



# Massachusetts Residential Energy Efficiency Workforce Needs, 2008–2012



**Residential Energy Efficiency Workforce Needs in Massachusetts: 2008-2012**  
**Final Report to the New England Clean Energy Council (NECEC)**  
**Prepared by: Kevin Doyle, Bruce Ledgerwood, and Art Willcox**

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## ***I. Background***

In 2008, National Grid and NStar (on behalf of themselves and other Massachusetts utilities) contracted with the New England Clean Energy Council (NECEC) to investigate residential, commercial and industrial energy efficiency workforce needs in Massachusetts under certain growth assumptions. This memorandum represents the final report related to workforce needs in the state's two major residential energy efficiency programs. A separate report related to the commercial and industrial energy efficiency contractor and workforce needs has been sent under separate cover.

To complete this work, NECEC contracted with Kevin Doyle, an independent consultant doing business as "Green Economy". At the time of contracting, Green Economy had begun related workforce needs research for JFYNetWorks (a nonprofit job training program), with funding from The Barr Foundation. An agreement was reached so that one effort could serve both clients.

To complete this residential energy efficiency workforce research, Green Economy partnered with experts Bruce Ledgerwood and Art Willcox, who were engaged in a very similar investigation for the Massachusetts Low Income Energy Affordability Network (LEAN).

This memorandum summarizes the results of our research and details our recommendations.

## ***II. Creation of Residential Energy Efficiency Workforce Needs Models***

The research team created models which create detailed estimates of residential energy efficiency workforce needs based on a variety of assumptions related to funding, efficiency measures selected, the projected scale of activity in selected measures, and other factors.

Workforce need models were created for:

- Massachusetts Low Income Weatherization Assistance Program
- Massachusetts Residential Conservation Services (MassSave) Program

We then combined the results of both models to produce statewide estimates of workforce needs.

Our models are attached as Excel spreadsheets, labeled Appendices A and B.

We strongly urge all readers of this report to examine the technical, program design and financial assumptions in our models, as outlined in the spreadsheets. These assumptions will not be discussed in detail in the body of this Memorandum, and yet the assumptions are critical to the final workforce projections. Even small changes in the assumptions can make a big difference in the final results.

The assumptions in the models include conclusions related to:

- **Funding** (expected funding available for different activities from various sources);
- **Production** (audits performed, insulation jobs completed, heating systems replaced, etc.);
- **"Uptake" rates** (percentage of audits which result in energy efficiency actions);
- **Worker productivity** (of auditors, insulation techs, HVAC/R techs, air sealers, etc.);
- **Average cost of selected measures** (insulation, air sealing, audits, HVAC actions, etc.);
- **Utility/Government Incentives** (amount of total cost of selected measures subsidized);

- **Consumer co-pays** (amount paid for by consumers under various incentive programs)
- **Staffing structures** (including distribution of work among “leads” and subcontractors).

The NECEC will continually update both of these models to reflect changing assumptions through the end of 2011. We invite questions and suggestions for improvement from utility staff, contractors, subcontractors, government officials, activists, academics and the public.

**III. Characteristics of the 2008 Residential Energy Efficiency Workforce**

Using survey data from energy efficiency contractors throughout the state, estimates of energy efficiency related employment at Community Action Plan agencies responsible for low-income weatherization assistance programs, data from the Massachusetts Department of Energy Resources, utility program reports, and interviews/surveys with executives at Conservation Services Group (CSG), Center for Ecological Technology (CET), RISE Engineering (and others), we characterized the 2008 residential energy efficiency workforce in Massachusetts.

All of the workforce needs below are counted in “full time equivalents” (FTEs). Each FTE represents the equivalent of one person working full-time in the job category. Readers should understand that the number of FTEs in any category is not the same as the number of individual people employed.

Since many people work part-time, by assignment only, or on job activities that are not related to residential energy efficiency, the number of people employed is actually larger than the number of FTEs. No effort was made to determine how many individual full-time and part-time workers are employed, as opposed to how many FTEs are required.

With this in mind, readers should avoid translating the number of FTEs required into 1-to-1 statements of “jobs created” or “jobs retained”. For example, when we state that the low-income and MassSave programs employed 93 “auditor FTEs” in 2008, this should not be automatically translated as “the system employed 93 auditors”.

**A. 2008 Employment (in FTEs)**

Based on surveys and interviews, we concluded that the Low-Income Program (300 FTEs) and the RCS Program (498 FTEs) employed a total of 798 FTEs in 2008. This includes employment at the Community Action Program agencies that manage the low-income program around the state, at the “lead” contractor companies for the RCS program (CSG, CET, RISE, etc.), and at insulation, weatherization, HVAC/R and related subcontractors that perform much of the residential energy efficiency field work.

*2008 Low-Income Program Employment (300 FTEs)*

CAP Agency Managers:	28
CAP Agency Administrative Staff:	28
CAP Agency Auditors:	56
Contracted Field Staff (Weatherization):	97
Contracted Field Staff (Windows):	N/A
Contracted Field Staff: (Heating Systems):	70
Contractor Administrative Staff:	21

*2008 Residential Conservation Service (498 FTEs)*

Lead Contractor Managers:	37
Lead Contractor Administrative Staff:	50
Lead Contractor Auditors:	39
Lead Contractor Project Coordinators:	41
Lead Contractor Air Sealing Technicians:	17
Subcontractor Insulation Installers:	162
Subcontractor HVAC/R Installers:	114
Subcontractor Administrative Staff:	38

B. Observations about the 2008 Residential Energy Efficiency Workforce

1. *About Energy Auditors*

We were struck by the productivity level of the auditing professionals, in both the low-income and RCS programs. For example, we found that only 39 auditor FTEs were required in the RCS program to complete 19,444 residential audits. This is a productivity rate of ~500 audits annually per Auditor FTE.

This productivity rate, of course, will be affected by a number of factors. For example, new auditors take longer to complete a professional audit than more experienced ones. In addition, if new requirements increase the expectations for what constitutes an acceptable audit, the productivity rate will fall as auditors take longer to complete each assignment.

2. *About Weatherization/Insulation Installers*

As with auditors, we noted that the productivity of these subcontractors is fairly high. Records indicate that at least 9,318 installments were completed in 2008 by an installation workforce that totaled about 259 FTEs. This is a rate of 36 completed installations, per worker FTE, per year.

3. *About HVAC/R Installers*

In popular “green job” discussions about the residential energy efficiency workforce, the bulk of attention often goes to energy auditors and insulation/weatherization workers. We noted with interest that the subcontractor HVAC/R workforce is a large part of the total. 184 total field FTEs were required to complete a wide variety of heating replacement, repair and “cleaning and tuning” jobs for the low-income and RCS programs combined.

So, while 46% of the total residential energy efficiency workforce FTEs were devoted to auditing and weatherization/insulation field work (the largest plurality), 23% of the FTEs were dedicated to HVAC/R related field work.

4. *About Air Sealers*

In 2008, air sealing tasks in the low-income program were performed by insulation and weatherization subcontractors as part of the subcontracted residential energy efficiency assignment. In the RCS program, it was sometimes the case that air sealing was performed as a separate activity by FTE field workers who were employed directly by the lead contractors (e.g. CSG, CET, etc.).

5. *About Managerial and Administrative Staff*

Residential energy efficiency work in the RCS and Low-Income Program requires a significant amount of marketing, “in-take”, management, evaluation, and paperwork. It’s not surprising, then, that nearly one-third (31%) of the total FTEs were devoted to these activities.

C. FTEs per Million Dollars of Investment (2008)

In 2008, each million dollars of residential EE investment supported 8.9 direct FTEs. It should be noted that each million dollars of investment includes expenditures on supplies, equipment and other costs in addition to labor expenditures on salaries and benefits.

**IV. Residential Energy Efficiency Workforce Projections 2009-2012**

A. Estimating future funding for RCS and Low-Income Residential Programs

As noted in the tables in the job calculator spreadsheets (Appendices A and B), expected funding sources for low-income and RCS residential energy efficiency programs include:

- US Department of Energy
- US Department of Health and Human Services
- Regional Greenhouse Gas Initiative payments to Massachusetts
- Electric Utility Company payments to low-income assistance programs
- Gas Utility Company payments to low-income assistance programs
- Systems Benefit Charge funds
- Forward Capacity Market funds
- American Recovery and Reinvestment Act (ARRA)
- Co-pays from residential customers participating in rebate/incentive programs

We based our estimates for future funding of these programs on conversations with public and private officials, the April 30 draft utility plans presented to the Massachusetts Energy Efficiency Council, and our own assessments. Readers should note that none of these funding estimates represent commitments from public or private sources. RGGI and ARRA estimates, in particular, are exclusively those created for the purpose of creating and running the job calculator model.

In addition, readers should be aware that the funding estimates in our models include only estimates of residential energy efficiency investments to be made in the RCS and Low Income programs. They do not include any residential efficiency investments outside of these programs which government agencies, nonprofit groups, municipal or investor-owned utility companies, private foundations, or private individuals may choose to make during 2009-2012.

Regarding estimates of co-pays from consumers used in our models, it’s important to note that these estimates do not include an assessment of whether or not it is reasonable to expect consumers to make such co-payments. The co-payments in the model represent the amount of consumer participation that would be required under the assumptions we’ve made regarding program design and scale of activity.

Finally, it’s critical that readers understand that the energy efficiency program structure in Massachusetts is undergoing substantial reform in keeping with the requirements of the 2008 Green Communities Act, and other related legislation. We have made educated guesses about

some of the program design reforms which we believe are likely to be included in the three-year plans covering 2010-2012, but the final approved plans may include much more extensive reforms to the current system, both in terms of funding and program design.

**B. Estimating Funding Increases for the RCS and Low-Income Programs**

For the purposes of this report, we estimate that funding for the two programs from all sources will rise from approximately \$86,000,000 in program year 2008 to over \$322,000,000 at the peak of program year 2012, almost quadrupling in less than four full years. By any standard, this is a very large increase. Moreover, we believe that future ratepayer and taxpayer investments in the two residential energy efficiency programs will actually be even higher. It is probable that our estimate represents a floor, not a ceiling.

**C. Estimating Workforce Needs for RCS and Low-Income Programs**

The chart (C1) below outlines our workforce needs projections for 2009-2012, from the baseline year of 2008. Readers will see that by 2012, the program will need nearly 3 ½ times as many worker FTEs as are currently employed by the system. The total will grow from 798 FTEs to 2,703 FTEs. The FTE needs grow by 637 additional units from 2008 to 2009, then by annual FTE increments of 540, 584, and 144.

If we had stated these increases in percentage terms, the growth rates would be quite impressive, leading to an intuitive concern about the system’s ability to recruit, screen, hire, train and deploy a significantly larger workforce in a very short period of time.

When stated in absolute numbers, however, and when spread out over several different job titles, over several years, and over the entire state of Massachusetts, the workforce increase appears much more manageable. In fact, the increase is quite small when compared to the high expectations for “green collar job” creation created by government, activist, academic and media observers. We anticipate that many will be somewhat disappointed by the reality.

**Chart C1: Projected Residential Conservation Services Program Workforce 2009-2012**

Year	Total \$	Total Employees	Mngrs	Adm Ast	Auditors	Project Coordinator	Insulation Installers	Air Sealing Installers	HVAC Contractor Installers	Admin Staff
2008	52,655,556	498	37	50	39	41	162	17	114	38
2009	105,374,997	911	67	83	51	92	211	51	285	71
2010	145,836,670	1239	91	111	61	132	253	81	412	98
2011	214,936,003	1758	127	153	79	188	329	105	637	140
2012	233,772,963	2020	150	183	103	214	427	137	646	160

The chart (C2) below outlines our low income program workforce needs projections for 2009-2012, from the baseline year of 2008. The numbers show trends similar to that for RCS.

**Chart C2: Projected Low Income Residential Efficiency Programs Workforce 2009-2013**

Program Year	Total \$	FTE Total Employees	FTE Mngrs	FTE Adm Ast	FTE Auditors	FTE Field WAP Empl	FTE Field Windows Empl	FTE Field HWAP Empl	FTE Field Adm Asst
2008	33,500,000	300	28	28	56	97	0	70	21
2009	60,850,646	525	37	37	74	226	16	95	41
2010	86,531,935	736	47	47	96	343	41	104	59
2011	95,813,935	801	52	52	110	365	41	117	63
2012	88,563,645	683	55	55	124	241	13	145	49

**Chart C3: Combined Total of Massachusetts Residential EE Workforce Needs 2009-2013**

Year	Low-Income Program	RCS Program	Total	Change
2008	300	498	798	
2009	525	910	1,435	+ 637
2010	736	1,239	1,975	+ 540
2011	801	1,758	2,559	+ 584
2012	683	2,020	2,703	+ 144

**Chart C4: Combined Totals of Workforce Needs by Selected Job Categories**

<u>Auditor FTEs</u>	<u>Change</u>	<u>Insulation/AS FTEs</u>	<u>Change</u>	<u>HVAC/R FTEs*</u>	<u>Change</u>
2008: 95	----	2008: 276	----	2008: 184	----
2009: 125	+ 30	2009: 488	+ 212	2009: 380	+ 196
2010: 157	+ 32	2010: 677	+ 189	2010: 516	+ 136
2011: 189	+ 32	2011: 799	+ 122	2011: 754	+ 238
2012: 227	+ 38	2012: 805	+ 6	2012: 791	+ 37

\* We are less confident in our estimate of increased HVAC/R technician employment for 2009-2011 than in any of our other estimates. This is because the increase is based on assumptions of increased heating system replacement and other work that requires relatively large consumer co-pays in the Residential Conservation Services program.

Given the current economic recession, it's possible that the actual rate of consumer participation will be lower than assumed in our model. We will make adjustments as statistics become available about actual numbers.

***V. Ability of Agencies and Employers to Secure New Contractors and Workers***

As noted above, the combined residential energy efficiency system in the state will require nearly 3 ½ more FTEs in 2012 than it employed in 2008.

Will the managers who operate these programs be able to find the contractors and employees they need to handle this level of ramp-up over the three year period? In a word, yes.

## A. Factors That Have Changed Since 2008 and Industry Response

We can be confident that this is case because as of late May, 2009, both programs have been aggressively bringing on new contractors and hiring/training new workers in all categories, with a fairly high degree of success. Although it is never easy to find, hire, train and retain a talented, motivated workforce, it appears that there will not be a ramp-up crisis, as some feared.

In fact, a number of employers in the residential energy efficiency system report that they are already adequately staffed to meet the increased workload they are already experiencing. A number of the CAP network agencies in the low income program have also been able to reallocate available administrative support due to cuts in other programs they manage.

Several factors have converged to ease the workforce demand crisis that had been expected in the summer of 2008.

1. *Changes in energy prices.* Some energy prices, which had risen to record highs in 2008, have dropped significantly. This has somewhat reduced that portion of residential energy efficiency demand which is driven by customer desire to save money on rising energy bills.
2. *Recession in the building industry.* The economic recession has hit the construction and remodeling industry particularly hard, throwing thousands of Massachusetts carpenters, remodelers, electricians, HVAC/R workers and plumbers out of work, and pushing many existing contractors and subcontractors to pursue new markets such as energy efficiency.

Moreover, the national credit and unemployment crisis has had a dampening impact on the number of customers participating in energy efficiency rebate programs. Utility customers are sitting on their funds, diminishing the need for more contractors and related workers to perform weatherization, insulation and HVAC/R work.

3. *Industry hiring response in 2008.* The state's 2008 push to prepare for a cold winter of high energy prices paid a dividend that we are happily reaping now. RCS administrative vendors significantly expanded their corps of auditors and reached out to new installation contractors. The auditors hired in 2008 now have more experience and knowledge, improving the state's ability to serve a large number of customers per auditor.
4. *Improved information about ARRA funds.* More detailed information about exactly how funding sources such as the ARRA and RGGI might be invested in the residential energy efficiency market is becoming available. Primary actors have taken steps to lock in existing contractors, recruit new ones, and the hiring of auditors and administrative workers.

The example of the federal stimulus legislation is particularly instructive. Financially strapped construction workers and contractors and their labor unions have followed the news about the ARRA just as avidly as have government workers, green collar job activists, and workforce training professionals. As it has become clear that the residential energy efficiency industry would receive ARRA funds, contractors have sought information about how to become involved in this work. Several program implementation managers said that "phones are ringing off the hook" with calls from interested contractors seeking energy efficiency work.

## B. Industry-Sponsored "Boot Camp" and Other Hiring Responses.

The industry has demonstrated a vibrant capacity to hire, train, and deploy workers who have significant building industry background, even though they lack specific residential energy efficiency experience. Although employers would like to have a large pool of people who have the exact knowledge, training, experience and certifications required to “hit the ground running,” many have been able to fill their residential efficiency contractor and employee needs through accessing the large group of candidates with experience in the building trades and willingness to learn quickly through “rapid response” internal training, on-the-job experience, and other available learning sources.

Although the sense of a workforce and contractor shortage crisis has somewhat diminished, the industry is aware that more contractors and trained workers are needed to successfully ramp up as funding increases and the requirements of the Green Communities Act become a major driving force in energy efficiency planning and implementation.

Various parties, including industry, the government, schools, and community organizations are responding to this need.

For example, an industry consortium is acting swiftly to implement a creative initiative aimed at increasing the technical skills of existing contractors while simultaneously bringing in new ones. This initiative is a multi-pronged marketing effort coordinated by the RCS and low-income program administrators, in collaboration with utility program administrators.

As one part of this initiative, the consortium of utility companies and program implementation administrators is establishing an interim training “boot camp” specifically designed to ramp up the available field contractor base by reaching out to existing insulation contractors not involved in the programs and available construction workers, remodelers, and other building trades professionals currently unemployed or underemployed. This initiative will be operational in June, 2009 and will positively impact the capacity to deliver results called for in the energy efficiency program plans and budgets currently being designed.

#### C. Massachusetts Clean Energy Center Plans for Statewide Training Institute(s)

The industry’s own 2009 initiative will soon be supplemented and improved by the creation of a statewide energy efficiency/renewable energy training initiative and facility with at least three sites across Massachusetts. The Massachusetts Clean Energy Center issued an RFP for the creation of this training initiative.

Four proposals were received by the May 15, 2009 deadline. Coalitions of community colleges, vocational schools, universities and nonprofit community groups submitted creative bids. The result will be a greatly enhanced training capacity for both existing contractors and new entrants.

Even without the planned training institute, nearly all of the state’s community colleges, vocational schools, job training programs and youth action programs are interested in the job creation potential of “green jobs,” including those in residential energy efficiency. Private foundations, state and local governments, and the federal government are all eager to identify and provide funding for green collar job training programs aimed at the clean energy industry.

### ***VI. Recommendations for Recruitment of New Contractors and Workers***

We recommend that worker and contractor development be focused in several areas, including:

A. Business assistance to existing contractors who would like to expand.

Our surveys found that there were a number of existing contractors who were interested in adding additional work crews to perform residential energy efficiency work, but who were inhibited by the cost of purchasing additional trucks with appropriate equipment, hiring more workers, or making other additions in a down economy with tight credit.

As these companies are in all other ways ready to perform quality work and hire more workers quickly, utility companies and/or state government should offer financial assistance in the form of grants or interest-free/low-interest loans to qualified contractors already in the system so that they can support new jobs immediately.

Another method of encouraging interested contractors to expand quickly is to promise a significant number of residential energy efficiency installations to selected contractors in advance. This allows the contractors to plan more securely and increase their staff with greater confidence that a steady flow of business will be forthcoming.

B. Business development assistance to underemployed contractors in related fields.

At a time when many parts of the construction and remodeling industry are suffering and credit is extremely tight, the state and/or utilities could assist interested contractors who have not yet entered the energy efficiency market by offering financial assistance for the purchase of needed equipment along with free energy efficiency training for crew members and crew chiefs.

This approach has several advantages: It expands the number of contractors available to the state's residential energy efficiency infrastructure, keeps small businesses afloat in difficult times, and increases the likelihood that contractors will build and remodel with energy efficiency in mind when the construction industry turns around and some of these contractors move back into their previous fields.

C. Creative outreach to potential contractors.

At a time when many in the building community need new business opportunities, additional incentives may not be needed in order to quickly add to the contractor base. Spreading the word to contractors that opportunities exist, and that more approved contractors are needed, may be enough.

Utility companies, RCS program implementation contractors, and state government should sponsor open houses, webinars, opportunity fairs, and targeted presentations aimed at reaching out to contractors and answering questions about the concerns that keep contractors from becoming involved. These concerns include: excessive paperwork, slow payments, low payments relative to private jobs, a lack of steady work, and a perception that program evaluators may require work to be redone.

D. Recruitment of unemployed and underemployed workers from related fields.

Program implementation agencies and companies should seek field service delivery employees from among the unemployed and underemployed building trade professionals who are most compatible with the needs of the retrofit energy efficiency services industry. The compatibility of

building trade professionals will be defined in part by building skills and knowledge, comparability of work environments, and salary requirements.

Having targeted the desired labor pool, raising awareness among these populations should be achieved using targeted mass media outreach, scheduled contractor meetings across the state, relevant industry publications, and available networking currently in place, such as GasNetworks and NEEP.

The Massachusetts CAP network and the RCS administrative vendors can provide intake for interested parties, whether individuals or established companies, and provide applicants with brochures or information packets that will function as the first filtering mechanism.

Those with continued interest can be directed to contact the training center administrator to schedule appropriate classes. The established program administrator relationship will work as a guide for the nascent contractor/crewperson's integration through the training period and into the established energy efficiency network of contractors. The final step in this controlled transition into the workforce will include supporting the scheduling and oversight of initial jobs.

#### E. Direct Support of Community-Based Green Collar Job Programs

One of the central findings of this study is that the number of truly new job opportunities for individuals seeking jobs and careers in residential energy efficiency will almost certainly be fewer than media accounts and political announcements have suggested.

This does not, however, mean that the industry should not encourage and support the development of "green collar" job programs for new entrants as a means of developing pathways out of poverty for people from low-income communities and communities of color.

We suggest that energy efficiency employers form partnerships with local job training programs and vocational schools that offer not only residential energy efficiency job training, but a wider array of skills development aimed at "green" building and/or renewable energy so that those seeking jobs and careers are given the core skills necessary to branch out in many possible "green" job directions which have the development of energy efficient residences at their core.

### ***VII. Recommendations for Improved Training of Existing Energy Efficiency Workers***

This report suggests that finding an adequate number of contractors and workers to meet the level of residential energy efficiency work projected may not be a major concern. This does not, however, imply that the Commonwealth can assume that all work will be done at the highest level of quality. In fact, assuring high quality through investments in contractor/worker training should be a high priority during the "ramp-up" period.

Below are several suggestions and recommendations regarding this training. Many of these suggestions are being incorporated into the "boot camp" mentioned above.

Training of existing vendors should focus on an industry-wide generalized protocol that may be delivered in multiple venues. This protocol should focus on the need to approach the delivery of energy efficiency and renewable energy services using a whole house approach that will result in the best set of services provided to each customer.

Existing vendors should be assessed with respect to their service delivery skill set. Appropriate training should be recommended for company staff members. Ongoing training efforts concentrating on new hires within the established vendor base and upgrading skills based on changing technology and building science or code developments, such as asbestos removal, K & T wiring mitigation, and moisture and mold abatement, should be required for all existing workers.

Areas of training should include:

- Air sealing
- Insulation materials and technique
- Health and safety
- Lead paint protocols
- Window and door replacement
- Code compliance
- Heating/cooling plant
- Business practices
- Equipment use and maintenance

Training should be delivered in connected courses, each having classroom and field components.

### ***VIII. Recommendations for Training of New Entrants***

This report suggests that most of the state's need for an increased residential energy efficiency workforce should be handled by bringing unemployed and underemployed building contractors into the residential energy efficiency market.

This does not mean, however, that we should not reach out to new entrants who have an interest in developing a career in energy efficiency. Although the number of opportunities will be fewer than many had hoped, there is always room for new people, especially in an industry which has a history of high turnover.

Training of new entrants must recognize the duality of the target labor pool. The existing building trades entrants will have different training needs from younger high school and college graduates looking for a career in energy efficiency. Therefore, curriculums should be designed in a flexible way that will provide for the most efficient and cost-effective administrative structure while serving the needs of all new field entrants.

The less experienced new entrants should spend more time in basic training courses with a more extensive field component. With a focus on transitioning these new insulators and air sealers in as timely a manner as possible, training should provide, in the order presented:

- Introduction/overview of the energy efficiency industry
- Basic building science principles
- Air sealing materials and techniques
- Insulation materials and techniques
- Customer relations
- Equipment use and maintenance

## ***IX. Conclusion***

The Commonwealth of Massachusetts is committed to dramatic increases in the amount of energy it saves through ramped-up efficiency measures. Although the increases in residential energy efficiency investments described in this report are very large and rapid, many energy efficiency leaders in Massachusetts expect that the actual increases will be even larger and quicker.

The NECEC research team is committed to tracking the decisions made by government officials, utility company program administrators, energy efficiency contractors, and others in the field so that we can continually update our models and help employers recruit, screen, hire, train and deploy the people we need to secure the state's clean energy future.

## ***X. Contact Us***

Kevin Doyle  
Principal, Green Economy  
137 Newbury Street, Suite 600  
Boston, MA 02116  
617-877-5804 - [kevinldoyle@gmail.com](mailto:kevinldoyle@gmail.com)

**Appendix A**

**Final 2009 Low Income Program Job Calculator**

**Projections for Insulation and Air Sealing WAP Workforce**

Calendar Year	\$ WAP DOE	\$ WAP Elect Utility	\$ WAP Gas Utility	\$ WAP Stimulus	\$ WAP Total \$	# WAP Units	FTE WAP Mngrs	FTE WAP Adm Ast	FTE WAP Auditors	WAP FTE Contractor Field Empl	Contractors working 100% of time for WAP	Contractors working 50% of time for WAP	WAP Contractor Adm Asst
2008	\$ 6,500,000	\$ 4,000,000	\$ 1,000,000	\$ -	\$ 11,500,000	3485	6	6	12	97	25	51	12
2009	\$ 10,620,000	\$ 5,000,000	\$ 1,250,000	\$ 8,526,452	\$ 25,396,452	5660	9	9	19	226	60	119	28
2010	\$ 4,800,000	\$ 6,500,000	\$ 1,625,000	\$ 25,579,355	\$ 38,504,355	8581	14	14	29	343	90	181	43
2011	\$ 4,800,000	\$ 8,450,000	\$ 2,112,500	\$ 25,579,355	\$ 40,941,855	9125	15	15	30	365	96	192	46
2012	\$ 4,800,000	\$ 12,675,000	\$ 3,168,750	\$ 6,440,000	\$ 27,083,750	6036	10	10	20	241	64	127	30

**Assumptions:** \$ 66,125,162 total stim \$ for WAP, plus \$9.0 PHA

DOE WAP would vary over 5 year period.  
 DOE WAP would fund windows at 10% of total DOE (not stimulus) funding beginning 2009  
 DOE WAP would fund windows at 20% of total DOE (not stimulus) funding beginning 2010-12  
 Beginning in 2010 elect and gas utility \$ would ramp up by 30%per year  
 Beginning in 2012 elect and gas utility \$ would ramp up by 50%per year  
 Ma would receive \$122.0 million from DOE Stimulus. \$ 27 million would go to large PHA and Clean Energy Center.  
 70 % of available DOE Stimulus funds would be spent on WAP.  
 DOE Stimulus bill would be spent over 31 months, beginning September 2009.  
 DOE Stimulus column includes \$9.0 million allocated to PHA scattered site housing, spent over 31 months.  
 2008 Average cost of a fully loaded job with today's allowable measures would be \$3300; average contractor costs of \$2500.  
 2009-2013 Average cost of a fully loaded job with today's allowable measures would be \$4487; average contractor costs of \$3500.  
 Managers can oversee 600 WAP jobs per year  
 Adm Assts can support 600 WAP jobs per year  
 Auditors can support 300 WAP jobs per year  
 2008 Contractor field employees can produce 36 WAP jobs per year per worker  
 2009-2013 Contractor field employees can produce 25 WAP jobs per year per worker  
 Contractor support staff can support 8 field workers per year

**Projections for Windows Replacement WAP Workforce**

Calendar Year	\$ Windows DOE	\$ Windows Elect Utility	\$ Windows Gas Utility	\$ Windows Stimulus	\$ Windows Total \$	# Windows Units	FTE Windows Mngrs	FTE Windows Adm Ast	FTE Windows Auditors	FTE Windows Contractor Field Empl	Windows Contractor Adm Asst
2008	\$ -	\$ -	\$ -	\$ -	\$ -	0	0	0	0	0	0
2009	\$ 1,062,000	\$ -	\$ -	\$ 3,654,194	\$ 4,716,194	1429	1	1	1	16	1
2010	\$ 1,200,000	\$ -	\$ -	\$ 10,962,580	\$ 12,162,580	3686	3	3	4	41	3
2011	\$ 1,200,000	\$ -	\$ -	\$ 10,962,580	\$ 12,162,580	3686	3	3	4	41	3
2012	\$ 1,200,000	\$ -	\$ -	\$ 2,740,645	\$ 3,940,645	1194	1	1	1	13	1

\$ 28,319,999.00 total stim \$ windows  
 \$ 94,445,161

**Assumptions:**

DOE WAP would fund windows at 10% of total DOE (not stimulus) funding beginning 2009  
 DOE WAP would fund windows at 20% of total DOE (not stimulus) funding beginning 2010-12  
 Elect and Gas windows funding would not exist.  
 30 % of available Stimulus funds would be spent on Windows  
 Stimulus bill would be spent over 31 months, beginning September 2009  
 Average cost of a fully loaded window would be \$3,300; average contractor costs of \$2,500.  
 Managers can oversee 1200 Window jobs per year  
 Adm Assts can support 1200 Window jobs per year  
 Auditors can support 1000 Window jobs per year  
 Contractor field employees can produce 90 Window jobs per year per worker  
 Window contractor support staff can support 16 field workers per year

**Projections for HWAP replacements:**

Calendar Year	\$ HWAP Repl HHS/RGGI	\$ HWAP Repl Elect Utility	\$ HWAP Repl Gas Utility	\$ HWAP Repl Stimulus	\$ HWAP Repl Total \$	# HWAP Repl Units	FTE HWAP Repl Mngrs	FTE HWAP Repl Adm Ast	FTE HWAP Repl Auditors	HWAP FTE Contractor Field Empl	HWAP Contractor Adm Asst
2008	\$ 4,250,000	\$ 4,250,000	\$ 4,250,000	\$ -	\$ 12,750,000	1897	3	3	5	38	5
2009	\$ 10,000,000	\$ 5,525,000	\$ 5,525,000	\$ -	\$ 21,050,000	3132	5	5	9	63	8
2010	\$ 10,000,000	\$ 7,182,500	\$ 7,182,500	\$ -	\$ 24,365,000	3626	6	6	10	73	9
2011	\$ 10,000,000	\$ 9,337,250	\$ 9,337,250	\$ -	\$ 28,674,500	4267	7	7	12	85	11
2012	\$ 10,000,000	\$ 14,005,875	\$ 14,005,875	\$ -	\$ 38,011,750	5657	9	9	16	113	14

**Assumptions:**

HHS/RGGI HWAP replacements funding would peak at \$10.0 million and then be funded at a steady state of \$10 million  
 Beginning in 2010, Elect utility HWAP replacement funding would ramp up by 30% per year.  
 Beginning in 2012 elect and gas utility \$ would ramp up by 50%per year  
 Gas utility HWAP funding would ramp up by 30% per year  
 Average cost of a fully loaded HWAP replacement job would be \$6720; average contractor costs of \$5,600.  
 Managers can oversee 600 HWAP replacement jobs per year  
 Adm Assts can support 600 HWAP replacement jobs per year  
 Auditors can support 350 HWAP replacement jobs per year  
 Contractor field employees can produce 50 replacement HWAP jobs per year per worker  
 HWAP contractor support staff can support 8 field workers per year

Projections for HWAP repairs:

Calendar Year	\$ HWAP Repr HHS/RGGI	\$ HWAP Repr Elect Utility	\$ HWAP Repr Gas Utility	\$ HWAP Repr Stimulus	\$ HWAP Repr Total \$	# HWAP Repr Units	FTE HWAP Repr Mngrs	FTE HWAP Repr Adm Ast	FTE HWAP Repr Auditors	HWAP FTE Contractor Field Empl	HWAP Contractor Adm Asst
2008	\$ 2,750,000	\$ -	\$ -	\$ -	\$ 2,750,000	6548	5	5	9	10	1
2009	\$ 2,750,000	\$ -	\$ -	\$ -	\$ 2,750,000	6548	5	5	9	10	1
2010	\$ 2,750,000	\$ -	\$ -	\$ -	\$ 2,750,000	6548	5	5	9	10	1
2011	\$ 2,750,000	\$ -	\$ -	\$ -	\$ 2,750,000	6548	5	5	9	10	1
2012	\$ 2,750,000	\$ -	\$ -	\$ -	\$ 2,750,000	6548	5	5	9	10	1

Assumptions:

HHS HWAP repair funding would start at \$2.75 million and then remain at \$2.75 million  
 Average cost of a fully loaded HWAP repair job would be \$420; average contractor costs of \$350.  
 Managers can oversee 1200 HWAP repair jobs per year  
 Adm Assts can support 1200 HWAP repair jobs per year  
 Auditors can support 700 HWAP repair jobs per year  
 Contractor field employees can produce 675 CTE HWAP jobs per year per worker  
 HWAP contractor support staff can support 8 field workers per year

Projections for HWAP CTEs:

Calendar Year	\$ HWAP CTEs HHS/RGGI	\$ HWAP CTEs Elect Utility	\$ HWAP CTEs Gas Utility	\$ HWAP CTEs Stimulus	\$ HWAP CTEs Total \$	# HWAP CTEs Units	FTE HWAP CTEs Mngrs	FTE HWAP CTEs Adm Ast	FTE HWAP CTEs Auditors	HWAP FTE Contractor Field Empl	HWAP Contractor Adm Asst
2008	\$ 1,500,000	\$ -	\$ -	\$ -	\$ 1,500,000	12500	6	6	8	22	3
2009	\$ 1,500,000	\$ -	\$ -	\$ -	\$ 1,500,000	12500	6	6	8	22	3
2010	\$ 1,500,000	\$ -	\$ -	\$ -	\$ 1,500,000	12500	6	6	8	22	3
2011	\$ 1,500,000	\$ -	\$ -	\$ -	\$ 1,500,000	12500	6	6	8	22	3
2012	\$ 1,500,000	\$ -	\$ -	\$ -	\$ 1,500,000	12500	6	6	8	22	3

Assumptions:

HHS HWAP CTEs funding would start at \$1.5 million and then remain at \$1.5 million  
 Average cost of a fully loaded HWAP CTE job would be \$120; average contractor costs of \$100.  
 Managers can oversee 2000 HWAP CTEs jobs per year  
 Adm Assts can support 2000 HWAP CTEs jobs per year  
 Auditors can support 1500 HWAP CTE jobs per year  
 Contractor field employees can produce 562 CTE HWAP jobs per year per worker  
 HWAP contractor support staff can support 8 field workers per year

Projections for 1-4 & MFB AMPs:

Calendar Year	\$ Elect AMPs HHS/RGGI	\$ Elect AMPs Elect Utility	\$ Elect AMPs Gas Utility	\$ Elect AMPs Stimulus	\$ Elect AMPs Total \$	# Elect AMPs Jobs	FTE Elect AMPs Mngrs	FTE Elect AMPs Adm Ast	FTE Elect AMPs Auditors/Contrs
2008	\$ -	\$ 5,000,000	\$ -	\$ -	\$ 5,000,000	10417	7	7	21
2009	\$ -	\$ 6,500,000	\$ -	\$ -	\$ 6,500,000	13542	9	9	27
2010	\$ -	\$ 8,450,000	\$ -	\$ -	\$ 8,450,000	17604	12	12	35
2011	\$ -	\$ 10,985,000	\$ -	\$ -	\$ 10,985,000	22885	15	15	46
2012	\$ -	\$ 16,477,500	\$ -	\$ -	\$ 16,477,500	34328	23	23	69

Assumptions:

Beginning in 2010, Elect AMP utility funding would ramp up by 30% per year  
 Beginning in 2012 elect and gas utility \$ would ramp up by 50% per year  
 Average cost of a fully loaded AMP service would be \$480; average contractor costs of \$400.  
 Managers can oversee 1000 AMP jobs per year  
 Adm Assts can support 1000 Amp jobs per year  
 Auditors can support 500 jAMP jobs per year

Summary STATEWIDE Funding and Employment Projections:

Calendar Year	\$ DOE	\$ HHS/RGGI	\$ Elect Utility	\$ Gas Utility	\$ Stimulus	\$ Total \$	# Total Employees	FTE Mngrs	FTE Adm Ast	FTE Auditors/Contrs	FTE Field WAP Empl	FTE Field Windows Empl	FTE Field HWAP Empl	FTE Field Adm Asst
2008	\$ 6,500,000	\$ 8,500,000	\$ 13,250,000	\$ 5,250,000	\$ -	\$ 33,500,000	298	28	28	56	97	0	70	21
2009	\$ 10,620,000	\$ 14,250,000	\$ 17,025,000	\$ 6,775,000	\$ 12,180,646	\$ 60,850,646	525	37	37	74	226	16	95	41
2010	\$ 4,800,000	\$ 14,250,000	\$ 22,132,500	\$ 8,807,500	\$ 36,541,935	\$ 86,531,935	736	47	47	96	343	41	104	59
2011	\$ 4,800,000	\$ 14,250,000	\$ 28,772,250	\$ 11,449,750	\$ 36,541,935	\$ 95,813,935	801	52	52	110	365	41	117	63
2012	\$ 4,800,000	\$ 14,250,000	\$ 43,158,375	\$ 17,174,625	\$ 9,180,645	\$ 88,563,645	683	55	55	124	241	13	145	49

incremental employees above 2010 level are likely to be private contractors

**Appendix B**

**Final 2009 RCS Program Job Calculator**

RCS Audits:

Year	\$ SBC, RGGI, FCM, & Gas	\$ Co-pays	\$ Total	# Audits	FTE Audit Mngrs	FTE Audit Adm Ast	FTE Field Auditors
2008	\$ 3,500,000	\$ -	\$ 3,500,000	19444	16	22	39
2009	\$ 4,550,000	\$ -	\$ 4,550,000	25278	21	28	51
2010	\$ 5,460,000	\$ -	\$ 5,460,000	30333	25	34	61
2011	\$ 7,098,000	\$ -	\$ 7,098,000	39433	33	44	79
2012	\$ 9,227,400	\$ -	\$ 9,227,400	51263	43	57	103
2013	\$ 9,227,400	\$ -	\$ 9,227,400	51263	43	57	103

Assumptions:

SBC Audit Funds remain flat through 2009	1.3
SBC Audit Funds increase by X% in year 2010	1.2
SBC Audit Funds increase by X% in year 2011	1.3
SBC Audit Funds increase by X% in year 2012	1.3
SBC Audit Funds increase by X% in year 2013	1
Cost of an audit	\$ 180
Managers can oversee X Audits per year	1200
Adm Assts can support X Audits per year	900
Auditors can complete X Audits per year	500

RCS Insulation:

Year	\$ SBC, RGGI, FCM, & Gas	\$ Co-pays	\$ Total	# Insulation Units	FTE Insulation Mngrs	FTE Insulation Adm Ast	FTE Insul. Project Coordinators	FTE Insulation Installers	FTE Insulation Installers Adm Ast
2008	\$ 11,666,667	\$ 7,583,333	\$ 19,250,000	5833	7	15	15	162	20
2009	\$ 15,166,667	\$ 9,858,333	\$ 25,025,000	7583	9	19	19	211	26
2010	\$ 18,200,000	\$ 11,830,000	\$ 30,030,000	9100	11	23	23	253	32
2011	\$ 23,660,000	\$ 15,379,000	\$ 39,039,000	11830	15	30	30	329	41
2012	\$ 30,758,000	\$ 19,992,700	\$ 50,750,700	15379	19	38	38	427	53
2013	\$ 30,758,000	\$ 19,992,700	\$ 50,750,700	15379	19	38	38	427	53

Assumptions:

Average cost of a fully loaded job contractor portion	\$ 3,300
Rebate Amount	\$ 2,000
Customer Copay	\$ 1,300
Managers can oversee X units per year	800
Adm Assts can support X units per year	400
Insulation Project Coordinators can support X units per year	400
Contractor field employees can produce X units per year per worker	36
Residential contractor support staff can support X field workers per year	8
Percent of audits served 2008/2009	30.0%
Percent of audits served 2010	30.0%
Percent of audits served 2011	30.0%
Percent of audits served 2012	30.0%
Percent of audits served 2013	30.0%

RCS Air Sealing:

Year	\$ SBC, RGGI, FCM, & Gas	\$ Co-pays	\$ Total	# Air Sealing Units	FTE AS Mgrs	FTE AS Adm Ast	FTE Insul. Project Coordinators	FTE AS Installers	FTE AS Installer Adm Ast
2008	1,516,667	\$ -	\$ 1,516,667	2528	4.2	4.2	8	17	3.2
2009	4,550,000	\$ -	\$ 4,550,000	7583	12.6	12.6	25	51	9.5
2010	7,280,000	\$ -	\$ 7,280,000	12133	20.2	20.2	40	81	15.2
2011	9,464,000	\$ -	\$ 9,464,000	15773	26.3	26.3	53	105	19.7
2012	12,303,200	\$ -	\$ 12,303,200	20505	34.2	34.2	68	137	25.6
2013	12,303,200	\$ -	\$ 12,303,200	20505	34.2	34.2	68	137	25.6

Assumptions:

Copay Customer	\$ -
Rebate SBC	\$ 600
Cost of fully loaded air sealing unit	\$ 600
Managers can oversee X AS units per year	600
AS Project Coordinators can support X units per year	300
Adm Assts can support X AS units per year	600
Installer AS units per year	150
Field Adm Assts can support X AS units per year	800
Percent of audits served 2008	13.0%
Percent of audits served 2009	30.0%
Percent of audits served 2010	40.0%
Percent of audits served 2011	40.0%
Percent of audits served 2012	40.0%
Percent of audits served 2013	40.0%

RCS HVAC Gas:

Year	\$ Gas	\$ Copays	\$ Stimulus	\$ Total	# HVAC Units	FTE HVAC Mgrs	FTE HVAC Adm Ast	FTE Insul. Project Coordinators	HVAC Contractor Installers	HVAC Contractor Adm Asst
2008	\$ 583,333	\$ 13,708,333	\$ -	\$ 14,291,667	2858	4.8	4.8	9.5	57	7.1
2009	1,137,500	17,820,833	-	18,958,333	3792	6.3	6.3	12.6	76	9.5
2010	1,092,000	17,108,000	-	18,200,000	3640	6.1	6.1	12.1	73	9.1
2011	2,957,500	46,334,167	-	49,291,667	9858	16.4	16.4	32.9	197	24.6
2012	3,844,750	60,234,417	-	64,079,167	12816	21.4	21.4	42.7	256	32.0
2013	3,844,750	60,234,417	-	64,079,167	12816	21.4	21.4	42.7	256	32.0

Assumptions:

HVAC Rebate	\$ 300
HVAC Copay	\$ 4,700
Total cost of HVAC unit	\$ 5,000
HVAC Managers can support X units per year	600
HVAC Adm Ast can support X units per year	600
HVAC Project Coordinators can support X units per year	300
Units per year for Contractor HVAC crew person	50
HVAC Field Adm Asst can support X units per year	8
Percent of audits served 2008	10.0%
Percent of audits served 2009	15.0%
Percent of audits served is X% 2010	12.0%
Percent of audits served is X% 2011	25.0%
Percent of audits served is X% 2012	25.0%
Percent of audits served is X% 2013	25.0%
Stimulus budget for 2009	\$ -
Stimulus budget for 2010	\$ -
Stimulus budget for 2011	\$ -
Stimulus budget for 2012	\$ -

RCS HVAC Oil:

Year	\$ SBC, RGGI, FCM	\$ Copays	\$ Stimulus	\$ Total	# HVAC Units	FTE HVAC Mngrs	FTE HVAC Adm Ast	FTE Insul. Project Coordinators	HVAC Contractor Installers	HVAC Contractor Adm Asst
2008	\$ 972,222	\$ 13,125,000	\$ -	\$ 14,097,222	2819	4.7	4.7	9.4	56	7.0
2009	\$ 1,895,833	\$ 47,062,497	\$ 3,333,333	\$ 52,291,663	10458	17.4	17.4	34.9	209	26.1
2010	\$ 1,820,000	\$ 76,380,003	\$ 6,666,667	\$ 84,866,670	16973	28.3	28.3	56.6	339	42.4
2011	\$ 4,337,667	\$ 99,039,003	\$ 6,666,667	\$ 110,043,337	22009	36.7	36.7	73.4	440	55.0
2012	\$ 6,407,917	\$ 87,671,247	\$ 3,333,333	\$ 97,412,497	19482	32.5	32.5	64.9	390	48.7
2013	\$ 5,638,967	\$ 50,750,700	\$ -	\$ 56,389,667	11278	18.8	18.8	37.6	226	28.2

Assumptions:

HVAC Rebate	\$ 500
HVAC Copay	\$ 4,500
Total cost of HVAC unit	\$ 5,000
HVAC Managers can support X units per year	600
HVAC Adm Ast can support X units per year	600
HVAC Project Coordinators can support X units per year	300
Units per year for Contractor HVAC crew person	50
HVAC Field Adm Asst can support X units per year	8
Percent of audits served 2008	10.0%
Percent of audits served 2009	15.0%
Percent of audits served is X% 2010	12.0%
Percent of audits served is X% 2011	22.0%
Percent of audits served is X% 2012	25.0%
Percent of audits served is X% 2013	22.0%
Stimulus budget for 2009	\$ 3,333,333
Stimulus budget for 2010	\$ 6,666,667
Stimulus budget for 2011	\$ 6,666,667
Stimulus budget for 2012	\$ 3,333,333

Summary RCS Workforce needs:

Year	\$ SBC, RGGI, FCM, & Gas	\$ Copays	\$ Stimulus	\$ Total	Jobs Per Million Dollars - Subsidy	Jobs Per Million Dollars - Total	Total Jobs	FTE Mngrs	FTE Adm Ast	FTE Auditors	FTE Project Coordinators	FTE Insulation Installers	FTE AS Installers	FTE HVAC Contractor Installers	FTE Admin Ast
2008	\$ 18,238,889	\$ 34,416,667	\$ -	\$ 52,655,556	27.30	9.46	488	37	50	39	42	162	17	114	38
2009	\$ 27,300,000	\$ 74,741,664	\$ 3,333,333	\$ 105,374,997	29.72	8.64	910	67	83	51	92	211	51	285	71
2010	\$ 33,852,000	\$ 105,318,003	\$ 6,666,667	\$ 145,836,670	30.58	8.50	1239	91	111	61	132	253	81	412	98
2011	\$ 47,517,167	\$ 160,752,170	\$ 6,666,667	\$ 214,936,003	32.46	8.18	1759	127	153	79	188	329	105	637	140
2012	\$ 62,541,267	\$ 167,898,364	\$ 3,333,333	\$ 233,772,963	30.66	8.64	2020	150	183	103	214	427	137	646	160
2013	\$ 61,772,317	\$ 130,977,817	\$ -	\$ 192,750,133	28.83	9.24	1781	136	170	103	187	427	137	482	139

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**Research was managed by:**

Kevin Doyle  
Principal, Green Economy  
137 Newbury Street, 6th Floor  
Boston, MA 02116  
(617) 877-5804  
kevinldoyle@gmail.com