DISTRICT OF COLUMBIA GOVERNMENT

February 2009

The DC Office of Planning, in conjunction with the Washington DC Economic Partnership and the DC Department of Employment Services, is please to provide this green collar job demand analysis for Washington, DC. The study, the first of its kind for Washington, DC, was prepared by a team that included The Louis Berger Group, Inc., ESOP Advisors, Inc., and the Green Builders Council of DC/Momentum Analysis.

While many similar studies across the country use projections and historical trends as the methodological framework, the District of Columbia Green Jobs Demand Analysis uses data from ***actual*** real estate and capital improvement projects as the primary source data.

The purpose of the District's green collar jobs analysis was twofold: 1) to estimate the number of potential green collar job opportunities generated from District government green policies or laws from 2009 through 2018, and 2) to identify barriers, opportunities and best practices from around the country. Although the short term economic outlook, both nationally and locally, has worsened since the focus groups were conducted (summer 2008), the District nonetheless believes that green building, sustainable development and green business practices continue to grow and are steadily becoming a larger and more permanent portion of the economy of the District of Columbia. As the economy rebounds, the District anticipates the concentration of energy efficient, green and sustainable development practices will serve to hasten the economic recovery and enhance the city's competitive position.

The study included the following inputs:

- Current DC government green policies or legislation (Green Building Act, Clean and Affordable Energy Act, etc.),
- Major real estate development projects and government capital investments, and
- Proposed green initiatives (Solar Trees, green roof demonstrations, etc.).

The analysis also included focus groups to hear the concerns of workforce training providers, developers, contractors and green business proprietors and a best practices study to understand which green collar job efforts across the nation were proving successful.

The definition of green collar jobs used for the demand study:

> Career-track employment opportunities in emerging environmental industries as well as conventional businesses and trades, created by a shift to more sustainable practices, materials, and performance. It includes both lower and higher skilled

employment opportunities that minimize the carbon footprint of all inputs necessary and directly results in the:

- Restoration of the environment,
- Generation of clean energy and improved energy efficiency,
- Creation of high performance buildings, and
- Conservation of natural resources.

The District used the terms green collar jobs and green jobs interchangeably. The demand analysis also focused on job opportunities which require little advanced training as a prerequisite for employment in order to address the needs of residents who have greatest barriers to steady employment.

Some important findings in the study include:

- The District of Columbia government's existing policies and legislation and proposed initiatives identified in the report could produce over 169,000 job opportunities between 2009 and 2018.
- Most of these green job opportunities are a result of the private sector real estate development projects that are required to comply with the Green Building Act (57,000) followed by the public sector real estate and capital projects required to comply with the Green Building Act (41,000). In the case where the private sector is voluntarily complying with the Green Building Act, about 22,000 green jobs are estimated during the same time period.
- Thirty seven percent of the green job opportunities require little to no preparation, and thus have the fewest barriers to entry. Forty two percent of the green jobs produced will require a moderate level of preparation and typically require an associate's degree while a few will require a bachelor's degree or higher.
- The top occupations that require the least preparation are:
  - Construction laborers
  - Roofers
  - Painters
  - Landscaping and groundskeeping workers
  - Office clerks
- The top occupations that need moderate job preparation include:
  - Carpenters
  - Construction trade supervisors
  - Operating engineers and construction equipment operators
  - Electricians (including photovoltaic panel installers)

- Plumbers, pipefitters and steamfitters

- DC is the national leader in terms of the number of certified or registered green buildings and projects. In January 2009, there were 420 certified or registered projects within Washington, DC.

- DC is conducting some of the most comprehensive watershed restoration projects in the country, including the Watts Branch, Pope Branch and Anacostia River.

- DC has one of the first and largest municipal green youth employment programs, the Green Summer Job Corps. In 2008, nearly 400 youth between the ages of 14 and 21 participated. In 2009, it is anticipated that 800 youth will participate.

- Based upon the Department of Employment Services labor market data, the industry-by-industry occupational assessment found that there are currently about 22,000 "green" jobs in the District. This is a little over 3% of the 702,000 jobs in the District. Another 3,167 jobs in DC were classified as "possibly green." The largest shares of green jobs were found in the following sectors:

  - Construction (5,400);
  - Architecture and Engineering (4,700); and
  - Federal Government jobs (5,300).

- Adopting green building standards strengthen market value in the commercial real estate sector. This is demonstrated through higher rents and higher resale values of green commercial buildings.

- No firm numbers are presently available for the green office employment, although many office-based businesses have the potential to become green through environmentally friendly procurement, energy efficiency improvements, recycling and green modes of transportation.

- In most cases, green collar jobs are existing jobs with new skill requirements.

- According to the Green Restaurant Association, a national association, the District has only two green restaurants and one green caterer.

- Currently, there is not any District government assistance specifically targeted or directed towards green businesses.

- Within the District government agencies, the Department of the Environment, Department of Public Works and the Department of Parks and Recreation, there are 300 green collar jobs.

I hope that readers find this study useful and informative. While the broad economic slowdown may push some of the job creation projections out over more years, there are

clearly more green jobs on the way. The recently passed American Recovery and Reinvestment Act of 2009 contains provisions for new transit investments, weatherization of homes and offices, and the green retro-fit of Federal buildings (particularly concentrated here), among other job creating provisions. Other programs are in the works that that will provide funding for eco-friendly projects. Whatever the size of the economic pie, it seems likely that the slice of the pie that's green will be growing.

Harriet Tregoning
Director, DC Office of Planning

District of Columbia

Green Collar Jobs Demand Analysis Final Report

- **Green Collar Jobs Demand Estimates**
- **Best Practices**
- **Focus Groups: Findings on Green Businesses**

Submitted to:

Washington D.C. Economic Partnership

and the

Washington D.C. Office of Planning

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Momentum Analysis

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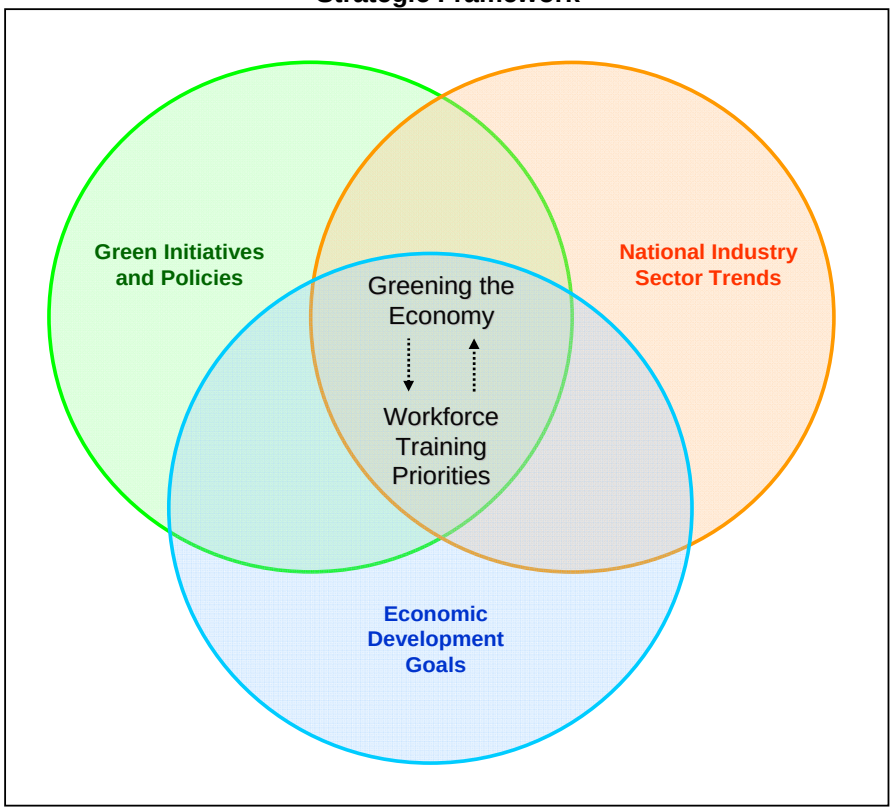
EXECUTIVE SUMMARY

STRATEGIC FRAMEWORK

The District of Columbia recognizes that meeting the challenge of global economic competition is served in part by the implementation of strategies to foster a more livable city. Policies that protect and enhance the environment and public health can play a complementary role in an economic development strategy. They may actually have a propulsive, transformative effect. The District recognizes this and wishes to capture both employment opportunities for its residents in emerging green industry sectors and create a greener, more sustainable local economy. These policy goals pose both opportunities and challenges for the District's resources and current workforce capabilities. This study will help inform the District's decision-making process on how to best allocate work force training and economic development resources in support of these goals.

It is no longer conventional wisdom to assume that achieving higher environmental standards is antithetical to growing businesses, creating jobs and developing a city's economy. Indeed, more businesses are looking at their "triple bottom line" (profit, environmental and social impacts) and finding sources of innovation. Recent and burgeoning global interest in "green collar jobs" is further testament to this shift in perspective. There is a realization that improving environmental and energy standards can actually drive demand for technological and process innovation and, commensurately, create employment opportunities. The District's goals of creating a green economy and capturing "green collar jobs" is a strategic response to emerging trends in the market and to current and anticipated needs of its labor force. Figure 1.0 presents a graphic illustration of how these elements overlap.

Figure 1.0
Strategic Framework



The combination of the District's *Green Initiatives and Policies* and broadly defined *Economic Development Goals*, and the exogenous force of emerging *National Industry Sector Trends* are portrayed in the figure as labor demand (skills) drivers. Green initiatives and policies will result in higher environmental performance standards and the introduction of new systems and technologies. Meeting these standards, operating new systems and using new technologies will require new skills. District economic development goals include creating and retaining job opportunities for residents, particularly the District's hard to employ (or chronically unemployed) population, across a broad occupational spectrum. Emerging national trends in green sectors (i.e. cleantech, alternative energy, environmental services) represent industry attraction opportunities for the District.

At the intersection of these demand drivers, *Greening the Economy* can be viewed as a responsive strategy and workforce training as an adaptive tool – to best prepare the District's residents, particularly its hard to employ population, to capture "green collar job" opportunities – and as a facilitative tool to enhance the District's ability to attract green industry sectors and foster greener outcomes with current DC businesses. Harmonizing workforce training and economic development programs to accelerate green development outcomes is a high priority for the District. Local businesses will play an important role in advancing the District towards a green economy. When more local businesses are able to employ more District residents, it strengthens the economic and social vitality of the city. As the only municipal government in the United States prohibited from taxing non-resident income, a strong residential employment base is critical to the District's ability to generate sufficient revenues to support the many services demanded. Identifying where the priorities should be placed for workforce training is one of the key goals of this study.

Recently implemented green initiatives and policies such as the *Green Building Act of 2006 ("Green Building Act")* and the *Clean and Affordable Energy Act of 2008 ("Energy Act")* will play a significant role in greening the District's economy. In concert with many other DC green initiatives, the Green Building and Energy Acts are expected to trigger demand for new job skills, as new building and energy standards will have to be met. In some instances, the green initiatives may trigger demand for entirely new jobs or new occupational categories.

The District defines "green collar jobs" as *career-track employment opportunities in emerging environmental industries as well as conventional businesses and trades, created by a shift to more sustainable practices, materials, and performance. The definition includes both lower and higher skilled employment opportunities that minimize the carbon footprint of all necessary inputs and directly result in the restoration of the environment, the generation of clean energy and improved energy efficiency, the creation of high performing buildings, and the conservation of natural resources*. This definition is born out of, and directly responds to, the District's unique socio-economic environment. Many jurisdictions have identified "green collar jobs" as blue collar, or manual labor, or low skilled or manufacturing jobs being performed with a new green or environmental focus. The District's economic and workforce composition, however, led it to take a broader, more inclusive approach to green collar jobs. The District, therefore, uses the terms "green collar jobs" and "green jobs" interchangeably.

OVERALL FINDINGS AND RECOMMENDATIONS

Greening the DC Economy

The District should implement a combination of internally and externally focused strategies to promote greener outcomes in its economy. The internal strategies should focus on creating stronger incentives for greener business practices and green business retention. Green business and clean tech industry attraction should serve as the focus of the external strategy. Key findings and specific recommendations include:

- ***Stimulate demand for environmentally preferable goods and services***. Institute an Environmentally Preferable Purchasing program similar to the DOD green procurement strategy at the District Office of Contracting and Procurement. Vendors supplying the District with products and services could be required to practice green supply chain and green IT standards. Such a program would require personnel training and the establishment of targeted green procurement parameters. A pilot program could be housed in the Department of Employment Services Procurement division.

- ***Strengthen green business retention and attraction and measure performance.*** Establish a green business program similar to other exemplary and recognized programs (e.g., the Bay Area Green Business program). Such a third party credentialing body with accepted standards and metrics for green business practices could serve several purposes:

  - Create greater incentives for businesses to adopt greener practices.
  - Provide businesses tangible, measurable standards to adopt and abide by.
  - Provide technical services to both existing and target industries on environmental compliance issues or on process innovation, which can support industry retention in and help attract businesses needing such services.
  - Support marketing and industry attraction efforts encouraging green businesses (or businesses interested in such practices and/or the "triple bottom line" approaches).
  - Support the District's ability to accurately track progress towards greening its economy by way of establishing recognizable standards/metrics for the environmental performance of businesses and by providing a reliable basis for classification and tracking.

- ***Direct development assistance at front end for green business and clean tech.*** Tax incentives do not exist for large energy producers on the state level for the renewable energy production mandates that states such as Nevada and California have implemented. The success of Pennsylvania efforts indicate that direct economic development incentive assistance, on the front end of business development and business attraction efforts, has more value than general tax credit based incentives. The District does not currently offer any tax benefits specifically targeted to green businesses to create green collar jobs.

- ***Green and clean tech industry attraction***. The District's (and the region's) economy does not have a large manufacturing base to expand on, and therefore must focus its efforts in sectors that have a business base which can be expanded in the near term. The District does have a substantial (but declining) printing and printing supply industry. The industrial expertise in the district could be redeployed to focus on utilization of this industrial base to serve green demand, as is being done with the use of "printing technology" for the manufacture of thin film "nano" solar cells in California.

- ***Most states and localities have not instituted separate efforts to attract and grow green businesses***, but include green businesses in their standard economic development business attraction and growth assistance efforts. Various states such as California and Nevada have instituted requirements for the utilization of renewably generated electricity but have not instituted tax incentives to encourage such utilization.

- ***Green standards strengthen market value in real estate sector***. A 2008 CoStar Group, Inc. study found that LEED-certified and Energy Star-rated buildings in both the U.S. and in the DC markets were "adding value" to buildings, as exhibited in higher occupancy levels, rents and sales prices as compared to traditional commercial properties.

Workforce Training and Green Collar Jobs

The District's workforce training strategy and programs should consider a continued focus on basic work readiness to assist residents seeking entry to many of the positions in the construction sector, as many offer relatively low barriers to entry. There will be new demand driven by the District's green initiatives for occupations with new green skills and knowledge.

- ***In most cases green collar jobs are existing jobs with new skills requirements***. The findings from the demand analysis and the green businesses focus group sessions indicate that most "green collar jobs" will be slightly modified versions of existing occupations. Many, however, will present opportunities for new training and skills in green practices and technologies.

- ***Pursue Federal Green Jobs funds***. The District should develop a comprehensive green jobs workforce support and workforce development program that can be funded when federal Green Jobs funds become available. This comprehensive effort should include soft skills, pre-apprenticeship training, and wraparound services that will be needed to serve the ex-offender, youth and other hard to serve populations. Soft skills include training for attitude, appearance and basic life skills.

- ***Emulate the New York City and Oakland programs*** as a model for the development of programs for youth and other hard to serve workforce development populations. Specifically, the District should partner with nonprofits that operate successful programs and encourage them to adopt green collar jobs as an area of focus.

- ***Workforce training programs should consider*** focusing on and reflecting District leadership, policy and involvement in Green Jobs as a resource for program development and implementation. District government should structure programs such that they can be scaled to meet growing future demands.

- Most participants in the focus groups said the responsibility for providing a job ready workforce (with the required life and soft skills) was that of the District government.

- ***Promote small business development*** that can create entry level or low barriers to entry green job opportunities for youth and ex-offenders.

REPORT SECTION SUMMARIES

The remainder of the Executive Summary provides brief summaries and highlights from the major sections of the report. They appear in the same order as in the report. Much greater detail is provided in the body of the report. Additional detail on findings and methods can be found in the Appendix.

Demand Analysis

Estimate of Current Green Collar Jobs

The estimate of current green collar jobs in the District is based on an original analysis performed for this study. The industry-by-industry assessment found that there are currently about 22,000 "green" jobs in the District. Based on an analysis of existing labor market data supplied by the District Department of Employment Services for 82 industries in DC, a total of ***22,283 jobs were classified as "green"*** and another ***3,167 jobs as "possibly green".*** The rationale underlying the classification differs from industry to industry. This is slightly more than three percent of all jobs in the District.

- Construction;
- Architecture and Engineering; and
- Federal Government jobs.

One of the key challenges the District (and other government agencies) faces in its quest to grow green collar jobs and green its economy is one of classification. Determining whether an industry, or an occupation within an industry, is green, or potentially green, is a relatively new and undefined process. The District's ability to properly count and track progress in growing green collar jobs and greening its economy speaks to one of the key findings and recommendations of this report. This study establishes a baseline (and tools) for classifying and tracking green jobs; however, the introduction of a third party credentialing body (e.g., a green business certification program) would serve the dual purpose of establishing clearer standards for counting green businesses (and jobs) and for creating new incentives to both attract green businesses and assist existing businesses in becoming green.

Green Initiatives Aggregate Labor Composition and Demand Estimate

The *Green Buildings Act of 2006* and the *Clean and Affordable Energy Act of 2008* constitute the bulk of the labor demand estimated for the years 2009 through 2018. The District's aggressive construction and development scenario will see a flurry of activity beginning in 2009 gradually taper off through year 2016. This could change, however, as the analysis is based on known (as of Summer 2008) major development "projects on the books" (i.e. proposed, planned or under construction). **The estimate does not factor in potential increases in build out capacity, for example if the District enacts rezoning legislation to intensify development, nor do the numbers reflect any precise assumptions about future market conditions.**

The estimate of total aggregate employment demand per year attributable to District green initiatives and proposals begins at about 23,931 annual job opportunities in 2009, gradually decreases to a low in the 10 year study period of 3,600 in year 2016, and then begins to increase again. These trends could change depending on future market conditions and on the rate at which

the District rolls out or approves projects. Current economic uncertainty, particularly in mortgage related industries, reinforces this point.

The composition of expected labor demand is of greater importance to this study and is arrived at through a more robust modeling process. The top line findings are:

- Over a third of the labor demanded by the green initiatives will be for occupations in Job Zones 1 and 2. Job Zone 1 represents occupations requiring the lowest educational and experience levels for laborers on a scale of 1-5. Zone 1 requires "little or no preparation;" Zone 2 requires "some preparation" and Zone 3 requires a "Medium Preparation" level.[1]
- About 42 percent of the demand is for occupations in Job Zone 3, which is less accessible than Zones 1 and 2.
- The 10 occupations in highest demand are:
    - carpenters
    - construction laborers
    - first-line supervisors/managers of construction trades and extraction workers
    - construction managers
    - operating engineers and other construction equipment operators
    - plumbers, pipefitters and steamfitters
    - roofers
    - electricians
    - cement masons and concrete finishers
    - painters, construction and maintenance

There are many green skills and knowledge areas for workers to learn for the "green collar" versions of the occupations in highest demand listed above. The second highest occupational category, which also has low barriers to entry, is construction laborers. Key green skills and knowledge components for ***construction laborers*** are listed below:

- *Helpers-Carpenters:* Know and understand green building materials, site considerations and passive building design, construction operations to reduce environmental impact, window benefits and technologies, sustainable construction technologies that enhance resistance to disaster.
- *Brick masons and block masons (and Helpers):* Understand the use of porous pavements to reduce stormwater runoff, know how to: reduce a building non-roof heat island effect, harvest site energy (using passive solar designs) and decrease the size of the building HVAC system, optimize energy performance.
- *Landscaping and groundskeepers:* Paving technologies-permeable, porous paving, heat island effect – LEED® points, high albedo and reflectance, shade planting, irrigation system and low impact planting strategies, surface water management, site lighting, natural pest control techniques.

Some of the occupations within the top 10 highest demand grouping require more experience and training than others for construction laborers. Several of these occupational categories are listed below along with some the key elements of skill and knowledge needed to change them into a green collar version of the occupation.

- *Carpenters* - Know and understand green building materials, site considerations and passive building design, construction operations to reduce environmental impact, window benefits and technologies, sustainable construction technologies that enhance resistance to disaster.

[1] Note: Descriptions of Job Zones are provided in report section 1.2 on aggregate labor demand. A more detailed explanation of Job Zones is in the Appendix.

- *Construction supervisors* - Effective management for green construction, waste management.
- *Cement masons and concrete finishers* - Building reuse, construction waste management , recycled content, regional materials, landscape and exterior design to reduce heat islands , stormwater management: rate and quantity , reduced site disturbance, minimum energy performance.
- *Plumbers* -Understand and utilize environmental impacts of plumbing design, construction and occupant uses, waste removal – waterless urinals, dual flush toilet, composting toilets, water collection – condensate, rain water cisterns, gray water, water efficiency.
- *Electricians* - Day lighting and artificial lighting, impact of electricity use on the environment and on size of mechanical system design, compact fluorescents and other efficient light sources, LEED® rating system, sizing of system- peak loads.

Green Skills Gap Assessment for Hard to Employ Population

Based on District Department of Employment Services (DOES) data, 22,200 persons, or 6.4 percent of the District's labor force, were unemployed in June 2008. The statistical profile of the District's unemployed developed for this report is based on a statistical analysis of the 2005 American Community Survey (ACS) Public Use Microdata Sample (PUMS) data, which was the most recent data available.

About one in five District residents identified as workers within the occupational categories of installation, maintenance and repair are unemployed. Notably, this group's skill sets and experience makes it a candidate for many of the green job opportunities that will be created by the District's green initiatives, particularly from the *Green Building Act of 2006*. The occupational categories of production, transportation, material moving and construction, while they do not account for a large share of the unemployed in DC, exhibit high unemployment rates. Unemployed persons in these occupational categories likely possess skills that are useful for the green jobs that will be created by the District's initiatives.

Individual Green Initiatives and Proposals

District of Columbia's Green Building Act of 2006. The District of Columbia's *Green Building Act of 2006* was created to establish high-performance building standards for the planning, design, construction, operation and maintenance of building projects. In addition, it established incentives for green building, such as a program to expedite the review of construction documents for qualifying green buildings. The *Green Building Act* also created a Green Building Fund and the Green Building Advisory Council. This initiative is estimated to generate a labor demand for 121,200 workers over 10 years. These occupations are mainly in the construction industry. In addition, demand for 9,200 workers to operate and maintain the newly constructed and retrofitted facilities is expected. Demand for building operations and maintenance jobs requiring some green skills will gradually increase due to the combination of development build out, potential intensification of development with re-zonings and more buildings being subject to the green building requirements.

Clean and Affordable Energy Act of 2008. On August 4, 2008, Mayor Fenty signed the District Energy Bill, which will be enacted as the *Clean and Affordable Energy Act of 2008* (CAEA) later this year. The CAEA includes several components that will positively contribute to making the District's economy greener. The CAEA authorizes the creation of a Sustainable Energy Utility (SEU), which will conduct sustainable energy programs. To fund the SEU and other new and

existing energy efficiency and renewable energy programs, the CAEA creates a non-lapsing Sustainable Energy Trust Fund.. In addition to authorizing public spending, the CAEA is expected to spur increased private spending in the economy by establishing benchmarking requirements for public and private buildings, increasing the solar energy requirement for electrical providers and allowing energy submetering for commercial tenants. In total, CAEA is estimated to generate a labor demand for 11,800 workers over 10 years. Additional findings on or related to this initiative include:

- A 2008 CoStar Group, Inc. study found that LEED-certified and Energy Star-rated buildings in both the U.S. and in the DC markets were "adding value" to buildings, as exhibited in higher occupancy levels, rents and sales prices than traditional commercial properties.

- ***Proposed Energy Audit Program Initiative.*** The District's proposed Energy Audit Program, modeled after the Berkeley, California Residential Energy Conservation Ordinance, places an emphasis on the seller of residences to provide an energy audit to prospective buyers. An energy audit is an inspection, survey and analysis of energy flows in a building, process or system with the objective of understanding the energy dynamics of the system under study. The program will have provide a buyer with an estimate of energy used by a residence, stimulating the seller to invest in their home to reduce energy consumption, making the home a more attractive purchase based upon future energy cost savings. This initiative is estimated to generate a labor demand for 300 energy inspectors over the 10 year study period.

Department of Transportation (DOT) Transit Infrastructure Projects. The District's Department of Transportation (DDOT), in coordination with other District departments, is implementing numerous environmentally focused projects that will result in green collar jobs in the occupational categories of design, construction and maintenance. The projects that are either planned or currently in construction include: a Low Impact Development (LID) program which, focuses on installation of storm water infrastructure improvements, including installation of storm water Best Management Practices throughout the District; numerous streetscape improvements; the Anacostia Demonstration Streetcar Project; and the retrofitting of school buses. This initiative is estimated to generate a labor demand for 10,300 workers over 10 years, primarily in the construction industry.

Waste Water and Water Treatment Infrastructure Improvements. The DC Water and Sewer Authority (WASA) is investing in several new projects as part of its overall Capital Improvement Plan (CIP). Key projects that will have both environmental benefits and improve the environmental performance of the system include the Combined Sewer Overflow Control Plan (CSOCP) and new digester facilities for wastewater treatment. These facilities are the single largest plant project ever undertaken by WASA. The new digester will reduce energy usage and help manage biosolids. The facility's construction budget has increased due to the escalating costs of construction materials and the schedule has been extended due to design and procurement-related delays. This initiative is estimated to generate a labor demand for 1,500 workers, mainly in the construction industry, over 10 years.

Proposed Photovoltaic Solar Trees Parking Lots Initiative. The proposed Solar Tree Initiative would install solar panels on parking lots throughout the District, serving the dual purpose of creating small scale clean energy farms and providing shade for parked cars. Beyond providing

clean, quiet energy and shade for vehicles, it would create a highly visible display of DC's commitment to creating a greener economy. This initiative is estimated to generate a labor demand for 440 workers, mainly in the construction industry over two years and supply 1,380 homes with solar energy indefinitely.

Proposed Green Roof Program Initiative. The proposed Green Roof Initiative is part of an ongoing commitment by the District to increase the number of Green Roofs within DC. The assumptions for generating the labor demand estimates were based in part on the study *RE-GREENING WASHINGTON, DC: A Green Roof Vision Based on Quantifying Storm Water and Air Quality Benefits* produced by the Casey Trees Endowment Fund and Limno-Tech Inc. in August 2005. This proposed initiative is estimated to generate a labor demand for 11,800 workers, mainly in the roofing contracting industry, over 10 years.

Best Practices Documentation and Recommendations Summary

Best practices were documented for approaches to workforce development for green collar jobs, job preparedness training for hard to employ populations, and for strategies to promote and attract green business and clean tech industries. The cases reflect a mix of non-profit organizations, local, regional and state government programs. It is notable that the District is ahead of the curve in terms of green strategies and workforce training for green collar jobs programs.

National green jobs support efforts focusing on youth and ex-offenders in connection with green jobs workforce development. Programs studied included Green for All, the Ella Baker Center in Oakland, California, and the Center for Employment Opportunities (CEO) in New York City. The groundbreaking efforts of the Green for All, and local efforts such as those being undertaken by the Ella Baker Center in Oakland, California and the Center for Employment Opportunities in New York City and the New York region are all still in their nascent stages, so only anecdotal evidence of program success and outcomes related to green collar jobs is available. The Center for Employment Opportunities (CEO) in New York City offers an exemplary model for helping the hard to employ population transition into, and stay in, the workforce. The District should consider emulating the New York City and Oakland programs as models for the development of programs for youth and other hard to serve workforce development populations. The District could be served well by partnering with both nationally and locally based nonprofit organizations operating successful programs and encourage them to adopt green collar jobs as an area of focus if they are not already.

Structure a workforce training program with a focus on renewable energy and energy efficiency, with a training curriculum capable of meeting the demands that will be directly generated by District and Federal policies and regulation, and program requirements, that can be funded under the new $125 million annual Federal DOL program. Energy Training funds are expected to fuel emerging demand for green collar jobs. The *Green Jobs Act of 2007* (Green Jobs Act) (H.R. 2847) authorizes up to $125 million in funding to establish national and state job training programs and is administered by the U.S. Department of Labor to help address job shortages that are impairing growth in green industries, such as energy efficient buildings and construction, renewable electric power, energy efficient vehicles and biofuels development. The District should develop a comprehensive green jobs workforce support and workforce development program that

can be funded when the federal Green Jobs funds become available. This comprehensive effort should include soft skills, pre-apprenticeship training, and wrap around services that will be needed to serve the ex-offender, youth and other hard to serve populations. Soft skills include training for attitude, appearance and basic life skills. Wraparound services include transportation and child care support required to enable the worker to receive workforce training and support long term employment in a green job. Pre-apprenticeship programs, typically carried out in partnership with a local community organization, provide basic skills support in math, English and other areas required to enter union and other apprenticeship programs. Training programs need to be linked with employers, so direct employment is the outcome.

State and local efforts to attract and grow new green businesses that can be adopted by the District. State economic development and business relocation/attraction efforts, with the exception of California and Pennsylvania, have not developed programs to focus on green businesses. Most states and localities have not instituted separate efforts to attract and grow green businesses but include green businesses in their standard economic development business attraction and growth assistance efforts**.** Pennsylvania and California are leaders in the effort to focus on green jobs. Localities generally have not developed green focused business relocation efforts. The District could emulate these state efforts, using its quasi-state status to undertake and fund local business growth development, business attraction and business relocation in the green economy. The District's economy is not based on manufacturing, so it must focus efforts on sectors that have a business base, which can be expanded in the near term. The District does have a substantial (but declining) printing and printing supply industry. The industrial expertise in the District could be redeployed to focus on utilization of this industrial base to serve green demand, as is being done with the use of "printing technology" for the manufacture of thin film "nano" solar cells in California.

Expand the market presence of District Certified Business EnterprisesCertified Business Enterprises (CBEs) in the federal and local government green marketplace, particularly with respect to meeting environmental remediation requirements at Walter Reed Army Hospital and the Potomac Annex, and the follow-on construction of new facilities at these sites for new federal tenants and to meet the public and commercial needs of local residents. The environmental remediation requirements at Walter Reed Army Medical Center (WRAMC) and the Potomac Annex, and the follow-on construction of new facilities at these sites for new federal tenants and to meet the public and commercial needs of local residents will create green collar job demands in the District. These environmental remediation requirements are funded by the Department of Defense (DOD), and will be contracted by DOD or the Army Corps of Engineers. The District can develop a program to assist existing District Certified Business Enterprises to become certified under the federal contracting preference program and available under the government wide (GWAC) contracting vehicles that will be utilized by DOD and the Corps to select vendors for the remediation and cleanup at WRAMC and Potomac Annex. Almost all large federal contracts will have a requirement for small business or other preferred federal contractors to be utilized for a percentage of sub-contacts. The District should focus its efforts on getting current and new CBE's certified under federal programs so that they can compete for these sub-contracts.

Develop and implement a Green Procurement Strategy and use Green Supply Chain analytics as a measurement approach and process tool to get DC vendors to participate in a Green Procurement Strategy. The District should consider instituting an Office of Contracting and Procurement Environmentally Preferable Purchasing program similar to DOD green procurement

strategy, as documented in the Department of Defense Green Procurement Strategy. The District could require vendors to institute green supply chain and green IT measures in order to qualify for the supply of products or provision of services to the District. Such an initiative could begin with a training program for procurement officers and the establishment of targeted green procurement standards. A pilot program could be instituted in the DC Department of Employment Services. Implementing green requirements for many District of Columbia vendors would jumpstart a green products and services market in the District. A green procurement program will have a multiplier effect by keeping spending within the District, in addition to making local businesses more competitive in the national and international market, since green practices are being demanded by numerous types of vendors and consumers. Fortunately, the green procurement best practices for the world's largest buyer, the DOD, are available for the District to use as a template.

Adopt a green business certification program modeled after the Bay Area Green Business Program. The Bay Area Green Business Program certifies businesses and government agencies – taking these entities beyond compliance with state and federal environmental regulations – in green business operations and practices across multiple sectors. This model offers a programmatic approach to bolstering the District's overall drive to create a greener economy and can play a supporting role in reinforcing the effects of green procurement strategies (for services) and green economic development strategies. The Bay Area Green Business Program (the program) is a cooperative program offering technical assistance to businesses and public agencies to not only meet compliance standards for all environmental regulations, but to adopt pollution prevention measures, conserve resources and operate in a more environmentally responsible manner overall. The potential benefits of establishing a **green business program** in the District include:

- Support development and effectiveness of District environmental priorities in procurement policies. If the District pursues environmentally preferable purchasing policies (EPPs), a third party certification system for businesses (services) would enable it to adopt more aggressive requirements for environmentally preferable services.
- Program standards and checklists could be aligned with a federal agency, particularly the DOD, to align environmental procurement policies to enhance service contracting opportunities for District businesses.
- A programmatic tool to support industry attraction and retention (technical assistance on environmental compliance and performance as an incentive). Businesses attracted by such a program are also more likely to observe standards consistent with the District's green economy goals.
- Linkages between green business program knowledge and standards and educational tools for District workforce programs focused on training green collar jobs skills.

Focus Groups: Integrated Research Findings on Green Businesses

Four focus groups were conducted at a focus group facility over the course of summer 2008 in the District of Columbia. Each focus group had approximately eight participants and lasted an hour and a half. A follow-up online survey was sent to the focus group recruitment population. The main findings include:

- ***Finding 1: There is little resistance to the green trend.*** There was no clear resistance to the green trend in any of the four focus groups, however the importance of District government leadership and incentives was clearly identified.

- ***Finding 2: There is variation in comfort with "green" as a term, and as a trend.*** Despite the lack of resistance to the green trend described above, many of the participants had different perspectives on the trend.

- ***Finding 3: The underemployed need multi-faceted training***. There was debate about workforce development issues in the focus groups, specifically in the focus group with training providers (focus group three). Nearly every employer who participated in the focus groups that employs low- and under-skilled workers expressed concern about finding the right employees they need to be successful.

- ***Finding 4: The green trend will create few new jobs, but these jobs will require new skills.*** The phrase "green collar job" struck many participants as a vague buzzword. In the online survey (conducted after the focus groups), only 38 percent of respondents said they were "very familiar" with the term, and 10 percent volunteered that the term "doesn't mean anything."

Recommendations from focus groups:

- Include other industries in the dialogue such as high-tech, creative, political and legal, and hospitality
- Use District resources to foster increased dialogue between employers and training providers on a breadth of issues not just green trends
- Develop an education program around sustainability for public schools, training providers, and others less familiar with the green trend
- Integrate green motivation as part of life-skills training programs
- Create strong incentives for people to purchase solar panels and smaller green renovations (like tankless water heaters), since there is little market activity in these areas
- Help publicize the smaller green companies and programs (such as green hauling)
- Create green economic zones where green companies can work collaboratively in a lower-rent, emerging neighborhood
- Avoid the phrase "green collar"—alternatives include "green job," "new green job" or "green retraining"
- Avoid an overpromising of new jobs as a result of the green trend; instead focus on new and different opportunities and retraining the current workforce
- Focus on the positives of the DC area—despite the national economic climate, the District is still a good place to do business, and being green is encouraged here

INTRODUCTION

This report contains the written component of the District's *Green Collar Jobs Demand Analysis*. Commissioned by the Washington, DC Economic Partnership (WDCEP) and the District's Office of Planning, the analysis was conducted from April to September of 2008. Findings and recommendations from this report will serve as inputs to the District's decision making on how to "green" the DC economy and best prepare its current workforce to capture emerging "green collar jobs" opportunities. The District defines "green collar jobs" as *career-track employment opportunities in emerging environmental industries, as well as conventional businesses and trades, created by a shift to more sustainable practices, materials, and performance. The definition includes both lower and higher skilled employment opportunities that minimize the carbon footprint of all necessary inputs and directly result in the restoration of the environment, the generation of clean energy and improved energy efficiency, the creation of high performing buildings, and the conservation of natural resources. The District uses the terms "green collar jobs" and "green jobs" interchangeably.*

This report focuses on the following themes:

- Status and characteristics of the District's green-collar work force;
- Expected impact of the District's green initiatives on future labor requirements;
- Best Practices in green collar workforce training and green economic development strategies; and
- Needs and challenges for District businesses and workforce training providers.

The analysis of these themes was organized around three major project Tasks, as prescribed by the WDCEP and the District Office of Planning. Each task report was developed as a stand-alone document. A synthesis of the reports is provided in the *Executive Summary*. The major tasks are listed below:

- Task 1 – Green Collar Jobs Demand Analysis
- Task 2 – Best Practices Documentation and Recommendations
- Task 3 – Focus Groups: Final Integrated Research Findings on Green Businesses

The *Demand Analysis* identifies the job opportunities (the labor demand) that are expected as a result of current or proposed public policies, laws, regulations, investments and capital improvements in support of DC's green initiatives. The two biggest policy drivers among the various green initiatives are the *Clean and Affordable Energy Act of 2008* and the *Green Building Act of 2006*. The Clean and Affordable Energy Act of 2008 establishes a sustainable energy utility that will be charged with reducing the city's energy use, training District residents to perform energy-efficiency work (green collar jobs) and helping low-income residents reduce their bills through energy efficiency. The Green Building Act of 2006 established high-performance building standards for both public and private buildings. **The estimates in the report do not factor in potential increases in build out capacity, for example if the District enacts rezoning legislation to intensify development, nor do the numbers reflect any precise assumptions about future market conditions. The data provided by the Washington, DC Economic Partnership and the DC Office of Planning reflect <u>actual</u> projects that have been vetted and are "on the books." The report does not look at projections based upon potential future projects or proposals that have not been vetted.**

The *Demand Analysis* is focused exclusively on the District and its residents; it is not a regional study. It estimates the labor requirements (i.e. magnitude and occupational characteristics) the District can expect over the next 10 years (2009 – 2018) as a result of its green initiatives and proposals. Detailed characterizations are provided of the likely occupations, including descriptions of the skills, experience, educational requirements and wage levels of new or newly defined "green collar" jobs. To the extent possible, the "green skills" distinguishing these jobs from traditionally defined occupations are described.

It should be noted that the demand analysis was not intended to address the question of *how many* job opportunities will result in *new* hires as a result of the District's green initiatives and proposals. Preparing the District's workforce and businesses to be full participants in the emerging "green" sector of the economy is the main policy objective. The demand analysis estimates future labor demand - not the economic impacts, hence specific impacts on job creation - of DC's various green initiatives. Special attention is paid to the estimated demand for employment opportunities in career tracks that offer relatively low barriers to entry (requiring only modest preparation and training) for DC's hard-to-employ population. The high unemployment figures for youth and the ex-offender populations in the District are a key concern. The District is particularly interested in determining how to help its hard-to-employ population capture these opportunities.

The *Appendix* contains a host of detailed reports from the demand analysis, detailed methodology descriptions for each of the major study components and lengthy model-based reports on the aggressive, conservative and pessimistic scenario runs for each of the green initiatives and proposals. The Berger Team, as requested by the WDCEP and the DC Office of Planning, developed database tools for the District to use after the conclusion of the study. In addition to the main demand analysis model, both Green Jobs (used to estimate the number of current green jobs in the District) and Green Skills (used as input to the demand model) database tools were developed for this study, which the Berger Team will also provide to the District and WDCEP for future use.

1.0 DEMAND ANALYSIS

1.1 Estimate of Current Green Jobs

Introduction and Methodology Overview

To assist the District in establishing baselines to assess its progress towards greening its economy and redirecting its workforce training programs, estimates of the number of current green jobs in the District were developed. To effectively track the District's progress, a database tool was also created.

Berger developed a customized *Current Green Jobs* database to track the number of green jobs in the District.[2] The database tool allows users to estimate green employment in 301 industries (including government) based on the industry's size, occupational composition and other available industry-specific data. For 82 industries, which together account for 75 percent of District employment, Berger identified specific criteria on which jobs could be categorized as green (list of industries in Appendix). Because of the high degree of subjectivity involved in the classification process, jobs were classified as either "green" or "possibly green" based on the degree of confidence with which a categorization was made (more information on methodology in Appendix).

The categorization was performed on an industry-by-industry basis. For some industries, the existence of industry or occupational certification programs allowed for a relatively straightforward identification of green jobs. For other industries, non-certification business listings, which a business can join freely, provide some limited guidance. However, in both cases, given the emerging character of the green sector, these listings are not likely to be exhaustive. Finally, because neither certifications nor listings exist for most industries, other criteria to distinguish green from non-green jobs were identified.

Given the emerging nature of the sector, there is no single practical methodology to estimate green jobs (a more detailed Methodology description is provided in the Appendix). The usefulness of the *Current Green Jobs* database lies in its integrative capacity and in its flexibility. The database provides a central location to store criteria, assumptions, data and other information utilized to estimate the number of green jobs. Assumptions can be updated to reflect new conditions and/or improved data availability. In addition to estimating green employment, the tool provides information and links to green business programs, initiatives, and trends throughout the U.S. In this capacity, the database is useful for developing a green business program. The District can use the Database in conjunction with the recent District Government Survey on Green Practices to connect businesses with green opportunities. Finally, the current green jobs database illustrates the broad scope of the greening of the economy, which is not limited to the typical green industries (i.e., energy, transit, construction, and environmental services) but includes a wide range of industries.

[2] The "User Guide for Current Green Collar Jobs Database" provides further elaboration on the evaluation methods used for the estimates. This approach was developed by Berger for this project. The User Guide was provided to WDCEP and the DC Office of Planning in a separate submission. The "Green Collar Jobs Demand Analysis Methodology" in the Appendix also offers a more detailed description of how the current green jobs estimates were developed.

Findings

Based on an analysis of 82 industries in DC, Berger classified a total of ***22,283 jobs as "green"*** and another ***3,167 jobs as "possibly green"*** that currently exist in the District***.*** The rationale underlying the classification differs from industry to industry. Some examples of green industries in DC are presented below.

- There are ***an estimated 5,491 green jobs in the construction industry in DC***. The estimate is calculated using different assumptions for different segments of the construction industry. For instance, for the commercial and industrial building industry the estimates are based on the percent of all commercial and institutional buildings currently under construction in DC follow the LEED green building guidelines, either voluntarily or as required by the Green Building Act. This percentage was applied to the industry's most recent total employment count to approximate green employment. Another example is the ***plumbing, heating, air-conditioning, and electrical construction trade*** where an estimated 42 percent of employment is green, taking into account green retrofits as well as the installation of solar panels on existing "brown" buildings or on the ground. A more stringent classification would be obtained by estimating the number of green jobs based on the number of certified construction personnel. Examples of certification programs include Green Advantage, an environmental certification program for building-related practitioners, complementary to LEED. However, given the emerging character of the industry, the limited number of certified practitioners would present a too restrictive picture of the green economy.

- ***An estimated 4,757 jobs in the architecture and engineering industry***, or 75 percent of the architecture industry's total employment and 50 percent of the engineering industry's total employment, within DC are green. The high percentage of employment within the architectural services field is exemplified by the extensive environmentally-sensitive practices that are used as mainstream architectural practice. In addition, according to the United States Green Builders Council ("USGBC"), the District contains a large number of LEED registered buildings, LEED Accredited Professionals, and architecture firms that are members of USGBC. Within the engineering industry, environmental engineering - which is considered green, contains a significant portion of the industry's total employment. In addition, similar to the architecture industry, many extensive environmentally-sensitive practices have been adopted throughout the engineering field and therefore engineering firms with other specialties can also be classified as green.

- Certain jobs within the ***Federal Government,*** which alone account ***for more than 5,300 jobs*** within the District, are considered green based on the agency's mission, such as the Environmental Protection Agency (EPA),.

- Leading by example, the ***District Government*** employs a total of approximately ***300 green collar workers, including employees*** at the Department of Public Works, the District Department of the Environment and the Department of Parks and Recreation.

- The District contains numerous ***environmental, conservation and wildlife organizations*** that focus on protecting the environment. There are ***1,672 jobs*** within these organizations.

- Loan officers at banks in DC offering Energy Efficient Mortgages ("EEM") can be counted as green jobs. Eleven lenders in DC, or eight percent of the total number of banks, offer EEM

which are designed to help homebuyers purchase energy efficient homes.[3] These lenders are ENERGY STAR partners. There are an estimated ***13 loan officers*** at these banks.

- Jobs repairing, selling or renting ***bicycles*** are considered green jobs. An estimated ***51*** persons are employed in these industries in DC.

- The restaurant industry is one of the largest private industries in the District. Employment at ***restaurants*** that follow environmental guidelines related to energy and water efficiency and conservation, alternative energy use, recycling and composting, sustainable food, pollution prevention, etc. can be considered green. The Green Restaurant Association certified a very small number of restaurants throughout the U.S., only one of which is in the District. As it is highly likely that many more restaurants in the District adhere to sustainable practices, the jobs count assumes that two percent of all full-service and limited-service restaurants, accounting for ***506 jobs, are possibly green***.

- While data on the number of ***office-based green businesses*** (e.g., service sector enterprises such as accounting, legal, real estate and marketing) within the District is being developed, and no firm numbers are presently available, it is important to note that any office-based business could potentially have a "green office." Greening an office can be achieved through a variety of measures, such as environmentally preferred purchasing programs, energy efficient lighting, energy star office equipment, recycling programs and the promotion of green transportation to work. The job count assumes that five percent of office-based jobs are in green offices and includes administrative services managers and supervisors of office workers and of administrative support workers in these offices as ***"possibly green"*** jobs. (Note: the District is currently compiling a list of green office-based businesses.)

[3] A listing of lenders offering EEMs is provided in Appendix. Source is EnergyStar.gov: https://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.showHomesResults&partner_type_id=LEN&s_code=DC

1.2 Green Initiatives Aggregate Labor Composition and Demand Estimate

Introduction

The overall labor demand estimates for select DC Green Initiatives were calculated based on the tallies of annual investment. Initiatives were selected for this study by the WDCEP and the District's Office of Planning. Those included in the study are listed below:

- Green Building Act of 2006 (including various development categories)
- Clean and Affordable Energy Act of 2008 (including sub-initiatives/components)
- Proposed Photovoltaic "Solar Trees" Parking Lots Initiative
- Proposed Energy Audit Program Initiative
- Department of Transportation (DOT) Transit Infrastructure Projects
- Waste Water and Water Treatment Infrastructure Projects
- Proposed Green Roof Program

Detailed descriptions of, and summary findings for, each initiative (actual or proposed) are provided in Section 1.4 of this report.

Comment on Method

Labor demand estimates were created for each initiative individually and can be taken as meaningful gauges of what the District can anticipate in labor demand for each initiative. However, the aggregate demand of the initiatives should be discounted, since it does not reflect any adjustments for potential redundancies or overlap between initiatives. As an example, it is unknown how many green roofs would be created in the Green Building Act of 2006's retrofitting activities or installed on new green buildings. A detailed compilation of the annual employment demand (and the totals for the 2009 to 2018 study period) for all of the initiatives and proposals analyzed for this report is provided in Table A.1 (next page insert). The estimates in Table A.1 are based on a middle, or "conservative", scenario. The Green Building Act of 2006 is estimated to create the highest levels of labor demand.

More detailed estimates of total and initiative labor demands and occupational profiles are provided in extensive detail in the Appendix along with full descriptions of the individual occupations that would be required by each initiative. Each profile contains information on wages, education and training, most pertinent skills and abilities, related occupations (which can be used to gauge transitioning in and out of the occupation), and the green skills needed.

The estimated range of total labor demand shown in Figure 1.1 is based on a simple summation of the annual totals for each initiative. **The level of sophistication required in the modeling to draw precise delineations between the effects of the various initiatives (e.g., interactions that would either compound or potentially cancel out effects on labor demand) was beyond the scope of this study**. The shape of the trend lines shown in Figure 1.1 reflects the expected timing of the rollouts of known District green initiatives and proposals. It is provided to illustrate the flow of initiative-driven labor demand, the range of expected demand levels and to help readers understand the structure (and limitations) of the analysis. The top line of Figure 1.1 represents the aggregate labor demand of the "aggressive" scenarios, while the lower line presents the "pessimistic" scenario. Aggressive, Conservative (Medium), and Pessimistic scenario estimates were created in order to show a range of potential outcomes. These "scenarios" primarily reflect assumptions made about the percentage of planned and proposed project (i.e. "projects on the books") investments that will be undertaken.

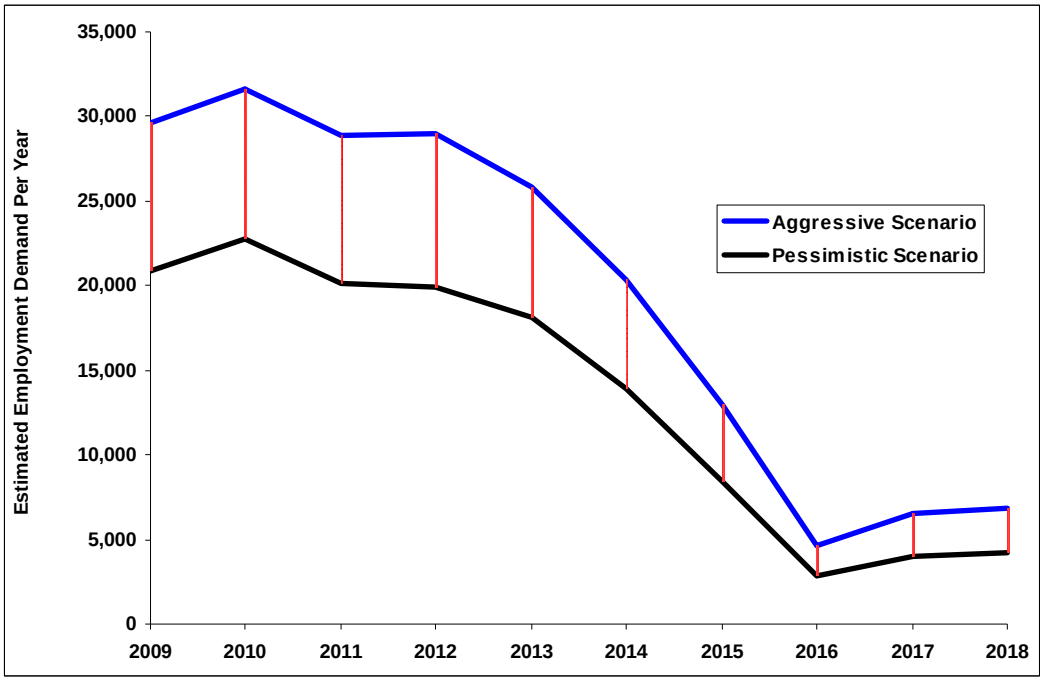
Table A.1
Summary of Estimated Annual Employment Demand (Conservative Scenario)
(for Studied Individual Initiatives and Proposals)

DC Green Initiative or Proposal	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total Labor Required
Green Building Act of 2006 -DHCD Projects	125	120	120	120	120	120	0	0	0	0	725
Green Building Act of 2006 -Market Response	10,849	6,147	2,151	1,522	873	108	108	108	108	108	22,080
Green Building Act of 2006 -Required Public	5,910	6,362	6,037	5,723	5,337	4,697	2,351	1,470	1,545	1,586	41,018
Green Building Act of 2006 -Required Private	4,881	7,554	9,466	9,634	8,875	7,074	4,963	642	2,045	2,221	57,355
Green Building Operations	18	165	423	634	837	1,011	1,232	1,600	1,637	1,637	9,194
Energy Act of 2008-Benchmarking	0	4,598	2,904	2,205	2,608	780	242	67	27	13	13,444
Energy Act of 2008-Solar Energy Legal Requirement	27	31	43	99	99	100	137	140	141	176	992
Energy Act of 2008-Submetering	44	44	33	33	22	22	11	11	0	0	219
Energy Act of 2008-Sustainable Energy Utility Retrofits	0	16	31	36	41	41	0	0	0	0	165
DOT Infrastructure Projects	695	640	1,329	2,507	1,919	1,919	1,210	16	16	16	10,267
Waste Water and Water Treatment Infrastructure	0	14	367	377	377	376	0	0	0	0	1,512
Solar Tree Parking Lot Initiative	220	220	0	0	0	0	0	0	0	0	440
Green Roofs Initiative	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	1,179	11,791
											169,202

Notes:
- The "Conservative Scenario" represents middle estimate between "Pessimistic" (low) and "Aggressive" (high).
- Further elaboration on scenarios provided in Figure 1.1 and Table A.2.

For example, not all building plans always make it to construction phase, or the construction cost estimates may turn out to be lower than initial cost estimates. **Conversely, the flow of development associated with or subject to the Green Building Act of 2006 - the primary numeric driver for the demand estimates - is not adjusted to reflect potential changes in the District's zoning that could be altered to extend DC's build out capacity via "up-zoning" (i.e. intensification of land-use or development)**. Alterations in investment levels, again depending on the execution of projects, would have a direct impact on the amount of labor demanded and how it would vary over the ten year study period.

Figure 1.1
Estimate of Annual Employment Demand Range
Based on Studied Initiatives and Proposals



Source: The Louis Berger Group, 2008, based on data compiled by DC Office of Planning.

In addition, changes in the scenarios will alter the aggregate totals as well as the occupational profiles. Table A.2 shows what percentage of total investment each initiative would constitute under each scenario. The Green Building Act of 2006 encompasses the bulk of total investment at nearly 80 percent. The share of Green Building Act initiatives increases as the scenarios become more pessimistic. This would have an impact on the types of occupations associated with each initiative and therefore the aggregate occupational profile.

Table A.2
Percentage of Total Investment

Initiative	Aggressive	Conservative	Pessimistic
Green Building Act of 2006	79.3%	79.6%	79.9%
Energy Act of 2008	7.2%	8.8%	9.9%
DOT Infrastructure Projects	7.3%	7.3%	7.3%
Green Roofs Initiative	3.4%	2.8%	1.6%
Solar Tree Parking Lot Initiative	1.6%	0.4%	0.1%
Waste Water and Water Treatment Infrastructure	1.2%	1.1%	1.1%

Findings on Labor Composition

The highest priority for the labor demand analysis was to create a detailed picture of the overall occupational profile – the mix and share of occupations demanded – as a result of investment made to implement the District's green initiatives. Since occupational profiles change, depending on the scenarios examined, the estimates of occupational profiles are based on the conservative estimate. Table A.3 provides the percentage of employment demand for all green initiatives by "Job Zone" and short-form descriptions for each zone description[4] (see footnote and Appendix for more information). The table shows that about 38 percent of total demand will be created for occupations in Job Zones 1 and 2, meaning over a third of the green collar job opportunities will have relatively low barriers to entry for DC job seekers. This is of particular importance to DC residents having a difficult time finding work or who are just entering the work force.

Table A.3
Job Zone Percentages

Job Zone	% of Total	Job Zone Description
1	15.75%	Little or No Preparation
2	21.91%	Some Preparation
3	42.30%	Medium Preparation
4	11.78%	Considerate Preparation
5	1.45%	Extensive Preparation

Although this study places emphasis on finding work for the hard-to-employ population, a focus on upgrading skills for the "more skilled" workers is also recognized as important. About 42 percent of the more skilled workers, defined as Job Zone 3, will make up the Green Collar workforce. Despite their higher level of work force preparation, they may need additional skills to handle the new tasks required for green construction or other green activities.

Table A.4 presents the top ten occupations in either Job Zone 1 or 2 that will be in high demand as a result of DC's Green Initiatives. The minimum requirements section of the table describes the most remedial sources of education and training, the type of education or training preferred by employers and the typical length of training required. Some common forms of training include a high school diploma, informal on-the-job training, previous work experience and a college degree. Other types of training include, but are not limited to, formal training (including internships), service in the U.S. Armed Forces and graduate or professional degrees.

In assessing the occupational fit for job seekers who are entering the workforce or who have a difficult time finding employment due to low skills or education, the higher percentages represent a better the fit. For example, while carpenter's helpers have a relatively high percentage across all training and education topics, iron and steel workers have a low amount of related work for workers with less than three months of related work experience. The wage level is correlated to the quantity of training and education, though the wage level in this case can be disregarded to some degree, since the occupations are largely regarded as stepping stones to future opportunities.

[4] "Job Zones" classify occupations into one of five categories based on levels of education, experience and training necessary to perform the occupation. The Job Zone definition is derived from O-Net data from job incumbents and occupational experts (OEs) regarding the levels of education, experience, and training needed for work in their occupations. Methodology paper by O-Net on Job Zones at: http://online.onetcenter.org/help/online/zones. Detailed descriptions of Job Zones classification system provided by the Green Collar Jobs Demand Analysis Methodology in the Appendix of this report.

Job opportunities created by the District's green initiatives are likely to create a higher percentage of what the Brookings Institution describes as "middle skill" occupations, which generally require education and training beyond high school but less than a bachelor's degree. Brookings estimated that in 2004, 33 percent of all jobs in the District were middle skilled; the level is expected to drop to 30 percent by 2014.[5] By comparison, the District's green initiatives are expected to generate 42 percent of its labor demand at Job Zone 3, which is similar to the middle skill level cited in the Brookings study.

Table A.4
Top Occupations in Job Zones 1 and 2

Rank	Top 10 Occupations (Zones 1 & 2)	Minimum Requirements				District Median Wages
		Education: *High School or Below*	Related Work Experience: *None, Or Less than 3 Months*	On the Job Training: *None to 3 Months*	On Site Training: *None to 3 Months*	
1	Construction laborers	61.3%	26.2%	46.0%	45.3%	$30,850
2	Roofers	86.2%	17.3%	36.5%	78.9%	$36,460*
3	Painters, construction and maintenance	63.9%	37.1%	44.2%	44.0%	$40,300
4	Landscaping and groundskeeping workers	78.2%	48.6%	57.1%	76.3%	$28,810
5	Office clerks, general	52.2%	22.6%	54.6%	49.6%	$31,020
6	Brickmasons and blockmasons	88.2%	10.9%	10.3%	34.7%	$55,180
7	Secretaries (except legal, medical, executive)	39.6%	18.2%	76.2%	77.1%	$41,680
8	Helpers—carpenters	92.8%	68.6%	54.5%	79.9%	$30,000
9	Truck drivers, heavy and tractor-trailer	75.3%	10.8%	64.8%	69.8%	$39,700
10	Structural iron and steel workers	68.5%	0.0%	22.2%	49.5%	$38,250*

* Uses Metropolitan Statistical Area Wages data.

Additional information on specific occupations from the Bureau of Labor Statistics is provided below. This information includes descriptions of qualitative characteristics of the occupation and opportunities and barriers to potential employees.

Construction Laborers

- Many construction laborer jobs require a variety of basic skills, but others require specialized training and experience.
- Most construction laborers learn on the job, but formal apprenticeship programs provide the most thorough preparation.
- Laborers who have specialized skills or who can relocate near new construction projects should have the best opportunities.

Roofers

- Most roofers learn their skills informally on the job; some roofers train through 3-year apprenticeships.
- Most job openings will arise from the need to replace those who leave the occupation because the work is hot, strenuous, and dirty, causing many people to switch to jobs in other construction trades.
- Demand for roofers is less susceptible to downturns in the economy than demand for other construction trades because most roofing work consists of repair and reroofing.

Painters, construction and maintenance

[5] From Envisioning Opportunity: Three options for a community college in Washington, DC, May 2008.

- Employment prospects for painters should be excellent due to the large numbers of workers who leave the occupation for other jobs.
- Most workers learn informally on the job as helpers, but some experts recommend completion of an apprenticeship program.
- About 42 percent of painters and paperhangers are self-employed.

Landscaping and groundskeeping workers

- Opportunities should be very good, especially for workers willing to work seasonal or variable schedules, because of significant job turnover and increased demand for landscaping.
- Many beginning jobs have low earnings and are physically demanding.
- Most workers learn through short-term on-the-job training.

Office clerks, general-

- Employment growth and high replacement needs in this large occupation will result in numerous job openings.
- Prospects should be best for those with knowledge of basic computer applications and office machinery as well as good communication skills.
- Part-time and temporary positions are common.

Brickmasons and Blockmasons

- Most entrants learn informally on the job, but apprenticeship programs provide the most thorough training.
- The work is usually outdoors and involves lifting heavy materials and working on scaffolds.
- About 24 percent were self-employed.

Helpers- Carpenters

- Help carpenters by performing duties of lesser skill. Duties include using, supplying, or holding materials or tools, and cleaning work area and equipment.
- Most significant source of postsecondary education or training: Short-term on-the-job training
- Excludes apprentice workers and construction laborers who do not primarily assist carpenters.

Truck drivers, heavy and tractor-trailer

- A commercial driver's license is required to operate large trucks.

Structural iron and steel workers

- Workers must be in good physical condition and must not fear heights.
- Most employers recommend completion of a formal 3-year or 4-year apprenticeship, but some workers learn on the job.
- Earnings of structural iron and steel workers are among the highest of all construction trades.

Although a major emphasis of this report examines the employment opportunities for low skilled individuals entering or returning to the workforce, it also provides information on the specific attributes of labor demand for skilled workers. Table A.5 illustrates the top 10 demanded occupations (at Job Zone level 3) for all of the DC Green Initiatives. As in Table A.4, the minimum amount of training and education is presented along with the median wage. It is important to note that many of the training and related work figures are low, which could indicate additional job training, related work experience and on-site training are needed to enter these occupations.[6]

[6] Full Occupational Profiles are provided in the Appendix.

Table A.5
Top Occupations in Job Zone 3

Rank	Occupational Title (Job Zone 3)	Minimum Requirements				District Median Wages
		Education: *High School or Below*	Related Work Experience: *None, Or Less than 3 Months*	On -the--Job Training: *None to 3 Months*	On-Site Training: *None to 3 Months*	
1	Carpenters	53.5%	2.8%	33.5%	49.2%	$49,570
2	First-line supervisors/managers of construction trades & extraction workers	60.9%	16.5%	13.2%	51.2%	$70,050
3	Operating engineers and other construction equipment operators	52.1%	8.7%	27.1%	30.2%	$49,340
4	Electricians	54.1%	17.9%	19.1%	37.0%	$58,860
5	Plumbers, pipefitters, and steamfitters	65.8%	14.5%	14.5%	14.5%	$54,890
6	Cement masons and concrete finishers	47.2%	34.4%	40.8%	20.7%	$39,980
7	Bookkeeping, accounting, and auditing clerks	21.5%	10.8%	40.3%	67.1%	$40,650
8	General and operations managers	18.0%	0.0%	11.4%	36.6%	$117,260
9	Executive secretaries and administrative assistants	44.6%	9.1%	67.1%	71.8%	$46,240
10	Heating, air conditioning, and refrigeration mechanics and installers	34.5%	2.6%	42.2%	44.8%	$52,550

Below is a list of additional information on Job Zone 3 occupations from the Bureau of Labor Statistics. The additional information provides characteristics of the occupations and their respective industry categories. Green Skills and possible certifications can be found in the text below Tables 1.5 and 1.6 (pages 31 and 33):

Carpenters

- About 32 percent of all carpenters—the largest construction trade—were self-employed.
- Between three and four years of both on-the-job training and classroom instruction usually is needed to become a skilled carpenter.

First-line supervisors/managers of construction trades & extraction workers

- Construction managers must be available—often 24 hours a day—to deal with delays, bad weather, or emergencies at the jobsite.
- Employers prefer jobseekers who combine construction industry work experience with a bachelor's degree in construction science, construction management, or civil engineering.
- Although certification is not required, there is a growing movement toward certification of construction managers.

Operating engineers and other construction equipment operators

- Many construction equipment operators acquire their skills on the job, but formal apprenticeship programs provide more comprehensive training.
- Hourly pay is relatively high, but operators of some types of equipment cannot work in inclement weather, so total annual earnings may be reduced.

Electrician-

- Most electricians acquire their skills by completing an apprenticeship program lasting four to five years.

- About four out of five electricians work in the construction industry or are self-employed, but there also will be opportunities for electricians in other industries.

Plumbers, pipefitters, and steamfitters

- Pipelayers, plumbers, pipefitters and steamfitters comprise one of the largest and highest paid construction occupations.
- Most states and localities require plumbers to be licensed.
- Apprenticeship programs generally provide the most comprehensive training, but many workers train in career or technical schools or community colleges.

Cement masons and concrete finishers

- Most learn on the job or though a combination of classroom and on-the-job training that can take three to four years.
- Cement masons often work overtime, with premium pay, because once concrete has been placed, the job must be completed.

Heating, air conditioning, and refrigeration mechanics and installers

- Employers prefer to hire those who have completed technical school training or a formal apprenticeship.

While the priority and scope of this study called for a focus on the labor demand and occupational profiles of jobs in Jobs Zones 1-3 (Zone 1 has the lowest barriers to entry of the five, meaning less stringent education and work experience requirements), it is important to note that the District's green initiatives will also create demand for new positions and new green-skill sets in Zone 4 and 5, where higher skill and experience requirements are needed for more technical positions such as energy auditors, architects, landscape designers and building commissioning agents.

1.3 Green Skills Gap Assessment for Hard to Employ Population

Introduction

Based on D.C. Department of Employment Services (DOES) data, 22,200 persons, or 6.4 percent of the District's labor force, were unemployed in June 2008. To help the District assess the "skills gap" that exists between District residents who need jobs and expected green collar employment opportunities, this section provides a profile of the District's unemployed. This statistical profile of the District's unemployed is based on a statistical analysis of the 2005 American Community Survey (ACS) Public Use Microdata Sample (PUMS) data, which was the most recent data available. The analysis and its results are described in more detail in Methodology (see Appendix). This section provides a summary of findings on demographic characteristics of the District's "hard to employ population" and how this segment of the population may adapt to, or capitalize on, emerging green skills opportunities.

Findings

About one out of every four unemployed in the District does not have a high school degree. Unemployment is heavily concentrated among younger persons with 15 percent of the labor force of age 25 or less being unemployed. However, because older age groups exhibit a higher rate of labor force participation, persons 25 and younger account for 31 percent of the District's total unemployed. Older persons with typically more work experience also account for significant shares of the unemployed with 11 percent in the 41 to 45 age group and 10 percent in the 31 to 35 age group.

A relatively large share of the District's unemployed can be considered long-term, or chronically, unemployed. About 39 percent of the District's unemployed have not worked in the past year, 14 percent of which have not worked in the past five years.

About 44 percent of those currently unemployed who held a job in the past five years were employed in the following four occupational groups: (1) office and administrative support (20 percent); (2) sales (nine percent); (3) food preparation (seven percent); and (4) building and grounds maintenance (seven percent). It can be assumed that persons previously working in building and grounds maintenance occupations will possess certain skills that are transferable to green jobs that will be created by green initiatives.

While not accounting for as many unemployed, some occupations exhibit very large unemployment rates. About one in five persons with an installation, maintenance and repair occupation are unemployed. It can be assumed that this group's skill set and experience makes them candidates for the green jobs that will be created by the initiatives. Production, transportation and material moving and construction are other occupational groups, that although they do not account for a large share of the unemployed, exhibit high unemployment rates. It can be assumed that unemployed persons in these occupational categories possess skills that are useful for the green jobs that will be created by the initiatives.

1.4 Individual Green Initiatives Future Demand Estimates

1.4.1 Green Building Act of 2006

Introduction

The District of Columbia's *Green Building Act of 2006* (Green Building Act) was created to establish high-performance building standards for the planning, design, construction, operation and maintenance of building projects. In addition, it established incentives for green building, such as a program to expedite the review of construction documents for qualifying green buildings. The Green Building Act also created a Green Building Fund and the Green Building Advisory Council.

The Green Building Act was an amendment to the Construction Codes Approval and Amendments Act of 1986, and provides for the revision of the Construction Codes to include green building practices. It also amended the Office of Property Management Establishment Act of 1998 to require priority leasing of buildings that meet certain green building standards.

The Green Building Act of 2006 was structured to phase in green building in DC. It requires:

- Commercial buildings to be certified, using the Leadership in Energy and Environmental Design $_{TM}$ (LEED) Green Building Rating System. LEED is a nationally-acclaimed benchmark for green building design, construction and operation. It is a whole-building approach to sustainability.
- Residential buildings to meet Green Communities standards. The Green Communities Checklist provides a clear, cost effective way to green multi- and single-family buildings.

Green building reduces environmental, economic and social impacts by making buildings more cost-effective, energy efficient, sustainable, safe, healthy and productive. Green building practices offer an integrated approach to planning, designing, building and maintaining buildings and their landscapes.

Data used for the job estimates were provided from various District agencies and the Washington DC Economic Partnership. Projections are based upon actual vetted projects "on the books" as planned or proposed. As projects are completed, the estimated labor requirements will adjust accordingly downward until such time that new, vetted projects are acknowledged by the District and WDCEP.

Findings

The Green Building Act of 2006's labor demand analysis focused on three types of green building projects and incorporated existing building permit data for major current and future construction or renovation projects and major capital infrastructure projects outlined in the District's Capital Projects Budget.[7] The types of projects analyzed were:

- *Department of Housing and Community Development Gap Financing Projects* - Residential Construction financed or assisted by the District.
- *Market Response Projects* - Construction and renovation taking place voluntarily (not currently subject to the legislative requirements) as a response to perceived market demand for green building standards.

[7] Data provided by various District government departments and the WDCEP, and compiled by the Office of Planning.

- *Required Projects* - Construction and renovation projects required by the legislation.
- *Operations and Maintenance* - The permanent employment created by finished building projects and retrofitting activities.

Total annual labor demand requirement for each project category is listed in Table 1.1. The estimates represent the expected annual number of jobs needed as a result of the investment (expenditure) levels in each category. The annual jobs levels correspond to the annual level of investment and do not represent "new" jobs from year to year. All labor demand estimates include construction and design labor and also permanent employment for ongoing maintenance.

Table 1.1
Annual Labor Demand

Category	Labor Demand Per Year, by Type (Conservative)									
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
DHCD	125	120	120	120	120	120	-	-	-	-
Market Response	10,849	6,147	2,151	1,522	873	108	108	108	108	108
Required Private	4,881	7,554	9,466	9,634	8,875	7,074	4,963	642	2,045	2,221
Required Public	5,910	6,362	6,037	5,723	5,337	4,697	2,351	1,470	1,545	1,586
Operations and Maintenance	18	165	423	634	837	1,011	1,232	1,600	1,637	1,637
Total	*21,784*	*20,349*	*18,197*	*17,632*	*16,042*	*13,010*	*8,653*	*3,820*	*5,335*	*5,552*

The estimates for labor demand requirements were calculated using the total construction or renovation investment per year. The high (Aggressive), Medium (Conservative) and low (Pessimistic) scenario estimates reflect the assumption that a certain percentage of planned and proposed project investments would not be constructed, that not all building plans will come to the construction phase or that the construction cost estimates will be lower than the permit cost estimates. Table 1.2 outlines the assumptions applied to each category of project.

Table 1.2
Percent of Planned and Proposed Investment Used

	Type of Scenario and *Percent of Planned and Proposed Investment Used*		
Type of Project[8]	**Aggressive**	**Conservative**	**Pessimistic**
DHCD Financing	100%	80%	70%
Market Response (Private)	90%	70%	60%
Market Response (Federal)	100%	80%	70%
Required (Private)	90%	70%	60%
Required (Public/Private)	100%	80%	70%
Required (New Construction Public-Budget)	90%	70%	60%
Required (Renovation Public-Budget)	100%	80%	70%
Required (Specific Contractors Public-Budget)	100%	80%	70%
Operations and Maintenance	90%	80%	70%

[8] Development project information for "Required (Public/Private)" category based on Construction Permit data and data provided by District Department Capital Budgets and compiled by DC Office of Planning. All other project category data was compiled by DC Office of Planning.

The aggressive scenarios assume that all planned and proposed project investment will be completed as scheduled. If all of the planned and proposed projects were finished, the District could be close to build out. Recent events in the credit markets, such as the constriction of financing for real estate developers and the increased cost of building materials, have reduced the most aggressive scenarios for private projects and new public construction by 10 percent. Table 1.3 presents the total investment and labor demand for all of the major green building projects in the District.[9]. The total labor requirement is expressed in person years, which is a summation of the annual labor requirements. For example, one carpenter working on the same project for five years equates to a total project requirement of five laborers.

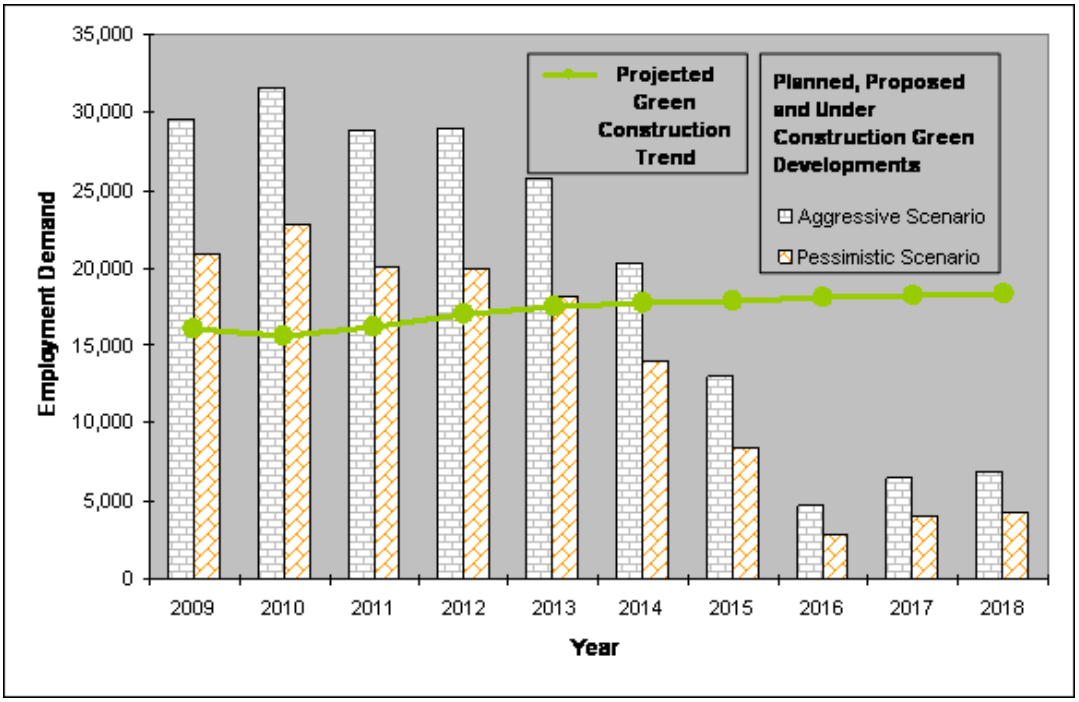
Table 1.3
Investment and Labor Amounts

Total Green Building Projects		
Scenario	**Investment Amount** ***(in millions)***	**Total Labor Requirements** ***(in person years)***
Aggressive	$21,057.6	149,429
Conservative	$17,055.3	121,177
Pessimistic	$15,054.1	107,051

Figure 1.2 shows the amount of employment needed to complete all the planned, proposed and under construction green building developments currently known, as well as a projection of overall demand for green construction jobs. The known green building projects do not include possible construction on the Walter Reed Army Medical Center site. Most of the known green building projects (represented by the bars) are assumed to start in the next few years and are assumed to be completed within the next five to six years, which is based on an aggressive public building timetable for new green construction and retrofits. For the second half of the 2009-2018 period, known green projects with their current timetables do not form a good basis for estimating green employment demand.

Figure 1.2
Employment demand for Green Developments

[9] Does not include Operations and Maintenance.

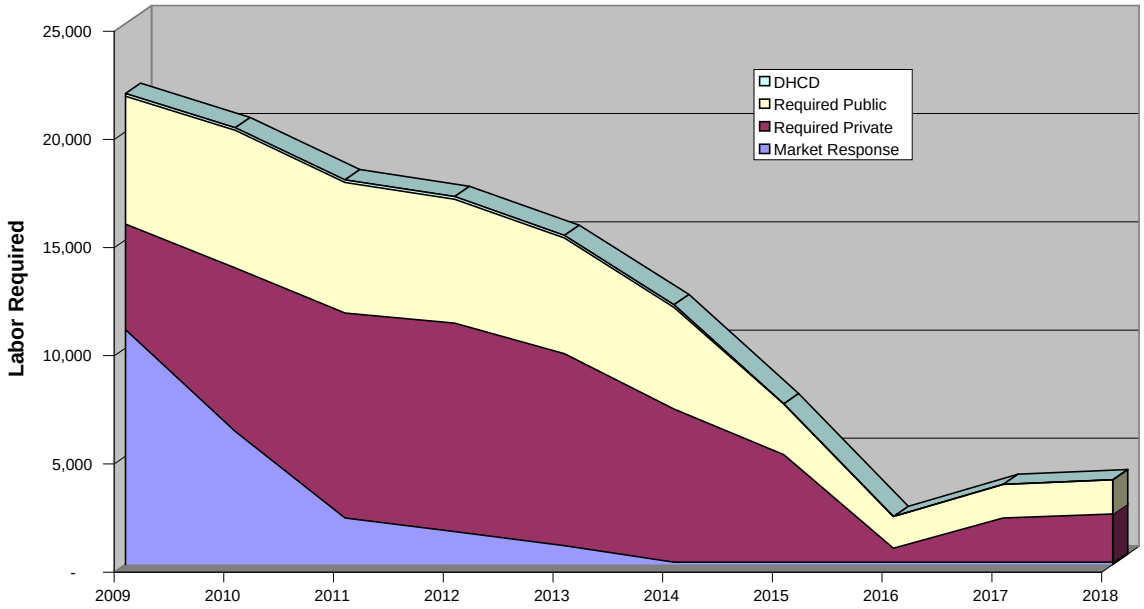


Source: District of Columbia Office of Planning, Louis Berger Group

The Projected Green Construction Trend line provides an estimate of demand for green employment in the 2009-2018 period. The projection was made by applying annual growth rates for investment in structures in the U.S. for 2009 through 2018 to spending on known green construction projects in 2008. The growth rate forecasts were obtained from Global Insight, a major economic forecasting firm.

Most *current* construction and retrofit projects analyzed under the Green Building Act initiative are private construction projects (see Figure 1.3) where green building standards are applied by choice. Figure 1.3 illustrates how this will diminish over time as more projects being built are subject to the provisions of the Green Building Act of 2006. High current market participation, indicates that a significant portion of developers in DC and their clients are interested in building green.

Figure 1.3
Labor Needed for Green Building Projects



Source: District of Columbia Office of Planning, Louis Berger Group

Modeling development expenditures under various scenarios, most projects were assumed to commit 10 percent of total project costs to design (architectural and engineering), which were allocated in year one of the project.

Table 1.4

	Green Building Labor Demand Per Year									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	26,335	24,747	22,037	21,119	18,890	14,867	9,333	2,680	4,573	4,848
Conservative	21,766	20,184	17,774	16,998	15,205	11,999	7,421	2,220	3,698	3,915
Pessimistic	19,481	17,902	15,642	14,938	13,362	10,564	6,465	1,989	3,260	3,448

The estimate for total annual labor demand for the Green Building Act of 2006 (see Table 1.4) is within range of the Metropolitan Statistical Area's (MSA) current payroll employment. According to the Bureau of Labor Statistics, the MSA in 2007 contained 44,992 new building construction workers, 114,759 specialty trade contractors, and 8,926 architects.. The labor estimates account for the total labor needed to complete a project within a prescribed budget and time constraint but are not adjusted for imported labor.

Estimating the total labor demand in the green building sector is an important step, but identifying and quantifying the demanded occupations with low barriers to entry is of greater importance to the District's workforce training and employment planning needs. For all projects under the Green Building Act initiative, 33 percent of the labor needed for projects will have a low barrier-to-entry and could provide significant opportunities for the chronically unemployed or those just joining the workforce.[10]

Table 1.5 below shows the top eight occupations (those exhibiting the highest numeric demand) with low barriers-to-entry and their respective percentages of the total Green Building employment demand.

Table 1.5

Occupation Title	% of Labor Required[11]
Construction laborers	14.4%
Office clerks, general	2.2%
Helpers: carpenters	1.9%
Secretaries, except legal, medical, and executive	1.9%
Structural iron and steel workers	1.4%
Brick masons and block masons	0.9%
Landscaping and groundskeeping workers	0.5%
Helpers: brickmasons, block masons, stonemasons, tile, marble setters	0.4%

Green Skills. Some occupations on the list will require additional training to achieve environmentally sustainable, or green, practices. The occupations requiring advanced green skills include[12]:

- *Construction Laborers* – Understand construction waste management practices and how to divert waste from landfill; know how to sort, store and collect non-hazardous recyclables such as paper, corrugated cardboard, glass, plastics and metals on site; knowledge about during-construction and before-occupation Indoor Air Management Plan (IAQ)
- *Helpers-Carpenters* – Know and understand green building materials, site considerations and passive building design and construction operations to reduce environmental impact; know about window benefits and technologies and sustainable construction technologies that enhance resistance to disaster
- *Structural iron and steel workers* – Understand content reuse (use recycled steel as steel usually has 25 percent of recycled contents, the difference between post- and pre-consumer recycling). Understand material reuse and reuse of building structural reuse, such as building envelop and core materials
- *Brick masons and block masons (and Helpers)* – Understand the use of porous pavements to reduce stormwater runoff, know how to: reduce a building non-roof heat island effect, harvest site energy (using passive solar designs) and decrease the size of the building's HVAC system to optimize energy performance
- *Landscaping and groundskeepers:* Paving technologies-permeable, porous paving, heat island effect – LEED® points, high albedo and reflectance, shade planting, irrigation system and low impact planting strategies, surface water management, site lighting, natural pest control techniques.

Certifications that can be acquired are:

[10] Defined as Job Zone 1 and 2.
[11] Occupations listed are defined as either Job Zone 1 or 2.
[12] Source: LEED New Construction and Major Renovation Reference Guide.

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council (USGBC), provides green building professionals LEED accreditation through the LEED Accredited Professional Exam. This accreditation enables an individual to facilitate the rating of buildings with various LEED systems. Professional accreditation is administered by the Green Building Certification Institute and covers various occupations.

Not all trades are offered green certification. Only some trade organizations offer training on understanding the LEED process. One example is the Mason Contractors Association of America LEED Seminar that provides members with an overview of what is expected in LEED construction.[13]

Another well recognized certification is the Green Advantage®[14] environmental certification for building-related practitioners. The certification is meant primarily for contractors, subcontractors and trades people. Certified individuals successfully passing the Green Advantage® Certification Exam demonstrate knowledge of current green building principles, materials and techniques. Commercial, Residential and Commercial/Residential Certifications are available, with a specific exam required for each. Because the green building field is rapidly changing, candidates must pass a re-certification exam every three years in order to remain Green Advantage Certified. This insures a workforce that possesses the most up to date knowledge of green practices.

More regionalized certification programs exist and can offer a guide to the District for the adoption of similar programs. In some cases regional organizations team up with national organizations to provide certifications. The certification programs include:

California's *Build It Green Certified Green Building Professional Training* is open to all California building professionals involved in the design and construction of residential buildings, as well as professionals that support and develop the market for green building. Certification is available for the following professionals: Architects/Designers, Carpenters, Consultants, Contractors, Developers, Electricians, Engineers, Interior Designers, Landscapers, Plumbing Contractors, Public Agencies, Non-Profits, Real Estate Professionals, Specialty Trades, Solar Contractors and Suppliers.

The Delaware Valley Green Building Council, in partnership with Green Advantage®, offers a comprehensive training program for the construction community. The Environmental Training and Green Advantage® Certification Program covers a full array of strategies, techniques and tools that commercial construction practitioners need to succeed in the green building market. The program includes the Green Advantage® Commercial Certification Exam.

In the District of Columbia, higher skilled workers[15], which make up 42 percent of the green workforce, will also have opportunities to improve their skills . Although many of these occupations have a higher thresholds to employment, they provide higher wage opportunities to existing workers with an increase in value added skills requirements.

[13] The course can be found at http://certification.masoncontractors.org/education/course.php?id=100026
[14] Information provided by http://www.greenadvantage.org/about-overview.php
[15] Defined as Job Zone 3.

Table 1.6 shows the nine "more skilled" occupations with higher barriers-to-entry and in most demand (i.e. numerically the highest total demand) along with their respective percentages of total Green Building Act employment demand.

Table 1.6

Occupation Title	Percent of Labor Required
Carpenters	18.5%
First-line supervisors/managers of construction trades and extraction workers	9.1%
Executive secretaries and administrative assistants	2.1%
Cement masons and concrete finishers	2.0%
General and operations managers	2.0%
Bookkeeping, accounting, and auditing clerks	1.9%
Operating engineers and other construction equipment operators	1.8%
Plumbers, pipefitters, and steamfitters	1.6%
Electricians	1.4%

Individuals working in these occupations are already trained and knowledgeable about their field, but they may need more training to understand environmentally sustainable building principles and standards. Occupations expected to require more specialized green skills include.[16]

- *Carpenters* – Know and understand green building materials, site considerations and passive building design and construction operations to reduce environmental impact, know window benefits and technologies and sustainable construction technologies that enhance resistance to disaster
- *Construction supervisors* – Effective management for green construction, waste management
- *Cement masons and concrete finishers* – Know building reuse, construction waste management , recycled content, regional materials, landscape and exterior design to reduce heat islands, stormwater management: rate and quantity , reduced site disturbance, minimum energy performance
- *Plumbers*-Understand and utilize environmental impacts of plumbing design, construction and occupant uses, waste removal – waterless urinals, dual flush toilet, composting toilets, Water collection – condensate, rain water cisterns, gray water, water efficiency
- *Electricians* – Day lighting and artificial lighting, impact of electricity use on the environment and on size of mechanical system design, compact fluorescents and other efficient light sources, LEED® rating system, sizing of system- peak loads

Certifications for more specialized trades can be used to provide training, such as:

Green Awareness Certification (A Green Mechanical Council Certification) - The exam consists of Green concepts, systems, terminology, products and how mechanical technicians interact with green systems. This certification covers a variety of trades including HVAC technicians, facilities maintenance personnel, plumbers, electricians, energy managers, service contractors, boiler contractors and general contractors.

[16] Source: LEED New Construction and Major Renovation Reference Guide.

Department of Housing and Community Development Gap Financing Projects

The District's Department of Housing and Community Development (DHCD) provides affordable housing for homeless families and the elderly. The project estimates reflect DHCD's identified projects in Fiscal Year 2008 and actual projects in DHCD's current pipeline. Some of the projects include Sarah's Circle and Delta Towers, both senior living centers, Texas Avenue and South Capital Street, permanent housing for the homeless. Table 1.7 lists the investments needed to complete DHCD's goals and the associated labor demand estimates. As was illustrated in Table 1.1, the aggressive scenario estimates are based on the assumption that the total amount of investment will be utilized. The conservative and pessimistic scenarios assume that 80 percent and 70 percent of the total will be used respectively.

Table 1.7

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$167.8	906	151	6
Conservative	$134.3	725	121	6
Pessimistic	$117.5	634	106	6

Table 1.8 presents the expected labor demand for the years the projects are under construction.

Table 1.8

	DHCD Estimated Labor Demand Per Year:									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	156	150	150	150	150	150	0	0	0	0
Conservative	125	120	120	120	120	120	0	0	0	0
Pessimistic	110	105	105	105	105	105	0	0	0	0

Market Response Projects

Increasingly, future projects will need to comply with the Green Building Act of 2006. Presently, some real estate developers are opting to have their buildings LEED certified. A major share of the market driven response toward environmentally sustainable buildings is occurring in the private sector. Only known major projects are accounted for in this analysis, therefore the estimates generated will be under counted. Some of these projects include the Union Place Phase II on 200 K Street, NE, in DC and the proposed Wonder Bread Factory on 641 S Street, NW, in DC.

The private sector has a majority of the LEED certified buildings, but the Federal government also has several projects that will be LEED certified. Even though the Federal government is not required to comply with the Green Building Act of 2006, it is doing so. Federal projects are included in the "market response" category because they are not strictly subject to the District's Green Building Act. An example is the Department of the Interior Phases IV-VI on 1849 C Street, NW, in DC.

Tables1.9 and 1.10 show the investment amounts and labor demand that will be generated from the construction and retrofits involved. Table 1.11 shows the annual labor requirements needed to complete all of the market response projects. The labor demand reflects the change that will occur when new construction and major retrofits will be covered under the Green Building Act of 2006.

Table 1.9

Total Market Response		
Scenario	**Investment Amount *(in millions)***	**Total Labor Requirements *(in person years)***
Aggressive	$3,760	26,398
Conservative	$3,137	22,080
Pessimistic	$2,826	19,921

Table 1.10

Market Response Private				
Scenario	**Investment Amount *(in millions)***	**Total Labor Requirements *(in person years)***	**Average Annual Labor Requirements**	**Duration of Initiative (in years)**
Aggressive	$3,511	24,694	2,496	10
Conservative	$2,922	20,609	2,061	10
Pessimistic	$2,628	18,567	1,857	10
Market Response Public (Federal Government)				
Scenario	**Investment Amount *(in millions)***	**Total Labor Requirements *(in person years)***	**Average Annual Labor Requirements**	**Duration of Initiative (in years)**
Aggressive	$250	1,703	426	4
Conservative	$215	1,471	368	4
Pessimistic	$198	1,355	339	4

Table 1.11

	Market Response Employment Demand Per Year:									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	12,935	7,398	2,593	1,834	1,037	120	120	120	120	120
Conservative	10,849	6,147	2,151	1,522	873	108	108	108	108	108
Pessimistic	9,806	5,521	1,930	1,366	791	102	102	102	102	102

Construction workers employed to work on federal projects should be familiar with the Federal Green Construction Guide (the Guide).[17] The Guide provides language that is inserted into construction specifications to provide some basic green building principles that must be adhered to by the construction contractor. The Guide covers specific activities, as well as general requirements such as:

- ✓ Continual Improvement of Environmental Quality
- ✓ Temporary Facilities and Controls
- ✓ Indoor Air Quality (IAQ) Management
- ✓ Noise and Acoustic Management
- ✓ Environmental Management
- ✓ Environmental Product Requirements
- ✓ Progress Cleaning

[17] Guide provided by the Whole Building Design Guide at http://www.wbdg.org/design/greenspec_msl.php?s=011000

- ✓ Construction Waste Management
- ✓ Operation and Maintenance Data
- ✓ Sustainable Design Close-Out Documentation
- ✓ Environmental Demonstration and Training
- ✓ Sustainable Design Requirements
- ✓ Green Power Requirements
- ✓ Commissioning

Required Public Projects

The projects that will be required to comply with the District's Green Building Act of 2006 are comprised of private and public sector new construction and retrofits which account for 80 percent of the overall green building investment amounts from 2009 to 2018 (see Table 1.3 for overall Green Building investment). The public projects include public/private partnership based developments, the District's departmental capital budgets for new construction, general retrofits (renovations) and trade-specific retrofits (i.e. electrical, HVAC, roofing). More refined figures and examples of each type of project included in the aggregate figures are presented in the following sections.

Table 1.12 illustrates the total investment amount for all of the required building projects and the total labor demand. Table 1.13 presents the annual labor demand from 2009 to 2018.

Table 1.12

Total Required		
Scenario	**Investment Amount *(in millions)***	**Total Labor Requirements *(in person years)***
Aggressive	$17,129	122,126
Conservative	$13,783	98,372
Pessimistic	$12,110	86,495

Table 1.13

	Required Estimated Employment Demand Per Year									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	6,982	7,497	7,134	6,752	6,293	5,504	2,833	1,735	1,824	1,873
Conservative	5,910	6,362	6,037	5,723	5,337	4,697	2,351	1,470	1,545	1,586
Pessimistic	5,374	5,795	5,488	5,208	4,858	4,293	2,109	1,338	1,406	1,443

Required Private Projects

As Figure 1.2 indicates, a significant portion of the green building projects will occur within the private sector. As of 2008, the majority of private sector green building has been undertaken voluntarily. Although the trend of developing green building based on market efficiencies may continue, new projects will fall under the jurisdiction of the Green Building Act of 2006 and are therefore analyzed under the "required" category. An example of the type of projects in DC is the Penn Branch Shopping Center on 3202 Pennsylvania Avenue, SE.

Private building projects will constitute a majority of the total green building projects in terms of labor demand. Table 1.14 provides the estimated labor demand by the private required projects, as well as the percentage labor demand of the total required building labor demand.

Table 1.14

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (in years)
Aggressive	$10,375	73,698	7,370	10
Conservative	$8,075	57,355	5,736	10
Pessimistic	$6,925	49,184	4,918	10

Table 1.15

	Required Private Employment Demand Per Year									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	6,262	9,702	12,159	12,383	11,410	9,094	6,380	825	2,629	2,855
Conservative	4,881	7,554	9,466	9,634	8,875	7,074	4,963	642	2,045	2,221
Pessimistic	4,191	6,480	8,119	8,259	7,608	6,064	4,255	550	1,753	1,904
	Private as a % of Total Required Employment Demand Per Year									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	47.3%	56.4%	63.0%	64.7%	64.5%	62.3%	69.2%	32.2%	59.0%	60.4%
Conservative	45.2%	54.3%	61.1%	62.7%	62.4%	60.1%	67.9%	30.4%	57.0%	58.3%
Pessimistic	43.8%	52.8%	59.7%	61.3%	61.0%	58.5%	66.9%	29.1%	55.5%	56.9%

Required Public Projects

The public projects in the required category have total investment and labor demand levels shown in tables 1.16 and 1.17. This reflects all of the public projects including public and public private partnerships, capital budget new construction, retrofits and trade specific retrofits.

Table 1.16

Required Public		
Scenario	**Investment Amount *(in millions)***	**Total Labor Requirements *(in person years)***
Aggressive	$6,754	48,428
Conservative	$5,708	41,017
Pessimistic	$5,186	37,311

Table 1.17

Scenario	Required Public Employment Demand Per Year									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Aggressive	12,010	13,035	12,610	11,405	10,390	8,602	5,846	2,844	2,512	1,873
Conservative	9,969	10,796	10,418	9,447	8,615	7,175	4,761	2,357	2,096	1,586
Pessimistic	8,949	9,676	9,322	8,468	7,727	6,462	4,218	2,114	1,888	1,443

Public and Public/Private Partnerships

The public and public/private partnership projects consist of projects that have some financing, ownership or other arrangements with the District. Table 1.18 shows the total investment and labor demand. On average, the public and private partnership projects constitute 42 percent of the total required public category project investment amount. The Ballpark District Waterfront Development, a partnership between DC Office of Planning and Economic Development and Forest City Washington, is an example of a project in this category.

Table 1.18

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$3,019	21,161	2,116	10
Conservative	$2,419	16,953	1,695	10
Pessimistic	$2,119	14,849	1,485	10

Capital Budget New Construction and Retrofits

The capital budget new construction and retrofits category is derived from various public department budgets. Each department has its own set of unique contributions to the green building projects in the District. The projects include new construction, general retrofits and specific trade oriented retrofits such as electrical or roofing. Since each of the various projects is different, they were analyzed separately in order to accurately measure their labor demand and specific occupational compositions.

New Construction

"New Construction" outlined in the District's budget is the largest component of the capital budget projects. An example of new construction budgeted is the Southwest Waterfront Redevelopment. The overall investment in new construction is more than four times the amount for retrofits. Table 1.19 shows the total investment and labor demand required for all of the new construction scenarios.

Table 1.19

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$2,994	22,255	2,225	10
Conservative	$2,648	19,725	1,973	10
Pessimistic	$2,476	18,460	1,846	10

Retrofits

The estimate of the retrofits portion of the required public projects used a synthesis of several specialty trades. The disbursement of the specialty trades mimics the average costs associated with each trade that would take part in a renovation/retrofit of an existing facility. Table 1.20 outlines the investments and total labor demand for all renovation projects. Examples of these projects include the renovation of the DC Armory and the renovation of community firehouses.

Table 1.20

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$678	4,598	657	7
Conservative	$582	3,951	564	7
Pessimistic	$535	3,628	518	7

Although total retrofitting activities in all of the green building categories (in this study) combined equals 10 percent of the total investment, many of the smaller projects not covered in this study may be undertaking, or even limited to, retrofitting. In addition, other initiatives laid out in this report, such as Benchmarking, will carry out retrofitting activities. For this reason the retrofitting activity is explained in more detail as it pertains to general retrofitting to increase energy efficiency.

It is assumed that renovations/retrofitting is a group of tasks performed by specialists in their own fields. Renovating a space for energy efficiency differs from providing a standard remodeling. The LEED standard uses the term "renovation" consistently to refer to major building restoration of building envelope, core and shell, and HVAC systems. It targets the building's environmental impacts rather than its aesthetic, or design, features. A significant portion of the renovation's costs are often used updating inefficient heating and cooling systems. Major improvements in the shell include new windows, sealing the building envelope and roof improvements (adding a reflective membrane or improving storm water drainage). Little investment is placed in changing the core of the buildings: stairways, halls or elevator shafts, etc.

Table 1.21 provides a breakdown of the average costs for completing a renovation/retrofit. Table 1.21 illustrates the occupational needs, their respective educational requirements and median wages paid in the District for 2008. This table's list of the 20 most in demand occupations is based on the costs in Table 1.21, therefore it only reflects occupations identified to work in retrofitting activities. Although the table focuses on educational requirements and not on-the-job training, it provides a good proxy for possible barriers-to-entry attributable to insufficient levels of educational attainment.

Table 1.21

Specialty Trade	Percent of total Investment
Poured Concrete Foundation and Structure	1.0%
Masonry	16.0%
Roofing	3.0%
Electrical	12.0%
Plumbing, Heating, and Air-Conditioning	25.0%
Other Building Equipment	4.0%
Drywall and Insulation	4.0%
Painting and Wall Covering	11.0%

Other Specialty Trade	24.0%

Source: Louis Berger Group Inc.

Table 1.21a

Percent of Total Retrofitting Labor Requirements	Occupational Title	Less than a High School Diploma	High School Diploma (or Equivalent)	First Professional Degree	Post-Secondary Certificate	Some College Courses	Associate's Degree (or 2-year degree)	Bachelor's Degree	*Median Wages*
11.0%	Construction Laborers*	24.5%	36.8%		11.7%	5.1%		21.8%	*$30,850*
9.8%	Painters, Construction & Maintenance*	39.7%	24.2%	16.2%	3.8%		16.2%		*$40,300*
9.7%	Plumbers, Pipefitters, & Steamfitters	5.2%	60.5%		34.2%				*$54,890*
7.6%	Electricians	24.0%	30.2%		40.5%	3.7%	1.5%	0.1%	*$58,860*
7.2%	Brickmasons & Blockmasons*	37.4%	50.8%		11.8%				*$55,180*
5.6%	First-Line Supervisors/Managers of Construction Trades & Extraction Workers	6.6%	54.2%	0.2%	9.9%	8.3%	11.6%	9.1%	*$70,050*
5.3%	Heating, Air Conditioning, & Refrigeration Mechanics & Installers	17.7%	16.8%		31.2%	5.6%	13.6%	15.0%	*$52,550*
4.7%	Operating Engineers & Other Construction Equipment Operators	11.3%	40.8%		47.8%				*$49,340*
3.4%	Cement Masons & Concrete Finishers	25.5%	21.8%		52.8%				*$39,980*
2.9%	Office Clerks, General*	4.3%	47.8%		14.2%	21.3%	12.3%		*$31,020*
2.8%	Sheet Metal Workers*	12.8%	49.4%		37.5%	0.2%			*$39,240***
2.5%	Helpers--Brickmasons, Blockmasons, Stonemasons, & Tile & Marble Setters*	33.0%	41.3%	2.5%	18.9%				*$24,860*
2.3%	Secretaries, Except Legal, Medical, & Executive*	1.9%	37.7%		16.3%	36.0%	4.3%	0.5%	*$41,680*
2.3%	Bookkeeping, Accounting, & Auditing Clerks		21.5%		5.8%	33.2%	21.5%	18.0%	*$40,650*
2.1%	Truck Drivers, Heavy & Tractor-Trailer*	22.1%	53.1%		21.7%	3.1%			*$39,700*
2.0%	Helpers--Pipelayers, Plumbers, Pipefitters, & Steamfitters*	19.9%	33.6%		46.5%				*$26,360*
2.0%	Roofers*	33.9%	52.3%		13.8%				*$36,460***
1.9%	Carpenters	28.9%	24.6%		44.8%	1.7%			*$49,570*
1.8%	Drywall & Ceiling Tile Installers*	6.9%	73.2%		19.9%	0.1%			*$37,380*
1.8%	General & Operations Managers		18.0%	0.5%	19.5%	11.4%	3.5%	34.7%	*$117,260*

*Identified as occupations with little or no barriers to entry (defined as either job zone 1 or,2). Non-asterisked occupations are defined as Job Zone 3.

** No District wages are available. Uses Metropolitan Statistical Area Wages.

On average, occupations in Job Zones 1 and 2 with lower barriers to enter, , earned $12,800 less than more skilled Job Zone 3 occupations. By removing management occupations, the difference decreases to $9,800. This wage difference correlates closely with the amount of education needed for the position. Occupations with low barriers to entry on average have education attainment of 67 percent high school or below. The more skilled occupations have 50 percent high school or below.

Despite the differences in education attainment and wages many of the occupations with low barrier to entry have the ability to move up into more skilled positions. As an example the Bureau of Labor Statistics Occupational Outlook Handbook states for construction laborers:

> *When the opportunity arises, they learn from experienced construction trades workers how to do more difficult tasks, such as operating tools and equipment. Construction laborers may also choose or be required to attend a trade or vocational school or community college to receive further trade-related training.*

A number of employers, particularly large nonresidential construction contractors with union membership, offer employees formal apprenticeships, which provide the best preparation.

Trade Specific Retrofits

The trade specific retrofits were analyzed separately in order to reflect the more skilled set of tasks they require. Analyzing retrofits that are exclusive to a specific specialized trade such as electrical, plumbing, heating, air-conditioning, roofing, and civil engineering construction projects allowed for a better understanding of the occupations involved in these projects. While many of the same specialty trades are used in the previous section (Retrofits), this section focuses on a narrower subset of specific trades. Some examples of trade specific retrofits found in DC include various park lighting projects for the Department of Parks and Recreation and various HVAC improvements for the Department of Health and Parks and Recreation.

Table 1-22 shows the overall investment amounts and labor demands for each of the scenarios. Tables 1-23 and 1-24 present the investments made and the total labor demands in each specialty trade.

Table 1-22

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$63	415	69	6
Conservative	$58	388	65	6
Pessimistic	$56	374	62	6

Table 1-23

Investment in Trade Specific Retrofits				
Scenario	**Plumbing, Heating, and Air-Conditioning**	**Roofing**	**Electrical**	**Civil Engineering Construction**
Aggressive	$32.2	$9.1	$12.5	$8.7
Conservative	$32.2	$7.3	$10.2	$8.7
Pessimistic	$32.2	$6.3	$9.0	$8.7

Table 1-24

Labor Demands for Trade Specific Retrofits				
Scenario	**Plumbing, Heating, and Air-Conditioning**	**Roofing**	**Electrical**	**Civil Engineering Construction**
Aggressive	208	59	81	66
Conservative	208	47	66	66
Pessimistic	208	41	58	66

Maintenance and Operations (Permanent Labor Requirements)

In addition to stimulating labor demand in the construction industry, the Green Building Act of 2006 will generate increased permanent labor demand in the future. These labor demands will come in the real estate management industry, where a larger base of buildings in DC and newly green-retrofitted or constructed buildings will require maintenance and operations personnel and new skills to meet green building standards.

A study completed by the Leonardo Academy Inc. published in April 2008 used a survey to compare the average operations and maintenance costs of LEED-EB (LEED Certified Existing Buildings) against standard existing buildings.[18] Table 1-25 illustrates the relative costs associated with the operations and maintenance of LEED-EB and their industrial average provided by the Building Owners and Managers Association (BOMA).

Table 1-25

Expenses –all values are per square foot	Average[19]	Percent of Total
Cleaning in LEED-EB Certified Buildings	$3.72	27%
BOMA Average Cleaning	*$2.66*	*19%*
Repair/Maintenance in LEED-EB Certified Buildings	$3.60	26%
BOMA Average Repair/Maintenance	*$3.16*	*22%*
Roads and Grounds in LEED-EB Certified Buildings	$0.65	5%
BOMA Average Roads and Grounds	*$0.46*	*3%*
Security Expenses in LEED-EB Certified Buildings	$0.50	4%
BOMA Average Security	*$1.10*	*8%*
Administrative Expenses in LEED-EB Certified Buildings	$1.77	13%
BOMA Average Administrative	*$2.52*	*18%*
Utility Expenses in LEED-EB Certified Buildings	$3.66	26%
BOMA Average Utility	*$4.35*	*31%*
Total Expenses in LEED-EB Certified Buildings (Ex-Utilities)	$10.24	74%
BOMA Average Total Expenses (Ex-Utilities)	*$9.90*	*69%*
Total Expenses in LEED-EB Certified Buildings	$13.90	
BOMA Average Total Expenses	*$14.25*	

The Table 1-25 shows that LEED-EB increased costs in operation areas but provides a significant cost savings in utility expenses. Table 1-26 presents the estimated amount of investment and the labor demands required to provide permanent operations and maintenance for a facility. Nearly 92 percent of the labor required falls within Job Zones 1, 2, or 3. Of that, 48 percent has lower barriers-to-entry.[20] In addition, facility operations and maintenance workers required are drawn from the various occupational backgrounds including installation, maintenance, and repair (25 percent), office and administrative support (18 percent), and building and grounds cleaning and maintenance (14 percent). This allows a greater amount of diversity in skills and abilities for employment candidates.

[18] The Economics of LEED for Existing Buildings for Individual Buildings 2008 Edition, Leonardo Academy Inc. April 21, 2008.
[19] The analysis is adjusted to the Washington D.C. BOMA Average Total Operational and Maintenance Expenses using the 2006 BOMA average and adjusting to 2008 prices. The Rate is then applied proportionately to the figures provided by the Leonardo Academy Inc. Study.
[20] Job Zone 1 and 2.

Table 1-26

Scenario	Total Investment *(in millions)*	Total Labor Requirements *(in person years)*	Average Number of Jobs per Working Year	Years of Work
Pessimistic	$408.03	8,370	837	10
Conservative	$448.22	9,194	919	10
Aggressive	$488.41	10,019	1,002	10

Table 1-27

Scenario	Total *(in millions)*	New Construction *(in millions)*	Retrofitting *(in millions)*
Aggressive	$488.4	$390.9	$97.5
Conservative	$448.2	$357.0	$91.2
Pessimistic	$408.0	$323.1	$84.9

Table 1-28

	Green Building Labor Demand Per Year:									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	20	180	461	691	912	1,102	1,343	1,743	1,783	1,783
Conservative	18	165	423	634	837	1,011	1,232	1,600	1,637	1,637
Pessimistic	17	151	385	578	762	921	1,122	1,456	1,490	1,490

Table 1-27 illustrates the estimated amount of investment needed to provide the average level of maintenance and operations expenses after the completion of all of the known green building projects. Nearly 20 percent of the project investments will be for retrofitted facilities whose maintenance crews may already be employed. However, they may require additional training. Table 1-28 provides the number of required labor for each year in the study period. The trend of permanent employment increases over time as new construction and retrofitting projects are finished and need maintenance and operation personnel to fill ongoing required labor needs.

With the Green Building Act of 2006 ushering in a host of new and retrofitted facilities well into the future, it is assumed that these facilities will be maintained properly to insure the maximum amount of energy efficiency and effectiveness. The LEED Existing Building Operations and Maintenance Manual lists requirements needed to earn the prescribed amount of points necessary to achieve and preserve "Operationally Green" status for a facility. The Manual states:

> *"Operations and Maintenance certification if based on actual building operations performance, not design expectations."*

A summary of requirements set forth by the Green Building Council's LEED-EB certification manual is listed below. In addition, the certification provides points for LEED certified professional staff and LEED training.

- Green Janitorial Services – provide green janitorial services that promote indoor air quality, occupant health and recycling, while reducing water and electricity consumption.

- Facility Maintenance – manage the entire facility operations to maximize electrical, HVAC and plumbing efficiency.
- Landscape Maintenance – provide LEED approved landscape management, which controls soil erosion, light pollution and irrigation system inspections.
- Integrated Pest Management – maintaining facilities that require little or no harmful pesticides by controlling litter, food access and other pest attractants.

In addition to LEED certification programs, BOMA also provides building managers with training seminars in keeping green operational standards high. Maintenance crews can also be trained in the various upgraded systems by attending manufacturers' seminars on meeting equipment maintenance warrantee specifications. Another alternative for maintenance training is the Green Mechanical Awareness Certification, which consists of green concepts, systems, terminology, products and instruction on how mechanical technicians interact with green systems.[21]

1.4.2 Clean and Affordable Energy Act of 2008

Introduction

On August 4, 2008, Mayor Adrian Fenty signed the District Energy Bill, which will be enacted as the Clean and Affordable Energy Act of 2008 (CAEA) in late 2008. The CAEA includes several components that will contribute to making the District's economy greener. The CAEA authorizes the creation of a Sustainable Energy Utility (SEU), which will conduct sustainable energy programs. To fund the SEU and other new and existing energy efficiency and renewable energy programs, the CAEA creates a non-lapsing Sustainable Energy Trust Fund.. In addition to authorizing public spending, the CAEA is expected to spur increased private spending in the economy by establishing energy benchmarking requirements for public and private buildings, increasing the solar energy requirement for electrical providers and allowing energy submetering for commercial tenants. Some of the key components of the CAEA are discussed in detail below.

For the purposes of this study it was assumed that the CAEA would take effect beginning calendar year 2009. Hence, Green Collar Jobs Demand estimates were developed from 2009 onward.

Sustainable Energy Utility

The CAEA authorizes the creation of a Sustainable Energy Utility (SEU). The selected SEU contractor will receive $7.5 million in its first contract year rising to $20 million in the fourth (2013) and subsequent years to conduct sustainable energy programs that reduce per capita energy consumption, increase renewable energy generating capacity, reduce growth of peak electricity demand, improve energy-efficiency in low-income housing, reduce growth of energy demand by the District's largest energy users and increase the number of green collar jobs in DC.

Because the selected SEU contractor will be responsible for proposing and developing the programs, the actual mix of expenditures that the SEU will generate is currently unknown. It is expected that expenditures will focus on demand management programs, but will also include renewable energy purchases and investment in market transformation strategies. Demand management programs will likely include technical assistance and financial incentives to

[21] Source: the Green Mechanical Council.

households and businesses to help them reduce their energy costs through purchasing energy-efficient products and green retrofitting.

This analysis assumes that 60 percent of the total money received by the contractor will be allocated toward demand management. Of that amount a certain percentage will be utilized for retrofits. The most aggressive assumption states that 70 percent of the demand management dollars will be used for retrofits while the conservative and pessimistic scenarios assume 50 percent and 30 percent respectively. All of the scenarios assume that the contract will cease after the five year period. Table 1-29 presents the required labor and investment.

Table 1-29

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$33.6	198	40	5
Conservative	$24.0	165	33	5
Pessimistic	$14.4	132	26	5

All of the labor required for this initiative will be similar to the labor profile of the Green Building Act of 2006's retrofits section.

Energy Efficiency Programs

The CAEA authorizes DC's Public Service Commission (PSC) to direct $6 million annually, beginning in fiscal year 2009 and continuing through fiscal year 2011, to be spent from the Sustainable Energy Trust Fund on Pepco energy efficiency programs, pursuant to Pepco's already submitted "Blueprint for the Future". The PSC could choose to approve less money or to approve more money and pass the additional cost to ratepayers. For the purposes of this analysis, it was assumed that the PSC will approve the spending levels and Pepco will spend $6 million annually in calendar years 2009, 2010 and 2011. According to the Blueprint's "Demand Side Management" (DSM) cost summary, Pepco has proposed to spend a total of $31,041,000 over a three-year period including $16,332,000 for non-residential programs.

All of Pepco's non-residential programs are expected to be approved - except for the Smart Stat proposal - and the following Pepco residential proposals will be accepted: HVAC Efficiency, Lighting and Appliances and partial funding of the Home Performance program with the balance of the $6 million available each year. Pepco is expected to begin allocating money for the Blueprint in calendar year 2009. This section of the CAEA is not being modeled for specific labor demand effects, as both the expenditure levels and characteristics were not yet known at the time of this study, summer 2008.

Benchmarking

The CAEA requires that all privately owned non-residential buildings (over 200,000GSF in 2010, over 50,000GSF in 2013) be benchmarked annually using the Energy Star Portfolio Manager and that this performance data be made accessible to the public. The GSF is reduced over the first four years, to allow for a phase in of the requirement, and will continue at the $50,000 level thereafter. It is expected that this requirement will trigger an increase in retrofitting activity, as building owners will have greater incentive to improve energy efficiency to remain competitive in the local market. This analysis assumes a range of "market response" levels for the purpose of estimating

the increases in green collar employment opportunities likely to be generated by increased demand for building retrofits and higher energy performance systems. Notably, the DC commercial market is already demonstrating a preference for Energy efficient and LEED Certified (green) buildings, which are commanding higher lease and rent values over non-certified buildings in the District's building market. A 2008 CoStar Group, Inc. study found that LEED-certified and Energy Star-rated buildings in both the U.S. the DC markets were "adding value" to buildings, as exhibited in higher occupancy levels, rents and sales prices than traditional commercial properties.[22]

Findings

To estimate a range of potential labor demand response for this program, various market responses are embodied in the analysis as: 70 percent of building space being retrofitted for the aggressive scenario and a 50 percent coverage is assumed to estimate the pessimistic (less responsive) scenario. Although market response is important, the types of retrofitting activity can alter the demand for labor. Because there is really no exact "standard" labor profile requirement in terms of retrofits – it depends entirely on building type and the type of renovation (e.g., shell, core, HVAC, or only urinals) – the assumption used for estimation purposes is more general and includes aspects of shell, core, and HVAC (see retrofits sections of Green Building Act of 2006). The cost of a "general retrofit" is estimated at $85 per square foot.[23] The results shown in Table 1-30 build on this cost assumption.

Table 1-30

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$1,982	13,459	1495	9
Conservative	$1,979	13,444	1,494	9
Pessimistic	$1,970	13,382	1,487	9

Notably, the occupational demand and profile for the benchmarking component of CAEA are similar to those of the Green Building Act of 2006's retrofits sections.

[22] CoStar Group research study presented by Andrew Florance (president and CEO of CoStar Group, Inc) March 13, 2008 at the D.C. Building Industry Association's (DCBIA) "The Continuing Evolution of the Green Revolution" program.
[23] Source: Harvard Public Health NOW, March 2001 http://www.hsph.harvard.edu/now/mar30/landmark.html

Solar Energy Requirement (Carve Out)

The Renewable Portfolio Standard Act of 2004 (RPSA) established renewable portfolio standards that required a fixed percentage of electricity suppliers' sales in the District of Columbia be derived from renewable sources. The CAEA amends the RPSA by increasing the renewable requirement in general and by increasing the solar energy requirement specifically.

For the purposes of estimating the potential green collar job demand impacts of this requirement, estimates were developed beginning in calendar year 2009 where the legislation states that the "carve out" requirement for tier one renewable sources be 2.5 percent, 2.5 percent from tier two renewable sources, and not less than 0.019 percent from solar energy. The percentage requirement of the carve out gradually increases through the analysis period, rising to 15.5 percent, 1 percent and 0.30 percent respectively in 2018. This part of the Energy Act functions like a procurement policy and is expected to incentivize increases in local production of renewable energy above and beyond the requirement.

Findings

To assess the labor demand created by the solar carve out, several assumptions were made. Table 1-31 provides the breakout of the program's prescribed solar energy requirements and the costs, mega-wattage and estimated households powered by solar.

Table 1-31

Year	Solar Requirements[24]	Total DC Electric Supply (MWh)[25]	Solar (MWh)	Estimated Capacity (MW)[26]	Cost[27]	Number of Households[28]
2007	0.0050%	11,000,000	550	0.458	$4,125,000	63
2008	0.0110%	11,055,000	1,216	1.013	$9,120,375	140
2009	0.0190%	11,110,275	2,111	1.759	$16,623,749	255
2010	0.0280%	11,165,826	3,126	2.605	$24,620,647	377
2011	0.0400%	11,221,656	4,489	3.741	$35,348,215	542
2012	0.0700%	11,277,764	7,894	6.579	$62,168,673	953
2013	0.1000%	11,334,153	11,334	9.445	$89,256,452	1,368
2014	0.1300%	11,390,823	14,808	12.340	$116,613,554	1,787
2015	0.1700%	11,447,777	19,461	16.218	$153,257,121	2,349
2016	0.2100%	11,505,016	24,161	20.134	$190,264,208	2,916
2017	0.2500%	11,562,541	28,906	24.089	$227,637,535	3,489
2018	0.3000%	11,620,354	34,861	29.051	$274,530,867	4,207

Table 1-32 (next page) illustrates the total labor demand for the solar energy requirement and is a sum of the year over year changes in the costs. Since the solar energy requirement is a legal statute, the scenarios are premised on the assumption that the lowest expectation is the legal limit

[24] Solar requirements are provided by the Clean and Affordable Energy Act of 2008 pages 27-28.
[25] Source: U.S. Energy Information Agency, Electric Sales/Revenue Data.
[26] Source: Major Solar Developer (name not listed here to protect competitive position; in database).
[27] Source: Find Solar.com (Assumes $9 per watt).
[28] Source: EIA, DOE Table 5. U.S. Average Monthly Bill by Sector, Census Division, and State 2006 (8,700 Kwh annual energy use per household): http://www.eia.doe.gov/cneaf/electricity/esr/table5.html.

set by the legislation. The more aggressive scenario assumes that an additional 5 percent of solar megawatts (Mwh) are installed in DC.

Table 1-32

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$265.4	1,044	104	10
Conservative	$252.3	992	99	10

The innovative nature of solar installers is such that they are not defined as a separate occupation in many of the standard occupational classification and code reference sources. Some studies have labeled Solar Technicians with "HVAC Installers", and some as "Other Engineering Technicians".[29]. Since this analysis assumes that all solar installations will be electrical units, and not hot water heating units, the use of data for some of the broader occupations, such as Electricians, will be used to document occupational profiles and wage statistics. Using this assumption, electricians and electrician helpers constitute about 70 percent of the annual labor requirements.

Although solar installers may be similar to electricians, a 2007 California Economic Workforce and Development Solar Technician study stated "solar industry employers are not offering very attractive wages to solar technicians as they are concerned about driving down the cost of installation to decrease its price to the consumer. However, employers place a high priority on retaining valuable employees, and therefore offer fast promotion along the career ladder and pay schedules. Solar installers can move up to the next level after the first six months on the job."

The 2008 Interstate Renewable Energy Council Entry Level Solar Electric Installers lists the most desired qualifications as:

- Strong work ethic, self motivation, organization and a can-do attitude
- Experience in mechanical installations, general construction and ladder work
- Basic understanding/experience with electrical wiring of AC and DC systems preferred
- One-two years of construction background is preferred
- Experience with all types of hand-held and power tools
- Experience with small machinery (trenchers, bobcats, forklifts) preferred
- Experience working with all types of building materials - various roof types, stucco, wood, concrete, Uni-strut, roofing, etc. is preferred
- Team player who listens, learns, and actively communicates
- Visual thinker good at problem solving and implementing ideas
- Knowledge of the RE marketplace, technology and industry
- Desire to learn and master all aspects of installing solar PV systems
- H.S. diploma, two-year degree in technology/industrial arts is preferred

The report also states that most Solar Electric Installers are trained on-the-job by their employers, starting as helpers in service to more experienced installers. The most promising entry level applicant would have completed high school shop courses in electricity and wood working and held jobs as construction helpers for plumbers, electricians, roofers or swimming pool/spa

[29] Source: California Employment Development Department, Labor Market Information Division, Information Services Group. U.S. and Department for Education, National Center for Educational Statistics, at http://nces.ed.gov/pubs2002/cip2000/occupationallookup.asp

contractors.

Current certifications of Solar Electric Installers are provided by the Northern American Board of Certified Energy Practitioners (NABCEP). NABCEP's Entry Level Certificate of Knowledge program is based on learning objectives developed by its own committee of subject matter experts. The skills identified in the program do not replace electrical trades, technician, technologist or engineering training. The skills are designed to get professional installers into the solar field. The program is also a way for trainees to show that they have achieved basic knowledge, comprehension and application of key terms and concepts of PV/Solar Thermal system operations. The certificate demonstrates that the student has passed an industry-designed exam based on learning objectives developed by subject matter experts.

NABCEP-Certified *Solar PV installers* are required to specify, configure, install, inspect and maintain a solar electric system that meets the performance and reliability needs of customers, incorporates quality craftsmanship, and complies with all applicable safety codes and standards. The following is a partial list of employer defined training needs, which are unique to solar PV installers.

- Site assessment as it pertains to system performance
- Photovoltaic cell and module characteristics as they apply to the design and performance of integrated systems
- Calculating system characteristics, such as wire sizes, to minimize power losses and maximize energy production
- Applicable wiring methods and technologies
- Mounting techniques and technologies
- PV system maintenance, diagnostic and troubleshooting techniques
- Customer education practices.

Submetering

The Submetering component of the CAEA is expected to spur demand for building retrofits, as owners change from single, or net, metering systems for commercial office and multi-dwelling unit properties to individual metering systems for each unit. This change in the law will not require unit-by-unit metering, but will allow for it. The change is expected to create greater incentives for building owners to raise the level of energy efficiency in their buildings, as individual unit occupants will prefer the option of greater control over their utility costs. In economic terms, this is eliminating a market failure, where building occupants have been shielded from accurate information about their consumption levels. The absence of effective price signals left occupants with imperfect information and even the perverse incentive to "free load" (consume more energy than other occupants) without paying the real cost.

While this sub-initiative is not in itself expected to create significant demand for jobs beyond an initial wave of retrofits to install the submetering systems, it will contribute to demand for occupations involved in building retrofits as part of a slew of incentives and requirements under both the CAEA and Green Building Act.

Findings

The analysis for the installation of submetering systems assumes that each private commercial building with more than one unit will want to submeter and that each unit represents one meter.

Using DC tax database data, an estimate of 83,518 units in private commercial buildings was derived.[30] However, the assumed market demand for the metering , was altered to show the various potential levels of market response. The most aggressive scenario assumes all of the buildings in DC will become submetered and each additional scenario will calculate the impact based on a 10 percent downward revision of market response, equating to a pessimistic response of 80 percent. Another key assumption for estimating the likely labor impacts for the submetering law change is time. All of the scenarios will assume a consistent disbursement of submetering installations, as illustrated in Table 1-33.

Table 1-33

Year	2009	2010	2011	2012	2013	2014	2015	2016
Building Units Submetering	20.0%	20.0%	15.0%	15.0%	10.0%	10.0%	5.0%	5.0%

The total estimated investment cost per submeter is $450 to install.[31] It is assumed that electricians will perform the work. Licensed electrical contractors should be able to provide this service with little or no new training. Table 1-34 provides the labor requirements and investment estimates for the three scenarios.

Table 1-34

Scenario	Investment Amount *(in millions)*	Total Labor Requirements *(in person years)*	Average Annual Labor Requirements	Duration of Initiative (*in years*)
Aggressive	$37.6	243	30	8
Conservative	$33.8	219	27	8
Pessimistic	$37.6	243	30	8

Costs for submetering have come down in recent years and vary by region. A 2008 per unit submeter cost estimate of $62.50 was provided to the District's Office of Planning by a submetering contractor.[32] Using this per unit cost would trigger roughly $4.6 million in expenditures over an eight year period, which would generate demand for 30 total jobs, or an annual labor demand of four. The labor impact of this submetering initiative is likely to come in the form of new training requirements for installing more sophisticated, energy efficient metering systems in order to meet standards from both the Green Building Act of 2006 and the Clean and Affordable Energy Act of 2008.

[30] Estimate of individual units in private commercial units derived from DC Tax Database data provided by District of Planning. This data was used to estimate total of 2,655 private commercial buildings with at least one unit.
[31] *Your Home; The Case for Submetering,* New York Times, July 8, 2001.
[32] A private submetering contractor SUBMETERONE, LLC provided a sample cost breakdown to the Institute for Market Transformation and the District Office of Planning in October, 2008.

1.4.3 Proposed Photovoltaic Solar Trees Parking Lots Initiative

Introduction

The DC Office of Planning is exploring opportunities for solar tree parking lot pilot programs. The proposed private sector driven Solar Tree Initiative would install solar panels on parking lots throughout the District, serving the dual purpose of creating small scale clean energy farms and providing shade for parked cars. The proposed initiative would provide several benefits to the District and its residents. Beyond providing clean, quiet energy and shade for vehicles, it would create a highly visible display of DC's commitment to creating a greener economy.

Findings

To assess the labor demands generated by this initiative, four possible scenarios were created. Table 1-35 illustrates the investment amount needed to fund the Solar Trees Initiative and the subsequent labor demand needed to accomplish the construction and installation tasks with a time constraint. As in previous analysis the scenarios will cover a high (aggressive), medium (conservative) and low (pessimistic) set of assumptions. The main assumption driver, illustrated in Table 1-36 (next page), is the Solar Trees' electrical output, which has been translated into an estimated number of households whose electrical demand would be supplied by the Solar Trees.

Table 1-35
Solar Tree Labor Demand

Scenario	Total Investment *(in millions)*	Total Labor Requirements *(in person years)*	Average Jobs per Working Year	Years of Work (*in years*)
Pessimistic	$28	140	140	1
Conservative	$88	440	220	2
Meeting CAEA ("carve out") Requirements	*$257*	*1,286*	*321*	*4*
Aggressive	$420	2,100	525	4

In addition to the standard scenarios, another scenario is provided for illustration purposes in Tables 1-35 and 36: it shows the approximate build-out level required to fulfill (supply) the "carve out" section of the Clean and Affordable Energy Act of 2008. If the total solar production carve out relied completely on the Solar Trees program, the investment amount needed to meet the requirement would be approximately $257 million for four years or $64.3 million per year.

Table 1-36
Solar Tree Outputs

Scenario	Parking Spaces Covered	Annual Energy Production *(MWh)*	Number of Household Electrical Supply
Pessimistic	1,425	3,600	414
Conservative	4,748	12,000	1,379
Meeting Act Requirements	14,363	36,300	4,172
Aggressive	23,742	60,000	6,897

Unlike the labor demand for the *Solar Energy Requirement* (see Clean and Affordable Energy Act of 2008), the solar trees will be fabricated on site. The *Solar Energy Requirement* assumes that pre-fabricated solar modules will be installed. The fabrication of units on the site alters the overall occupation profile demanded for this initiative.

Nearly 70 percent of the employment used in the fabrication and installation of the Solar Trees reside in the construction and extraction disciplines. A substantial portion (83 percent) of the labor required possesses a significant level of training and education (classified at Job Zone 3).

Of the labor that will be needed for this initiative, only the construction laborers position has no or low barriers to entry (Job Zone 1). This occupation requires an able body, ability to do basic math, and knowledge of tools and equipment. Over half of the construction laborers in DC have at least a high school degree and six months of on-site training.

Approximately 83 percent of the work will be completed by more specialized trades involved, including electricians, metal fabricators and cement masons. For jobs in the cement masons and electricians occupational categories, at least 50 percent require post secondary certificates. A sizable portion (about 75 percent) of metal fabricators have a high school diploma or below and possess little or no on-site training and related work experience. In addition, DC would have an insufficient labor supply of metal fabricators and people employed in the assembly and fabrication industry.

1.4.4 Proposed Energy Audit Program Initiative

Introduction

The Proposed Energy Audit Program Initiative is based on the current Berkeley, California Residential Energy Conservation Ordinance (RECO) program instituted in 1985 to increase energy and water efficiency in residences. RECO applies to all homes, residential areas of mixed-use buildings, tenants-in-common, condominiums, multi-family properties, live-work spaces and boarding houses (including the common areas/common systems).

The two ways RECO is enacted is either through a residential renovation with a combined permit value of $50,000 or more or through a sale or transfer of property. All homes or apartment buildings, sold or transferred, must demonstrate compliance with RECO requirements by being inspected and filing "Certificate of RECO Compliance" with the city of Berkeley.

The District's proposed plan would require the seller of a residence to provide an energy audit to prospective buyers. This step would provide the buyer with an estimate of the costs of energy used by the residence and possible upgrades to reduce energy consuption. This step in the home selling process would stimulate sellers to invest in their home to reduce their overall energy consumption thereby making it a more attractive purchase due to future energy cost savings.

An energy audit is an inspection, survey and analysis of energy flows in a building, process or system with the objective of understanding the energy dynamics of the system under study. Typically an energy audit is conducted to seek opportunities to reduce the amount of energy input into the system without negatively affecting the output(s). When the object of study is an occupied building, then reducing energy consumption, while maintaining or improving human comfort, health and safety are of primary concern.

An energy audit of a home may involve documenting various characteristics of the building envelope including the walls, ceilings, floors, doors, windows, and skylights. For each of these components the area and resistance to heat flow (R-value) is measured or estimated. The leakage rate, or infiltration of air through the building envelope is of concern and strongly affected by window construction and quality of door seals (weather stripping). The goal of the audit is to quantify the building's overall thermal performance. The audit may also assess the efficiency, physical condition and programming of mechanical systems such as the heating, ventilation, air conditioning equipment and thermostat.

There are generally three types of energy audits that can be performed:

- *Preliminary audit* – is the simplest and quickest type of audit. It involves minimal interviews with site-operating personnel, a brief review of facility utility bills and other operating data, and a walk-through of the facility to become familiar with the building operation and to identify any glaring areas of energy waste or inefficiency.

- *General audit* – expands on the preliminary audit described above by collecting more detailed information about facility operation and by performing a more detailed evaluation of energy conservation measures. This type of audit will be able to identify all energy-conservation measures appropriate for the facility, given its operating parameters. A detailed financial analysis is performed for each measure based on detailed estimates of implementation costs, site-specific operating cost savings and the customer's investment criteria. Sufficient detail is provided to justify project implementation.

- *Investment-grade audit* – expands on the general audit described above by providing a dynamic model of energy-use characteristics of both the existing facility and all energy conservation measures identified. The building model is calibrated against actual utility data to provide a realistic baseline against which to compute operating savings for proposed measures. Extensive attention is given to understanding not only the operating characteristics of all energy consuming systems, but also situations that cause load profile variations on short and longer term bases (e.g. daily, weekly, monthly, annual).

Findings

Currently there is no occupational listing for an Energy auditor in the Standard Occupational Code systems used in the Demand Analysis. However, existing occupations such as building inspectors do exist in the District and can therefore provide a proxy for how many Energy Auditors are needed. According the 2007 Bureau of Labor Statistics data the District has 300 building

inspectors (2,780 in the MSA), which includes fire, home and other infrastructure inspectors. The average pay for an inspector in the District is $66,680 and requires a medium amount of skills preparation (Job Zone 3).

According to the Bureau of Labor Statistics: Home inspectors conduct inspections of newly built or previously owned homes, condominiums, town homes, manufactured homes, apartments, and at times commercial buildings. Home inspection has become a standard practice in the home-purchasing process. Home inspectors are most often hired by prospective home buyers to inspect and report on the condition of a home's systems, components and structure. Typically, they are hired either immediately prior to a purchase offer on a home or as a contingency to a sales contract. In addition to examining structural quality, home inspectors inspect all home systems and features, including roofing as well as the exterior, attached garage or carport, foundation, interior, plumbing, and electrical, heating and cooling systems. Some home inspections are done for homeowners who want an evaluation of their home's condition, for example, prior to putting the home on the market or as a way to diagnose problems.

A 2007 California Economic Workforce and Development Study lists several types of occupations within the Energy Auditor realm.[33] These are:

- *Energy Auditor***:** conducts energy audits (including investment grade audits) of buildings, as well as building and process systems.
- *Energy Analyst***:** analyzes energy and building data, researches energy saving opportunities, and recommends a prioritized list of energy conservation and renewable energy options.
- *Building Operator/Building Technician***:** manages all building operations.
- *Resource Conservation/Efficiency Manager***:** plans, recommends and supervises implementation of resource efficiency and conservation projects.
- *Measurement and Verification Technician***:** installs, maintains, and troubleshoots HVAC, electrical, and energy management instrumentation.
- *Systems Technician***:** integrates energy efficiency, energy management, and alternative energies into the operation and maintenance of facilities.

Each of the various auditors play a role in either producing an audit report or in solving problems pointed out in the audit. The final three types of auditors are more technical in nature and will most likely have a higher skill level pertaining to the residence's environmental systems and may fall into a special trade contractor category (Electrician, Heating, Air Conditioning, and Refrigeration Mechanics and Installers, so on).

The study presents the main responsibilities of an energy auditor:

- Assess customer's wants and needs.
- Establish/follow interview protocols for assessing customer's needs.
- Analyze energy bills (including utility rates and tariffs) for historical energy usage data.
- Inspect and evaluate building envelopes, mechanical systems, electrical systems, and process systems to determine the energy consumption of each system.
- Determine pattern of building use to show annual needs for heating, cooling, and lighting.
- Select and operate various energy analysis measuring and monitoring devices

[33] Energy Efficiency Occupations September 2007, Center of Excellence, EWD Region 4 Bay Region City College of San Francisco, www.cccewd.net

- data logger
- universal data recorder
- light meter
- sling psychrometer
- psychrometric chart
- flue gas analyze
- amp-probe
- watt meter
- volt meter
- thermometer
- utility meter

- Collect, analyze, and validate energy usage field data.
- Prepare total energy profile for a facility.
- Identify and analyze opportunities for improving the operation, maintenance and energy efficiency of each system.
- Write energy audit reports that provide energy analysis results and recommendations for energy cost savings.
- Interpret operations and maintenance manuals and other technical documents.
- Demonstrate an understanding of building and process systems and the interrelationships of those systems.
- Understand and apply basic engineering principles regarding energy production and use, building construction, maintenance, operation, systems and process systems.

In addition, the report identifies the top three basic skills required as: knowledge of Excel (i.e. spreadsheets), good writing and basic knowledge of electricity. Basic analytical skills are needed to take the data and then make recommendations to building owners.

There are several options for obtaining a license or certification in the field of energy auditing. The first option is a Residential Energy Services Network (RESNET) Accredited Rater. The RESNET certified home energy rater must successfully complete training by a RESNET Accredited Rater Training Provider and must be certified by a RESNET Accredited Rating Provider. The rater must also successfully complete training by a RESNET accredited rater training organization.

Training is then conducted in accordance with a syllabus developed by RESNET. The training addresses:

- ✓ Basic principles of building science (i.e., viewing the home as a system)
- ✓ Thermal resistance of insulation materials
- ✓ The minimum rated features for buildings
- ✓ Blower door testing procedures
- ✓ Duct leakage testing procedures
- ✓ Variations in construction types and their ramifications
- ✓ Types and efficiencies of windows
- ✓ Types and efficiencies of heating, cooling, water heating, and lighting systems
- ✓ Types and characteristics of space conditioning and domestic hot water distribution systems
- ✓ Types of thermostatic controls
- ✓ Determination of azimuth
- ✓ Determination of air leakage
- ✓ Determination of fuels used by major appliances
- ✓ Utility rate structures

- ✓ On-site inspection procedures
- ✓ Producing a scaled and dimensioned drawing of a home
- ✓ Calculating the area of rectangles, triangles, circles, ovals and combinations of these shapes
- ✓ Calculating the volume of boxes, pyramids, spheres, and other geometric shapes
- ✓ Completing a home energy rating checklist or entering data into a home energy rating software program
- ✓ Completing a home energy improvement analysis or entering data into a home energy rating software program that performs improvements analysis
- ✓ Basic knowledge of financial incentive programs and energy efficient mortgages
- ✓ Communicating the benefits of energy saving measures and practices to the consumer
- ✓ Quality assurance

Each candidate rater must perform two ratings including software operations, in the presence of trainers. Certified Raters must also pass examinations that demonstrate a practical, working ability to effectively use the knowledge and skills set contained in Section 5.3 of Chapter Two of the national home energy rating standard to produce accurate and fair Home Energy Ratings. This examination may either follow training or it may be taken as a challenge examination.

Another certification program is offered by the Association of Energy Engineers. However, all of the certifications require an engineering degree as a prerequisite.

1.4.6 DC Department of Transportation (DOT) Transit Infrastructure Projects

Introduction

The District of Columbia Department of Transportation (DDOT), in coordination with other District departments, is implementing numerous environmentally-focused projects that are expected to generate demand for green collar jobs in the occupational categories of design, construction and maintenance. The projects that are either planned or currently in construction include: a Low Impact Development (LID) program, which focuses on installation of stormwater infrastructure improvements, including installation of storm water best management practices (BMPs) throughout the District; numerous streetscape improvements throughout the District; the Anacostia Demonstration Streetcar Project; and the retrofitting of school buses. A single, aggregate labor demand estimate was developed for this set of DDOT driven current and planned initiatives.

Low Impact Development (LID) Program. The majority of DDOT's Low Impact Development "LID" projects are performed utilizing Municipal Separate Storm Sewer System "MS4" funds. These projects focus on environmental stormwater infrastructure improvements, including BMPs, and involve: removing paving and installing storm water BMPs; water quality catch basins monitoring; installing mechanical trash racks to remove suspended solids from storm water; construction of bio-retention ponds; and landscaping streets.

Streetscape Improvements throughout the District. There are a variety of planned streetscape improvements throughout the District intended to promote bicycle and pedestrian circulation, increase transit use and landscape the streets. The Nannie Helen Burroughs Great Streets Project is slated for the design and construction of streetscape enhancements, streetlights, traffic signals and BMPs for water quality. DDOT's main goal is for Nannie Helen Burroughs Great Streets Project to become a model "green street" and have it be replicable throughout the District.

Anacostia Demonstration Streetcar Project. The Anacostia Demonstration Streetcar Project extends from the Anacostia Metro Station to Bolling Airforce Base along Firth Sterling Avenue and South Capital Street. There will be four stations: Anacostia Metro Station, Barry Farm, Naval Annex, and Bolling Air Force Base. The project includes three streetcars, the reconstruction of Firth Sterling Avenue, the installation of streetcar infrastructure, and the construction of a supporting maintenance facility.

In addition, planned improvements to H Street, NE and Benning Road include the introduction of streetcar service. The project includes a full reconstruction of the street and the installation of tracks. Streetcar service is anticipated within the next five to seven years.

Retrofitting School Buses. Twenty-two DCPS buses will be retrofitted with Particulate Matter (PM) filters, or "Catalyzed Continuously Regenerating Technology (CCRT)", to reduce air pollution – primarily PM, VOC's and Carbon Monoxide (CO). It is projected that the CCRT will eliminate 85 to 90 percent of the PM, which is especially important to the children who ride the buses and are in close proximity to the exhaust gases emitted.

Findings

The estimate of future labor demand likely to be generated by the DDOT projects was calculated under three scenarios. Table 1-37 shows the investment amount needed to fund DDOT's environmentally-focused projects. As with the other demand analyses, the scenarios cover a high (aggressive), medium (conservative) and low (pessimistic) set of assumptions. The assumptions vary depending on the amount of investment utilized for transportation projects. The most aggressive scenario assumes all planned and proposed investment will be used, while the conservative and pessimistic scenarios assume only 80 percent and 70 percent utilization respectively.

Table 1-37
Transit Infrastructure Projects

Scenario	Total Investment *(in millions)*	Total Labor Requirements *(in person years)*	Average Jobs per Working Year	Years of Work
Aggressive	$1,950.4	12,833	1,283	10
Conservative	$1,560.5	10,267	1,027	10
Pessimistic	$1,365.5	8,984	898	10

Nearly 48 percent of the total labor demand will be for occupations with little or no barriers to entry. Some of the occupations chronically unemployed or those who are just beginning in the workforce are: Construction laborers, crossing guards and highway maintenance workers.

Table 1-38

	Required Public Employment Demand Per Year Transit Infrastructure Projects									
Scenario	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Aggressive	869	800	1,661	3,133	2,399	2,399	1,512	20	20	20
Conservative	695	640	1,329	2,507	1,919	1,919	1,210	16	16	16
Pessimistic	609	560	1,163	2,194	1,679	1,679	1,059	14	14	14

Candidates for highway, streetscape and other transportation projects should know basic construction waste management practices and how to divert waste from landfills. They should also know how to sort, store and collect non-hazardous recyclables such as paper, corrugated cardboard, glass, plastics and metals on site. This emphasis on utilizing recycled materials is underscored by the District's Greenstreets Regulations General Rules: *1101.2 Recycled materials shall be used to meet the requirements of these regulations whenever possible.*

1.4.7 Waste Water and Water Treatment Infrastructure Improvements

Introduction

DC Water and Sewer Authority (WASA) is investing in several new projects as part of its overall Capital Improvement Plan. Key projects that will have both environmental benefits and improve the environmental performance of the system include the Combined Sewer Overflow Control Plan and new digester facilities for wastewater treatment. These facilities are the single largest plant project ever undertaken by WASA. The new digester will reduce energy usage and help manage biosolids disposal by reducing odor, increasing the facility's ability to decant and dewater solids, and reducing Bacterial Oxygen Demand and Chemical Oxygen Demand levels. The facility's construction budget has increased due to escalating costs of construction materials and the schedule has been extended due to design and procurement-related delays.

Findings

To assess the labor demands generated by this initiative three possible scenarios have been created. Table 1-39 illustrates the investment amount needed to fund the construction of the new digester facilities.

Table 1-39

Scenario	Total Investment *(in millions)*	Total Labor Requirements *(in person years)*	Average Jobs per Working Year	Years of Work
Aggressive	$308.0	1,872	374	5
Conservative	$246.4	1,498	299	5
Pessimistic	$215.6	1,310	262	5

1.4.8 Proposed Green Roof Program Initiative

Introduction

The proposed Green Roof Initiative is part of an ongoing commitment by the District to increase the number of Green Roofs in DC. The assumptions for generating the labor demand were based in part on the study *RE-GREENING WASHINGTON, DC: A Green Roof Vision Based on Quantifying Storm Water and Air Quality Benefits* produced by the Casey Trees Endowment Fund and Limno-Tech Inc. in August of 2005. The study calculated some of the Green Roof benefits:

> "On a per roof basis, the storm water mass balance model predicted that an extensive green roof can reduce roof runoff volumes by approximately 65 percent, while an intensive roof can reduce runoff by 85 percent. Using a combination of 80 percent extensive and 20 percent intensive ratio across all green roof-ready buildings in the District, roof runoff volume would decrease by as much as 69 percent as compared to conventional rooftops"

The study also supplies an in depth analysis of the possible roof coverage that can be obtained on roofs that have the potential to be green. The study provides several scenarios or "cases", which are provided in Table 1-40. The estimations of commensurate environmental benefits are shown in the adjacent columns.

Table 1-40

Scenario	Percent Green Roof Coverage	Total Green Roof Area *(1,000 SF)*	Total Available Roof Storage *(Million gal)*	Annual Storage Provided by Green Roofs *(Million gal)*	Reduction in Annual Citywide Runoff
Case 1	0%	0	2	0	0.0%
Case 2	*20%*	*14,994*	*23*	*297*	*1.2%*
Case 3	*40%*	*29,988*	*45*	*594*	*2.3%*
Case 4	*60%*	*44,982*	*68*	*891*	*3.5%*
Case 5	80%	59,976	90	1188	4.6%
Case 6	100%	74,970	113	1,485	5.8%

Findings

The labor demand analysis used Cases 2 – 4, pessimistic to aggressive scenarios respectively, in the fore mentioned study as the basis for the estimated investment. Another key assumption is the type of green roof being constructed. For the labor demand analysis, the most minimal type of roof, extensive green roofing, is assumed to be created. Extensive green roofs are generally lightweight and maximize the environmental benefits that a green roof can bring to a building. Extensive green roofs feature a layer of growing medium that is six inches deep or less and planted with sedums or native plant species. Extensive green roofs are generally not accessible to the public. This is contrary to the intensive green roofs, which are generally designed as an amenity space that can be used by building tenants or by the general public. Intensive green roofs are generally heavier, include a deeper layer of growing medium, support a wider variety of plants, and have greater needs for irrigation and maintenance. The cost of an extensive roof is estimated to be $20 per square and any additional costs for an intensive roofing system will be absorbed by higher materials costs. All of the scenarios expect an even 10 year distribution of green roof creation. Table 1-41 presents the labor requirements and total investment.

Table 1-41

Scenario		Total Investment *(in millions)*	Total Labor Requirements *(in person years)*	Average Number of Jobs per Working Year	Years of Work
Pessimistic	*Case 2*	$299.9	5,895	590	10
Conservative	*Case 3*	$599.8	11,791	1,179	10
Aggressive	*Case 4*	$899.6	17,686	1,769	10

Although green roofing has been around for decades, businesses that create green roofs are considered innovative relative to the standard roofing industry. For this reason, the standard roofing industry occupational profile does not fit with the labor required to produce a green roof and a unique labor profile needs to be created.

The labor profile of a green roofing business was provided by a leading and nationally recognized developer of green roof technology and installation systems of green roofing.[34] The profile shows that 75 percent of the labor accounts for the actual construction of the green roofing while the remaining 25 percent of the labor accounts for the design of the green roofing.

The design and management positions require a significant amount of education and work experience. On average, these positions , require at least an associate's degree. The positions that are most likely to be utilized (60 percent of the required labor) are roofers and landscapers, which often require substantially less education and work experience than designers.

Additional training requirements for roofers who would like to construct green roofs include understanding drainage systems and heat island effects. Landscaping personnel would need to know efficient irrigation systems, surface water management and sustainable planting strategies. Prospective green roofers can be certified by *The Green Roofs for Healthy Cities' Accredited Green Roof Professional Designation Program.*

[34] Note: To respect wishes of information source, name of company is only cited in model database. Company provided "typical" project and labor requirement information (August 2008) for the purposes of this study but asked not to be listed in body of the report (to protect against unfair advantage by competitors).

2.0 BEST PRACTICES DOCUMENTATION & RECOMMENDATIONS

2.1 Introduction

The Best Practices Documentation and Recommendations for the DC Green Jobs project were chosen to reflect the priorities that the DC Project Team established in the RFP and further detailed in subsequent meetings. These priorities include:

1. Best practices should focus on and reflect government leadership and involvement in Green Jobs program development and implementation.

2. Best practices should illustrate jobs efforts/programs that can be scaled to meet growing future demands over time and support green business development, expansion and relocation efforts, as well as indicate the potential for near term positive impacts.

3. Best practices should illuminate successful efforts in the creation of entry level jobs for hard to serve populations, such as youth and ex-offenders.

The six areas agreed for Best Practice documentation are:

1. Federal and New York City leadership in the area of green procurement strategies that could be used to influence and direct the efforts of all vendors in the District's supply chain to become more green.

2. National Green Jobs support efforts being undertaken by Green for All, and local efforts such as those by the Ella Baker Center in Oakland, California and the Center for Employment Opportunities in New York City to serve youth and ex-offenders in connection with green jobs workforce development programs.

3. Local and multi-jurisdictional efforts to develop and structure new renewable energy and energy efficiency and work force development and training programs to serve near term job demands that will be directly generated by District and Federal policies, regulation and program requirements that can be funded under the new $125 million annual funding Federal DOL program.

4. State and local efforts to attract new green businesses that can be adopted by the District.

5. Development of recommendations based on best practices for expanding the market presence of District Certified Business Enterprises in the federal and local government green marketplace, particularly with respect to meeting environmental remediation requirements at Walter Reed Army Medical Center and the Potomac Annex, and the follow-on construction of new facilities at these sites for new federal tenants and to meet the public and commercial needs of local residents. We also recommend the implementation of certain approaches to fostering the continued economic development of the green sector in the District economy.

6. Recommendation that the District adopt a green business certification program modeled after the Bay Area Green Business Program. The Bay Area Green Business Program

certifies businesses and government agencies – taking these entities beyond compliance with state and federal environmental regulations – in green business/operations practices across multiple sectors. This model offers a programmatic approach to bolstering the District's overall drive to create a greener economy and can play a supporting role in reinforcing the effects of green procurement strategies (for services) and green economy development strategies.

Each of the best practices overview sections is presented with an Overview, Findings and Key Recommendations section.

Acknowledgements

The community of activists and program representatives promoting Green Collar Jobs and green business practices was extremely valuable to this component of the analysis. While the movement is in its nascent stage, there are a significant number of lessons learned which can be applied to DC's effort. A great deal of thanks goes out to the following people who, both on the phone and through their documented resources, have assisted in compiling this section of the report. In no particular order:

- Raquel Pinderhughes, Ph.D. City of Berkeley Office of Energy & Sustainable Development and San Francisco State University
- Sarah White, Center On Wisconsin Strategy
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- Jeremy Hays, Green for All
- Marta Nelson, Center for Employment Opportunities
- Ceil Scandone, Bay Area Green Business Program
- Pamela Evans, Bay Area Green Business Program

2.2 Best Practices Methodology

The Berger Team pursued wide ranging research to support the District in the development of best practices for meeting the future demand for green collar jobs in the region. The District should be pleased to know that it is among the earliest participants in the green collar jobs effort. The Berger Team's research has shown that the other leaders in this area are on the "bleeding edge" of innovation in the green jobs area, and therefore the kind of "Best Practices" that the District may have been anticipating are not available. In other words, the other early leaders are just finishing the development of their programs and entering implementation, or have implemented pilot programs and are preparing for further program evolution. No other green jobs efforts have a history and track record that would allow for a full program evaluation or assessment, the results of which could be documented for the District. Therefore, the Berger Team is presenting those green jobs efforts which, in its opinion, represent leading edge efforts that local governments and communities have begun to take to translate the potential green collar job demand into opportunities for local workers, especially those populations that have been hard to serve with typical workforce development programs.

This Best Practices documentation section is organized as a presentation of the six agreed best practice areas: 1) best practices of national green jobs support efforts, and local efforts such as those being undertaken by other cities to serve youth and ex-offenders in connection with green jobs workforce development programs; 2) local and multi-jurisdictional efforts to develop and structure new renewable energy and energy efficiency and work force development and training programs that can be funded under the new $125 million annual funding Federal DOL program are examined and documented; 3) best practices generated from state and local efforts to attract and grow green businesses that are possible for the District are documented; 4) recommendations based on best practices for expanding the market presence of District Certified Business Enterprises in the federal and local government green marketplace, particularly with respect to meeting environmental remediation requirements at Walter Reed Army Medical Center and the Potomac Annex, are developed and documented; 5) green procurement efforts and green supply chain efforts such as those at the U.S. Department of Defense are documented, as well as a more introductory level program for environmentally preferable purchasing (EPP), the Responsible Purchasing Program; and 6) the recommendation that a green business certification program is adopted by the District based on the nationally recognized Bay Area Green Business Program, which certifies businesses and government agencies in environmentally responsible business/operations practices across multiple sectors.

*For the purpose of this study, green collar jobs and green jobs are being used interchangeably***.** The District defines a green collar job as a career-track employment opportunity in emerging environmental industries, as well as conventional businesses and trades, created by a shift to more sustainable practices, materials and performance. The definition includes both lower and higher skilled employment opportunities that minimize the carbon footprint of all inputs necessary and directly result in the:

- restoration of the environment,
- generation of clean energy and improved energy efficiency,
- creation of high performing buildings, and
- conservation of natural resources.

2.3 Best Practices Documentation and Recommendations

A. National green jobs support efforts being undertaken for youth and ex-offenders in connection with green jobs workforce development programs including those of Green for All, the Ella Baker Center in Oakland, California and the Center for Employment Opportunities in New York City.

Overview

The groundbreaking efforts of the Green for All and local efforts such as those being undertaken by the Ella Baker Center in Oakland, California and the Center for Employment Opportunities in New York City and the New York region are all still in their nascent stages, so there is little more than anecdotal evidence to draw from. Their work is outlined below. Analysis was performed in late 2007 by social scientist Dr. Raquel Pinderhughes. She concentrated on efforts in the San Francisco Bay area, including the Ella Baker Center.

Green For All works on three main fronts, which are provided below (from their Mission Statement):

- ***National Advocacy:*** *Green For All will spur action in the federal government and the private sector to ensure that the United States has an abundant supply of well-trained "green-collar" workers and entrepreneurs, focusing on those from disadvantaged backgrounds.*

- ***Technical Assistance:*** *In cities where advocates for the disadvantaged seek "green-collar" job training and other opportunities, Green For All will help align business, labor unions, community organizations and educational institutions to support their efforts.*

- ***Public Education:*** *Green For All will impact news coverage, produce videos, host convening's, create advocacy toolkits, employ new media and anchor a Web 2.0 strategy for shaping debate, organizing discussion and sharing best practices.*

The Ella Baker Center has a local focus. The Ella Baker Center recently initiated the Oakland Green Jobs Corps. Key elements of the Oakland Green Jobs Corps' mission are listed below:

- *The Oakland Green Jobs Corps will provide world-class job training to prepare young adults in Oakland for green-collar careers. The program will have a special focus on providing "green pathways out of poverty" by recruiting and training people with barriers to employment (e.g., lack of job skills, lack of education, language/cultural barriers, or history in juvenile/criminal justice system).*

- *The Oakland Green Jobs Corps will address two critical crises (of the environment and of poverty) with one solution. The global warming climate crisis is showing everyone that we must make our civilization more energy efficient and environmentally sustainable. We must retrofit our buildings, remake our transportation systems, retool our manufacturing processes, and rethink our patterns of consumption. Oakland can engage and employ our young adults to do the work of this colossal project, providing a shining national example of using the rising green wave to "lift all boats."*

The Green Jobs Corps is a collaboration of community-based organizations, unions, the City of Oakland and private companies. It provides local Oakland residents with job training, support, and work experience to assist them in pursuing careers in the new energy economy. Specific aspects of the program include:

- *Recruit participants and provide them with ongoing support;*
- *Teach participants "soft" skills: general life skills necessary to be successful in any work environment;*
- *Teach participants "hard" skills: specific required to work on new energy projects as a member of the Oakland Green Corps;*
- *Provide participants with employment experience for a limited time on City-funded renewable energy and efficiency projects;*
- *Support participants in transitioning from the Oakland Green Jobs Corps into independent employment.*

Key Findings from Green for All and the Ella Baker Center

The Oakland Green Jobs Corps is a central piece of Oakland policy work. The Oakland City Council recently voted to fund the Corps in the amount of $250,000, which provides a vital pool of seed funding for attracting matching funds over the long-term. A portion of these funds will create special paid internships for Green Jobs Corps graduates in renewable energy (like solar panel installation) and energy efficiency (making buildings more efficient). In short, there is real money on the table to create new jobs.

The Oakland Green Jobs Corps will create partnerships between job training programs and green employers. It will also provide key links to educational institutions, labor unions and community based organizations. Notably, Washington DC, through the District's Department of the Environment (DDOE), has developed its own "Green Summer Job Corps" program in 2008. The program employed about 350 high school-aged young people over a 10 week period.[35]

Dr. Pinderhughes' research on the Green Collar Jobs Training and Placement Model, utilized by the Oakland Green Jobs Corp Program and managed by the Ella Baker Center and Oakland Apollo Alliance, provides in-depth analysis on methods for connecting young adults with little to no skills to jobs in the growing green collar sector. Key points include:

- The training program targets 18-to-35 year old men and women with barriers to employment. The training program is three to six months in length and includes:
    - Initial assessment; basic literacy skills; life skills; financial management skills; OSHA safety training certification; environmental education; and basic vocation skills
- Internships designed to place clients in green collar jobs for a trial period of two to six months
- Case management & follow up
- Pathways to employment & educational and occupational mobility

Table 2-1 below provides a description of select green business sectors and the services they offer (in the Bay Area). These businesses provide workers with a wide range of green collar work force

[35] Information about the DDOE based program can be found at http://ddoe.dc.gov/ddoe/site/default.asp.

opportunities. They include jobs in agriculture, attic insulation, bike repair, bike delivery, biofuels, energy audits, energy efficiency, energy retrofits food preparation, furniture making, green building and architectural construction, heating, ventilation, and air-conditioning (HVAC), landscaping, recycling, materials reuse, organic agriculture, solar panel installation, tree cutting and pruning, water efficiency, water retrofits, and whole home performance. Table 2-1 also shows that these jobs provide workers with career ladder opportunities: entry level jobs are shown in each service area, as well as more advanced positions.

Table 2-1

Green Collar Jobs Are Community Serving Work Force Opportunities			
Green Business Sector	**Types of Services Providing Green Collar Jobs**	**Types of Entry Level Green Collar Jobs Currently Available**	**More Advanced Green Collar Work**
Energy	Energy Retrofits HVAC (Heating, Ventilation, Air Conditioning)Solar Installation Water Conservation Whole Home Performance	Customer Service, Evaluation, Installation, Construction, Maintenance, Repair	Energy Partner Journeyman Solar Electrician Service Technician Project Manager
Water	Water Conservation Adaptive Grey Water Reuse	Installation, Construction, Maintenance, Repair	Journeyman Project Manager
Green Building	Construction Demolition & Removal	Construction, Carpentry Demolition, Hauling, Driving	General Contractor Project Manager
Woodworking	Custom architecture, cabinetry, furniture, repairs	Assembly, Sanding, Finishing, Carpentry, Installation	Journeyman Head Carpenter
Green Space	Parks & Open Space Landscaping	Planting, Maintenance Tree Cutting/Pruning	Project Manager Head Gardener
Food	Urban Agriculture Farmers' Markets Specialty Foods Production Baking	Growing, Packaging, Delivery Set-up/Tear-down, Selling Brewing, Roasting, Packaging Baking, Mixing, Cleaning	Production Manager Market Manager Floor Manager Head Baker
Transportation	Bicycle Delivery Bicycle Repair Bio-Diesel/Veggie Fuels Public Transportation	Dispatch and Delivery Assembly and Repair Fuel Production, Distribution Driving, Maintenance, Repair	Messenger/Owner Shop Manager Production Manager Head Mechanic
Non-Toxic Printing	Commercial Printing Services	Binding, Post-Press, Delivery	Press Op, Pre-Press
Non-Toxic Cleaning	Residential & Commercial Cleaning	Cleaning, Customer Service	Team Leader
Waste Stream Diversion	Materials Recycling, Materials Re-use	Collection, Sorting, Driving, Loading, Salvaging, Warehouse, Packaging and Composting	Warehouse Manager, Floor/Department Manager

Source: Pinderhughes 2007.

Center for Employment Opportunities in New York City

The Center for Employment Opportunity (CEO)'s experience in the promotion of green collar Jobs is important to the Green Collar Jobs Demand Analysis, since it is targeting the same population: difficult to employ ex-offenders. The CEO vision is to prepare anyone who wants a job, even those with a recent criminal history, with the support and training they need to "stay connected to the

labor force." Their mission is to "provide immediate, effective and comprehensive employment services to men and women returning home from prison and detention facilities to New York City. Our highly structured and tightly supervised programs help participants regain the skills and confidence needed for a successful transition to a stable, productive life."

When working to focus on the hard to employ community in New York City, the Center for Employment Opportunities (CEO) has made a significant contribution. For 20 years they have been training and placing people with criminal records in transition jobs. Their program is directly funded by the NY State Prison Parole program, with additional funding from foundations. If the District of Columbia decides to replicate the program, the connection to corrections is important. CEO combines one week of life skills training with a transitional work model. The transitional work model is more of a crew-based approach, where the trainee is placed on subcontractor basis with an employer as part of a group for on-the-job training, as opposed to a scattered site model where the trainee would be placed on an individual basis. The final step involves long term placement of the client in a private sector job.

Seeing the potential in green collar jobs, CEO has begun to employ new methods to capture emerging opportunities and integrate these with the New York State Department of Parole. This might be a best practice worth emulating. When run up against the Pinderhughes scale of 'what are good jobs' – jobs that provide people with living wages, meaningful work, health benefits, high levels of job satisfaction, additional benefits and opportunities for occupational mobility – grafting green collar jobs onto the CEO model presents a powerful best practice.

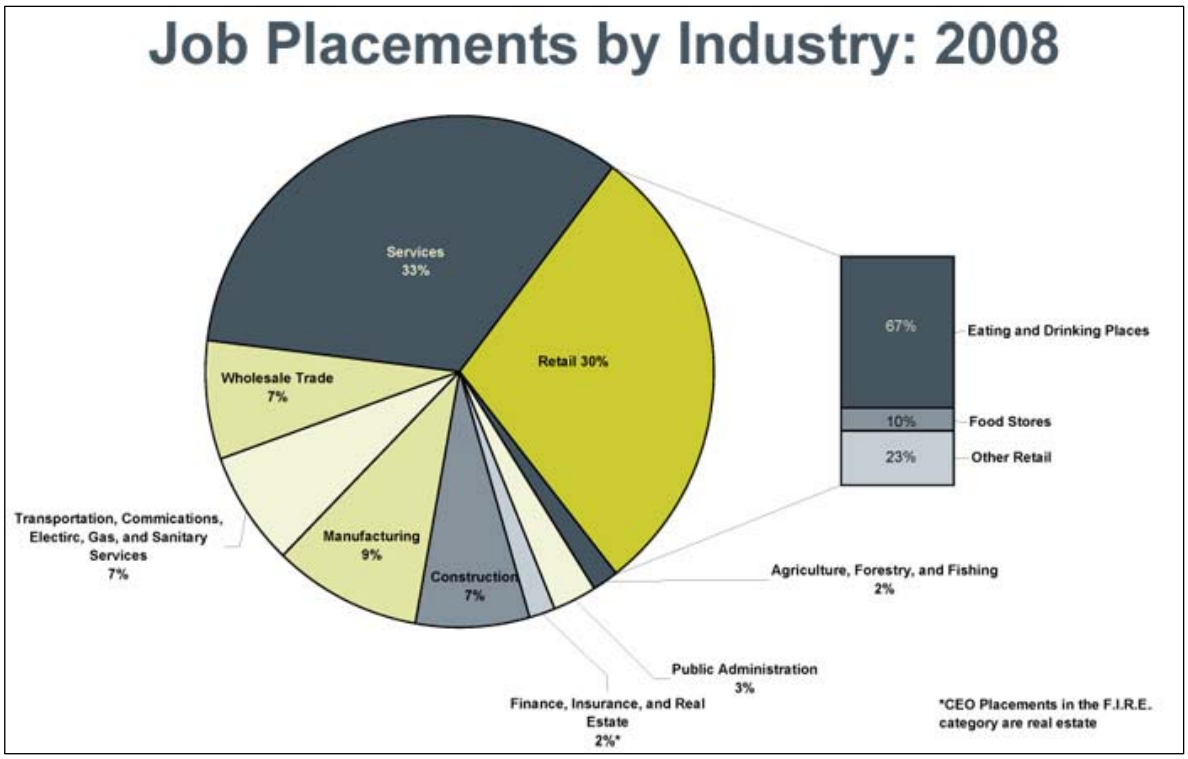
CEO secures employment for people returning from prison in order to provide the structure, the confidence, and the income necessary for them to lead productive lives within their communities. CEO believes that the most successful pathway to stable employment is through work itself, which is why it emphasizes transitional employment immediately following release from prison or jail.

CEO's Methodology. CEO targets recent parolees in order to initiate their program during the crucial early days after release. CEO's model includes:

- Pre-employment job readiness training through intensive classroom-based instruction;
- Meetings with a job coach;
- Paid transitional work at one of CEO's supervised worksites;
- Vocational assessment and job development with a job developer;
- Unsubsidized job placement;
- Job retention support.

CEO's Success. CEO has demonstrated that people who have been incarcerated have the motivation to find and keep stable employment. CEO prepares over 2,000 people each year to move into mainstream employment. Within to three months, over 65 percent of CEO participants who begin a job search are placed in permanent jobs. In the past decade, CEO has made 10,000 placements of formerly incarcerated people into full-time employment. Those that were recently released from prison were 50 percent less likely to be re-incarcerated for any reason. A fuller breakdown of CEO's work is included in the Appendix.

Figure 2-1



Recommendations

The District should consider emulating the New York City and Oakland programs as models for the development of programs for youth and other hard to serve workforce development populations. Specifically, the District should partner with nonprofits that operate successful programs and encourage them to adopt green collar jobs as an area of focus.

B. Local and multi-jurisdictional efforts to develop and structure renewable energy and energy efficiency and work force development and training programs to serve near term job demands that will be directly generated by District and federal policies and regulation, and program requirements that can be funded under the new $125 million annual federal Department of Labor program

Overview

Energy Training funds are expected to fuel emerging demand for green collar jobs. The Green Jobs Act of 2007 (Green Jobs Act) (H.R. 2847) authorizes up to $125 million in funding to establish national and state job training programs and is administered by the U.S. Department of Labor to help address job shortages that are impairing growth in green industries, such as energy efficient buildings and construction, renewable electric power, energy efficient vehicles and biofuels development.

The Green Jobs Act would also help identify and track new jobs and skills needed to expand renewable energy and energy efficiency industries. Among other things, this effort would link research and development in green industry to job standards and training curricula.

New job training programs would create jobs that put workers on a path to financial self-sufficiency. Funding for these programs could be used to pay for occupational training and support services, such as child care, for workers while they are in training. Veterans, displaced workers and at-risk young people would receive priority for these training programs.

The $124 million in H.R. 2847 was not funded for 2008. Therefore the District has time to plan for a program application and could be eligible to access funds beginning in October 2009 (FY 10). California, following the Ella Baker Center example, is taking the lead in funding, using the state's own training funds. On the public policy front, California is concentrating on SB 1672 (Steinberg), the "Renewable Energy, Climate Change, Career Technical Education, and Clean Technology Job Creation Bond Act" (the Act). The Act's proposed solutions to pressing environmental and economic problems in California are visionary. The Act will create a $3 billion fund to provide grants and loans to state, regional, and local partnerships for career technical education and job training, to support green business growth and job creation, to create meaningful employment and green pathways out of poverty, and to promote high school completion. The fund has the capacity to stimulate the state and regional economies, creating clean, green jobs for Californians who live in low-income and polluted communities.

Key Findings from Local Government Efforts to Develop Renewable Energy Workforce Training Programs

Soft skills and comprehensive services are currently available for many segments of the ex-offender and youth populations to support workforce development in many local areas. The Baltimore community has developed the East Baltimore Community Corporation (EBCC), in concert with and funded by the Enterprise Foundation, to provide the soft skills and comprehensive services needed to support green jobs programs and has links to employment training programs in lead abatement and building trades. The EBCC operates the Youth Construction Skills Program and the Ready to Work Grow Program. The Youth Construction Skills Program is a job readiness and pre-apprenticeship program that trains participants in construction skills, counsels them in life planning processes, builds self esteem through close mentoring and participation in peer support

groups and ultimately places them in construction-related jobs or apprenticeships. The Ready to Work Grow Program provides general reading skills and GED/SAT preparation, job training and job placement to children of custodial parents and low-income youth or foster care youth. The District could follow the road map developed by the EBCC in constructing a green jobs oriented employment support program that can be linked with green jobs training and certification.

Contact could be made with the DC Labor Council to determine the best approach for linking with the existing local labor apprenticeship programs and to develop local training programs for green jobs areas if none currently exist. There are numerous programs in other localities that can serve as models, including:

- The Earth Conservation Corps and the Civil Justice Corps established in Austin, Texas for youth offenders
- Youth Build, Green Jobs community efforts in Pittsburg affiliated with the USW
- San Diego Programs with the electrical workers for solar installation local Workplace Investment Board
- Soft skills and comprehensive wraproud services utilized by King County, Seattle, Washington with a focus on wider opportunities for women.
- In New Orleans, Dillard University has developed a program for training in mold abatement that was expanded after Hurricane Katrina.
- The American Federation of State County & Municipal Employees (AFCSME) has developed a program with the Coalition of Black Trade unionists in Chicago and Tennessee to link environmental justice principles and local organizations with a training program for community members in environmental remediation and hazardous waste remediation and disposal.

Recommendations

The District should develop a comprehensive green jobs workforce support and workforce development program that can be operational when the Federal Green Jobs funds become available. This comprehensive effort should include soft skills, pre-apprenticeship training, and wraparound services that will be needed to serve the ex-offender, youth and other hard to serve populations. Soft skills include training for attitude, appearance and basic life skills. Comprehnsive wraproud services include transportation and child care support required to enable the worker to receive workforce training and support long term employment in a green job. Pre-apprenticeship programs, typically carried out in partnership with a local community organization, provide basic skills support in math, English and other areas required to enter union and other apprenticeship programs. Certification programs in the green jobs include *Hazwopper* training through the Laborers union, NABSEP certification the IBEW on solar panel installation and grid connection, and HERS [Home Energy Rating System] training and certification for energy retrofitting of residential structures. Training programs need to be linked with employers so direct employment is the outcome.

C. State and local efforts to attract and grow new green businesses that can be adopted by the District

Overview

State economic development and business relocation/attraction agencies, with the exception of California and Pennsylvania, have not developed programs to focus exclusively on green businesses. General business attraction efforts can be utilized for a green jobs focus. Research by the Berger Team indicates that most states and localities have not instituted separate efforts to attract and grow green businesses but include green businesses in their standard economic development business attraction and growth assistance efforts. Various states such as California and Nevada have instituted requirements for the utilization of renewably generated electricity but have not instituted tax incentives to encourage such utilization.

Key Findings on State/Local Efforts to Attract Green Businesses

Pennsylvania is leading the nation in an effort to modernize energy infrastructure to provide affordable, reliable, cleaner fuel. The Pennsylvania "Energy Deployment for a Growing Economy" initiative, or EDGE, provides regulatory and financial incentives to shut down older, dirtier, inefficient power plants and re-power with advanced coal gasification technology that produces synthetic gas for manufacturing feedstock, synthetic natural gas to heat homes, transportation fuels or electricity. Pennsylvania Energy Development Authority has awarded $15 million in grants and loans for 41 clean energy projects that will leverage another $200 million in private investment.

Pennsylvania has a success story in its attraction of international builders of windmills. Spanish wind-energy company Gamesa Corp. is expanding operations in Pennsylvania by investing another $34 million to open three new modern manufacturing centers on 20-plus acres of U.S. Steel's former Fairless Hills industrial site. The company previously had invested $50 million in Pennsylvania, including funding for another manufacturing facility, its first in North America.

Three new advanced technology plants in Bucks County will create more than 300 new jobs in the production of windmill blades and towers and the assembly of nacelles, which house the wind turbines.

The nation's very first coal gasification-liquefaction plant is being built in Schuylkill County, Pennsylvania. Construction of Waste Management and Processors Inc.'s waste-coal-to-diesel plant will create as many as 1,000 jobs. Operating the plant will produce another 600 permanent, high-paying positions. The plant will clean up tens of millions of tons of waste coal, while giving the state and consumers clean diesel at a fraction of the market price.

The Pennsylvania Governor also launched the East Coast's first commercially viable biofuels storage and blending system in Middletown, Dauphin County. The plant will replace 3.2 million gallons of foreign oil with domestically produced biodiesel and will keep about $6 million worth of energy dollars in the state by reducing its need to purchase imported fuels.

In general, tax incentives do not exist for large energy producers on the state level for the renewable energy production mandates that states such as Nevada and California have implemented. In the appendix, we show a table and give a link that describes all of the state level programs, and the federal programs that do provide tax incentives for large producers on a

nationwide basis. The success of Pennsylvania efforts would indicate that direct economic development incentive assistance on the front end of business development and business attraction efforts has more value than general incentives based on tax credits.

Recommendations

Research by the Berger Team indicates that most states and localities have not instituted separate efforts to attract and grow green businesses, but include green businesses in their standard economic development business attraction and growth assistance efforts**.** Pennsylvania and California are leaders in the effort to focus on creating green jobs and localities have generally not developed green focused business relocation efforts. The research indicates that the District could emulate the state efforts, using its quasi state status to undertake and fund local business growth development, business attraction, and business relocation in the green economy. The District's [and the region's] economy does not have the manufacturing base enjoyed by Pennsylvania and California, and therefore must focus efforts in sectors that have a business base, which can be expanded in the near term.

The District and localities do have a substantial [but declining] printing and printing supply industry. The industrial expertise in the district could be redeployed to focus on utilization of this industrial base to serve green demand, as is being done with the use of "printing technology" for the manufacture of thin film "nano" solar cells in California. The District could set up a fund to prime investments in this technology and link this fund to business development efforts in the areas of infrastructure improvements and assist in the assemblage of required real estate and facilities. The founder of Google and others are investors in a thin film nano solar cell printing operation in California, which is currently operating at capacity and is looking to expand.

Towards this end, one of the Berger Team members has spoken to a contact connected with the Board of Directors from Signet Solar, a German based leading manufacturer of thin film solar cells. They have expressed interest in meeting representatives from the District to explore the concept of establishing a manufacturing facility in DC. Of course a significant amount of preparation must be done prior to any such meeting and subsequent proposal.

D. Development of recommendations based on best practices for expanding the market presence of District Certified Business Enterprises in the federal and local government green marketplace, particularly with respect to meeting environmental remediation requirements at Walter Reed Army Medical Center and the Potomac Annex, and the follow-on construction of new facilities at these sites for new federal tenants and to meet the public and commercial needs of local residents

Overview

The environmental remediation requirements at Walter Reed Army Medical Center (WRAMC) and the Potomac Annex, and the follow-on construction of new facilities at these sites for new federal tenants and to meet the public and commercial needs of local residents will create specific green collar job demands in the District. These environmental remediation requirements are funded by DOD and will be contracted by DOD or the Corps of Engineers. These jobs demands, as detailed below in this section, could total up to 300 jobs. Existing District Certified Business Enterprises (CBEs) potentially have capabilities that match with the requirements to be contracted.

In order to expand the market presence of District CBEs in the federal government green marketplace**,** the District can emulate and utilize for green economic development purposes the best practices implanted by previous Base Realignment and Closure (BRAC) impacted localities that were facing substantial redevelopment of affected sites. The Hunters Point Shipyard project is a redevelopment of the former Navy shipyard in South San Francisco, California, which closed as a result of BRAC 1993 recommendations. This redevelopment effort does provide an excellent example of current best practices with respect to the utilization of redevelopment and economic diversification to extend benefits to the local community and local businesses and regional economic base. Hundreds of jobs were transitioned from work for the Navy to cleaning up after the Navy. The Navy supported the project first with the necessary retraining of the employees and then a contract to perform the work. The Navy also retained professionals to establish a transitional measure to allow the employees to continue their work. Subsequent to the employees leaving the Navy, a contract called an Indefinite Delivery/Indefinite Quantity (IDIQ) was issued to allow private sector contracting back to the Navy.

Key Findings on Expanding District Certified Business Enterprises

Near Term Federal Demand for Environmental Remediation. A review of DOD data concerning the relevant Environmental issues and plans to mitigate environmental impacts and concerns related to District BRAC actions shows that DOD has identified environmental remediation required at WRAMC and plans to accomplish this remediation prior to the scheduled 2011 closure.

The environmental remediation requirements at WRAMC are listed in the table below. The Army has allocated tens of millions of dollars for the required environmental remediation of the Walter Reed property. The Naval Sea Systems Command's (NAVSEA) environmental detachment strategy detailed in Table 2-2 (next page) could be applied to establish resident DC-based environmental remediation companies.

Table 2-2

Walter Reed Medical Center						
Issue Type	**Description of Issue**	**Acreage Affected**	**Cost To Complete ($K)**	**Description of Plans**	**Estimated Start Date**	**Estimated Completed Date**
Building DECON	Decontamination of buildings.	NA	$15,110	Verify site and requirements inFY07. Fund verified and refined closure requirements inFY09 through FY11.	Oct 2008	Sep 2011
Radio-logical DECON	Conduct radiological decommissioning efforts.	NA	$13,524	Verify site and requirements inFY07. Fund verified and refined closure requirements in FY09 FY 11.	Oct 2008	Sep 2011
Landfill Closure	Close operational landfills.	0.0	$1,000	Verify site and requirements in FY07. Fund verified and refined closure requirements in FY11.	Oct 2010	Sep 2011
Tank Closure	Close underground storage tanks.	0.0	$240	Verify site and requirements in FY07. Fund verified and refined closure requirements in FY10.	Oct 2009	Sep 2010
Totals		0	$29,874		Oct 2008	Sep 2011

Hunters Point Shipyard Case Study

The Hunters Point redevelopment project in San Francisco employed local residents and used local businesses through the development and implementation of a wide ranging program of community assistance by the developer and the city of San Francisco. These programs can be repurposed to support the housing redevelopment and economic redevelopment in the affected District neighborhoods and through the creation of subcontracting opportunities for District CBE's from the redevelopment of the BRAC sites. The major elements of the Hunters Point, (South San Francisco) California community assistance program are shown below.

Community Overview

Below is a brief description of the benefits programs. Please use the accompanying links for information about the programs, locate contact information and find out how each program serves the Bayview-Hunters Point community.

- Construction Assistance: to provide technical and financial assistance to Contractors' participating in the construction process of Phase 1
- Homebuyers Assistance: to educate the Bayview-Hunters Point (BVHP) community of homeownership opportunities, first-time buyer financing programs, and to provide counseling services. Click here to see the map of affordable housing parcels.
- Interim African Marketplace: an open-air marketplace for local grocers and artisans to retail their goods

- MBE/WBE Mentorship Protégé Program: to create a professional mentoring partnership between Contractors' and local BVHP businesses
- Cultural Historical Recognition Program: to honor the history and culture of the BVHP neighborhood through art and urban architecture
- Community Builder: to develop 30% of lots designated for private housing in a joint venture with Lennar/BVHP or singularly as an independent developer
- Business Incubator: to designate space for the growth and development of a variety of local businesses in BVHP
- Job Training and Employee Assistance: to work with established community job training organizations to identify job training and social service needs in the neighborhood
- Priority Leasing: to provide leasing space for displaced BVHP businesses to locate and/or expand on the Shipyard
- Small Business Assistance: to assist BVHP local businesses to obtain contracts for and participate in other business opportunities at the Shipyard

Additionally, the city of San Francisco and the developer have teamed to fund and implement a small business assistance program to assist small businesses in the redevelopment area to obtain benefits from the project. A summary of this program is shown below.

Small Business Assistance Program

The purpose of the Small Business Assistance Program is to identify opportunities to assist small businesses in the Bayview-Hunters Point (BVHP) Area to obtain contracts for and participate in other business opportunities at the Shipyard. The term "small business" means businesses located in and with a principal business address in the BVHP Area (94124, 94134, 94107) and which has fewer than 50 employees.

The District should consider utilizing the comprehensive and successful community assistance programs developed at the Hunters Point redevelopment in San Francisco, California to target business and community assistance to increase the local District economic development opportunities that can arise from the future use development of the WRAMC and Potomac Annex sites. The District can utilize many of the Hunters Point best practices listed below to jump-start its Green Jobs program.

- **Construction Assistance:** to provide technical and financial assistance to District contractors that could participate in the construction process of reuse of WRAMC and the Potomac Annex
- **Homebuyers Assistance**: for first-time buyers, provide financing programs and provide counseling services to increase access to residential units that may be forthcoming from the District's redevelopment of Georgia Avenue adjacent to the WRAMC site.
- **Community Marketplace for Local Grocers and Artisans:** to retail their goods in connection with the Georgia Avenue redevelopment adjacent to WRAMC
- **MBE/WBE Mentorship Protégé Program**: create a professional mentoring partnership between construction contractors participating in the WRAMC and Potomac Annex redevelopment and local District businesses
- **Cultural Historical Recognition Program**: honor the history and culture of the Georgia Avenue neighborhood and the Foggy Bottom area through outstanding art and urban architecture's inclusion in the redevelopment efforts

- **Business Incubator**: to designate space for the growth and development of a variety of local businesses in connection with the redevelopment but not necessarily at the redevelopment sites

- **Job Training and Employee Assistance**: expand the current DOES WRAMC efforts to identify job training efforts that can support the other community assistance program described above

- **Priority Leasing:** provide leasing space for local District businesses to locate and/or expand in the Georgia Avenue corridor

- **Small Business Assistance**: assist District local businesses to obtain contracts for and participate in other business opportunities in the redevelopment efforts.

Recommendations

The District can develop a program to assist existing District Certified Business Enterprises (CBEs) in becoming certified under the federal contracting preference program and available under the government wide (GWAC) contracting methods that will be utilized by DOD and the Army Corp of Engineers (the Corps) to select vendors for the remediation and cleanup at WRAMC and Potomac Annex. It is unlikely that existing District CBEs have the capability and track record to become qualified for current and future DOD and General Services Administration (GSA) GWAC's, but almost all large federal contracts will have a requirement for small business or other preferred federal contractors to be utilized for a percentage of sub-contacts. The District should focus its efforts on getting current and new CBE's certified under federal programs, so that they can compete for these sub-contracts.

There are no current federal requirements for green certification, or green requirements per se required of federal contractors in environmental remediation that are not directly related to performance and capability for specific tasks.

In addition, best practices developed under the Base Closing and Realignment effort show that the District will have the opportunity to introduce and advocate for "green development" at the WRAMC and Potomac Annex sites. This green development can be encouraged with respect to the federal government's redevelopment plans for reuse of WRAMC and the Potomac Annex, both with respect to building and architectural guidelines, as well as planning to reduce environmental impacts from transportation of workers to these sites.

Such green development can be directly encouraged by the District with respect to its planning for the commercial and retail development at the southeast corner of the WRAMC site that is envisioned by both the District's comprehensive plan and the Upper Georgia Avenue plan. For example, the District could hold an international *Green Development Plan* competition for the plan for the envisioned commercial and retail development at WRAMC that would also tie to green transportation initiatives for the local community and for the future GSA and State department workers.

A similar Affordable Housing Development Competition was held in Boston in 2006, and met with great success. Similarly, the Design & Development Competition held in San Francisco for the Transbay Transit Center included a Green Design Component. The winning Architect, Richard Rogers, designed a Transit Center *"…crowned with a visually striking, working wind turbine that will create useable energy, the progressive green-design will be a model of environmentally sound, energy efficient sustainability. The Transbay Tower will be as practical as it is beautiful. Combining destination and local retail, office space, hotel rooms, condominiums, and affordable*

housing, the Tower, with its community spaces devoted to education and culture will be a microcosm of the City and Bay Region itself."

The District should engage the Army and future users to plan for former WRAMC and Potomac Annex infrastructure development that can benefit DC. The District can engage the DOD with respect to planned environmental issues and remediation for the redevelopment of the Potomac Annex, as well as historic preservation issues. The Potomac Annex has been identified as an area of special requirements and focus in the District's Most Endangered Places by the DC Preservation League (published May 2007). As part of the Base Realignment and Closure process, environmental characterization of all BRAC sites is required.

The District can utilize the green jobs demand created by the remediation and redevelopment of all eight District BRAC sites to create new private sector green jobs and stimulate economic development in the Georgia Avenue corridor. The Navy has successfully implemented such a strategy in conjunction with the local redevelopment authorities in Vallejo, California and Charleston, South Carolina in connection with the 1995 BRAC closure of the Charleston Naval Shipyard and the Mare Island Naval Shipyard. The District can emulate this program and encourage the Army to institute such a program at WRAMC and other BRAC sites. This program is described in detail in Appendix C.

E. Key Recommendation: District develop and implement a Green Procurement Strategy and use Green Supply Chain analytics as a measurement approach and process tool to get DC vendors to participate in a Green Procurement Strategy

Overview

The District Office of Contracting and Procurement Environmentally Preferable Purchasing program can be instituted in a manner similar to the U.S. Department of Defense (DOD) green procurement strategy, as documented below. We recommend that DC vendors be required to institute green supply chain and green IT efforts in order to supply the District with products and services. Utilizing green requirements for the many vendors to the District of Columbia would jumpstart a green products and services market in the District. A green procurement program will have a multiplier effect by keeping spending within the District, in addition to making local businesses more competitive in the national and international market, since green practices are being demanded by numerous types of vendors and consumers. Fortunately, the green procurement best practices for the world's largest buyer - the DOD, is available for the District to learn from.

DOD has the nation's largest procurement operation. Applying a green procurement strategy would have the highest return on investment in terms of energy and environmental impact reduction. As the federal bureaucracy with the largest footprint, DOD's procurement strategy underwent a significant research and development phase (see Appendix for graphical illustration of process). Discussions with experts in this area suggest that greening of the procurement chain is a potentially high impact, immediate option municipalities and states can undertake with minimal upfront investment.

The District can create a demand for green jobs by regulating and requiring the green purchases of its vendors, even if "green" products are not being purchased from these vendors. Green supply chain management is the best tool to bring about vendor compliance. Green supply chain best practices involve District vendors in the process of wringing cost and environmental impact from the products and services they deliver.

Key Findings on Green Procurement Strategies

The key findings from the DOD Green Procurement Program are below. The limited resources of the District will necessitate a prioritization as to which of the key points the DC Office of Contracts and Procurement will choose to follow. *Key points for the Department of Defense's Green Procurement Program (GPP) include:*

Purpose of GPP:

- Enhance and sustain mission readiness through cost effective acquisition that achieves compliance and reduces resource consumption and solid and hazardous waste generation.
- Purchase of environmentally preferable products and services in accordance with one or more of the established federal green procurement preference programs.
- Applies to all acquisitions from major systems programs to individual unit supply and service requisitions.
- Defines the management framework all DOD organizations will use to ensure compliance with procurement preference requirements as a routine part of day-to-day purchasing activities.
- DOD's procurement of green products and services contributes to sound management of the Department's financial resources, natural resources and energy. In its day-to-day operations, DOD has the opportunity and obligation to be environmentally and energy conscious in its selection and use of products and services.
- Proper attention to green procurement will enhance the Department's credibility and demonstrate DOD's commitment to environmental stewardship by becoming a model consumer of green products and services. Across the government, sound environmental management and procurement are known under a variety of other names such as Affirmative Procurement (AP) and Environmentally Preferable Purchasing (EPP).
- DOD's GPP is focused not only on the procurement function but also on the roles and responsibilities of each member of the Department and recognizes that every person has a role to play. Educate all appropriate DOD employees on the requirements of federal green procurement preference programs, their roles and responsibilities relevant to these programs and the DOD GPP, and the opportunities to purchase green products and services
- Increase purchases of green products and services consistent with the demands of mission, efficiency, and cost-effectiveness, with continual improvement toward Federally established procurement goals
- Reduce the amount of solid waste generated
- Reduce consumption of energy and natural resources
- Expand markets for green products and services

The DOD policy requires that green products or services must be considered as the first choice in all procurements. There are some green procurement rules that mandate the specific procurement

of supplies/services and there are some rules that only emphasize that procuring green products/services is highly preferred/recommended. For example, procurement rules require purchasing green products when planning to purchase products and services in the following categories:

- Non-Ozone depleting substances (http://www.ofee.gov/gp/snap.ht)
- Office products (including electronic equipment and furniture)
- Printing services
- Fleet vehicles and fleet maintenance products
- Building construction, renovation and maintenance (including janitorial and landscape services)
- Traffic control
- Park and recreation
- Appliances
- Lighting

The products and services categories listed above are addressed in one or more of the following components of the federal green procurement preference programs:

- Recovered material (www.epa.gov/cpg)
- Environmentally preferable (www.epa.gov/epp)
- Energy efficiency (www.eere.energy.gov/femp/technologies/eeproducts.cfm)
- Biobased products (http://www.biobased.oce.usda.gov and www.ofee.gov/gp/bioprod.html)
- Alternative fuels and fuel efficiency (http://www.eere.energy.gov/vehiclesandfuels/)
- Non-ozone depleting substances (http://www.ofee.gov/gp/snap.html)

In addition, under Executive Order 13148, agencies are reducing their usage of five priority chemicals: cadmium, lead, polychlorinated biphenyls, mercury and naphthalene. Procurement of products containing alternatives to these chemicals is integral to reducing usage. As alternatives are identified, information will be posted on the Office of the Federal Environmental Executive's web site, www.ofee.gov.

DOD green procurement requirements apply to both supply and service acquisitions. A large number of DOD procurement and contract actions fall into the above categories. In every procurement action, the procurement request originator must justify a decision not to procure a green alternative in accordance with the requirements of Federal green procurement preference programs. As an example, for recovered material content and biobased purchases, the justification must be based upon the inability to acquire the product in a timely manner, at a reasonable price or to satisfy the technical/performance requirements.

The Environmental Protection Agency (EPA) database at http://www.epa.gov/epp/database.htm provides a quick reference guide to the various programs and products involved in DOD's GPP. Once at the EPA site, click on "Search Now" and follow the links to see detailed explanations of products, guidance and sources of supply.

Key Findings on Green Supply Chains

The District are that the District can create a demand for green jobs by regulating and requiring the green purchases of its vendors, even if "green" products are not being purchased from these vendors. Green supply chain management is the best tool to bring about compliance on the part of vendors. The best work in green supply chain management has been done at DOD, and the Logistics Management Institute has done the best work to date in identifying green supply chain concepts and approaches (illustrations provided in Appendix).

Green supply chain best practices involve District vendors in the process of maximizing cost and environmental impact from the products and services that they deliver. A typical supply chain for a product encompasses the full life cycle, including the following: conception of the product, design of the product, extraction of raw material for the product, processing of these raw materials, energy production involved in the product, the manufacture of the product, shipping of the product, marketing and selling at the wholesale and retail level of the product, consumer transport of the product, energy or operation of the product and disposal and recycling of the product.

The District, through incentives and regulation, can create a program that requires its vendors enter into an effort to green its supply chain. If instituted, the District would be a world leader in state and local government green supply chaining.

The District can emulate the federal best articles now in green Information Technology (IT) management. The report, *Going Green: Strategies and Solutions to Serve the Federal Government* (Jun 2008) examines the potential of the federal green IT market, and provides strategies and recommendations for building a successful green IT strategy.

As the federal government develops strategies for reducing its environmental footprint, green IT will emerge as a powerful toolset for reducing costs and enabling environmental stewardship. Agencies are facing a mandate requiring a 30 percent reduction in energy consumption by 2015. Shrinking budgets, rising energy costs, and a constantly increasing demand for technology will drive the green IT market, but contractors must have well-developed business strategies in order to take advantage of the opportunities.

Contractors can create a competitive advantage by incorporating the environmental efficiencies of their solutions into business development strategies, proposals, value propositions and customer discussions. The report includes:

- Analysis of green IT drivers and challenges
- Review of potential green IT solution areas
- Recommendations for shaping business development strategies

Infoworld, the leading IT publication, has published many articles on green IT that recommend simple approaches to greening. Their recommended practices can be found at the following links:

- Companies seeking to inject sustainable practices into their datacenter operations are looking for clear standards to guide the way, according to results at: weblog.infoworld.com/sustainableit/
- An electronic document management system is another example of a sustainable IT investment: weblog.infoworld.com/sustainableit/archives/2007/10/green_tech_vs_s.html
- Apr 24, 2008. Sumo is one example of initiatives at Yahoo to inspire employees to embrace sustainable practices: weblog.infoworld.com/sustainableit/archives/2008/04/green_business.html?source=rss

- Tips for buying green desktop gear. April 17, 2008: weblog.infoworld.com/sustainableit/archives/2008/04/green_pcs_monit.html
- Apple asserts iPhone meets eco standards. October 16, 2007: weblog.infoworld.com/sustainableit/archives/2007/10/report_apple_as.html
- When PCs don't snooze, you lose. June 14, 2007: weblog.infoworld.com/sustainableit/archives/2007/06/when_pcs_dont_s.html
- Give telecommuting the green light. June 07, 2007 (TAGS: Telecommuting): weblog.infoworld.com/sustainableit/archives/2007/06/telecommuting_c.html

Recommendations

The District should consider instituting an Office of Contracting and Procurement Environmentally Preferable Purchasing program similar to DOD green procurement strategy, as documented in the Department of Defense Green Procurement Strategy. The District could require vendors to institute green supply chain and green IT measures in order to qualify for the supply of products or provision of services to the District. Such an initiative could begin with a training program for procurement officers and the establishment of targeted green procurement standards. A pilot program could be instituted in the DC Department of Employment Services.

F. Key Recommendation: The District adopt a green business certification program modeled after the Bay Area Green Business Program. The Bay Area Green Business Program certifies businesses and government agencies – taking these entities beyond compliance with state and federal environmental regulations – in green business operations and practices across multiple sectors. This model offers a programmatic approach to bolstering the District's overall drive to create a greener economy and can play a supporting role in reinforcing the effects of green procurement strategies (for services) and green economic development strategies.

Overview

The Bay Area Green Business Program (the program) is a cooperative program offering technical assistance to businesses and public agencies to not only meet compliance standards for all environmental regulations, but to adopt pollution prevention measures, conserve resources and operate in a more environmentally responsible manner. If they successfully meet program standards, businesses and agencies are awarded a "Green Business Certification" and use the recognition and program logo in their advertising. This is part of the incentive for participation, as it makes it easier for consumers (and other businesses) to identify environmentally responsible businesses.

The program was initiated and developed by the *Hazardous Waste Management Facility Allocation Committee* (the Committee) of the Association of Bay Area Governments. The Committee championed the program as a way to promote pollution prevention and resource conservation. The program provides clear information and technical assistance on:

- Complying with environmental regulations, including those pertaining to: air quality, wastewater discharge, storm water management, chemical storage and handling and hazardous waste management; and

- Going beyond compliance to adopt environmentally-sound practices in four areas: energy efficiency, water conservation, solid and hazardous waste reduction and pollution prevention.

The program is coordinated by the Association of Bay Area Governments. The standards and practices are implemented by the "Green County Coordinators" in each of the Bay Area's nine participating counties. It has certified over 1,000 businesses and agencies since launching in 1996. Initial program outreach targeted auto repair shops and restaurants. The range of business types included has expanded greatly. Standards checklists have been developed for:

- Auto services, printing, hotels, restaurants, landscape design and maintenance, remodeling, garment cleaning (using wet cleaning or CO2 systems exclusively), dentists, wineries, and office and retail operations

Each county has the option of focusing its efforts on particular industries, based on its environmental priorities (e.g., the wine industry is a priority in Napa and Sonoma Counties).

Key Findings from the Bay Area Green Business Program

The program is notable and relevant to the District's green economy and workforce development aspirations on several fronts. First, it offers a consolidated resource and framework for businesses and agencies that need to meet regulatory standards and want to improve their environmental

performance. While the program does not offer direct financial incentives (for example tax abatements, grants, contracting preferences, etc), Bay Area Business Program representatives emphasized that in addition to the marketing benefits conferred on participants, the eco-efficiencies businesses achieved through the adoption of program standards and practices were translating into significant production improvements and cost savings.

One of the program's original goals, which it is achieving, is to promote better relationships between businesses and environmental regulators. Perhaps more importantly, the program represents a viable model for inter-agency partnerships and coordination. It was developed by Bay Area local governments (spearheaded by the Hazardous Waste Management Facility Allocation Committee) in collaboration with the US EPA, Cal EPA Department of Toxic Substances Control, and the local business community.

Program funding is provided by local and regional government agencies, utilities, special districts and nonprofit organizations that promote environmental compliance, pollution prevention and resource conservation. Some additional grant-based funding is funneled into the program from both government agencies and non-profit foundations.

Program representatives noted that they have been pursuing a closer strategic relationship with the economic development entities of the region, as the rise in the level of interest in sustainable business practices, green collar jobs, and environmental issues generally is bringing to light the connection between industry attraction/retention efforts and the Green Business Program.

The Bay Area Green Business Program is also increasing its outreach efforts to connect with the emerging green collar jobs movement and has recently co-sponsored a networking event with the Ella Baker Center of Oakland and the Sustainable Business Alliance (of the East Bay). The guidelines and industry-specific checklists developed by the Bay Area Green Business Program can serve as an educational resource for local workforce training programs (e.g., training workers in energy, water and waste management assessments for small businesses).

Recommendations

A green business certification program similar to the Bay Area's Green Program could bolster the District's ability to develop a greener economy and harness emerging green collar jobs opportunities. The District should consider pursuing a similar program or actively support the creation of a regional program (i.e. with the Metropolitan Washington Council of Governments Region). The potential benefits of a green business program include:

- *Support development and effectiveness of District environmental priorities in its procurement policies*. If the District pursues environmentally preferable purchasing policies (EPPs), a third party certification system for businesses (services) would enable it to adopt more aggressive requirements for environmentally preferable services.
- *Program standards and checklists could be aligned with federal agency, particularly DOD, environmental procurement policies* to enhance service contracting opportunities for District businesses.
- *A programmatic tool to support industry attraction and retention (technical assistance on environmental compliance and performance as an incentive).* Businesses attracted by such a program are also more likely to observe standards consistent with the District's green economy goals.
- *Linkages between green business program knowledge and standards and educational tools for District workforce programs* focused on training green collar jobs skills.

3.0 Focus Groups: Final Integrated Research Findings on Green Businesses

Introduction

This section reviews findings from Task Three of the Green Collar Jobs Demand Analysis. The focus group work was conducted by the Green Builders Council of DC in conjunction with Momentum Analysis and the DC Office of Planning and the Washington, DC Economic Partnership (WDCEP), and elicited useful information about local attitudes toward both "green" and workforce development issues. This report recaps the methodology used, research objectives and findings. Included in this report (in the Methodological Appendix) are a sample of the focus group discussion guide, individual focus group summaries and the topline findings from the follow-up online survey.

Methodological Overview

Four focus groups were conducted at a focus group facility over the course of summer 2008 in the District of Columbia. Each focus group had approximately eight participants and lasted an hour and a half. Discussions were open-ended, and led by Margie Omero of Momentum Analysis. Participants were paid for their participation. Recruiting was performed by the focus group facility, with assistance from the entire Green Collar Jobs Demand Analysis project team.

Thirty one individuals participated in the focus group discussions: four African American women, six African American men, five white women and sixteen white men.

FG1	May 5	Smaller green construction, architecture and landscape firms
FG2	June 2	Larger green construction firms and developers
FG3	June 12	Training providers
FG4	June 25	Green product manufacturers and retailers

A follow-up online survey was sent to the focus group recruitment population. It was conducted during the week of July 14-18, 2008. Twenty-one participants completed the survey out of 31 potential respondents, representing a response rate of 67 percent (a very high rate). The survey included a combination of open- and closed-ended questions and is included in the Appendix.

Neither the focus groups nor the online survey are representative surveys of the business community nor of any other group. Participants were pre-selected by the team for their relevant experience and knowledge and to contribute to the universe's diversity along industry, geographic, racial and gender lines. Further, focus groups, by their nature are not random samples, since participants interact as a group in addition to responding with their own pre-existing views. Most participants lived in the District, and all companies did work in the District, even if some were headquartered in Maryland or Virginia. Because of focus group research ethics and protocol, the names of participants cannot be publicly released.

Objectives

The benefit of a largely qualitative project allowed for exploration of a series of research questions which were poised to focus group participants:

- What encourages area construction/development businesses to "go green"? Market forces? Environmental commitment? The District's Green Building Act?
- How easy or difficult is it to find the workers that one needs to be successful? Is it difficult to find employers to hire underemployed workers?
- What kinds of additional programs might be necessary to encourage employers to hire underemployed workers in the District? What might encourage potential employees to seek green, skilled labor jobs?
- To what extent can the green economy create new jobs, specifically for the underemployed?

Definitions

"Green", "going green," or "green trend": The current national trend to seek more environmentally sustainable products, business practices, and standard operating procedures.

"Green jobs", or "green collar jobs": Jobs created, across industries and skill levels, by a shift to more sustainable practices, materials, and performance.

"Green motivation": Using an interest in going green to encourage participation in a specific industry, or to cultivate soft skills.

"Greenwashing": The practice of a business misleading the public into believing it is more environmentally sustainable than it really is.

"Workforce development": Involving the training, locating, placing, hiring, or retention of employees.

"Underemployed": Workers employed below their physical capacity, due to the economic climate, personal choice, lack of interest, or lack of soft or hard work skills. Also includes the ex-offender and ex-substance abuser populations.

Overview

The research conducted for this Task showed little resistance to the green trend. While participants were selected specifically for their work in industries with an obvious green component, even those most distant from the trend showed no hostility toward environmentalism. Most business owners were even open to taking steps to "green" their business.

In regard to workforce development issues, Focus Group three participants (training providers) had a much different perspective than that found in the other three focus groups. Remedying workforce development issues historically endemic to the District, such as employing the chronically underemployed, means facing obstacles that have little to do with the green trend. But the debate stems from what employers can do.

There was debate about whether or not new jobs would actually be created by the green movement. Some focus group participants did not believe that the green trend required a new green collar job

workforce. Instead, there was a common opinion that the current workforce could easily be retrained to use new products or skills, without many new kind of employment opportunities created. And irrespective of familiarity with the green trend, participants questioned terms such as "green collar," which was seen to pigeonhole the term to the class lines drawn by white or blue collar jobs.

Below four key findings from this research are outlined and analyzed:

1. There is little resistance to the green trend
2. There is variation in comfort with green as a term and as a trend
3. The underemployed need multifaceted training
4. The green trend will create few new jobs, but these jobs will require new skills

Analysis

Finding 1: There is little resistance to the green trend

There was no clear resistance to the green trend in any of the four focus groups. This was determined through observation of participants' opinions in the focus groups and in their responses in the online survey distributed after all four focus groups had been concluded.

In the focus groups, not one participant questioned the validity of climate change, or the necessity of environmental regulations. Even the training providers, who of all participants were the least familiar with the green trend, did not express disbelief or animosity toward being green. The idea of promoting the green trend (or at least a lack of objection to this) cuts across partisan, racial and socio-economic lines. The online survey bolstered these findings with results that showed that more than eight in ten (86 percent) respondents consider themselves to be part of the "green economy."

Participants were also open to the government offering incentives to those who adopt new green practices. For example, the green product manufacturers and retailers group noted that legislation in Maryland caused a boom in solar panel installation. Incentives were seen as not just a way to boost green businesses, but as the way to create real environmental change.

The participants in business worked in fields where green is becoming hugely relevant, chiefly construction, development, architecture and other building trades. But these participants also noted that Washington is unique as it is not a manufacturing town. This seemed to be a cause of the friendlier attitudes displayed in the focus groups toward the green trend, as there is no history in DC of decisively less green industries like car manufacturing or steel mills.

Finding 2: There is variation in comfort with "green" as a term, and as a trend

Despite the lack of resistance to the green trend described above, many of the participants had different perspectives on the trend. Each of the focus groups defined green jobs differently, reflecting their depth of knowledge on the subject, and personal green motivation.

The green product manufacturers and retailers, for example, were early adopters of green practices. Many had been "green" in some way, for decades, or specifically sought a job that promoted sustainability. Indeed, these early adopters preferred the word "sustainable" to "green" because of concerns about greenwashing that has come with the recent surge in green awareness. They felt

they had a high level of knowledge about the green economy, and shared information readily across industries.

The designers, contractors and developers, regardless of company size, varied more in their comfort with the idea of green collar jobs. Instead of installing an overall greener company policy, like our early adopters, the most common green policy initiated by contractors or developers in the focus groups were recycling programs (also the most popular green activity according to our survey).

And instead of being driven to "go green" by personal belief, the construction industry leaders said that the market was largely driving any changes in their practices. To stay competitive, companies needed to start incorporating green practices into their work. Some wondered about the collective industry knowledge. LEED certification is relatively new, and not all subcontractors have the experience they claim to have. Nonetheless, they report the industry is evolving toward green, and quickly.

By contrast, the training providers were largely alienated from the green movement. A "green collar job" to them, meant a chef in a restaurant focused on sustainable food. Unless the training providers directly, and almost exclusively, dealt with green industries, the training providers knew little about green trends in the economy.

Finding 3: The underemployed need multi-faceted training

There was debate about workforce development issues in the focus groups, specifically in focus group three. Nearly every employer who participated in the focus groups that employs low- and under-skilled workers expressed concern about finding the right employees they need to be successful. Employers are looking for workers with soft skills (attendance, responsibility, etc.) as well as hard skills (experience in construction). Many employers in the construction industry found it difficult to find people interested in that career track. As a result, some employers had taken matters into their own hands by starting mentoring programs, apprenticeships and fellowships. In the online survey, more than half volunteered that their business had made efforts on its own to hire from this population. Ultimately, though, most of the employers were somewhat removed from the challenges facing the underemployed populations, and only 14 percent surveyed said hiring from this population is a top priority. Most participants felt that the responsibility for providing a job ready workforce (with the required life and soft skills) was that of the District government.

Training providers, not surprisingly, have a different experience from the employers mentioned above. The training providers are very involved in the daily life of their trainees. Improving credit records and job histories, teaching basic work skills, and helping ex-offenders and ex-substance abusers are all part of their work. Many told of the difficulty of establishing daily routines for their trainees. Some said that if a trainee was committed, prompt and eager, a trainee could be placed in a job immediately. However, these training providers did feel some resentment toward employers who fell short of their goals for hiring District residents. Only a handful of training providers seemed to work as closely with employers as they do with trainees. Only one training provider in the focus group seemed to have a direct linkage with employers who hire and the students that complete their training program. None of the training providers currently focused on green collar job training.

Finding 4: The green trend will create few new jobs, but these jobs will require new skills

The phrase "green collar job" struck many participants as a vague buzzword. In the online survey (conducted after the focus groups), only 38 percent said they were "very familiar" with the term, and 10 percent volunteered that the term "doesn't mean anything." Despite the phrase becoming popular in the media, these business leaders felt that the phrase lacked specificity.

A few components of the phrase aroused confusion. First, the term "collar" sounded like something parallel to "blue collar," or "white collar." Even when probed to think about a broader definition of the phrase, participants noted it sounded like a skilled or unskilled labor position. Second, participants felt the term suggested the creation of new jobs, while they believed that in reality green collar jobs would be nothing more than renamed jobs already in existence. Participants exemplified this view by noting that if a carpenter begins using sustainable lumber, the practice may be green, but there has not been any creation of a new job.

Setting aside the label, participants saw an opportunity for new jobs at the college-educated and post-college level. Green consultants, in charge of overseeing new green practices, were an obvious new type of jobs. Employees would be needed to ensure LEED and other standards were being met, to train new workers and to create an internal green culture at large companies. But despite these opportunities, the potential for a new green workforce seemed somewhat limited.

For less skilled positions, green jobs means retraining, rather than new job creation. It also requires communication with training programs about new techniques and materials, as new products and new procedures demand adaptation. One training provider said he now needed to train his workers for repairs to hybrid cars. A landscape designer in the first focus group (large construction and design firms) talked about training workers for greener gardening practices. Many participants talked about the basics of greener waste disposal.

Conclusion

By measuring the potential market for new green collar jobs, this research revealed the absence of some obstacles and the presence of others. It is worth noting the broad acceptance of the green trend. However, the lack of communication between some training providers and employers means some providers are not keeping current with the employers' needs and demand. It also means that some employers are not as aware of the difficulties trainers face in finding and training qualified workers. Indeed, discussions of workforce development frequently digressed from green issues to focus on a discussion of urban problems such as crime, drugs and the need for family cohesion and involvement. Finally, a green workforce concept should specify new jobs versus retooled jobs and college-educated jobs versus skilled or non-skilled labor positions.

Recommendations

- Include other industries in the dialogue, such as high-tech, creative, political, legal and hospitality
- Use District resources to foster increased dialogue between employers and training providers on a breadth of issues, not just green
- Develop an education program around sustainability for public schools, training providers and others less familiar with the green trend
- Integrate green motivation as part of life-skills training programs
- Create strong incentives for people to purchase solar panels, and smaller green retrofits (like tankless water heaters) since there is little market activity in these areas

- Help publicize the smaller green companies and programs (such as green hauling)
- Create green economic zones where green companies can work collaboratively in a lower-rent, emerging neighborhood
- Avoid the phrase “Green Collar” — alternatives include “Green Job,” “New Green Job” or “Green Retraining”
- Avoid an overpromising of new jobs as a result of the green trend instead focus on different opportunities and retraining the current workforce
- Focus on the positives of the DC area — despite the national economic climate, the District is still a good place to do business, and green is encouraged here