

NMP3CEm Resource

From: Steven Penn [penn@hws.edu]
Sent: Monday, July 20, 2009 11:57 PM
To: NMP3COLEIS Resource
Subject: Comments on the scope of the NMP3 COL Environmental Review
Attachments: CWF GJGH Policy Brief.pdf; ATT00002.htm

To Whom It May Concern:

I am writing to provide comments regarding the scope of the NMP3 COL Environmental Review:

Nine Mile Point 3
Environmental Scoping Comment
Federal Register Notice - May 21, 2009
74 FRN 23895-897

1) Tritium exposure: US Pressurized Water Reactor (PWR) release between 400-800 Curies/year of tritium. At Nine Mile Point this tritium would be released into Lake Ontario or from the cooling tower in the form of tritiated water (TOH). In the winter months this water, because of its higher relative temperature, would evaporate, cool, crystalize and fall back to earth as snow. The colder the outside air, the shorter distance this water would travel before being deposited as snow. Thus it would seem that during the winter the deposition pattern of tritium would mirror the prevailing lake-effect snow patterns. But the colder the winter the more concentrated the tritium levels. Can you please construct a conservative model to estimate the maximum tritium annual deposition and compare this level to the allowed US dose limit for tritium.

2) Emergency Evacuation in Winter: Oswego is known for having heavy snowfalls. In the 2007-2008 winter, Oswego had 12 feet of snow on the ground at one point. The roads were mostly impassible. If a nuclear accident were to occur during these times, how would the residents of Oswego be evacuated? If radioactive gas were to be emitted during this accident, exposure would be closest near the plant, so asking the residents to remain in Oswego is not advisable. Moreover, if an accident were to occur, it seems unlikely that the resident would obey a request to not flee the city. Thus a nuclear accident during a harsh winter storm seems likely to cause grave injury in either scenario. Would it not be prudent to shutdown the reactor during times when weather prevents an evacuation of the city?

3) Backup Diesel generators: When diesel generators become too cold they lose the ability to start reliably. At what outside temperature do the backup emergency generators fall below a 90% threshold for automatic starting? On average, what percentage of the time is the outside temperature in Oswego below this temperature?

4) Prohibitively Expensive: The proposed design of Nine Mile Point 3 mirrors the design of the Areva plant being built in Olkiluoto, Finland. The plant has experienced numerous safety problems and cost overruns. To quote the New York Times from 28 May 2009:

After four years of construction and thousands of defects and deficiencies, the reactor's 3 billion euro price tag, about \$4.2 billion, has climbed at least 50 percent. And while the reactor was originally meant to be completed this summer, Areva, the French company

building it, and the utility that ordered it, are no longer willing to make certain predictions on when it will go online.

These costs will continue to climb. This pattern is indicative of the Nine Mile Point 2 plant construction that eventually topped \$6 billion. These cost overruns are still being paid off by the residents of Central New York, thus adding financial pain to an area already suffering economic woes. Assuming similar cost overruns on the NMP3 plant, what will be long term the economic impact to the central new york region. Please examine all of CNY, not just Oswego, and over the long term, not just during the building phase.

5) Safety: The Finnish government was quoted on the BBC last week as saying that the safety systems for the Olkiluoto plant were insufficient and that they require major redesign. Even the plant owner state that the plant design will not pass safety regulations in the foreseeable future, but they maintain that the systems will pass after being redesigned. Will the company submit the original design or the redesigned safety systems for use in NMP3. Do Finnish nuclear safety codes surpass the standards of the NRC?

6) Power surplus: CNY currently produces 50% more energy than we consume. Why is a new reactor required? Please see the attached document (Also available at <http://centerforworkingfamilies.info/cleanenergygreenjobs/CWF%20GJGH%20Policy%20Brief.pdf>). If the energy is unnecessary, then the expenditure is wasteful and will not help the residents of CNY.

7) It has been reported that Unistar was seeking an 80% loan guarantee for the construction of the plant, using a provision of the Energy Bill of 2005. Given an estimated building cost of \$10-12 billion, that means that the company is depending on \$8-10 billion in federal loans during a time of great economic uncertainty. That seems far too risky for the US taxpayer and the CNY ratepayer.

8) Would the federal loan guarantees allow the underselling of nuclear energy and thus provide an unfair economic advantage with respect to renewable sources of energy.

Sincerely,
Steve Penn

Federal Register Notice: 74FR23895
Comment Number: 13

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POLICY BRIEF: GREEN JOBS/GREEN HOMES

Green Jobs/Green Homes NY is a partnership to develop a state program that will make our homes energy-efficient, pay for itself, save consumers money, create tens of thousands of green jobs and fight global warming. New York State faces rising energy costs and an economy in which New York's growing number of low-wage and unemployed households cannot afford to heat their homes. At the same time, our energy use patterns are damaging local environments and fueling climate change. Consider these figures:

- **Energy costs have soared:** the New York Independent System Operator, which oversees the state power grid, reported that the average price of electricity has jumped almost 22% in one year.¹
- **Wages and household income are declining:** In the first half of 2008, the real median wage has dropped 1.5%, and unemployment has reached 20% in some metro areas of the state. Even before this shock, between 2000 and 2006, New York lost jobs in high-wage sectors.
- **New York homes are energy-guzzlers:** New York ranks fourth in the US for residential energy consumption. It's not just because we don't turn off lights; it's because our homes are not energy-efficient.
- **Our home energy use drives environmental & community problems:** Forty percent of our fossil fuel CO₂ emissions are produced by New York's home energy use, including 19% from using energy in our homes and another 21% from generating just the portion of electricity that powers our homes.² CO₂ traps heat and spurs climate change, which creates immediate problems for local communities (like worsening health outcomes) as well as a long term threat to the planet.

These problems, deeply linked, undermine our economic and environmental sustainability, hitting vulnerable communities the hardest. They can be resolved with strong leadership and creative, comprehensive policy bridging economic and energy issues. The state can forge solutions by developing a program to invest in housing infrastructure improvements – residential retrofits – that improve energy-efficiency on a mass scale, pay for themselves, and transform local economies. The needed retrofits are straightforward but highly effective: they include upgrades like weatherized walls and ceilings, energy-efficient heat and hot water systems, and energy-saving appliances and light bulbs.

The Green Jobs/Green Homes NY campaign is a partnership between leading environmental, labor, workforce development, affordable housing and community development stakeholders to support the creation of a state program to perform one million green residential retrofits (that both increase energy efficiency and lower environmental impact) in five years. Based on rough estimates, reaching this goal will cost an estimated \$2.4 billion and result in energy savings of 30% per home, or \$1.1 billion per year across the state.³

¹ Caruso, David. "Oil spike drives state power prices." *Albany Times-Union* 12 July 2008

² "State CO₂ Emissions from fossil fuel combustion, 1990-2005." *US Dept. of Environmental Protection*. Retrieved at: http://www.epa.gov/climatechange/emissions/downloads/CO2FFC_2005.pdf and "New York Household Electricity Use by End Use." *US Energy Information Administration*. Retrieved at: http://www.eia.doe.gov/emeu/rep/nduse/er01_ny_tab1.html

³ For further detail on costs and returns estimates, see Appendix A.

A well-crafted Green Jobs/Green Homes NY program can save homeowners money, generate tens of thousands of quality green jobs and combat global warming. With innovative financing, it can cover costs using the reliable revenue from energy savings to leverage private investment in a New York State retrofit fund.

New York State has already made great progress upon which to build. Existing state programs have performed retrofits that yield impressive energy savings; local governments are enacting “green up” efforts; and New York’s “15x15” goal, which calls for reduced energy use and increased renewable energy production, has brought together many stakeholders to move forward energy-efficiency policy.⁴

The state can forge solutions by developing a program to invest in housing infrastructure improvements – residential retrofits – that improve energy-efficiency on a mass scale, pay for themselves, and transform local economies.

A new green economy in New York State is emerging. Determining how quickly the state acts to deal with residential energy inefficiency, and who will benefit, is a matter of public policy. The Green Jobs/Green Homes NY program is an unprecedented effort to ensure that combating climate change and rising energy costs begins now, is undertaken on a large scale, and fully capitalizes on the opportunity for significant public benefits – like the creation of tens of thousands of family-sustaining jobs. This brief aims to lay out the need for such a program and what benefits it will deliver; identify barriers to further development, along with solutions; and suggest principles to guide future implementation.

ENVIRONMENTAL & ECONOMIC CONTEXT

Despite the fact that New York’s high population density and well-developed mass transit make it a relatively energy-efficient state, we rank fourth nationally for residential energy consumption.⁵ Buildings are major culprits in New York’s energy consumption and negative environmental

impact. A 2006 report from the US Energy Administration showed that buildings account for 38% of the state’s carbon dioxide emissions. They contribute directly to warming through the “heat island effect” – the increase in local temperatures created by buildings and other objects that hold the sun’s heat. (In New York City, for example, buildings and pavement can raise temperatures by seven degrees or more.)⁶ In addition to these environmental impacts, residential structures alone in New York account for 16% of our total energy use.⁷

New York already pays more for energy than any state but Hawaii and Connecticut. This year, as costs hover at historic levels, the average New Yorker’s household energy bill will top \$3,700. That’s about 7% of median household income

⁴ New York State’s “15x15” Clean Energy Strategy was announced in 2007 by Governor Spitzer and then-Lt. Governor Paterson. (Text of speech: www.ny.gov/governor/keydocs/CleanEnergySpeech-final.pdf)

⁵ “Energy Consumption by Sector, Ranked by State, 2005.” US Energy Information Administration State Energy Data System (SEDS). www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use.html. “Energy Consumption by Source and Total Consumption per Capita, Ranked by State, 2005.” US Energy Information Administration State Energy Data System (SEDS). www.eia.doe.gov/emeu/states/sep_sum/plain_html/rank_use_per_cap.html. “New York State Energy Profile.” US Energy Information Administration State Energy Data System (SEDS).

⁶ “Keeping New York City “Cool” is the Job of NASA’s “Heat Seekers.” NASA. 30 Jan 2006. Retrieved at http://www.nasa.gov/centers/goddard/news/topstory/2005/nyc_heatisland.html

⁷ “NYS Energy Fast Facts, 2006.” NYSERDA. 2007 Retrieved at: www.nyserd.org/Energy_Information/FastFacts06.pdf

⁸ “Energy Price Estimates by Source, 2005.” US Energy Information Administration State Energy Data System (SEDS). Retrieved at: http://www.eia.doe.gov/emeu/states/sep_sum/html/sum_pr_tot.html.

⁹ Last year, the average NYS home heating bill was around \$1500. This year, NYSERDA estimates that NYS households will pay about \$1260 more.

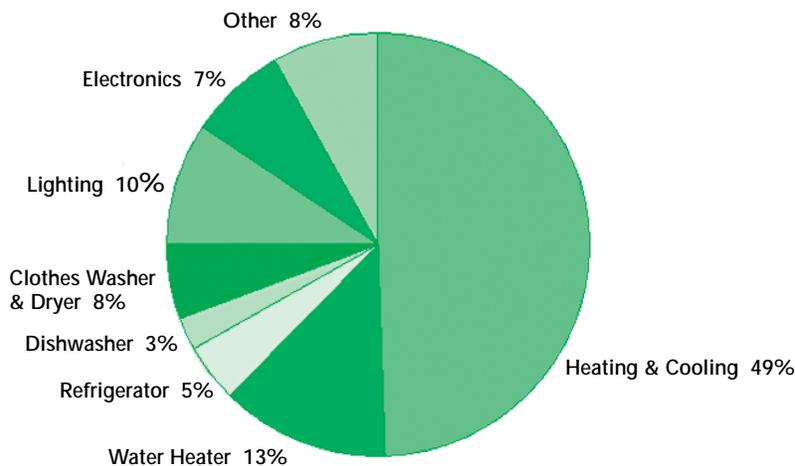
– or, for households at poverty level, a full 21% of income. For lower- and middle-income families, providing for home heating during the freezing winter months is becoming increasingly difficult.

The energy cost burden grows heavier as the economy contracts: already in 2008, New York’s median hourly wage has declined by 1.5%, unemployment has spiked by 20% in some parts of the state, and middle-income families are earning less than they were in 2000.

WASTED ENERGY

Even as energy drains our economic resources, we don’t get the full benefit of the energy we buy. Our housing infrastructure is aging – and wasteful. Much of our energy is simply lost as we heat and cool leaky buildings, run inefficient boilers, or use energy-guzzling lighting and appliances. Quick policy fixes that reduce household cost, like emergency home heating grants, won’t solve these problems: we urgently need to think about long-term, sustainable solutions.

HOME ENERGY CONSUMPTION, BY END USE



The cheapest, greenest power is the power never generated – the power we don’t have to make, transmit or buy because we no longer need it. Residential units and larger facilities must be upgraded to reduce heating and cooling needs, electric consumption, CO2 emissions, heat island effect and storm water run-off. These retrofits (like air-sealing, installing boiler controls, replacing oversized water heaters, etc.) have been proven to save around 30% a year – between \$1100-\$1500 – on a household’s energy costs. State programs through the New York State Energy Research & Development Authority (NYSERDA), although limited by funding and other resource constraints, achieve these levels of success.

source: US Dept. of Energy Residential Energy Consumption Survey Data, 2001

Reducing energy use with energy-efficiency retrofits – not just conserving, but making our housing run on less power – is New York’s most significant opportunity to address our energy problem, while at the same time creating quality jobs and reducing our environmental impact.

¹⁰ Based on New York income data from the 2006 American Community Survey.

¹¹ “New York’s Rising Unemployment – The Other Crisis in Albany” Fiscal Policy Institute. 28 Aug 2008. Retrieved at: http://fiscalpolicy.org/FPI_Release_JobLossesRise_August2008.pdf.

¹² Energy use in New York State: Residential: 16%, Commercial: 13%, Industrial: 5%, Transportation: 27%, Electric Generation: 39% (“NYS Energy Fast Facts, 2006.” NYSERDA. 2007)

THE PROGRAM

The First Step: Energy Audits

A Green Jobs/Green Homes NY program would start by providing home energy audits to homeowners who wanted them, much as NYSERDA does now. The audit would assess the energy efficiency of the building, identifying air leaks, poor insulation and inefficient heating; evaluating cooling and electrical systems; and looking at customer usage data provided by the local utility. Auditors would then use computer modeling to propose cost-effective means of improving efficiency – from simple fixes to systemic overhauls – and provide an assessment of how much energy could be saved through a given combination of retrofits (including those that provide “non-energy” environmental benefits in addition to lowering bills). This service would be available to owners of any type of housing, at any level of income, as long as they were customers of an energy utility.¹³

What Retrofits Would be Available?

Retrofits that are cost-effective, and that are proven to have relatively fast energy savings returns (pay for themselves by reducing estimated energy bills within ten years [or other maximum period]) would be available. Some retrofits that did not provide returns, but yield important environmental benefits at low cost, would also be included. The program would focus on a broad but reasonable menu of proven retrofits to streamline implementation, leverage bulk purchasing power to lower prices, and spur the development of New York State green businesses. Retrofits could include:¹⁴

Retrofits — like air-sealing, installing boiler controls, replacing oversized water heaters, etc. — have been proven to save around 30% a year — between \$1100-\$1500 — on a household’s energy costs.

Improvements to the building envelope

These include air-sealing pipe penetrations, beams, and outlets; weather-stripping around walls and floors, adjusting doors and installing gaskets to stop air flow; and insulation of wall spaces. These measures generally provide savings of 30% of heating energy use in houses, and 20% or more in larger multifamily buildings. Typical payback for insulation and related measures is about 5 years. (Average savings: around 15% of total home energy use.)

Heat/Hot water retrofit

Improving heat/hot water systems through boiler maintenance, installing computerized/sensor-based controls, pipe insulation and/or system replacement. New, smaller systems that minimize energy use can be installed on top of existing systems, reserving older equipment as backup for peak load needs. These improvements can save 10-40% on energy use. Typical payback is just over a year for boiler controls in multifamily buildings, and 5-8 years for system replacement. (Average savings: around 1-5% of total energy use.)

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¹³ Utility customers who are not in good standing with utility companies, or who have histories of non-payment on utility bills, may be excluded. Utilities’ right of refusal is discussed in the On-Bill Recovery section of this document. It may also be possible to include non-utility customers who contract with oil heat providers.

¹⁴ This initial menu of retrofits has been compiled in consultation with energy efficiency and environmental experts within the Green Jobs/Green Homes NY coalition. The average available savings is based the experience of contractors with NYSERDA and the Weatherization Assistance Program. “Savings on total home energy use” figures are derived from the “Home Energy Consumption, by End Use” data presented on p.3.

Appliance replacement

Refrigerators are the most common energy hogs among residential appliances; efficient models use dramatically less energy. Washers, dryers and ovens also offer opportunities for major savings. Replacing appliances can save 10-45% on energy, depending on the efficiency of the old models. Typical payback for appliance replacement has run about 10-12 years, but could be reduced through bulk purchasing. (Average savings: around 1-6% of total home energy use.)

Washing machine and dishwasher replacement can each provide hot water reductions of 30%, which cuts payback time in half. (Average savings: around 4% of total home energy use.)

Lighting systems & bulb replacements

Replacing in-unit incandescent bulbs with Compact Fluorescent Light bulbs (CFLs) saves up to 65% on lighting energy, for near-immediate payback. Similarly, replacing common area lighting systems with fluorescent, bi-level systems can reduce lighting energy use by up to 50%. (Average savings: around 6.5% of total home energy use.)

Solar Thermal

Solar thermal systems consist of collector panels installed on a roof that use solar energy to heat water. Solar thermal systems present high up-front cost, but because they provide major energy impact solar thermal systems should remain under consideration for inclusion in a state retrofit program. Systems can reduce energy use for water by up to 75%. Payback can be fairly long – up to 25 years – but is reduced by state and federal subsidies of up to 55%.¹⁵ (Average savings: around 45% of total home energy use.)

Green Roofing

Green roofs consist of base layers of roof-sealing material, with added layers of material to hold hardy plants, soil, drainage material and unabsorbed rainwater. Green roofs provide substantial benefits to communities, including lowering area temperatures, improving air quality and reducing

**GREEN JOBS/GREEN HOMES NY
RETROFIT BUILDING BLOCKS**

Ensure energy/environmental impact by assessing the total cost-effective energy savings that can be achieved in each house or building through retrofits, and performing retrofits that achieve at least 60% [or other minimum] of those savings.

Define “cost-effective retrofits” as measures whose actual expected savings provides payback of ten years or less [or other maximum.]

Allow retrofits to be performed across fuels, with on-bill recovery on electric/gas bills, oil bills or both.

Allow energy audits to incorporate household energy use data from utility records.

Serve homeowners, owners of multi-family housing, and tenants.

Serve varied housing stock in cities, towns, villages and rural communities.

Eliminate up-front costs to owners and residents.

Use the monthly savings created by the energy efficiency measures to pay back costs associated with the improvements. (Or, if funding is available to subsidize costs for lower-income units, allow more of the savings to remain with owners.)

Recycle materials and objects removed from homes in the course of retrofits, and use the resulting revenue stream to offset program costs.

Create an ongoing, comprehensive marketing and consumer education program.

Create an enhanced quality control mechanism for consumer complaints and resolutions

Support ongoing, independent program measurement and evaluation to monitor overall program effectiveness; the value of energy efficiency improvements to the consumer, state government, economy and environment; the need for continued updating of energy efficiency retrofits and renewable technologies and other information necessary for the sound management of the program.

¹⁵ For solar thermal, a 25% tax credit is available from NYS. An additional 30% tax credit (up to \$2000) is available from the federal government. (“New York Incentives for Renewables and Efficiency: Solar and Fuel Cell Tax Credit.” **DSIRE USA**. 24 Sept 2007. Retrieved at : http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NY03F&state=ny&CurrentPageID=1&RE=1&EE=1)

storm run-off. They also provide some insulation to the building below, although their impact on energy savings is difficult to determine. Green roofs are relatively cheap to install, running about \$18/sf. In New York State, installation costs have been significantly reduced by a tax credit of \$4.50/sf, signed into law in 2008.

Energy payback varies widely. But green roofs eventually pay for themselves even at zero energy savings: since the base material of green roofs is heavily protected and sealed, green roofs have historically performed for about twice the useful life of conventional roofs – about 40 years.

Water-consumption retrofits

Installing faucet aerators and low-flow showerheads and low-flow toilets significantly reduce water bills, but since those savings are not reflected on energy bills, they are not calculated for the purpose of cost recovery. However, hot water reductions can be calculated as energy savings. Faucet aerators save 25-50% of water usage per tap, and low-flow showerheads can save 30% of total hot water usage. (Average savings: around 4% of total home energy use.)

Preserving Consumer Choice

An energy audit would identify multiple packages of potential retrofits to preserve consumer choice: one with a relatively short payback period of 3 years or less, if available¹⁶; another with a 4-6 year payback; and a third containing all cost-effective measures with a 10-year payback or less. Each package of retrofits would have to achieve an expected energy savings of at least 60% [or other minimum] of total cost-effective energy savings available. It would also contain a minimum set of environmentally beneficial measures that increase the payback period by 25% or less [or other maximum], such as faucet aerators, low-flow toilets, or green roofs. For rental units, at least 10% [or other minimum] of expected energy savings would be required to benefit tenants by reducing their estimated energy and/or water bills to receive retrofit subsidies.¹⁷

Costs & Expected Returns

Estimating the total cost and benefit of one million retrofit packages is not an exact science. The costs and benefits of each retrofit measure depend on factors including the prior condition of the housing unit, fuels used, patterns of appliance and space usage. In addition, costs and energy savings would vary based on the particular bundle of retrofits selected by the homeowner, and the prices of fuels. However, a combination of housing survey data, contractor reports and retrofit program experience allows us to estimate program costs and returns.¹⁸

The cost of retrofitting one million buildings in New York would be approximately \$2.4 billion (Appendix 1, Table 2), but the annual revenue from energy savings would pay off these costs in just 3-7 years (Appendix 1, Table 3), even as owners were keeping twenty percent of their savings. For example, a retrofit package for a single-family house in New York could cost approximately \$3,500 per unit, and yield annual energy bill savings of \$750. In that instance, ret-

16 Few homes would see a “3 years or less” payback, since such fast-paying measures are limited to small projects like light bulb replacement, and would not likely meet the program’s standards for significantly reducing energy use.

17 For instance, where an owner pays electric bills but a tenant pays water bills, replacing the tenant’s water-using appliances would qualify as a “tenant-benefiting retrofit.”

18 Much of the cost and opportunity data is derived from the Energy Center of Wisconsin’s house-to-house assessment of Milwaukee housing stock; which, although not an exact match, in many cases approximates New York housing stock in age and mix of housing types. Additional data has been gathered from contractors, the US Dept. of Energy and other sources.

rofit costs would be recovered in 5 years (Appendix 1, Table 3). Similarly, a 15-unit building where retrofits might cost \$29,900 could save \$5,300 annually on energy bills and pay back costs in 6 years; and a 40-unit building could pay back an initial investment of \$20,300 in only 3.5 years with annual cost savings of \$10,100 (Appendix 1, Table 3).

HOW WE CAN DO IT: ONE MILLION GREEN HOMES & 30,000 GREEN JOBS IN FIVE YEARS

The Green Jobs/Green Homes NY program would require coordination and action by a wide range of players to leverage the benefits of the green economy. Program planning and implementation – including developing workforce capacity and building business and homeowner interest in retrofits – could be coordinated by NYSERDA, with support and participation by the NYS Department of Labor, NYS Power Authority, NYS Dormitory Authority, Long Island Power Authority and such other agencies. Sustained engagement and good communication among these governmental bodies and key outside stakeholders¹⁹ will be critical to building a Green Jobs/Green Homes NY program that achieves maximum public benefit.

A retrofit package for a single-family house in New York could cost approximately \$3,000 per unit, and yield annual energy bill savings of \$750. In that instance, retrofit costs would be recovered in 5 years.

Administrative program costs (such as program development, maintenance of technological expertise, measurement of outcomes) could be funded by state sources rather than by residential energy efficiency savings. Sources for this funding might include savings from energy-efficiency retrofits on state-owned buildings, Regional Greenhouse Gas Initiative (RGGI) funds, or internal contributions from NYSERDA, NYPA, NYS DOL, DASNY and other participating agencies.

Where We Are Now

New York State starts from a strong position of experience with residential retrofits. NYSERDA has successfully managed energy-efficiency incentive programs for over a decade. The Department of Housing Conservation & Renewal (DHCR) has long worked in partnership with community groups to perform federal grant-funded Weatherization Assistance Program (WAP) retrofits that lower the energy bills of low-income tenants. But limited funding and labor shortages have kept these programs from reaching most of the New York's housing stock.

NYSERDA programs have accomplished about 14,000 residential retrofits per year. The majority of these are retrofits of 1-4 family homes, although NYSERDA's recent program changes have increased participation by multifamily landlords. The work performed on houses consists mainly of audits, insulation and weather-stripping. In multifamily buildings, work includes weatherization, upgrading lighting, replacing refrigerators with Energy Star units, replacing old or inefficient heating systems, improving ventilation, installing water-saving devices and other projects.

¹⁹ The stakeholder group should include low-income advocacy groups, consumer protection groups, community-based organizations, tenant groups, environmental and environmental justice organizations, labor organizations, representatives of contractors and other businesses doing retrofit work, landlord representatives, utilities, lenders and other potential providers of private sector funds for retrofit work.

NYSERDA requires that work be supervised by contractors with Building Performance Institute (BPI) accreditation, with staff certified in most categories of work performed. BPI reports that it currently has just 250-300 accredited contractors in New York State, and about 1000 certified individuals, some of whom work independently. NYSERDA reimburses 75% of certification costs, as well as training and equipment costs for contractors who demonstrate that they are performing energy efficiency work. But up-front cost for certification, lack of confidence in demand for certified skills in green technology, and lack of program information among contractors are known factors in low certification.

Federal WAP subgrantees in New York State currently accomplish approximately 12,000 retrofits per year.²⁰ The majority of these are retrofits of units in NYC multifamily buildings, although several thousand houses statewide are accomplished each year. The work performed consists mainly of audits, air-sealing, insulation and weather-stripping. Weatherization funds are allocated to the state as a block grant. The program is administered by the NYS Department of Housing Conservation and Renewal, which subgrants to 67 contracting providers. The program routinely spends down its funds, and maintains waiting lists.

Diverse program elements must be coordinated to bring a Green Jobs/Green Homes NY program to scale: identifying creative financing in a deficit environment to fund one million retrofits, building the green labor capacity to retrofit New York's 7.6 million homes, creating standards to ensure subsidized retrofits reach homeowners with the greatest need and are used to create quality jobs; and educating homeowners about the value of retrofits and protecting them from unforeseen side effects.

All of these needed elements suggest that the state is a critical vehicle for bringing a mass-scale retrofit program to scale.

The Case for a State-Led Program in New York

A New York State-led retrofit program can relieve owners of up-front costs – without relying on grants and subsidies that limit the scale of work – by creating a private investment pool to fund retrofits that yield known energy savings (discussed further below). The state can bring down costs by negotiating lower bulk rates for energy audits and materials and by aggregating large numbers of home retrofits into bigger contracts so more and bigger contractors, including union contractors, can bid on them.

A New York State commitment to retrofits would allow retrofits to be paired with an intensive workforce development program, supported by requirements and incentives to ensure that retrofit jobs are quality jobs, linked to training, certification and family-sustaining wage standards. The state can include requirements and incentives for contractors to hire local workers, use small and Women- and/or Minority-Owned Business (W/MBE) subcontractors, and partner with apprentice programs and workforce development/barrier-removal programs so that jobs reach both existing workers and long-term unemployed populations.

A state role would allow the targeting of retrofits to areas around New York that are most affected by emissions, energy-inefficient housing, and unemployment. Financing could be tied to provisions that guarantee that each home is retrofitted to produce maximum energy savings, including retrofits benefiting the public. Measures to insulate ten-

²⁰ "New York State - Energy Efficiency Portfolio Standard Working Group 2 – Program Summaries" NYS Public Service Commission submission. No date. Retrieved 8 Sept 2008 at: http://www.dps.state.ny.us/07M0548/workgroups/inventory/WG2_PS_DHCR_WAP.doc

ants from improvement-related rent increases could also be included, along with linkages to housing preservation programs so that residents of severely distressed units, where energy-efficiency work must be preceded by basic repairs, are not excluded.

Targeting the First Million Retrofits

Residential retrofits should initially be targeted to geographic areas, both to concentrate the environmental and economic effects of retrofits, and to facilitate program administration, contracting and local workforce development.

Retrofits should be targeted to areas that show:

- High emissions (CO₂ and other pollutants) and high levels of air, water and soil pollution.
- Housing that is energy-inefficient through disrepair or lack of capital for upgrades/improvements.
- High energy cost burden, meaning that the cost of energy is high enough in relation to income that it impairs households' ability to obtain energy or other essential needs (requiring an index of energy costs, other costs of living and income.)
- High unemployment resulting from marginalization, where access to training for work in emerging industries has been severely limited.

A New York State-led retrofit program can relieve owners of up-front costs – without relying on grants and subsidies that limit the scale of work – by creating a private investment pool to fund retrofits that yield known energy savings.

In New York State, 47% of housing units are single-family homes (including 5% of renters), another 17% are in 2-4 unit houses, 12% in 5-20 unit buildings, and 13% are in buildings with 20 or more units. Retrofits should be allotted to a representative mix of houses and apartment buildings, as well as renters and owners, and urban and rural communities.

How Would Retrofits be Paid For?

For homeowners who have been interested in “greening up” in the past, barriers have included lack of access to capital (even low-interest loans have not always been sufficient, particularly for homeowners with poor credit); uncertainty about economic benefits; the “mover’s disincentive,” meaning that owners don’t want to invest in energy-efficiency if they may not stay in the home; and, in the case of landlords, the “split incentive” problem, meaning that some energy-efficiency work that lowers energy bills benefits tenants, but not owners. The Green Jobs/Green Homes NY program would remove these barriers by

providing homeowners a range of retrofits at no up-front cost, using a state role to guarantee savings and ensure both public and private benefit in each retrofit package.

The key to removing these obstacles is the creation of a state-backed investment pool (a NYS residential retrofit investment fund) that acts as a repository for private investment capital to cover up-front retrofit costs.

The fund would: (1) allow the state to raise money for retrofits far beyond the constraints of the state budget; and (2) allow the state to define the terms of retrofits – including deep interventions in greenhouse gas emissions, equitable

economic development and work opportunities, performance guarantees, mixed public-private benefit – to leverage the enormous public benefit potential offered by energy retrofits.

Investments in the fund would be repaid through “on-bill recovery”: following the retrofit, utilities would include a monthly charge on retrofitted customers’ bills, less than the expected savings, until costs (including the cost of borrowing) were recovered. On-bill recovery, a financing innovation developed to leverage the economic potential of energy-efficiency, is the mechanism that provides a secure means of recovering costs, and a linchpin for attracting investment in the NYS residential retrofit fund.

In addition, on-bill recovery could eliminate the need for program participants to be deemed creditworthy in two ways: (1) utility bills present an extremely low default rate even for utility customers with poor records of paying other debts; and (2) it would allow the repayment obligation to “stay with the meter” rather than the individual – meaning that if ownership of the unit changed, the new owner would take over both the retrofit and the obligation. Importantly, it would also allow the program to produce a mix of retrofits that reduce energy bills and retrofits that mitigate carbon emissions without providing direct financial benefit – using the savings from “paying” retrofits to subsidize “non-paying” measures.

GATHERING THE NEEDED RESOURCES & REMOVING BARRIERS TO SCALE

Green Jobs/Green Homes NY has identified three areas in which change and development are needed in order to bring energy-efficiency to scale: (1) expanding the green workforce and contractor pool; (2) organizing homeowner, landlord and tenant participation; and (3) extending consumer protections.

Expanding the green-collar workforce

This initial phase of greening our housing, funded by billions of dollars in state-driven investment, is estimated to generate more than 150,000 job-years in construction – and still more jobs in marketing and other program work. This represents a major opportunity to address economic inequalities: the work component must be structured to ensure the new green economy is a fair economy. That means green jobs must be quality jobs that pay a family-sustaining wage and offer real advancement; that opportunities for union work and union workers must be a focus; and that communities who have been excluded from the traditional economy through unemployment, lack of access to well-paying jobs or lack of educational and job training opportunities must have meaningful access to these jobs.

We must also speed the development of a workforce skilled in energy-efficiency retrofits; to date, progress has been slow. The hurdles of learning new equipment, becoming certified, and taking a new, energy-centered approach to residential work – in the absence of certain, sustained demand – have proven too high. Scaling up retrofits requires more workers, more engaged contractors, and state leverage to support good wages, lower costs and assure continued demand for greening work.

Some important resources are already in place. NYSERDA’s progress in seeding green skills training at community colleges around the state, and developing curricula for broader dissemination, is an excellent starting point. Community workforce development groups are actively working to incorporate basic green skills into barrier-removal programs.

²¹ Job-years calculation is based on early draft estimates of 10 job-years per \$1m in weatherization retrofits, and a crude cost for one million retrofits of approximately \$2.4b.

Labor unions, including partners in the Green Jobs/Green Homes NY coalition, are strategizing around green skill upgrades for existing skilled members and apprenticeships to develop new workers.

The Green Jobs/Green Homes NY program should deepen, coordinate, and provide context for these actors as they build the green economy.

The program should:

- **Lead consumer demand for energy-efficiency contracting:** Clearly define the number of retrofits that will be performed in each targeted area, so that contractors can invest in switching to the energy-efficiency business model and be assured of work within reach.
- **Bundle retrofit contracts for economies of scale:** Use a General Contracting structure, similar to the current NYSERDA “Program Implementer” model, to aggregate jobs into bundles of houses, to lower transaction costs and allow higher-skilled workers to be deployed over several projects.
- **Bulk purchase & negotiate supply contracts where possible:** Use state leverage and the scale of program work to lower costs and support New York State green business development.
- **Create “on-ramps” for green skills certification & accreditation:** Allow contractors to perform energy-efficiency work as they work toward certification, and create NYS Department of Labor-recognized green skill certifications for workers from entry-level to skilled trades.
- **Recognize green contracting as a skilled trade in demand:** Create apprenticeships to develop the green business skills and capacity of aspiring contractors.
- **Support contractors to reorganize retrofit work:** Maximize the capacity of the existing workforce by deploying highly-skilled workers as project supervisors and problem-solvers, and bringing entry-level workers into installation tasks.
- **Incentivize and/or require labor practices that meet goals for equitable economic development:** These include hiring from local communities, small contractors, W/MBEs, etc. and employing graduates of workforce development programs, apprenticeships and other training programs. Contractors must also be supported to meet these goals.
- **“Green up” workforce development/barrier removal programs:** Develop green skills curricula for programs that reach long-term unemployed populations, and provide graduates with direct linkages to green jobs.

Organizing homeowner, landlord and tenant participation

Lack of popular understanding about greening, the invisibility of most energy-efficiency work on homes and communities’ lack of trust in contractors and state programs have been major barriers to accomplishing retrofits. To overcome these obstacles, Green Jobs/Green Homes NY needs the support of community-based organizations to provide “push” education, lead opinion, make energy-efficiency work visible, help communities understand the local benefits of greening, and act as an intermediary for the program in targeted areas.

Green Jobs/Green Homes NY should also be designed as a tool for community organizing around the physical improvement of housing, housing affordability, and equitable community development. Organized communities should be invited to make the case for designation as a target area for retrofits, and should be supported and/or incentivized to develop outreach strategies that result in deep local energy savings.

We must ensure access for owners and residents of distressed housing. Energy-efficiency retrofits are not effective in units that need more serious repair to windows, roofs or other major area. But many distressed units are in areas eligible for targeting by Green Jobs/Green Homes NY. The program must create one-stop linkages with New York's home repair programs.²² Program development should also include investigation of creative financing mechanisms, using the economic

power of energy-efficiency to support debt, and the development of additional home repair programs aimed specifically at bringing housing units from distress to efficiency.

Green Jobs/Green Homes NY should be designed as a tool for community organizing around the physical improvement of housing, housing affordability, and equitable community development. Organized communities should be supported and/or incentivized to develop outreach strategies that result in deep local energy savings.

Extending consumer protections

Participants in the Green Jobs/Green Homes NY program – meaning homeowners, building owners and any affected renters – must be protected against negative or unintended effects of the program.

How do we make sure retrofits result in savings?

Retrofits should provide a minimum of 20% savings on home heating bills – and typically, 30-40% – assuming no changes in customer behavior. Residential retrofit experience shows, however, that customer and/or user behavior frequently changes after a retrofit, reducing energy savings outcomes by 30-40%.

Since payback calculations are based on expected savings, and the goal is to provide a net reduction in utility bills even during the payback period, program participants need some assurance of savings. The following measures are essential components of quality assurance and measurement, protecting both consumers and contractors.

- Use of well-trained, certified crews supervised by experienced workers with knowledge of building science and systems
- Use of standard, field-tested materials for retrofits
- Good baseline information about customers' total energy usage, verified with utility data; and about the energy usage of specific home systems, like water heaters.

These building blocks should allow contractors to guarantee a portion of the energy savings. Where savings fail to materialize, the program must clearly define paths of recourse and responsibility for the maintenance of installed equipment.

Protecting against utility shut-offs during on-bill recovery

New York State's Home Energy Fair Practices Act (HEFPA) outlines the circumstances under which utility customers' service may be shut off. When retrofit cost recovery charges are added to utility bills, customers should be provided with the additional right to assert defenses to payment of efficiency charges based on failure, theft, removal, lack of maintenance or other qualifying problem. HEFPA, in combination with this addition, is generally adequate for protecting consumers whose bills carry on-bill recovery charges in combination with other protections including performance guarantees; payback levels below expected savings, and payback periods shorter than the life of equipment; and owner responsibility for equipment maintenance.

²² A list of NYS home repair programs is available at: <http://www.dhcr.state.ny.us/Publications/HousingReport/NYSHousingReport.htm>

Protecting rent affordability as we improve New York's housing

Retrofits are intended to improve housing affordability by lowering costs and upgrading systems. But as retrofits add value to buildings, to maintain affordability to renters, retrofitted units must be protected against "upgrade"-related rent increases.

Existing renter protection language from federal Weatherization Assistance Programs should be adapted and extended for the Green Jobs/Green Homes NY program, and should apply to all tenants regardless of rent-regulation status.

Disclosure to subsequent owners

The existing New York State Energy Law requires that heating and cooling costs be disclosed to home purchasers upon request, but this program should extend that protection by requiring disclosure. Prospective buyers of premises where the meter bears energy efficiency obligations must be notified before the purchase is completed.

NEXT STEPS

To bring the Green Jobs/Green Homes NY to scale, in the coming year the Center for Working Families, with the help of our partners, will continue:

Building and motivating a "new deal" green coalition. Developing transformative policy, and campaigning to make it reality, requires a strong stakeholder coalition. The Center has convened a committed group of unions, businesses, community workforce groups, environmental and environmental justice groups, housing and community development groups, finance experts, investors and other policy experts to move this work forward.

Solving issues to moving to scale. Along with partners, the Center for Working Families will continue to conduct deep research and analysis to determine strategies for expanding green workforce capacity and develop training ladders; identify options for structuring and capitalizing a NYS residential retrofit fund; assess the environmental and economic impact of these policies around New York State; and build avenues for stakeholder participation throughout implementation.

Building popular and political will. Developing knowledge and demand for greening at the community level is central to both the campaign and the implementation of Green Jobs/Green Homes NY. In conjunction with our growing number of community partners, the Center will undertake an organizing and public education plan driven by local strategies.

Working with policymakers. The Center is continuing to meet with a broad range of leading policymakers to educate them on the concrete values of the project (environmental conservation, jobs, reduced energy costs to families, improved housing stock, and economic development) and build support for positive policy change.

The pressing challenges presented by global warming, rising energy costs and lack of good jobs provide New York State with an unprecedented opportunity to initiate creative, comprehensive solutions with broad public benefit. The Green Jobs/Green Homes NY campaign seeks to seize this opportunity with a large-scale program to aggressively tackle the state's residential energy-efficiency problem; and in turn combat climate change, lower energy costs and create tens of thousands of family-sustaining jobs. New thinking, innovative cross-sector collaboration and political leadership will build the policy into a working program, and ultimately establish New York as a model for national action on these complex issues.

Appendix A: Residential Retrofits: Costs & Expected Returns

The tables on the following page estimate the cost of each measure, the expected energy savings, and the proportion of units where such a measure would be a cost-effective opportunity. Much of the cost and opportunity data is derived from the Energy Center of Wisconsin's house-to-house assessment of Milwaukee housing stock, which, although not an exact match for New York's housing stock, in many cases approximates New York housing in age and mix of housing types.

TABLE 1. RESIDENTIAL RETROFITS: COSTS & EXPECTED RETURNS (BY BUILDING SIZE).

1-4 UNIT HOUSES (65%)			5-20 UNIT BUILDINGS (12%)			20+ UNIT BUILDINGS (23%)		
Job	Cost/Unit	Yearly Savings	Job	Cost/Unit	Yearly Savings	Job	Cost/Unit	Yearly Savings
Audit	\$200	0	Audit	\$100	0	Audit	\$125	0
Bldg. env.	\$1,575	\$650	Bldg. env.	\$250	\$201	Bldg. env.	\$200	\$201
Appliances	\$1,200	\$102	Appliances	\$800	\$76	Appliances	\$800	\$76
(SolarThml	\$4,400	\$300)	Lightbulbs	\$70	\$200	Lightbulbs	\$70	\$200
TOTALS:	\$2,975	\$752	Green roof	\$117	\$18	Green roof	\$24	\$12
			Heat/HW	\$410	\$115	Heat/HW	\$410	\$115
			Boil contr.	\$49	\$39	Boil contr.	\$49	\$39
			TOTALS:	\$1,796	\$649	TOTALS:	\$1,686	\$643

TABLE 2. COST OF ONE MILLION RESIDENTIAL RETROFITS (BY BUILDING SIZE).

1-4 UNIT HOUSES 650,000 UNITS		5-20 UNIT BUILDINGS 120,000 UNITS		20+ UNIT BUILDINGS 230,000 UNITS	
Job	% of Units	Job	% of Units	Job	% of Units
Audit	100%	Audit	100%	Audit	100%
Bldg. env.	85%	Bldg. env.	80%	Bldg. env.	80%
Appliances	75%	Appliances	80%	Appliances	80%
(SolarThml	35%)	Lightbulbs	95%	Lightbulbs	95%
COST:	\$1.9b	Green rf	5%	Green rf	50%
		Heat/HW	50%	Heat/HW	80%
		Boil contr.	80%	Boil contr.	80%
		COST:	\$151m	COST:	\$315m

TABLE 3. MODEL BUILDINGS WITH MIXED RETROFIT PACKAGES (BY BUILDING SIZE).

MODEL BUILDING: 1 UNIT			MODEL BUILDING: 15 UNITS			MODEL BUILDING: 15 UNITS		
Job	Cost/Unit	Yearly Savings	Job	Cost/Unit	Yearly Savings	Job	Cost/Unit	Yearly Savings
Audit	\$200	0	Audit	\$100	0	Audit	\$125	\$0
Bldg. env.	\$1,575	\$650	Bldg. env.	\$250	\$201	Bldg. env.	\$200	\$201
Appliances	\$1,200	\$102	Appliances	\$800	Occupant:\$76*	Lightbulbs	\$70	Occupant:\$76*
Total:	\$2,975	\$752	Lightbulbs	\$70	Occupant:\$200*	Greenroof	\$24	\$12
True cost with 5% interest and 20% savings retention		\$3,468	H/HW	\$410	\$115	Boil contr	\$49	\$39
			Boil contr	\$49	\$39	Per Unit:	\$476	\$252
			Per Unit:	\$1,679	\$355	Total:	\$18,720	\$10,080
			Total	\$25,185	\$5,325			
			True cost with 5% interest and 20% savings retention		\$29,864	True cost with 5% interest and 20% savings retention		\$20,283
			PAYBACK:	5 years		PAYBACK:	3.5 years	

*Note on excluding occupant savings from payback: Many apartment occupants are renters whose energy savings do not pay back retrofits initiated by building owners. When occupants are also owners, payback is faster.

APPENDIX B: Retrofit labor & training

The following pages present an inventory of retrofits that might be included in a New York State residential retrofit program. Side-by-side mapping of current organization of labor, possible reorganization of tasks and training requirements indicate that restructuring green labor is possible, and could resolve labor log-jams even if demand were enormously increased.

Retrofit	Work Entailed	Training	New Opportunities
<p>House audits: 1-4 unit homes</p>	<p>House energy audits require skill in building science, measurement and performance verification, quality standards and project specs. The auditor uses the basic tools of building analysis to identify energy loss and opportunities for reducing need. Tools of measurement include blower doors, Carbon Monoxide analyzers, manometers (which measure differences in pressure), gas leak detectors and basic construction tools.</p>	<p>A GED-holder with no experience could be trained within a few on the job sessions to perform data-gathering.</p> <p>A GED-holder with basic construction background (including fluency with rulers and blueprints, units of measurement, conversions and proportions; trade terminology; identification of tools; and mechanical reasoning) could be trained as an auditor through the NYSEERDA's 36-hour community college course.</p> <p>Regular contractors who are familiar with retrofit work but lack house system knowledge, but could upgrade skills and become certified through a 5-day course.</p>	
<p>Building audits: Multifamily buildings</p>	<p>Energy audits are performed BPI-certified Multifamily Building Analyst Professionals. Building data is gathered, and then modeled by an engineer. MBAPs should be versed in emerging technologies, and use audit diagnostics to prescribe retrofits. Assistants can be all levels of workers, from trainee engineers to relatively low-skilled "technicians."</p>	<p>Training to be an MBAP requires an engineering background.</p> <p>A GED-holder with computer literacy skills could be trained to take the MBAP exam in a year. Training would take approximately 6 months of coursework, plus 6 months on the job.</p>	<p>Currently, audits take 2-4 weeks, including data-gathering and modeling, to return results. Relegating the data-gathering task to assistants rather than engineers may be appropriate.</p>
<p>Building Envelope (Air-sealing, Insulation, Weather-stripping)</p>	<p><i>Air-sealing</i> is performed by spraying material to plug gaps or holes in ceilings, floors or walls.</p> <p><i>Weather-stripping</i> is performed by caulking at the junction of walls and floors, adjusting doors for better fit, and placing rubber gaskets and floor sweeps on doors.</p> <p><i>Insulation</i> is performed using blown fiber and cellulose or rigid foam sprayed with high-expandable foam. Cellulose will soon be required for WAP work.</p>	<p>Insulation installation is generally learned hands-on through contractors.</p> <p>Air-sealing is slightly more complicated, and could require a week or more of on the job training, or 4-5 houses, to ensure quality work.</p> <p>Skilled workers are needed to oversee the lower-skilled workers and projects as a whole.</p>	
<p>Heat/Hot Water retrofits (Fueled systems)</p>	<p>1-4 unit homes HHW retrofits might include boiler maintenance and tuning, computerized/sensor-based controls, pipe insulation, etc. Replacing the heating system means replacing an existing boiler with a separate boiler and hot water heater, or (in smaller/lower-volume units) a tankless coil that eliminates the need for a water heater. Pipe insulation involves assessing and improving insulation on heating system pipes.</p> <p>Multifamily buildings HHW retrofits might include boiler maintenance and tuning, smart boiler</p>	<p>Lower-skilled support workers can be trained on the job in some tasks (pipe insulation, boiler controls installation, etc.)</p> <p>Standard HVAC training applies to specialist work, but skill upgrades/additional training in new technologies is needed.</p> <p>For boiler controls and heat computers, training is offered by manufacturers and ranges from hours to days.</p> <p>Trades needed for large multifamily building systems are currently trained through a patchwork of structures including</p>	<p>Lower-skill components of specialized heating work may be appropriate for pre-apprentices working toward apprenticeship.</p>

	controls and pipe insulation. In addition to the above skills, steamfitters' and stationary engineers' skills are needed for heating retrofits. Asbestos workers may be needed for work on pipe insulation and abatement during wall openings.	tech schools and coursework at community colleges, manufacturer--based certification, on the job training and existing apprenticeship structures; but the need for composite-skilled workers means that new approaches will likely be needed.	
Water-saving retrofits	Replacement of standard toilets with low-flow toilets is performed by plumbers or building maintenance staff. Replacement of faucets and shower heads with low-flow fixtures is performed by plumbers, building maintenance staff or residents. Water leaks must also be located and fixed by plumbers or building maintenance staff.	Mapping of training and new workforce opportunities is underway.	
Appliance retrofits	Appliance replacement is generally performed by sellers or contractors performing larger jobs. Servicing that improves energy efficiency includes cleaning of burners, coils and air passages. Plumbers may be needed for water-based appliances that connect to house piping systems.	Appliance installation and maintenance is typically learned on the job, and may be supported by coursework in electricity/electronics.	
Lighting retrofits	Common-area lighting retrofits include switching incandescent lights and fixtures fluorescent bar/ring lights or CFLs, in some cases using sensor-driven bi-level lighting. Fixture and sensor installation is performed by building maintenance staff or electricians. CFL installation in apartments can be done by tenants directly, although some may need assistance.	Standard training for building maintenance staff and licensed electricians is needed for this work.	
Green Roofing	Green roofing design requires an experienced professional in landscape architecture, and a structural engineer to assess the interaction of the roofing with the building's existing structure. Installation includes plant selection, assembling of materials and construction of the roof. Plant selection requires workers skilled in landscape contracting, with some added specialized skill in green roofing. Laborers with basic knowledge of plants and roof safety are needed to bring materials from ground to roof, and install each layer of material for protection, drainage and planting. Maintenance requires higher-skilled work using landscape contracting skills, including plant management and horticultural problem-solving. Maintenance consists of a few days' work each year	Basic installation skills, for a worker under higher-skilled supervision, include basic knowledge of plants, spatial logic and roof safety. Basic installation skills can be taught in several days, with an additional few days of on the job training. Maintenance requires a worker with well-rounded training in basic horticulture and green roof management. Unskilled workers are currently trained to this intermediate level with a 10-week course by Sustainable South Bronx.	

Solar Thermal	<p>Solar thermal systems are designed in accordance with available sunlight, roof slope, hot water needs and other factors, by energy professionals. Collector panels are installed on a roof (approximately 2 panels for a standard household.) A heat storage unit is attached to the water heater. Pipes are run from the roof through the house, connecting the panel system to the heat storage unit. Currently, installation on houses is performed by two workers, one worker at each end of the system.</p> <p>Solar thermal installation for a multifamily building follows the same model. The roof installation is a large box of multiple panels, rather than individual panels.</p>	<p>Training in Solar Thermal design and installation is offered primarily by energy efficiency organizations and US DOE. Courses run 2-3 days, and are designed as skill upgrades for fully-trained plumbers, pipe fitters, HVAC contractors or solar installers.</p>	
Multifamily Building Operator	<p>Energy efficient systems operation includes assessing and adjusting the workings of heating, ventilation, lighting and other building systems. Skills required are an upgrade for incumbent superintendents</p>	<p>Training is a 3-day course offered in conjunction with NYSERDA. The course covers standards and best practices for building managers, maintenance staff, technical staff and others running building systems. The course includes "an introduction to key concepts such as the whole building systems approach, and a primer on basic thermodynamics and energy analysis... [P]articipants will learn the key building components that affect energy performance and basic steps that can be taken to save on energy usage and maintenance costs." A similar training is currently offered by SEIU Local 32BJ for supers in New York City, and BPI training will be offered in the 2008-2009 academic year.</p>	
Salvage, Recycling and Waste	<p>Retrofits generate a waste stream that includes demolished building materials (pieces of broken wall, etc.) as well as equipment that, while obsolete, contains ample materials for salvage.</p>	<p>Mapping of current labor patterns and workforce opportunities is underway.</p>	
Program Marketing and Consumer Education	<p>Generating participation in the retrofit program by homeowners, building owners and tenants requires both traditional marketing work – like advertising and mailing – and collaborations with community organizations that can present greening information in culturally-competent formats, bridge communication gaps between state agencies and communities, help normalize the adoption of new technology and practices. In addition to marketing jobs, staff time in community-based organizations and a substantial team of community-based consumer educators will be needed to support homeowners and tenants in thinking about energy, efficiency, cost and effective use of retrofitted systems.</p>	<p>Mapping of current labor patterns and workforce opportunities is underway.</p>	<p>Consumer education and marketing of greening ideas (rather than products) is a new area of training currently under consideration by combined soft skills/green skills providers. This may also be an opportunity for non-GED holders, and for youth workforce development. Marketing training should be possible within a span of weeks, if paired with ongoing institutional support for understanding new technologies and programs is provided.</p>

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