Overcoming Implementation Barriers to HVAC Contractor-Led Building Retrofits

Research services
provided to HRAI

by:

Climate Action Services Incorporated
LHart@ClimateActionServices.com
416-898-0835

LETTER OF TRANSMITTAL

May 31, 2021

Ryan O'Connor
Grants Manager
The Atmospheric Fund
75 Elizabeth Street,
Toronto, ON M5G 1P

Dear Ryan:

Pursuant to our contribution agreement that enabled the funding for the research, HRAI is pleased to provide you with this Final Report on the results of our efforts towards Overcoming Implementation Barriers to HVAC-Led Building Retrofits.

Thank you for your support, and the support of TAF, on this important preliminary research.

Sincerely,

Martin Luymes

EXECUTIVE SUMMARY

HRAI recognizes that HVACR contractors need to play a more significant leading role for Canada to meet its international carbon emission reductions obligations with regard to building-generated emission targets. This research project defined offering a house-as-a-system approach, and whole home energy/carbon retrofit services as the end state expression of HVACR climate leadership. HVACR contractors have been very active in leading energy retrofit programs that aimed at reducing natural gas consumption. HRAI knows that, under the right circumstances, they could again play a leadership role in achieving carbon emission reductions targets in buildings.

In looking for barriers preventing industry from offering these services, the Research Team found few "real" or "hard" barriers, in the sense of systemic or regulatory hurdles that need to be removed for the industry to move forward. Instead, the research identified a broadly held desire, and a willingness, among business owners to do more to mitigate climate impacts. The barriers identified by the research were instead more like hesitancies resulting from a lack of in-field experience, some uncertainty over the risks involved, and an incomplete understanding of the potential benefits and opportunities from showing this leadership. The Research Team deemed these "soft barriers," in that they can be resolved by supporting the industry in ways that help increase comfort and knowledge.

This research identifies a path forward and recommends next steps, including: forming a Peer-Exchange-Process (PEP) Committee, curating existing training, creating low-risk opportunities for hands-on learning and mentoring, and some targeted initial technical support to ensure a smooth transition. The soft barriers identified should be mitigated as contractors tap into their entrepreneurial skillset to lead small and medium sized companies and, through their example, transform the industry.

1.3.3 (5) FINAL REPORT

Note to the Reader: To ensure that all deliverables were addressed, this report uses a combination of numbered headings proposed in the contribution agreement and additional headings added from the Research Team. Headings beginning with a number are contract headings. Other headings that begin with a letter and number, or with a word, were generated by the authors.

INTRODUCTION TO THE RESEARCH

This report is the result of research funding from The Atmospheric Fund (TAF) to support HRAI's interest in engaging the HVACR industry to identify ways to overcome barriers to climate leadership. This engagement explored barriers to residential home heating electrification, incentive program participation, carbon reduction calculation, hybrid systems, trade-off analysis, and taking a whole-home, or "house-as-a-system," approach to energy/carbon retrofit projects.

The underlying premise behind the research is that there is a growing need and opportunity for HVACR contractors to take more of a leadership role in residential low carbon/energy retrofits. Private sector climate leadership will be needed for Canada to meet its aggressive carbon emission reduction targets, and to ensure that this low carbon/energy retrofit work is done well, in a cost-effective manner, and with the health and comfort of home and building occupants as a priority. This approach will help prevent any unnecessary disincentives to low carbon/energy retrofits.

Why Focus on HVACR Contractors?

Ultimately this research was inspired by HRAI's desire to be a part of the solution to help stop anthropogenic climate change. The focus on the HVACR industry is a small part of what must be a much larger solution, but HVACR contractors are vital players in the mitigation effort.

HVACR technicians are trusted experts, invited into homes and buildings by owners and operators, and entrusted to advise, install, repair, and maintain systems that provide occupant comfort and health. In theory, contractors could build on this trust relationship to promote a broader range of home/building retrofits (e.g. envelope improvements) than they currently offer. It does not require much of a logical leap for HVACR contractors to expand their concern for occupant health and comfort within a building to include larger climate health and global comfort issues around carbon emission reductions, as they are impacted by the building.

Contractors have been hesitant to reconfigure their businesses in ways that would enable them to expand their service offerings to focus on low carbon/energy retrofits. This research project engaged contractors, in a variety of ways, to identify the barriers (real or perceived) that contribute to this hesitancy, and to develop strategies for overcoming those barriers.

Less than a decade ago, HVACR contractors were the leaders driving energy efficiency retrofits in homes, as they championed the transition from mid- to high-efficiency furnaces and power vented hot water tanks. However, as action to address climate change has ramped up, contractors have not come along as quickly to this transition. HRAI knows that HVACR contractors could again take a leadership role and drive the uptake of whole deep carbon/energy retrofits. The importance of HVACR contractors in effecting carbon emission reductions targets in buildings is hard to overstate. Moving the industry from passengers to drivers of deep energy/carbon retrofits is the ultimate goal. Why it has not happened already? The question explored by this research is: What is holding contractors back and preventing them from moving forward as climate leaders?

The research affirmed that, with a few notable exceptions, HVACR contractors have yet to embrace anything close to their full potential as Climate Leaders in enhancing building performance.

About the Research Team

Founded in 1968, the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) is a non-profit national trade association of manufacturers, wholesalers and contractors in the Canadian heating, ventilation, air conditioning and refrigeration (HVACR) industries.

HRAI advocates a safe, responsible and fair industry where indoor environment systems and refrigeration processes are designed, installed and serviced by qualified professionals in order to ensure efficient and energy-conscious operation. The association's activities are directly related to the needs and requests of its membership and include education and training programs, industry meetings, up-to-date industry information, technical support, government and industry advocacy, statistics and trends, and a biennial national trade show.

On a consumer level, HRAI contractor member companies are required to provide and maintain insurance coverage, valid trade certificates and licenses, and must sign and agree to conform with the HRAI Member Code of Ethics. In choosing an HRAI member contractor to maintain your home or business's indoor environment, you can be assured of their proven credentials, and a track record of reliability and quality.

Three HRAI staff provided the bulk of the support for this project: the VP of Government and Stakeholder Relations, who was the project sponsor; the Director of Business Development, and the Business Development Coordinator, who were very hands-on with all aspects of the research. Some episodic support was also given by the IT and Communications departments for engagement support.

To facilitate and undertake this research, HRAI has engaged Climate Action Services Incorporated (CASI) to lead much of the research effort. CASI is a Toronto-based organization established in 2017 to support and operationalize a wide variety of decarbonization activities. CASI specializes in program design, research, program management, small scale renewable energy systems, and residential and commercial engagement strategies.

CASI provided strategy, research, engagement and facilitation services to HRAI for this research project, and is the primary author of this report. CASI is a trusted partner to HRAI, and that relationship is grounded in a shared sense of priorities for moving carbon reduction strategies into the mainstream, and a common belief in the industry's ability to lead this transformation.

Research Context

This research work was undertaken with a particular line of inquiry in mind: What are the barriers inhibiting the HVACR industry from taking a leadership role in supporting governments (at all levels), utilities, and other stakeholders in operationalizing changes to meet the carbon reductions targets set out for residential homes (Ontario Building Code (OBC) Part 9 buildings)? Can these barriers be overcome? And how can HRAI help to move the industry forward?

Underpinning this line of inquiry are six assumptions that HRAI generally holds to be true:

1) HRAI members have families and loved ones, like anyone else, and they care about climate change and are interested in being part of the solution, because they know that we cannot continue to indulge the consequences of burning fossil fuels.
2) Carbon reduction targets are beneficial to the HVACR industry, and although they may require contractors to adapt their business strategies, they offer an opportunity that is unprecedented.
3) Among the current team of trades and industry professionals involved in any given deep residential energy retrofit project, HVACR technicians are uniquely skilled in home-comfort analysis, and in assessing the interactive effects of the different components of house systems upon one another. These are the same elements that interact to create home comfort.

4) Engineers, architects, or general contractors are likely to be a cost-prohibitive addition to most residential deep energy retrofit projects, whereas HVACR trades are already involved and are the lowest cost, most effective project leadership option.

5) Carbon emission reductions cannot be achieved through top-down targets and programs alone; ground-up entrepreneurial ideation is required to identify solutions and opportunities that will transform the market. Engagement of key service sectors, like HVACR contractors, is essential to meeting Canada's emission commitments.

6) Finally, and perhaps most importantly, taking a house-as-a-system approach to HVACR retrofits is beneficial to both the quality of the service rendered and to the comfort and satisfaction of customers.

These assumptions have been treated as axioms to inform the research direction and structure the engagement with HRAI members. This report simply acknowledges them, but does not try to debate their specifics, as the point of this research is to identify and suggest ways to overcome barriers to operationalizing carbon retrofit action.

METHODOLOGY

In addition to the project sponsor, HRAI provided two staff to oversee and support this research project. They also engaged CASI as an external consultant to lead participant engagement, survey design and evaluation, group session facilitation, and report writing. The collaboration was quite successful, but it should be noted that both groups contributed well beyond their predicted resource time without impacting the project budget. It is estimated that an additional 40% of the budget was in-kind contributions of time, contributed by HRAI staff, and time generously given by participants in the various engagement activities. Not only does this speak to the high-value that TAF realized for its funding contribution, but it is further indication of the enthusiasm and excitement of all those involved for the potential that this research has to transform the marketplace.

While the research can be notionally broken into two phases — Barrier Identification and Solution Ideation — the methodologies undertaken are reasonably grouped into the following four distinct activities.

Activity 1: One-on-One Interviews

After developing a first draft of the questions for the Membership Survey, in consultation with CASI and HRAI industry experts, the Research Team conducted a series of 12 one-on-one interviews with selected industry representatives to get a sense of whether the overall direction

of the survey was on target, whether there were issues that were missed, whether the right priority had been placed on each line of inquiry, and in order to gauge the tolerance level that potential survey participants would have to complete the questions. From these interviews the survey questions were revised significantly and a small incentive was added to encourage participation. Additional interviews with industry stakeholders and potential funders (including Municipalities and Manufacturers) were also undertaken to help establish opportunities for any next phases to follow this research project. Enbridge Gas staff were also interviewed to understand their best practice learnings from previous and current whole home programming efforts.

Activity 2: Membership Survey

The membership survey was uploaded into the Survey Monkey software that HRAI uses for its survey work. The survey responses were anonymized, but the act of completing the survey was tracked for gift card fulfillment (each survey participant received a $10 Gift Card redeemable at Tim Hortons Inc.). A total of twenty-nine (29) questions were developed that ranged from scoping questions to drill-downs into service offerings. The survey was sent to members on March 15th, 2021, and closed on April 5th, 2021. HRAI sent out six reminders while the survey was open. There were 98 members who provided at least one answer, and 78 who completed the entire survey. Once the survey closed, HRAI sent 78 gift cards out to participants.

Activity 3: Focus Group Sessions

Three focus group sessions were held to explore and refine the results from the surveys. They were virtual sessions lasting an hour and a half, held on April 15th, April 27th, and April 28th, 2021.

The facilitated sessions were structured by a slide presentation that presented key survey findings and then probed the focus group for thoughts and interpretations. The Focus Groups had 40 attendees in addition to the facilitator.

Activity 4: Ideation Workshops

The workshop sessions were held right after the Focus Groups, with a 15-minute health break between the two sessions. They varied from one to two hours long and involved the same attendees as the Focus Groups, 40 in total. These sessions were also facilitated, but were set up as a group discussion, without a slide presentation to focus on, so that attendees could see and interact with each other. The facilitator encouraged responses from all attendees and let the conversation flow where possible.

1.3.1 - LESSONS AND BEST PRACTICES FROM LEADING HVAC INDUSTRY PROVIDERS OF WHOLE-HOME RETROFIT SERVICES IN OTHER JURISDICTIONS

Examples of true whole-home retrofit leadership in the HVACR industry are not common even in other jurisdictions. The Research Team was able to interview two such leaders, one from the Maritime region in Canada and the other from the Northeastern United States.

The Maritime Contractor was very gracious in sharing his thoughts and business strategy. The founder is a former Energy Auditor who transitioned into HVACR and then expanded into whole home services including insulation, windows, doors and draft proofing. They see their business as "House Doctors" providing skilled diagnostics and suggesting the best solution, rather than simply doing whatever the customer asks for. They use software modelling to do heat loss calculations and energy savings estimates. In many of the Maritime jurisdictions, the company installs cold climate air-sourced heat pumps, replacing oil or propane furnaces.

When the company undertakes a fuel switching project, they begin with a heat loss calculation in HOT2000 and look for opportunities to lower the heating load by upgrading insulation, windows, doors or air tightness. By modelling a baseline and several upgrade scenarios they can reduce the sizing of the heat pump to suit the smaller load. As they offer all these services, they then do a cost/benefit analysis to help the customer understand the upfront and long-term savings involved. In several provinces they also help the customer participate in provincial carbon reduction program incentives and factor these incentives into the cost/benefit analysis.

This Maritime Contractor has seen rapid growth (from a just a few to over 150 employees) in the last few years and is looking to expand to Quebec, BC and Ontario. They attributed the challenge in the industry to most HVACR companies offering only one or two services, which means that homeowners are presented with a one-size-fits-all solution to all their problems. This can temper homeowners' desire for, or contribute to their confusion over, deep energy/carbon retrofits and dissuade them from deeper carbon/energy reduction solutions. Their tack is providing unbiased energy efficiency recommendations, and offering the entire range of home efficiency upgrades, thereby eliminating any and all conflicts of interest.

While the model of the Maritime Contractor clearly informs the potential for success of this research, it should be noted that they too have had challenges with finding staff trained in house-as-a-system analytics and competing with commercial firms for Red Seal refrigeration techs, for example, because such certificate holders are few in number and over-qualified for residential project.

The Northeastern US contractor has a strong online presence and uses apps and social media to find customers. They specialize in whole home analytics and diagnostics, assessing indoor air quality, duct leakage, and back drafting levels. They do not focus on carbon, but take a very robust approach to home energy performance following NCI Certification standards. Below is a quote from the NCI website:

> National Comfort Institute, Inc. (NCI) is an organization that provides heating, air conditioning, plumbing and electrical contractors with unique business management, sales, marketing and technical tools, training, support and coaching [….] NCI coined the phrase "Performance-Based Contracting" which describes a unique approach that originated with delivering measured performance in HVAC systems to consumers. This term was later expanded to further describe how contractors manage their businesses through accountability and measurable results. Performance-Based Contracting™ is as much about changing a company's culture as it is proving that you did what you said you were going to do. [nationalcomfortinstitute.com/pro/index.cfm?pid=1014]

The Northeastern US contractor has embraced the NCI model and augmented it with virtual tools such as apps for homeowners. This best practice model is of interest to HRAI going forward, as the idea of certification did get some support in the Workshops, and the need for project management training and support was mentioned on several occasions.

1.3.1 - ANALYSIS OF POTENTIAL ECONOMIC BENEFITS FOR HVAC INDUSTRY PROVIDERS OF WHOLE-HOME RETROFIT SERVICES

The ultimate trajectory of the industry is clear; the only debate left is over the timing. The de-carbonization of home comfort is coming. Up until now the timeline for this change has been very dependent on the government of the day, even with international commitment to reduce emissions. However, in recent years a coalescence of opinion (both domestically in voter and internationally in world governments) has developed that will make it difficult for governments to back away from their international commitment on carbon emission.

For governments in Canada, at all levels, to set significant carbon emission reduction targets is a tremendous accomplishment in the fight to mitigate Climate Change. However, this commitment must be buttressed on all sides by those who will be charged with actually doing the work. HVACR technicians, sales agents, wholesalers, distributors, and manufacturers need to support the realization of these targets. Too often stories have surfaced of homeowners keen to move forward with low carbon/energy retrofits or incentive program enrolment, only to be

talked out of it by the contractor, who only wants to sell the stock they have and not venture into new services. The HVACR industry should be a positive driver, actively educating and inspiring homeowners to make low carbon/energy retrofit choices. They should be introducing and facilitating incentive program participation, and offering customers better low carbon/energy solutions.

For those contractors that understand the timing is now right, and become Climate Champions, the opportunity to grow their service offerings, tap into the momentum that incentives bring, and attract younger skilled trades to their business is not something this research can quantify, but it looks to be very substantial.

1.3.1 - IDENTIFICATION OF EXISTING BARRIERS TO HVAC INDUSTRY PROVIDERS OF WHOLE-HOME RETROFIT SERVICES

Introduction

One of the clear advantages of this research project has been the amount and variety of interactions with, and input from, members of the HVACR sector. The Research Team was able to engage approximately 150 HRAI members via surveys, interviews, workshops, and focus group sessions. While there was naturally some overlap between these sessions, the Research Team is confident that a statistically-significant representative portion of HRAI members were engaged in this research. This gives considerable confidence to the findings. It also reaffirms the value of working with an industry association, because of the reach it has and the trust it has built up.

A large and diverse association of members, like HRAI has, will typically provide a plurality of opinion, but the Research Team feels confident that the information gathered and the insights gained are representative of membership opinion.

The tremendous generosity of participants, in giving their time and their insights, is something the Research Team greatly appreciated, and it is also indicative of members' interest in the subject matter. If the success or failure of the research was based on the engagement of the industry alone, then this should be considered a very fruitful endeavour. However, the research did yield some surprising and nuanced insights into the barriers holding the industry back.

Looking for Barriers

The Research Team relied upon multiple sources to identify and refine the perceived barriers that the HVACR industry feels are inhibiting them from offering a wider array of energy retrofit services to residential and small commercial customers. This included initial discussions with industry experts, interviews with a dozen leading HVACR contractors, a survey of members, three focus group sessions, and three ideation Workshop sessions. The research drew on the insights and assessment of industry experts who identified several themes for investigation. Implicit in the approach to this research was the understanding that HVACR tradespersons are trusted experts, invited into homes and buildings by owners and operators and entrusted to install, maintain, and configure mechanical systems. In theory, these contractors could build on that trust relationship to educate and inform homeowners on a broader range of home/building retrofits (e.g. electrification of heating and the impact of envelope improvements on energy and comfort). This research started with the premise that in order to meet substantial carbon reduction targets, governments need to have Climate Champions within the building service industry to enhance occupant comfort, improve energy performance, and reduce carbon emissions. The research focus was on what barriers have inhibited HVACR contractors from becoming Climate Champions.

Discussions with Industry Experts

The Research Team initially looked to industry experts to identify some likely barriers and help form a set of working postulates to inform the development of research questions and probes. Some of the initial barriers identified were:

i. An apparent industry-wide caution or conservatism in their approach to significant change or a lack of openness to innovation in the way they do business.

It was postulated that this might be linked to the apprentice learning approach that is fundamental to the trades, or perhaps as a result of the strong market growth over the past two decades. There is little motivation to change what is working well.

It was later shown that there was some caution in the industry, but not complacency towards innovation. The apprenticeship learning strategy did come up on multiple occasions as a solution to industry caution, rather than a barrier. Comfort levels with regard to whole home energy retrofits were generally low across the industry, and few technicians have had much experience with such projects. This is the source of much of the caution, and also a clear path forward to get more contractors engaged. Learning by doing in a supported, and low risk

environment, is what contractors identified as the best way to improve comfort levels around whole home energy retrofits.

ii. Since most contractors are small to medium sized business that make their living installing natural gas appliances, there was the general assumption that they would have a lower level of environmental or "green" sympathy, and might even be climate change skeptics or simply not convinced of the benefits of low carbon or energy saving options.

It was postulated that this antipathy towards climate issues might manifest itself in more subtle or passive ways, rather than any active climate denial position – something along the lines of "well customers don't really ask about it, so I don't offer it," or more devastatingly they actually are not convinced of the rationale for the upgrade and dissuade customers who are interested with "no you don't need that, it doesn't do much good, it's all just marketing."

The surveys did not bear this out and, in fact, they revealed an openness toward moving the industry to take greater leadership on climate change mitigation and to discuss energy efficiency and fuel switching options with customers. Survey respondents were strongly in favour of energy efficiency and the benefits it brings, but were more or less split on the issue of carbon mitigation. The Focus Groups showed that this is likely due to a lack of knowledge, comfort, and experience with carbon issues. There is still a reluctance on the part of HVACR contractors due to their lack of experience in discussing and implementing carbon reduction solutions.

The Focus Groups clearly showed that this was not due to being climate change skeptics, but to inexperience with the subject matter.

iii. Regulation and government paperwork was identified as a potential cause for resistance to governmental involvement. Whether it is carbon taxes, regulatory standards, or market skewing programs, the Team suspected that the industry might feel that encouraging government involvement in the industry would not be not desirable.

While it seems obvious that most HVAC trades would welcome government incentives, it was postulated that some previous government programs were paperwork-heavy and clumsily planned, without industry input, and had incentive levels that skewed the market into a boom/bust cycle that hurt many businesses in the long run. It was postulated that an administrative or regulatory weariness might manifest itself as general pessimism toward innovation and risk and a feeling of disempowerment to make big changes.

The survey results show a distinct preference for incentive programs, and while carbon taxes scored much lower, it was revealed in the Focus Groups that this is more about the negative connotation of taxation than about seeing it as a negative solution to move the market. HVACR contractors clearly welcome incentive programs that help move the market, but as the Focus Groups showed, they do assess the cost vs benefits of program participation. If the benefit to them and their customers is too low, as compared to the administrative effort, then they avoid participation. Likewise, very high incentives can cause problems with opportunistic new entrants into the sector, who do not have the experience or quality control of established HRAI members.

Contractors also mentioned the challenges of keeping up with all the program changes, regional differences, and administrative rules that apply to customers. Some contractors work across the province or even the country and have dozens of programs that impact their business. Some support with organizing and accessing programs and program rules was generally desired. And while many contractors preferred to not have to do the paperwork at all, most focused on the uncertainty of "stacked" (or multiple measure) incentives, the paperwork delays, and the customer complaints about the programs as their main challenges. In the GTHA, in particular, the IESO programs were cited for their delays and paperwork burden, and the Enbridge/Union Gas programs for their incentive uncertainty.

iv. Industry training was also expected to be a potential barrier, in that few options appear to be available, and most of the house-as-a-system training outside the HVACR trade, was typically not tailored to the needs of HVACR technicians, making the learning curve steeper.

It was confirmed that HVACR trades rely heavily on free manufacturers' training sessions to keep staff up to date on new practices and new technologies. This is a systemic barrier to big picture house-as-a-system, or integrated energy design training because the manufacturer only sells items with a narrow category of upgrades. Several participants confirmed that there are few house-as-a-system, or integrated energy/carbon design training sessions for HVAC trades available in the market, outside of HRAI training which is mainly aimed at new home system design. It was postulated that even if more training was made more widely available through NRCan or some other group, the fit might still be problematic, unless courses like "building envelope upgrades for HVACR contractors" were offered. Several focus group participants noted that the fit issue might be overcome with a mandatory training for program participation. The idea of curated training was introduced at the Focus Groups and it generated interest.

The surveys showed that access to training and trained workers, and the cost of training were moderate barriers to moving the industry forward. The Focus Groups revealed that broader

envelope and carbon training is available, but that it is not well suited to HVACR technicians' interests, needs, or learning styles. There was some interest in a certification program for those who did take broader training, but it was mixed. Further exploration of both curated training and certification interest is clearly necessary. Courses on project management, carbon calculations, envelop upgrades and design trade off calculations were all identified as desirable options.

One-on-One Interviews

Prior to finalizing the survey questions, the Research Team conducted a dozen one-on-one interviews with HRAI members to help vet some of the barrier research assumptions that underpinned the survey draft design. This was a very useful exercise that is recommended as a best practice for survey development. It helped confirm and refine many of the barriers postulated by the experts, as well as identify new areas of inquiry, and began the discussion of solutions to those barriers.

It is noteworthy that a surprising numbers of those interviewed stated that their companies were already offering broader services to customers to improve energy savings. On closer examination, it turned out that the offerings were in fact quite limited but interviewees felt that they were offering added value, and wanted to do so. This speaks to the way that the industry sees itself. Simply put, the industry generally assumes that it has only a limited role in whole home energy retrofits, and considers offering a referral to a window or insulation company, or doing a new heat loss calculation, to be extending beyond that role. Clearly some expectation expansion is needed, as the potential for HVACR contractors to do more is much larger.

How to expand these expectations was a topic that came up in the Workshops, and most of the responses centered on training, but a few also mentioned creating a low-risk, learning-by-doing learning environment where new services could be explored and capacity developed. One participant referred to this as "guided discovery." Having a "space" to test new services with both technical and process support, was an important preliminary finding, and one that strongly influenced the team's thinking about what the next phase of this work should entail.

The following barrier discussions came out in the interviews:

a) **The issue of quality control and service warranties was identified as a barrier to subcontracting building envelope trades for a whole home energy retrofit job. Given that much of the warranty work that HVACR trades do is internally covered at their own cost, they do not want to be "on the hook" for someone else's work.**

Most members interviewed have loose referral relationships with one or more companies in other trade sectors in order to offer customers more of a one stop shop experience for their renovation needs. This arms-length relationship shifts responsibility, and reinforces the reluctance to subcontract work that is not considered core to their business. Because the trades that they refer do not have the capacity to install natural gas furnaces, few interviewees saw this hands-off approach as a potential point where they might lose the sale.

Some of the interviewees who had participated in the Enbridge/Union Gas program noted that it requires multiple upgrades across traditional trade service lines, and, since this program pays for an energy auditor to work with homeowners (after the fact and not 100% of the costs), they felt that the program currently offered very little incentive for HVACR trades to expand their service offerings.

A network of trusted affiliates is currently the most common service expansion offering that those interviewed would offer — although it was interesting to note that the rationale of offering customers a one stop shop did drive several to expand into electrical and plumbing services. Depending on your perspective, simple referrals does not seem to be a service expansion or a one-stop shop solution, but simply a shifting of responsibility back onto the homeowner. This apparent disconnect did impact the survey design, which drilled down into which service offerings were done in-house, outsourced, or simply not offered.

The survey showed a variety of approaches taken to offering augmented service options, but that those are rarely offered in-house, were those that would be seen as whole-home upgrades: solar, windows and doors, insulation, and home energy modelling. The result was Question 6: "Does your company currently offer any of the following services or products?" Options included several whole home services, but also other services like oil furnace replacement.

b) Investment start-up and ongoing operating costs for new business lines was a mixed topic that arose on several occasions.

Contrary to the idea that the industry might be complacent because of the historical boom market, a small number of interviewees from larger, province-wide, companies pointed out that their companies are now owned by external investors who have high growth expectations. This has led them to expand into either electrical and/or plumbing services. Interestingly none had even considered expanding into insulation and/or other envelope improvements. Despite praising the benefits of being a one-stop-shop for customers, none of those interviewed had extended this to building envelope upgrades. This may be due to an industry culture bias, in that these services are not seen as a "natural" expansion of their current services, from a trade or technician perspective. This is clearly an issue of perspective, because from a comfort, energy,

and climate change mitigation perspective envelope upgrades are the most natural extension of HVACR services.

The issue of a reluctance to invest in new equipment and new staff was divided, perhaps based on the size of the respondent. Larger companies' relative ease with capital investment contrasted with smaller companies' reluctance to invest capital or take on the "hassle" of more staff. Larger companies were actively trying to meet double digit growth targets and had resources to fund most capital investments. This informed the survey design, which drilled down into the issue of capital investment as a barrier to see if this divide was more universal. It should be noted that the surveys did not show access to capital as a significant barrier in general, but that smaller companies did show a larger concern about access to capital.

c) A reluctance to add an integrated system design, heat loss calculations, and Whole Home retrofits was discussed by several interviewees.

The Research Team started from the working assumption that heat loss calculations are rare for most furnace replacements, especially in emergency heat out situations. A few of the interviewees said they did cursory thumbnail sketch calculations, but did not look at the impact of envelope improvements on the sizing requirement. Interestingly, those who offered technology switches, to heat pumps for example, found that it was necessary to do integrated heat loss design calculations, and even duct depressurization and duct sizing calculations, for these projects. Two of the interviewees would make envelope upgrade suggestions, but not include this as a service they would offer, so it is hard to see how this might impact reducing the sizing of the equipment. This is close to a best practice, but ultimately one could be much more effectively implemented.

The surveys showed that 56% of respondents did heat loss calculation using their own staff resources, 31% outsourced the service, and only 12% did not offer it at all. Compare this to what is seen as a common added value service for HVACR contractors — plumbing work. Here only 30% did the work in house, 45% outsourced it, and 25% did not offer it at all. In all, the most outsourced services were Blower Door Depressurization Testing (60%), Windows and Doors (49%), Solar (49%), and Lighting upgrades (41%), and most did not even offer these services at all. The most frequently outsourced and least frequently in-housed services, after Blower Door Depressurization Testing, were the services we most commonly associate with whole-home retrofits: Insulations (48% / 13%), Windows and Doors (48% / 3%), Lighting (44% / 15%), and Solar (40% / 11%).

The questions as to why was later put to the Focus Groups and they generally said that they or their staff knew how to do heat loss calculations, but that it was "not required" for most jobs.

Further prompting showed that while familiar with a house-as-a-system approach, their comfort level with the subject matter was more theoretical, and had not been operationalized.

d) Contractors that refer Energy Auditors

Some interviewees noted that they had past or current relationships with independent energy auditors, whom they would call in to support a retrofit project for a customer who wanted deeper energy savings. This approach protects the contractor from perceptions about conflicts of interest, which has been an issue in the past for NRCan, as the certifier and overseer of Energy Auditors and Service Organizations. None of the HVAC contractors we spoke to had Certified Energy Auditors on staff, although two had ex-auditors doing sales. In the past, the expectation of a separation between evaluators and HVAC (or other) contractors may have been a barrier to broadening services, but it is clear that the energy evaluation business has been rather anemic, even dormant since the Eco-Energy grants program ended a decade ago. Some auditors moved into home inspection, others found work doing audits for the IESO Home Assistance Programs but, in general, the number of certified agents has declined dramatically. With a new federal audit program, a lot of time and money will be spent rebuilding this industry.

One of the original assumptions of this project was that HVACR contractors already had some of the needed trustworthiness and expertise to do this work in house, and so it might make sense to invest in them rather than working to rebuild an industry that is so heavily reliant on government funding. Such an approach would require clear, enforceable guidelines and conceivably, these rules may be a barrier. Survey questions to probe this potential opportunity were devised (e.g. asking about who was best to champion deep energy/carbon home retrofits).

In the Focus Groups we asked how easy it was to work with auditors, and if they helped to drive business or were more like program gatekeepers, and the response was fairly positive, as several contractors had found an Energy Auditing company that they could work with successsfully.

e) Awareness and education of building owners was a topic frequently raised

Whether HGTV's focus on paint, tiles and backsplash is to blame or the general misinformation that solar panels or light bulbs will get you bigger energy savings than HVAC, most interviewees noted that the market is not well educated on energy performance issues. This observation influenced more than one survey question that probed into whether consumer interest or education was a barrier.

f) Comfort with the topic of energy efficiency/carbon reduction

It was noted by a couple of interviewees that they were not up-to-speed with the topic of a "house-as-a-system" analysis to maximize energy savings. One interviewee suggested that the average age of industry technicians is well over 50, and that these persons' interests and abilities to learn new things may not be as high as with some younger trades. Clearly it runs both ways, in that many younger people may want to be more involved in climate solutions and therefore less likely to stream into the HVACR trades as currently perceived. One interviewee thought it would be a strong recruitment and retention strategy for the industry to take more of a leadership stance when it comes to energy and carbon issues. HVACR tradespersons can be more like HVACR "doctors" for their clients, as most homeowners have little understanding of the subject and, because the tech is trusted and knowledgeable, people are inclined to follow their advice. As even one progressive interviewee put it: "it's easier to stick to what you know."

Conversely, it seems that tradespersons do not want to appear uninformed or uncertain on topics where they are not the experts, so they may avoid integrated energy solution discussion simply due to a lack of familiarity and comfort. This puts a new spin on the idea that HVACR contractors talk their clients out of energy upgrades because they think it's not wise or a bad investment; it might just be because they don't want to appear unknowledgeable. Other than two ground source heat pump installers, many of the interviewees seem to be negative about electrification options and were getting mixed information on it. Some thought that hybrid systems were necessary and others thought the fuel costs made it a non-starter. In the survey, age and openness to change are directly sought to allow the Research Team to get insights into attitude stratification.

g) Sales constraints and heat out emergencies

A couple of interviewees noted that the integrated design conversation would best fit as part of the sales cycle for new clients (as opposed to the maintenance visits for existing ones), but that this was not a skill set or knowledge base that most sales agents possess. They also noted, that in situations where the heat is out during the winter, there is a real time constraint to adding additional analysis into to the sales cycle. With a bit of probing, it seems clear that other upgrades such as HEPA filters or HRVs can be sold under these conditions, but one hard barrier was identified: contractors cannot ethically install an undersized furnace on the promise of envelope improvements, because they would be liable if the improvement were not made and the system failed. In a time-sensitive replacement, such as a no heat situation, it is clear that there will not be time to wait for envelope improvement renovations before fixing the heating appliance. Perhaps putting a heating system with sizing flexibility (like a dual-stage furnace or

heat pumps) could be an option, but it seems that this is a scenario where the barriers might be insurmountable. It should be noted that a "House Doctor" does have appeal to contractors, as does the issue of one-stop-shopping, so this may be an opportunity for further exploration.

Speed of sale and speed of transaction seemed to be dominant themes for larger HVACR contractors in the residential space. Commercial sales can be longer term efforts, but much of the residential sale is "get in, get out, get paid." Having said that, the contractors interviewed were not part of the "race to the bottom" part of the industry.

Some interviewees mentioned that they had trouble seeing how additional analytics would be paid for by the customer and worried it would simply be a cost to them. Interestingly, this fits with a minor theme that could be summed as "what's in it for me?" As some interviewees said, the government should pay them to do this, or have it become a requirement of a rebate program. Some interviewees noted that many in the industry dissuade customers from participating in certain programs (e.g. recent Enbridge programs) simply because the HVACR contractor gets too little incremental benefit out of the transaction to cover the cost of the paperwork that falls on the contractor to complete.

h) In expectation of government action, some contractors may be hesitant to be "too early" adopters

It is clear that there may be a *race to be second*, so to speak, when it comes to deep retrofits and integrated building systems analysis. There is less risk in being later to the table, and yet virtually all the benefits remain. Contractors have also been burned by adapting quickly to past government and utility programs, preparing for programs by investing in products and people only to see those investments unrewarded. One interviewee, who had interest in offering deeper retrofit solutions (mostly systems analysis and advice rather than whole home retrofit services), flatly acknowledged that their company will wait for rebates to begin before acting on these interests. Carbon tax pricing, fuel switching incentives, or even rebate programs would all be the tipping point for action for this interviewee. It was also noted by some that the contractor support networks that the gas and electric utilities developed in the past are now mostly dead or unsupported; this too is a consequence of programs ending.

i) The supply and distribution chains for HVACR equipment were noted to be quite different from those for insulation and doors and windows.

One interviewee noted that window manufacturers have their "guys" who only sell their windows. While this is also true of some furnace manufacturers, the distribution intermediates are not there. The same is true for insulation. If HVACR trades have to go to big box retailers

for their envelope supplies to maintain the freedom of product offering, then they will likely not be price competitive. This is clearly the level of barrier detail that requires further investigation.

SURVEYS AND FOCUS GROUP CLARIFICATION

The survey results generally showed few, if any, hard barriers that are preventing HVACR contractors from providing whole home energy/carbon retrofit services and house-as-a-system analysis.

Q1: Please indicate your level of agreement with the following statements.

Answered: 83 Skipped: 1

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE OR DISAGREE	AGREE	STRONGLY AGREE	TOTAL	WEIGHTED AVERAGE
I am optimistic about the future of the HVACR industry.	2.41% 2	7.23% 6	8.43% 7	50.60% 42	31.33% 26	83	75.01
The HVACR industry should take a leadership role in reducing carbon emissions in Canada.	1.20% 1	1.20% 1	14.46% 12	51.81% 43	31.33% 26	83	77.41
Providing building envelope services (insulation, windows, etc.) is a logical extension of traditional HVACR services.	4.82% 4	21.69% 18	33.73% 28	26.51% 22	13.25% 11	83	55.34
An HVACR company that offers envelope improvements (insulation, windows, etc.) would have a competitive advantage in our market over one that does not.	3.61% 3	20.48% 17	31.33% 26	33.73% 28	10.84% 9	83	56.86

Question 1 was positioned as a scoping question to identify pre-held opinions or biases of respondents with regard to the overall goal of this research, in order to understand in advance the challenges that might appear in the project. Four out of five HVACR contractors surveyed were optimistic about their industry's role in carbon mitigation; additionally, most contractors were optimistic about the future of the industry. This is a remarkable affirmation that goals that

the research intends to support are valid. However, responses were much more evenly divided on including building measures as an extension to current service offerings.

This seeming contradiction can either be seen as lack of understanding of the issues involved in climate leadership, or as an indication that the industry sees climate leadership as largely being restricted to HVACR efficiency upgrades and perhaps some augmented advice to customers. The argument made in this research is that low carbon/energy retrofits require whole home upgrades, and a systems approach to them. It is hard to see how the HVACR industry can play anything close to a leadership role if it continues to swap like-for-like furnaces with slightly higher efficiency ratings.

It seems an obvious point, but it should be noted that when respondents say the industry should take more of a leadership role on carbon emission reductions, the focus group noted this is partially saying someone else should do it, but also saying my business is interested in it as an opportunity.

Q2: What impact do you think the following will have on the Canadian HVACR industry over the next 5 years?

Answered: 83 Skipped: 1

	HIGHLY NEGATIVE	NEGATIVE	NO IMPACT	POSITIVE	HIGHLY POSITIVE	I DON'T KNOW	TOTAL	WEIGHTED AVERAGE
Federal "price on carbon" (carbon tax)	10.84% 9	28.92% 24	13.25% 11	20.48% 17	14.46% 12	12.05% 10	83	49.62
Incentive programs (utility, government)	0.00% 0	6.02% 5	4.82% 4	42.17% 35	44.58% 37	2.41% 2	83	81.64
Electrification of home heating systems	4.82% 4	21.69% 18	12.05% 10	32.53% 27	21.69% 18	7.23% 6	83	61.83

This question was to look for attitudes of HVACR contractors towards common program and policy directives. The split response to carbon taxes is seen elsewhere, and might be a reaction to taxation in general, but the positive response to incentive programs fits well with the current federal approach to deep energy retrofits. More challenging to interpret is why electrification had more or less neutral response. For those few respondents outside of Ontario who have electricity that is generated from high carbon emitting sources, this could be seen as a reasonable response, but as most responses were from Ontario, a province with a relatively clean electrical grid, other factors must be at play.

There have been some misleading reports in the view of the Research Team, that have raised the spectre that it would overwhelm the grid if everyone were to switch to electric heat. This topic also came up in the Focus Groups. These reports seem to have failed to take into account load shifting and energy conservation efforts that naturally come with fuel switching. The cost of electric heating has long been an issue for residential homes and it will drive efficiency. In fact, in Ontario the building code requires higher insulation levels in electrically heated homes, not for the sake of the grid, but to mitigate the higher cost of electricity per thermal unit of energy.

As was noted by a Manufacturer Representative in the Focus Groups sessions, cold climate heat pump technology improvements have reduced the cost gap between electric and natural gas heating significantly, and carbon tariffs on natural gas are ramping up and will become an additional levelling tool.

In the end, the responses to Q2, much like Q1, show that additional education is required to improve the understanding of these big picture issues.

Q3: How open is your company to change? Please use the slider to indicate your response between 1 (Not at All Open to Change) and 100 (Very Open to Change).

Answered: 50 Skipped: 34

ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
	79	3,951	50
Total Respondents: 50			

This question was meant to assess respondents' level of conservatism, or their self-perceived resistance to change. The answers show that respondents' self-perception is fairly progressive and open to change. This bodes well for the goal of the research. The high number of questions skipped may mean that this question is not well suited to the audience, so some caution should be given to putting weight behind it.

Q4: My company currently uses the following strategy to be more competitive.

Answered: 80 Skipped: 4

	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS	TOTAL	WEIGHTED AVERAGE
Acquiring new businesses	12.50% 10	27.50% 22	25.00% 20	20.00% 16	15.00% 12	80	49.35
Cultivating a growth mindset	0.00% 0	7.59% 6	21.52% 17	41.77% 33	29.11% 23	79	72.81
Sourcing skilled workers	0.00% 0	1.25% 1	20.00% 16	43.75% 35	35.00% 28	80	77.78
Investing in the development of our employees	0.00% 0	1.25% 1	18.75% 15	51.25% 41	28.75% 23	80	76.59
Adopting product and service innovations	0.00% 0	6.25% 5	16.25% 13	62.50% 50	15.00% 12	80	71.41
Offering diversified services	0.00% 0	8.75% 7	21.25% 17	37.50% 30	32.50% 26	80	73.11
Targeting new construction projects	11.25% 9	18.75% 15	26.25% 21	28.75% 23	15.00% 12	80	54.34
Competitive pricing	1.25% 1	8.75% 7	21.25% 17	48.75% 39	20.00% 16	80	69.19
Flexible purchase financing options	7.50% 6	11.25% 9	25.00% 20	27.50% 22	28.75% 23	80	64.47

This question was a drill down into how respondents envisioned growth and operational competitiveness. It appears companies are operationally focused and open to new makes/models. The growth orientation and openness to diversifying services, reinforces the responses to Q3. The emphasis on acquiring new employees and investing in training for them is a key factor that was further emphasized in the focus group sessions. The survey shows that the industry skews older, and showed signs that it is struggling to attract new younger employees. In the Focus Groups, climate leadership was seen as a means to address both.

Q5: How frequently are the following topics proactively discussed with your customers?

Answered: 80 Skipped: 4

	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS	TOTAL	WEIGHTED AVERAGE
Energy efficiency/savings benefits	0.00% 0	1.25% 1	12.50% 10	41.25% 33	45.00% 36	80	82.05
Environmental benefits	2.50% 2	12.50% 10	35.00% 28	41.25% 33	8.75% 7	80	60.25
Low-carbon technology benefits	7.50% 6	26.25% 21	31.25% 25	28.75% 23	6.25% 5	80	50.01
Fuel switching options	0.00% 0	16.25% 13	38.75% 31	33.75% 27	11.25% 9	80	59.89
Indoor air quality upgrades	2.50% 2	2.50% 2	21.25% 17	51.25% 41	22.50% 18	80	71.99

This question was intended to get a sense of what respondents were bringing up with customers, to see their biases, and also to get a sense of what customers are being educated about by their HVACR contractors. The very strong weighting for Energy efficiency is a positive sign, with more neutral responses on low carbon and fuel switching technology clearly showing the emphasis that HVACR contractors put on natural gas efficiency.

That 65% of respondents did not regularly discuss carbon implications of HVACR choices with customers, and 85% did not regularly discuss fuel switching options at all, is a definite problem for governments hoping to transition to a low carbon/energy economy. Focus group feedback noted the reluctance of contractors to talk about subjects that they are less confident or less informed about. A reasonable conclusion from this question might be that more education/training is needed to improve comfort levels and empower more discussion with customer on low carbon, electric heating options.

Q6: Does your company currently offer any of the following services or products?

Answered: 80 Skipped: 4

Q6. Results Table

	DO OURSELVES	REFER TO ANOTHER BUSINESS	DO NOT OFFER	TOTAL
Heat loss and heat gain calculations and reporting	56.25% 45	31.25% 25	12.50% 10	80
Blower door testing	8.75% 7	60.00% 48	31.25% 25	80
Insulation installation	12.50% 10	48.75% 39	38.75% 31	80
Windows and doors	2.50% 2	48.75% 39	48.75% 39	80
Air sealing work	37.50% 30	36.25% 29	26.25% 21	80
Ground source heat pumps	43.75% 35	28.75% 23	27.50% 22	80
Air source heat pumps	83.75% 67	7.50% 6	8.75% 7	80
Natural gas furnaces	86.25% 69	3.75% 3	10.00% 8	80
Oil heating systems	21.25% 17	30.00% 24	48.75% 39	80
Propane heating systems	78.75% 63	7.50% 6	13.75% 11	80
Fuel switching/electrification of home heating systems	80.00% 64	6.25% 5	13.75% 11	80
Energy modeling and optimization	32.50% 26	36.25% 29	31.25% 25	80
Lighting retrofits	15.00% 12	43.75% 35	41.25% 33	80
Solar	11.25% 9	40.00% 32	48.75% 39	80
Air balancing/re-commissioning	37.50% 30	40.00% 32	22.50% 18	80
Ductwork adjustments	86.25% 69	7.50% 6	6.25% 5	80
Gas-electric hybrid systems	75.00% 60	11.25% 9	13.75% 11	80
Boilers/hydronic systems	76.25% 61	13.75% 11	10.00% 8	80
Back-up generators	32.50% 26	33.75% 27	33.75% 27	80
Plumbing services	30.00% 24	45.00% 36	25.00% 20	80
Duct cleaning	15.00% 12	57.50% 46	27.50% 22	80

This question was a general service offering scoping question to see where the main stream lane was. Not surprisingly, respondents provide the following core products/services: air source heat pumps; natural gas furnaces; home heating systems; ductwork; boiler systems. The following ancillary services are rarer: blower door testing; duct cleaning; windows and doors; insulation work. It was not a surprise that there is a clear indication that building envelope upgrades are not being offered by those surveyed.

Only 10% of those surveyed offered any building envelope improvements or renewable energy options. Only a few (7.3%) offered whole home energy analysis in-house with most (40-50%) simply referring customers to energy auditors, insulators, or other trades to pursue on their own. In the Focus Groups it was revealed that the idea of providing envelope upgrades had generally not been on the radar of most HVACR contractors. They noted that, from a natural gas retrofits perspective (which is generally speaking the perspective of the vast majority of the industry in Ontario) there is not much incentive to consider envelope issues when replacing a furnace. Gas prices have been low, and it has been easy to make a profit by simply replacing furnaces and hot water tanks with higher efficiency, like-sized furnaces or hot water tanks. Therefore, most have not seen the need for addressing envelope upgrades simultaneously.

The issue of what is offered in-house versus what is offered as a subcontracted job is more a matter of how long a contractor has offered the service, since the first step would typically be to subcontract. A distinction should be made between subcontracting and referrals, in that referral places the burden back onto the customer and cannot be considered evidence of a leadership effort by the HVACR contractor.

Those focus group and interview participants who were actively involved in ground source heat pumps installation did not share this perspective because the replacement is not cheap. Nor is it like-for-like, so an evaluation of the building envelope is one of the first steps that needs to be undertaken.

Q7: Is the lack of available training a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	22.97%	17
Small Barrier	18.92%	14
Moderate Barrier	39.19%	29
Significant Barrier	18.92%	14
TOTAL		74

A lack of training availability was one of the barriers that the Research Team suspected was limiting HVACR leadership on climate issues. The results of Q7 are less than conclusive, but the focus group sessions provided more nuanced insight into barriers associated with training. While roughly three quarters of respondents did identify training as a barrier, only 18.92% saw it as a significant barrier.

Focus group feedback noted that ample training is available to contractors, but it is not well suited to them, and not that helpful in expanding their business offerings. Participants noted that the industry is founded upon a hands-on apprenticeship approach to learning, and that this is not easily found for building envelope or house-as-a-system training. They also noted that cross-training, using other service sector courses, can be problematic, since there is little shared nomenclature, goals, or experiences. This led to the idea that will be explored in the workshop section of "curating" courses from other service sectors to be more tailored to the experiences and needs of HVACR technicians.

Q8: Is the cost of available training a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	27.03%	20
Small Barrier	33.78%	25
Moderate Barrier	24.32%	18
Significant Barrier	14.86%	11
TOTAL		74

The Research Team was curious as to whether the cost of training was a barrier, and the results of this question were fairly inconclusive, in that the majority said it was either not a barrier or a small barrier. Focus Groups showed that much HVACR training is free, or paid for by product manufacturers/wholesalers/distributors. The cost barriers identified in the Focus Groups were largely about lost time costs, from pulling a technician out of the field to sit in a classroom. This further supported the idea of learning by doing, especially on a jobsite where the technician's labour is covered. The lack of a cost barrier was further reinforced by Q10, which found access to capital investment was not a barrier for most.

Q9: Is recruiting new employees a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	13.51%	10
Small Barrier	25.68%	19
Moderate Barrier	25.68%	19
Significant Barrier	35.14%	26
TOTAL		74

Recruitment of younger, skilled employees was a consistent theme that was mentioned in all Contractor engagements. In the Focus Group sessions, it was discussed that younger tradespeople have grown up learning about the issue of climate change and feel a much stronger sense of responsibility to address it. It seems reasonable to expect that if an HVACR contractor were to adopt a leadership approach to climate change, it might also serve as a tool to recruit younger tradespeople.

Q10: Is your ability to secure investment capital a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	50.00%	37
Small Barrier	27.03%	20
Moderate Barrier	13.51%	10
Significant Barrier	9.46%	7
TOTAL		74

In discussion there were some differences of opinion based on the size of company, but in general the industry is relatively well-capitalized to invest in their businesses should they see the right opportunity.

Q11: Is the lack of consumer interest a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	22.97%	17
Small Barrier	41.89%	31
Moderate Barrier	25.68%	19
Significant Barrier	9.46%	7
TOTAL		74

In interviews and conversations leading up to the final drafting of the survey, the Research Team would hear claims such as "customers don't ask for it" and "I would do more, but there isn't any demand." Given the technical nature of HVACR solutions, and the trust that customers place in their contractors to provide them with solution advice, this seemed like a rationalization. One of the probes put to the Focus Groups was whether customers ever ask for high efficiency furnaces, by-pass HEPA filtration, set-back thermostats, or ERVs. These beneficial upgrades were sold to the customer, on the recommendation of the HVACR sales person or technician, to improve comfort, indoor environment health, or to save money.

The results show that customer interest is not considered to be much of an impediment to climate leadership. Customer may not ask for it very often, but the Focus Groups generally upheld that hesitation by contractors to sell the benefits is clearly the more pressing issue to be addressed.

Q12: Are regulatory requirements (trade licenses, insurance, etc.) a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	36.49%	27
Small Barrier	31.08%	23
Moderate Barrier	25.68%	19
Significant Barrier	6.76%	5
TOTAL		74

Prior to engaging the industry, the Research Team suspected that regulatory issues would be a larger factor in the research. However, Q12 and the Focus Group feedback was that the barriers were small and could be overcome. Less than 7% of respondent thought them to be a significant barrier. The general feedback was that this is a highly regulated industry, with lots of challenges that are overcome every day, and that any added regulatory challenges of offering whole homes services would not change this burden much.

Q13: Is finding new suppliers a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	66.22%	49
Small Barrier	18.92%	14
Moderate Barrier	13.51%	10
Significant Barrier	1.35%	1
TOTAL		74

Supply chain issues do not seem to be of concern to respondents.

Q14: Is your focus on emergency sales calls a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	64.86%	48
Small Barrier	22.97%	17
Moderate Barrier	12.16%	9
Significant Barrier	0.00%	0
TOTAL		74

The fact that the time constraints of heat-out emergency calls was not a barrier, was surprising to the Research Team but it was backed up by the Focus Groups.

Q15: Is the challenge of implementing a new sales funnel or model a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	36.49%	27
Small Barrier	39.19%	29
Moderate Barrier	20.27%	15
Significant Barrier	4.05%	3
TOTAL		74

The topic of sales was a prominent part of all the engagement sessions, with a good deal of discussion going into whether the technician or the sales person would be more likely to engage the customer in a discussion of whole home energy/carbon retrofits. The Research Team included this question in the survey to look for barriers in the sales channel. The results are weighted towards this not being a significant area of concern, but the Focus Group session did shed some insights.

Sales quotes and upsells are vital to the success of the industry, and a major means to educate and inform customers on low carbon/energy options. The Focus Groups noted that for customers with regular maintenance contracts, especially commercial customers, the opportunity to educate and promote would tip towards technicians. They also noted that the technicians garnered more trust and were seen as experts focused on building performance, rather than a sale. A focus on the technician channel is as important as a focus on the sales channel. But, as the Focus Groups noted, both need to have better training.

Q16: These services don't align with our business priorities.

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	48.65%	36
Small Barrier	32.43%	24
Moderate Barrier	12.16%	9
Significant Barrier	6.76%	5
TOTAL		74

In order to discover any reluctance towards climate science or skepticism as to the impact that individuals can have, the Research Team asked if pursuing low carbon/energy retrofits were aligned with the contractors' business priorities, so that this misalignment would then be deemed a barrier. Much like in Q1, the answer was decisively "no," so the Research Team chose not to explore this topic further in the Focus Group sessions, as it is fairly clear that this issue was mostly a non-starter.

Q17: Is your company's lack of familiarity with the house-as-a-system approach to home comfort and energy management a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	55.41%	41
Small Barrier	22.97%	17
Moderate Barrier	18.92%	14
Significant Barrier	2.70%	2
TOTAL		74

The Research Team was aware that house-as-a-system training was taught in trades schools and also by NRCan and HRAI, but wondered if respondents felt familiar enough with the concepts or if this was a barrier. The responses would lead one to believe that it is not, but the Focus Group made a distinction between familiarity and functionality. The suggestion is that a practical hands-on, refresher course would be good, especially since carbon has not been a part of the systems equation in previous training.

Q18: Is the lack of government incentive programs a barrier?

Answered: 74 Skipped: 10

ANSWER CHOICES	RESPONSES	
Not a Barrier	29.73%	22
Small Barrier	18.92%	14
Moderate Barrier	36.49%	27
Significant Barrier	14.86%	11
TOTAL		74

The topic of incentives and incentive programs was a significant one in all the engagement discussions. Recency bias led many to feel negative about incentive program administrative hurdles due to GreenON and IESO programs, but other issues were identified, including incentive levels skewing the market and encouraging poor quality service in boon times. However, there was strong acceptance of the idea that to overcome higher first costs of deep carbon/energy, incentives are vital.

There was also support for the idea of introducing ongoing incentives (i.e. lower electricity pricing for those who have converted to low carbon heating). The support for incentives is a positive sign that HVACR contractors will give the plethora of emerging incentive programs a fair opportunity to move the market.

Q19 Are there other barriers not mentioned that would inhibit your company from offering Whole Home Energy Retrofits?

Answered: 20 Skipped: 63

The Research Team included an open-ended barrier question to allow for barriers to be identified that might have been overlooked in the survey development process. This was the most skipped question of the survey, and that is likely indicative of the lack-of-hard-barriers conclusion that this overall project saw.

Of the comments that were given, several were about the challenges of working across traditional trade lines and with subcontracting other trades, these could be grouped under the quality control/risk mitigation concerns. Otherwise, there were few barriers identified that could be said to extend beyond idiosyncratic concerns that are particular to the business of the respondent.

Although the results were less than insightful in identifying additional barriers, they do reinforce the idea that there no real hard barriers that are preventing greater Climate Leadership by HVACR contractors.

Q20: What risks does your company face by taking a leadership role in offering Whole Home Energy Retrofit solutions?

Answered: 74 Skipped: 10

	NO RISK	SMALL RISK	MODERATE RISK	HIGH RISK	EXTREME RISK	TOTAL	WEIGHTED AVERAGE
Overextending financially	17.57% 13	28.38% 21	37.84% 28	14.86% 11	1.35% 1	74	38.68
Difficulty in finding skilled workers	4.05% 3	18.92% 14	31.08% 23	31.08% 23	14.86% 11	74	58.34
Difficulty finding interested customers	10.81% 8	29.73% 22	37.84% 28	20.27% 15	1.35% 1	74	43.00
Difficulty communicating new services to customers	20.27% 15	35.14% 26	31.08% 23	13.51% 10	0.00% 0	74	34.66
Inexperience in taking new services to market	12.16% 9	22.97% 17	48.65% 36	12.16% 9	4.05% 3	74	43.32
Liability of offering subcontracted services	6.76% 5	24.32% 18	45.95% 34	16.22% 12	6.76% 5	74	47.97

Risk was a topic that came up in the interviews and the Focus Group sessions. Risk and warranty liability are key management priorities for HVACR contractors. One of the reasons most contractors choose to provide homeowners with referrals to other building trades for insulation or windows, is because they did not want to be responsible for fixing issues that might arise. The survey showed that the risk of not being able to recruit a workforce with the necessary skills to offer whole home low carbon/energy retrofits services was a barrier to change. This speaks to the need for curated and integrated training, and perhaps even an accreditation program to make it easier to recognize those individuals who are trained.

Q21: Would the following make your company more likely to offer Whole Home Energy Retrofits?

Answered: 69 Skipped: 15

	NO MORE LIKELY	SLIGHTLY MORE LIKELY	MORE LIKELY	SIGNIFICANTLY MORE LIKELY	EXTREMELY MORE LIKELY	TOTAL	WEIGHTED AVERAGE
Proven success by other established HVACR businesses	13.04% 9	24.64% 17	40.58% 28	17.39% 12	4.35% 3	69	43.93
Demonstrated consumer demand	8.70% 6	8.70% 6	36.23% 25	33.33% 23	13.04% 9	69	58.29
"House-as-a-system" certification for employees	10.14% 7	18.84% 13	33.33% 23	24.64% 17	13.04% 9	69	52.87
Current suppliers sold the products required to offer these services at competitive prices	14.49% 10	15.94% 11	42.03% 29	18.84% 13	8.70% 6	69	47.88
Government mandated standards for a "house-as-a-system" approach	13.24% 9	13.24% 9	41.18% 28	25.00% 17	7.35% 5	68	50.06
Rebates or incentives for these services	5.80% 4	17.39% 12	34.78% 24	23.19% 16	18.84% 13	69	57.84
Your employees supported it	7.35% 5	20.59% 14	47.06% 32	23.53% 16	1.47% 1	68	47.85
Investment capital was available to cover the startup costs	14.71% 10	23.53% 16	33.82% 23	19.12% 13	8.82% 6	68	46.01
Consumers were educated about the advantages of the "house-as-a-system" approach	7.25% 5	8.70% 6	39.13% 27	28.99% 20	15.94% 11	69	59.33

The Research Team wanted to avoid too many negative barrier questions and so Q21 was framed in a more positive manner, identifying the drivers that might motivate change. Most of the items identified were seen as positive drivers, with incentives, mandates, consumer education and consumer demand all appearing quite favourable.

Q22: Which type of entity do you think is best positioned to offer the 'house-as-a-system' analysis required for Whole Home Energy Retrofits for the next 5 years in your market?

Answered: 69 Skipped: 15

ANSWER CHOICES	RESPONSES	
Energy Auditor	34.78%	24
Engineering Firm	2.90%	2
HVACR Contractor	37.68%	26
Insulation Contractor	2.90%	2
Windows and Doors Installer	0.00%	0
Utility Energy Service Provider	5.80%	4
General Contractor	14.49%	10
Other:	1.45%	1
TOTAL		69

The historical barriers put in place by NRCan that prevented Energy Auditors from being directly employed by retrofit contractors still has some lingering effect, but has clearly become much less of an issue. Partnering between the energy auditor and HVACR contractors is a natural alliance to facilitate home as a system, and whether this is an in house or arms-length service, will depend on many other factors. The relatively low support for engineering firms was a big surprise, and it may hint at some antipathy there.

One of the axioms that underpins this research is that of the traditional trades who are involved in a deep carbon/energy retrofit project (carpenters, plumbers, electricians, windows and door, insulation, and HVACR), HVACR trades are suited to overall project leadership. While Energy Auditors, Architects, and General Contractors could also step up into that leadership role, this would typically increase project cost by adding another trade to the mix.

Q23: If your company was required to deliver HVACR services and envelope improvements to become a delivery agent in a successful government program, which of the following approaches would you most likely choose to pursue?

Answered: 69 Skipped: 15

ANSWER CHOICES	RESPONSES	
Scale operations to include envelope improvements	20.29%	14
Partner with an established company to satisfy requirements	46.38%	32
Acquire a company with the necessary competencies	11.59%	8
Pass on the opportunity	14.49%	10
Capitalize on the opportunity and sell company to an interested party	7.25%	5
Other:	0.00%	0
TOTAL		69

This question was meant to push the point with an operational scenario. It clearly shows that as a first step, most HVACR contractors would prefer to partner with proven affiliates. Interestingly, only 7.25% would pass on the opportunity as presented. This again reinforces the idea that the industry is supportive of taking a climate leadership role.

Q24: In what Canadian provinces or territories does your company conduct most of its business?

Answered: 67 Skipped: 17

ANSWER CHOICES	RESPONSES	
Ontario - Inside the Greater Toronto Area or Hamilton Region	34.33%	23
Ontario - Outside the Greater Toronto Area and Hamilton Region	46.27%	31
Nova Scotia	4.48%	3
British Columbia	2.99%	2
Alberta	5.97%	4
Saskatchewan	1.49%	1
Quebec	1.49%	1
Manitoba	7.46%	5
Nunavut	0.00%	0
New Brunswick	0.00%	0
Northwest Territories	0.00%	0
Prince Edward Island	0.00%	0
Newfoundland and Labrador	0.00%	0
Yukon	0.00%	0
Total Respondents: 67		

Larger HVACR companies may have operations in several jurisdictions, so making the distinction between working with the GTHA or not, is something of a matter of interpretation, it is clear that this survey was very Ontario centric (which is also true of HRAI membership). Further exploration of other provincial jurisdictions would be interesting, but the change in carbon intensity of the Ontario electrical grid that resulted from the closing of all coal power plants clearly makes Ontario a place where we might expect to see industry still adjusting to emerging low carbon opportunities. This question is the first of a series of demographic scoping questions that were inserted to help understand barriers by allowing the Research Team to analyze opinions in a more granular way.

Q25: How long has your company been in operation?

Answered: 67 Skipped: 17

ANSWER CHOICES	RESPONSES	
Less than 5 years	4.48%	3
6 years to 10 years	7.46%	5
11 years to 15 years	14.93%	10
16 years to 20 years	14.93%	10
20 years to 30 years	16.42%	11
More than 30 years	41.79%	28
TOTAL		67

In general, the HVACR industry (or at least those respondents to the survey) is a mature industry, and one with depth of market success. Survey respondents, like those who tend to be involved in giving back to their industry through association participation, tend to be more established companies. Newer, social media-savvy entrants to the sector do not tend to join the industry association right away. Nonetheless, having the largest single category being the 30 year plus category was still a surprise to the Research Team.

Q26: Approximately how many full-time employees does your company have?

Answered: 67 Skipped: 17

ANSWER CHOICES	RESPONSES	
Less than 10	43.28%	29
11 to 50 employees	52.24%	35
51 to 100 employees	1.49%	1
101 to 250 employees	1.49%	1
251 to 400 employees	0.00%	0
Greater than 400	1.49%	1
TOTAL		67

While the industry itself is populated mostly with small to medium sized business, it is a positive sign to see that the survey did get some representation from the larger (and even one very large) HVACR companies who can impact the industry significantly.

Q27: How old are you?

Answered: 67 Skipped: 17

ANSWER CHOICES	RESPONSES	
18 to 29	1.49%	1
30 to 39	14.93%	10
40 to 49	28.36%	19
50 to 59	34.33%	23
60+	20.90%	14
TOTAL		67

One of the potential barriers the Research Team wanted to indirectly explore was age-driven reluctance or complacency, and the obvious indicator would be the age of the respondents. Typically, those at the end of their careers tend to be less entrepreneurial than those starting out. While some complacency was evident, it was more than likely driven by success rather than age. The survey gained responses from a good distribution of age groups and age was not a notable factor in how people responded to questions.

Q28: Please enter the percentage of your company employees that that fall into each of the following age brackets.

Answered: 67 Skipped: 17

ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
Under 30 years of age	27	1,591	59
Between 30 and 50 years of age	43	2,911	67
Over 50 years of age	19	1,006	53
Total Respondents: 67			

As the Research Team was led to believe from the interviews, the HVACR industry is an aging industry. Despite the fact that the work is physically demanding, the largest age demographic is still 50-59. Many of those engaged spoke of the challenges of recruiting younger people into the trade.

Q29: Enter the percentage of your company revenue that come from each of the following market segments. (Please ensure responses total 100)

Answered: 67 Skipped: 17

ANSWER CHOICES	AVERAGE NUMBER	TOTAL NUMBER	RESPONSES
Residential	70	4,614	66
Small Commercial	29	1,685	59
ICI	14	401	29
Total Respondents: 67			

While the building types can be similar, the building code makes the distinction between the two fairly cut and dry, the Research Team was looking to engage mostly residential HVACR contractors, because the building science is more manageable and does not require engineering oversight to provide whole home services.

1.3.3 - STRATEGIES TO OVERCOME EXISTING BARRIERS TO HVAC INDUSTRY PROVIDERS OF WHOLE-HOME RETROFIT SERVICES

DESIGN WORKSHOP IDEATION

After the Focus Group session, the topic shifted from barriers to solutions and opportunities, and this was easily the most productive and inspiring aspect of this entire project. This was a fortuitously wise choice because the discussion in the Workshops required a good deal of contextual insight to be given, and the Focus Group session provided this.

Despite being market competitors, focus group participants shared ideas openly with each other, and seemed greatly inspired by the opportunity to "problem solve" with their peers. Some members were already part of the HRAI Peer Exchange Program (PEP) groups and it was noted more than once how that model might be a good model for the pilot phase of this research.

Most attendees saw government emission targets and pending program rollouts as an emerging opportunity to grow their business, and conceded that the recent downturn in the economy due to the pandemic response had not affected their essential business lines nearly as much as it impacted other businesses. While most of the attendees' businesses were dominated by natural gas furnace and hot water tank sales, they were experienced with air source heat pumps (as this is essentially what every air conditioning unit is) and yet they seemed to realize that the days of incentives for gas furnace replacement are coming to an end.

Many in the Workshops noted that they previously were active participants in Enbridge and Union Gas residential incentive programs, but have moved away from them as they began to bundle incentive with envelope and other measures. This was recognized by some as a lost opportunity.

As participants gained more context of the emerging opportunity for the industry there was a noticeable shift in perspectives, as was noted in Q1, from "*someone should do this*," to "*my business could and should do this*." The enthusiasm and problem solving of the Workshop sessions all effected this change of gears. All the Workshops eventually evolved into entrepreneurial ideation sessions where the facilitator took a back seat as peer-to-peer discussions took off.

Several ideas around training were explored, including the concept of "curated" training to better suit HVACR technician and sales agents. The debate about which of these two would be the lead in engaging customers of climate solutions came down to both the context of the situation (new quote vs service call) and to the ability or skill set of the current staff to incorporate new analysis and new service quotes. It was agreed that training should be broad, to gain buy-in from all staff, and that carbon sales training would be good for all.

The training discussion also focused on how the HVAC industry prefers to take in new information. While seminars and webinars have a role to play, the most effective training was agreed to be experiential, learning by doing. The dominant industry training model is mentor and apprentice based, and may companies have mock furnace room training facilities for staff to do hands on repairs and diagnostics.

Assuming curated training could be developed to suit the needs of the industry, the Workshops were more split on the idea of training certification. Some thought it would be an essential differentiator, whereas others felt that, since it would not have much brand recognition, it would just be something else that the sales and marketing teams would have to sell. Linkage to program participation was seen as a more powerful motivator for adding a certification

component to the curated training. In the end this topic was not resolved and likely will require further examination.

Risk mitigation was also a topic that arose during in the training discussions. Working with natural gas appliances is inherently risky, both in terms of fire/explosions and CO poisoning, so it is no surprise that the participants mentioned risk mitigation, as it is always top of mind. By learning in a mentored hands-on environment, technicians can get the technical support needed to ensure that their actions are safe from other risks such as mold creation, or under ventilation.

This controlled, low-risk, support approach was suggested for future pilot programming, and while it might be cost prohibitive to create mock whole home as opposed to mock furnace rooms, the idea of mitigating risk by providing mentoring and technical support was clearly favoured.

Areas of expertise that were identified as most lacking in the industry were carbon calculations and whole home trade off assessment for electrification retrofits, building envelope best practices, home energy/carbon modelling, and incentive program rules and eligibility support. All of these were seen as areas of support, in addition to classroom training, that would help pilot participants transform their businesses and mitigate risk.

Perhaps the most positive aspect of the working groups was the entrepreneurial solution solving energy that arose as participants became more engaged in solution ideation. The success of small and medium businesses in the HVACR industry is clearly attributable to the entrepreneurial energy and skill of those who work in the sector. Tapping into this energy to find solutions for barrier facing HVACR contractors was a goal of this research, but in the Workshops that energy began to move past barriers and look at solutions that would enable Climate Leadership.

The Workshops were presented with a pathway forward for Climate Leadership. It was generally agreed that the majority of the industry had not yet begun this journey, but the interest in the opportunities it might yield was there.

How each business will address each of these stages is very much open to nuance, and this is where their entrepreneurial energy will serve to develop a strategy that best suits each individual business and the markets they serve. While no formal commitments were asked for, most of the HVACR companies who participated in the Workshops said they would be interested in participating in a pilot if it was structured along the lines discussed above. The lack of progress to date seems to be mostly because there have been so few attempts. This is likely because of inexperience and a lack of confidence in the subject matter. The Workshops began the process

of how to, not so much remove barriers, but create positive environments that will facilitate and encourage exploration and growth of deep low carbon/energy retrofit services.

MUNICIPAL STAKEHOLDER ENGAGEMENT

With some findings from the research in hand, HRAI contacted four GTHA municipal leaders to apprise them of the progress and plant a seed to get future support in the next phase of this project. The interest from municipal leaders was strong; however, for the most part, funding options are still in development or already allocated. HRAI spoke with representatives from the Cities of Markham, Hamilton, Toronto, Newmarket and Burlington.

Markham has committed to a Net Zero Energy Target for 2050 and has already undertaken several pilots in new and existing residential homes. These projects have showcased geothermal district energy, micro-CHP, and improved insulation and air tightness performance. It was agreed that greater HVACR industry leadership would be beneficial to projects like these.

Going forward, Markham will be doing feasibility research into LIC loans and exploring a concierge service option to help residential customers. This service will help customers find qualified energy auditors, apply for incentives, and connect with knowledgeable contractors. The initiative will would benefit from HRAI's planned next phase of this project, which aims to accelerate climate leadership in the HVACR industry.

Toronto and Newmarket have initiatives for home retrofits that are underway. Both have local improvement charge (LIC) loan programs that are either in market or in the process of coming to market. These are important programs for them and because of this there is less of a focus on new pilot activities. Nonetheless, some new pilots are underway including a Net Zero Firehall pilot in Toronto that would seem to be a close cousin of the pilot concept that HRAI is proposing for Phase Two. HRAI feels that the opportunities with municipalities are still emerging and warrant maintaining a regular dialogue with officials to keep each party up to date on the activity of the other.

The opportunities to work with Markham and other leading municipal governments are many and still growing. Markham is a member of HRAI and will very likely play a role in the next phase of the project.

Hamilton and Burlington are coordinating their program development with Mohawk College and environmental groups. HRAI has offered to provide industry insight to this process. Hamilton is finalizing its Community Energy and Emission Plan that once approved will enable the setting up of a Climate Change office likely in the Fall of 2021. They are also developing a

home energy retrofit program, dubbed HERO, that will be incentivized using LIC loan options. Supporting low-income residents in their desire to lower their carbon emissions is of particular interest to Hamilton. HRAI noted that by empowering HVAC contractors to take on a climate leadership role, cost savings can be realized by reducing the number of trades on site.

HRAI has shared the research results and the phase two aspirations with these municipal leaders and feels confident that opportunities to work together exist for Phase Two and beyond.

1.3.3 - SUMMARY OF WHOLE-HOME RETROFIT SERVICES THAT HVAC INDUSTRY PROVIDERS CAN DELIVER

There is a definite skew in the currently industry in favour of offering natural gas products and services, such as boilers, high efficiency furnaces, and hot water tanks. A number of companies noted that they also offer heat pumps, both cold climate air source, and to a lesser extent ground source. Several HVACR companies offered additional services, including expanding into other traditional trade sectors such as plumbing and electrical. It is not surprising that few if any respondents offered building envelope upgrade services directly, as this concept is still new to the industry. More surprising was the limited level analysis and project management that HVACR contractors currently offer to customers.

Fundamentally, HVACR contractors could take a greater leadership role in the planning and analysis of deep carbon/energy home retrofit projects. This has always been a part of what HVACR contractors would do, but in like for like swap outs, there is less need for it. However, in fuel switching situations, or Net Zero retrofits, the need for heat loss calculations, duct design and depressurization analysis, carbon/energy modelling, and house-as-a-system trade-off calculations becomes much more necessary. As was evidenced in the Survey and Focus Group results, few HVACR techs are comfortable with providing all of these analytical services. This is where further education and hands-on learning would be highly effective. This was seen as Step 1 in the Climate Leadership process by the Workshops groups.

It is still not clear if many HVACR contractors will offer as a service or subcontract any sort of building envelope upgrades identified as necessary through their analysis of the home. Will they become like general contractors and project manage insulation upgrades and window replacements? Will they be motivated to do this because they need to know the work is done to safely install a smaller heat pump unit? These are questions that cannot as yet be answered.

In the past, these building envelope upgrades have been identified by an Energy Auditor and largely left to the homeowner to coordinate. Unsurprisingly, that process has been a barrier to uptake of deep carbon/energy retrofits. It seems likely that there would be a significant increase

of deep home Energy retrofits if HVACR contractors could successfully bridge the chasm to whole home retrofit services. The Workshop attendees saw this as a potential means to meet carbon/energy reduction targets, but not one that was going to be easily or readily attained. They saw it as Step 3 of the four-step Climate Leadership pathway, and felt that a good deal of work still needed to be done to help move the industry along this path.

CONCLUSIONS AND NEXT STEPS

From the perspective of the Research Team, this project was a success. It clarified the questions as to why HVACR contractors have not taken more of a leadership role in low carbon/energy retrofits, by identifying several soft barriers, it yielded good insights into to how to move forward, and it showed there is considerable interest in taking on a greater leadership role, and it primed the network with a number of potential participants in the subsequent pilot phase.

The more subtle soft barriers identified fit well with the idea that the industry is ready to change. Challenges identified with attracting younger staff into the industry also mesh well with contractors taking a leadership position with regard to climate change. But perhaps the most significant progress was made when peer-to-peer engagement took over the workshop sessions. This is the clear model for nurturing industry development going forward: support and facilitate industry stakeholders through a "guided discovery" process in their collective journey to becoming Climate Champions.

In the Workshops a four-step pathway model was developed as a means to assess the direction and progress of the industry in moving to support carbon emission commitments. Key learning strategies were revealed that prioritized experiential learning and the mentor apprenticeship model that dominates the industry.

Clarification from the Focus Groups as to why the surveys showed training to be a barrier was key to developing the concept of curated training that takes content from other sectors and adapts it to meet the needs and learning styles of the HVACR industry.

There was a hesitance and a lack of certainty on behalf of most participants engaged in this survey to speak with authority about carbon and fuel switching best practices and measure trade-offs. And, while most had taken house-as-a-system training at some point in their career, very few were confident that they had the necessary tools (calculators, modelling software, and experience) to implement their knowledge in the field.

The Workshops gave birth to the idea of a "Peer Exchange Program (PEP) group" to be a support network for contractors trying to do more. Originally conceived of as a community of

practice pilot, the goal was to be a catalyst for helping participating contractors to upgrade their skills through supported learning. This idea later morphed back to the idea of a Climate Leadership path and noted how slow the progress was, so the idea of an Accelerator Pilot was finally landed upon.

Participants will have access to curated training, technical expertise, project management support, modelling and other resources to accelerate their progression along a four-step pathway or "self-development" process towards becoming low carbon/energy, whole-home retrofit contractors.

The survey research more or less shows that currently fewer than 10% of HRAI members could be considered to be at or near Step 1, and only a handful would be at Step 2 or better.

The next phase must focus on whole home energy retrofit services including: fuel switching, envelope improvements, ventilation testing, and trade-off calculations. Recent federal funding for "deep home energy retrofits" presents an opportunity for the HVACR industry to transition to a one-stop, whole-home retrofit service model. Currently, HVACR companies are more likely to dissuade fuel switching and renewable energy options, than to promote them. Even those who don't dissuade, usually leave non-HVACR services off the table for the homeowner to pursue independently. Most homeowners are not equipped to tackle whole-home retrofit project management successfully, and hiring an engineer, general contractor, or architect can be cost prohibitive.

It was agreed that energy auditors, on their own, can provide good analysis and advice, but they typically would not go so far as to coordinate retrofit work, which puts the onus on the homeowner to plan and project manage the retrofit. Several contractors noted that they have developed a working relationship with specific Energy Auditing companies, but would consider bringing these skills in-house if the volume of work warranted it.

The plan is that HRAI will enlist between 10 and 20 companies in the GTHA to participate in the Whole Home Retrofit Accelerator Pilot. Each participant will be fully supported on at least two whole-home retrofit projects in the GTHA and be part of a Peer-Exchange-Program (PEP) Committee as a further resource. The accelerator pilot will focus on learning-by-doing, as these contractors operationalize whole home energy retrofit services for customers. It will increase their knowledge and comfort levels of how to expand strategic advice and service offerings to drive deep carbon/energy retrofits.

In that most of the barriers identified were softer, knowledge and comfort level barriers, this Accelerator pilot seems like the best way to get contractors past their initial hesitance and tap

into the desire to become climate leaders. As an accelerator and demonstration pilot, it will act as a catalyst for further market activity by the participating HVACR companies, and eventually by their competitors once they see their success. This will drive HVACR lead Whole Home retrofits both within and outside the GTHA.

In the end, we estimate that during the course of the two-year pilot a further 1,000 to 2,000 tonnes of carbon emissions will be eliminated (with in the GTHA), and post-pilot the lasting industry effect should result in many thousands of tonnes saved by 2030.

APPENDICES

1.2.2 LESSONS LEARNED FROM ENBRIDGE AND THEIR INCORPORATION INTO THE PROJECT WORK

In researching current efforts to drive whole home energy efficiency, we interviewed two members of the Enbridge DSM team involved in the design and implementation of the Whole Home Residential Retrofit program for the gas utility. HRAI thanks Enbridge staff for their candour and generosity in taking the time to download the depth of knowledge that their residential DSM team has amassed.

For more than two decades, Enbridge and Union Gas (now one company) have been leaders in residential energy retrofits programs, active in new home construction, building design charrettes, and process improvement projects, as well as whole home retrofits. Enbridge has run the full cycle of whole home energy retrofits, from early work that pushed fuel switching to natural gas home heating and hot water, to depressurization testing, to high efficiency furnaces, and now are exploring hybrid systems and geothermal loops.

After helping to transform the market, and the building code, to high efficiency furnaces, Enbridge was no longer able to realize cost effective DSM influence over furnace improvements, so they began to bundle measures like insulation or hot water tank efficiency improvements into their programs and required whole home energy audits prior to doing work. While this could have encouraged many HVACR companies to add these non-HVACR services into their offerings, in reality it did not have this effect, and may have actually contributed to less program participation by traditional HVACR companies.

Multiple HVACR technicians interviewed acknowledged that they do not encourage customers to participate in the Enbridge program, and maybe even actively dissuade customers from participating. Barriers seems to be focused on the relatively small size of the furnace incentive (due to the limited savings potential above a baseline of 90%), and the uncertainty from a furnace installer's perspective (in that the rebate amount is tied to the whole bundle of upgrades, not just the furnace). This can be juxtaposed with previous Enbridge and Union Gas programs where significant rebates were provided for moving homes from a mid-efficiency to high efficiency furnace. These older programs were focused on picking "low hanging fruit" and were very popular, quite lucrative, and fairly easy for HVACR contractors to participate in.

It is interesting that even though our barrier research showed that incentive programs were favoured by the vast majority of HRAI members who participated, there are very clear limits to how much effort contractors are willing to put out for these rebates, and that effort levels drop significantly as the rebates decrease. More than one interviewee noted that they would often just offer customers a discount commensurate to the expected rebate amount, rather than

actually put them into a program like the IESO's recent offerings, that was paperwork intensive. Enbridge is conscious of the paperwork burden and tries to mitigate it, by having the Energy Auditor play a more active role in information gathering and application development. In fact, Energy Auditor companies are the program delivery agents for the Enbridge programs.

There is clearly merit in this model. However, by Enbridge's own analysis, HVACR company participation in their programs is declining. And while this does not mean their programs are struggling, it does limit the potential of this model as a program driver, particularly where home heating fuel switching is a central measure (as would be the case for carbon reductions programs looking to realize significant emission reductions).

1.3.1 SUMMARY OF FINDINGS FROM SURVEY, INTERVIEWS, FOCUS GROUPS

The main takeaways from the survey and focus group research are that the impediments to HVACR contractors taking Climate Leadership role and offering house-as-a-system analysis and advice, along with whole home low carbon/energy retrofit services are largely internal barriers. Education and comfort with the subject matter are barriers, but it is not for the lack of educational opportunities. Conversely, a nascent leadership aspiration was clearly identified in the research, and this fits well with the optimism and entrepreneurial aspirations that also presented, as does the cautious openness to incentive program participation. Challenges revealed around hiring qualified new staff seem to be more of a driver than a barrier for Climate Leadership.

Customer enthusiasm, customer education, and the cost of training are all small hindrances that HVACR contractors would prefer were not there, but they are not significant barriers. Likewise, investment capitalization, finding new supply chains, and the time pressure emergency heat out calls are not barriers for most.

In summary, the barriers identified can be considered soft barriers, in that they have more to do with staffing, industry practice/culture, and individual confidence levels with the subject matter. Thus, it does not seem to be much of a stretch to say the Research Team looked for barriers, and found only some hesitation and reluctance plus a lot of unrealized opportunity.

1.3.2 SUMMARY OF STRATEGIES FROM DESIGN WORKSHOPS

The Workshops developed a pathway to suggest the step for Climate Leadership. As briefly mentioned above, the following four steps were identified as likely paths forward.

- **Step 1** (Groundwork Stage): offering more comprehensive systems analysis – energy modelling, trade off assessment
- **Step 2** (Resourcing Stage): one-stop service offering – overseeing subcontractors for complementary services
- **Step 3** (Expansion Stage): service growth expansion – develop fully integrated "one-stop service" offering and lower costs
- **Step 4** (Climate Champions): actively tracking and lowering carbon in homes, and systematically educating staff, customers, and the industry

It was generally agreed that the vast majority of the industry was not yet at Step 1, so some progression, even to that first step, would be a significant advancement. It was identified that the progress would need to be self-directed to be effective, and that the journey would be best accomplished with peer groups and some initial technical support. Suggestion was made that HRAI should form a PEP group (with contractors, trainers, energy advisors, wholesalers, distributors and manufactures) to facilitate an ideas exchange and support system to assist participating contractors in along the path.

The next step outcomes were later summarized for the follow up proposal for Accelerator Pilot funding from TAF as follows:

Outcome #1: Create and facilitate quarterly (min) Peer Exchange Program leadership committee to support the pilot and drive entrepreneurial innovation towards whole home energy retrofit offerings.	Strategy/ies: Facilitating a group dedicated to whole-home energy retrofit services will enable participants to positively transform their businesses. PEP programs are a proven way to move the industry forward, by empowering motivated participants to share information and resources. This is a preferred learning method identified by the barrier research project.
Outcome #2: Curate a Whole Home Energy Retrofit training (including reviewing the option for certification with the PEP). The pilot will offer participating companies specifically adapted training to enable them to offer and successfully implement Whole Home Energy Retrofits projects.	Strategy/ies: This pilot will review the available training from partner training providers like NAIMA, NRCan, and others to scope the options available. Then we will "curate" the training to make it accessible to the HVACR audience. The building science is well established and the training required already exists, but HVACR technicians are not accessing it. The option of certification will also be reviewed with the PEP committee and pursued only with their support.

Outcome #3: Provide pilot project support services in order to create a low-risk, learning-by-doing environment. During the 1-2 supported retrofits each participant company will have the educational support to assist with home energy and carbon modelling, upgrade trade-off analysis, Incentive program identification and application, and project management support.	Strategy/ies: One of the barriers identified during the original TAF funded HRAI research was the lack of confidence and experience that companies had with offering whole home services and analysis. The pilot will enable the participating companies to learn while doing, buy offering expertise and support for 1-2 pilot projects. This support will be both informative and empowering, so that it can be replicated after the pilot. It will also de-risk the initial retrofit learning projects for the companies.
Outcome #4: Accelerate participating company progress along the four-step pathway identified in the previous TAF funded HRAI barrier research. Getting 40% of participants to Step 1, and a further 20% to Step 2+	Strategy/ies: By using a metric created during the barrier research pilot, this pilot is letting participants in the PEP know the expectations of their participation and putting a progress milestone (not unlike a sales or fundraising target) to them to take ownership of and to work towards. It is envisioned that this target progress will eventually be part of the PEP meeting reports. It is the means by which the success of pilot and the pilot participants will be assessed.

1.3.4 SUMMARY OF KNOWLEDGE TRANSFER ACTIVITIES PLANNED AND UNDERTAKEN TO SHARE RESULTS OF REPORT

The results of this research identified soft barriers and strategies to move forward. The Research Team has communicated these findings to the Municipal Leaders we interviewed, but has not found any opportunity that makes sense for wide circulation of this preliminary research. Without any hard barriers, it is hard to imagine an audience that would find these research findings operationable. HRAI will work with its training partners to inform them of the training feedback.

1.2.1 COMMUNICATIONS WITH HVACR INDUSTRY EMPLOYERS AND EQUIPMENT MANUFACTURERS

HRAI will write up a summary for the HRAI newsletter, but would strategically prefer to wait for confirmation of the Accelerator pilot funding to use the previous research findings as motivation to encourage participants to sign up for the pilot.

1.3.5 COMMUNICATIONS WITH GTHA MUNICIPAL ORGANIZATIONS

The Research Team engaged five Municipal Leaders to make them aware of the research and to prime them for the potential of an Accelerator Pilot. As part of the proposal for the next phase pilot, local government (among others) programs and incentives would be accessed to support individual deep energy/carbon retrofit projects. Additionally, HRAI looked to see if there was an opportunity to build on the Accelerator Pilot work by having local government programs incorporate HVACR Climate Champion leadership as a component to enable the success of current developing programs.

The Research Team spoke with Municipal leaders from Markham, Hamilton, Newmarket, Toronto and Burlington.

1.3.5 COMMUNICATIONS WITH POTENTIAL FUNDERS

In addition to speaking with Municipal Leaders and submitting a phase 2 Accelerator Pilot proposal to TAF, the Research Team has also engaged NRCan and CMHC representatives to look to incorporate HVACR Climate Champion leadership as a component to enable the success of current of developing programs. As most of these programs are in the active development stage, the timing was good. HRAI has also applied for funding from Employment and Social Development Canada (ESDC), under its Sectoral Initiatives Program, to support a multi-pronged workforce development plan entitled "Accelerating the Development of Canada's Low-Carbon HVACR Workforce" which features as a leading issue the need to overcome internal industry points of resistance (what we have referred to here as "soft barriers") to accepting a leadership role in delivering a broader array of low carbon, energy efficient solutions. The findings of this research project will help to inform that plan and, conversely, the training and communications elements of the ESDC project will complement nicely the additional work that is being proposed here.

4.2 FINAL REPORT APPENDICES

Project Activity List

The project activities were in-line with the critical path action items without amendments.

Task
Agreement signing
HRAI to sign contribution agreement with TAF
CASI to sign a service agreement with HRAI
Kick off zoom meeting to set goals and roles
Contact Enbridge and record notes on past project
One-to-One Interviews
Preparing for interviews
Provide draft interview outreach communication to HRAI
Provide draft discussion questions to HRAI for feedback
Provide interview participants list to CASI
Finalize interview outreach communication
Create data consent for interview participants
Send discussion question feedback to CASI
Finalize discussion questions
Interviews
Send interview outreach communications to interview participants list (copy Martin)
Confirm dates and times with interview participants (invite Martin)
Facilitate interviews, record notes, collect data consent forms
Write up notes and share with HRAI
Send feedback on notes to CASI

Surveys
Prepare survey questions for on-line engagement
Use interview responses to revise draft survey questions, send to HRAI
Send survey question feedback to CASI
Finalize survey questions
Establish incentives/prize options if any
Draft survey participant outreach communication, send to HRAI
Create data consent for survey participants
Finalize survey outreach communication
Setting up survey for on-line engagement
Send questions to HRAI to convert to on-line format
Setup on-line survey, include survey data consent
Beta test on-line survey for results gathering and analysis
Survey drop
Send electronic survey to survey participants list with deadline to participate
Send reminder(s) out (multiple times depending on response rate)
Process responses and summarize/categorize findings
Write up notes and share with HRAI
Group Sessions
Logistics and Materials for Focus Groups and Workshops
Establish focus group and workshop participants list
Create data consent for focus group participants
Draft workshop agenda (won't know the specific strategies)
Draft and finalize focus group and workshop 'save the date' communication
Draft and finalize focus group and workshop invitation communication
Confirm location/format and logistics of focus group and workshop sessions

Planning Focus Groups and Workshops
Send 'save the dates' and confirm participants for session timeslots as responded to
Send invitations and confirm participants for session timeslots
Review interview and survey results to draft focus group agenda
Give feedback on draft focus group agenda
Refine and finalize the agenda based on feedback
Focus Groups
Circulate agenda to focus group participants list, confirm participation
Prep facilitator and dry run as needed
Facilitate focus group sessions and capture feedback and insights
Summarize findings and share with HRAI
Workshops
Use focus group findings to finalize workshop agenda
Prep facilitator and dry run as needed
Facilitate workshop sessions and capture feedback and insights
Summarize findings and share with HRAI
Outreach
Identify funders to contact
Identify municipalities to contact
Reach out to funders and municipalities and record notes
Summarize findings and draft final report / next steps
Reporting
Circulate preliminary final report to HRAI for review
Provide feedback / change suggestions on preliminary report

Incorporate feedback into final draft
Share final draft with TAF for feedback
Incorporate any suggestions from TAF and issue final report
Next steps

Progress Meeting Proposal Objectives

The Research Team for both CASI and HRAI had a standing weekly meeting once the project was underway, and the research was a collective effort with strong collaboration.

Problems or Opportunities Encountered in Project Work and Modifications Taken

Several issues were encountered in this project. First survey responses were lower than targeted, despite adding a gift card incentive. It is likely that the original response estimates were unrealistic, given the limited size of the HRAI membership pool of potential respondents. HRAI pushed survey responses via email blasts and newsletter reminders a total of eight times.

Similarly, it was difficult to get focus group and workshop attendees to commit to six different dates, so the Research Team decided to run them sequentially to ensure maximum participation. The results were very positive.

Project Financials: Budget and Variances

Revenues	**Year 1**	**Notes**
Donations and Contributions		
TAF (requested)	32,800	
Other funders (list by funder type and provide status*)		
Foundations		
Government		
Corporations		
Individual Donors		

Other Revenue			
In-kind contributions (list)	37,500		HRAI staff assigned, participants, on-line and survey resources
Other sources (list)			
Total	**70,300**		
Expenses	**Year 1**		**Notes**
	TAF Request	**Total Cost**	
Salaries (list per task area as identified in the project plan table)			
Activity 1: Expert Panel Logistics	394	2,886	Under budget – panel met three times and there were no hard costs.
Activity 2: 1-on-1 Interviews	1,181	18,589	On budget for interviewer - approx. 45 hrs of in-kind time provided by HRAI staff and 15 interview subjects, in-kind contribution was likely lower than estimated
Activity 3: Ideation Workshops	984	13,258	On budget for facilitation - approx. 40 attendees gave 2.5 hours of their in-kind time
Activity 4: Report Authorship	1,378	11,917	On budget for facilitation - in kind contributions from HRAI staff was likely lower than estimated
Consultants (list per task area, specify activity)			
Evaluation	2,488	13,500	On Budget - in-kind contribution was likely lower

Program costs (e.g., equipment, materials, etc.)	26,076		On Budget - Climate Action Services Inc. acted as the project consultant
Travel		5,000	In-kind travel contribution was actually zero as all meetings were virtual due to the ongoing pandemic.
Administration (rent, office set-up, etc.)		4,850	In-kind contribution was likely much higher as HRAI put in 200-225 hours on this project.
Training and Staff Development		-	Curriculum development, planning, etc.
Other expenses (list)	300	300	Over budget on the HRAI contribution, as gift cards totaled $980
Total	**32,800**	**70,300**	

Project Literature

As HRAI has an industry newsletter, this project was not promoted in any third-party publications, but in the newsletter.

The following articles were published in the HRAI industry newsletter:

March 25th, 2021

Carbon Emission Reduction Programs Are Coming: Are You Ready?

Climate change is a pressing human health challenge that is garnering a global response. Governments at all levels in Canada are setting emission-reduction targets and developing programs to lower greenhouse-gas emissions. As we know, governments may be good at setting targets and funding programs but, in the buildings sector, the real work of lowering carbon emission will be in the hands of the actual businesses and trades that provide advice

and carry out the work of upgrading building systems. Meeting the country's targets will require innovation and leadership from *our* industry.

HRAI wants to better understand how to help members prepare for the opportunities that are on the horizon.

In recent years, the limits of "incremental conservation" approaches have become apparent: despite spending millions on energy reduction targets, Canada has not come close to meeting its Paris Accord commitments. The failure of incrementalism is leading governments to seek deeper solutions, such as Net Zero or Passive House building certifications.

Much has been done to improve new construction, especially in low-rise residential homes, and even with improved building code standards and voluntary efficiency standards like Energy Star, new homes are still significant carbon emission contributors, in part because of the embodied carbon emissions in the materials used in construction (an estimated 50 tonnes per new home before people even move in).

Even if new buildings can be brought to "net zero," greater opportunities for reductions exist in the *existing building stock*. This is why governments' focus is turning to retrofitting existing homes in order to achieve more immediate carbon reduction targets through efficiency improvements and fuel switching.

Programs that simply replace mid-efficiency gas furnaces with high-efficiency models are long gone as there are few additional gains to be made on this front. More and more, the holistic "building-as-a-system" approach is being pursued, requiring the symbiotic interaction of envelope and HVAC system improvements, while introducing passive and renewable energy options. Going forward, programs will be looking to promote low-carbon fuel sources and super-insulated building envelopes in an integrated way. They will require more extensive building systems modelling and analysis, and a more integrated delivery approach.

This creates a leadership opportunity for the HVACR industry. HVACR tradespeople are trusted experts whose advice building owners and operators seek for solutions to the building performance needs. HVACR contractors can build on that trust, and offer a broader range of home/building solutions that improve performance and lower carbon output.

HRAI advocates for well-designed and thoughtful programs and policies that will benefit members and future generations. To assist in this work we need to better understand and address the barriers that may be *preventing* or *hindering* industry members from taking a leadership role in climate change program delivery, so we can work to remove or overcome those barriers and help members take full advantage of the growth opportunities.

To this end, HRAI has undertaken a research project entitled: ***Overcoming Implementation Barriers to HVAC-led Building Retrofits***, funded by The Atmospheric Fund (TAF).

HRAI Members are encouraged to participate in this research by registering for an online focus group workshop on either April 22 (9am – Noon) or April 27 (1pm – 4pm).

Please email Len Hart at LHart@ClimateActionServices.com to register!

April 14th, 2021 and April 21st, 2021

Are you a residential HVAC contractor thinking about your future? We need to hear from you!

With funding support from The Atmospheric Fund (TAF), HRAI has undertaken a research project entitled *Overcoming Implementation Barriers to HVAC-led Building Retrofits* to explore the barriers faced by our industry in reducing carbon emissions from buildings and to help our members take full advantage of future growth opportunities.

There are incentive programs coming from multiple levels of government (and utilities) that will focus on "whole home retrofits." We want to know what it will take to ensure our members are ready to take full advantage!

Come and be heard at one of our focus groups!

Only one date remains open: Wednesday, April 28th 2021 (9:00 am – 12 noon)

Register today by emailing Lenard Hart at lhart@climateactionservices.com.

The following email blasts were sent out:

March 10, 2021

2021-03-10 Email Copy.pdf

March 16, 2021

2021-03-16 Email Copy.pdf

March 31, 2021

2021-03-31 Email Copy.pdf

Survey, Interview, Focus Group Findings Report

HRAI sent a survey link to its 741 contractor members. Over a two-week period, non-respondents were sent follow-up emails (which garnered between 30% and 48% click-through rate) on three separate occasions and the survey was promoted in the HRAI newsletter. In total, we received 98 responses, which equates to a 13.2% response rate.

Respondents were compared on key demographics (geography, class of membership, and size of organization) and was found to be representative of the overall population.

At an 80% confidence level, the margin-of-error (confidence interval) for this survey was estimated to be +/- 5%. As a result, HRAI believes the findings to be a reliable representation of the HVACR industry as a whole.

Design Workshop Findings Report

As the barriers found were largely soft in nature, the Workshops focused on methods to support contractors in moving forward along a path to Climate Leadership. Many noted that adapting HRAI Peer-Exchange-Program (PEP) committees would provide a community of practice environment to enable collective progress.

Attendees were mostly positive about government emission targets and pending program roll outs, as they present an emerging opportunity to grow their businesses. Some acknowledged that the recent down turn in the economy due the pandemic response had not affected their essential business lines nearly as much as it impacted other businesses, but it did exacerbate staffing challenges. Despite the fact that most of the attendees' businesses were dominated by natural gas furnace and hot water tank sales, many were experienced with air source heat pumps (as this is essentially what every air conditioning unit is) and realize that the days of incentives for gas furnace replacement is coming to an end.

All the Workshops fostered some entrepreneurial ideation, where the facilitator took a back seat as peer-to-peer discussions on how and who took over.

Several ideas around training were explored, including the concept of "curated" training to better suite HVACR technician and sales agents. The debate about which of these two kinds of staff would be better to the lead the engagement of customers about climate-positive solutions came down to context, not job description. Factors such as whether the job was a new quote vs service call, the ability and skill set of the staff to incorporate new analysis and new service quotes, and volume all were factors discussed. It was agreed that training should be broad, to gain buy in from all staff, and that carbon sales training would be good for all.

Training discussion also focused on how the HVAC industry traditionally prefers to take in new information. While seminars and webinars have a role to play, it was agreed that the most effective form of training for this kind of expansion of service was experiential, or learning-by-doing training. The industry is founded on mentor and apprentice learning, and many companies use mocked-up of furnace rooms for mentored training of new staff or on new products.

In terms of the course content, the workshop attendees noted that there is a lot of training available, both for house-as-a-system analysis and for building envelop improvement work. However, it was noted that this training is not that well suited to HVAC contractors and would benefit from some adaptation to address the specific hurdles they face. The term "curated training" got wide spread support; however, the workshop attendees were more split on the idea of a need for training certification. Some thought it would be an essential differentiator, whereas others felt that since it would not have much brand recognition, it would just be something else that the sales and marketing teams would have to sell. Linkage to program participation was seen as a more powerful motivator for adding a certification component to the curated training. In the end this topic was not resolved and likely will require further examination.

Risk mitigation, or having a low-risk environment to try new things, was also a topic that arose in the training discussions. Working with natural gas appliances is inherently risky, both in terms of fire/explosions and CO poisoning, so it is no surprise that the participants mentioned risk mitigation. One attendee noted that in the early days of Passive House retrofits, several general contractors 'experimented' by first renovating their own homes, rather than learning on a client's house, to mitigate risk if something went wrong. Since not everyone can use mock homes or renovate their own house, it was proposed that a few initial projects get additional technical and

project management support, a form of hands-on mentoring, so that technicians can gain the confidence to work on a customer's home.

Some of the areas of expertise that were identified as most in need of support, by the workshop attendees, were carbon calculations, whole home trade-off assessments for electrification retrofits, building envelope upgrades best practices, home energy/carbon modelling, and available incentive program rules and eligibility support. All of these were seen as areas where added support would be needed initially. Along with curated classroom training, the makings of a pilot project began to form.

Perhaps the most positive aspect of the working groups was the entrepreneurial solution solving energy that arose as participants became more engage in solution ideation. This was an indication of the how the industry should be able to figure this out with a little be of targeted support.

The Workshop attendees agreed to the following Climate Leadership Pathway for transforming the industry towards a low carbon future.

- **Step 1** (Groundwork Stage): offering more comprehensive systems analysis – energy modelling, trade off assessment
- **Step 2** (Resourcing Stage): one-stop service offering – overseeing subcontractors for complementary services
- **Step 3** (Expansion Stage): service growth expansion – develop fully integrated "one-stop service" offering and lower costs
- **Step 4** (Climate Champions): actively tracking and lowering carbon in homes, and systematically educating staff, customers, and the industry

It was generally agreed that the vast majority of the industry was not yet at Step 1, so a great progression even to that first step would be a significant advancement. This progression was not seen as a solo journey, and that fit well with the idea of forming a PEP group (with contractors, trainers, energy advisors, wholesalers, distributors and manufactures) to create the idea exchange and support network.

How each business will address each of these stages is very much open to nuance, and each should be able to develop a strategy that best suits each individual business and the markets they serve. While no formal commitments were asked for, most of the HVACR companies who participated in the Workshops said they would be interested in participating in a pilot if it was structured along the lines discussed above.

The interest in this subject grew as the participants were further engaged, and the enthusiasm for a pilot that arose in the workshop session further underscored the finding that there was no real hard barrier to be found preventing contractors from becoming Climate Champions.

See section 1.3.2 Summary of Strategies from Design Workshops for more detail on the findings.

Survey, Interview, Focus Group Promotional Outreach

Both the Focus Groups and Workshops were promoted together, and the survey was promoted using email blasts and through the HRAI newsletter. Interviews were set up via networking only.

Design Workshop Promotional Outreach

Both the Focus Groups and Workshops were promoted using email blasts and through the HRAI newsletter and by individual networking outreach.

Post-Project Communications Promotional Outreach

The project results are more strategic than newsworthy, and HRAI has chosen not to promote them as yet for strategic reasons. HRAI is open to sharing the survey results, and will do so in a limited way in its newsletter and with direct communications with stakeholders. As the results are largely psychological or perceptual in nature, making them widely known may, in fact, work counter to the goals of the next steps Accretor Initiatives. The goal of the Accelerator pilot is to create the optimal conditions to move the market, but to do it in a way that is not too manipulative as to elicit any pushback.

Third-Party Evaluations of Project Work

The survey methodology was submitted to KMDR Research for evaluation and an assessment of accuracy.

HRAI sent a survey link to its 741 contractor members. Over a two-week period, non-respondents were sent follow-up emails (which garnered between 30% and 48% click-through rate) between on three separate occasions, and the survey was promoted in the HRAI newsletter. In total, they received 98 responses, which equates to a 13.2% response rate.

Respondents were compared on key demographics (geography, class of membership, and size of organization) and was found to be representative of the overall population.

At an 80% confidence level, the margin-of-error (confidence interval) for this survey was estimated to be +/- 5%. As a result, KMDR Research believes the findings to be a reliable representation of the HVACR industry as a whole.

Critical Narrative Report

(1) Describe the single most positive and negative aspects of the project. If you had to do it all over again, what would you do differently?

In general, this research project should be seen as a success. The Research Team was able to engage HVACR contractors on the issues of deep energy retrofits, fuel switching, trade analysis and carbon calculations. They were able to identify several "soft barriers" around comfort, risk, and training that seem to have been enough to inhibit uptake. But a huge positive take away was that the industry is strongly in favour of taking a leadership role on climate issues and being a part of the solution. From the engagement session, participants clearly began to look at the opportunity to be climate champions, and developed a greater understanding of the political and market forces that will drive the transition to low carbon energy. They began to think about how they could address these challenges as part of their business. The Research Team was buoyed by the responses of the participants and the evolving enthusiasm for the project goals. The positivity inspired the rapid turnaround of a proposal for a Phase Two Accelerator Pilot, as there is clearly an opportunity to build upon this latent enthusiasm and create the conditions for the market to transform.

Perhaps the only, and somewhat ironically, negative aspect was that the research revealed was that there were few, if any, "hard barriers" that could be directly tackled going forward. If, for example, a lack of access to capital was the issue, or insurance and WSIB restrictions, or something else that could be directly addressed, then the challenge of next steps might have been simpler and more direct. Addressing soft barriers requires the continuation of the dialogue and interaction that was started under the research project, to help contractors take deliberate steps down the path to becoming climate champions. Fortunately, the working group sessions were helpful in revealing clear preferences in how the industry would like to see the soft barriers, that were identified in the research, addressed.

(2) What have you learned from your project? How will you apply your lessons? Lessons learned may relate to collaboration strategies, communications, policy, scientific matters or other interesting insights gained from your work.

The learning curve for both researchers and participants was considerable. The Research Team went out looking for barriers, things that were preventing HVACR contractors from offering

Deep Energy Retrofit services. However, what was found were not really barriers, but more like confidence and learning experience shortfalls that have led to hesitation and avoidance. To a certain extent the success of the industry in installing high efficiency natural gas appliances has led to some complacency, which has meant that many contractors have not kept up with technology changes and the emerging market drivers that public emission reduction commitments have brought. Very few contractors we engaged had a strong grasp on the changes in the heat pump technology, a clear understanding of the ramping carbon tax on fossil fuel, or a sense of the opportunity that is revealing itself in the fuel switching.

Nonetheless, all the contractors who participated did have a good sense of the importance of building envelope upgrades in supporting low carbon HVACR upgrades, and had a keen sense that homeowners are struggling to find resources to support their aspiration for a more sustainable home. In some ways the research team expected to encounter more resistance than they did to the issue of climate change. One contractor noted that she was a bit sheepish to discuss the subject with customers because her business was installing high carbon emission furnaces, hot water tanks, and fireplaces. This was a mild revelation that some in the industry felt a conflict between how they make their living and how they would like to live their life.

In terms of best practice insights, the value of doing a dozen one-on-one interviews to hone and improve the survey question was perhaps the leading take away from the project methodology.

(3) How has your project contributed to the greater city-wide/provincial/national campaigns or strategies for climate change and/or air pollution in Canada? What will happen as a result of the project in the next five years or beyond?

This research project is the first step in a much larger building carbon transformation effort. It has helped HRAI to understand the challenges members face and to have a clear path forward to help overcome these challenges and empower HVACR contractors to be climate leaders.

(4) How did your collaboration efforts contribute to the project? Describe your collaboration activities with a comment on how you measured impact and what results can be traced back specifically to your collaboration efforts? What challenges did you face with your collaborations?

Aside from the great support and collaboration of HRAI members, who replied to surveys, consented to interviews, and participated in Focus Groups and Workshops, the Research Team benefitted greatly from insights given by Enbridge staff and several municipal collaborators. Enbridge and (former Union Gas) staff were very generous of their time and thoughts on how to

move the market towards deep energy retrofits and provided the research team with very cogent insight into the program efforts their organization(s) have undertaken.

(5) How did you find your experience working with The Atmospheric Fund? Please provide feedback on positive aspects and areas where the relationship could be improved.

TAF is a leader in funding and enabling projects that have real benefits to the climate. Their understanding of the influence that HRAI could bring to helping its members become Climate Leaders, was fundamental to this project being funded. HRAI and the entire Research Team would like to thank TAF for enabling this research and supporting the vision of an HVACR industry that will be active partners to governments and utilities in helping them to meet their emission reduction targets for buildings.

(6) We encourage you to provide interesting high-resolution photos and images (no more than three), or online links related to your project. For those that are publishable, please include permission for us to use them in our publications and include credit details.

Please feel free to use either or both of the Research Team company logos.

LIST OF INTERVIEW CANDIDATES

Name	Company
Nathalie Brooks	Brooks Heating and Air Inc.
Vaughan Goettler	Boonstra Heating and AC (Airtime)
David Graeme (or Phili	Belyea Bros.
Michael Grochmal	AtlasCare
Roger Grochmal	AtlasCare
Nancy McKeraghan	Canco ClimateCare
Peter Messenger	A1 Air Conditioning and Heating
Gaston Minetti	The Green Method Inc.
Sean O'Brien	Reliance Home Comfort
Andrew Vasilak	Hamco Heating & Cooling
David Weishuhn	Blue Flame Heating and AC
Victor Hyman	Climate Care Cooperative
Outside of GTHA	
Jim Bolger	Waterloo Energy Products
Jacques Campeau	Campeau Heating
Joe Carr	Nottawasaga Mechanical
Chad Hayter	The Hayter Group
John Holtom	Top Hat Home Comfort Services
Peter Inch	Roy Inch & Sons (Service Experts)
Kevin McCrea	McCrea's ClimateCare
Marci McMullen	Haven Home Climate Care
Andre Soucy	Haven Home Climate Care
Darren Parsons	Anchor ClimateCare
Jimmie Thom	Atel Heating and Air Conditioning

LIST OF FOCUS GROUP AND WORKSHOP ATTENDEES

Name	Company
Session 3 - April 28, 2021	
Candace Steinberg	Mitsubishi Electric Sales Canada Inc.
Chris DesRoches	Mitsubishi Electric Sales Canada Inc.
Chris Hann	Wolseley Inc.
Christian Witt	Climateworks
Jeff Armstrong	Climateworks
Martin Luymes	HRAI
Lenard Hart	Climate Action Services Inc.
Lauralei Heggie	HRAI
Rachel Moncur	HRAI
John Harris	DSG Building Diagnostics
Sadia Zafar	HRAI
Session 2 - April 27, 2021	
John Harris	DSG Building Diagnostics
Lenard Hart	Climate Action Services Inc.
Martin Luymes	HRAI
Lauralei Heggie	HRAI
Rachel Moncur	HRAI
NATHALIE BROOKS	Brooks Heating and Air
Chris DesRoches	Mitsubishi Electric Sales Canada Inc.
Jacque Campeau	jack@campeauheating.com
Candace Steinberg	Mitsubishi Electric Sales Canada Inc.
Andrew Vasilak	Hamco Heating & Cooling Ltd.
Arnold Perea	Best Climate Inc.
Abdell	Tabreed Thermal Control Ltd.
Sadia Zafar	HRAI
Dave	Arseneau Home Comfort
Jennifer Bromley	Reliance Home Comfort
KenTurner	Anchor Home Comfort
Session 1 - April 27, 2021	
Lenard Hart	Climate Action Services Inc.
Martin Luymes	HRAI
Lauralei Heggie	HRAI
Rachel Moncur	HRAI
Victor Hyman	ClimateCare Cooperative Corp.
Jason Brownlee	Noll ClimateCare
Kerri Beaulieu	ClimateCare Cooperative Corp.
Chris Link	Link ClimateCare
Glenn Mellors	ClimateCare Cooperative Corp.
Steve Charmley	Advantage Airtech ClimateCare
Mike Mundell	Haven Home ClimateCare
Rick Buffham	RB Heating ClimateCare
Kim Schaab	Emke Schaab ClimateCare
Kevin McCrea	McCrea's Climate Care Renfrew
M. Little	Air Treatment ClimateCare
Andrew La Posta	Woodbridge GTA ClimateCare
Sadia Zafar	HRAI
Nancy McKeraghan	Canco ClimateCare
Mike	TRS Heating & Cooling ltd

SLIDE DECK USED IN FACILITATION OF FOCUS GROUPS SESSIONS

Focus group facilitation deck .pd

INTERMISSION SLIDES SHOWN DURING HEALTH BREAKS

Intermission sides sessions.pdf