed data related to the energy workforce. Overall, the report said there were 70,538 jobs in the energy sector. DOL calculated 63,118 based on the Quarterly Census of Employment and Wages (QCEW). However, the QCEW does not include the Self-Employed but only employment that is covered by the Unemployment Insurance system. The DOL also noted that the construction industries identified included companies that do work that is not directly related to energy. This will be true of other sectors as well. The DOL employment data is in the Appendix beginning on page 114.

Telephone interviews were conducted with representatives of Eversource and UI to discuss the findings from the survey and interviews. Both companies noted that some of their vendors were having a difficult time finding qualified workers to perform both commercial/industrial and residential energy efficiency programs. Both companies felt that the technical high schools and community colleges could add content to their current programs or develop new programs that provide individuals with additional certifications such as BPI and other training such as health and safety training, lead awareness, customer service training, sales training and other related topics. Both company representatives agreed that the present allocation system for energy efficiency dollars could be causing some of the workforce issues with vendors when employees move to different companies as allocations run out. The representatives noted that they work closely with their vendors providing them training and administrative help to get training such as the DOE training on the home energy rating system. There was an acknowledgement that the companies could establish a process to get additional feedback from the vendors on other training needs. The companies agreed that 21st Century skills training may be needed to prepare the entry level individuals for working in the field. Consistent training, beyond certifications such as BPI, which is available to all the businesses would ensure a better trained and prepared workforce.

VII. Conclusion

The analysis of the energy workforce is a complicated subject. The “traditional” energy workforce was the utility companies. As energy efficiency and renewable energy projects have expanded new businesses have been created, companies interested in doing businesses in Connecticut have entered the market and other sectors of the workforce have entered into the energy workforce. The NAICS code analysis indicates a robust energy sector with over 5,600 businesses employing approximately 68,000 employees. The trends in job postings and stable employment indicators show growth in several areas. Without proactive and reactive indicators of what is

happening in the energy sector, businesses and educational providers have limited information for workforce training and educational program development.

Although there are a number of educational programs and providers to support the development of the entry level energy workforce, degreed individuals, and the continuing education of the current employees, many programs are regional in nature. Based on these regionally located programs, the availability of these programs to all business and individuals interested in a career in the energy field is limited. The Technical High Schools have an opportunity to continue to provide entry level employees who have both the classroom and hands-on experience to support the energy industry. These programs are critical to supplying the future energy workforce. Excellent programs are being run at the workforce boards for entry level positions when there is the need for a “cohort” of students and there are potential jobs. Businesses needing only one or two new hires and are not in a region where programs are being conducted have difficulty finding entry level or qualified workers. There are a number of community college programs that have been eliminated or put on hold over the recent years. Lack of funding, lack of employer involvement and the lack of hiring in certain positions have forced community colleges and other providers to stop the programs. In some cases, businesses have filled this void by creating their own training programs which could lead to inconsistent training and additional cost for businesses. The utility companies also offer programs that provide certifications and CEUs based on an as needed basis. These programs are sometimes offered in conjunction with educational organizations such as the Institute for Sustainable Energy.

It is obvious from the survey data and interviews that some businesses are struggling to fill some energy workforce positions as the energy industry continues to change and grow. Even if individuals have received training, the lack of work experience limits the number of qualified applicants. Some businesses noted they need to start with approximately 10 applicants to get a couple of qualified individuals. Several factors impact the hiring such as background checks, prior work experience, logistical challenges such as transportation and inconsistent work performance once hired is impacting some companies. In some cases, providing consistent work for prospective employees also is impacting hiring. Lack of a living wage, seasonal work, and inconsistent funding of projects limits the pool of candidates for some positions or results in individuals constantly changing employers in search of a better wage or working condition.

Close corporation between the utility companies, the Green Bank, the educational institutions and the businesses is required to ensure a qualified workforce. Partnerships between businesses and educational providers ensure appropriate and consistent training content. Monitoring of the workforce issues and providing feedback to the utility companies and educational providers will continue to improve the training of the existing workforce and provide a platform for educating future workers. Measuring the outcomes of the workforce development initiative is crucial as the industry prepares for a new workforce and continuously upgrades the knowledge and skills of the incumbent workers. Having an overall training plan with input from the businesses, the utility companies, the educational providers and regulators should ensure that the appropriate training is developed and readily available as the energy industry continues to evolve and grow.

Survey Data

General Questions for ALL Respondents				
1. Which of the following best describes your company?				
Answer	Response	%		
We manufacture energy-related products.	3	5%		
We provide/install energy-related products or services.	42	72%		
We generate or distribute energy to residential, commercial or institutional customers.	13	22%		
	Total	58		
2. What is your company's NAICS code? (optional)				
Text Response				
48621				
333-999-8556				
238210, 334515, 423610, 926130				
454311				
Connecticut light & power				
238210, 334515, 423610, 926130				
3. In what energy sectors does your company concentrate in Connecticut? (check all that apply)				
Answer	Response	%		
Hydro	4	7%		
Fuel Cells	3	5%		
Natural Gas	17	28%		
Geothermal	4	7%		
Oil	10	17%		
Propane	6	10%		

Solar	23	38%	
Transmission and Distribution (Utilities)	9	15%	
Wind	3	5%	
Residential Energy Efficiency	31	52%	
Commercial and Industrial Energy Efficiency	21	35%	
Other renewable or alternative fuel. Please specify:	3	5%	
<u>Other renewable or alternative fuel. Please specify:</u>			
Biodiesel			
CHP			
Smart technology			
4. Which of the following does your company use to recruit job applicants? Check all that apply.			
<u>Answer</u>	<u>Response</u>	<u>%</u>	
CT.jobs.com (Connecticut Dept of Labor)	9	28%	
Jobs Funnel Initiative (Connecticut Dept of Labor)	4	13%	
Employee referral	23	72%	
Internet - general	11	34%	
Career fairs	7	22%	
Company website	12	38%	
Indeed.com	9	28%	
Monster.com	3	9%	
CareerBuilder.com	5	16%	
Craigslist.com	10	31%	
Technical high schools	10	31%	
2 Year Community Colleges	12	38%	
Temp agencies	7	22%	
Other - Please specify	9	28%	
4 Year Colleges/Universities	12	38%	

<u>Other - Please specify</u>			
energy websites			
workplace			
linked in			
NABCEP			
LinkedIn			
word of mouth			
local and national associations			
asking friends or employees			
5. What is your best resource for finding qualified candidates?			
<u>Text Response</u>			
Company website, colleges, and specific niche websites specific to industry. all depend on position			
Employee referral			
Have been fairly successful with CareerBuilder			
workplace craigslist			
referrals			
UCONN			
Technical schools			
Currently the job funnel has our biggest supplier of people.			
employees tech schools			
I have not found one.			
Entry level NABCEP training			
job funnel			
Indeed. Want to work with Community Colleges more			
Referral			
craigslist			
employee referrals			

LinkedIn			
UCONN			
friends or employee recommendations			
Total Responses	19		
6. What strategies does your company use to improve employee skills? (check all that apply)			
Answer	Response	%	
On-the-job training program	30	97%	
In-house certification training	10	32%	
Vendor-provided certification training	22	71%	
Classroom education during work hours	16	52%	
Classroom education outside of work hours	12	39%	
Online education during work hours	11	35%	
Online education outside of work hours	12	39%	
Other - Please specify	0	0%	
7.How confident are you in the accuracy of your company's projections for Connecticut vacancies for the next 24 months (end of 2016):			
Answer	Response	%	
Very confident	5	15%	
Confident	20	61%	
Not very confident	7	21%	
Unsure	1	3%	
Total	33		
8.Additional comments:			
Text Response			

A minimum of "entry level" NABCEB solar PV training is required across all jobs. I teach this at Gateway Community College but have not seen active support from your organization, STEM, trade associations, or state labor department in the form of tuition scholarships or public relation promotion and information sharing.			
Several projects are in the pipeline that could greatly increase job creation			
All data provided is for the specific department I am in and is not company-wide data. 2015 vacancies are immediate. 2016 data is an estimate based on historical attrition rates and other known factors such as potential retirements, etc.			
9.Are you available for additional questions and/or interview:			
<u>Answer</u>	<u>Response</u>	<u>%</u>	
Yes	20	61%	
No	13	39%	
Total	33		
11. Would you like a copy of the survey results?			
<u>#</u>	<u>Answer</u>	<u>Response</u>	<u>%</u>
1	Yes (if yes please complete the contact information above)	19	58%
2	No	14	42%
	Total	33	

Manufacturing Jobs "We manufacture energy-related products"					3 responses				

NAICS code? (optional)									
333-999-8556									
In what energy sectors does your company concentrate in Connecticut? (check all that apply)									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
Hydro	2	67%							
Fuel Cells	1	33%							
Commercial and Industrial Energy Efficiency	1	33%							
4. Which of the following does your company use to recruit job applicants? Check all that apply.									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
CT.jobs.com (Connecticut Dept of Labor)	1	33%							
Jobs Funnel Initiative (Connecticut Dept of Labor)	0	0%							
Employee referral	2	67%							
Internet - general	2	67%							
Career fairs	2	67%							
Company website	2	67%							
Indeed.com	0	0%							
Monster.com	0	0%							
CareerBuilder.com	1	33%							
Craigslist.com	0	0%							

Technical high schools	0	0%							
2 Year Community Colleges	2	67%							
Temp agencies	1	33%							
Other - Please specify	0	0%							
4 Year Colleges/Universities	2	67%							
5. What is your best resource for finding qualified candidates?									
Have been fairly successful with CareerBuilder									
6. What strategies does your company use to improve employee skills? (check all that apply)									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
On-the-job training program	2	100%							
In-house certification training	1	50%							
Vendor-provided certification training	1	50%							
Classroom education during work hours	0	0%							
Classroom education outside of work hours	0	0%							
Online education during work hours	0	0%							
Online education outside of work hours	0	0%							
Other - Please specify	0	0%							

7.How confident are you in the accuracy of your company's projections for Connecticut vacancies for the next 24 months (end of 2016):									
Answer	Response	%							
Very confident	0	0%							
Confident	1	33%							
Not very confident	2	67%							
Unsure	0	0%							
Total	3								
9.Are you available for additional questions and/or interview:									
Answer	Response	%							
Yes	1	33%							
No	2	67%							
Total	3								
10. Please provide the following.									
11. Would you like a copy of the survey results?									
Answer	Response	%							
Yes (if yes please complete the contact information above)	2	67%							
No	1	33%							
Total		3							

12. How many Connecticut job vacancies do you currently have in each of the following positions? How many people do you plan to hire for each position by the end of next year and by the end of 2016?									
<u>Current vacancies</u>	<u>Hiring by end of 2015</u>	<u>Hiring in 2016</u>							
Engineer (Biodiesel, Chemical, Environmental, Electrical, Facility, Fuel Cell, Mechanical)									
2	4								
3									
	2	4							
Procurement Specialist									
1									
Electromechanical									
	1	2							
Engineering									
	1	2							
Fuel Cell									
2									
Quality Control									
2									
13. For only the job vacancies you selected above, select all of the skills required to meet job qualifications:									

<u>Question</u>	<u>Soft skills</u> (employability, punctuality, work ethic)	<u>Physical</u> <u>skills</u>	<u>Job-</u> <u>specific</u>	<u>Technical</u> <u>skills</u>	<u>HS diploma</u> <u>/GED</u>	<u>Job-specific</u> <u>certification</u> <u>(license)</u>	<u>Associates</u> <u>degree</u>	<u>Bachelor's</u> <u>degree</u>	<u>Other</u>
Engineer (Biodiesel, Chemical, Environmental, Electrical, Facility, Fuel Cell, Mechanical)	2	1	2	2	0	0	0	3	1
Manager (Maintenance, Material, Operations, Production)	0	0	0	0	0	0	0	1	0
Electromechanical	0	0	1	1	0	1	1	0	0
Engineering	1	0	1	1	0	0	1	0	0
Fuel Cell	0	0	0	0	1	0	0	0	0
Quality Control	0	0	0	0	1	0	0	0	0
14. Please list any other job specific skills, requirements, certification, or licenses needed to fill the job vacancies you identified:									
<u>Other - Please specify</u>									
Knowledge of specific software such as Pro E.									
15. For only the job vacancies you selected above, how many years of work experience must a candidate have, and what is the salary range? All answers are confidential.									

Engineer (Biodiesel, Chemical, Environmental, Electrical, Facility, Fuel Cell, Mechanical)									
<u>Years of work experience required</u>	<u>Salary range</u>	<u>Please indicate hourly or annually</u>							
1 to 5	60,000 - 72,000								
5									
10	75-100k	annually							
Engineering									
10	20-30	hr.							
Fuel Cell									
3									
Quality Control									
3									
16. For only the job vacancies you selected above, on a scale of 1 to 5, how difficult is it to fill the positions?									
<u>Question</u>	<u>1 (not difficult)</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5 (extremely difficult)</u>				
Engineer (Biodiesel, Chemical, Environmental, Electrical, Facility, Fuel Cell, Mechanical)	0	0	1	0	2				
Manager (Maintenance, Material, Operations, Production)	0	0	0	1	0				
Engineering	0	0	1	0	0				

Fuel Cell	0	1	0	0	0				
Quality Control	0	1	0	0	0				

Installation Jobs "We provide/install energy-related products or services."						42 responses				
2. What is your company's NAICS code? (optional)										
238210, 334515, 423610, 926130										
238210, 334515, 423610, 926130										
3. In what energy sectors does your company concentrate in Connecticut? (check all that apply)										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
Hydro	1	2%								
Fuel Cells	1	2%								
Natural Gas	8	19%								
Geothermal	2	5%								
Oil	8	19%								
Propane	5	12%								
Solar	20	48%								
Transmission and Distribution (Utilities)	1	2%								
Wind	2	5%								
Residential Energy Efficiency	21	50%								

Commercial and Industrial Energy Efficiency	13	31%								
Other renewable or alternative fuel. Please specify:	2	5%								
CHP										
Smart technology										
4. Which of the following does your company use to recruit job applicants? Check all that apply.										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
CT.jobs.com (Connecticut Dept of Labor)	6	25%								
Jobs Funnel Initiative (Connecticut Dept of Labor)	4	17%								
Employee referral	17	71%								
Internet - general	6	25%								
Career fairs	4	17%								
Company website	6	25%								
Indeed.com	8	33%								
Monster.com	1	4%								
CareerBuilder.com	3	13%								
Craigslist.com	10	42%								
Technical high schools	8	33%								
2 Year Community Colleges	7	29%								
Temp agencies	3	13%								
Other - Please specify	7	29%								
4 Year Colleges/Universities	6	25%								
<u>Other - Please specify</u>										
workplace										

linked in										
NABCEP										
LinkedIn										
word of mouth										
asking friends or employees										
5. What is your best resource for finding qualified candidates?										
workplace craigslist										
referrals										
UCONN										
Technical schools										
Currently the job funnel has our biggest supplier of people.										
employees tech schools										
I have not found one.										
Entry level NABCEP training										
job funnel										
Indeed. Want to work with Community Colleges more										
Referral										
craigslist										
LinkedIn										
UCONN										
friends or employee recommendations										

6. What strategies does your company use to improve employee skills? (check all that apply)										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
On-the-job training program	23	96%								
In-house certification training	7	29%								
Vendor-provided certification training	16	67%								
Classroom education during work hours	12	50%								
Classroom education outside of work hours	8	33%								
Online education during work hours	9	38%								
Online education outside of work hours	9	38%								
Other - Please specify	0	0%								
7.How confident are you in the accuracy of your company's projections for Connecticut vacancies for the next 24 months (end of 2016):										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
Very confident	4	17%								
Confident	16	67%								
Not very confident	3	13%								
Unsure	1	4%								
Total	24									

A minimum of "entry level" NABCEB solar PV training is required across all jobs. I teach this at Gateway Community College but have not seen active support from your organization, STEM, trade associations, or state labor department in the form of tuition scholarships or public relation promotion and information sharing.										
Several projects are in the pipeline that could greatly increase job creation										
9.Are you available for additional questions and/or interview:										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
Yes	16	67%								
No	8	33%								
Total	24									
10. Please provide the following.										
<u>Name:</u>	<u>Title</u>	<u>Email:</u>	<u>Phone #</u>	<u># of employees your company currently employs in Connecticut</u>						
Richard Vocke	President									

Stephen W. Possidento	CEO			18						
Vivian Perez	owner			8						
Peter Callan	Principal			40						
Tom Wemyss	VP			6						
Craig Frenkel	owner			45						
Joshua Ross	Owner			24						
Elijah	Owner			2						
Leticia Colon	CEO			27						
Guy Wanegar	president			9						
Dwayne Escola	Member LLC			4						
Bob Mariani	Operations Manager			16						
Zak Poston	Director of CT Operations			about 20						

Gail Burrington				1 + subcontractors						
John Greeno	Owner			33						
Timothy Maurer	Director of Energy Information Services			35						
Lorenzo Wyatt	VP/owner			85						
Vivian Perez	owner/member			8 including owners						
Karla Donnelly	Senior Sustainability Specialist			65						
Steven Winter	President			35						
Tom Wemyss	VP			7						
Corinne Morrison	co-owner			3 + 2 active owners						
Total Responses	22									
11. Would you like a copy of the survey results?										
<u>Answer</u>	<u>#</u>	<u>%</u>								
Yes (if yes please complete the contact information above)	14	58%								
No	10	42%								

Total	24									
12. How many Connecticut job vacancies do you currently have in each of the following positions? How many people do you plan to hire for each position by the end of next year and by the end of 2016?										
<u>Current vacancies</u>	<u>Hiring by end of 2015</u>	<u>Hiring in 2016</u>								
Architect/Systems Designer										
0	0	0								
0	0	1								
	1									
	1	1								
	2	4								
	1	1								
Apprentice (Electrical, HVAC, Installation, Plumbing)										
0	0	0								
2	2	2								
2	2									
2	3	4								
3	3									
2	2	4								
2	0	2								
	1									
	1	1								
	1	1								
		2								

		1								
Commissioning Agent										
0	0	0								
0	0	1								
	1	2								
Consultant (Remediation, Energy Efficiency)										
0	0	0								
1	1									
2	3	3								
2										
Energy Auditor										
0	0	0								
1	1	1								
3	4									
1	1									
2	3	3								
2	4									
0										
2	2	4								
2										
1	1									
	1									
	1									
	2	3								
Engineer (Energy, Electrical, Environmental, Mechanical)										
0	0	0								
0	0	1								
	1	2								
		1								

Field Supervisor/Crew Chief/Lead (Carpentry, Electrical, HVAC, Installation, Plumbing)												
0	0	0										
3	4	4										
2	3	3										
1	1	1										
	1	1										
	1	1										
		2										
Helper/Pre-Apprentice												
0	1	0										
2	2	2										
1	1											
2	2	2										
2	4											
	2	2										
HERS (Home Energy Rating System) Rater												
0	0	1										
1	1											
Maintenance and Repair Worker, General Laborer												
0	0	0										
	1	1										
Manager (Construction, Installation, Project)												
0	0	0										
1	1											
2	2	2										
1	1	1										
	1											
	1	1										

		2								
		1								
Quality Control/Inspector										
0	0	0								
1										
Site Surveyor										
0	0	0								
1										
	1	1								
		1								
Technical Sales Representative/Marketing/Out reach										
0	0	0								
2	2	2								
3	3									
2	4									
4	4	8								
	1	1								
	2									
	1	1								
		2								
Technician										
0	0	0								
1	1									
2	1	1								
		6								
Home Energy Solutions Technician										
0	0	0								
1	1	1								
2	2									

3	2	2								
2	1	1								
2	4									
2	2	4								
2	2	2								
2										
HVAC Technician										
0	0	0								
1	1									
		X								
Building Automation Technician										
0	0	0								
	1									
Electrical Technician										
0	1	0								
3	3	3								
1										
	2	2								
Plumbing Technician										
0	0	0								
		X								
Roofing Technician										
0	1	0								
Home Performance with Energy STAR Technician										
0	0	0								
1	1	1								
1	2									
Pipefitter/Steamfitter Technician										
0	0	0								

		X								
Environmental Remediation Technician										
0	0	0								
Solar PV Installer Technician										
0	1	0								
3	3	4								
6		6								
2	2	2								
	2									
	2	3								
	1	2								
Weatherization Installer Technician										
0	0	0								
2	2									
2	2									
2	2	1								
3	6									
2										
	1									
13.For only the job vacancies you selected above, select all of the skills required to meet job qualifications:										
<u>Question</u>	<u>Soft skills (employability, punctuality, work ethic)</u>	<u>Physical skills</u>	<u>Job-specific</u>	<u>Technical skills</u>	<u>HS diploma /GED</u>	<u>Job-specific certification (license)</u>	<u>Associates degree</u>	<u>Bachelor's degree</u>	<u>Other</u>	<u>Total Responses</u>
Architect/Systems Designer	4	0	3	3	2	2	2	2	1	19

Apprentice (Electrical, HVAC, Installation, Plumbing)	9	9	10	10	7	4	2	2	1	54
Commissioning Agent	2	0	2	2	0	1	0	0	1	8
Consultant (Remediation, Energy Efficiency)	1	1	1	1	1	0	1	1	0	7
Energy Auditor	7	3	4	9	5	8	3	0	0	39
Engineer (Energy, Electrical, Environmental, Mechanical)	1	0	1	1	0	1	0	1	0	5
Field Supervisor/Crew Chief/Lead (Carpentry, Electrical, HVAC, Installation, Plumbing)	5	5	5	5	3	3	1	1	0	28
Helper/Pre-Apprentice	5	6	3	3	3	2	0	0	1	23
HERS (Home Energy Rating System) Rater	0	0	1	0	0	1	1	0	0	3
Maintenance and Repair Worker, General	1	1	1	1	0	1	0	0	1	6
Manager (Construction, Installation, Project)	5	5	6	6	4	5	3	3	1	38
Quality Control/Inspector	0	0	0	0	0	0	0	0	0	0
Site Surveyor	3	3	2	3	2	1	0	0	1	15
Technical Sales Representative/Marketing/Out reach	6	3	6	6	4	1	6	4	1	37
Technician	2	2	2	2	2	2	0	0	0	12
Home Energy Solutions Technician	8	5	7	7	5	6	0	1	0	39
HVAC Technician	2	2	2	2	2	2	0	0	0	12
Building Automation Technician	0	0	0	0	0	0	0	0	0	0

Electrical Technician	1	2	2	2	1	0	0	0	0	8
Plumbing Technician	1	1	1	1	1	1	0	0	0	6
Roofing Technician	1	1	1	1	1	0	0	0	0	5
Home Performance with Energy STAR Technician	2	1	1	2	2	2	0	0	0	10
Pipefitter/Steamfitter Technician	1	1	1	1	1	1	0	0	0	6
Environmental Remediation Technician	0	0	0	0	0	0	0	0	0	0
Solar PV Installer Technician	7	7	7	7	6	7	2	1	1	45
Weatherization Installer Technician	5	5	3	4	3	2	0	0	0	22
Other - Please specify										
Building controls										
14.Please list any other job-specific skills, requirements, certification, or licenses needed to fill the job vacancies you identified:										
Text Response										
BPI certifications for technicians, Energy Auditor for energy auditors										
More NABCEP certified installers and solar experienced electricians										
BPI analyst and envelope certified, Tablet abilities, PC excel, word, email skills. customer service skills, some sales or ROI basics										
More licensed PV installers are desperately needed. The state needs a clearer path to obtaining the PV license here										

in the state.										
Building Controls integration, configuration and user experience design Energy audit/CEM Knowledge of Energy efficiency, utility rates, demand response										
4 year degree required.										
BPI Building Analyst, BPI Envelope Professional, DOE Home Energy Assessor, EPA Lead RRP certification										
Must pass back ground check: good driving record, 7 yr. criminal history and other checks. Carpentry skills very helpful Bilingual										
OSHA certified, Lead safe worker.										
Total Responses	9									
15. For only the job vacancies you selected above, how many years of work experience must a candidate have, and what is the salary range? All answers are confidential.										
<u>Years of work experience required</u>	<u>Salary range</u>	<u>Please indicate hourly or annually</u>								
Architect/Systems Designer										

2	35-50k	annual								
0	50-80	annual								
1	35k-45k	annual								
Apprentice (Electrical, HVAC, Installation, Plumbing)										
1	15/hr.	hourly								
0	12	hr.								
1		18								
1	35k	annual								
4		15								
1	10/hr.									
1	20	hourly								
2	25,000	annually								
0	15-Dec	hourly								
1	\$16	Hourly								
Commissioning Agent										
0	50-80	annual								
Consultant (Remediation, Energy Efficiency)										
3	60K	an								
Energy Auditor										
0-any amount										
2	50000	25								
3	54,000									
1	18-23	hourly								
5	40,000	annually								
3	20	hourly								
1	45,000 - 60,000	annual								
2	45000	21.63								
	50000	annual								

Engineer (Energy, Electrical, Environmental, Mechanical)										
0	50-80	annual								
Field Supervisor/Crew Chief/Lead (Carpentry, Electrical, HVAC, Installation, Plumbing)										
2	45	annual								
10		30								
1	20-23	hourly								
5	28	hourly								
6	55000	26.44								
HERS (Home Energy Rating System) Rater										
2	20/hr.	hourly								
	50000	annual								
Manager (Construction, Installation, Project)										
5	75K	an								
3 to 4	45	annual								
10		35								
Site Surveyor										
0	30-40k	annual								
Technical Sales Representative/Marketing/Out reach										
5	60k	an base								
2	50000	25								
5	40-100k	annual								
5		20								
2	25	hourly								
0	45000	21.63								

	50,000-70,000 + commission									
Technician										
1	30-40k									
3		22								
10		25								
Home Energy Solutions Technician										
0- any amt										
1		14								
3	18-23	hourly								
3	50,000	annually								
3	20	hourly								
2	45000	21.63								
varies		DOE								
HVAC Technician										
10										
4	30/hr.									
Building Automation Technician										
1	70,000-90,000									
Electrical Technician										
2	25/hr.	hourly								
3 to 4	60k	annual								
2	20-30	hourly								
Plumbing Technician										
10										
Roofing Technician										
2	25/hr.	hourly								

Home Performance with Energy STAR Technician										
1	18-23	hourly								
Pipefitter/Steamfitter Technician										
10										
Solar PV Installer Technician										
5	30/hr.	hourly								
2	35-50k									
1	25	hourly								
2	20-28	hourly								
Weatherization Installer Technician										
0- any amt										
1	24000	12								
1	15-18	hourly								
	15	hourly								
0	12	hour								
16. For only the job vacancies you selected above, on a scale of 1 to 5, how difficult is it to fill the positions?										
<u>Question</u>	<u>1 (not difficult)</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5 (extremely difficult)</u>					
Architect/Systems Designer	1	1	2	0	1					
Apprentice (Electrical, HVAC, Installation, Plumbing)	2	3	2	1	1					
Commissioning Agent	0	1	0	2	1					
Consultant (Remediation, Energy Efficiency)	0	1	0	0	2					

Energy Auditor	0	0	2	3	4					
Engineer (Energy, Electrical, Environmental, Mechanical)	0	0	1	1	2					
Field Supervisor/Crew Chief/Lead (Carpentry, Electrical, HVAC, Installation, Plumbing)	0	0	2	1	2					
Helper/Pre-Apprentice	1	1	0	0	1					
HERS (Home Energy Rating System) Rater	0	0	1	1	2					
Maintenance and Repair Worker, General	0	0	0	0	1					
Manager (Construction, Installation, Project)	0	0	0	1	3					
Quality Control/Inspector	0	0	0	0	1					
Site Surveyor	0	0	2	0	1					
Technical Sales Representative/Marketing/Out reach	2	0	0	4	2					
Technician	0	0	2	1	1					
Home Energy Solutions Technician	0	1	0	1	4					
HVAC Technician	0	0	0	0	2					
Building Automation Technician	0	0	0	2	1					
Electrical Technician	0	1	0	0	2					
Plumbing Technician	0	0	0	0	1					
Roofing Technician	0	1	0	0	1					
Home Performance with Energy STAR Technician	0	0	0	0	1					

Pipefitter/Steamfitter Technician	0	0	0	0	1					
Environmental Remediation Technician	0	0	0	0	1					
Solar PV Installer Technician	0	1	0	1	4					
Weatherization Installer Technician	0	2	1	1	1					
Other - Please specify	0	1	0	0	1					

Generation & Distribution Jobs "We generate or distribute energy to residential, commercial or institutional customers"										
13 Responses										
2. What is your company's NAICS code? (optional)										
48621										
454311										
3. In what energy sectors does your company concentrate in Connecticut? (check all that apply)										
<u>Answer</u>	<u>Response</u>	<u>%</u>								
Hydro	1	8%								
Fuel Cells	1	8%								
Natural Gas	9	69%								

Geothermal	2	15%							
Oil	2	15%							
Propane	1	8%							
Solar	2	15%							
Transmission and Distribution (Utilities)	8	62%							
Wind	1	8%							
Residential Energy Efficiency	9	69%							
Commercial and Industrial Energy Efficiency	7	54%							
Other renewable or alternative fuel. Please specify:	1	8%							
Other renewable or alternative fuel. Please specify:									
Biodiesel									
4. Which of the following does your company use to recruit job applicants? Check all that apply.									
Answer	Response	%							
CT.jobs.com (Connecticut Dept of Labor)	2	40%							
Jobs Funnel Initiative (Connecticut Dept of Labor)	0	0%							

Employee referral	4	80%							
Internet - general	3	60%							
Career fairs	1	20%							
Company website	4	80%							
Indeed.com	1	20%							
Monster.com	2	40%							
CareerBuilder.com	1	20%							
Craigslist.com	0	0%							
Technical high schools	2	40%							
2 Year Community Colleges	3	60%							
Temp agencies	3	60%							
Other - Please specify	2	40%							
4 Year Colleges/Universities	4	80%							
<u>Other - Please specify</u>									
energy websites									
local and national associations									
5. What is your best resource for finding qualified candidates?									
Company website, colleges, and specific niche websites specific to industry. all depend on position									
Employee referral									
employee referrals									

6. What strategies does your company use to improve employee skills? (check all that apply)									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
On-the-job training program	5	100%							
In-house certification training	2	40%							
Vendor-provided certification training	5	100%							
Classroom education during work hours	4	80%							
Classroom education outside of work hours	4	80%							
Online education during work hours	2	40%							
Online education outside of work hours	3	60%							
Other - Please specify	0	0%							
7.How confident are you in the accuracy of your company's projections for Connecticut vacancies for the next 24 months (end of 2016):									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
Very confident	1	17%							
Confident	3	50%							
Not very confident	2	33%							

Unsure	0	0%							
Total	6								
8.Additional comments:									
All data provided is for the specific department I am in and is not company-wide data. 2015 vacancies are immediate. 2016 data is an estimate based on historical attrition rates and other known factors such as potential retirements, etc.									
9.Are you available for additional questions and/or interview:									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
Yes	3	50%							
No	3	50%							
Total	6								
11. Would you like a copy of the survey results?									
<u>Answer</u>	<u>Response</u>	<u>%</u>							
Yes (if yes please complete the contact information above)	3	50%							
No	3	50%							
Total			6						

12. How many Connecticut job vacancies do you currently have in each of the following positions? How many people do you plan to hire for each position by the end of next year and by the end of 2016?									
<u>Current vacancies</u>	<u>Hiring by end of 2015</u>	<u>Hiring in 2016</u>							
Utility Line Worker									
2									
0	0	0							
10	6	5							
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)									
7									
0	0	1							
8	6	2							
5	5	5							
Field Supervisor/Crew Chief/Project Manager									
0	0	1							
0									
3	3	2							
Inspector									
0	0	0							
2	1	1							

1	1	1							
Pre-apprentice/Apprentice									
0	1	0							
0									
Sales Representative									
0	0	0							
0									
2	1	1							
Field Service Technician									
0	1	0							
0									
13.For only the job vacancies you selected above, select all of the skills required to meet job qualifications:									
<u>Question</u>	<u>Soft skills (employability, punctuality, work ethic)</u>	<u>Physical skills</u>	<u>Job-specific</u>	<u>Technical skills</u>	<u>HS diploma /GED</u>	<u>Job-specific certification (license)</u>	<u>Associates degree</u>	<u>Bachelor's degree</u>	<u>Other</u>
Utility Line Worker	1	1	0	0	1	0	0	0	0
Energy Auditor	1	1	1	1	1	1	0	0	0
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)	4	1	4	4	2	3	2	4	1
Field Supervisor/Crew Chief/Project Manager	2	1	2	2	1	1	2	1	1

Inspector	2	1	2	2	2	2	2	1	1
Pre-apprentice/Apprentice	1	1	1	1	1	0	0	0	0
Field Service Technician	1	1	1	1	1	0	0	0	0
14.Please list any other job-specific skills, requirements, certification, or licenses needed to fill the job vacancies you identified:									
AEE CEM, BMS controls, HVAC knowledge base, Residential home design, Commercial building design, Bldg. codes									
not required but helpful are Certified Energy Manager (CEM) and Certified Energy Auditor (CEA) certifications, Professional Engineering (PE) license									

15. For only the job vacancies you selected above, how many years of work experience must a candidate have, and what is the salary range? All answers are confidential.									
<u>Years of work experience required</u>	<u>Salary range</u>	<u>Please indicate hourly or annually</u>							
Utility Line Worker									
4 to 5	\$36.20	hourly							
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)									
0-5	\$62-\$76	annual							
3 to 5	76.8 - 115.2	Annual							
5	70000	annually							
Field Supervisor/Crew Chief/Project Manager									
3	76.8-115.2	Annual							
3	65000	annually							
Inspector									
1	60000	annually							
Pre- apprentice/Apprentice									
1	40-45,000	Annual							
Field Service Technician									
2	53.4-80.0	Annual							

16. For only the job vacancies you selected above, on a scale of 1 to 5, how difficult is it to fill the positions?									
<u>Question</u>	<u>1 (not difficult)</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5 (extremely difficult)</u>				
Utility Line Worker	0	0	1	0	1				
Energy Auditor	0	0	0	1	0				
Engineer (Compression, Corrosion, Electrical, Energy, Environmental)	0	0	0	1	3				
Field Supervisor/Crew Chief/Project Manager	0	0	0	2	0				
Inspector	0	0	1	1	0				
Pre-apprentice/Apprentice	0	1	0	0	0				
Field Service Technician	0	1	0	0	0				

Educational Program Listing

Engineering (Electrical, Civil, Power, Environmental, Architectural)				
University of Connecticut	Electrical Engineering	Electrical engineering program	Undergraduate and Graduate	Yes
	Civil Engineering	Civil engineering program	Undergraduate and Graduate	Yes
	Environmental Engineering	Understanding the impact of human activity and pollutants on the environment as well as the need for sustainable manufacturing processes and sustainable development.	Undergraduate and Graduate	Yes
	Environment Engineering Minor	Environmentally sound manufacturing process and sustainable development	Undergraduate	Yes
	Environmental Economics and Policy Minor	Overview of key concepts and methods used by economics to analyze problems associated with human use and misuse of natural resources and the environment and to evaluate policy options for better management of these resources for current and future generations	Undergraduate	Yes
	Natural Resources	Apply modern technology, concepts and principles dealing with sustainable development	Undergraduate and Graduate	Yes
	Natural Resources Management and Engineering	Prepares students to manage and conserve the environment	Undergraduate and Graduate	Yes
	Introduction to Power systems	Students learn Fundamentals of power system planning, operation, and management. Power generation, transmission and distribution. Sustainable energy sources such as photovoltaic, solar-thermal power, wind farms, and their grid integration. Modern power system monitoring/control, fault analysis, and transient stability analysis using computer tools.	Undergraduate	Yes

	Sustainable Energy Sources and Systems	Topics include current energy sources and usage, environmental pollution from use of fossil fuels, nuclear energy, biomass energy, geothermal energy resources and usage, hydroelectric, solar, wind and tidal energy conversion principles, hydrogen generation and usage in electrochemical devices, energy economics and effects of energy pricing on economically viable energy options.	Undergraduate	Yes
	Materials for Alternative, Renewable Energy	Overview of energy conversion and storage systems - centralized and distributed generation to stationary and motive batteries; efficiency calculation and thermodynamics; electrochemistry - primary and secondary batteries; fuels - chemistry, processing, impurities; combustion, gasification and electrochemical systems; materials requirements; bulk and surface properties; metals, ceramics and super alloys; gas - metal interactions; gas - liquid - metal interactions; development trend - alloying principles, coatings, claddings; alloy processing and coating techniques.	Undergraduate	Yes
	Energy Economics	Economics of energy issues with special reference to impacts on local, regional, and global environmental quality, energy markets and regulatory policies. Environmental and economic implications of developing alternative sources of energy. Conservation policies in relation to transportation, industry, and residential energy use.	Undergraduate	Yes
	Living in an Engineered World	A survey course that provides students an insight into the technical world around them. As a society in the 21st Century, we will be faced with a rapidly changing world influenced greatly by the advances in technology, the history of technological changes and the continued need for conservation of energy and sustainability.	Undergraduate	Yes

	Materials for advanced fossil fuel systems	Will familiarize students with the state of the art in fossil fuel power generation technologies ranging from conventional combustion to emerging technologies such as oxyfuel combustion; integrated coal gasification (IGCC) and fuel cell (IGFC) systems; and CO2 separation and sequestration.	Undergraduate	Yes
	Materials for Alternative, Renewable Energy	Overview of energy conversion and storage systems - centralized and distributed generation to stationary and motive batteries; efficiency calculation and thermodynamics; electrochemistry - primary and secondary batteries; fuels - chemistry, processing, impurities; combustion, gasification and electrochemical systems; materials requirements; bulk and surface properties; metals, ceramics and super alloys; gas - metal interactions; gas - liquid - metal interactions; development trend - alloying principles, coatings, claddings; alloy processing and coating techniques.	Undergraduate	Yes
	Fuel Cell	Advanced course on fuel cells as an alternative energy conversion technology. Subjects covered include: thermodynamics and electrochemistry of fuel cells, operating principles, types of fuel cells, overview of intermediate/high temperature fuel cells, polymer electrolyte fuel cells and direct methanol fuel cells	Undergraduate	Yes
	Energy, Environment, and Society	Sociological perspectives on energy production, distribution and consumption, environment and social organization.	Undergraduate	Yes
Central Connecticut State University				
	Biology: Specialization in Environmental Science	Prepares students for careers in environmental science and natural resources management	Undergraduate	Yes

	Construction Management	Focuses on field operations, estimating and project management processes.	Undergraduate and Graduate	Yes
	Heating, Ventilation and Air Conditioning System Design	Analysis and design of heating, ventilating, air conditioning and refrigerating systems (HVAC) for buildings and industrial applications, including equipment and component selection. Energy-efficient concepts and controls will be emphasized.	Undergraduate	Yes
	Introduction to Technology Management	Current trends in technology management including innovation, technology systems, sustainable energy, materials, and historical perspectives.	Undergraduate	Yes
	Energy Conversion Systems	Design of energy producing systems utilizing combustible fuels and renewable sources; solar, wind, tidal, geothermal, fuel cells, nuclear. Study of energy demand and available resources and distribution in the world. Energy storage; distribution, conservation, and environmental impacts.	Undergraduate	Yes
	Mechanical technology	Students work on industrial equipment including electrical generators, internal combustion engines, steam and gas turbines, refrigeration and air-conditioning equipment	Undergraduate	Yes
Eastern Connecticut State University				
	Certificate in Energy Management and Policy	Focus on environmental issues, environmental management and environmental policy.	Certificate	Yes
	Sustainable Energy Laboratory	An experiential introduction to energy and society issues through laboratory study of climate change, energy efficiency, and renewable energy systems.	Undergraduate	Yes
	Energy and Development	An eight to twelve day field experience in a developing country. An intensive study, including interviews and site visits, of the role that sustainable energy systems play in sustainable development in a developing country.	Undergraduate	Yes

	Sustainable Buildings	Energy consumption for heating, cooling, lighting, and appliances in conventional buildings and strategies for reducing energy consumption and carbon emission. LEED and other green building design. Renewable energy systems, including the design of solar thermal, solar electric, wind and hydroelectric power systems for buildings.	Undergraduate	Yes
	Energy Resources and Conservation	Fossil fuel resources and the environmental impact of fossil fuel consumption. Renewable energy recourse and the feasibility of transitioning from fossil fuel to renewable energy to generate electricity and to power transportation. Topics include: electricity generation, clean coal, peak oil, shale gas, tar sands, nuclear power, concentrating solar power, solar electric power, hydroelectricity, wind energy, ocean energy, geothermal energy, electric vehicles, fuel cells, biomass and biofuels.	Undergraduate	Yes
	Sustainable Energy	This course will evaluate the environmental impacts of power generation based on fossil fuels and nuclear fission and will describe alternatives to these technologies, including conservation, mass transit, electric and hybrid electric vehicles, passive solar energy, solar thermal systems, photovoltaic power systems, hydroelectric power, wind energy, tidal power, ocean thermal energy, biomass, fuel cells, hydrogen fuel systems, and nuclear fusion. The course will evaluate the environmental, economic, and social issues related to the transition to sustainable energy systems.	Undergraduate	Yes
	Environmental Earth Science, minor in Sustainable Energy Studies	Introduce students to sustainable energies and insure students understand social and economic implication of energy technology and energy policy.	Undergraduate	Yes

Southern Connecticut State University				
	Environmental Studies Minor	Interdisciplinary program including land use planning, pollution prevention and controls, societal, political and economic pressures on the environment	Undergraduate	Yes
Western Connecticut State University				
	Energy	This course will investigate present and possible future energy sources, and discuss man's use and misuse of the different forms of energy and the effects of these energy uses on society.	Undergraduate	Yes
Private Universities				
Yale University				
	Chemical Engineering	Courses include Green Chemistry	Undergraduate	Yes
	Green Business Operations	Course in business	Undergraduate	Yes

	Electric Utilities: An Industry in Transition	Students explore technological innovations, improving economics, and regulatory incentives provide a transformational opportunity to implement demand-side resources and distributed energy technologies that will both lower emissions and improve service to customers	Undergraduate	Yes
	Sustainability: Environment, Energy, and the Economy in the Twenty-First Century	This course explores the interlocking set of challenges that stem from society's desire for low-cost, clean energy that can support a vibrant economy and the simultaneous need to reduce pollution, address climate change, conserve natural resources, and address the other negative impacts of industrialization and economic growth.	Undergraduate	Yes
	Energy Economics and Policy Analysis	This course examines energy policy issues that pertain to the environment, with a focus on providing tools for analyzing these issues. A primary objective is to apply economics to particular issues of energy markets, environmental impacts, investment in renewables, and other energy issues such as transportation and energy efficiency.	Undergraduate	Yes

	Renewable Energy	Introduction to renewable energy, including physical principles, existing and emerging technologies, and interaction with the environment. Energy demand; transmission and storage; generation by hydroelectric, wind, solar, biofuel, and geothermal sources, as well as waves and tidal generation.	Undergraduate	Yes
	Engines, Energy and Environment	Energy sustainability and global warming; thermodynamic fundamentals; engines (combustion technologies, fossil-fuel pollution, carbon capture and sequestration). Wind, solar, biomass, and other renewable energy sources.	Undergraduate	Yes
	Photovoltaic Energy	Survey of photovoltaic energy devices, systems, and applications, including review of optical and electrical properties of semiconductors. Topics include solar radiation, solar cell design, performance analysis, solar cell materials, device processing, photovoltaic systems, and economic analysis.	Undergraduate	Yes
	Green Engineering and Sustainable Design	Study of green engineering, focusing on key approaches to advancing sustainability through engineering design.	Undergraduate	Yes
	Electrical Engineering	Electrical engineering in energy and power generation.	Undergraduate and Graduate	Yes
	Environmental Studies	Studies in environmental teaching, writing, resource management and conservation.	Undergraduate and Graduate	Yes
	Environmental Engineering	Students work on problems related to improving environmental conditions including reduction of indoor and outdoor pollution.	Undergraduate and Graduate	Yes
	Masters of Environmental Management	Students pursue careers in environmental policy and analysis, stewardship, education, consulting or management.	Graduate	Yes
	Masters of Business Administration and Masters of Environmental Management	Students learn an understanding that business success depends on integrating environmental cost and benefits into long-term planning.	Graduate	Yes

	Master of Architecture and Environmental Management	Students incorporate sustainable design and development at an urban to regional scale.	Graduate	Yes
	Master of Environmental Management	Students pursue careers in environmental policy, analysis, stewardship, education, consulting and management.	Graduate	Yes
Trinity College				
	Civil Engineering		Undergraduate and Graduate	Yes
	Issues in Environmental and Energy Economics	The economic analysis of selected environmental and energy issues such as current air pollution control policies and water pollution control policies, recycling strategies, conservation, the development of new energy sources, such as solar energy and wind power, and the environmental consequences of different energy types.	Undergraduate	Yes
	Environmental Science	Students learn energy and environmental programs facing the current and future populations	Undergraduate	Yes
	Sustainable Urban Environment	This course introduces students to urban studies which deals with sustainable development, including exploration of the debates on the meanings of sustainability and development in cities.	Undergraduate	Yes
	The Science and Policies of Energy and Sustainability	This course will study the fundamental science of energy and its usage, and the environmental, economic, and societal impacts of coal, petroleum, natural gas, waste combustion, biomass, hydrogen, nuclear fission, nuclear fusion, solar, hydroelectric, wind, and geothermal power.	Undergraduate	Yes
University of New Haven				
	Civil Engineering	Students learn challenges related to energy needs, urban redevelopment and community planning	Undergraduate	

	Introduction to Traditional and Alternative Energy	An introduction to the technical and economic fundamentals of traditional and alternative energy systems. Course introduces the processes and components of energy generation and conversion systems including fuel cells, passive solar heating, fossil fuel and nuclear energy plants, cogeneration, and others.	Undergraduate	Yes
	Thermal Physics	Basic thermodynamics and its applications. Major emphasis on the efficiency of energy conversion and utilization. Topics include the laws of thermodynamics, entropy, efficiency of heat engines, solar energy, the energy balance of the earth, energy systems of the future, economics of energy use	Undergraduate	Yes
	Introduction to Energy Efficiency	Analysis of selected engineering systems with a focus on improvements in electrical/thermal efficiency. Thermal and electrical power management and conservation in buildings with specific focus on HVAC system efficiency, energy efficient technologies (electrical motors, lighting, heat pumps). Energy audits, power management and cogeneration are discussed	Undergraduate	Yes
	Solar Energy	Introduction to the fundamentals of solar energy thermal processes including solar radiation, flat plate and focusing collectors, energy storage, hot water heating, cooling and auxiliary system components. Emphasis on the design and evaluation of systems as they pertain to commercial and residential buildings	Undergraduate	Yes

	Electrical Power Systems	Changing power systems landscape, electric energy sources including renewable and various distributed generation (DG), environmental consequences of the electrical energy, AC transmission lines and cables, power flow in transmission networks, load ability of transmission lines, transformers, High Voltage DC (HVDC) transmission lines, power electronics devices and their applications, power quality and power factor, synchronous generators, voltage regulation and stability, peak load issues, ways to prevent voltage collapses, dynamic stability, automatic generation control (AGC).	Undergraduate	Yes
	Fundamental of Renewable Energy Systems	A study of the technology and engineering design issues of renewable energy systems (solar, wind, geothermal, tidal); availability of renewable resources and assessment of generation capacity. Topics include active and passive solar methods tied to HVAC systems; solar, thermal, and electric power generation alternatives; wind and tidal power engineering; and current waste to energy systems	Undergraduate	Yes
	Energy: Present and Future	Explores the nature, role, and economic impact of energy in our society. Topics include the nature and growth of energy consumption, physical limits to energy production and consumption, environmental effects, and comparisons of energy alternatives. Special emphasis on the technical, environmental, and economic aspects of nuclear power as well as energy sources of the future such as fast-breeder reactors, fusion, solar, and geothermal power.	Undergraduate	Yes

	Solar Energy	Introduction to the fundamentals of solar energy thermal processes including solar radiation, flat plate and focusing collectors, energy storage, hot water heating, cooling and auxiliary system components. Emphasis on the design and evaluation of systems as they pertain to commercial and residential buildings.	Undergraduate	Yes
	Fundamentals of Renewable Energy Systems	A study of the technology and engineering design issues of renewable energy systems (solar, wind, geothermal, tidal); availability of renewable resources and assessment of generation capacity. Topics include active and passive solar methods tied to HVAC systems; solar, thermal, and electric power generation alternatives; wind and tidal power engineering; and current waste to energy systems.	Undergraduate	Yes
	Electrical Engineering	Electrical engineering concerned with analysis, design, development and operation of electrical and electronic system.	Undergraduate and Graduate	Yes
Connecticut College				
	Energy and the Environment	An introduction to the physics of energy and the laws of thermodynamics as applied to environmental issues. Emphasis on processes for producing electrical energy.	Undergraduate	Yes
	Sustainable Architecture	An introduction to the principles and practice of sustainable architecture.	Undergraduate	Yes
Wesleyan University				
	Environment Studies	Environmental studies related to creation of a sustainable economy, resource efficiency and responsible environmental policies.	Undergraduate	Yes
University of Bridgeport				
	Interior Design	Plumbing, heating, ventilating, air conditioning, acoustics and solar energy will be examined.	Undergraduate	Yes

	Electrical Engineering/Energy Conservation	Students comprehend the engineering fundamentals of various types of fuel/photovoltaic cell systems, system design and integration issues, and system evaluation and economic analysis.	Undergraduate	Yes
	Solar Energy/Solar Cells	This course offers a review of renew-able energy (solar, winds, and tides) versus bio-energy (coal, oil, natural gas).	Undergraduate	Yes
	Foundations of Environmental and Energy Management	Alternative energy sources are reviewed, including examination of energy technologies in each fuel cycle stage for fossil (oil, gas, synthetic), solar, biomass, wind, hydro, nuclear, and geothermal energy types, along with storage, transmission, and conservation issues.	Graduate	Yes
	Alternative Energy technologies	This is a graduate level course and aims to introduce the alternative energy technologies in photovoltaic cells (PV) and fuel cells.	Graduate	Yes
	Sustainable Development	The course will examine the critical relationship between oil supply and demand and environmental challenges and the international priorities and policy initiatives of modern states.	Graduate	Yes
	Economic, Regulatory, Cultural, and Societal Issues in Environment and Energy Management	The course will focus on a review of the environmental and energy management safety.	Graduate	Yes
	Electrical Engineering	Electrical engineering degree	Undergraduate and Graduate	Yes
Fairfield University				

	Electrical	Electrical engineering program	Undergraduate	Yes
	Energy Conservation	This course covers the major topics in energy conversion, including fuels used in energy conversion; solar energy; gas turbine engines and applications; internal combustion engines; heat pumps; classic and novel power and refrigeration cycles; system analysis; system economics; and environmental considerations.	Graduate	Yes
	Green Power Generation	This course compares various methods of green power generation including solar power, wind power, water power, and several others.	Undergraduate	Yes
	Energy and the Environment	This course introduces students not majoring in the natural sciences to topics relating to work, energy, and power, and explores many of the environmental consequences resulting from our use of energy.	Undergraduate	Yes
University of Hartford				
	Solar Energy Design	Evaluation and design of solar thermal processes and equipment; availability of solar radiation, flat plate, and focusing collectors, and energy storage systems are treated	Undergraduate	Yes
	Energy Conversion System Design	Introduction to methods of energy conversion, including both conventional and renewable methods of energy generation. These include, but are not limited to, cogeneration, nuclear, solar, wind, and fuel cells. Each consists of a review of the basic engineering principles of design and operational configurations	Undergraduate	Yes
	Heating, Air Conditioning and refrigeration	Thermodynamic principles of refrigeration; refrigerants; psychometrics; air-conditioning processes; physiological considerations of thermal comfort, calculation of heating, cooling loads of structures; analysis and sizing of thermal and energy distribution systems; indoor noise control; energy calculations; special design project requiring written term paper and oral presentation.	Undergraduate	Yes

	Electrical Engineering Degree	Electrical Engineering degree program	Undergraduate and Graduate	Yes
	Architectural Design	An advanced architectural design studio with an emphasis on the principles and practices of sustainable design, including LEED criteria and process.	Undergraduate	Yes
	Sustainable Design	This course presents sustainable design and construction goals, processes, and strategies with a focus on larger commercial and institutional buildings.	Undergraduate	Yes
Rensselaer				
	Energy Systems	Global energy systems	Graduate	Yes
	Energy Systems	Clean Energy Management	Graduate	Yes
	Energy	Energy Engineering	Graduate	Yes
	Electrical	Electrical engineering program	Graduate	Yes
Coast Guard Academy				
	Electrical	Electrical engineering program	Undergraduate	Yes
Associate Degree and Certification Classes for engineering, solar, environmental, fuel cell, sustainability, building efficiency and construction				
Gateway Community College				
	Alternate Fuel Vehicle	Preparation and conversion of vehicles to run on natural gas.	Credit Bearing	As required
	Solar Energy Programs	Students learn solar PV and solar thermal including North American Board of Certified Practitioner standards	Credit bearing	As required
	Center for a Sustainable Future	Courses in solar PV, solar thermal, geothermal heating and cooling.	NABCEP Entry-level Exam	As required
	Environmental Engineering	Introduction to alternative energy system	Credit Bearing	As required

	Electrical	Electrical engineering Technology	Credit	Yes
Manchester Community College				
	Environmental Science	Sustainable energy and the environment	Credit Bearing	As required
	Sustainable Energy	Sustainable energy program	Certificate	As required
Naugatuck Valley Community College				
	Fuel Cell	Fuel cell certificate program	Certificate	As required
Norwalk Community College				
	Construction Technology	Students learn building efficiency auditing	Credit Bearing	As required
	Professional Development	Energy savings	No credit	As required
	Professional Development	Students learn building efficiency auditing	No credit	As required
	Building Efficiency	Building efficiency and sustainable technology program (BEST)	Certificate	As required
Quinebaug Valley Community College				
	Recreation	Home Energy savings	No credit	As required
	Construction Technology	Construction	Certificate	As required
Three Rivers Community College				
	Sustainable Facilities Management	Sustainable Facilities Management	Certificate	As required
	Electrical	Electrical engineering technology	Credit	Yes
Northwestern Community College				

	Electric Power Pathway	The Electrical Power Technology Pathway is articulated with Bismarck State College (BSC) and provides access for individuals interested in career pathways into the transmission and distribution sectors of the energy industry, by offering online Electric Power Technology classes to students enrolled in the Connecticut Community College System (CCCS).	Associate	As required
	Industrial Technology	The Technology Studies – Industrial Technology Option associate degree program prepares students primarily to transfer to complete a B.S. degree in civil, mechanical, manufacturing, composite, or computer engineering technology. Graduates will receive a background in mathematics, science, and general education courses for transfer into a four-year program. Careers in this field include jobs in industrial design, occupational health and safety, sustainable energy generation/transmission, lean manufacturing analysis, and laser technicians.	Associate	As required
High School education for entry into construction trades including HVAC, Plumbing, Electrical, Carpentry and Construction Trades.				
Connecticut Technical High Schools	Marketing Management and Entrepreneurship	Marketing and Entrepreneurship	High School	Yes
	Environmental Science	Training in scientific instrumentation, operating in the field and OSHA compliance	High School	Yes

	E-House Green Technology	High school training in building alternative energy homes	High School	Yes
	Electronics Technology	High school education in electronic equipment	High School	Yes
	Electrical	High school education for electrical apprenticeship careers	High School	Yes
	Heating, Ventilation and Air Conditioning	High school education for HVAC apprenticeships	High School	Yes
	Manufacturing Technology Plumbing and Heating (Solar Strand)	High school education for manufacturing	High School	Yes
	Electrical Engineering and Electronic Technology	High school educations for electronics	High School	Yes
	Welding and Metal Fabrication	High school education for welding and metal fabrication	High School	Yes
	Electrical, Plumbing, HVAC, Solar and Gas Training provided by Union Training Centers			
IBEW	Electrical programs	Wiring solar panels, wind turbines and biofuel plant apprenticeship	Apprenticeships	Yes
Local 777	Local 777 Veterans Training School Plumbers and Pipefitters	Plumbing and Pipefitting	Apprenticeships	Yes
Apprenticeship Training Center	Green Tradesman Certificate	Carpenters, Iron Workers, Finishing, Bricklayers, Sheet Metal workers, electricians, and Plumbers	Apprenticeships	Yes
Apprenticeship Training Center	Green Tradesman Training	Painters and Allied Trades	Apprenticeships	Yes
Labor's Training Center Pomfret	Labor Training	All labor positions including gas installation	Apprenticeships	Yes

Northeastern Joint Apprenticeship Training	Electrical Line worker	Electrical Line worker positions	Apprenticeships	Yes
IBEW	Solar Voltaic	Local 488 Electricians	Apprenticeships	Yes
Apprenticeship training (HVAC, Plumbing, Solar, Electricity, Plumbing, Gas) and energy efficiency training in BPI, LEED, Green Building, Energy Analysis and Building analysis. (Private Training Companies)				
Home Performance Institute of New England				
	BPI, Energy Auditor, Home Inspection and Computer Software	Commercial and residential courses for BPI, Energy Analysis, Building Analysis and technical training/consulting	Certificate and continuing training	Yes
Everblue Training Institute				
	LEED Project 101:Implementation and Documentation	Teaches students all phases of LEED project work from initial registration to final LEED certification	Certificate	As required
	LEED Home Rating System Review	One day course for LEED credits, financial incentives and green home opportunities	Certificate	As required
	Introducing LEED, the USGBC and the GBCI	Students learn US Green Building Council, the Green Building Certification and Led Certification.	Certificate	As required
Connecticut Center for Advanced Technology				

	Energy and Sustainability	Energy and sustainability program for middle and high school teachers		As required
	Catalyst	Exploration in sustainable energy and the environment (High School enrichment program)		As required
Center for Occupational Development and Education				
	Continuing Training	CODE is the plumbers' industry school organized to provide the mandatory Continued Education for Plumbing License Holders.	Continuing training hours	Yes
Construction Education Center, Inc.				
	Continuing Training	Provides educational training for apprentices, journeypersons, and supervisors of construction companies. Green building fundamentals.	Continuing training hours	Yes
	Heating, Venting and Air Conditioning	Heating, venting and air conditioning (HVAC) I, II, III & IV - S2 License	Continuing Training	Yes
	Continuing Training	Heating, venting and air conditioning (HVAC) I, II, III & IV - D2 License	Continuing Training	Yes
Heatspring Learning Institute				
	Solar, geothermal, green house and energy efficiency	Our online classroom & curriculum-building software for expert-led online training.	Continuing training hours and exam preparation	Yes
Independent Connecticut Petroleum Institute				
	N/A	Independent Connecticut Petroleum Association Education Foundation is a nonprofit corporation that benefits educational institutions and related activities, focusing specifically on adult, continuing education programs.	Continuing training hours	Yes

	Solar Thermal	Solar thermal training (ENTECH)	Continuing training hours	Yes
	Electricity	Basic electricity program	Continuing training hours	Yes
	HVAC	Heating, venting and air condition training license - D2	Continuing Training	Yes
	Heating Specialist Training	Heating specialist training	Continuing Training	Yes
	Warm Air Heating and Cooling	Warm Air Heating and Cooling Mechanic training - D2 License	Continuing Training	Yes
	Heating and Cooling	Heating and Cooling Mechanic training - S2 License	Continuing Training	Yes
	Heating System	Heating 1 Steam System training	Continuing Training	Yes
	Heating System	Heating System 2 Hydronics system training	Continuing Training	Yes
	Gas Heating	Gas Heating system training	Continuing Training	Yes
ENTECH				
	HVACR, Propane, BPI	Entech Advanced Energy Training is a state-certified, private, non-profit, technical school affiliated with CEMA (Connecticut Energy Marketers Association). Programs include HVACR, Propane, CDL Driving and BPI Building Analysis training.	Certificate	Yes
Independent Electrical Contractors of New England				
	Electrical Training	Continuing training for electricians	Apprenticeships	Yes
Industrial Management and Training Institute				
	Solar, HVAC, Electrical, Electronic System, and Plumbing	IMTI has been successfully training electricians, plumbers, and HVAC technicians in current technologies and career-oriented job skills. Curriculum for all IMTI programs focuses on classroom study and practical hands-on industry skill training. Solar system technician and installer	CEU credit bearing, certification and continuing training	Yes

Institute of Environmental Management Technology				
	BPI, Weatherization and OSHA classes	The Institute of Environmental Management and Technology, Inc. (IEMT) is an approved Building Performance Institute Test Center. We offer BPI Building Analyst, Envelope Professional, proctor exams, and a wide range of other courses approved for BPI Continuing Education Units. We have alternative energy, infrared thermography and weatherization classes along with training in lead and asbestos remediation. IEMT also has OSHA authorized instructors for the 10 and 30 Hour Construction and General Industry Outreach Programs and teaches the 40 hour Hazwoper class.	Certifications	As required
Porter and Chester				
	Electrician Certificate	Our electrician program will help you take the first steps toward becoming an electrician. Provides student with a foundation of basic electrical theory and the technical skills you'll need to work in residential, commercial and industry settings.	Certificate	Yes
	Electronic Certificate	Students acquire the skills needed to install, maintain and troubleshoot a whole range of the low voltage systems used in homes, businesses, hospitals and corporations all across the country.	Certificate	Yes
	HVCR Certificate	Students acquire skills in heating, ventilation, air conditioning and refrigeration to install, maintain and troubleshoot HVACR units in residential, commercial and industrial settings.	Certificate	Yes
Connecticut Business and Industry Association				
	Academic Enhancement	High school enrichment and teacher educational programs	High School	As required

Baran Institute of Technology				
	Electrician Certificate	Introduces students to electrical application, skills and theory. Graduates are entry level apprentices	Certificate	As required
	HVAC/R Technology program	Electrical, plumbing and troubleshooting commercial and domestic heating and refrigeration/cooling units	Certificate	As required
Lincoln Technical Institute				
	Energy Technology	Electrical and renewable energy technology	Certificate	Yes
	Air Conditioning, Refrigeration and Heating	Air conditioning, refrigeration and heating technology training	Certificate	Yes
American Job Center, DOL and Workforce Board Training in construction trades including carpentry, Green occupations, solar, electrical, building insulation, weatherization, gas, welding and basic entry level construction trades.		(This includes workforce board partners such as EastConn and CREC.		
Eastern Connecticut Workforce Board	Green Jobs	Green job incumbent worker training	Certificate and continuing training	As required
Northwestern Regional Workforce Investment Board	Building Performance	Building performance institute training	Certificate and continuing training	As required
Capital Workforce Partners	Green Jobs	Multiple funnel sessions for green jobs including welding and gas installation	Certificate and continuing training	As required
City of New Haven Construction Workforce Initiative	Construction Skills	Basic construction skill education	Certificate and continuing training	As required
The Workplace, Inc.				

	Green-up Bridgeport	Brownfield clean-up	Certificate and continuing training	As required
	Weatherization Training Program	The Weatherization Training Program provides career counseling and training in basic weatherization installer, energy auditor, envelope professional and advanced Building Performance Institute certified courses including multi- family.	Certificate and continuing training	As required
	Building Efficiency	“Green Jobs”, those focused on energy efficiency and renewable energy, include weatherization, energy audits, Smart Grid	Certificate and continuing training	As required

Industry Overview

CT Energy Sector in Connecticut

Capital Workforce Partners



One Union Place
Hartford, Connecticut
06103

860.522.1111

Parameters

Industries

64 items selected. See Appendix A for details.

Regions

Code	Description
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9	Connecticut
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Timeframe

2013 - 2018

Datarun

2014.4 – QCEW Employees, Non-QCEW Employees, and Self-Employed

Industry Summary for CT Energy Sector

70,538

Jobs (2014)

7% **below** National average

+3.2%

% Change (2013-2018)

Nation: **+6.9%**

\$81,180

Avg. Earnings Per Job (2014)

Nation: \$77,075

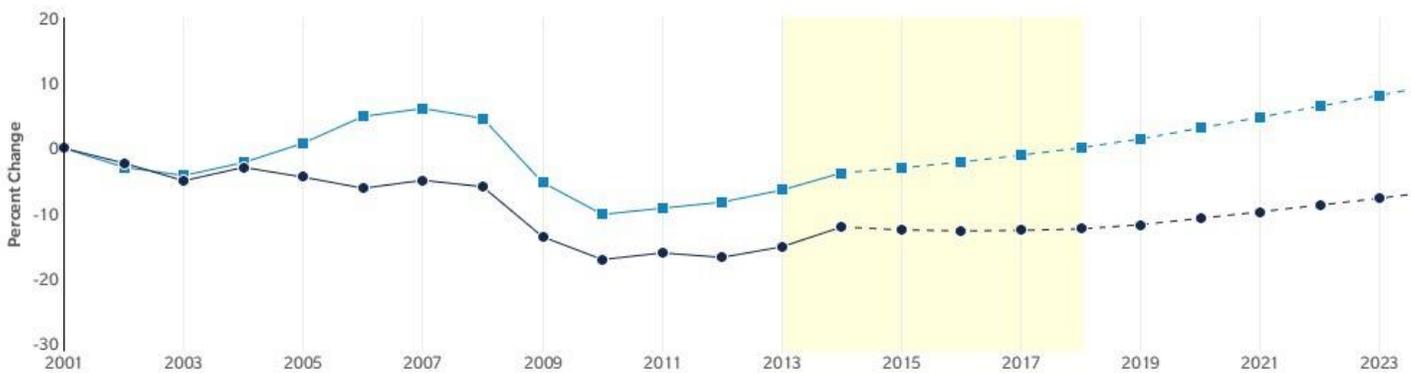
Industry Detail

Establishments (2014) 5599

Jobs Multiplier 2.72

Unemployed (11/2014) Only Available for 2-Digit

Regional Trends

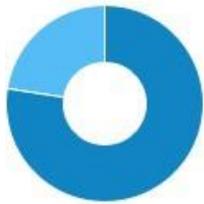


Region	2013 Jobs	2018 Jobs	% Change
A Region	68,090	70,296	3.2%
B United States	6,130,843	6,556,821	6.9%

Occupations Employed by these Industries

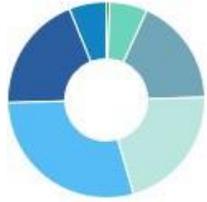
Description	Employed in Industry Group (2014)	% of Total Jobs in Industry Group (2014)
General and Operations Managers	2,229	3.2%
Carpenters	2,675	3.8%
Construction Laborers	2,335	3.3%
Plumbers, Pipefitters, and Steamfitters	3,097	4.4%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2,798	4.0%

Industry Gender Breakdown



Gender	2014 Jobs	2014 Jobs Percent
A Males	54,617	77.4%
A Females	15,921	22.6%

Industry Age Breakdown



Age	2014 Jobs	2014 Percent
A 14-18	406	0.6%
A 19-24	4,378	6.2%
A 25-34	12,552	17.8%
A 35-44	14,792	21.0%
A 45-54	20,440	29.0%
A 55-64	13,656	19.4%
A 65+	4,313	6.1%

Industry Race/Ethnicity Breakdown



Race/Ethnicity	2014 Jobs	2014 Percent
A White (Not Hispanic or Latino)	58,930	83.5%
A Hispanic or Latino (All Races)	5,962	8.5%
A Black or African American (Not Hispanic or Latino)	3,312	4.7%
A Asian (Not Hispanic or Latino)	1,871	2.7%
A Two or More Races (Not Hispanic or Latino)	360	0.5%
A American Indian or Alaska Native (Not Hispanic or Latino)	69	0.1%
A Native Hawaiian or Other Pacific Islander (Not Hispanic or Latino)	34	0.0%

Industry Requirements

Industry	Amount	In-Region	Out of Region
Copper Rolling, Drawing, Extruding, and Alloying	\$277,824,196	59.3%	40.7%
Petroleum Refineries	\$258,291,130	0.0%	100.0%
Nonferrous Metal (except Aluminum) Smelting and Refining	\$249,320,887	3.7%	96.3%

Corporate, Subsidiary, and Regional Managing Offices	\$212,797,882	55.6%	44.4%
Engineering Services	\$131,014,478	57.3%	42.7%

Top Regional Businesses

Business Name	Industry	Local Employees
Legrand-wiremold	All Other Miscellaneous Electrical Equipment and Component Manufacturing (335999)	900
Omega Engineering, Inc.	Engineering Services (541330)	800

Dresser Instrument Division	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use (334512)	750
Ofs	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding (331491)	700
Sempra Energy Trading Corp.	Plumbing, Heating, and Air-Conditioning Contractors (238220)	650

Source: Equifax Business-Level Data

DISCLAIMER: Business Data by Equifax is third-party data provided by EMSI to its customers as a convenience, and EMSI does not endorse or warrant its accuracy or consistency with other published EMSI data.

Appendix A - Industries

Code	Description
221111	Hydroelectric Power Generation
221112	Fossil Fuel Electric Power Generation
221113	Nuclear Electric Power Generation
221114	Solar Electric Power Generation
221115	Wind Electric Power Generation
221116	Geothermal Electric Power Generation
221117	Biomass Electric Power Generation
221118	Other Electric Power Generation
221330	Steam and Air-Conditioning Supply
236220	Commercial and Institutional Building Construction
237110	Water and Sewer Line and Related Structures Construction
237120	Oil and Gas Pipeline and Related Structures Construction
237130	Power and Communication Line and Related Structures Construction
238160	Roofing Contractors

238220	Plumbing, Heating, and Air-Conditioning Contractors
238290	Other Building Equipment Contractors
238310	Drywall and Insulation Contractors
238390	Other Building Finishing Contractors
314999	All Other Miscellaneous Textile Product Mills
321918	Other Millwork (including Flooring)
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
327993	Mineral Wool Manufacturing
331318	Other Aluminum Rolling, Drawing, and Extruding
331420	Copper Rolling, Drawing, Extruding, and Alloying
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding
332321	Metal Window and Door Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
334413	Semiconductor and Related Device Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334514	Totalizing Fluid Meter and Counting Device Manufacturing
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334519	Other Measuring and Controlling Device Manufacturing
335121	Residential Electric Lighting Fixture Manufacturing

335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335210	Small Electrical Appliance Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers
423730	Warm Air Heating and Air-Conditioning Equipment and Supplies Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
424710	Petroleum Bulk Stations and Terminals
424720	Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
454310	Fuel Dealers
486110	Pipeline Transportation of Crude Oil
486990	All Other Pipeline Transportation
541330	Engineering Services
541350	Building Inspection Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541690	Other Scientific and Technical Consulting Services
561790	Other Services to Buildings and Dwellings
562213	Solid Waste Combustors and Incinerators
562910	Remediation Services
624229	Other Community Housing Services

Appendix B - Data Sources and Calculations

Industry Data

EMSI industry data have various sources depending on the class of worker. (1) For QCEW Employees, EMSI primarily uses the QCEW (Quarterly Census of Employment and Wages), with supplemental estimates from County Business Patterns and Current Employment Statistics. (2) Non-QCEW employees data are based on a number of sources including QCEW, Current Employment Statistics, County Business Patterns, BEA State and Local Personal Income reports, the National Industry-Occupation Employment Matrix (NIOEM), the American Community Survey, and Railroad Retirement Board statistics. (3) Self-Employed and Extended Proprietor classes of worker data are primarily based on the American Community Survey, Nonemployer Statistics, and BEA State and Local Personal Income Reports. Projections for QCEW and Non-QCEW Employees are informed by NIOEM and long-term industry projections published by individual states.

State Data Sources

This report uses state data from the following agencies: Connecticut did not provide us with a data source

Input-Output Data

The input-output model in this report is EMSI's gravitational flows multi-regional social account matrix model (MR-SAM). It is based on data from the Census Bureau's Current Population Survey and American Community Survey; as well as the Bureau of Economic Analysis' National Income and Product Accounts, Input-Output Make and Use Tables, and Gross State Product data. In addition, several EMSI in-house data sets are used, as well as data from Oak Ridge National Labs on the cost of transportation between counties.

Staffing Patterns Data

The staffing pattern data in this report are compiled from several sources using a specialized process. For QCEW and Non-QCEW Employees classes of worker, sources include Occupational Employment Statistics, the National Industry-Occupation Employment Matrix, and the American Community Survey. For the Self-Employed and Extended Proprietors classes of worker, the primary source is the American Community Survey, with a small amount of information from Occupational Employment Statistics.

Equifax Business-Level Data

Data for individual businesses is provided by Equifax (<http://www.equifax.com/commercial/>), which maintains a database of more than 20 million U.S. business entities. Note that in aggregate it will not be consistent with EMSI labor market data due to differences in definitions, methodology, coverage, and industry/geographic classification.

Industry Overview

CT Energy Sector in Connecticut

Date: May 9, 2015

From: Patrick Flaherty

Re: Energy Sector Employment & Hiring

I was asked to look at the employment levels in the NAICS codes identified in the Capital Workforce Partners' "Industry Overview" based on emsi data. The Appendix to this report contained a list of industries. Overall, the report said there were 70,538 jobs in the energy sector. My calculations are 63,118 based on the Quarterly Census of Employment and Wages (QCEW). However, QCEW does not include the Self-Employed but only employment that is covered by the Unemployment Insurance system. The emsi data includes Non-QCEW Employees and the Self-Employed.

I have also included some charts at the end of this memo regarding hiring.

There were a few industries with ZERO employment in Connecticut according to our Quarterly Census of Employment and Wages (QCEW).

Industries with Zero Connecticut Employment

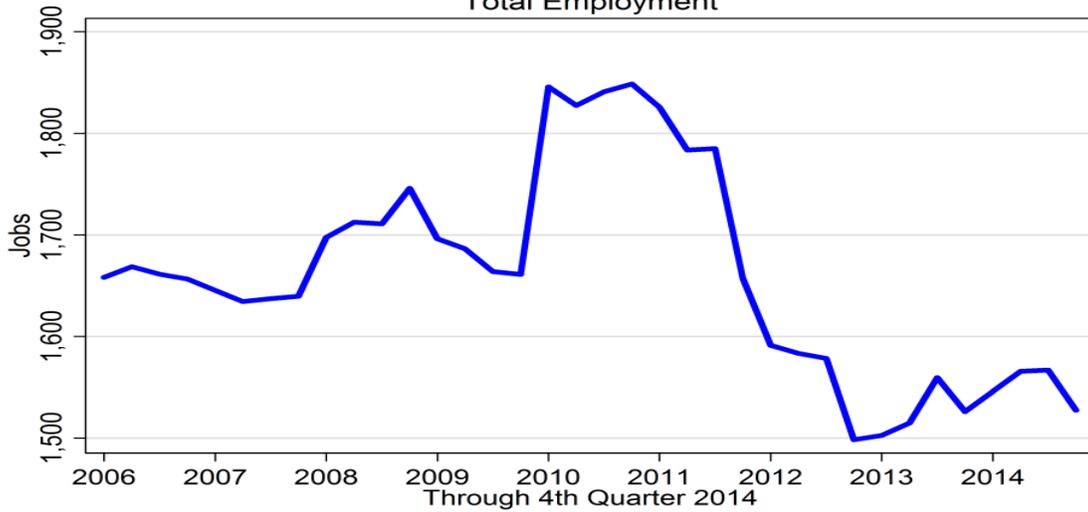
221116	Geothermal Electric Power Generation
221117	Biomass Electric Power Generation
221118	Other Electric Power Generation
486110	Pipeline Transportation of Crude Oil
486990	All Other Pipeline Transportation

For the other NAICS codes I added employment by sector so we could see trends. I have produced a summary table series of charts which are below.

SECTOR	2014	Change 2010 to 2014
Total - All Sectors	1,653,517	57,742
ENERGY		
Utilities	1,552	-289
Construction	22,914	2,900
Manufacturing	14,261	-151
Wholesale Trade	6,435	47

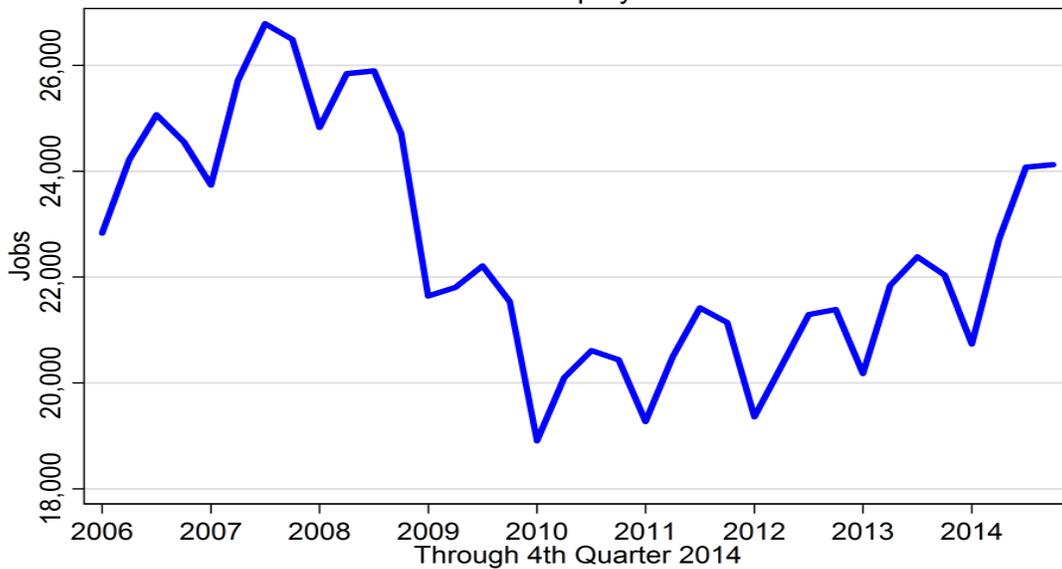
Retail Trade	4,354	-58
Prof., Scientific & Tech. Services	10,048	1,541
Administrative & Support Svcs.	3,184	423
Health Care & Social Assistance	369	9
Total ENERGY	63,118	4,420

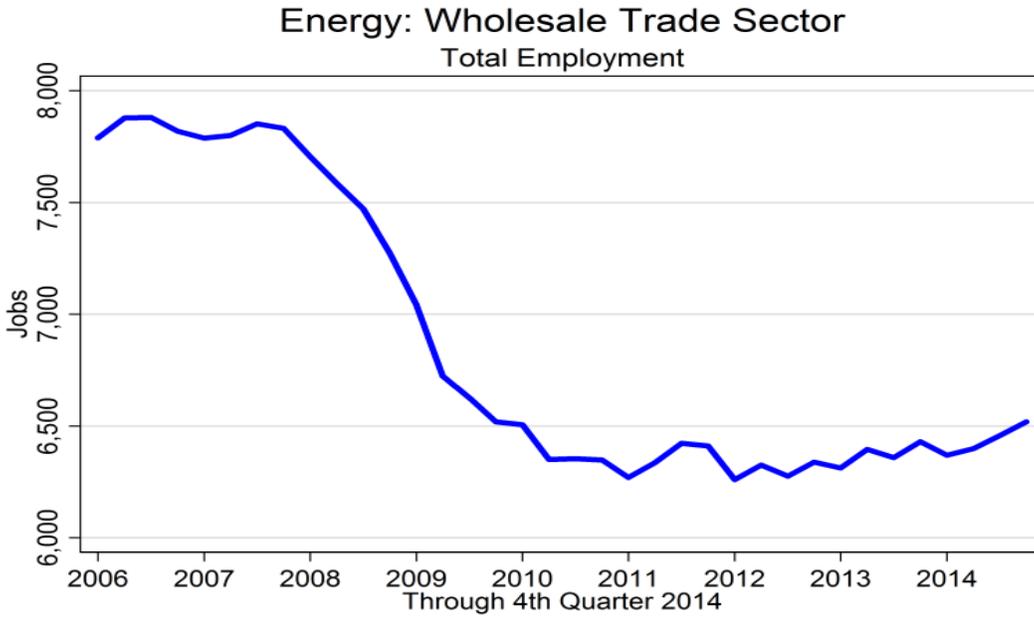
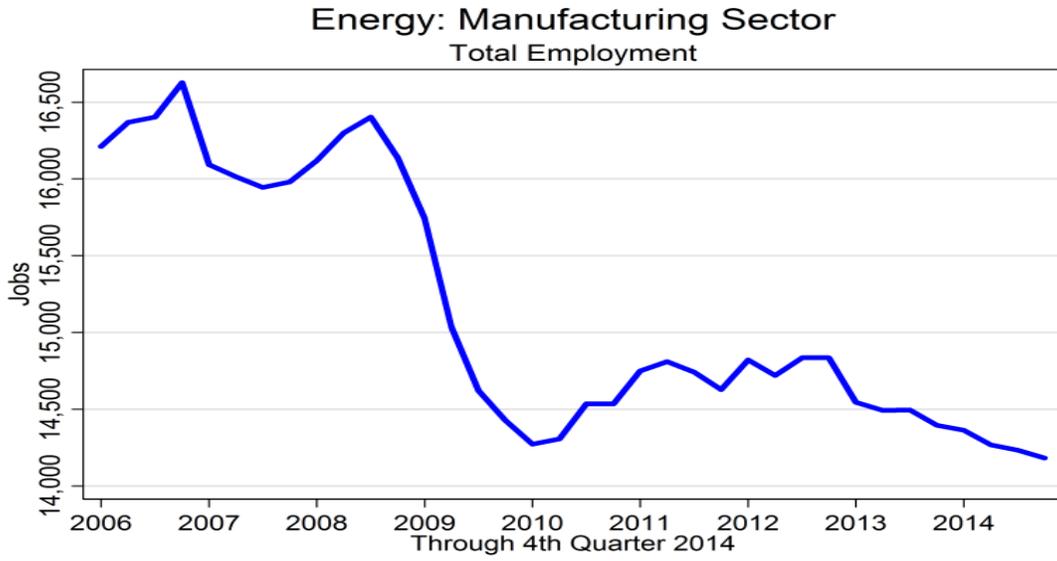
Energy: Utilities Sector
Total Employment



Note: the construction industries identified will include companies that do work that is not directly related to energy. This will be true of other sectors as well.

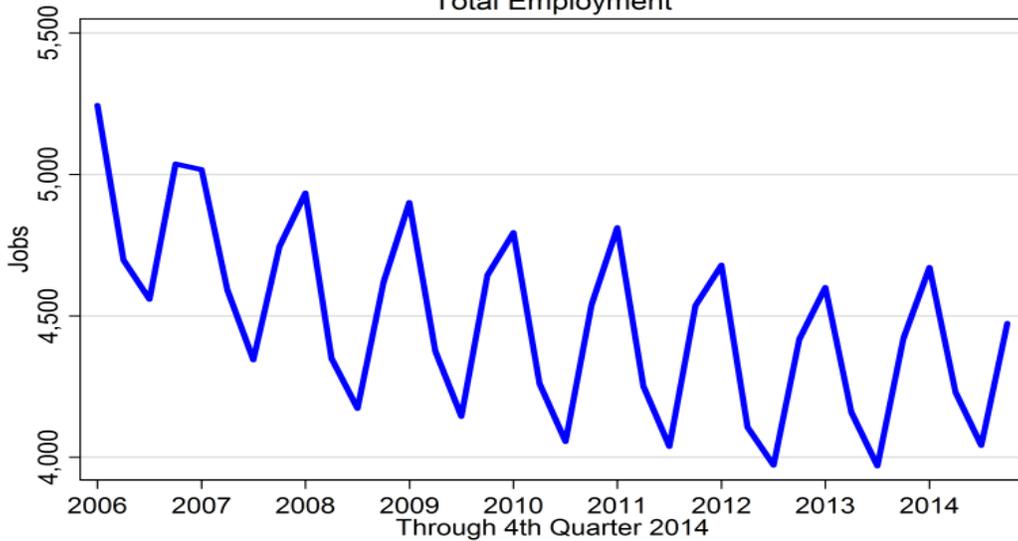
Energy: Construction Sector
Total Employment





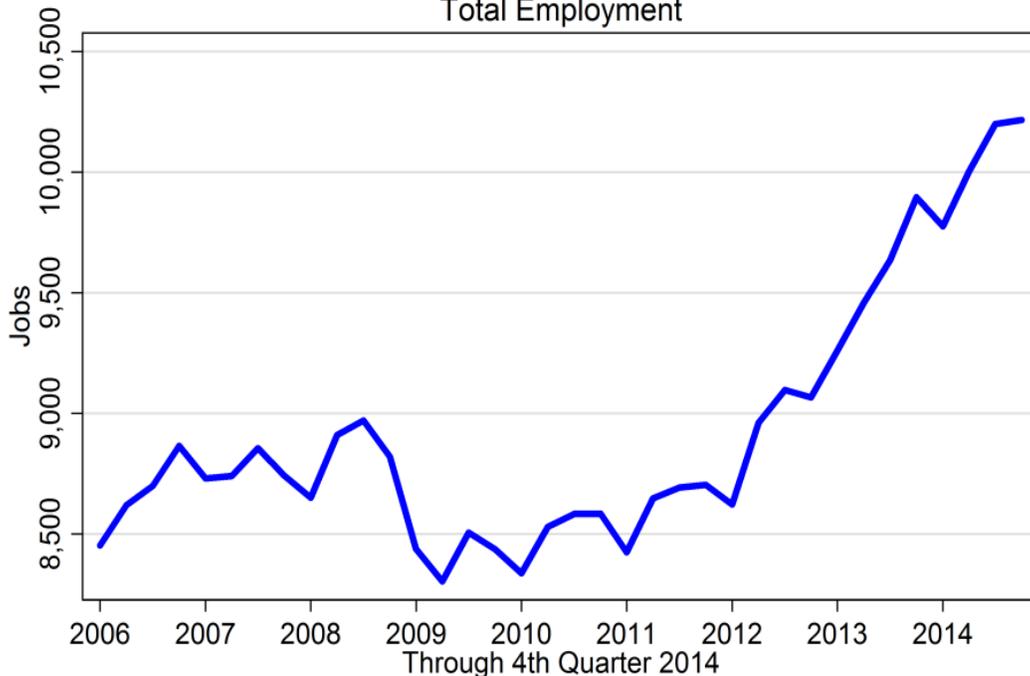
There is only one industry in the Retail Trade Sector, and that is fuel dealers, a highly seasonal industry.

Energy: Retail Trade Sector
Total Employment

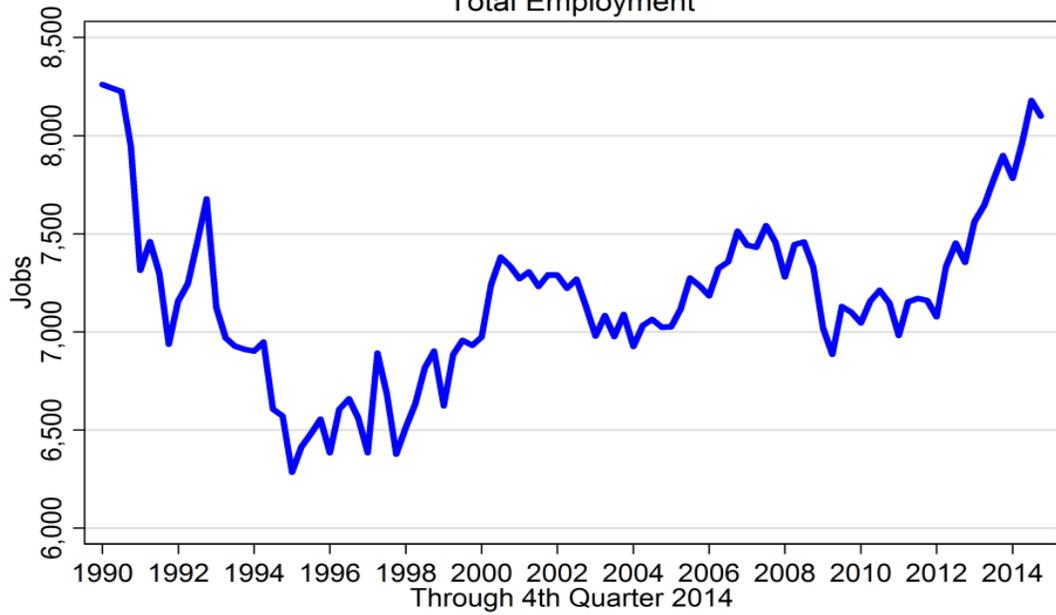


Because Professional, Scientific and Technical Services have shown such strong growth and because they often contain high-paying jobs which require considerable skills and education, I also produced charts for the individual components revealing that this growth is being driven by engineering services. (Note the individual industries show a longer timeframe. Also note that the up and down in inspection services, while it looks dramatic on the chart, is only 25 jobs.

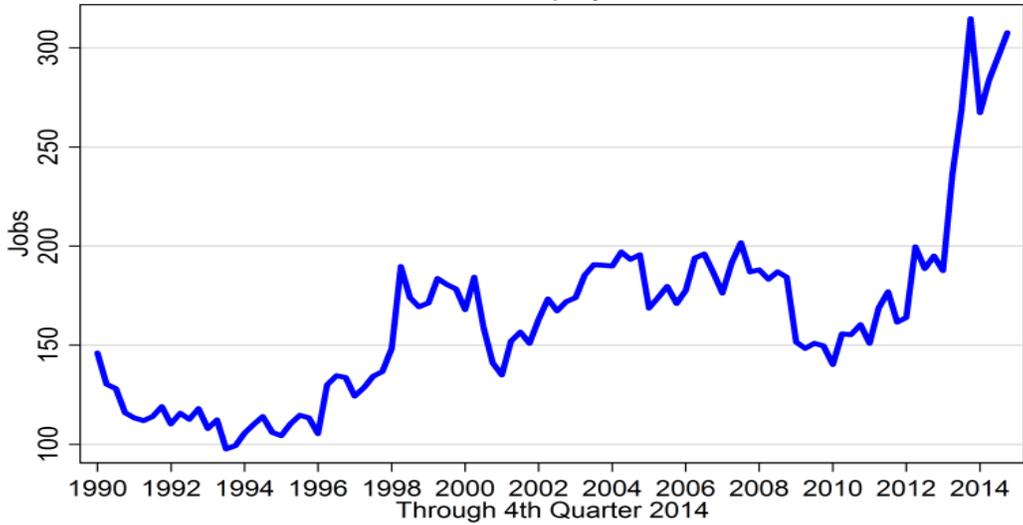
Energy: Professional, Scientific,
and Technical Services Sector
Total Employment



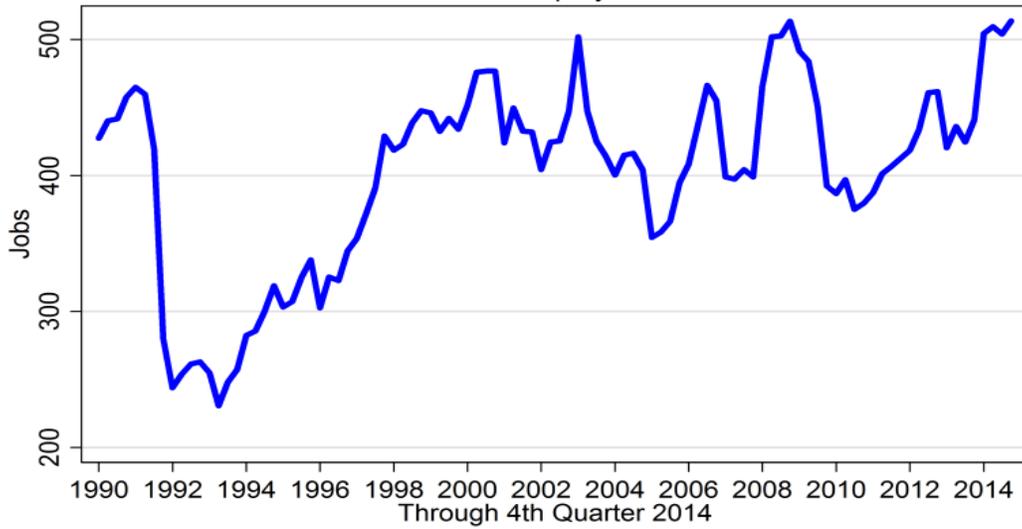
Engineering Services
Total Employment



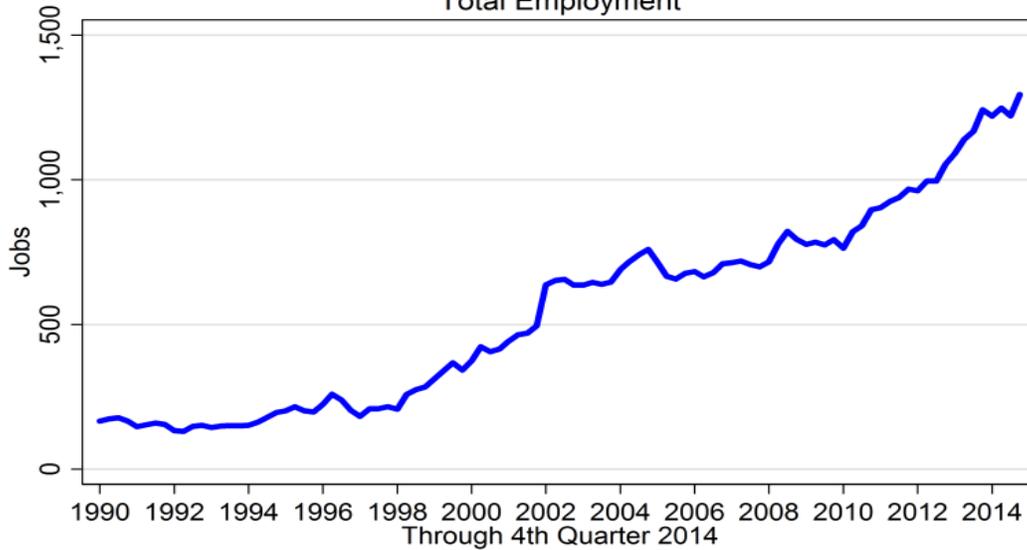
Building Inspection Services
Total Employment



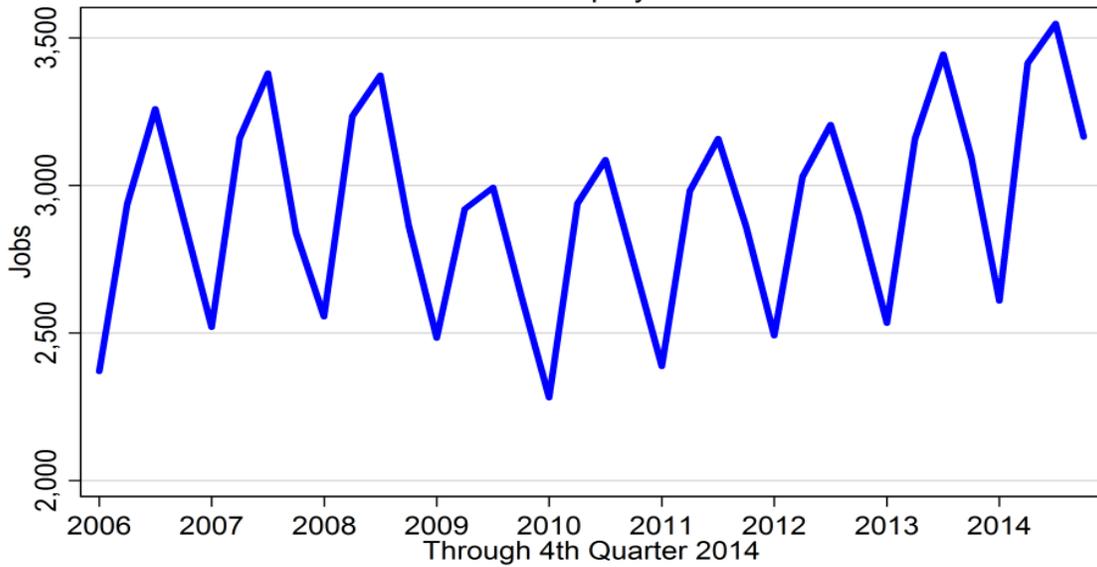
Process, Physical Distribution
and Logistics Consulting Services
Total Employment



Other Scientific and Technical Consulting Services
and Logistics Consulting Services
Total Employment

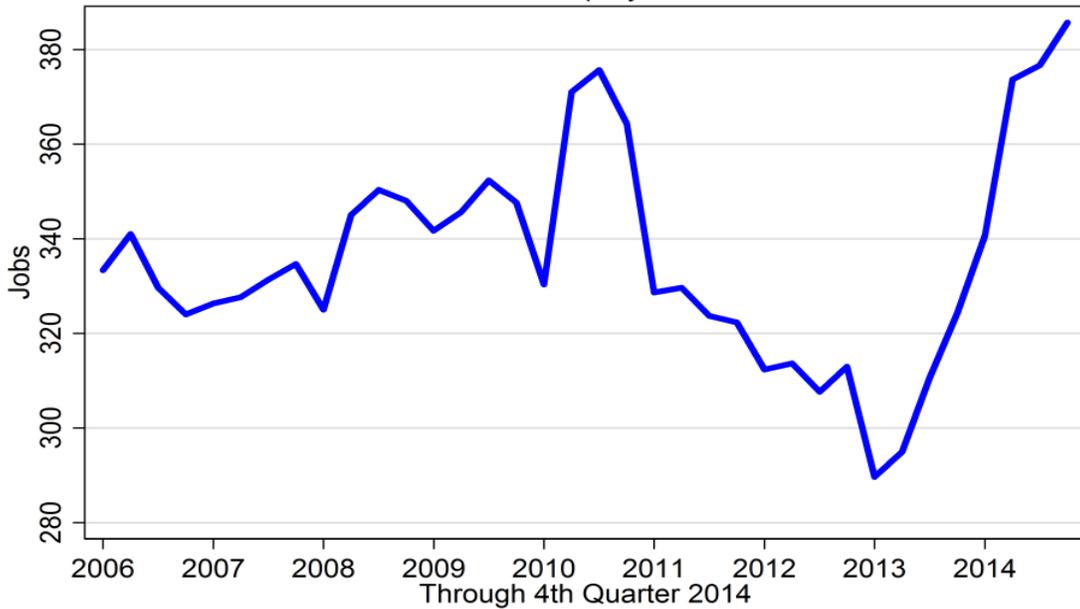


Energy: Administrative and Support
and Waste Management and Remediation Services Sector
Total Employment



There is only one industry in the Health Care & Social Assistance Sector, and that’s “Other Community Housing Services”. It’s only a few hundred jobs.

Energy: Health Care and Social Assistance Sector
Total Employment



Data on hiring comes from the Quarterly Workforce Indicators (QWI). Data is only available down to the 4 digit

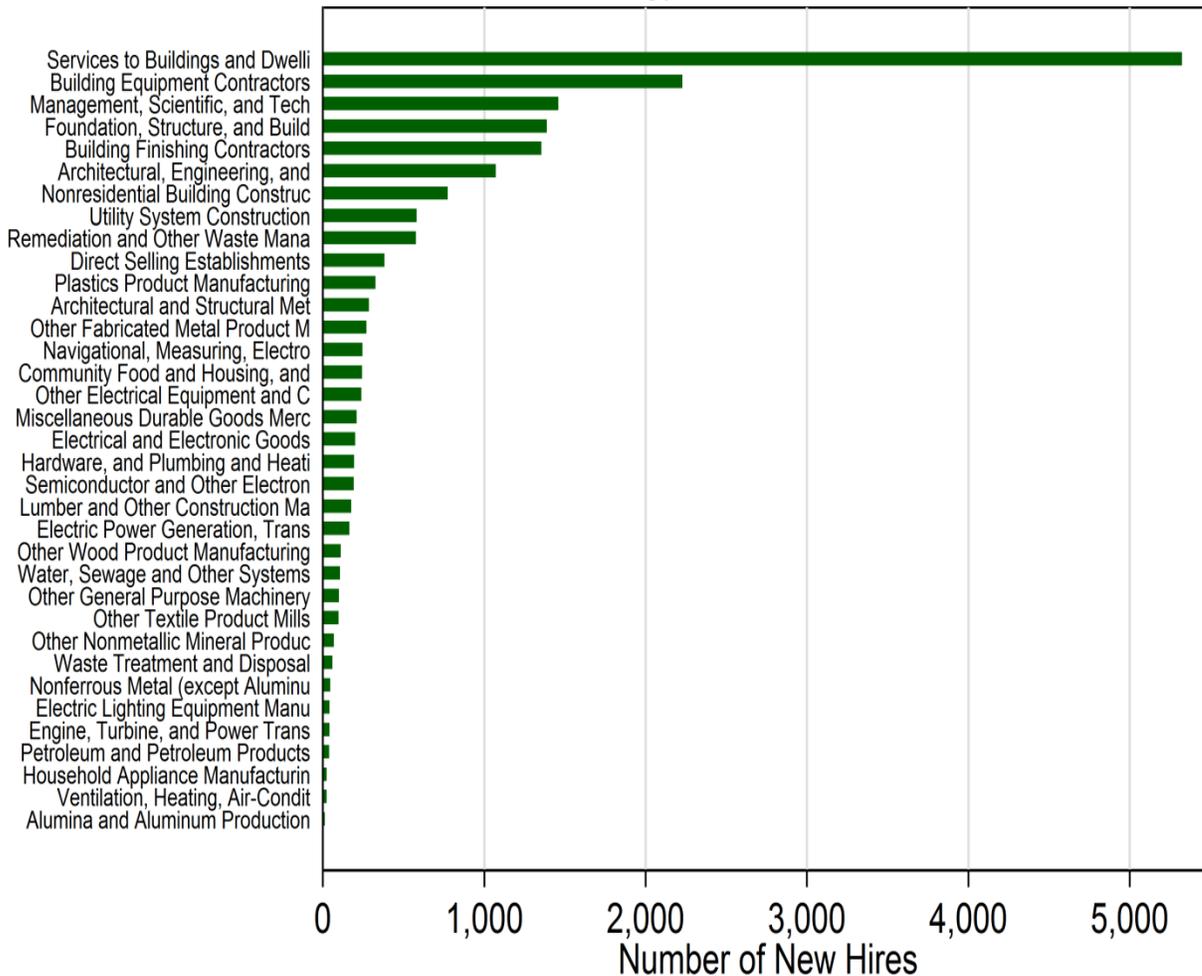
level, so I looked at all the 4-digit industries that contained at least one of the 6-digit industries we've been discussing.

“Hires” means someone had a job in one quarter and did not have a job with the same employer in the previous quarter. Most new hires are not newly created jobs but replacement of workers who left the company for retirement or a job someplace else.

“Stable Hires” means that the person was hired and kept the job at least one calendar quarter. This eliminates a lot of temporary and seasonal hires.

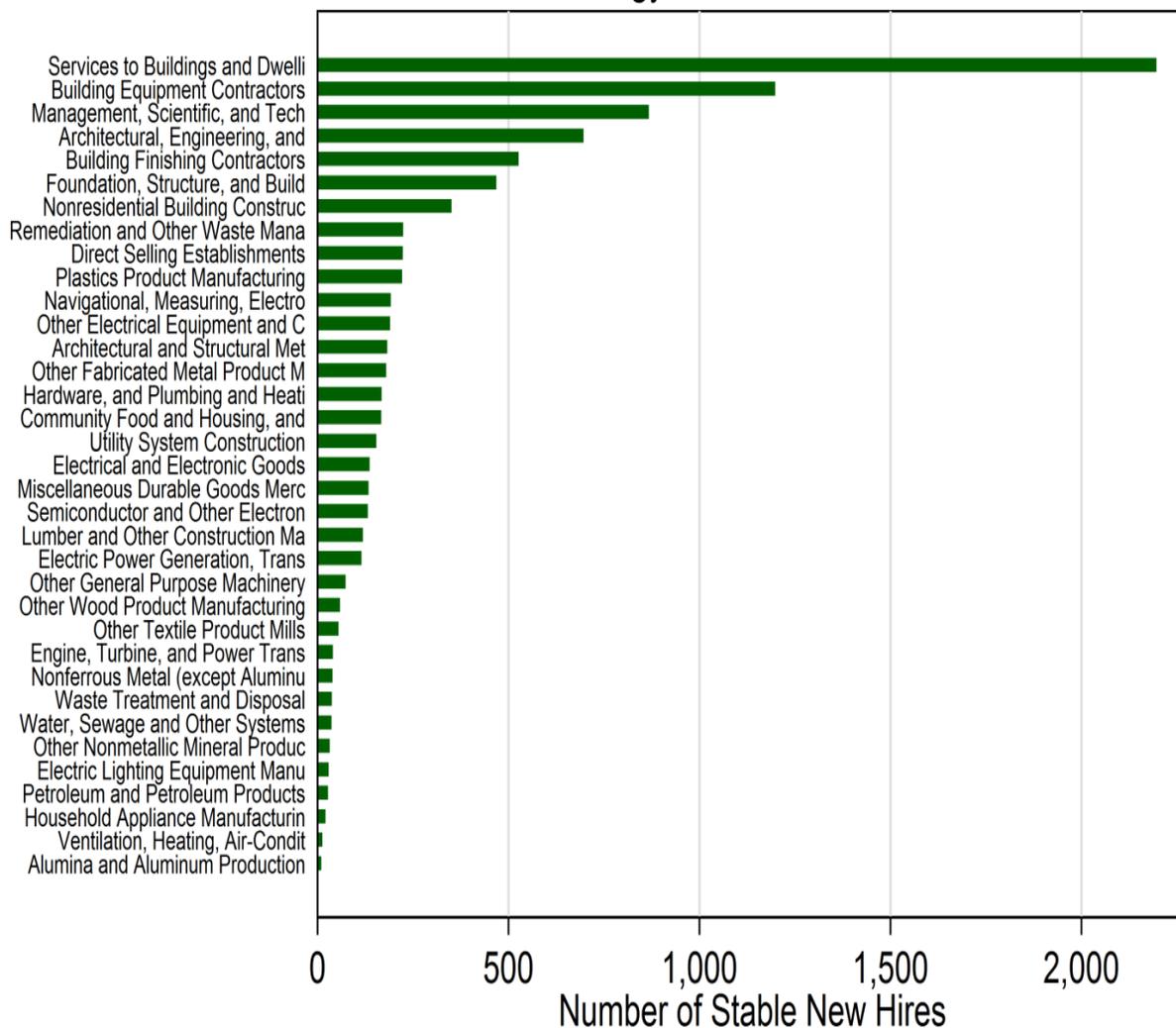
The numbers in the charts are average number of hires per quarter for the most recent year for which we have data (year ending 2Q 2014 for hires and 1Q 2014 for stable hires).

Hirings Per Quarter Energy Related Industries



Stable Hirings Per Quarter

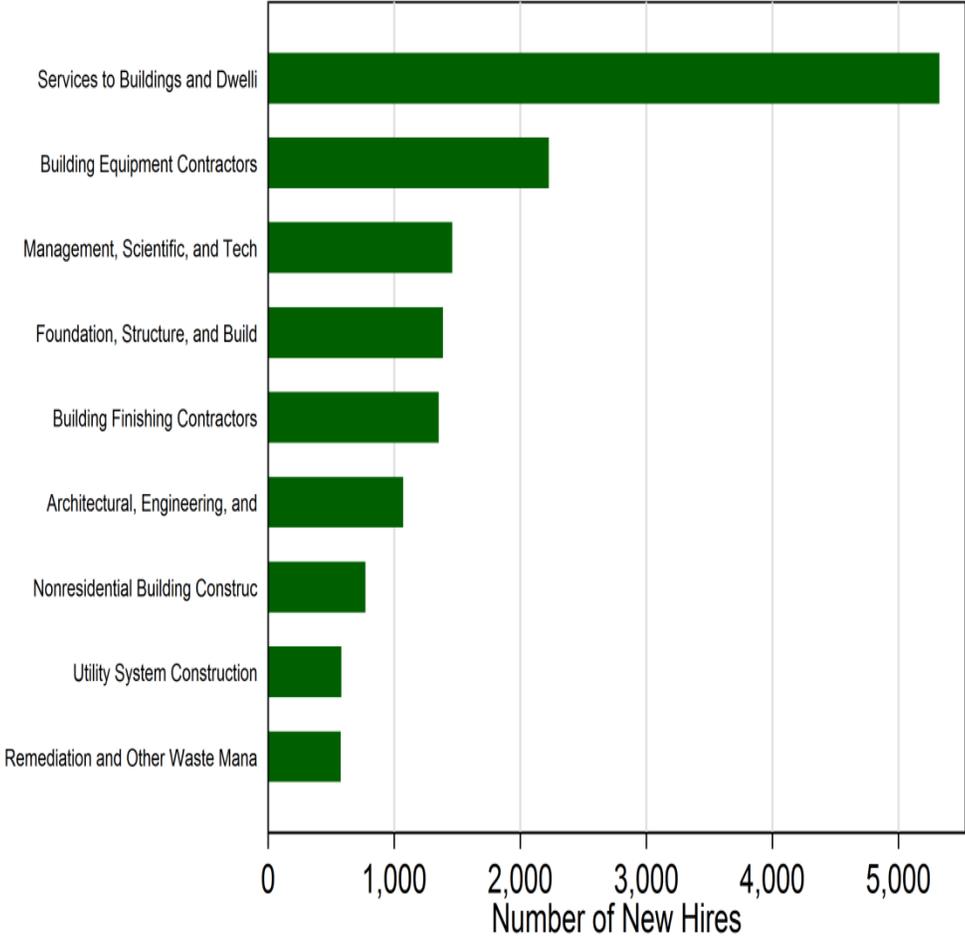
Energy Related Industries



Just to make it easier to see what's going on, I broke up the charts above in to industries with lots of hiring and those with a smaller number of hires. Note there is a comparable data for separations which we could look at if there's interest.

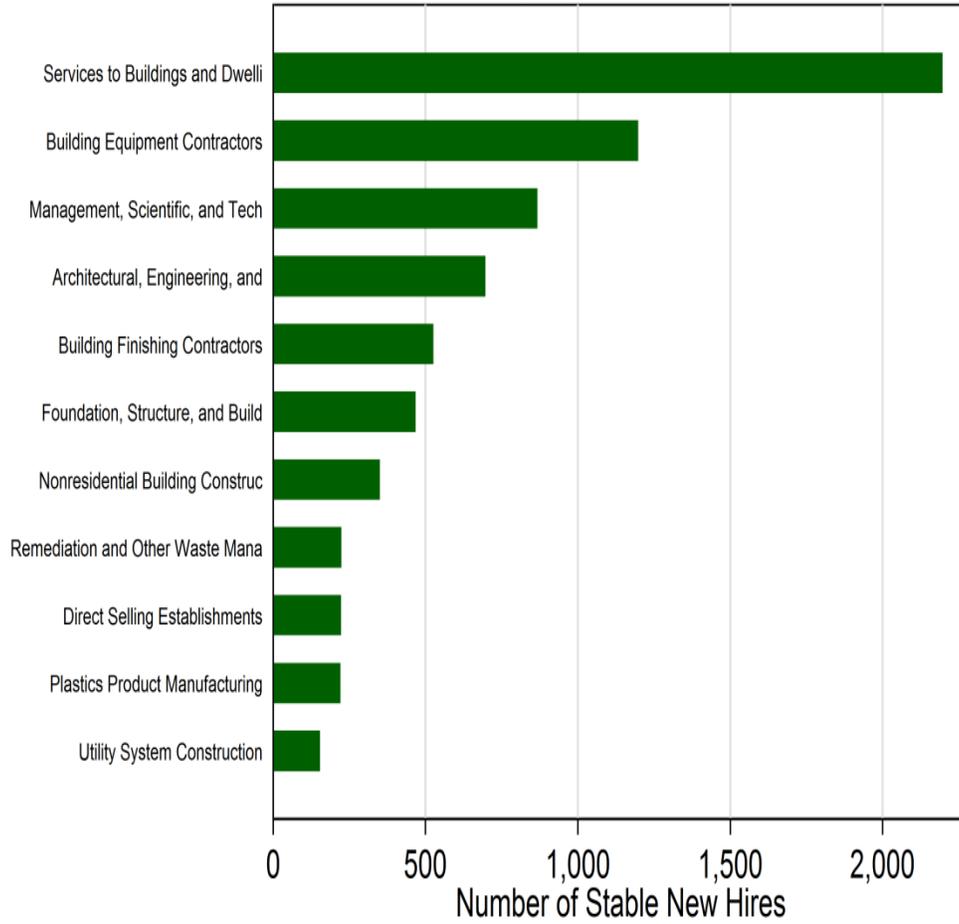
Hirings Per Quarter

Energy Related Industries



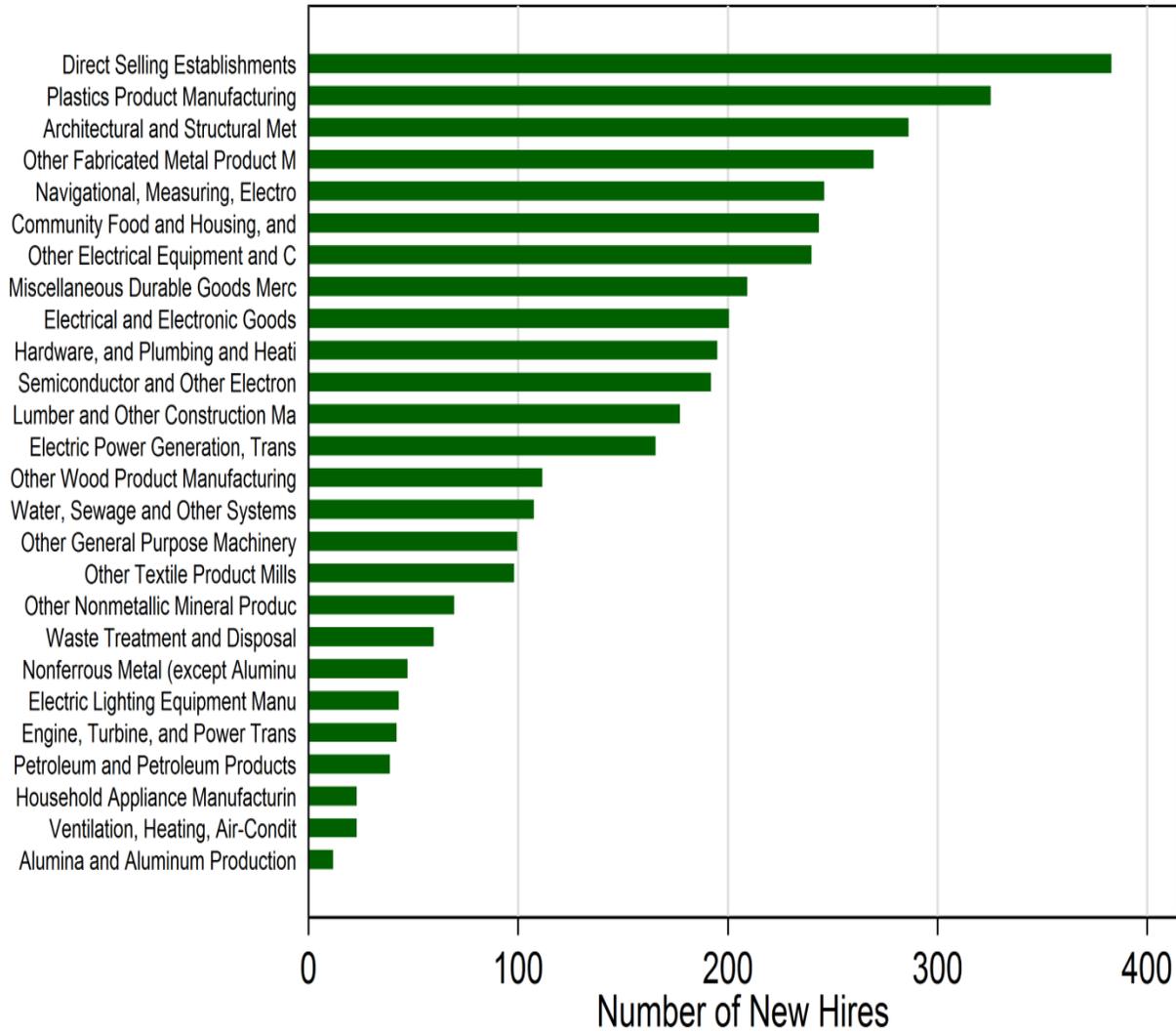
Stable Hirings Per Quarter

Energy Related Industries



Hirings Per Quarter

Energy Related Industries



Stable Hirings Per Quarter Energy Related Industries

