

# **Connecticut Green Jobs Workforce**

## **Report and Recommendations**

Prepared by Regional Plan Association  
For Connecticut's Green Job Partnership

August 2012

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## Executive Summary

Regional Plan Association has prepared this report for the Connecticut Department of Labor, Office of Workforce Competitiveness and the Connecticut Employment and Training Commission's Green Jobs Partnership committee to assess the green jobs landscape in Connecticut and propose recommendations to develop a skilled workforce to meet anticipated job demands.

The study's goals were to measure existing and projected green employment in Connecticut, to survey current incentives and policies in place that impact the growth of green employment, to assess available education and training opportunities as they relate to expected growth in green occupations, and to identify where gaps exist between education and training and potential growth.. We assessed existing and projected green employment using resources developed by the U.S. Bureau of Labor Statistics (BLS) and Connecticut Department of Labor (DOL). Incentive programs and/or policies potentially influencing green employment were also identified for six categories of activity: renewable energy, energy efficiency, other greenhouse gas reduction strategies, reducing pollutants, reducing waste, and conserving natural resources.

Because state policies, programs, and market conditions are ever-changing, their influence on employment growth should be re-examined on an annual basis. A few areas that may soon see either expanded state support or market-based growth include waste management, energy efficiency, infrastructure supporting electric vehicles, and conversion of oil-and coal-burning facilities to less-expensive natural gas fuel. Future analyses of green employment in Connecticut must examine these trends and look to identify additional factors on the horizon. Industry leadership, involvement, and guidance- as is present within the Green Jobs Partnership- is also critical in identifying and initiating needed training programs.

In 2010, there were **39,207** green jobs in Connecticut, projected to grow to **41,171** by 2018 based on BLS and DOL data-- which does not include direct consideration of current policies and incentives also impacting green employment. These jobs are in 118 unique green job occupations that over all the industrial sectors represent 1,738 specific occupations. A profile of educational and experience requirements for green employment in 2018 reveals that most will require significant amounts of education or training. One quarter of jobs will require Associate degrees or higher, and 34% of green jobs will require moderate or long-term on-the-job training. Only 29% of jobs can be filled through vocational training or short-term on-the-job training, compared to 40% of the state's overall employment at this skill level.

Based on the profile of existing and projected green employment, it is recommended that state agencies and partners:

- Enhance workforce and training policies to support green jobs targeted to moderate and long-term on-the-job training and postsecondary vocational training;
- Build on existing partnerships with businesses to promote greening of occupations and increasing green jobs employment;
- Target industries such as Transportation and warehousing, Public administration, Manufacturing, Administrative and waste services, Professional services and Construction that make 87% of the expected green jobs in the State by 2018; and
- Continue to follow and integrate efforts by the federal government to define and quantify green jobs.

State programs and policies incentivizing the development of several green sectors will push growth in several areas beyond what is currently projected. Employment in **Renewable Energy** will grow due to demand for in-state and regionally-produced renewable energy that will come from several state programs and mandates. The ZREC/LREC program will invest over \$1 billion to develop renewable generation capacity in the next six years. More aggressive Renewable Portfolio Standards as well as Clean Energy Finance and Investment Authority programs that facilitate private investment in renewable generation and adoption will also increase demand for workers in renewable energy production and distribution.

- Training programs in renewable energy systems exist at three community colleges but demand may warrant expanding programs across the state, especially in high-demand areas.
- The state should also determine the capacity of the local workforce to supply the necessary carpentry and electrician workforce that contribute to construction of renewable energy facilities.

Funding for Connecticut's **Energy Efficiency** programs comes from a surcharge on utility bills. Energy audit and weatherization programs are managed by the Connecticut Energy Efficiency Fund and administered by individual utilities. Training programs exist within the state's technical high schools, in multiple community colleges, in Jobs Funnel programs throughout the state, and through apprenticeship programs run by labor unions.

- The 2012 Integrated Resource Plan recommends expanded investment and focus on energy efficiency due to its status as a highly cost-effective strategy for reducing utility costs. Further expansion of programs will increase the need for trained workers and training programs.
- Future investments may reach beyond weatherization to focus on enhancing operational efficiencies, which will require the expansion of programs such as Norwalk Community College's *Building Efficiency and Sustainable Technology*

certificate program and Three Rivers Community College's *Sustainable Facilities Management Certificate*.

**Greenhouse Gas Reduction** strategies not included in renewable energy and energy efficiency relate to increasing the efficiency of the transportation network and transitioning vehicles to cleaner fuels. Our analysis reveals few current programs to support these strategies, and few training programs to supply workers who can service electric vehicles.

- If the state increases its support of electric vehicle infrastructure and adoption, it should also develop training programs that help existing automotive technicians service new equipment.

In the category of **Reducing Pollutants**, Connecticut has developed a number of programs that support the assessment and remediation of contaminated brownfields. Employment in remediation occupations generally require Bachelor's or higher degrees which may be satisfied by current programs.

- A survey of the educational backgrounds of Licensed Environmental Professionals is recommended to determine whether education of these workers is being accomplished in-state.

Programs in **Reducing Operational Waste/Recycling** focus on greening existing operations through training of existing workers. Only two such programs exist in Connecticut, run by CONNSTEP and CCAT.

- This category potentially represents an untapped opportunity to expand incentive programs and training that currently focus on energy efficiency to include reductions in materials waste for economic and environmental gains. This category is also representative of an approach that could green processes across all industries through training of existing workers and policies that emphasize efficiency and environmental protection.

Jobs in **Conserving Natural Resources** are supported by policies that promote stormwater management, sustainable forestry and agriculture, and responsible management of sensitive lands.

- Current programs appear to be adequate to meet future employment needs, but career paths for advancement can encourage workers to pursue conservation occupations.
- Additional training programs may be needed if techniques such as green infrastructure are promoted for use across the state.

## Part 1. Defining and Estimating Green Jobs in Connecticut

### Green Jobs Definition

There is no standard definition of green jobs. A diverse number of studies report on different types of activities counted as green jobs and report different numbers of green jobs. Different reports have estimated their number for the whole state economy while others focus on estimating employment within specific industries or sectors. As seen in the following table, four key studies report on the number of green jobs in Connecticut are based on distinct definitions and methods for counting these jobs as either “bottom-up” studies through original surveys of employers, or as “top-down” through use of economic models:

Source	Method	Industrial Classification	Connecticut Employment
Bureau of Labor Statistics – 2012 “Employment in Green Goods and Services – 2010”	Bottom-up	Green Goods and Services	39,207
Brookings Institution - 2011 “Sizing the Clean Economy. A National and Regional Green Jobs Assessment”	Bottom-up	Green Goods and Services	29,751
CT Department of Economic and Community Development - 2009 “The Economic Impact of the Renewable Energy/Energy Efficiency Industry on the Connecticut Economy”	Top Down	Renewable Energy & Energy Efficiency	4,746
Navigant – 2009 “CT Renewable Energy / Energy Efficiency Economy Baseline Study”	Bottom-up	Renewable Energy & Energy Efficiency	4,544

Of these studies, the DECD and Navigant studies identified the number of green jobs in specific sectors of the economy. The emphasis in these studies is on renewable energy and energy efficiency. As such these studies are only defining green jobs as the ones associated with these two specific activities and give only a partial view of the jobs landscape. The BLS and Brookings studies measured green jobs for the economy as a whole.

This report bases its analysis on the Bureau of Labor Statistics (BLS) “Green Jobs Initiative<sup>1</sup>.” BLS uses two approaches to define and measure green jobs: (1) the output approach, which identifies establishments that produce green goods and services and

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<sup>1</sup> <http://www.bls.gov/green/>

counts the associated jobs, and (2) the process approach, which identifies establishments that use environmentally-friendly production processes and practices and counts the associated jobs. Each approach requires different measurement strategies and will tend to count different jobs, with some overlap in industries that produce green goods and services.

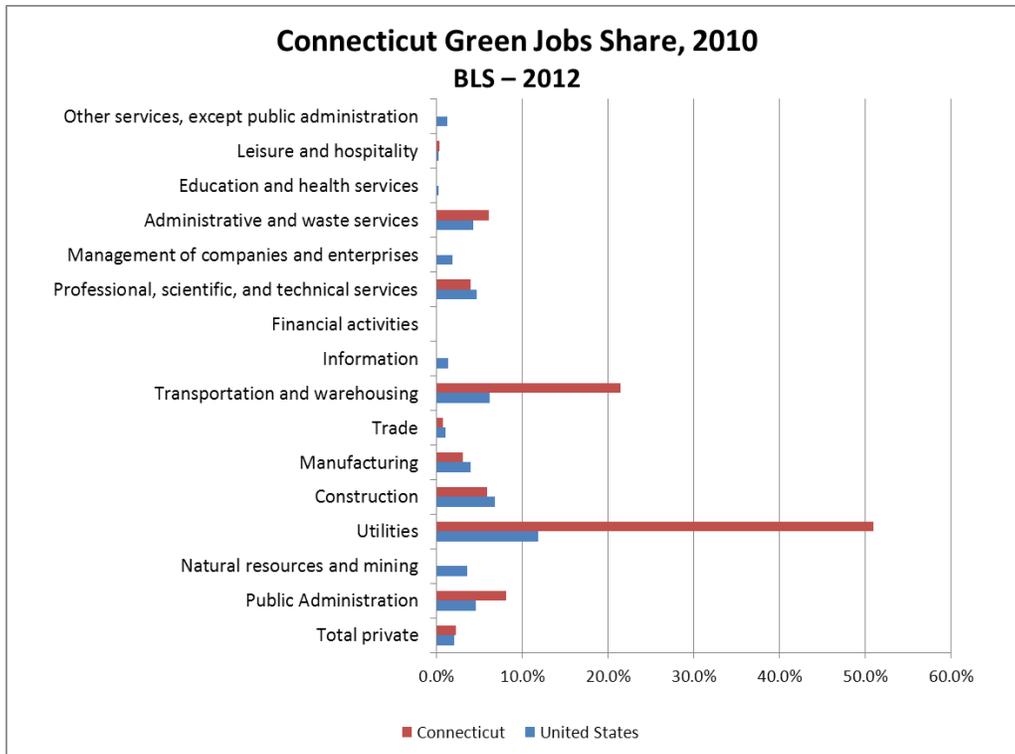
In the *output* approach to measuring green jobs, BLS is concerned with jobs related to producing a specific set of goods and services, and is not concerned with the environmental impact of the production process. In this report, we use the BLS output approach to estimate current and future green jobs in Connecticut.

The *process* approach of measuring green employment is intended to consider the “greening” aspect of occupations and jobs. In the process approach, BLS is concerned with whether the business uses practices or technologies that have a favorable impact on the environment, regardless of the ultimate good or service produced. The process approach is relevant within any industry. In this report, we use the BLS process approach to frame our analysis of incentives in Connecticut.

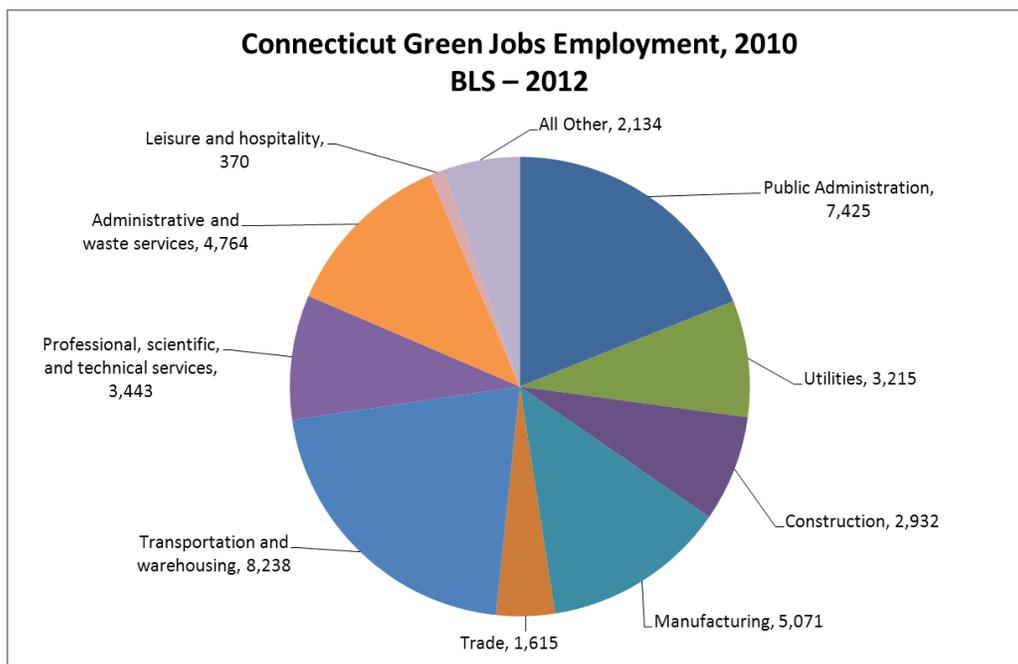
### Connecticut Green Jobs and Forecast Scenarios

The Bureau of Labor Statistics has compiled output employment data through the Green Goods and Services survey under the Quarterly Census of Employment and Wages (QCEW) program. The output survey samples approximately 120,000 business and government establishments nationwide within 333 industries that are identified as potentially producing green goods or providing green services. Sample businesses reported whether they produced green goods and services and the percentage of their revenue associated with that green output. The share of green revenue was then multiplied by their total employment to estimate the number of employees engaged in green goods and services work.

The following chart shows how this survey reports on the share of jobs associated with green goods and services output in Connecticut compared to the United States. (A definition of each sector can be found in Appendix A.) These shares report on the amount of revenue or employment associated with green jobs output, as mentioned above, and are self-reported by survey respondents:



As this data is self-reported, it should be interpreted with caution, but is nevertheless the best and most systematic data-set available for estimating green employment by industry. Applying these shares to industry employment within Connecticut, green employment in Connecticut shows the following composition:



The Green Goods and Services Survey suggests that Transportation and Warehousing; Public Administration; Manufacturing; Administrative and waste services; Professional, scientific, and technical services; Utilities; and Construction are the top sectors employing most workers as green jobs<sup>2</sup>. This depicts a diverse green jobs landscape that supports green goods and services in the State across a whole gamut of economic activities. The share of Green employment in Utilities in Connecticut is reported as 51%, far higher than the 12% national average. This is likely due to the presence of large numbers of jobs in nuclear energy that were reported as green.

Scenarios for future employment have been developed using ten-year industry employment forecasts developed by the State of Connecticut Department of Labor's Office of Research along with the BLS Green Goods and Services Survey shares to estimate future employment specifically within green activities<sup>3</sup>. Based on these baseline numbers, three scenarios for future employment have been developed using the BLS output data and the 2018 CT DOL jobs forecast for the State:

- **CT Share Scenario:** estimates green jobs in Connecticut based on the current Connecticut share of green jobs in the 2018 CT DOL projections by sector;
- **US Share Scenario:** estimates green jobs in Connecticut based on the current U.S. share of green jobs in the 2018 CT DOL projections by sector;
- **Preferred Scenario:** estimates green jobs in Connecticut based on the current Connecticut share of green jobs in the 2018 CT DOL projection for all sectors except Utilities, for which the U.S. share is used to prevent current employment figures in nuclear energy from skewing the future employment forecast in the Utilities sector.

The projections use the projected growth by sector identified in the DOL 2008-2018 forecast, and apply the share of jobs identified by the BLS green jobs survey for the US and CT resulting in three green job scenarios for the State. Thus, inputs for this scenario analysis include the BLS output employment baseline for Connecticut, the State and US shares and the CT DOL forecast as follows:

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<sup>2</sup> ACCEF 2009 study identified the fuel cell industry as accountable for 71% of renewable jobs and 72% of renewable employment income.

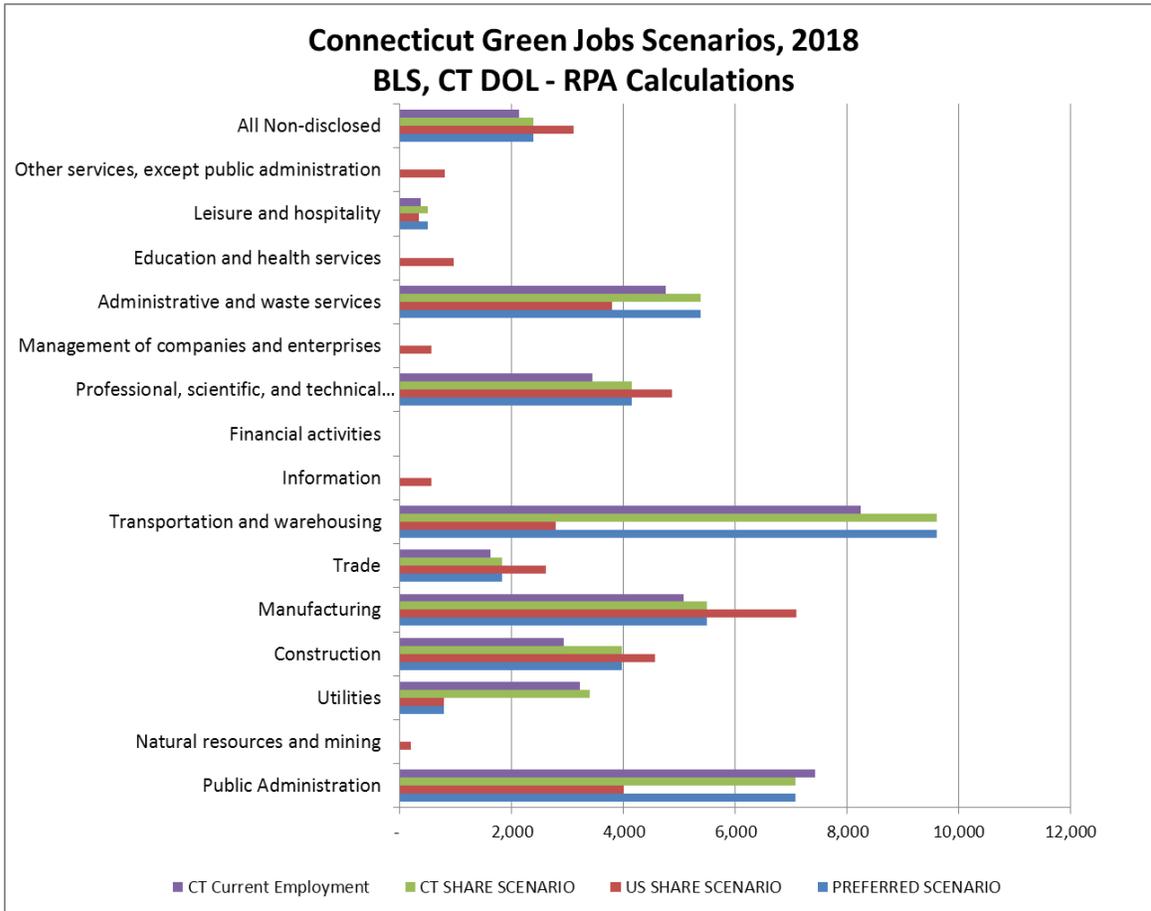
<sup>3</sup> Every two years, the State of Connecticut's Department of Labor Office of Research creates ten-year industry employment forecasts. It examines historical trends to help project Connecticut's employment changes between 2008 and 2018. Adapted from: <http://www1.ctdol.state.ct.us/lmi/projections.asp>

	BLS GGS 2010 SURVEY			CT DOL 2018 FORECAST			
	CT Employment	CT Sector Share	US Sector Share	Estimated 2008	Projected 2018	NET	PERCENT
Public Administration	7,425	8.1%	4.6%	91,193	86,935	(4,258)	-4.9%
Natural resources and mining	-	0.0%	3.6%	5,566	5,553	(13)	-0.2%
Utilities	3,215	50.9%	11.9%	6,764	6,657	(107)	-1.6%
Construction	2,932	5.9%	6.8%	65,380	67,228	1,848	2.7%
Manufacturing	5,071	3.1%	4.0%	187,249	177,173	(10,076)	-5.7%
Trade	1,615	0.7%	1.0%	257,703	261,329	3,626	1.4%
Transportation and warehousing	8,238	21.4%	6.2%	43,829	44,874	1,045	2.3%
Information	-	0.0%	1.4%	37,659	40,386	2,727	6.8%
Financial activities	-	0.0%	0.0%	143,530	148,130	4,600	3.1%
Professional, scientific, and technical services	3,443	4.0%	4.7%	92,705	103,735	11,030	10.6%
Management of companies and enterprises	-	0.0%	1.9%	28,476	30,015	1,539	5.1%
Administrative and waste services	4,764	6.1%	4.3%	86,117	88,115	1,998	2.3%
Education and health services	-	0.0%	0.2%	428,315	485,458	57,143	11.8%
Leisure and hospitality	370	0.3%	0.2%	158,282	167,694	9,412	5.6%
Other services, except public administration	-	0.0%	1.3%	58,187	61,208	3,021	4.9%
All Non-disclosed	2,134	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL	39,207	N/A	N/A	1,690,955	1,774,490	83,535	2.9%

Figures for total jobs were calculated for the three scenarios. These scenarios can be seen in the following summary:

	2018 PREFERRED SCENARIO	2018 US SHARE SCENARIO	2018 CT SHARE SCENARIO	2010 CT Current Employment
Public Administration	7,078	4,006	7,078	7,425
Natural resources and mining	-	200	-	-
Utilities	792	792	3,388	3,215
Construction	3,966	4,572	3,966	2,932
Manufacturing	5,492	7,087	5,492	5,071
Trade	1,829	2,613	1,829	1,615
Transportation and warehousing	9,603	2,782	9,603	8,238
Information	-	565	-	-
Financial activities	-	-	-	-
Professional, scientific, and technical services	4,149	4,876	4,149	3,443
Management of companies and enterprises	-	570	-	-
Administrative and waste services	5,375	3,789	5,375	4,764
Education and health services	-	971	-	-
Leisure and hospitality	503	335	503	370
Other services, except public administration	-	796	-	-
All Non-disclosed	2,382	3,102	2,382	2,134
TOTAL	41,171	33,954	43,768	39,207

The spread of the forecast scenarios and preferred scenario can be seen in the following chart:



Expected job growth and future number of green jobs in Connecticut under the preferred scenario should be interpreted as a projection of Connecticut shares of green jobs by sector except for Utilities that is adjusted by using the US share for that sector. A breakdown of occupations by sector can be seen in Appendix B. *The projections are based on BLS and DOL data and are independent of Connecticut’s incentives and policies influencing green employment, discussed in Part 2 of this report.*

**Educational and Experience Requirements for Green Occupations**

This report identified the green job occupations in the economic sectors and their educational and experience requirement as identified by Connecticut DOL. The green jobs occupation taxonomy is based on CT DOL’s listings of the National Center of O\*NET Development “Green Economy” resources reported at 2006 Standard Occupational Classification (SOC) major group and detailed occupation levels.

Based on BLS' 2011 National Occupational Employment Statistics (OES) Survey, this study identified the green job occupations in each sector. As a result it has identified **118** unique green job occupations that over all the industrial sectors represent **1738** specific occupations. Using Connecticut Department of Labor definitions for education and experience requirements (available in Appendix C) this report identifies the percentage of green jobs by educational and experience requirements for employment in the preferred scenario as follows:

	2018 Number of Green Jobs by Educational and Experience Requirements	2008 CT Labor Force Education and Experience
Associate degree	3%	4%
Bachelor's degree	15%	14%
Bachelor's or higher degree, plus work experience	7%	6%
Long-term on-the-job training	9%	6%
Master's degree	1%	2%
Moderate-term on-the-job training	26%	14%
Postsecondary vocational training	3%	7%
Short-term on-the-job training	26%	34%
Work experience in a related occupation	11%	10%

### Workforce Recommendations Based on Projected Growth

The analysis suggests that about 75% of green job occupations in Connecticut do not require postsecondary education but do require some experience or on-the-job training, helping frame recommendations that will help to meet the anticipated demand for workers in expanding green occupations and fields. If the 26% that can be performed with just short-term training is excluded, then employability for 49% of green jobs, or about 20,000 jobs in total, could be enhanced with workforce programs that provide skills usually gained through vocational training, experience or substantial on-the-job training. A complete listing of occupations, projected employment, 2010-2018 change and educational and experience requirements can be found in Appendix D.

On average, green jobs require higher levels of skill than jobs in the state economy as a whole, as shown in the table above. Although fewer green jobs require postsecondary education (25% vs. 29%), 35% of green jobs require moderate or long-term on-the-job training, compared to 20% of all jobs. By contrast, only 26% of green jobs require short-term training, compared to 34% of all jobs.

Based on the preferred scenario and occupational forecast, specific workforce recommendations include:

- Follow and integrate current efforts by the Federal Government to define and quantify green jobs statistics into State efforts to promote green jobs. This includes streaming data from the Bureau of Labor Statistics, O\*NET with CT Department of Labor definitions of green jobs, occupational taxonomies and industrial and occupational projections;
- Target industries expected to grow to build on the State's existing labor force pool and its strengths such as Transportation and warehousing, Public administration, Manufacturing, Administrative and waste services, Professional, scientific, and technical services and Construction that make 87% of the expected green jobs in the State by 2018;
- Enhance workforce and training policies to support green jobs targeted to moderate and long-term on-the-job training and postsecondary vocational training. This will need further discussion and involvement by the parties capable of and interested in providing the training. Questions such as which institution(s) will participate, which institutions are capable of this training, how will people have the opportunity to participate as well as pay for the training, and will there be any consideration for incentives should be explored further as a follow-up to this report. The largest of these occupations, as shown in Appendix D, include customer service representatives, maintenance and repair workers, team assemblers, construction laborers, carpenters, electricians, operating engineers and other trades such as ironworkers. Other large green job occupations, such as truck drivers, may only require short-term on-the-job training but have other barriers to entry that could be addressed through workforce programs.
- Respond to the needs of existing industries and build on existing partnerships with businesses to promote greening of occupations and increasing green jobs employment. As shown by the educational and experience requirements for green jobs, significant on-the-job training can be leveraged by promoting business programs to support existing and emerging occupations with green skills. Examples of how to build on existing partnerships with businesses are to promote involvement by all industry sectors to advance green jobs, supporting internships, apprenticeship programs, on-the-job training and other workforce training opportunities that lead to enhanced opportunities within the category of green jobs.

## Part 2. Prospects for Occupational Growth Related to Current State Policies and Incentives

### Summary of State Policies and Incentives

State and federal support for the growth of green jobs in Connecticut comes from programs providing or enabling funding for green industries as well as policies and regulations that positively affect the growth of private sector markets for green industry products and services. In all, 83 separate programs or policies were identified throughout the state. A useful way of categorizing these programs is by *Green Technology & Practice Area*, a classification recently developed by the U.S. Bureau of Labor Statistics to collect information on green economy establishment<sup>4</sup>. The six *Green Technology & Practice Areas* are as follows:

1. **Renewable Energy:** Generate electricity, heat, or fuel from renewable sources primarily for use within the establishment.
2. **Energy Efficiency:** Use technologies or practices to improve energy efficiency within the establishment.
3. **Other Greenhouse Gas Reducers:** Use technologies or practices in operations to reduce greenhouse gas emissions through methods other than renewable energy and energy efficiency.
4. **Reducing Pollutants:** Use technologies or practices to either reduce the creation or release of pollutants or toxic compounds as a result of operations, or to remove pollutants or hazardous waste from the environment.
5. **Reducing Operational Waste/Recycling:** Use technologies or practices to reduce or eliminate the creation of waste materials as a result of operations.
6. **Conserving Natural Resources:** Use technologies or practices in operations to conserve natural resources, excluding the use of recycled inputs in the production process.

Of the 83 identified programs and policies identified that are likely to impact green employment, 59 are related to either producing and purchasing renewable energy (Area 1) or making homes and businesses more energy-efficient (Area 2).

The 2011 Session of the Connecticut General Assembly passed Public Act 11-80, a landmark bill reconfiguring environmental regulatory agencies and placing energy policy under the authority of the newly created Department of Energy and Environmental Protection. Major PA 11-80 actions include the establishment of the ZREC/LREC zero-

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<sup>4</sup> This classification uses the process approach green jobs definition and complements the output approach used in the previous part of the report.

and low-emissions program that directs \$1 billion of investment towards local renewable energy generators over the next 20 years. Renewable Portfolio Standards in existence since 2006 also require a gradual ramping-up of renewable energy use, increasing from 16% class 1,2, or 3 resources (loosely defined as renewable sources, trash-to-energy, or combined heat & power systems) in 2012 to 27% by 2020.

State-directed incentive programs supporting renewable energy generation and adoption continue to transition since 2011 from a subsidy model to an investment model. PA 11-80 also directed the transition of the activities of the former Connecticut Clean Energy Fund (CCEF) which supported the growth and adoption of the clean energy industry in Connecticut primarily through grants and subsidies, into a new organization, Connecticut Energy Finance and Investment Authority (CEFIA), which would support clean energy growth through self-sustaining loans and through creation of financial vehicles that enable private investment of renewable energy generation and use. Most of the 30 programs or policies related to renewable energy are administered or supported by CEFIA.

A diverse assortment of programs supports energy-efficiency improvements through weatherization, new equipment, or through developing more efficient practices. The Connecticut Energy Efficiency Fund (CEEF) is supported by surcharges on customer bills of two of Connecticut's largest utilities- CL&P and UI- and funds a variety of programs that provide relief to low-income residents and support the adoption of energy-efficient technologies (such as CFL light bulbs or high-efficiency HVAC systems) as well as weatherization of existing homes. CEEF programs are managed by Connecticut's Energy Efficiency Board (formerly Energy Conservation Management Board). A similar structure exists at a smaller scale for a cluster of municipally-owned utilities primarily in Southeastern Connecticut who are members of the Connecticut Municipal Electrical Energy Cooperative and run efficiency programs that parallel CEEF programs.

Utility-led CEEF efficiency programs and CEFIA-administered energy generation programs are complemented by regulatory requirements and enabling acts such as ZREC/LREC and legislative approval of the use of Property Assessed Clean Energy programs for both commercial and industrial sites, wherein energy efficiency and renewable energy improvements can be financed through a benefit assessment on the property.

Programs supporting the development of new technologies exist within CEFIA as well as through other organizations such as Connecticut Innovations, which offers programs targeted specifically toward the green economy as well as making more general programs available to green entrepreneurship. The Connecticut Center for Advanced Technology (CCAT) and CONNSTEP, both 501(c)3 organizations supported by Connecticut's Department of Economic and Community Development, work with manufacturing firms to reduce energy and materials waste. In addition, CCAT and the University of Connecticut Center for Clean Energy Engineering support research and

development of clean and efficient energy systems, developing systems for implementation and also participating in educating and training university students and offering professional development for workers already in the field.

*Green Technology & Practice Area 3* programs include Connecticut's support of electric vehicle infrastructure, adoption of hybrid diesel and other efforts to reduce transportation-related energy and pollution. Connecticut's suite of brownfields programs support activities in Area 4 (reducing pollutants). A few programs, such as the aforementioned CCAT and CONNSTEP manufacturing assistance programs, focus on reducing operations-related waste (Area 5). Few programs relate to Area 6, which focuses on the management of natural resources.

A more detailed inventory of incentive programs and policies is available in Appendix D, which lists the specific technology focus and administrator of each program, as well as the *Green Technology & Practice Area* it supports.

**Occupations likely to be impacted & recommendations for training programs**

The BLS *Green Technology & Practice Areas* also provide a useful framework for assessing the potential employment impacts of programs and policies within Connecticut and comparing groups of occupations with available training. Each of the 118 green occupations identified by CT DOL was linked to one or more *Practice Areas* likely to employ workers from that occupation.

Occupations were further grouped by associated training and education levels in order to identify types of training programs that might support green employment by Connecticut residents.

Occupations identified by employment projections reported in Part 1 of this report as high-growth are called out through special notations within part 2. Occupations marked <sup>TOP 10%</sup> and <sup>TOP 10 Growth</sup> are occupations that according to the 2018 CT Department of Labor

Forecast are projected to be among the top 10 occupations to grow by 2018 either by percent change from current levels of employment (<sup>TOP 10%</sup>), or by overall employment levels (<sup>TOP 10 Growth</sup>), and indicate occupations where the potential for new employment is particularly high independent of specific policies and programs encouraging their expansion.

Training programs included in the text are programs requiring less than a four-year degree. Additional information on Bachelor’s level and higher curricula was gathered in 2009 in a report by Eastern Connecticut State University’s Institute for

*Top 10 Green Occupations by Projected Percent Change in Employment, 2008-2018*

Roofers	34%
Insulation Workers, Floor, Ceiling, and Wall	33%
Cement Masons and Concrete Finishers	32%
Structural Iron and Steel Workers	31%
Helpers--Carpenters	31%
Carpenters	28%
Construction Managers	22%
Sheet Metal Workers	20%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	20%
Construction Laborers	19%

*Top 10 Green Occupations by Number of Projected New Workers, 2008-2018*

Heavy and Tractor-Trailer Truck Drivers	581
Laborers and Freight, Stock, and Material Movers, Hand	441
Construction Laborers	171
General and Operations Managers	156
Carpenters	144
Team Assemblers	106
Shipping, Receiving, and Traffic Clerks	104
Industrial Truck and Tractor Operators	97
Sales Representatives, Services, All Other	94
First-Line Supervisors of Construction Trades and Extraction Workers	74

Sustainable Energy that is viewable at  
<http://www.ctenergyeducation.com/images/greenjobCT709.pdf>.

Gateway Community College's *Center for a Sustainable Future* Also offers a number of course in green business development that cannot be classified into specific Green Technology & Practice areas, including

- Business Law in a Greening Business Environment
- Creating a Web Presence for Your Green Business
- Grant Proposal Writing
- Selling Green: Rationale, Approaches, and Psychology
- Sustainable Business Advisor Program
- Sustainable Business Development
- Sustainable Business Growth: A Financial Roadmap to Measuring the Performance of Your Business
- Sustainable Community Enterprises and Cooperatives: Creating, Managing
- Sustainable Living: Issues that Impact You at Home and Work

## Green Technology & Practice Focus Area #1- Renewable Energy

### Programs

Our analysis identified 33 programs or policies that directly reference or address renewable energy production. The ZREC/LREC requirements passed by PA 11-80 require United Illuminating and Connecticut Light & Power to invest just over \$1 billion over 20 years in zero-emissions energy sources (e.g. solar, wind) and low-emissions (e.g. fuel cell) energy sources, dramatically increasing demand for small- and moderate-scale renewable energy facilities especially in the first 6 years of the program when facilities must be constructed.

CEFIA currently administers 19 programs supporting renewable energy, and in fact nearly all of CEFIA's programs are linked to renewable energy production or purchase in some way. CEFIA programs address both specific technologies such as solar photovoltaic cells, combined heat & power systems, or anaerobic digestion, or address regulatory or financial barriers that various markets face in purchasing green energy or production systems. CEFIA is transitioning its programs from incentives-based support to one that develops and provide mechanisms to finance private investment in renewable energy production and purchase.

Connecticut's Department of Consumer Protection administers a number of licenses related to solar PV, wind energy, and solar thermal systems for which training and work experience/apprenticeships are required. These licenses enable workers who lack more general electrical and plumbing licenses to work on renewable energy installations. Contractors wishing to be approved by CEFIA for participation in solar

#### **Existing Training & Educational Programs: Connecticut Center for Advanced Technology (CCAT)**

Energy & Sustainability Program for middle & high school teachers  
CATALYST: Explorations in Sustainable Energy & the Environment (H.S. Enrichment Program)

#### **Eastern Connecticut Workforce Investment Board**

Green Jobs Incumbent Worker Training

#### **Northwestern Regional Workforce Investment Board**

Building Performance Institute Training

#### **Manchester Community College**

Sustainable Energy Certificate

#### **Gateway Community College**

Solar Technology Certificate  
*Center for a Sustainable Future*  
courses in Solar PV and Solar Thermal, Geothermal Heating & Cooling, NABCEP Entry-Level Exam

#### **Naugatuck Valley Community College**

Alternative Energy Systems Technology Certificate

#### **Norwalk Community College**

Building Efficiency and Sustainable Technology (BEST) Cert. Program

#### **Connecticut Department of Labor**

Apprenticeships

#### **Connecticut Business and Industry Association**

Academic Skills Enhancement for Energy-Related Careers  
High School Classroom/Internships

#### **Trade Union Training**

IBEW Electrical apprenticeship, Solar PV, Wind Turbine  
*Solar Thermal*: Sgt. David Coullard & Local 777 Veterans Training School, CT Plumbers & Pipefitters Local 777 Joint

Apprenticeship Training Center  
*Green Tradesman Certificate:*  
Carpenters, Ironworkers Local  
15, Finishing, Bricklayers,  
Sheet Metal Workers,  
Electricians, Plumbers  
*Green Tradesmen Training:*  
Painters and Allied Trades  
*IBEW Solar Voltaic:*  
Local 488 Electricians

**Connecticut Technical High School  
Curricula**

E-House Green Technology  
Electronics Technology  
Electrical  
Heating, Ventilation, and Air  
Conditioning  
Manufacturing Technology  
Plumbing & Heating (Solar  
Strand)  
Electrical Engineering and  
Electronics Technology  
Welding and Metal Fabrication  
Marketing Management &  
Entrepreneurship

**Private Providers in Solar Thermal  
training:**

(CODE) Center For Occupational  
Developmental and Education  
Construction Education  
Center, Inc.  
HeatSpring Learning  
Institute  
Independent Connecticut  
Petroleum Institute  
Independent Electrical Contractors  
of New England  
Industrial Management & Training  
Institute

**Other Private Providers**

Institute of Environmental  
Management Technology  
Industrial Management and  
Training Institute

PV or solar thermal programs must employ staff who have passed the NABCEP entry level PV exam or are licensed ST-1 employees (solar thermal). Approximately 75 solar PV and 30 solar thermal companies have been approved by CEFIA.

**Recommendations**

Training programs are offered at community colleges in Waterbury, North Haven, and Manchester that prepare workers for jobs installing small-scale renewable energy technologies (Solar PV, Solar thermal, geothermal). Programs in other regions of the state may be warranted, especially where demand is likely to be high due to population and income levels. Current training programs do not address additional employment that will be created at larger production facilities likely to respond to additional demand for low-emissions energy supported by Connecticut's rising portfolio standards. Assessments should be made of the ability of the Connecticut workforce to provide the electrician and carpentry skills necessary for the deployment of green energy production facilities. Although this report does not focus on bachelor's and higher educational opportunities, it should be noted that Yale University's joint MBA/Environment Master's Program is considered a leader in the field of renewable energy education.

## Related occupations by required training/education

Employment in 74 of the 118 green occupations is likely to be increased by programs supporting renewable energy development, the most number of occupations associated with any Practice Area. Occupations are also well-distributed across training levels, with several top 10 occupations requiring relatively little training and other occupations requiring Bachelor's or Masters Degrees.

*Work experience in a related occupation:* Construction and Building Inspectors; First-Line Supervisors of Construction Trades and Extraction Workers <sup>TOP 10 Growth</sup>; First-Line Supervisors of Farming, Fishing, and Forestry Workers; First-Line Supervisors of Mechanics, Installers, and Repairers; First-Line Supervisors of Production and Operating Workers; Industrial Production Managers; Managers, All Other; Sales Representatives, Services, All Other <sup>TOP 10 Growth</sup>; Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products; Transportation Inspectors; Transportation, Storage, and Distribution Managers

*Short-term on the job training:* Electrical and Electronic Equipment Assemblers; Engine and Other Machine Assemblers; Heavy and Tractor-Trailer Truck Drivers <sup>TOP 10 Growth</sup>; Helpers--Carpenters <sup>TOP 10%</sup>; Helpers--Installation, Maintenance, and Repair Workers; Industrial Truck and Tractor Operators <sup>TOP 10 Growth</sup>; Laborers and Freight, Stock, and Material Movers, Hand <sup>TOP 10 Growth</sup>; Shipping, Receiving, and Traffic Clerks <sup>TOP 10 Growth</sup>

*Moderate-term on the job training:* Chemical Equipment Operators and Tenders; Computer-Controlled Machine Tool Operators, Metal and Plastic; Construction and Related Workers, All Other\*; Construction Laborers <sup>TOP 10% TOP 10 Growth</sup>; Customer Service Representatives; Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic; Dispatchers, Except Police, Fire, and Ambulance; Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic; Inspectors, Testers, Sorters, Samplers, and Weighers; Installation, Maintenance, and Repair Workers, All Other\*; Insulation Workers, Floor, Ceiling, and Wall; Mixing and Blending Machine Setters, Operators, and Tenders; Operating Engineers and Other Construction Equipment Operators; Structural Metal Fabricators and Fitters; Surveying and Mapping Technicians

*Long-term on the job training:* Compliance Officers; Electrical Power-Line Installers and Repairers; Electricians; Industrial Machinery Mechanics; Machinists; Maintenance and Repair Workers, General; Millwrights; Plumbers, Pipefitters, and Steamfitters; Power Plant Operators; Stationary Engineers and Boiler Operators; Structural Iron and Steel Workers <sup>TOP 10%</sup>

*Associate Degree:* Agricultural and Food Science Technicians; Chemical Technicians; Electrical and Electronics Engineering Technicians; Electro-Mechanical Technicians; Engineering Technicians, Except Drafters, All Other; Industrial Engineering Technicians; Mechanical Engineering Technicians; Occupational Health and Safety Technicians

*Bachelor's Degree:* Chemical Engineers; Chemists; Civil Engineers; Construction Managers <sup>TOP 10%</sup>; Electrical Engineers; Electronics Engineers, Except Computer; Engineers, All Other; Financial Analysts; Financial Specialists, All Other; Health and Safety Engineers, Except Mining Safety Engineers and Inspectors; Landscape Architects; Logisticians; Materials Scientists; Mechanical Engineers; Nuclear Engineers; Occupational Health and Safety Specialists; Personal Financial Advisors; Physical Scientists, All Other; Public Relations Specialists

*Bachelor's or Higher Degree, plus work experience:* Securities, Commodities, and Financial Services Sales Agents; Advertising and Promotions Managers; Arbitrators, Mediators, and Conciliators; Architectural and Engineering Managers; Marketing Managers; Economists; Urban and Regional Planners

## **Green Technology & Practice Focus Area #2- Energy Efficiency**

### **Programs**

The majority (20) of the 37 energy efficiency programs in Connecticut are administered by utility companies under the direction of the Connecticut Energy Efficiency Fund or Connecticut Municipal Electrical Energy Cooperative. The first step towards utilizing many of the programs is to obtain a home energy audit by a contractor who assesses a home's efficiency level and recommends weatherization and technology improvements that are then financed or subsidized through other state programs.

### **Recommendations**

Two community college programs exist which serve as models for programs which convey the types of comprehensive knowledge that will be required from managers and implementers of energy efficiency projects. Norwalk Community College's Building Efficiency & Sustainable Technology (BEST) program provides graduates with a suite of technical and interpersonal skills necessary to design and manage efficiency projects, including communications, energy auditing, and construction management. Manchester Community College's Sustainable Energy Certificate provides technical information on efficiency (as well as small-scale renewable energy) and also provides training in business finance. Additional assessments should be made as to whether there are sufficient skilled carpenters and electricians to reposition into energy efficiency work and whether entry-level training programs such

#### **Existing Training & Educational Programs:**

##### **Norwalk Community College**

Building Efficiency and Sustainable Technology (BEST) Certificate Program

##### **Jobs Funnel** programs offering training and placement in construction fields

Capital Workforce Partners Jobs Funnel

City of New Haven Construction Workforce Initiative

Eastern CT Workforce Investment Board

Northwest Construction Careers Initiative

##### **Gateway Community College Center for a Sustainable Future**

Energy Efficiency Part I: Applications course

##### **The Workplace, Inc.** (Bridgeport)

Green-up Bridgeport

Weatherization Training Program

State Energy Sector Partnership Grant training in building efficiency

##### **Connecticut Business and Industry Association**

Academic Skills Enhancement for Energy-Related Careers

High School Classroom/Internships

##### **Manchester Community College**

Sustainable Energy Certificate

##### **Eastern Connecticut Workforce Investment Board**

Green Jobs Incumbent Worker Training

##### **Northwestern Regional Workforce Investment Board**

Building Performance Institute Training

##### **Quinebaug Valley Community College**

Certificate in Construction Technology

##### **Three Rivers Community College**

Sustainable Facilities Management Certificate

##### **Connecticut Technical High School Curricula**

Carpentry; E-House Green Technology; Electronics Technology; Electrical Heating, Ventilation, and Air Conditioning; Manufacturing Technology; Plumbing & Heating; Plumbing, Heating, & Cooling; Sustainable Building Technology; Welding and Metal Fabrication; Marketing Management & Entrepreneurship

##### **Trade Union apprenticeships**

IBEW Electrical

Plumbers & Pipefitters (currently closed)

as Green-up Bridgeport should be expanded throughout the state.

### Related occupations by required training/education

About half of the 50 occupations supported by this *Practice Area* require Bachelor's Degrees or higher, but many of those that do not require formal education are among occupations projected to grow the most over the next 10 years. Workers involved in conventional construction can often transition to energy efficiency work with little or no additional training.

*Postsecondary Vocational Training:* Architectural and Civil Drafters; Heating, Air Conditioning, and Refrigeration Mechanics and Installers <sup>TOP 10%</sup>

*Work experience in a related occupation:* Construction and Building Inspectors; First-Line Supervisors of Mechanics, Installers, and Repairers; First-Line Supervisors of Production and Operating Workers; Managers, All Other

*Short-term on the Job training:* Electrical and Electronic Equipment Assemblers, Engine and Other Machine Assemblers; Helpers--Carpenters <sup>TOP 10%</sup>; Helpers--Installation, Maintenance, and Repair Workers; Industrial Truck and Tractor Operators <sup>TOP 10 Growth</sup>; Laborers and Freight, Stock, and ; Material Movers, Hand <sup>TOP 10 Growth</sup>; Shipping, Receiving, and Traffic Clerks <sup>TOP 10 Growth</sup>

*Moderate-term on the job training:* Cement Masons and Concrete Finishers <sup>TOP 10%</sup>; Construction Laborers <sup>TOP 10% TOP 10 Growth</sup>; Customer Service Representatives; Dispatchers, Except Police, Fire, and Ambulance; Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic; Installation, Maintenance, and Repair Workers, All Other\*; Insulation Workers, Floor, Ceiling, and Wall <sup>TOP 10%</sup>; Roofers <sup>TOP 10%</sup>

*Long-term on the job training:* Carpenters <sup>TOP 10% TOP 10 Growth</sup>; Compliance Officers; Electrical Power-Line Installers and Repairers; Electricians; Maintenance and Repair Workers, General Plumbers, Pipefitters, and Steamfitters; Sheet Metal Workers <sup>TOP 10%</sup>

*Bachelor's Degree:* Occupational Health and Safety Technicians (requires Associate Degree); Aerospace Engineers; Architects, Except Landscape and Naval; Business Operations Specialists, All Other\*; Chemical Engineers; Civil Engineers; Commercial and Industrial Designers; Construction Managers <sup>TOP 10%</sup>; Financial Analysts; Financial Specialists, All Other; Industrial Engineers; Landscape Architects; Logisticians; Materials Scientists; Mechanical Engineers; Occupational Health and Safety Specialists; Personal Financial Advisors; Public Relations Specialists; Securities, Commodities, and Financial Services Sales Agents

*Bachelor's Degree or higher, plus work experience:* Advertising and Promotions Managers; Architectural and Engineering Managers; Marketing Managers; Economists

## Green Technology & Practice Area #3: Other Greenhouse Gas Reducers

### Programs

Although the definition of this *Practice Area* is broad, only 6 state programs were identified that reduce greenhouse gases through means other than renewable energy or energy efficiency, and they all relate to reducing carbon emissions from transportation either through electric vehicles and associated infrastructure or through helping diesel freight trucks reduce idling time. A fuller analysis of potential employment within this practice area should consider additional strategies listed in Connecticut's 2005 Climate Change Action Plan, associated actions, and ongoing work by the Department of Energy and Environmental Protection to implement strategies to reduce greenhouse gases and measure their impacts.

#### **Existing Training & Educational Programs:**

##### **Gateway Community College**

Alternative Energy Transportation  
Technology Certificate

*Center for a Sustainable Future* courses:

CNG Diagnosis and Repair, Electric and  
Hybrid Vehicle Drive, Introduction to  
Clean Energy Transportation

##### **Connecticut Technical High School Curricula**

Marketing Management &  
Entrepreneurship

##### **Trade Union Training**

IBEW: Electrical Vehicle Station  
Installation

### Recommendations

Monitor the state's Comprehensive Energy Strategy, currently under development, to assess future needs for training programs necessary to facilitate transitioning to alternative transportation fuels. A transition to natural gas, hydrogen, or electric-powered vehicles could dramatically increase demand for skilled workers to convert and service vehicles and install and operate fueling infrastructure. Additional discussion of the potential for expansion in this sector is included in Part 3 of this report (Potential Future Influences).

### Related occupations by required training/education

*Postsecondary vocational training:* Automotive Service Technicians and Mechanics

*Short-term on-the-job training:* Shipping, Receiving, and Traffic Clerks <sup>TOP 10 Growth</sup>

*Moderate-term on-the-job training:* Bus Drivers, Transit and Intercity; Cargo and Freight Agents

*Long-term on-the-job training:* Compliance Officers

*Bachelor's Degree:* Financial Analysts; Financial Specialists, all other

*Bachelor's or higher degree, plus work experience:* Arbitrators, Mediators, and Conciliators;

Advertising and Promotions Managers; General and Operations Managers <sup>TOP 10 Growth</sup>; Social  
Scientists and Related Workers, All Other; Urban and Regional Planners

## Green Technology & Practice Area #4: Reducing Pollutants

### Programs

Identified programs within this Practice Area support brownfield remediation and redevelopment, a focus in Connecticut since at least 1999, when the legislature created the Connecticut Brownfields Redevelopment Authority (CBRA), a quasi-public authority that invests in brownfield remediation and development. In 2006, the legislature created the Office of Brownfields Remediation and Development (OBRD) within the Department of Economic and Community Development (DECD), which administers several programs to facilitate brownfields assessments and cleanups.

CBRA and OBRD/DECD run 17 of the 22 programs identified that support brownfield remediation in Connecticut.

#### **Existing Training & Educational Programs:**

##### **Gateway Community College**

Clean Water Management Certificate

##### **The WorkPlace, Inc. (Bridgeport)**

Bridgeport Environmental Job Training Program (lead/asbestos/hazardous waste abatement)

State Energy Sector Partnership Grant training in clean water operations

##### **Waterbury Construction Careers Initiative**

Brownfield Job Training

##### **Northwestern Regional Workforce Investment Board**

Brownfield Pilot Training

##### **Connecticut Technical High School Curricula**

Bioscience Environmental Technology

##### **State Energy Sector Partnership Green Jobs Program training**

Lead/Asbestos, Hazardous Waste, OSHA

### Recommendations

Occupations within this practice area generally require bachelor's degree or higher training, although some laborer and transportation occupations require training in dealing with hazardous materials. In 1997, Connecticut developed a Licensed Environmental Professional (LEP) programs that for many applicants includes certification of bachelor's or advance degrees in related fields. A survey should be done of LEP backgrounds to determine whether Licensed Environmental Professionals working in Connecticut have been receiving advanced degrees within Connecticut or elsewhere.

### Related occupations by required training/education

Many of the occupations require Bachelor's or higher degrees, although lower-skilled occupations exist that perform movement of materials common in remediation.

*Short-term on-the-job training:* Heavy and Tractor-Trailer Truck Drivers <sup>TOP 10 Growth</sup>; Shipping, Receiving, and Traffic Clerks <sup>TOP 10 Growth</sup>

*Moderate-term on-the-job training:* Hazardous Materials Removal Workers

*Bachelor's Degree:* Civil Engineers; Financial Analysts; Financial Specialists, All Other; Conservation Scientists; Occupational Health and Safety Specialists; Environmental Engineers; Environmental Engineering Technicians (Associate); Health and Safety Engineers, Except Mining Safety Engineers and Inspectors;

*Bachelor's or higher degree, plus work experience;* Arbitrators; Mediators, and Conciliators; General and Operations Managers <sup>TOP 10 Growth</sup>; Natural Sciences Managers

**Green Technology & Practice Area #5: Reducing Operational Waste/Recycling**

**Programs**

Connecticut law requires recycling of both commercial and residential waste, with the list of items required to be recycled expanding since the first recycling laws went into effect in 1991. Although programs to reduce energy waste from operations exist under Practice Area 2, only two programs directly addresses materials waste. The non-profit organizations Connecticut Center for Advanced Technology (CCAT) and CONNSTEP run programs assisting companies with sustainable manufacturing as part of overall mission to support manufacturing and entrepreneurship.

**Recommendations**

The vast majority of occupations within this Practice Area will require little to no retraining in order to operate more sustainably. CCAT and CONNSTEP’s program assists firms with retooling their production methods to save energy, materials, and labor costs. The only training program that enables work similar to this is Three Rivers Community College’s Sustainable Facilities Management Certificate, a two semester program meant to reposition skilled displaced workers and provide new workers with a knowledge of building systems and construction design. A cost-benefit analysis of operations efficiency methods should be performed to determine whether additional support of the industry could yield higher economic output and employment.

<p><b>Existing Training &amp; Educational Programs:</b></p> <p><b>Three Rivers Community College</b> Sustainable Facilities Management Certificate</p> <p><b>Gateway Community College</b> <i>Center for a Sustainable Future</i> Deconstruction and Recycling course</p> <p><b>Connecticut Technical High School Curricula</b> Marketing Management &amp; Entrepreneurship</p> <p><b>State Energy Sector Partnership Green Jobs Program training</b> Lead/Asbestos, Hazardous Waste, OSHA</p> <p><b>Painters and Allied Trades</b> Green Tradesmen Training</p>
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### **Related occupations by required training/education**

Because this Practice Area involves redesigning production processes, it supports occupations that require advanced training and education as well as those engaged in operations.

*Work experience in a related occupation:* First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand

*Short-term on-the-job training:* Heavy and Tractor-Trailer Truck Drivers <sup>TOP 10 Growth</sup>;  
Industrial Truck and Tractor Operators <sup>TOP 10 Growth</sup>; Laborers and Freight, Stock, and Material Movers, Hand <sup>TOP 10 Growth</sup> ; Shipping, Receiving, and Traffic Clerks <sup>TOP 10 Growth</sup> , Refuse and Recyclable Material Collectors

*Moderate-term on-the-job training:* Hazardous Materials Removal Workers; Customer Service Representatives; Production Workers, All Other\*; Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders

*Long-term on-the-job training:* Compliance Officers

*Associate Degree:* Occupational Health and Safety Technicians

*Bachelor's Degree:* Chemical Engineers; Financial Analysts; Financial Specialists, All Other; Health and Safety Engineers, Except Mining Safety Engineers and Inspectors

*Bachelor's or higher degree, plus work experience:* Advertising and Promotions Managers; Economists; General and Operations Managers <sup>TOP 10 Growth</sup>

## Green Technology & Practice Area #6: Conserving Natural Resources

### **Programs**

Practice Area #6 includes the conservation of wildlife, soil, and water; stormwater management; organic agriculture; and sustainable forestry. Activities within this practice area include forestry, fisheries management; enforcement of natural resources protection laws; park design, construction, and maintenance; and wildlife management biologists. Maintenance and expansion of Connecticut's water, wastewater, and stormwater management infrastructure is an important engine for green job growth. Connecticut has authorized bond funding for Clean Water projects totaling \$270 million per year in 2012 and 2013. Hartford's Metropolitan District Commission will invest over \$90 million per year for the next twenty years in the greater Hartford region, with other cities considering how to respond to similar infrastructure needs.

### **Recommendations:**

Existing certificate programs as well as undergraduate and graduate programs in the natural sciences seem to be sufficient to meet existing demand for natural resource conservation positions. Recent programs such as the Connecticut Conservation Corps address a need for training municipal and state conservation worker but do not yet create clear, credentialed career paths with opportunities for advancement within the field. Although forestry/natural resource programs are offered at both Yale and the University of Connecticut, neither provide enough credits for graduates to become certified foresters, so students must go out-of-state to obtain a forestry degree. The need for additional training and an official forestry program should be revisited if the state incentivizes or mandates new management techniques such as sustainable forestry, low-impact development or green infrastructure at a larger scale.

### **Related occupations by required training/education**

Work experience in a related occupation: First-Line Supervisors of Farming, Fishing, and Forestry Workers

Moderate-term on-the-job training: Surveying and Mapping Technicians

#### ***Existing Training & Educational Programs:***

##### **Three Rivers Community College**

Sustainable Landscape Ecology & Conservation

##### **Gateway Community College**

Advanced Wastewater Management Certificate

*Center for a Sustainable Future* courses:

Building Your Own Backyard Composting Bin, Farming as a Business, Soil and Land Care: Applications for Sustainable Development, Urban Organic Farming and Land Care

##### **Northwestern Regional Workforce Investment Board**

Conservation Corps Training in parks management

##### **Connecticut Technical High School Curricula**

Bioscience Environmental Technology

Long-term on-the-job training: Compliance Officers  
Associate Degree: Agricultural and Food Science Technicians  
Bachelor's degree: Conservation Scientists; Landscape Architects  
Bachelor's or higher degree, plus work experience: Natural Sciences Managers;  
Environmental Engineers; Operations Managers <sup>TOP 10 Growth</sup>; Environmental Scientists and  
Specialists; Urban and Regional Planners; Hydrologists

### Part 3. Potential Future Influences on Green Employment in Connecticut

Demand for workers to fill green occupations and for existing workers to adapt to new emphases on energy efficiency and environmental impacts will be influenced by an ever-changing policy environment and external market conditions that can dramatically sway the direction of private investment. Economic forecasts such as the one presented in this report should be used with caution and act as guidelines to advance policies to support the labor market place as it develops. Inventories of state policy programs must be revised on an annual basis to reflect new trends and discontinued programs. Periodic review and assessment of green jobs labor market data should provide ongoing oversight for changing conditions and guide policies to balance the supply and demand for green jobs.

The Department of Energy and Environmental Protection's June 2012 Integrated Resource Plan assesses the current energy environment to identify strategic opportunities for reducing future utility costs. It concludes that the state can cost-effectively achieve energy efficiency savings and advocates for more aggressive support of energy-efficiency measures, including low-cost financing, building codes and standards, information and training, and even new rate structures that enable energy generators to earn adequate returns even under a trend of declining usage.

The Integrated Resource Plan also explores the potential employment impacts of Connecticut's renewable energy targets, which can be satisfied either by purchasing renewable energy from producers in the Northeast or by Connecticut utilities paying Alternative Compliance Payments that would then support renewable energy production within Connecticut. The prospect for local employment in energy production depends heavily on the ultimate strategy pursued to satisfy the renewable energy requirements.

Connecticut's Comprehensive Energy Strategy (CES) will be released in the fall of 2012 and will provide long-term guidance on energy as it relates to a number of demand and environmental factors. The CES being released this fall evaluates a range of strategies aimed at reducing energy use and costs—targeting electricity, buildings, industry, transportation, and natural gas. Implementing these strategies will create both near- and long-term growth opportunities in green employment.

CEFIA's portfolio of programs continues to evolve as it transitions further from subsidy provider to facilitator of private investment. Its upcoming 2013 budget will propose further restructuring and termination of existing programs and potentially develop new

activities to fulfill its mission. The 2013 budget will be available in the fall of 2012 for review.

Other major initiatives at the state level that may impact prospects for green employment include a fresh assessment of waste management strategies that can reduce costs associated with waste and even convert some waste into energy and materials resources. Aging stormwater and wastewater facilities will require investments beyond those currently being made in Hartford and elsewhere, and may involve traditional wastewater practices and/or green infrastructure techniques that require very different skills.

Among the most influential external factors that may impact green employment is the recent decline in the market price of natural gas, especially as it relates to alternative coal and oil prices. A continued price differential will produce a number of new markets to capitalize on natural gas prices: expansion of natural gas infrastructure to currently-underserved areas, retrofits of residential and commercial oil-burning furnaces and other equipment, demand for natural gas-powered vehicles, and potentially conversion/replacement of coal- and oil-powered electrical generation facilities.

## Appendices

### A. US Industrial Sector Definitions<sup>5</sup>

#### Other Services (except Public Administration) sector

The Other Services (except Public Administration) sector comprises establishments engaged in providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities, such as equipment and machinery repairing, promoting or administering religious activities, grant making, advocacy, and providing dry-cleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services.

#### Leisure and Hospitality supersector

The leisure and hospitality supersector consists of these sectors: Arts, Entertainment, and Recreation: NAICS 71, and Accommodation and Food Services: NAICS 72. The Arts, Entertainment, and Recreation sector includes a wide range of establishments that operate facilities or provide services to meet varied cultural, entertainment, and recreational interests of their patrons. This sector comprises (1) establishments that are involved in producing, promoting, or participating in live performances, events, or exhibits intended for public viewing; (2) establishments that preserve and exhibit objects and sites of historical, cultural, or educational interest; and (3) establishments that operate facilities or provide services that enable patrons to participate in recreational activities or pursue amusement, hobby, and leisure-time interests. Some establishments that provide cultural, entertainment, or recreational facilities and services are classified in other sectors. The Accommodation and Food Services sector comprises establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption. The sector includes both accommodation and food services establishments because the two activities are often combined at the same establishment.

#### Education and Health Services supersector

The education and health services supersector consists of these sectors: Educational Services: NAICS 61, and Health Care and Social Assistance: NAICS 62. The Educational

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<sup>5</sup>Definitions are based on: [http://www.bls.gov/iag/tgs/iag\\_index\\_naics.htm](http://www.bls.gov/iag/tgs/iag_index_naics.htm)

Services sector comprises establishments that provide instruction and training in a wide variety of subjects. This instruction and training is provided by specialized establishments, such as schools, colleges, universities, and training centers. These establishments may be privately owned and operated for profit or not for profit, or they may be publicly owned and operated. They may also offer food and/or accommodation services to their students. Educational services are usually delivered by teachers or instructors that explain, tell, demonstrate, supervise, and direct learning. Instruction is imparted in diverse settings, such as educational institutions, the workplace, or the home, and through diverse means, such as correspondence, television, the Internet, or other electronic and distance-learning methods. The training provided by these establishments may include the use of simulators and simulation methods. It can be adapted to the particular needs of the students, for example sign language can replace verbal language for teaching students with hearing impairments. All industries in the sector share this commonality of process, namely, labor inputs of instructors with the requisite subject matter expertise and teaching ability. The Health Care and Social Assistance sector comprises establishments providing health care and social assistance for individuals. The sector includes both health care and social assistance because it is sometimes difficult to distinguish between the boundaries of these two activities. The industries in this sector are arranged on a continuum starting with those establishments providing medical care exclusively, continuing with those providing health care and social assistance, and finally finishing with those providing only social assistance. The services provided by establishments in this sector are delivered by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.

#### Administrative and Support and Waste Management and Remediation Services sector

The Administrative and Support and Waste Management and Remediation Services sector comprises establishments performing routine support activities for the day-to-day operations of other organizations. These essential activities are often undertaken in-house by establishments in many sectors of the economy. The establishments in this sector specialize in one or more of these support activities and provide these services to clients in a variety of industries and, in some cases, to households. Activities performed include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

#### Management of Companies and Enterprises sector

The Management of Companies and Enterprises sector comprises (1) establishments that hold the securities of (or other equity interests in) companies and enterprises for the purpose of owning a controlling interest or influencing management decisions or (2) establishments (except government establishments) that administer, oversee, and manage establishments of the company or enterprise and that normally undertake the strategic or organizational planning and decision making role of the company or enterprise. Establishments that administer, oversee, and manage may hold the securities of the company or enterprise. Establishments in this sector perform essential activities that are often undertaken, in-house, by establishments in many sectors of the economy. By consolidating the performance of these activities of the enterprise at one establishment, economies of scale are achieved.

#### Professional, Scientific, and Technical Services sector

The Professional, Scientific, and Technical Services sector comprises establishments that specialize in performing professional, scientific, and technical activities for others. These activities require a high degree of expertise and training. The establishments in this sector specialize according to expertise and provide these services to clients in a variety of industries and, in some cases, to households. Activities performed include: legal advice and representation; accounting, bookkeeping, and payroll services; architectural, engineering, and specialized design services; computer services; consulting services; research services; advertising services; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services.

#### Financial Activities supersector

The financial activities supersector consists of these sectors: Finance and Insurance: NAICS 52, and Real Estate and Rental and Leasing: NAICS 53. The Finance and Insurance sector comprises establishments primarily engaged in financial transactions (transactions involving the creation, liquidation, or change in ownership of financial assets) and/or in facilitating financial transactions. Three principal types of activities are identified: 1. Raising funds by taking deposits and/or issuing securities and, in the process, incurring liabilities. Establishments engaged in this activity use raised funds to acquire financial assets by making loans and/or purchasing securities. Putting themselves at risk, they channel funds from lenders to borrowers and transform or repackage the funds with respect to maturity, scale, and risk. This activity is known as financial intermediation. 2. Pooling of risk by underwriting insurance and annuities. Establishments engaged in this activity collect fees, insurance premiums, or annuity considerations; build up reserves; invest those reserves; and make contractual payments. Fees are based on the expected incidence of the insured risk and the expected return on investment. 3. Providing specialized services facilitating or

supporting financial intermediation, insurance, and employee benefit programs. In addition, monetary authorities charged with monetary control are included in this sector. The Real Estate and Rental and Leasing sector comprises establishments primarily engaged in renting, leasing, or otherwise allowing the use of tangible or intangible assets, and establishments providing related services. The major portion of this sector comprises establishments that rent, lease, or otherwise allow the use of their own assets by others. The assets may be tangible, as is the case of real estate and equipment, or intangible, as is the case with patents and trademarks. This sector also includes establishments primarily engaged in managing real estate for others, selling, renting and/or buying real estate for others, and appraising real estate. These activities are closely related to this sector's main activity, and it was felt that from a production basis they would best be included here. In addition, a substantial proportion of property management is self-performed by lessors. The main components of this sector are the real estate lessors industries (including equity real estate investment trusts (REITs)); equipment lessors industries (including motor vehicles, computers, and consumer goods); and lessors of nonfinancial intangible assets (except copyrighted works).

#### Information sector

The Information sector comprises establishments engaged in the following processes: (a) producing and distributing information and cultural products, (b) providing the means to transmit or distribute these products as well as data or communications, and (c) processing data. The main components of this sector are the publishing industries, including software publishing, and both traditional publishing and publishing exclusively on the Internet; the motion picture and sound recording industries; the broadcasting industries, including traditional broadcasting and those broadcasting exclusively over the Internet; the telecommunications industries; Web search portals, data processing industries, and the information services industries. The Information sector groups three types of establishments: (1) those engaged in producing and distributing information and cultural products; (2) those that provide the means to transmit or distribute these products as well as data or communications; and (3) those that process data.

#### Transportation and Warehousing sector

The Transportation and Warehousing sector includes industries providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation. Establishments in these industries use transportation equipment or transportation related facilities as a productive asset. The type of equipment depends on the mode of transportation. The modes of transportation are air, rail, water, road, and pipeline.

#### Trade supersector

The trade, supersector consists of these sectors: Wholesale Trade: NAICS 42 and Retail Trade: NAICS 44-45. The Wholesale Trade sector comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The merchandise described in this sector includes the outputs of agriculture, mining, manufacturing, and certain information industries, such as publishing. The wholesaling process is an intermediate step in the distribution of merchandise. Wholesalers are organized to sell or arrange the purchase or sale of (a) goods for resale (i.e., goods sold to other wholesalers or retailers), (b) capital or durable nonconsumer goods, and (c) raw and intermediate materials and supplies used in production. Wholesalers sell merchandise to other businesses and normally operate from a warehouse or office. These warehouses and offices are characterized by having little or no display of merchandise. In addition, neither the design nor the location of the premises is intended to solicit walk-in traffic. Wholesalers do not normally use advertising directed to the general public. Customers are generally reached initially via telephone, in-person marketing, or by specialized advertising that may include Internet and other electronic means. Follow-up orders are either vendor-initiated or client-initiated, generally based on previous sales, and typically exhibit strong ties between sellers and buyers. In fact, transactions are often conducted between wholesalers and clients that have long-standing business relationships. The Retail Trade sector comprises establishments engaged in retailing merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The retailing process is the final step in the distribution of merchandise; retailers are, therefore, organized to sell merchandise in small quantities to the general public. This sector comprises two main types of retailers: store and nonstore retailers. 1. Store retailers operate fixed point-of-sale locations, located and designed to attract a high volume of walk-in customers. In general, retail stores have extensive displays of merchandise and use mass-media advertising to attract customers. They typically sell merchandise to the general public for personal or household consumption, but some also serve business and institutional clients. In addition to retailing merchandise, some types of store retailers are also engaged in the provision of after-sales services, such as repair and installation. 2. Nonstore retailers, like store retailers, are organized to serve the general public, but their retailing methods differ. The establishments of this subsector reach customers and market merchandise with methods, such as the broadcasting of "infomercials," the broadcasting and publishing of direct-response advertising, the publishing of paper and electronic catalogs, door-to-door solicitation, in-home demonstration, selling from portable stalls (street vendors, except food), and distribution through vending machines.

### Manufacturing sector

The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Establishments in the Manufacturing sector are often described as plants, factories, or mills and characteristically use power-driven machines and materials-handling equipment. However, establishments that transform materials or substances into new products by hand or in the worker's home and those engaged in selling to the general public products made on the same premises from which they are sold, such as bakeries, candy stores, and custom tailors, may also be included in this sector. Manufacturing establishments may process materials or may contract with other establishments to process their materials for them. Both types of establishments are included in manufacturing.

### Construction sector

The construction sector comprises establishments primarily engaged in the construction of buildings or engineering projects (e.g., highways and utility systems). Establishments primarily engaged in the preparation of sites for new construction and establishments primarily engaged in subdividing land for sale as building sites also are included in this sector. Construction work done may include new work, additions, alterations, or maintenance and repairs. Activities of these establishments generally are managed at a fixed place of business, but they usually perform construction activities at multiple project sites. Production responsibilities for establishments in this sector are usually specified in (1) contracts with the owners of construction projects (prime contracts) or (2) contracts with other construction establishments (subcontracts).

### Utilities sector

The Utilities sector comprises establishments engaged in the provision of the following utility services: electric power, natural gas, steam supply, water supply, and sewage removal. Within this sector, the specific activities associated with the utility services provided vary by utility: electric power includes generation, transmission, and distribution; natural gas includes distribution; steam supply includes provision and/or distribution; water supply includes treatment and distribution; and sewage removal includes collection, treatment, and disposal of waste through sewer systems and sewage treatment facilities.

### Natural Resources and Mining supersector

The natural resources and mining supersector consists of these sectors: Agriculture, Forestry, Fishing and Hunting: NAICS 11, and Mining, Quarrying, and Oil and Gas Extraction: NAICS 21. The Agriculture, Forestry, Fishing and Hunting sector comprises establishments primarily engaged in growing crops, raising animals, harvesting timber,

and harvesting fish and other animals from a farm, ranch, or their natural habitat. The establishments in this sector are often described as farms, ranches, dairies, greenhouses, nurseries, orchards, or hatcheries. A farm may consist of a single tract of land or a number of separate tracts which may be held under different tenures. For example, one tract may be owned by the farm operator and another rented. It may be operated by the operator alone or with the assistance of members of the household or hired employees, or it may be operated by a partnership, corporation, or other type of organization. When a landowner has one or more tenants, renters, croppers, or managers, the land operated by each is considered a farm. The Mining sector comprises establishments that extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas. The term mining is used in the broad sense to include quarrying, well operations, beneficiating (e.g., crushing, screening, washing, and flotation), and other preparation customarily performed at the mine site, or as a part of mining activity.

### Public Administration

The Public Administration sector consists of establishments of federal, state, and local government agencies that administer, oversee, and manage public programs and have executive, legislative, or judicial authority over other institutions within a given area. These agencies also set policy, create laws, adjudicate civil and criminal legal cases, provide for public safety and for national defense. In general, government establishments in the Public Administration sector oversee governmental programs and activities that are not performed by private establishments. Establishments in this sector typically are engaged in the organization and financing of the production of public goods and services, most of which are provided for free or at prices that are not economically significant. Government establishments also engage in a wide range of productive activities covering not only public goods and services but also individual goods and services similar to those produced in sectors typically identified with private-sector establishments. In general, ownership is not a criterion for classification in NAICS. Therefore, government establishments engaged in the production of private-sector-like goods and services should be classified in the same industry as private-sector establishments engaged in similar activities. As a practical matter, it is difficult to identify separate establishment detail for many government agencies. To the extent that separate establishment records are available, the administration of governmental programs is classified in Sector 92, Public Administration, while the operation of that same governmental program is classified elsewhere in NAICS based on the activities performed. For example, the governmental administrative authority for an airport is classified in Industry 92612, Regulation and Administration of Transportation Programs, while operating the airport is classified in Industry 48811, Airport Operations. When separate records for multi-establishment companies are not available to distinguish

between the administration of a governmental program and the operation of it, the establishment is classified in Sector 92, Public Administration.

## B. Projected 2018 Green Jobs by Occupation and Sector in Connecticut

Occupations	Public Administration	Natural resources and mining	Utilities	Construction	Manufacturing	Trade	Transportation and warehousing	Information	Financial activities	Professional, scientific, and technical services	Administrative and waste services	Management of companies and enterprises	Education and health services	Leisure and hospitality	Other services, except public administration	All Non-disclosed	TOTAL
11-0000 Management Occupations	877	-	58	314	427	206	414	-	-	684	396	-	-	146	-	366	3,888
13-0000 Business and Financial Operations Occupations	1,490	-	39	17	119	81	191	-	-	421	190	-	-	20	-	365	2,932
15-0000 Computer and Mathematical Occupations	270	-	4	1	78	15	17	-	-	387	41	-	-	1	-	64	877
17-0000 Architecture and Engineering Occupations	775	-	111	58	579	24	90	-	-	1,281	138	-	-	2	-	91	3,149
19-0000 Life, Physical, and Social Science Occupations	509	-	10	0	62	3	3	-	-	259	23	-	-	0	-	21	891
23-0000 Legal Occupations	9	-	-	-	0	0	-	-	-	4	0	-	-	-	-	1	14
27-0000 Arts, Design, Entertainment, Sports, and Media Occupations	68	-	4	1	15	5	3	-	-	102	14	-	-	12	-	76	300
29-0000 Healthcare Practitioners and Technical Occupations	76	-	4	4	10	1	11	-	-	14	8	-	-	0	-	9	135
41-0000 Sales and Related Occupations	6	-	10	38	51	140	138	-	-	294	270	-	-	35	-	193	1,174
43-0000 Office and Administrative Support Occupations	304	-	92	39	398	394	1,442	-	-	324	1,141	-	-	56	-	367	4,556
45-0000 Farming, Fishing, and Forestry Occupations	8	-	0	-	1	2	0	-	-	0	1	-	-	0	-	13	26
47-0000 Construction and Extraction Occupations	864	-	69	2,946	153	15	72	-	-	101	500	-	-	12	-	137	4,869
49-0000 Installation, Maintenance, and Repair Occupations	920	-	252	352	436	286	436	-	-	66	314	-	-	170	-	426	3,658
51-0000 Production Occupations	166	-	123	64	2,615	110	170	-	-	134	819	-	-	7	-	89	4,296
53-0000 Transportation and Material Moving Occupations	738	-	17	133	547	550	6,616	-	-	77	1,520	-	-	43	-	165	10,406
Grand Total	7,078	-	792	3,966	5,492	1,829	9,603	-	-	4,149	5,375	-	-	503	-	2,382	41,171

### **C. CT DOL Minimum Education and Experience Descriptions**

- **First Professional Degree** - Completion of the academic program usually requires at least six years of full-time equivalent academic study, including college study prior to entering the professional degree program.
- **Doctoral Degree** - Completion of the degree program usually requires at least three years of full-time equivalent academic work beyond the bachelor's degree.
- **Master's Degree** - Completion of the degree program usually requires one or two years of full-time equivalent study beyond the bachelor's degree.
- **Work Experience, plus Bachelor's or Higher Degree** - Most occupations in this category are managerial occupations that require experience in a related non-managerial position.
- **Bachelor's Degree** - Completion of the degree program generally requires at least four years but not more than five years of full-time equivalent academic work.
- **Associate Degree** - Completion of the degree program usually requires at least two years of full-time equivalent academic study.
- **Postsecondary Vocational Training** - Some programs last only a few weeks while others may last more than a year. In some occupations, a license is needed that requires passing an examination after completion of the training.
- **Work Experience in a Related Occupation** - Some occupations requiring work experience are supervisory or managerial occupations.
- **Long-Term On-The-Job Training** - This category includes occupations that generally require more than 12 months of on-the-job training or combined work experience and formal classroom instruction for workers to develop the skills needed for average job performance. This category includes formal and informal apprenticeships that may last up to four years, and short-term intensive employer-sponsored training that workers must successfully complete. Individuals undergoing training are generally considered to be employed in the occupation. This category includes occupations in which workers may gain experience in non-work activities, such as professional athletes who gain experience through participation in athletic programs in academic institutions.
- **Moderate-Term On-The-Job Training** - This category includes occupations in which workers can develop the skills needed for average job performance after one to 12 months of combined on-the-job experience and informal training.
- **Short-Term On-The-Job Training** - This category covers occupations in which workers can develop the skills needed for average job performance after a short demonstration or up to one month of on-the-job experience or instruction.

**D. Connecticut Green Job Occupations 2018 Employment, 2010-2018 Change and Education and Experience Requirements**

OCCUPATIONAL CODE	OCCUPATIONAL TITLE	2018 EMPLOYMENT	2010-2018 CHANGE	EDUCATION AND EXPERIENCE REQUIREMENTS
53-3032	Heavy and Tractor-Trailer Truck Drivers	4,348	581	Short-term on-the-job training
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	3,828	441	Short-term on-the-job training
43-4051	Customer Service Representatives	2,485	33	Moderate-term on-the-job training
11-1021	General and Operations Managers	2,139	156	Bachelor's or higher degree, plus work experience
13-1199	Business Operations Specialists, All Other*	1,556	(2)	Bachelor's degree
49-9071	Maintenance and Repair Workers, General	1,416	43	Moderate-term on-the-job training
51-2092	Team Assemblers	1,133	106	Moderate-term on-the-job training
47-2061	Construction Laborers	1,059	171	Moderate-term on-the-job training
43-5071	Shipping, Receiving, and Traffic Clerks	905	104	Short-term on-the-job training
53-7051	Industrial Truck and Tractor Operators	864	97	Short-term on-the-job training
41-3099	Sales Representatives, Services, All Other	818	94	Work experience in a related occupation
47-2031	Carpenters	663	144	Long-term on-the-job training
47-2111	Electricians	626	56	Long-term on-the-job training
53-3021	Bus Drivers, Transit and Intercity	623	34	Moderate-term on-the-job training
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	619	74	Work experience in a related occupation
51-1011	First-Line Supervisors of Production and Operating Workers	598	(49)	Work experience in a related occupation
11-9199	Managers, All Other	571	(11)	Work experience in a related occupation
17-2051	Civil Engineers	559	24	Bachelor's degree
47-2073	Operating Engineers and Other Construction Equipment Operators	548	29	Moderate-term on-the-job training
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	540	(87)	Work experience in a related occupation
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	518	36	Moderate-term on-the-job training
15-1133	Software Developers, Systems Software	513	64	Bachelor's degree
43-5032	Dispatchers, Except Police, Fire, and Ambulance	482	33	Moderate-term on-the-job training
13-1041	Compliance Officers	445	(20)	Long-term on-the-job training

OCCUPATIONAL CODE	OCCUPATIONAL TITLE	2018 EMPLOYMENT	2010-2018 CHANGE	EDUCATION AND EXPERIENCE REQUIREMENTS
49-3023	Automotive Service Technicians and Mechanics	436	22	Postsecondary vocational training
47-2152	Plumbers, Pipefitters, and Steamfitters	434	24	Long-term on-the-job training
51-4041	Machinists	415	30	Long-term on-the-job training
15-1799	Computer Occupations, All Other*	365	(0)	Associate degree
43-5061	Production, Planning, and Expediting Clerks	361	16	Moderate-term on-the-job training
51-4121	Welders, Cutters, Solderers, and Brazers	352	20	Postsecondary vocational training
53-7081	Refuse and Recyclable Material Collectors	342	14	Short-term on-the-job training
49-9041	Industrial Machinery Mechanics	328	(60)	Long-term on-the-job training
17-2141	Mechanical Engineers	325	23	Bachelor's degree
43-5011	Cargo and Freight Agents	324	46	Moderate-term on-the-job training
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	319	39	Work experience in a related occupation
51-9399	Production Workers, All Other*	302	25	Moderate-term on-the-job training
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	284	31	Work experience in a related occupation
11-9041	Architectural and Engineering Managers	279	(4)	Bachelor's or higher degree, plus work experience
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	253	42	Postsecondary vocational training
13-1151	Training and Development Specialists	248	0	Bachelor's degree
27-3031	Public Relations Specialists	244	12	Bachelor's degree
17-2112	Industrial Engineers	242	14	Bachelor's degree
17-3023	Electrical and Electronics Engineering Technicians	240	(38)	Associate degree
11-9021	Construction Managers	239	43	Bachelor's degree
17-2071	Electrical Engineers	236	(100)	Bachelor's degree
17-2199	Engineers, All Other	235	(1)	Bachelor's degree
47-4011	Construction and Building Inspectors	229	(2)	Work experience in a related occupation
49-9051	Electrical Power-Line Installers and Repairers	223	(410)	Long-term on-the-job training
11-3071	Transportation, Storage, and Distribution Managers	215	16	Work experience in a related occupation
13-1081	Logisticians	210	(2)	Bachelor's degree
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	197	17	Moderate-term on-the-job training
19-2041	Environmental Scientists and Specialists, Including Health	195	(4)	Master's degree

OCCUPATIONAL CODE	OCCUPATIONAL TITLE	2018 EMPLOYMENT	2010-2018 CHANGE	EDUCATION AND EXPERIENCE REQUIREMENTS
51-2022	Electrical and Electronic Equipment Assemblers	194	17	Short-term on-the-job training
17-2072	Electronics Engineers, Except Computer	188	11	Bachelor's degree
49-9799	Installation, Maintenance, and Repair Workers, All Other*	181	(7)	Moderate-term on-the-job training
13-2099	Financial Specialists, All Other	174	(2)	Bachelor's degree
13-2051	Financial Analysts	168	9	Bachelor's degree
11-2021	Marketing Managers	167	12	Bachelor's or higher degree, plus work experience
17-1011	Architects, Except Landscape and Naval	159	24	Bachelor's degree
47-2211	Sheet Metal Workers	159	26	Long-term on-the-job training
17-3011	Architectural and Civil Drafters	157	22	Postsecondary vocational training
47-2051	Cement Masons and Concrete Finishers	151	37	Moderate-term on-the-job training
11-3051	Industrial Production Managers	151	(4)	Work experience in a related occupation
49-9098	Helpers--Installation, Maintenance, and Repair Workers	146	(6)	Short-term on-the-job training
17-3029	Engineering Technicians, Except Drafters, All Other	132	(3)	Associate degree
17-2011	Aerospace Engineers	129	12	Bachelor's degree
19-2031	Chemists	128	6	Bachelor's degree
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	121	9	Moderate-term on-the-job training
29-9011	Occupational Health and Safety Specialists	116	(8)	Bachelor's degree
19-3051	Urban and Regional Planners	112	(3)	Master's degree
17-2081	Environmental Engineers	112	2	Bachelor's degree
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	107	8	Moderate-term on-the-job training
17-3031	Surveying and Mapping Technicians	106	(10)	Moderate-term on-the-job training
47-2181	Roofers	104	27	Moderate-term on-the-job training
51-8013	Power Plant Operators	98	(229)	Long-term on-the-job training
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	93	(3)	Postsecondary vocational training
11-9121	Natural Sciences Managers	92	3	Bachelor's or higher degree, plus work experience
47-4041	Hazardous Materials Removal Workers	87	7	Moderate-term on-the-job training
19-4031	Chemical Technicians	85	3	Associate degree
53-6051	Transportation Inspectors	82	5	Work experience in a related occupation

OCCUPATIONAL CODE	OCCUPATIONAL TITLE	2018 EMPLOYMENT	2010-2018 CHANGE	EDUCATION AND EXPERIENCE REQUIREMENTS
19-3099	Social Scientists and Related Workers, All Other	79	(0)	Master's degree
51-2041	Structural Metal Fabricators and Fitters	73	7	Moderate-term on-the-job training
13-1022	Wholesale and Retail Buyers, Except Farm Products	72	7	Long-term on-the-job training
41-3031	Securities, Commodities, and Financial Services Sales Agents	72	4	Bachelor's degree
17-3026	Industrial Engineering Technicians	70	1	Associate degree
19-4091	Environmental Science and Protection Technicians, Including Health	68	(1)	Associate degree
47-2221	Structural Iron and Steel Workers	62	15	Long-term on-the-job training
17-3027	Mechanical Engineering Technicians	59	6	Associate degree
47-4799	Construction and Related Workers, All Other*	57	4	Moderate-term on-the-job training
19-2099	Physical Scientists, All Other	54	(3)	Bachelor's degree
19-1031	Conservation Scientists	53	(2)	Bachelor's degree
13-2052	Personal Financial Advisors	52	6	Bachelor's degree
51-8021	Stationary Engineers and Boiler Operators	47	(14)	Long-term on-the-job training
51-9011	Chemical Equipment Operators and Tenders	46	4	Moderate-term on-the-job training
47-3012	Helpers--Carpenters	45	11	Short-term on-the-job training
17-3025	Environmental Engineering Technicians	42	1	Associate degree
49-9044	Millwrights	41	6	Long-term on-the-job training
51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	39	4	Moderate-term on-the-job training
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	38	1	Bachelor's degree
19-4092	Forensic Science Technicians	38	(2)	Bachelor's degree
17-2041	Chemical Engineers	38	1	Bachelor's degree
51-2031	Engine and Other Machine Assemblers	35	3	Short-term on-the-job training
11-2011	Advertising and Promotions Managers	34	5	Bachelor's or higher degree, plus work experience
19-3011	Economists	33	(1)	Master's degree
17-1012	Landscape Architects	32	4	Bachelor's degree
27-1021	Commercial and Industrial Designers	31	4	Bachelor's degree
17-2161	Nuclear Engineers	29	(49)	Bachelor's degree
47-2131	Insulation Workers, Floor, Ceiling, and Wall	26	6	Moderate-term on-the-job training
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers	26	1	Work experience in a related occupation
27-3022	Reporters and Correspondents	25	3	Bachelor's degree

OCCUPATIONAL CODE	OCCUPATIONAL TITLE	2018 EMPLOYMENT	2010-2018 CHANGE	EDUCATION AND EXPERIENCE REQUIREMENTS
17-3024	Electro-Mechanical Technicians	21	(1)	Associate degree
19-4011	Agricultural and Food Science Technicians	20	2	Associate degree
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	20	2	Moderate-term on-the-job training
29-9012	Occupational Health and Safety Technicians	19	(1)	Associate degree
19-2043	Hydrologists	18	0	Master's degree
23-1022	Arbitrators, Mediators, and Conciliators	14	0	Bachelor's or higher degree, plus work experience
19-2032	Materials Scientists	10	1	Bachelor's degree
13-1021	Buyers and Purchasing Agents, Farm Products	7	0	Long-term on-the-job training



### E. Incentive Programs and Policies Influencing Green Employment and Targeted Technologies

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted											
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment	Efficient Vehicles & Infrastructure
CBRA/CDA Tax Increment Financing	CBRA/CDA				X														
CBRA/CDA Direct Loans	CBRA/CDA				X														
CBRA/CDA Loan Guarantees	CBRA/CDA				X														
CEFIA- Solar Thermal Incentive Program aka Solar Hot Water Incentive Program	CEFIA	X	X																
CCAT Energy Program	CCAT	X		X					X						X				X
Clean Energy Financial Innovation Program	CEFIA	X	X	X						X	X		X	X	X	X	X		X
Combined Heat & Power program	CEFIA	X	X							X		X							
Condominium Renewable Energy grant program	CEFIA	X																	
Predevelopment loans	CEFIA	X																	
On-site Anaerobic Digestion (OAD) Pilot Program	CEFIA	X																	
CT Solar Lease	CEFIA	X	X																
Residential Solar PV Investment program	CEFIA	X	X																
Community Innovation Grants	CEFIA	X	X																

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted											
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment	Efficient Vehicles & Infrastructure
Residential Clean Energy Financing Program	CEFIA	X	X							X	X			X	X	X	X		
CEFIA- Project 150	CEFIA	X																	
CEFIA- CCEF Strategic Investment Opportunity	CEFIA	X																	
Green Loan Guaranty Fund	CEFIA	X	X							X	X	X	X	X	X	X	X	X	
Feasibility Studies	CEFIA	X																	
Neighbor to Neighbor energy challenge	CEFIA	X	X							X	X			X	X	X	X		
Sun Rise New England - Open for Business	CEFIA	X																	
CEFIA- CCEF- Connecticut Clean Energy Communities Program	CEFIA/CEEF	X																	
Commercial Property Assessed Clean Energy	CEFIA with municipalities	X	X																
Residential Energy Efficiency Financing Program	CHIF		X							X				X			X		
ZREC long-term contracts	CL&P and UI	X																	
LREC long-term contracts	CL&P and UI	X																	
CMEEC Municipal Commercial & Industrial Cool Choice aka "Equipment Replacement"	CMEEC Utilities		X							X				X					
CMEEC CT Municipal Motor Up	CMEEC Utilities		X							X								X	
CMEEC Ct Municipal	CMEEC Utilities		X							X				X				X	

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted										
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment
CFL lighting	CMEEC Utilities		X							X	X							
CMEEC Home Energy Savings Rebate on attic insulations	CMEEC Utilities		X							X						X		
Groton Utilities- Residential programs	CMEEC Utilities		X							X	X		X		X	X		
CONNSTEP EPA certification in sustainable manufacturing	CONNSTEP		X							X							X	
Connecticut Conservation Corps	DEEP						X											
CCAT Manufacturing Optimization	CCAT		X							X							X	
Sales and Use Tax Exemption for Energy-Efficient Products	CT Dept of Revenue Services		X							X						X		
Sales and Use Tax Exemption for Solar and Geothermal Systems	CT Dept of Revenue Services	X																
Sales and Use Taxes for Items Used in Renewable Energy Industries	CT Dept of Revenue Services	X																
Clean Tech Fund	CT Innovations	X						X	X	X		X		X				
Eli Whitney Fund	CT Innovations	X	X	X	X			X										
Pre-Seed and Seed Funds	CT Innovations	X	X	X	X			X										
Drycleaning Establishment Remediation Fund	DECD				X													
Special Contaminated Property Remediation and Insurance Fund	DECD				X													
Urban Sites Remedial Action Program	DECD				X													

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted											
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment	Efficient Vehicles & Infrastructure
Brownfield Liability Protection/Brownfield Remediation and Revitalization Program	DECD				X														
Targeted Brownfield Development Loan Program	DECD				X														
Municipal Brownfield Grants	DECD				X														
Economic Development and Manufacturing Assistance Act- Environmental Insurance Program	DECD				X														
CT Brownfield Revolving Loan Fund	DECD				X														
CT EPA Site Assessment Program	DECD				X														
Urban and Industrial Sites Reinvestment Tax Credit	DECD				X														
Abandoned Brownfield Cleanup Program	DECD				X														
Regional Brownfields Grant Program	DECD				X														
Clean Water Revolving Fund	DEEP				X														
Safe Drinking Water Revolving Fund	DEEP				X														
CT DEEP Diesel Emission Reductions	DEEP			X						X									X
Electric company ownership of renewable generation	DEEP	X																	
Lead by Example	DEEP w/CEFIA	X	X																
Voluntary Remediation Program for Property Located on Contaminated Ground Water	DEEP				X														

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted											
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment	Efficient Vehicles & Infrastructure
Voluntary Remediation Program for contaminated Property Regardless of Location	DEEP				X														
Brownfield fee exemptions	DEEP				X														
CT Clean Cities Future Fuels Project	Greater New Haven Clean Cities Coalition			X						X									X
Smart Grid Investment Program	ISO-New England CMEEC		X							X				X					
Property Tax Exemption for Renewable Energy Systems	Municipalities	X																	
Norwich Public Utilities - Zero Percent Financing Program	Norwich Public Utilities		X							X	X			X	X	X	X		
Residential New Construction Program	Utilities		X							X	X			X	X	X	X		
Home Energy Solutions Program	CEEF		X							X	X			X	X		X		
Home Energy Solutions Program- Income Eligible	CEEF		X							X	X			X	X		X		
Energy Efficiency Fund (Electric and Gas) - Residential New Construction Program	Utilities		X							X	X			X	X	X	X		
Renewables Portfolio Standard	Utilities	X																	
Home Performance with Energy Star	CEEF		X							X	X			X	X		X		
Energy Star Retail Products	Utilities		X							X	X								
Time of use rates and meters	Utilities		X							X				X					
Commercial and Industrial Energy Efficiency Programs	CEEF		X							X	X			X				X	

Program	Administrator	Green Technology & Practice Area						Strategies/Technologies Promoted											
		1) Renewable energy generation	2) Energy Efficiency	3) Other GHG reducers	4) Reduce pollutants	5) Recycling	6) Conserving Natural Resources	Any	Developing technologies	Energy Efficiency	CFL lighting	Combined Heat & Power	Efficient plumbing	HVAC	Power management	Energy-efficient building design	Weatherization	High-efficiency industrial & commercial equipment	Efficient Vehicles & Infrastructure
Small Business Energy Advantage Program	CEEF		X							X	X			X				X	
Energy Opportunities (EO) & Small Business Energy Advantage (SBEA) programs Comprehensive Initiative	CEEF		X							X	X			X				X	
Energy Conscious Blueprint	CEEF		X							X					X				
CEEF Operations & Maintenance (O&M Fund)	CEEF		X																
CEEF RetroCommissioning "RCx – Improving Efficiencies in Building Management System Operation"	CEEF		X							X	X			X				X	
Process Reengineering for Increased Manufacturing Efficiency	CEEF		X							X								X	
Internal Revenue Code Section 48C - Advanced Energy Manufacturing Tax Credit	IRS	X																	
UConn Center for Clean Energy Engineering	University of Connecticut	X	X						X										