



## Executive summary

This study evaluates the a number of current and future City of Toronto initiatives in home energy retrfits from an economic development perspective, focusing on green jobs creation, workforce development and local business opportunity. These initiatives include the Home Energy Assistant Toronto (HEAT) program, Home Energy Help program, and the currently under development Live Green Home Energy Retrofit program. A user interactive job estimation model is developed as a part of this study. Model results, combined with literature review, online surveys and conversations with industry players inform the major findings of this study. The following provides an overview of these findings:

- The potential economic benefits in employment generation and local business development associated with the home energy retrofit are significant.
- City wide expansion of the Live Green Home Energy Efficiency Program, which would target 50% of the Toronto single family housing stock, would generate about 3,200 direct person-years of employment and about 4,300 indirect person years of employment.
- Almost 40% of jobs are estimated to be generated for certified insulation applicators, about one-third for general labourers and trainees and about a quarter for energy advisors.
- The Home Energy Assistance Toronto (HEAT) program is estimated to have generated 114 direct person-years of employment and about 156 indirect person years of employment.
- Incentives paid through various levels of government for home energy retrofits in Toronto have resulted in about 7 jobs per \$1 million of government grants. The HEAT and Help program are estimated to have resulted in 4 and 6 jobs per \$1 million of City of Toronto incentives only.
- Unattractive apprenticeship salaries and poor attitude towards professions requiring physical labour are two of the major recruitment challenges faced by the home energy retrofit industry, and the construction industry as a whole.
- There is a high degree of skill transferability from general construction trade fields to the home energy retrofit field. However, there is still a need for training programs to facilitate this transfer of skills. Offering an insulation applicator training program through colleges is an example of a potential skill transfer program.
- With termination of home energy retrofit incentives from higher levels of government the future of the home energy retrofit industry in Toronto is currently unclear. The success of the Live Green Home Energy Efficiency program is vital in retaining the momentum in the industry and achieving energy efficiency in a large portion of Toronto's housing stock.
- While forming a small part of this study, local procurement of material and equipment required in home energy retrofits could be of significant value to empowering the local economy. It is recommended that a more extensive study on supply chain of home energy retrofit materials and equipment be conducted.

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## 1 Background

In December 2009, City Council approved The Power to Live Green: Toronto's Sustainable Energy Strategy, which detailed an approach to build upon the goals for reducing greenhouse and smog causing emissions by adopting a number of recommendations to act as principles and targets for Toronto's sustainable energy future.

In an effort to build upon its adoption of the Green Economic Sector Development Strategy, and in recognizing the creation of jobs and economic opportunities as a result of the emergence of the green energy sector, the Green Jobs Action Team has been established. The objective of this action team is to advance policies, investments, collaborations and partnerships in the city to ensure that Toronto is delivering its commitments in the Power to Live Green, by making more jobs green and by creating more green jobs.

A number of City divisions have been developing and implementing several environmental initiatives in order to meet the goals and objectives of the City's sustainable energy strategy. While the environmental benefits of these initiatives are mostly quantified, their economic impact, specifically green jobs potential and workforce requirements, have not been thoroughly evaluated. Many of the City's environmental initiatives present several prospects for creating a variety of local green employment and procurement opportunities.

This document reports the result of evaluating the Home Energy Assistant Toronto (HEAT) program, Home Energy Help program, and the currently under development Live Green Home Energy Retrofit program (LGHEE) from a job creation and workforce development perspective. As a part of this analysis a Microsoft Excel model is developed. The model provides estimates for person-years of employment generated in various project phases and skill levels as a result of the initiative. Users have the option of modifying default assumptions, future scenario parameters, and program targets and observe the resulting changes in employment estimates. It must be noted that the model is not meant as a design tool, since the complexity of estimation parameters and their level of precision are not fit for that level of analysis. Rather, it is meant as a higher level evaluation tool for investigating aggregate employment impacts.

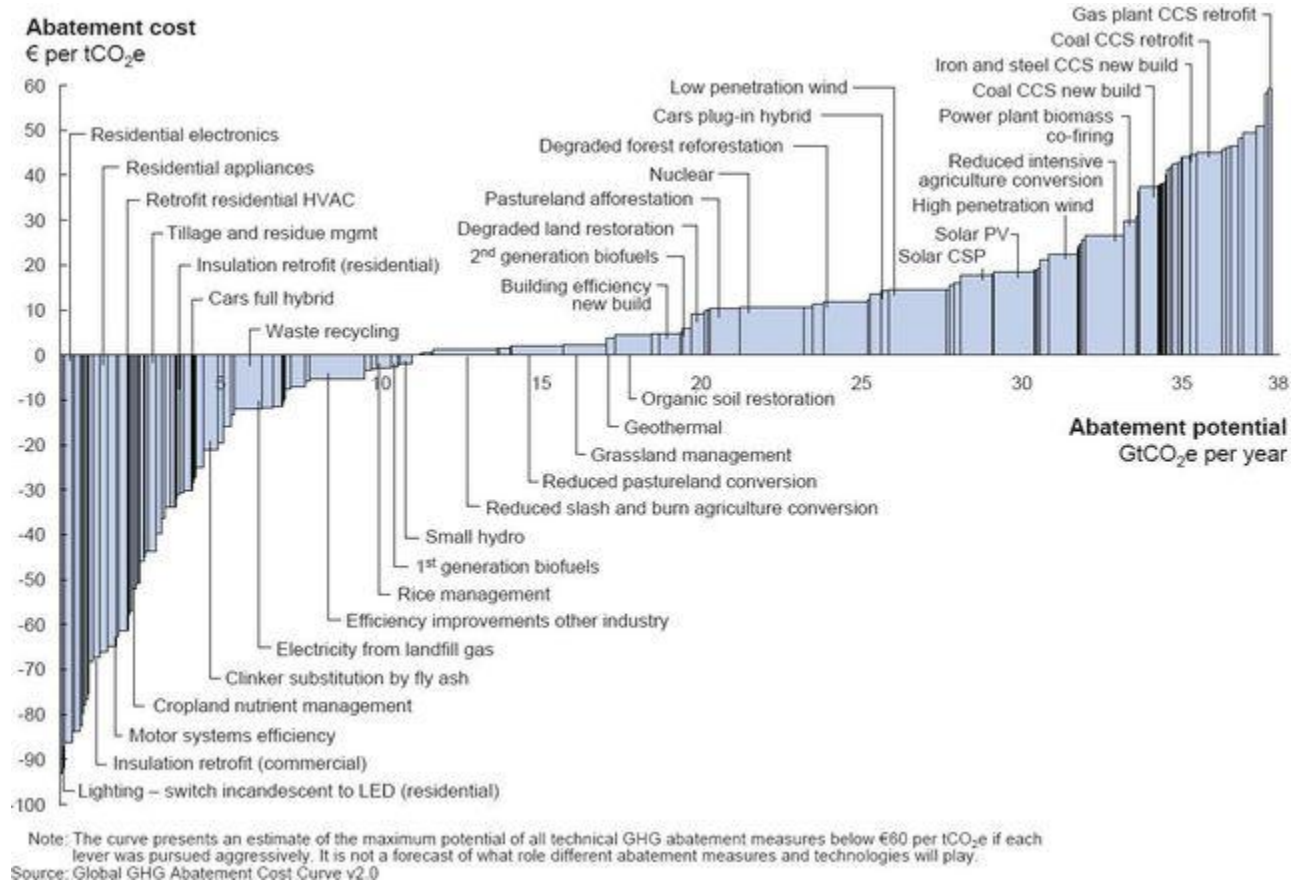
For the purposes of this study green jobs are defined as direct employment generated due to a City of Toronto environmental policy or program. Spin-off jobs related to this direct employment (e.g. clerical support, equipment transportation, etc) are considered indirect jobs and are not included in this analysis. Similarly, induced jobs, which are jobs generated due to re-spending of worker income in consumer goods and services, are not quantified.

*Together with two similar reports on other programs, this study is a part of an initiative by the Green Jobs Action Team for developing a framework for evaluating the economic impact of City of Toronto environmental initiatives.*

This document, together with two similar reports on other programs, is a part of an initiative by the Green Jobs Action Team for developing a framework for evaluating the economic impact of City of Toronto environmental initiatives. Results of this and future evaluations would allow the City to better understand additional benefits of environmental initiatives and plan for the future in order to strengthen Toronto's green economy.

## 2 Introduction

Home energy retrofit measures are known to be some of the most cost effective ways of saving energy, saving money and reducing greenhouse gas emissions. This is perhaps best illustrated through results of a study by McKinsey & Co<sup>1</sup> displayed in Figure 1. As the figure suggests, home energy retrofit measures such as insulation, energy efficiency appliances and HVAC systems are some of the best GHG reduction measures since they save more money than they cost.



**Figure 1 Global GHG Abatement cost curve beyond business-as-usual, 2030**

Over 40% of Toronto's energy usage is for residential lighting, heating and cooling<sup>2</sup>. Single detached and semi-detached forms of housing are the most energy inefficient forms of dwelling, primarily due to the high ratio of exposed building envelope to indoor living area. Over 40% of households in the city of Toronto live in detached or semi-detached housing units. Such statistics provide a clear potential for cost and energy savings through home energy retrofits. This will even become more prevalent as the price of energy increases in Ontario.

In addition to energy and cost savings effects of home energy retrofits, such measures can result in a significant number of local employment opportunities. As Table 1 suggests, 9 direct and 5.2 indirect jobs can be expected to result from every \$1 million spent in conservation and demand management

<sup>1</sup> McKinsey & Co (2009). "Pathways to a low carbon economy"

<sup>2</sup> City of Toronto (2007) " Energy Efficiency and Beyond Toronto's Sustainable Energy Plan" Staff Background Report

measures in Ontario<sup>3</sup>. The study suggests that all other green energy investments result in fewer direct jobs than conservation and demand management.

**Table 1 Employment impacts of alternative Ontario green energy investment<sup>3</sup>**

Energy Source	Direct job creation per \$1 million in spending (# of jobs)	Indirect job creation per \$1 million in spending (# of jobs)	Direct + Indirect job creation per \$1 million in spending (# of jobs)
Conservation and demand management	9.0	5.2	14.2
Hydroelectric	8.2	6.0	14.2
On-shore wind	7.6	7.1	14.7
Off-shore wind	7.6	8.2	15.8
Bioenergy	8.4	8.0	16.4
Waste energy recycling	8.2	7.9	16.1
Solar	8.2	7.6	15.8
Smart grid	7.0	7.1	14.1

Evaluation process and result of three City of Toronto initiatives related to home energy retrofit measures will be discussed here. These include the Home Energy Assistance Toronto (HEAT) program, the Home Energy Help program, and the Live Green Home Energy Efficiency (LGHEE) program, which is currently under development. As mentioned earlier, only direct jobs resulting from the three initiatives are directly quantified here, while multipliers are used to estimate indirect and induced jobs.

The Home Energy Assistance Toronto ("HEAT") program, launched in October 2009 and wrapping up in March 2011, works in partnership with the Federal ecoEnergy and Provincial Home Energy Savings programs in subsidizing low-rise residential energy efficacy measures. HEAT provides up to \$1,000 in grants for homeowners who upgrade their insulation, on top of the \$10,000 available from the Federal and Provincial governments each for measures such as furnace and water heater upgrades, insulation improvements, air sealing and window replacements.

The federal government stopped accepting new enrolments for the Federal ecoEnergy grant program as of March 31<sup>st</sup>, 2010. Further, the Ontario Home Energy Savings Program will continue to provide up to \$5,000 per household only until March 31<sup>st</sup>, 2011. As a result, HEAT funds will no longer be offered after this date.

Between August 2009 and January 2011 more than 37,000 Toronto residents participated in the ecoEnergy program, over 11,000 of which received grants through the City's HEAT program. Greenhouse gas emissions have been reduced by an estimated 12,300 tonnes per year by Toronto residents participating in the program.

The Home Energy Help program, adopted by Council in May 2010, addresses electricity, gas and water conservation for low-income residents. In addition to the three insulation measures covered under HEAT, other measures such as draft proofing, heating equipment upgrades, low flow toilet installation and basic energy efficiency measures are also included. The City, in partnership with Enbridge and Toronto hydro, fully pay for the cost of home energy assessment and retrofit measures for 300 qualified

<sup>3</sup> Pollin, Robert and Heidi Garrett-Peltier (2009). " Building the Green Economy: Employment Effects of Green Energy Investments for Ontario" Report sponsored by Green Energy Act Alliance, Blue Green Canada and World Wildlife Fund

low income households in Toronto, partially through provincial and federal grants. The average cost of services for each house is about \$6,000 and the average reduction in greenhouse gas emissions is estimated to be 4.5 tonnes per home. To date about 50 of the 300 target households have gone through the program.

With the federal and provincial incentives for home energy retrofits coming to an end, the City has started working on developing a new program in order to continue the positive trend in home energy retrofits. The new program, currently titled Live Green Home Energy Efficiency (LGHEE) program, is meant to be a neighbourhood based approach to providing information and education, energy auditing and retrofit services while taking advantages of cost savings due to economies of scale. The pilot version of the program and a city wide expansion of it are evaluated separately in this report.

### 3 Methodology

In 2010 The Tower Renewal Office commissioned a study by Professor Ted Kesik from the University of Toronto to look at workforce challenges and opportunities in the tower renewal industry in Toronto<sup>4</sup>. The methodology adopted by this study has guided a major component of the work presented here. Given the difference between the tower renewal industry and home energy retrofit industry certain aspects of the methodology differ from those of the Tower Renewal study.

A large component of labour data collected for the employment model developed in this study has been through several personal meetings, phone conversations and e-mail correspondence with numerous industry players involved in different aspects of home energy retrofit services. A detailed database of job components, required skill level, and hours of work associated with each retrofit measure has been compiled as a result (see Appendix B). The following is a list of home energy retrofit measures evaluated in this study:

- Basic draft proofing;
- Foundation wall insulation;
- Foundation header insulation;
- Roof insulation;
- Wall insulation;
- Replacement of heating equipment;
- Replacement of cooling system;
- Installation of low-flow toilets; and
- Basic energy conservation measures.

In addition to this primary research, a literature review of existing studies on the subject of employment in the home energy retrofit industry was conducted. Significant findings from the literature review and comparable figures will be discussed later in this report.

As described earlier, HEAT grants are only a component of the total incentives home owner received for performing energy efficiency measures on their homes. Therefore, a component of the analysis presented here relates to understanding the isolated effect of City of Toronto grants on the number of employment opportunities generated. This estimation is made under the assumption that there exists a linear relationship between proportion of funding and proportion of generated jobs.

In order to understand gaps and opportunities in workforce training an inventory of college and university programs related to the home energy retrofit field was conducted through accessing

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<sup>4</sup> Kesik, Ted. (2010). "Tower renewal workforce challenges & opportunities" Report prepared for the Tower Renewal Office

information available through institution websites. In addition, an online survey on workforce training and recruitment was conducted. This survey, presented in Appendix A – Workforce Survey, collected information from industry players in the region in the following areas:

- Basic information about the respondent and their business size;
- Whether they would manage with their existing staff size if demand for their services suddenly doubled;
- What skill areas are most challenging to recruit?
- What are the primary sources for finding labour in this field?
- What partnerships are working to help with recruitment and workforce development?
- What are the barriers/obstacles with recruitment?
- What are the primary sources for workforce development in the industry? and
- What are some of the gaps in quality or quantity of existing training programs?

Respondents to the survey were contacted through the phone and later contacted through a follow up e-mails where a link to the online survey was provided. Some 10 companies involved in provision of services in a variety of home energy retrofit measures completed the online survey. The results of this survey will be discussed later in section 6 of this report.

### **3.1 User Interactive Employment Estimation Model**

This study has resulted in a user interactive Microsoft Excel based job estimation model. This open architecture estimation tool provides capabilities for users to view and modify the base assumptions used in calculations. In addition, a number of opportunities are built in to allow for variable modification and quick result visualization. The main user interface page of the model guides the user through colour coded cells indicating what is default information, what are modifiable default assumptions, what are modifiable system specific variables, and what are estimation outputs. Model outputs include person-years of employment by project phase and by occupation type, in addition to some rough cost estimations.

*This study has resulted in a user interactive Microsoft Excel based job estimation model. This open architecture estimation tool provides capabilities for users to view and modify the base assumptions used in calculations.*

The following is a brief description on methodology of model development.

*One person-year of employment is equivalent to 1,960 hours of work.*

A typical Toronto home is the unit of analysis used in the model. The database of employment breakdown, illustrated in Appendix B, tabulates the number of hours of work and crew size for performing various retrofit measures on one home. Using this database and specifications associated with each program (ecoEnergy, HEAT, Help, LGHEE), the total hours of work required for each program are calculated, which are then converted to person-years of employment. Each person-year of employment is considered to be made up of 1,960 hours of work. This figure is commonly used as average total number of hours in one year of full-time employment<sup>5</sup>. There are certainly limitations in making this broad assumption. Certain occupations have longer work hours than

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<sup>5</sup> Singh, Virinder and Jeffrey Fehrs (2001). "the work that goes into renewable energy" Research report: Renewable Energy Policy Projects, Washington, DC.

others. In addition, depending on the state of the industry, employers might ask employees to work overtime in the event of increased work load, rather than choosing to hire new staff. Nevertheless, this estimation approach is deemed acceptable at this level of analysis since it normalizes employment figures and facilitates further evaluation and comparisons.

The model provides the user with the option for two types of analysis. The first provides estimation for hour and cost of completing any combination of retrofit measures on a single home. This component ignores program specification. The second component allows for evaluation of actual City of Toronto programs. Average costs associated with various home energy retrofit measures are derived from data available through the Home Energy Help Program

Table 2 below provides a list of modifiable program assumptions and a description of how each one affects employment estimation.

**Table 2 - Modifiable program assumptions**

<b>Modifiable Assumption</b>	<b>Employment Effect</b>
<b>% of targeted houses receiving energy auditing</b>	Depending on the design of the program and outreach measures, the amount of energy auditing work as a percentage of total housing stock can vary.
<b>% of home owners who do their own contract administration work</b>	Contract administration can only generate employment if it is performed through a service provider, as opposed to through individual home owners.
<b>% of targeted homes going with at least one retrofit measure</b>	These two factors define how many times in total a retrofit measure is performed as a part of the program being evaluated.
<b>% take-up of individual retrofit measures by the total housing stock.</b>	

Although not a component of the model design, percentage of home owners who perform their own construction/installation work is another influencing factor. Certain measures such as attic insulation and toilet replacement may be doable by a homeowner who is also an experienced handyman. While there are no direct jobs resulting from such Do-It-Yourself activities there are some indirect and induced job impacts. Lack of data on trends in this type of activity inhibits us from accurately reflecting its effect on employment estimates. Moreover, this only effects estimations for the HEAT program since the Home Energy Help and the LGHEE programs assume 100% of services to be supplied through professional contractors.

Analysis of net impact of energy efficiency measures suggests that 1.37 indirect and induced jobs are generated for every direct job in energy efficiency<sup>6</sup>. This net impact is the combination of generation reduction, increased expenditure, program expenditures and reduced expenditures. This multiplier is used in the model to make rough estimations of indirect and induced jobs.

The model ultimately provides results in the form of person-years of employment associated with each evaluated program. Employment figures are broken down by project component and skill type.

<sup>6</sup> IndEco Strategic Consulting Inc. and Econometric Research Limited (2008). "The employment impact of energy conservation". Report prepared for the Ontario Power Authority

## 4 Estimated Workforce Impacts

### 4.1 A Typical Example

Table 3 below displays the hours of work and average cost associated with applying various home energy retrofit measures to a single Toronto home. The Excel model allows for inclusion/exclusion of specific retrofit components. Figure 2 and Figure 3 provide a visual breakdown of hours and costs, respectively.

**Table 3 – Employment and cost estimates for home energy retrofit of a typical Toronto home**

		Hours of work	Estimated Cost
<b>Energy Auditing</b>		6	\$450
<b>Construction/Installation</b> ( <i>use the plus sign to refine retrofit measures</i> )		107	\$13,705
<b>Retrofit Components</b>	<b>retrofit included?</b>		
basic draft proofing,	Yes	8	\$620
Foundation wall insulation	Yes	17	\$363
Foundation header insulation	Yes	9	\$725
Roof insulation	Yes	12	\$1,114
Wall insulation	Yes	37	\$3,311
replacement of heating equipment	Yes	16	\$3,209
replacement of air conditioning equipment	Yes	6	\$3,200
installation of low-flow toilets	Yes	2	\$848
Other conservation measures	Yes	1	\$315
<b>Total</b>		<b>112</b>	<b>\$14,155</b>

It is evident that almost 70% of the required hours of work are associated with the four insulation measures. Energy auditing makes up about 5% of the total hours. Observation of the costs breakdown suggest that heating and cooling equipment replacement and wall insulation are the three most costly measures, which together take up about 70% of the total cost.

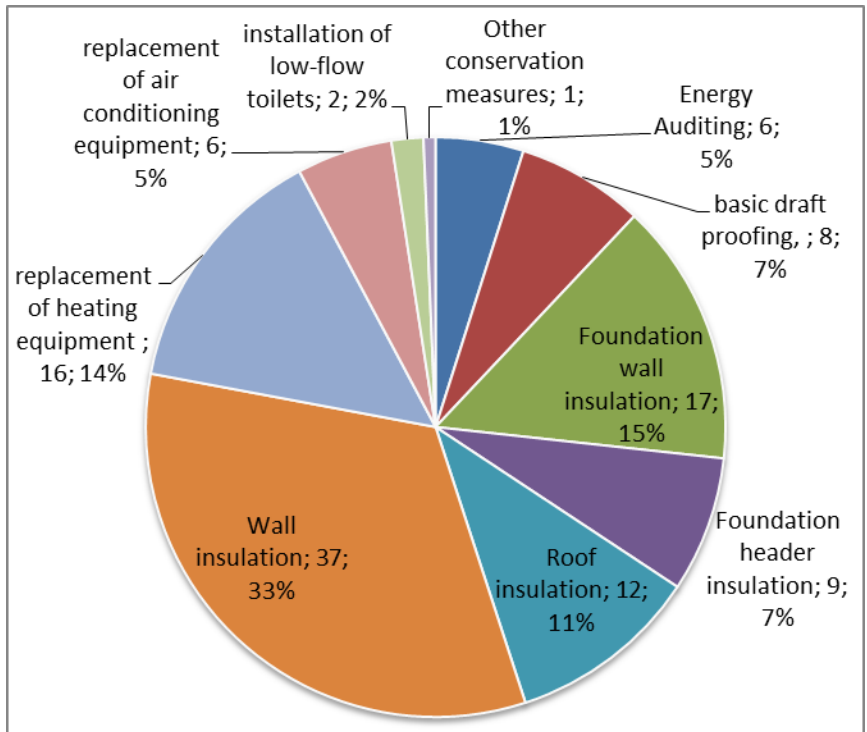


Figure 2 - Hours of work for various retrofit measures for a typical Toronto home

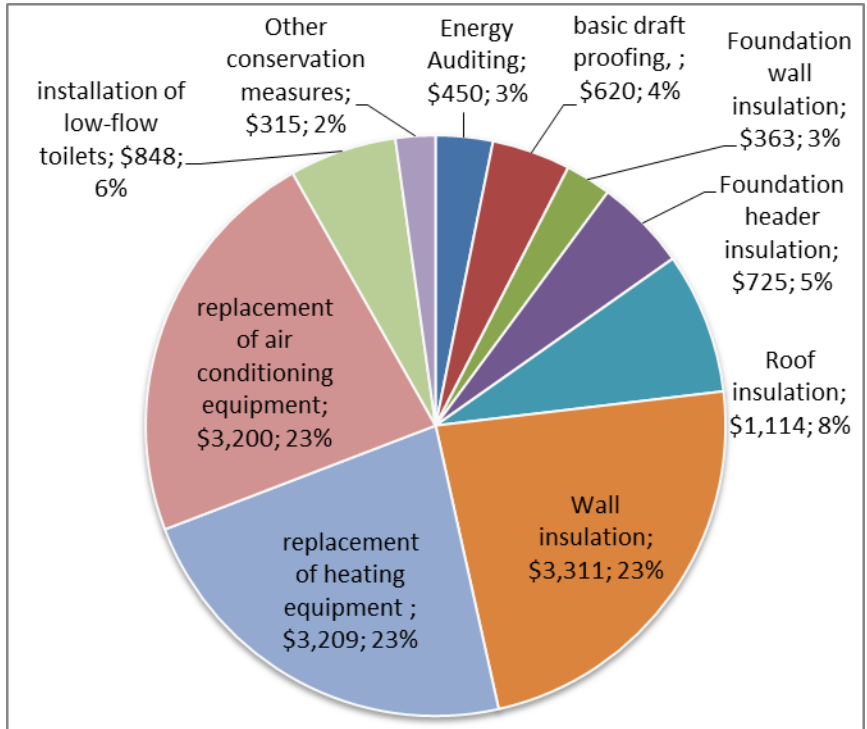


Figure 3 Cost of various energy retrofit measures for a typical Toronto home

## ***4.2 Scope of existing initiative and future expansions***

The model evaluates the following programs separately:

- **ecoEnergy:** All homes that received eco-energy funds in Toronto for the following retrofit measures: basic draft proofing, foundation wall insulation, foundation header insulation, roof insulation, wall insulation, replacement of heating equipment, replacement of cooling system, installation of low-flow toilets, basic conservation measures
- **HEAT:** All homes that received HEAT funds in addition to ecoEnergy. Heat funds were provided for insulation measures only.
- **Home Energy Help:** Total of 300 homes receiving free home energy retrofits through the Home Energy Help program.
- **LGHEEP Pilot:** Live Green Home Energy Efficiency program, targeting 5 neighbourhoods of about 5,000 homes each.
- **LGHEEP city wide:** City wide expansion of Live Green Home Energy Efficiency pilot.

Characteristics associated with each of the 5 programs ultimately affect the number of jobs resulting from each program. Table 4 provides a summary of these specifications. For further information on the source of data in this table and the assumptions made please refer to Appendix C – Program specification Assumptions.

**Table 4 - Current and Future Energy Retrofit Programs**

	Current Programs			Future Programs	
	ecoEnergy	HEAT only (a component of Eco-Energy)	Home Energy Help	Live Green Energy Efficiency Program (City Wide)	Live Green Energy Efficiency Program (Pilot)
<b>Target Housing stock</b>	450,000	450,000	450,000	450,000	25,000
<b>% of targeted houses receiving energy auditing</b>	17%	5%	0.13%	50%	25%
<b>% of targeted houses taking part in some form of retrofit</b>	8%	3%	0.07%	25%	10%
<b>% Home owners doing their own contractual work</b>	60%	60%	0.00%	0%	0%
<b>% of retrofitted dwellings conducting....</b>					
basic draft proofing,	32%	0%	75%	75%	75%
Foundation wall insulation	10%	10%	58%	58%	58%
Foundation header insulation	7%	7%	58%	58%	58%
Roof insulation	29%	29%	58%	58%	58%
Wall insulation	8%	8%	67%	67%	67%
replacement of heating equipment	76%	0%	58%	58%	58%
replacement of cooling system	28%	0%	30%	30%	30%
installation of low-flow toilets	27%	0%	33%	33%	33%
basic conservation measures	0%	0%	80%	80%	80%

### 4.3 Evaluation of employment effect of programs

The model provides estimation for person-years of employment associated with each program based on specifications highlighted earlier. Table 5 displays the results of direct and indirect/induced employment estimates. Direct jobs are further broken down by project phase and skill type.

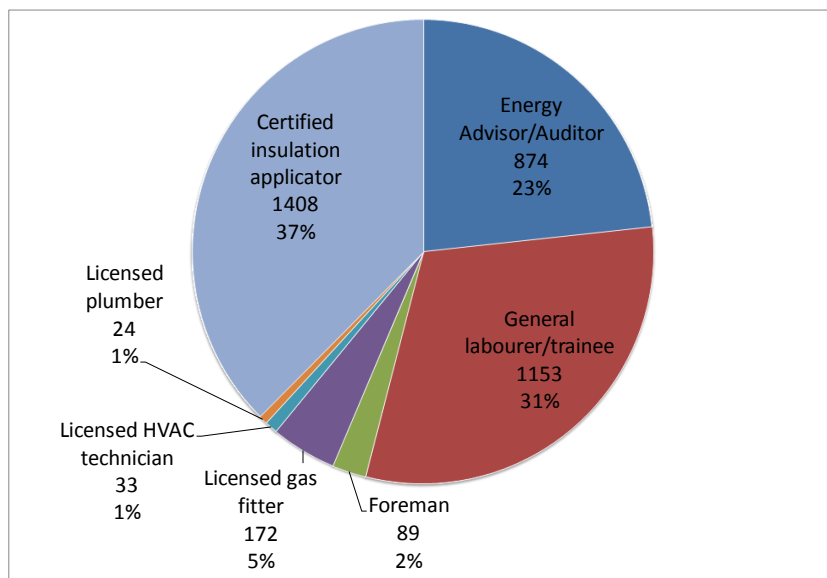
**Table 5 - Employment impact of various home energy retrofit programs**

	Current Programs			Future Programs	
	eco-Energy overall	HEAT only	Home Energy Help	Live Green Energy Efficiency Program (City Wide)	Live Green Energy Efficiency Program (Pilot)
Person-Years of Direct Employment	651	114	12	3169	110
Person-Years of Indirect and Induced Employment	892	156	16	4341	151
Direct employment breakdown by Project phase					
Program Outreach <sup>7</sup>	N/A	N/A	N/A	180	10
Planning and design	161	61	2	585	18
Construction/Installation	490	53	10	2404	83
Direct employment breakdown by Skill Type					
Energy Advisor/Auditor	322	102	2.6	874	26
General labourer/trainee	297	37	4.0	1153	43
Foreman	14	5	0.4	89	3
Licensed gas fitter	116	0	0.7	172	6
Licensed HVAC technician	16	0	0.1	33	1
Licensed plumber	10	0	0.1	24	1

*City wide expansion of the Live Green Home Energy Efficiency Program, which would target 50% of the Toronto single family housing stock, would generate about 3,200 direct person-years of employment and about 4,300 indirect person years of employment.*

<sup>7</sup> While existing programs have likely resulted in jobs in outreach, only neighbourhood outreach jobs associated with the future LGHEE program are evaluated in this study

Figure 4 illustrates the breakdown of person-years of employment expected to be generated from city wide expansion of the LGHEE program. Results suggest that a significant number of jobs (1,408) are for certified insulation applicators, followed by general labourer/trainees (1,153) and energy advisors (840). It is also evident that professional engineering or architectural skills are not required for any of the programs. While such skills are involved in the industry as a whole, they are not necessarily part of the day-to-day implementation of routine retrofit measures.



**Figure 4 - Employment breakdown by skill type - Live Green Home Energy Efficiency program, city wide**

A helpful measure of effectiveness of a program is evaluating how many jobs are created per unit monetary value of investment. Considering overall federal, provincial and municipal grants paid into the retrofit measures in Toronto, it is calculated that 7 jobs are generated per \$1 million of grants. In order to isolate City of Toronto grant contributions to employment a direct relationship between funding and employment is assumed. Given that HEAT grants made up about 9% of the total incentive paid to home owners for insulation retrofits, it is concluded that 9% of the jobs generated due to such retrofits are the direct result of HEAT grants. This translates to 4 jobs per \$1 million of HEAT grants. For the Home Energy Help program this number is calculated to be 6 jobs per \$1 million of City of Toronto contribution. Table 6 illustrates steps involved in calculation of the figures above.

According to a study conducted through the Political Economy Research Institute (PERI) of University of Massachusetts-Amherst<sup>8</sup> about 9 direct jobs can result from every \$1 million Ontario Green Energy Investment in energy efficiency. This number is comparable to the 7 jobs per \$1 million that was calculated above for overall investment. It must be noted that our estimations do not include certain retrofit measures such as window replacement, which was performed on 28% of households in the program. A study by Sundquist<sup>9</sup> suggests that 9.1 jobs are generated per \$1 million investment in home

<sup>8</sup> Pollin, Robert and Heidi Garrett-Peltier (2009). " Building the Green Economy: Employment Effects of Green Energy Investments for Ontario" Report sponsored by Green Energy Act Alliance, Blue Green Canada and World Wildlife Fund

<sup>9</sup> Sundquist, E. (2009). "Estimating jobs from building energy efficiency". Report prepare for Center on Wisconsin Strategy (University of Wisconsin-Madison) and the Powell Center for Construction and Environment (University of Florida)

energy retrofits. Moreover, according to the Economic Opportunity Studies<sup>10</sup> based in the US 9.3 annual direct jobs in installation/construction and auditing has resulted from every \$1 million funding through the Weatherization Assistance Program.

Other studies have looked at the overall impact of investments in energy efficiency on the economy as a combination of direct, indirect and induced jobs. A report by ICLEI Global<sup>11</sup> suggests this combined effect to be up to 70 person-years of employment for every \$1 million invested into energy efficiency. This estimate is significantly higher than what our research and other literature suggest.

**Table 6 - Evaluation of employment per \$1 million in grants**

<b>Overall retrofits In Toronto</b>	
ecoEnergy grants	\$44,188,025
Provincial grants	\$49,758,275
HEAT grants	\$2,409,493
Total grants funded	\$96,355,794
Direct Jobs per \$1 million of all government grants	7
<b>HEAT</b>	
ecoEnergy grants for insulation retrofit measures only <sup>12</sup>	\$9,371,234
Provincial grants for insulation retrofit measures only <sup>13</sup>	\$14,941,484
HEAT grants to date	\$2,409,493
% City of Toronto contribution	9%
Estimated number jobs created due to HEAT grants only	10
Direct Jobs per \$1 million of City of Toronto grants	4
<b>Home Energy Help</b>	
Total Cost	\$1,912,076 <sup>14</sup>
% paid by City of Toronto	61% <sup>15</sup>
Estimated number jobs created due to City's contributions	7
Direct Jobs per 1\$ million of City incentives	6

## 5 Existing Workforce Training Programs

Table 7 and Table 8 provide an overview of related programs offered through colleges and universities in the city of Toronto and the region. This visualization follows a similar template used by a 2007 report by the Clean Air Partnership on skills for energy efficient construction<sup>16</sup>. Highlighted cells indicate that one or more programs on the specific area of interest are offered through the institution. In addition, some highlighted cells are accompanied by further description of the relevant components of the program. The tables also include a list of programs specific to building energy efficiency. York University, Ontario College of Art and Design, Wilfred Laurier University, Trent University and Willis College were also included in the inventory but are do not offer relevant programs. Brief descriptions of the integrated programs offered through colleges, listed in Table 7, are provided in Appendix D.

<sup>10</sup> Economic Opportunity Studies (2009). "How Many Workers Does the Weatherization Assistance Program Employ Now? What Jobs Will the Recovery Act Offer?". Washington, DC.

<sup>11</sup> Goldberger, Dan & Philip Jessup (1994). "Profiting from energy efficiency!" Report prepared for ICLEI Global.

<sup>12</sup> Based on personal correspondence with ecoEnergy accounting department

<sup>13</sup> Assuming equal contribution as ecoEnergy in addition to \$150 per household

<sup>14</sup> Estimated based on average cost of different retrofit measures and expected percentage take up of each retrofit based on program observations to date

<sup>15</sup> Based on program observations to date

<sup>16</sup> Penney, Jennifer (2007). "Skills for energy efficient construction" Clean Air Partnership

**Table 7 College programs related to building energy retrofit industry in Toronto and vicinity**

	Conventional Trade programs						Conventional Engineering/Architecture programs				Integrated Programs
	Construction Carpenter	Electrician	Facilities Maintenance Mechanic/Electrical	Plumber	Refrigeration and AC Mechanic	Gas Fitter / Gas technician	Construction Engineering-Buildign renovation	Civil	Mechanical	Architecture	
Centennial											
Humber							Home renovation technician				Home Inspection Certificate , LEED Green Building: Core Concepts and Strategies
Seneca									with a Building Science stream		Bridging to green careers, Building Systems Engineering Technician
George Brown											LEED Green Building: Core Concepts and Strategies
Mohawk											
Fleming							Construction Skills				Sustainable Building Design and Construction Sustainable Renovations
Conestoga										Architecture - construction engineering	Construction Techniques (Gas, Welding, Plumbing, Electrical and HVAC)
Durham											
Sheridan											
Georgian											

**Table 8 University programs related to building energy retrofit industry in Toronto and vicinity**

University	Building Science	Civil Engineering (Construction Management)	Civil engineering (Structural)	Mechanical Engineering	Electrical Engineering	Architecture
University of Toronto						
Ryerson University						
University of Waterloo						
McMaster University						
University of Guelph						
UOIT						

## 6 Workforce Challenges and Opportunities

As this study's employment estimations suggest, there is a need for an array of trades level skills and energy advisors in order to improve the energy efficiency of Toronto's single family housing stock. As the Tower Renewal Workforce Challenges & Opportunities study indicates:

"[Skilled workers] are rapidly becoming an endangered species in a world where much higher status and prestige are attached to knowledge workers.... Nearly 50,000 workers in the Ontario construction industry are set to retire in the next several years and there does not appear to be a replacement strategy in place at the provincial level."<sup>17</sup>

Responses to our survey also suggest that trades level jobs are not viewed as a professional career option and apprenticeships offer low unattractive salaries. The majority of the surveyed contractors and service providers also expressed the need to hire more staff if demand were to increase. In the energy auditing field however, there seems to be enough slack currently in the workforce that would be able to meet increased demands. This is likely because work for energy auditors has diminished significantly with the elimination of government incentives. Another recruitment challenge highlighted in survey responses is non-English speaking workers who need CIC Enhanced Language Training.

*Unattractive apprenticeship salaries and poor attitude towards professions requiring physical labour are two of the major recruitment challenges faced by the home energy retrofit industry, and the construction industry as a whole.*

*There is a high degree of skill transferability from general construction trade fields to the home energy retrofit field. However, there is still a need for training programs to facilitate this transfer of skills. Offering an insulation applicator training program through colleges is an example of a potential skill transfer program.*

A large portion of the relevant training programs, indicated in the matrix of college programs above, are not specific to home energy retrofits. Yet these general trade programs are applicable to this study because the skills acquired are relatively easily transferable to the home energy retrofit field. A recent report by Toronto Workforce Innovation Group<sup>18</sup> provides an overview of possibilities in skill transferability to green jobs amongst top occupations in the construction industry. The report suggests that low skilled, entry level construction trades helpers and labourers have the greatest transferability through the strong internal progression towards green fields. Carpenter skills are identified to be directly transferable to insulation applicators. Management level occupations in construction and residential home builders and renovators are identified to be transferable to green fields through internal progressions. The report also identifies other occupations such as plumber and electrician to have significant overlap of skills between the traditional and greener fields. The 2007 Clean Air

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<sup>17</sup> Kesik, Ted. (2010). "Tower renewal workforce challenges & opportunities" Report prepared for the Tower Renewal Office

<sup>18</sup> Parsons, D. & Associates (2009). "Greening the Economy Transitioning to New Careers". Report prepared for Toronto Workforce Innovation Group.

Partnership (CAP) report on skills for energy efficient construction also confirms this high degree of transferability in the field<sup>19</sup>.

There is, however, still a need for some training programs to facilitate this transfer of skills. Insulation applicator, for instance, are commonly carpenters trained and certified in-house by product manufacturers. At higher levels of education, energy auditors are commonly graduates from college or university engineering and technician programs that receive additional and on-the-job training to become energy auditors. According to the employment estimation results these two occupations together make up about 60% of the expected number of jobs generated as a result of city wide expansion of the Live Green Home Energy retrofit Program.

There are a number of challenges with offering formalized training and education programs specific to the field of home energy retrofitting as highlighted by the CAP study<sup>20</sup>. These include:

- Shortage of demand to justify the supply of education and training courses. Expanding demand in the field would highlight deficiencies and result in higher quality programs;
- Reluctance of apprentices and journeymen to taking supplementary courses since they are fully employed with their existing skills; and
- Lack of formal trades training of non-union workers in home construction. Such workers are unlikely to be included in any energy efficiency training through union training centres.

While green training programs in the region are still new, they are coming together according to some industry representatives. Majority of colleges have identified the need to develop programs to meet this demand. There are, however, certain gaps in existing college programs and opportunities for improvement.

In order to deal with the challenge of aging workforce and lack of interest in trade level jobs it is very important to offer training options through colleges. This would target younger workforce such as graduating high school students and attract them to the profession.

Incorporation of energy efficiency training into existing training programs is described as fragmented, ad hoc and uncoordinated<sup>20</sup>. The need for teachings on general building science and energy efficacy was highlighted through our survey responses. Additionally, a common complaint amongst industry players is lack of field experience and hands-on training in college programs

To be an energy auditor, one needs a diverse set of skills. These include math, English, construction, renovation, building science, general home inspection skills, etc. As such, it is suggested that a province-wide program for training auditors would prove to be beneficial.

## 7 Industry Prospects in Toronto

With termination of home energy retrofit incentives from higher levels of government the future of the home energy retrofit industry in Toronto is currently unclear. Many contractors are expecting to lay off a significant portion of their workforce. Demand for efficient heating and cooling solutions is quite minimal without incentives. As Clifford Maynes, Executive Director of Green Communities Canada stated in an interview:

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<sup>19</sup> Penney, Jennifer (2007). "Skills for energy efficient construction" Clean Air Partnership

<sup>20</sup> Penney, Jennifer (2007). "Skills for energy efficient construction" Clean Air Partnership

“At a time when we should be ramping up – like the U.S. and the U.K. – we are losing jobs and businesses in every community, including energy contractors and advisors....and we are losing the skilled workforce needed to meet targets for energy efficiency and greenhouse gas reductions.”<sup>21</sup>

In addition to lack of government incentives, industry stakeholders believe lack of consumer education and home owner knowledge is also damaging to the industry. The inevitable increases in energy costs could cost home owners much more if energy efficiency actions are not taken.

In terms of regulations, it is argued that the existing Ontario building code is not going far enough with regards to enforcing energy efficiency in new construction. As professor Pressnail from University of Toronto engineering department points out, the cost of retrofitting is far greater than the cost of building efficiently in the first place<sup>22</sup>.

## 8 Local Procurement Opportunities

**It is not within the scope of this study to identify trends in procurement of equipment and material involved in the home energy retrofit industry. There are several service delivery and procurement options in the residential home energy retrofit industry which make this type of analysis complicated. However, a list of major materials and equipment involved in the field are provided in**

Table 9 below as a guide and a first step to future effort in investigating local procurement opportunities and related employment impacts. The table also provides information about cost of the material/equipment as a percentage of total cost (total cost = labour cost + equipment/material cost).

As indicated earlier in section 4, the total cost of insulation and heating and cooling equipment replacement constitute almost 70% of cost of applying all previously listed retrofits. Therefore, local spending in insulation material (25% of total insulation cost) and efficient HVAC equipment (50% of total HVAC replacement cost) could be a large component of contributions of the industry to the local economy. Based on a preliminary inventory of local suppliers there are currently two suppliers of insulation materials in the GTA (Roxul Inc in Milton and Owen Corning Canada in Scarborough), while there are no local manufacturers of HVAC equipment located in Toronto and vicinity. Although window replacement was not one of the retrofit measures studied by this report, it is expected that local procurement of windows can also have a similar level of contribution.

*Local procurement of material and equipment required in home energy retrofits could be of significant value to empowering the local economy. It is recommended that a more extensive study on supply chain of home energy retrofit materials and equipment be conducted.*

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<sup>21</sup> Making your Home Green (2010) “Interview Opportunity – ecoENERGY shutdown is killing Ontario jobs”. Accessed through <http://ridge.ca/2011/01/interview-opportunity-ecoenergy-shutdown-is-killing-ontario-jobs-2/>

<sup>22</sup> Personal conversation.

**Table 9 - Material and equipment involved in home energy retrofits**

Material/Equipment	Percentage of total cost <sup>23</sup>
Insulating material	25%
○ Spray foam	
○ extruded polyurethane	
○ Loose-Fill	
○ Batt-Type	
HVAC equipment	50%
○ Furnace	
○ Boiler	
○ Water heater	
○ Central Air conditioner	
In-window air conditioning unit	75%
Low flow toilets	75%
Low flow shower heads	75%
Energy efficient lighting	75%
Energy efficient windows	75% <sup>24</sup>

While this study has not focused extensively on local procurement opportunities of materials involved in home energy retrofits, this area could be of significant value to empowering the local economy if Toronto is to reach its goal in improving energy efficiency of our large stock of inefficient single family homes. Therefore, it is recommended that a more extensive study on supply chain of home energy retrofit materials and equipment be conducted.

## 9 Summary of Major Findings

The following summarizes the significant findings resulting from this study based on the research, surveys and interviews conducted.

- The potential economic benefits in employment generation and local business development associated with the home energy retrofit are significant.
- City wide expansion of the Live Green Home Energy Efficiency Program, which would target 50% of the Toronto single family housing stock, would generate about 3,200 direct person-years of employment and about 4,300 indirect person years of employment.
- Almost 40% of jobs are estimated to be generated for certified insulation applicators, about one-third for general labourers and trainees and about a quarter for energy advisors.

<sup>23</sup> Sundquist, E. (2009). "Estimating jobs from building energy efficiency". Report prepare for Center on Wisconsin Strategy (University of Wisconsin-Madison) and the Powell Center for Construction and Environment (University of Florida)

<sup>24</sup> Malvern contracting, personal conversation

- The Home Energy Assistance Toronto (HEAT) program is estimated to have generated 114 direct person-years of employment and about 156 indirect person years of employment.
- Incentives paid through various levels of government for home energy retrofits in Toronto have resulted in about 7 jobs per \$1 million of government grants. The HEAT and Help program are estimated to have resulted in 4 and 6 jobs per \$1 million of City of Toronto incentives only.
- Unattractive apprenticeship salaries and poor attitude towards professions requiring physical labour are two of the major recruitment challenges faced by the home energy retrofit industry, and the construction industry as a whole.
- There is a high degree of skill transferability from general construction trade fields to the home energy retrofit field. However, there is still a need for training programs to facilitate this transfer of skills. Offering an insulation applicator training program through colleges is an example of a potential skill transfer program.
- With termination of home energy retrofit incentives from higher levels of government the future of the home energy retrofit industry in Toronto is currently unclear. The success of the Live Green Home Energy Efficiency program is vital in retaining the momentum in the industry and achieving energy efficiency in a large portion of Toronto's housing stock.
- While forming a small part of this study, local procurement of material and equipment required in home energy retrofits could be of significant value to empowering the local economy. It is recommended that a more extensive study on supply chain of home energy retrofit materials and equipment be conducted.

## Appendix A – Workforce Survey

### City of Toronto Home Energy Retrofit Industry Survey

The City of Toronto Economic Development and Culture Division along with the Toronto Environment Office are undertaking a study to identify gaps in supply of skilled labour in the home energy retrofit industry. This study will also identify gaps in university and college training program. The study will ultimately identify ways in which the City of Toronto can help promote the home energy retrofit industry in the city.

To help us reach these goals we ask that you take about 5 minutes to complete this online survey. We assure you that any information you provide is entirely confidential and the source of the data will not be reported. Only aggregate data from several sources will be analyzed.

If there are any questions or comments please feel free to call Sheyda Saneinejad at 416-397-4831 or e-mail her at [ssanein@toronto.ca](mailto:ssanein@toronto.ca).

Thank you

1. At what capacity are you involved in the home energy retrofit industry?

- Energy auditing
- Attic insulation
- Wall insulation
- Heating and cooling equipment replacement
- Low-flow toilet installation
- Draft Proofing

other (please specify)

2. If demand for your services was to double, would you have existing capacity to meet this demand or would you need to hire more staff?

3. In addition to discontinued incentives, where do you see the bottlenecks in the growth of the industry? and what could the City of Toronto do to help with the uptake of the industry?

4. What are the top 4 skill areas that are most challenging to recruit?

- Energy auditor
- Electrical/Electrical technician
- Gas fitter
- Refrigeration and air conditioning mechanics
- Plumber
- Carpenter

- General labourer
  - Foreman
  - Electrical Engineer
  - Mechanical Engineer
- other (please specify)

**5. What are the primary sources for finding labour in your field today?**

- head hunters
  - on-line postings
  - united way programs
  - high school recruitment fairs
  - OYAP
  - union calls
  - colleges
  - father and son industry,
  - inter-generational recruitment
  - engineers through universities
- other (please specify)

**6. What partnerships are working to help you recruit and/or source labour?**

- Colleges
  - co-ops
  - OYAP/YMCA
  - Friends and family
  - Unions
- other (please specify)

**7. What are the top 3-5 barriers/obstacles for recruitment and selection today in GTA?**

- Perception of the trades not viewed as a career
- Nepotism
- Low salary for apprenticeship
- Shortage of qualified engineers
- Many youth don't have the Grade 12 Physics and Math
- Non English speaking people need CIC Enhanced Language Training

other (please specify)

**8. What are the primary sources for training and development today?**

- Union training centres
- Co-op in high schools
- Universities for Engineers
- Colleges and universities for green technology
- Colleges for construction trades
- INGO associations e.g. Canada Green Building Council
- On-job / in-house training
- Government training centres
- Product manufacturers
- Industry and trade associations e.g. Toronto Construction and Mechanical Contractors, Kortrigh Centre for conservation

other (please specify)

**9. What partnerships exist in training and development?**

- Apprenticeships monitored by local Apprenticeship Councils
- Construction association and Ministry of Training, Colleges and Universities and Apprenticeship Council
- LEED training
- Home Builders Association and Carpenters Union
- Colleges of the Trades
- Co-ordination between locals and companies
- Unions working with universities and colleges

other (please specify)

**10. In your opinion, what are some of the gaps in quality and quantity of training programs available through colleges and universities?**

## Appendix B – Employment Breakdown

Phase	Job Component	Job Title	Type of work	total Hours	Full time Employees
<b>Outreach<sup>25</sup></b>					
	Neighbourhood outreach	general labourer/trainee	working with community leaders to "spread the word", door to door marketing to promote the program	1	1
<b>Planning and Design</b>					
	Energy Audits			5.5	
		Energy Advisor/Auditor	Pre inspection, Report preparation	2.5	1
		Energy Advisor/Auditor	post inspection, Report preparation	3	1
	Contract Administration			4	
		General labourer/trainee	permits and approvals, project management, etc	4	1

<sup>25</sup> Figures based on 1 full time employee for one year (1960 hours) providing outreach services for 2,500 targeted households

## Appendix B – Continued

Phase	Job Component	Job Title	Type of work	total Hours	Full Time Employees
<b>Construction / Installation</b>					
	basic draft proofing,			8	
		General labourer/trainee	draft proofing windows, doors, ceiling and basement wall penetrations	8	2
	Foundation insulation			25	
	Foundation header	Certified insulation applicator		8	2
	Foundation walls	Certified insulation applicator		16	2
		Foreman		1	1
	Roof insulation			12	
		Foreman		2	1
		General labourer/trainee		10	2
	Wall insulation			37	
		Certified insulation applicator		36	3
		Foreman		1	1
	heating equipment replacement			16	
		Trained licensed gas fitter		8	1
		General labourer/trainee		8	1
	Central air conditioning equipment replacement			6	
		HVAC Licensed technician		3	1
		General labourer/trainee		3	1
	installation of low-flow toilets			2	
		plumber		2	1
	Other conservation measures			1.5	
	Electricity efficiency	General labourer/trainee	efficient bulbs, power bars with timer, outlet covers)	0.75	1
	Other conservation measures	General labourer/trainee	Installation of other conservation products (showerheads, aerators, hot water pipe wraps, programmable thermostats)	0.75	1

## Appendix C – Program specification Assumptions

Table 10 Assumptions associated with Table 3

	ecoEnergy	HEAT only (a component of Eco-Energy)	Home Energy Help	Live Green Energy Efficiency Program (City Wide)	Live Green Energy Efficiency Program (Pilot)
<b>Target Housing stock</b>	Housing stock in Toronto	Housing stock in Toronto	Housing stock in Toronto	Housing stock in Toronto	5 neighbourhoods of 5000 households each
<b>% of targeted houses receiving energy auditing</b>	Conversation with industry stakeholders	Conversation with industry stakeholders	Conversation with industry stakeholders	Expected figures based on program design	Expected figures based on program design
<b>% of targeted houses taking part in some form of retrofit</b>	EcoEnergy stats	EcoEnergy stats	Help program Stats	Expected figures based on program design	Expected figures based on program design
<b>% Home owners doing their own contractual work</b>	Conversation with industry stakeholders	Conversation with industry stakeholders	None. All are covered by Help program	None. This service is provided through the program based on the program design	None. This service is provided through the program based on the program design
<b>% of retrofitted dwellings conducting....</b>	EcoEnergy stats	EcoEnergy stats	Help program Stats	Expected figures based on program design	Expected figures based on program design

## **Appendix D – Description of Relevant Training programs**

### **IBEX - Industrial and Building Energy eXpertise Training – Centennial College**

The Centennial Energy Institute offers a self-paced independent study program meant for internationally trained professionals, career retrainers, and technology students/graduates to develop competency in facility energy management, energy conservation and energy retrofit projects. The IBEX program which is funded by the Ontario Power Authority (OPA) and is composed of 16 on-line modules, and 6 workshops that can either be attended in person, or viewed at a later date via a video archive. The on-line modules cover topics such as fuel combustion, combustion equipment, electrical energy, heat transfer and flow, energy measurement, water efficiency, energy auditing, energy costs, rate structures and scheduling, and energy efficiency.

### **Sustainable Energy and Building Technology – Humber College**

Humber College offers a three year advanced diploma in Sustainable Energy and Building Technology. Graduates of the program will be able to assess site characteristics and client needs, provide advice on renewable energy, building design and heating/cooling system alternatives, prove energy efficiency through energy audits and energy performance simulation, cost energy systems and select appropriate suppliers and contractors. The program offers a co-op option, where students will have the chance to work as a paid employee in the energy efficiency, green building or sustainable energy industry sectors following semester four.

In addition to some general mathematics courses students take courses on construction drawings, energy metrics, electric circuits, building science, renewable energy technologies, building energy loads, green building policies and programs, project management, energy auditing, energy performance simulations, energy sales and marketing, energy system integration and community development policies.

### **Home Inspection Certificate - Humber College**

This certificate program includes 9 required courses that can be taken either on-line or in the classroom. Upon completion of the course students can inspect and report on the physical condition of the various system of the home including the roof, exterior, foundation, plumbing, electrical, heating, cooling, interiors and insulation. Successful completion of the program fulfills the academic entrance requirements of the OAH accreditation process leading toward the Registered Home Inspector (RHI) designation.

### **LEED Green Building: Core Concepts and Strategies**

This 36-hour approved course from the (CaGBC) Canada Green Building Council is offered through Humber College and George Brown College. In this course students will gain knowledge in the core concepts and strategies utilized to reduce the impact of the built environment. Learn about different types of techniques to utilize the materials and technologies involved in creating green buildings. Students will gain insight into the rating system that LEED utilizes. This is not a prep course for any of the LEED accreditation exams but it will assist with providing a solid knowledge base.

### **Building Systems Engineering Technician – Seneca College**

This two-year diploma program provides students with both theory and practice of heating, air conditioning, refrigeration, air handling, electricity and control systems. The curriculum further highlights emerging renewable energy technologies and energy efficiency principles. Students are

trained in building systems softwares and computer assisted drafting and gain practical hands-on experience in the field. Students also have the chance to earn a Seneca Certificate with the designation of Building Environmental Systems Operator Class II and/or a Seneca Certificate with the designation of Building Environmental Systems Operator Class I upon completion of a number of required courses.

There is also a co-op option that provides the chance to work as a paid employee for a period of year before completing the program.

### **Bridging to green careers – Seneca College**

This 8 month certificate program is designed to help internationally trained immigrants succeed in Canada’s environmental sector through intensive environmental training, job-specific language classes and employment counselling. The program focuses on two streams of built environment and the natural environment. Graduates of the BGC program will be able to examine building structures and systems, create operating strategies for energy demand and supply, minimize operating costs and environment/energy impacts, and work within a building sciences engineering team to achieve new levels of energy efficiency and environmental sustainability.

The following is a list of eligibility requirements:

- Be able to work in Canada
- Be a skilled immigrant living in Canada for less than five years
- Be unemployed and lacking in professional Canadian experience in your field of training
- Have a language level CLB 8+ or higher
- Have a professional and academic background in engineering or life sciences
- Have your international academic and professional credentials evaluated
- Complete an application and submit a current resume
- Attend an information session
- Successfully complete a panel interview

### **Sustainable Building Design and Construction – Fleming College**

This certificate program is a 20-week intensive, hands-on experience that puts students at the centre of the construction of a full-sized (1200-2000 square foot) and cutting-edge sustainable building. During the course of the project students take on direct responsibility for one structural, one mechanical and one administrative role. Students take courses on architecture design, mechanical and structural design and construction of sustainable buildings, and contracting and project management.

Some of the projects that past year students have worked on are habitat for humanity LEED Platinum Certified home, Camp Kawartha environment centre, and the Madoc performing arts centre

### **Sustainable Renovations - Fleming College**

This is a 15-week compressed certificate program modelled after the Sustainable Building Design and Construction program. During the course of the program, students work on a ‘real world’ renovation project involving a wide variety of sustainable systems and materials and learn the following skills:

- Assessment of existing buildings and their systems and components

- Theoretical and practical understanding of building science, and green building principles to promote a holistic understanding of the complexities and interdependence of renovation projects
- Understanding of administrative aspects such as permits and contracts, building codes, costing, incentive and rebate programs, energy assessment, urban site management and materials recycling and reuse
- Carrying out the actual construction and installation of sustainable improvements, including overseeing hiring and coordination of qualified installers
- Practicing client relations and how to be an informed advocate for green building through completing the concept for a unique renovation project with a client,
- Selection and use of sustainable renovation materials and techniques based on the principles of house-as-system, environmental and social responsibility and business profitability.

Students also take 8 core courses on topics such as administration for sustainable renovations, building structures, business development, mechanical and structural construction, and safety