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The Case for *DEEP GREEN* Energy Efficiency

Why Basic Weatherization will Fall Short in Maximizing Carbon Reductions and Green Job Opportunities

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May 2010

Table of Contents

Executive Summary

Today in the United States, buildings account for approximately 40% of total energy use and 73% of total electricity use annually. A *deep green* approach to energy efficiency refers to the design and technical implementation of energy efficiency retrofit programs in a manner that maximizes job creation, greenhouse gas emissions reductions, and energy savings as compared to basic weatherization. This topical brief highlights how and why a *deep green* approach to energy efficiency can unlock these opportunities. The brief outlines recommendations for developing clear program objectives and outcomes for a *deep green* approach to energy efficiency.

Stakeholders and decision-makers who are interested in maximizing greenhouse gas emissions and expanding green job opportunities should opt for ***deep green*** **energy efficiency retrofit programs** that start with a comprehensive building audit.

Stakeholders and decision-makers who are interested in achieving significant reductions in energy consumption and expanding green job opportunities should opt for a ***deep green*** **approach to an energy efficiency retrofit program** over those that only do basic weatherization or advocate for starting with basic rebate measures instead of beginning with a comprehensive building audit. In the residential market, basic weatherization traditionally includes "lowest hanging fruit" elements such as insulation, air sealing, and pipe-wrapping. *Deep green* energy efficiency work takes a "whole-house" approach to retrofits by including a whole building audit at the beginning of a retrofit process, and consists of electrical, plumbing, heating and air-conditioning, water conservation, and other energy and water-related upgrades.

As compared to basic weatherization and/or appliance upgrades, a deep green energy efficiency retrofit unlocks the largest opportunities to reduce the amount of energy used by buildings, reduce greenhouse gas emissions, increase indoor air quality and comfort, and create the largest number of green career opportunities in construction and other industries.

The *deep green* energy efficiency retrofit process needs to start with comprehensive, whole-building audits. Comprehensive audits are based on time-tested building science and best practices in the construction industry and are critical to maintaining public health. These audits result in a full scope of work that takes into account the non-mechanical and mechanical elements of a building, and include public health concerns such as asbestos abatement in order to accomplish safe*, deep green* energy efficiency.

Comprehensive energy audits illuminate the full scope of work needed for a building to achieve maximum energy savings and emission reductions. Financing more expensive retrofit elements becomes easier when included in the full scope of work. Through cost averaging - spreading out the cost of more expensive retrofit elements (lighting, building controls, HVAC)

alongside the "low-hanging fruit" (air sealing, insulation) – building owners are able to finance a larger scope of work with a realistic payback period.

Developing and financing larger scopes of work using the *deep green* energy efficiency approach directly leads to maximizing the number of workers per retrofit project. This fact highlights how the technical implementation of retrofits is the key to unlocking deep emission reductions, deep energy savings, and a deeper amount of economic activity and thus job creation in the industry.

Deep green energy efficiency shaped through comprehensive audits will help local municipalities, states, and the federal government accomplish program objectives and meet the "triple-bottom line" goals of economic growth and stability, responsible environmental stewardship, and social justice and equity. For municipally-run programs, we recommend the following **program objectives** for a *deep green* approach to energy efficiency:

1) Maximize reductions in green house gas emissions;
2) Maximize potential energy savings;
3) Maximize the opportunities to generate high-road apprenticeable jobs, and business development opportunities (within the construction sector & indirect sectors);
4) Strengthen community-labor-management-municipal relationships; and
5) Educate community on energy-saving and green behaviors.

We recommend the following **design components** for effective implementation of a *deep green* energy efficiency program:

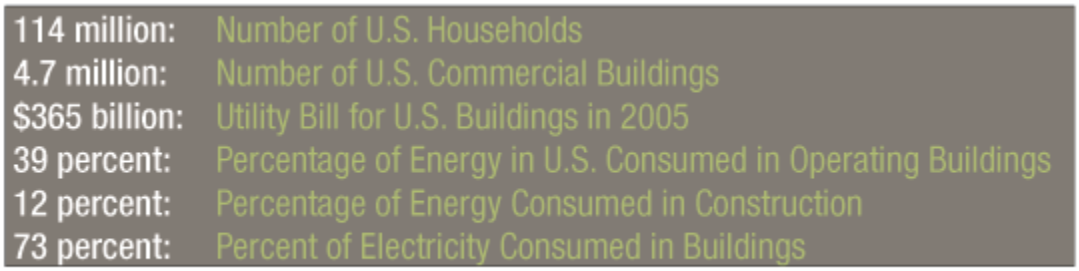
1) Targeted outreach and education based on neighborhood geography and demographics (determined by available financing)
2) Detailed analysis of building stock, building types, tenancy, and utility metering
3) A turn-key approach to program delivery (one-stop for the customer)
4) Local hire job opportunities and enforceable labor standards
5) Work begins with standardized, BPI/RESNET certified, whole building audits
6) Aggregated and bundled contracts by a public-private Coordinating Entity
7) Immediate improved comfort and/or energy savings for participants
8) Sustainable financing options based on consumer type
9) Third party certification of savings, including monitoring and verification of completed work

A *deep green* approach to energy efficiency will accomplish important economic, environmental, and social equity goals crucial for our nation's cities at this time in history. Basic weatherization and creating incentives for DIY (Do It Yourself) replacement will not create the industry we need to propel our nation into a new clean energy future and create the wave of jobs desperately needed. Through careful consideration of best practices in the home performance and construction industry, and along side community groups' desire for jobs and equity, cities can accomplish simultaneous objectives through the design and technical implementation of *deep green* energy efficiency programs.

I. Introduction

Today in the United States, there are 114 million households, 4.7 million commercial buildings, and also numerous publicly-owned buildings. These buildings account for approximately 40% of the energy used in the United States annually, and 73% of the electricity used annually. Utility costs for these buildings totaled $365 billion in 2005 alone, which is the equivalent of almost half of the total economic stimulus package (American Recovery and Reinvestment Act) of 2009. By significantly reducing energy use in buildings through *deep green* energy efficiency retrofits as opposed to basic weatherization, we will maximize the reduction in greenhouse gas emissions, significantly lessen the energy cost for households, businesses, and taxpayers, and create the largest number of family-supporting careers and entrepreneurship opportunities.

Figure 1: Energy Consumption of Buildings in the United States



Source: Department of Energy, Energy Information Administration

II. Public Investments & Regulations

At the federal level of government, there is very strong support for energy efficiency programs through financial investments as well as through enabling policies and personnel commitments. Through grants, tax credits, and loans from the American Recovery and Reinvestment Act (ARRA), popularly known as the "stimulus," many states, municipalities, and local organizations are able to access billions of dollars worth of funds dedicated to increasing energy efficiency in buildings.

The Office of the Vice President Joe Biden through his Middle Class Task Force released a report called "Recovery Through Retrofit" last fall, which outlines the federal government's recognition that energy efficiency retrofits will help to accomplish dual federal goals: 1) Create good jobs, and 2) Reduce domestic levels of greenhouse gas emissions and energy bills. The report recognizes that there are clearly many barriers to implementing successful energy efficiency programs, including lack of information, difficulties accessing financing, and lack of a trained workforce, but also offers some solutions that the federal government plans on implementing.[i] This level of federal support in the next few years will only be able to transform the field of energy efficiency beyond a niche market with single upgrades offered by utility programs into a systematized industry if cities and states adopt a *deep green* approach to program design and technical implementation.

Figure 2: Energy and Transportation-Related Spending in ARRA

THE AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009
Energy- and transportation-related spending

The federal stimulus bill enacted in February 2009 includes an array of provisions to spur clean energy generation and energy efficiency businesses, jobs and investments. A total of $84.8 billion has been set aside for energy- and transportation- related spending. Amounts are in thousands.

AREA OF INVESTMENT	TOTAL INVESTMENT
Energy efficiency and conservation	$16,470,000
Improving the grid	$11,000,000
Energy research	$7,900,000
Clean energy generation	$6,000,000
Jobs training	$500,000
Vehicle spending	$2,600,000
Transportation spending	$18,400,000
Climate science research	$570,000
Tax credits for renewable energy and energy efficiency	$19,668,000
Tax credits for alternative fuel pumps	$54,000
Investment credits in energy generation and energy efficiency technologies	$1,600,000
Total	**$84,762,000**

SOURCE: Pew Center on Global Climate Change, Key Provisions: American Recovery and Reinvestment Act, March 2009 (updated April 16, 2009), http://www.pewclimate.org/docUploads/Pew-Summary-ARRA-Key-Provisions.pdf (accessed April 28, 2009).

In addition to actions at the federal level that will spur additional growth in the energy efficiency markets, there are actions being taken by the State of California that will enable even more growth locally. California is nationally known as the leader in implementing statewide policies that are aimed at reducing energy consumption while increasing economic development and job generation in the clean technology and clean energy sectors. The combination of policies include: energy performance standards, consumer incentives, procurement mandates in the public sector, and public investments in research and development (R&D) of green technologies.[ii]

The Energy Efficiency Standards for Residential and Nonresidential Buildings (Title 24) was developed in 1978 as a result of a legislative mandate to significantly decrease California's energy use. California also leads the country in its Renewable Portfolio Standard (RPS), developed in 2002, which mandates that 20% of the energy generated by investor-owned utilities must be from renewable energy sources by 2010. More recently, in 2006, California passed the Global Warming Solutions Act (AB 32), which mandates that statewide greenhouse gas emissions levels in the state be reduced to 1990 levels by the year 2020. It is estimated that as a result of AB 32, the State would reap a $74 billion increase in GDP and would generate

89,000 new jobs by the year 2020.[iii] Since buildings are responsible for 40% of the greenhouse gas emissions, it makes sense that significant public investments be directed towards increasing the energy efficiency of California's building stock in order to meet these ambitious goals.

In the County of Los Angeles, there is currently a planning process to develop an energy program that will include significant incentives to building owners to fund energy efficiency retrofits. The sources of funding for this project includes the California Assembly Bill 811 (AB 811) energy efficiency bond program, as well as competitive Energy Efficiency and Conservation Block Grant (EECBG) funds that the County has won.

In another example of energy efficiency innovations in California, the City of Los Angeles has adopted a policy that is being implemented in order to make the City's public building stock significantly more energy efficient. The Building Retrofits & Workforce Program commits the City to retrofit 1,000 municipally-owned buildings in the City of Los Angeles and to ensure that the jobs generated from these retrofits will be well-paying jobs that are accessible to a diverse workforce in Los Angeles.[iv]

The policies and programs that have been put in place so far will expand the energy efficiency market significantly in the Los Angeles region and in California as a whole. These policies and programs should be developed and implemented to drive the deepest emission reductions, and highest job creation and cost savings. The resulting energy efficiency market expansion from these policies can bring with it career opportunities, entrepreneurship opportunities, environmental and health effects, as well as additional tax revenue to the residents of Los Angeles and of California.

III. Employment Overview

Currently, the employment landscape in Los Angeles is dismal, with unemployment 4% higher than the national average. In the construction industry, where most jobs for energy efficiency retrofits will be created, the California State Building Trades Council is reporting some construction trades are facing 30-40% unemployment. The economic crisis has left the new construction market at a virtual standstill, and the associated new construction jobs have disappeared. If policies and financing are put in place to expand the energy efficiency markets for existing buildings, then there is potential for this market to create well-paying opportunities for incumbent workers who lack work opportunities as well as new workers who wish to enter into apprenticeships in the construction industry. Only through the consumer demand for a home performance and energy efficiency retrofit industry will more construction jobs be created. Furthermore, if the industry is created using a *deep green* approach, we can expect energy efficiency to also yield significant emission reductions, maximize savings and local job opportunities for communities in need.

In addition, jobs in the energy efficiency sector do not just include construction careers, but there are many other employment opportunities that are associated with energy efficiency

retrofits. Depending on how a program is designed, there is a potential for a wide variety of non-construction jobs to be created. Some examples include an expansion of the manufacturing sector in addition to energy auditors, office administrators, operations engineers, architects, community organizers, and financial analysts.

Various reports have attempted to quantify the number of energy efficiency jobs that are projected in the next 10 years. While these projections are methodologically sound, they are attempting to make estimates in an energy efficiency sector that is still relatively new and under-developed on a mass scale.[vvi] These projections may change greatly according to what governmental regulations, public incentives, private investments, and enabling financing mechanisms are put in place at the local and national levels in the future. What is clear at this point is that stakeholders, including municipalities, contractors, labor unions, community advocates, and workforce practitioners should be pushing for the type of *deep green* energy efficiency retrofits that will drive demand for high-road green careers instead of for low-road short-term jobs.

IV. General Challenges Facing Urban Areas in California

Today, cities in California are facing a multitude of challenges, ranging from skyrocketing utility costs, old and inefficient building stock, high concentrations of vulnerable populations, lack of high-road career opportunities, and limited opportunities for entrepreneurship, especially for women, low-income communities, and communities of color.

Energy efficiency improvements can make the most significant gains in urban communities that comprise the oldest and least efficient building stock. Residents in these inner city communities are a natural constituency for conservation and efficiency because they can least afford to waste-water, energy, and materials. Reducing utility bills, and thus increasing disposable income, often functions as a built-in income generation program for residents and businesses in these communities.

Urban communities with high unemployment and poverty need well-paying jobs and apprenticeship opportunities the most. Work creation coupled with apprenticeship opportunities not only support individuals, but also contributes indirectly to economic development in their communities, and significantly reduces spin-off costs from unemployment and poverty. Thankfully, if cities and utilities focus on maximizing energy savings and emission reductions through comprehensive versus prescriptive program design and technical implementation, it will also maximize the number of job opportunities, and, thus, simultaneously address several of our country's urban challenges through this work.

V. Case Study: The City of Los Angeles

The building stock characteristics in Los Angeles demonstrate that there is potentially a huge market for energy efficiency retrofits in the city. Meanwhile, the demographic characteristics of the city demonstrate that economic, social, and environmental benefits to implementing a successful program will be felt far beyond just the construction industry. According to Geographic Information Systems (GIS) data provided by the GIS Division of the Department of City Planning in the City of Los Angeles, of the approximately 650,000 residential properties in the City of Los Angeles, 590,000 of those were built before 1978 and will probably benefit greatly from energy efficiency retrofits. Approximately 47,000 commercial buildings out of a total 61,000 commercial building were also built before 1978, and approximately 19,000 out of 25,000 industrial building are over 32 years old. There are also approximately 1,000 municipally-owned buildings that are in need of energy efficiency retrofits for an estimated total of 657,000 buildings sitting idle as "energy generators," capable of redistributing significant amounts of power back onto the grid.

In addition, most of the tenants in the older building stock in Los Angeles are renters, who make up approximately 61% of the buildings' dwellers (38% are owner occupied residential residences). This ratio of renters to owners is very typical in urban communities, and any energy efficiency program that seeks to gain deep market penetration must take into consideration how these rental units will be retrofitted.

Figure 3: Building Types, Building Age, and Tenancy in the City of Los Angeles

Type of Building	Number of Buildings	Built Before 1978
Single Residence	515,078	472,459
2 Units Residential	51,469	46,652
3 Units Residential	17,180	15,922
4 Units Residential	16,912	15,786
5+ Residential	50,965	40,586
Commercial	61,389	46,980
Industrial	25,036	19,330
Total	**763,065**	**677,045**

Source: Geographic Information Systems Chief Systems & GIS Division, Department of City Planning - City of Los Angeles

VI. The Benefits of a *Deep Green* Approach to Energy Efficiency

Technical Aspects of a *Deep Green* Approach

The technical implementation of a *deep green* approach to energy efficiency starts with a whole-building, comprehensive, certified audit (BPI/RESNET) and takes into account:

1) Basic weatherization elements such as insulation, sealing of air leaks, and pipe-wrapping;
2) Upgrades to electrical, HVAC, and plumbing;
3) Inclusion of on-site renewable energy generation when possible;
4) Procurement and usage of building materials that are beneficial to the environment and to building occupant health;
5) Water conservation elements (Southern California is currently experiencing water shortages and droughts, and 17% of the state of California's electrical use stems from transporting and treating water);
6) Site improvements on the existing property so that it is structurally sound enough to support energy efficiency retrofits;
7) Retro-commissioning; and
8) Continued building maintenance so that retrofits elements continue to operate and ensure certain levels of energy savings and greenhouse gas reductions.

Figure 4 below shows the components of basic weatherization as compared to the components of *deep green* energy efficiency. For a more detailed list of the technical components of a *deep green* energy efficiency retrofit, please see Appendix A.

Figure 4: Comparing Basic Weatherization & Comprehensive Energy Efficiency

Basic Weatherization Elements
Sealing Air Leaks & Caulking
Insulation
Wrapping Pipes & Water Heaters

Comprehensive Energy Efficiency Elements
Weatherization
Lighting changes & lighting controls
HVAC system upgrades
Smart grid and building monitoring systems
Renewable Energy Generation
Materials beneficial to the environment and occupant
Healthy indoor environmental quality
Site improvements
Water conservation
Operations and maintenance

The *deep green* energy efficiency retrofit process needs to start with comprehensive, whole-building audits. Comprehensive audits are based on time-tested building science and best

practices in the construction industry and are critical to maintaining public health. Construction industry best practices treat buildings as comprehensive systems where the various mechanical and non-mechanical elements are connected to one another. Certain elements are mechanically interconnected such as heating and cooling and ventilation. For example, if a contractor seals a building too tight in order to make it warmer in the winter, a building occupant runs the risk of reducing the amount of air flowing through calibrated ventilations systems that flush indoor toxins and maintain indoor air quality. Others building elements are connected by proximity, such as lead paint and electrical wires. Building codes regulate thousands of items like these to ensure public health and safety and system efficiency during new construction and major remodels. Energy efficiency retrofits need to be seen as connected to these best practices of treating buildings as whole and integrated systems.

The certified building audits developed by the Building Performance Institute and the ResNet/HERS rating system utilize building science that treat the building as whole systems and take into account how even basic non-energy elements can fall out of code over time and cause hazards if related elements are upgraded in a siloed approach. These comprehensive, certified audits result in a full scope of work that takes into account the non-mechanic and mechanical elements, and public health concerns, such as asbestos abatement, in order to accomplish safe, deep green energy efficiency.

Comprehensive energy audits determine the full scope of work needed for a building to achieve maximum energy savings and emission reductions. The scope of work developed through an audit combines the "lowest hanging fruit," often items addressed through basic weatherization, with deeper energy efficiency upgrades such as lighting, heating and cooling, ventilation and air-conditioning, and plumbing that can move home performance from a 15-20% reduction in energy consumption to a 30 to 40% reduction.

Combining low cost elements with higher cost elements, which contributes to further energy savings, also creates a more feasible payback period for consumers. Siloing basic elements will make it prohibitively costly to pay for the more expensive (mostly mechanical) energy efficiency upgrades in the future since they are not be balanced by the savings generated with lower-cost basic weatherization retrofits. Thus, just doing basic weatherization first often creates a financial disincentive for the installation of more comprehensive retrofits in the future. [vii] Furthermore, supplying the building owner with the full scope of work will most likely lead to more money spent on the home or building, provide deeper energy reductions, and create more career and business opportunities than if an owner chooses a prescriptive approach offered through legislation such as Home Star, which includes only basic weatherization.

ENVIRONMENTAL Benefits of a *Deep Green* Approach

A *deep green* energy efficiency retrofit program creates many environmental benefits by greatly reducing energy consumption and greenhouse gas emissions and by investing in building-level and community-level infrastructure upgrades. The inclusion of measurement and evaluation tools after an initial whole-building audit allows for ongoing monitoring and

measurement of actual impacts on the environment, and lays the groundwork for ongoing maintenance and retro-commissioning of the projects.

Deep green energy efficiency also prevents "skimming the cream" whereby the easiest retrofit elements with the highest energy savings are installed on a property without including the more costly energy efficiency retrofit elements that would help to achieve deeper reductions in energy consumption and greenhouse gas emissions.

Politically, the deeper reductions in energy usage and greenhouse gases will help cities meet state, national, and global environmental targets and mandates. It is also imperative that local utilities use energy efficiency to meet required Renewable Portfolio Standards (RPS), which a *deep green* approach helps to meet more effectively and in a shorter time period than basic weatherization or one-off replacement of appliances.

Finally, the inclusion of site improvements, smart grid, water conservation elements, and other infrastructure improvements also leverages *deep green* energy efficiency projects to achieve necessary urban infrastructure upgrades that create more environmentally sustainable communities.

ECONOMIC Benefits of a *Deep Green* Approach

By starting with a comprehensive, whole-building audit, a *deep green* approach to energy efficiency will in most cases increase the scope of work selected by the building owner, as compared to basic weatherization. Larger scopes of work are possible when paired with robust financing mechanisms as part of the *deep green* strategy and have significant direct and indirect economic impacts. Beginning with whole building audits to build a *deep green* scope of work also generates additional "high-road" work opportunities for a variety of contractors, incumbent workers, and apprentices. Figure 5 shows the federal Davis-Bacon prevailing wage determination for Weatherization in California. The wage rate for a "Weatherization Worker" in residential construction in Alameda County is $15.25 plus $.50 in additional benefits, while the rate for an Electrician is $29.87 plus $11.95 in additional benefits, and the rate for a Plumber is $45.96 plus $24.90 in additional benefits.

A *deep green* approach using a place-based aggregated group of buildings will help achieve economies of scale that help to make the approach more financially feasible. Even with the coordination of multiple and comprehensive energy efficiency upgrades, an energy efficiency effort conducted at the individual building scale represents a piecemeal approach that misses greater opportunities. Instead of treating buildings as individual units that do not relate to other physical structures and community systems, community-level planning, such as planning for retrofits of related buildings and infrastructure in a community, can improve the retrofit process on several fronts. First, coordinating a variety of homes, businesses, and municipal buildings and infrastructures across a neighborhood will lead to more efficient delivery of services and will achieve economies of scale. For example, aggregating individual home contracts into larger contracts based on blocks of homes or neighborhoods can help scale small

home performance contractor businesses more quickly due to the assurance that there will be adequate demand for their work and it more easily incentivizes high-road contractors with larger scale and more predictable contracting opportunities.

Community level contracts can also increase local purchasing power for materials. As projects are aggregated, the comprehensive audit of each building will help to organize materials and procurement priorities, and identify workforce rollout demands in a cost effective and systematic approach based on what the actual retrofit needs will be of the buildings in a particular neighborhoods. Thus, the information provided through comprehensive audits will lend itself well to increasing economies of scale. In addition, these larger contracts will provide sub-contracting opportunities for new entrepreneurs and contractors who are recruited from the local communities, creating additional economic opportunities in the neighborhoods. Finally, this organizing effort led by trusted community organizing and advocacy groups will help to educate and raise the awareness of building owners and dwellers regarding the benefits of retrofits and the incentives available to them to help pay for these retrofits over time. This will help to address the barriers of distrust and lack of information that are cited as two of the top reasons why energy efficiency retrofits have not been adopted by building owners and renters on a mass scale.

Figure 5: Davis-Bacon Residential Weatherization Prevailing Wage Determination (California)

Weatherization Survey (S2009-CA-001)				Existing Residential Wage Determination (www.wdol.gov)		
Counties	Weatherization Worker	Doors & Windows Replacement Worker	HVAC, Furnace, Heating & Cooling Repair, Installation Replacement Worker	Carpenter (Excludes Door and Window Replacement, and work listed as performed by weatherization worker)	Electrician (Excludes electrical work associated with HVAC installation, overhaul, and work listed as performed by weatherization worker)	Plumber (Excludes work associated with HVAC installation repair or overhaul and work listed as performed by a weatherization worker)
Alameda	$15.35+.50	$24.73+10.34	$20.00+.38	$36.50+21.40	$29.87+11.95+3%	$45.96+24.90
Alpine	$11.18+.69	$11.18+.69	$17.93+1.54	$13.00	$12.67	$10.25
Amador	$16.14+5.71	$16.14+5.71	$17.93+1.54	$18.58+6.455	$17.93+3.38+3%	$19.72+6.71
Butte	$16.21+3.83	$16.21+3.83	$18.88+5.14	$9.63+1.61	$9.00	$14.00+5.14
Calaveras	$16.14+5.71	$16.14+5.71	$17.93+1.54	$29.27+20.96	$26.72+10.65+3%	$27.35+6.85
Colusa	$15.24+4.50	$18.10+7.18	$20.00	$11.30+3.645	$9.89+2.91	
Contra Costa	$15.28	$22.77+3.65	$27.00+.52	$36.50+21.40	$29.87+11.95+3%	$33.66+14.69
Del Norte	$13.00+.25	$13.00+.25	$20.00	$19.08+6.915 $19.23+6.955	$18.80+5.53+3%	$16.47+9.45
El Dorado	$13.97	$13.97	$18.88+5.14	$29.27+20.96	$29.87+11.95+3%	$29.78+9.57

Source: US Department of Labor. Wage and Hour Division.[viii]

Besides the economic benefits for workers engaged in delivering energy efficiency retrofits, increased energy savings as a result of retrofits will free up additional disposable income for building occupants/owners over time. These owners/occupants will then invest or spend these

savings on other goods and services that will drive economic growth. Helping building occupants reduce energy consumption will protect them from facing additional financial distress as energy costs are projected to rise over time. Since the building occupants will be using less energy overall, they will be less vulnerable to spikes in energy prices. This will create more stable personal finances for building occupants, therefore decreasing the risks of future loan defaults and other financial risks due to current and projected high energy costs.

Beyond the single-building level, the financial instruments that will be generated in order to help building owners and occupants pay for the up-front costs of retrofits will also generate dependable investment opportunities for public and private investors that will meet triple-bottom line investment standards. The utilization of auditing tools/mechanisms will also provide a basis for investment and tracking of energy savings and greenhouse gas reductions that may lend itself to cap and trade or other finance mechanisms currently being considered.

SOCIAL Benefits of a *Deep Green* Approach

A *deep green* energy efficiency retrofit program increases the types & scales of long-term work opportunities available to a larger number of workers and entrepreneurs. For example, if only basic weatherization elements are included in a retrofit program, then the types of direct construction jobs created would be limited to those who do insulation, caulking, and pipe-wrapping, which tend to be lower-paid construction jobs. However, if more comprehensive energy efficiency retrofits elements are included, then the range of direct construction jobs can include plumbers, HVAC, electricians, green gardeners, et cetera, which tend to pay higher wages and benefits. In addition, these higher skill demands and larger projects will provide more opportunities for contractors, including minority and women contractors, to participate in the energy efficiency retrofit programs. In addition, each building has unique deficiencies and assets that can only be accurately measured through audits. Beginning any retrofit process with a comprehensive audit will open and expand additional work opportunities in the green construction space that may be missed though a “one-size-fits-all” basic weatherization program.

Deep green energy efficiency retrofits also provide a wide-range of green job opportunities outside of construction, including research, design, manufacturing, marketing and outreach, auditing, program administration, and more. Thus, the direct and indirect positive social impacts of comprehensive energy efficiency retrofits, especially if the jobs created can be accessed by local communities, are much more significant than that of basic weatherization.

Currently, many urban communities also face safety and health hazards and building deficiencies that need to be addressed. Leveraging energy efficiency projects to address other safety and health hazards or deficiencies in buildings, such as lead & asbestos abatement, toxic paints, and poor indoor air ventilation, can help to create healthy, sustainable communities.

Creating stable and well-paying green career opportunities in low-income communities, coupled with entrepreneurship opportunities, energy bill reductions, water conservation, and increased indoor comfort can contribute to healthy, engaged, and economically strong communities.

VII. Overall Vision for a *Deep Green* Energy Retrofit Program

In order to achieve the goals of environmental, social, and economic stewardship and growth through a *deep green* approach to energy efficiency retrofits, as well as to address the barriers preventing the city-scale installation of these retrofits, cities need an over-arching vision for how to integrate these objectives into a program design and technical implementation that will shape the industry. This program is meant to act as an ideal standard for *deep green* energy efficiency retrofit program objectives and outcomes. How these goals are achieved will be dependent on local conditions, relationships, and assets, though the authors will publish more detailed and prescriptive recommendations regarding these objectives and outcomes in the future.

Overarching Program Objectives for a Municipally-run *Deep Green* Energy Efficiency Retrofit Program

1) Maximize reductions in green house gas emissions
2) Maximize potential energy savings
3) Maximize the opportunities to generate high-road apprenticeable jobs, and business development opportunities (within the construction sector & indirect sectors)
4) Strengthen community-labor-management-municipal relationships
5) Educate community on energy-saving and green behaviors

Design Components for a *Deep Green* Energy Efficiency Retrofit Program

1) **Place-based retrofits.** The energy efficiency retrofit program should target whole neighborhoods instead of individual buildings, and view each neighborhood as a distinct market with different consumer demographics. This will help to realize the highest economies of scale and synergies, and to address community-level infrastructure needs.

2) **Effective outreach & education.** The energy efficiency retrofit program should utilize community-based organizations to perform education, outreach, and marketing in neighborhoods in order to increase and aggregate demand, bundle contracts, achieve economies of scale, and encourage behavior changes. This will help to address the barriers of lack of information and risk aversion.

3) **Detailed analysis of building stock, building types, tenancy, and utility metering.** The energy efficiency retrofit program should not treat all buildings the same. The differences regarding building stock, building types, building tenancy, and who pays the utility meter will greatly affect what types of retrofits should be installed, how the retrofits are financed, how the costs of retrofits are repaid, and who should pay for those retrofits. Buildings differ greatly according to type and use, such as single-family residential, multi-family residential, small commercial, large commercial, industrial, and municipal buildings. This level of detailed analysis will be most effective when it stems from comprehensive auditing processes that identify actual needs and allow for cost benefit analysis at the beginning of each project.

   Buildings also differ greatly according to building age and materials used. In addition, the type of tenancy within a building also vary greatly, such as owner-occupied, leased to one tenant, leased to multiple tenants, or municipally-owned. Finally, with respect to utility metering, in some buildings, the owners pay the cost of utilities, in others the tenants pay the cost of utilities their own utilities, and in other buildings, the costs of utilities are spread evenly across a number of different tenants. Thus, understanding who is paying the meter will help energy efficiency retrofit program developers understand who has the financial incentives to reduce their energy consumption.

   A more detailed analysis of building stock, tenancy, and metering and the development of a energy efficiency retrofit program that takes into consideration these differences will help to address the barriers of split financial incentives, lack of information, and siloed approaches.

4) **A turn-key approach.** Currently, building owners/occupants have to go out individually to research incentives, to recruit quality contractors, and to apply for relevant loans. Instead, program administrators should develop a user-friendly interface and approach to customer service that will help partner a building occupant/owner with a program administrator or "energy advocate" that will walk them through the process from the beginning to end. Ideally, building occupants would only have to sign onto a program where the work flows and capital flows are handled by a third party or utility, therefore reducing the barriers of risk aversion, lack of information, disruption costs, and siloed approaches.

5) **Local hire job opportunities and enforceable labor standards.** The energy efficiency retrofit program should create career pipelines for local communities, and also regulate and enforce labor standards to level the playing field for all contractors. In order to achieve the maximum amount of triple-bottom line benefits within a community, it is critical that the employment, business ownership, and other economic opportunities are retained within a community through the use of local hiring policies. It is also important to ensure that the jobs that will be created as a result of the program will be subject to high labor standards, including family-supporting wages, healthy working condition and health benefits, retirements benefits, and training pathways that will

allow workers to gain professional skills, certifications, and career pathways. Generating additional income within a community will also enable more people to be able to afford the costs of retrofits, therefore helping to reduce the high up-front cost barrier.

6) **Comprehensive energy efficiency audits.** The energy efficiency retrofit program should start with a comprehensive audit that includes energy efficiency elements that go beyond weatherization. This *deep green* technical approach uses a BPI standard audit and includes: electrical systems, heating and cooling (solar thermal & combined heat and power), water conservation, renewable energy, solar thermal elements, and healthy home elements. For a more detailed list of comprehensive energy efficiency retrofit measures, please see Appendix A.

7) **Immediate comfort and/or energy savings for participants.** Building owners and tenants, whether for municipally-owned, commercial, and residential properties, should realize an immediate and quantifiable reduction in energy costs as a result of the retrofit work. Helping the rate-payers to benefit financially in the short-term and long-term as a direct result of retrofit work will help to address the barriers of high up-front costs and risk aversion.

8) **Sustainable financing.** The financial risks in an energy efficiency retrofit program should be mitigated through the development of sound financial assumptions, education and financial counseling for building owners/occupants, loan loss reserves, and credit enhancements. Revolving loans can provide financing for additional projects over time, therefore helping to create a sustainable source of financing. The development of funds that will invest in energy efficiency retrofits will also produce opportunities for public investments to be leveraged with private investments in order to generate larger sums for energy efficiency retrofits.

   In addition, energy efficiency retrofit programs should make available a variety of financing mechanisms for building owners/occupants that would address their various financing needs. Some examples of financing mechanisms include: on-bill financing and/or on-bill repayment, property assessed clean energy (PACE) programs, tax rebates, and energy efficiency mortgages. The development of sustainable financing mechanisms that are offered in a variety of ways in order to meet the different needs of building owners/occupants will address the barriers of high up-front costs, lack of public and private capital, and split financial incentives.

9) **Third party certification of savings, including monitoring and verification of completed work.** The energy efficiency retrofit program should utilize a third-party label for each building, such as ENERGY STAR, to certify the energy savings as a result of the work. Having an independent entity monitor and verify actual energy savings as compared to estimated savings will help to ensure that quality work is being performed, to shore up financial assumptions that should be based on the level of actual energy savings

realized, to ensure building owners/occupants that they will realize the expected energy savings or will be offered some form of recourse, and to create a "brand of distinction" for the more energy efficient building. These benefits will make *deep green* energy efficiency retrofits more attractive to potential building occupants and helping bring awareness regarding the benefits of energy efficiency retrofits to people who pass by the building. Third party monitoring and verification will help to address the barriers of lack of information and risk-aversion.

VIII. Conclusion & Looking Forward

This brief argues that *deep green* energy efficiency retrofits should be prioritized over basic weatherization in order to maximize the "triple-bottom line" objectives of economic growth and stability, responsible environmental stewardship, and social justice and equity.

In some form or another, buildings across the country will undergo work that contributes to saving energy. However, the outcomes of an energy efficiency retrofit program will differ greatly depending on the overall goals of the program. In addition, the desired objectives and outcomes of the program should determine decisions about HOW the program gets implemented. As a starting point, maximizing the emission reductions, job opportunities, and energy savings should drive cities to adopt a *deep green* approach to energy efficiency.

The next step is to determine the program models that will result in these desired goals and outcomes, including more detailed analysis and recommendations of: 1) Relevant financial mechanisms, 2) Models for organizing and preparing contractors to engage with the program, 3) Relevant auditing, monitoring, and evaluation criteria, 4) Processes through which workforce pipelines can be created that will create a well-payed, highly-skilled, and locally-hired workforce, 5) Partnerships necessary in order to successfully implement the program, and 6) Strategies on how to bring this program to a city-scale and beyond.

Finally, it is imperative that stakeholders across the country, including public officials and decision-makers, businesses, labor unions, community advocates, workers, students, researchers, workforce development practitioners, environmentalists, economic development professionals and others, seriously consider a *deep green* approach to energy efficiency retrofit programs instead of basic weatherization programs in order to realize the unprecedented opportunities afforded to us in this moment, as we reshape a "high-road" industry for the 21st Century.

Endnotes

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[v] "U.S. Metro Economies: Green Jobs in U.S. Metro Areas" Global Insight. October 2008.

[vi] "The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America." The Pew Charitable Trusts. June 2009. Retrieved on April 27th, 2010 from http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf

[vii] "Profiting from Energy Efficiency!" ICLEI-Global Governments for Sustainability. Accessed April 25th, 2010 from http://www.iclei.org/index.php?id=1675

[viii] California Residential Weatherization Wage Determination. United States Department of Labor. Wage and Hour Division. Retrieved on April 23rd. 2010 from http://www.dol.gov/whd/recovery/dbsurvey/weatherCA.htm

Appendix A – Comprehensive & *Deep Green* Energy Efficiency Retrofit Elements

Comprehensive & Deep Green Energy Efficiency Elements	
Comprehensive Building Audits	
	Energy audit (includes weatherization; lighting systems; HVAC systems; and renewable energy generation)
	Water audit
	Indoor environmental quality
	Interior remodel/replacement needs
Weatherization	
	Weather stripping & caulking doors + windows
	Window tint
	Window shading & glare protection
	Window replacement
	Insulation of walls, roofs, water heaters, pipes
Lighting Systems	
	Replace lighting fixtures
	Install lighting sensors
	Install skylights
Heating & Cooling systems	
	HVAC unit replacement
	HVAC controls upgrade/replacement
	Geothermal pump installation
	Thermal solar
	Variable speed fans installation
	Heat recovery equipment installation
	Radiant heating and cooling installation (under floor, etc.)
	Cool roofs
	Green roofs
Distributed Energy Generation	
	Photovoltaic installation
	Micro-wind turbines
	Biomass
	Geothermal
	Combined heating & cooling CHP; cogeneration
	(List Continued on Next Page)

Comprehensive & Deep Green Energy Efficiency Elements **(Continued)**	
Indoor Water Conservation	
	Re-piping
	Grey water collection and recycling
	Water sensor installation
	Replace water-intensive appliances & fixtures: faucets; toilets; urinals
Outdoor Water Conservation	
	Landscape re-design
	Drip systems installation
	Planting of native species
	Water reclamation system installation
	Cistern and rainwater catchments
Building Operations & Maintenance	
	Building systems monitoring
	Smart grid
	Non-toxic, green cleaning products & practices
Indoor Environmental Quality	
	Thermal control systems
	Lighting controls
	Indoor air quality monitoring system installation
Interiors	
	Flooring replacement using low VOC and sustainable flooring materials
	Use of low VOC paints & sealants
	Energy efficient appliances
Third Party Monitoring & Verification; Certification	
	Verify quality
	Verify savings
	Certify using HERS; Energy Star; or other label