Training commercial energy users in behavior change: A case study

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ABSTRACT

Within the commercial sector, energy managers and building operators have a large impact over their organizations' energy use. However, they mostly focus on technology solutions and retrofits, rather than human or corporate behaviors, and how to change them. This gap in targeted commercial sector research and behavioral interventions provides a great opportunity which is currently not being addressed. This paper presents a field research pilot where an empirical behavior change research process was applied and taught to commercial energy users in Ontario, Canada. This course served to fill an identified market gap and to improve commercial energy managers' literacy in behavioral science theory and techniques. A needs assessment identified a clear gap in behavioral training for energy managers, and high interest in the course further proved out the market opportunity for professional training on how to design, implement and evaluate behavior change interventions. Evaluation results identified positive feedback in terms of course reaction, self-reported learning and behavioral outcomes, and tangible results when course participants returned to work to apply their learnings. Evaluation results suggest that such training fills a vital gap in the current Strategic Energy Management (SEM) landscape, and could unlock significant savings in the commercial energy sector.

Introduction

Global and national goals for energy savings have been at the forefront of policy making and program design. The march towards these goals cannot wait for a single silver bullet, but rather must use the entire toolbox of options available. Changing individual and corporate behaviors and associated energy cultures remains an integral tool to attain these targets.

While significant gains have been made to impart energy-efficient behavior modifications to residential energy users (e.g., Dietz et al. 2009), the residential sector only accounts for about 38% of total U.S. electricity use and 18% of total U.S. natural gas use (EIA 2019). Thus, targeting the residential sector alone leaves a lot of opportunity for further efficiency gains. The commercial sector accounts for nearly as much energy use as residential (36% of electricity use and 13% of gas use, ibid), but the amount of research, governmental initiatives, and advice for commercial sector efficiency behaviors is far more limited in comparison (Chester et al. 2020).

While the savings potential between the residential and commercial sectors is quite similar, the strategies used to garner savings may not be. While the residential sector is broken down into a small handful of building types (e.g., single-family, multi-family, condominium, townhouse, and apartment building), the commercial sector by nature is immensely diverse, encompassing everything from multi-story open-plan offices, to single-room retail stores in shopping malls, to massive educational facilities, to hospitals, etc. Much of the published work on commercial sector efficiency has remained generalized to the entire commercial sector (often simplified as "office buildings", see Paone and Bacher 2018; Chester et al. 2020), neglecting to account for this diversity in its approach to energy efficiency.

An additional challenge to commercial sector efficiency is the diversity in actors using energy in the workplace. While households are largely similar in the composition of actors - single, couple, roommates, or family unity, there are many different types of employees in most organizations, with unique impacts on energy use. Many of them do not have direct motivation to save energy, nor do they have visibility into building energy use. As noted in a 2018 review of energy-related occupant behavior (Tam et al. 2018), commercial buildings "are more complex and therefore have more elements influencing energy use, such as owners, design professionals, operation staff, and occupants." For example, behavioral advice needs to be different when it is given to the building owner compared with the management of the company who is paying the utility bill (e.g., Janda et al. 2018), as well as employees (e.g., Paone and Bacher 2018), who can have different energy profiles (Hong et al. 2017) vs. business customers (e.g., Orfanedes et al. 2016). Each of these different potential actors and audiences has a unique agency over energy use, their own motivations (or lack thereof) to embrace efficiency, and a different level of potential impact on the energy use of a building and/or business.

While building operators and energy managers account for a small percentage of the people using energy in a commercial building, they have a very high relative impact on energy use in a building - up to 21% (Erhardt-Martinez 2016). Some interventions have specifically chosen to target building operators and energy managers and provide training for this reason. One example of such a program is the *Energy Connect* intervention at Atrium Health (Tools of Change 2019). This program began with a UNCC five-week course on "Introduction to energy management and building operations". This course was modified from the DOE *Building Retuning* course. It became apparent during this training course that energy literacy was a major issue among frontline facilities staff, with various levels of engineering education and knowledge and little to none on behavior change (Cowan et al. 2018). Almost all energy efficiency interventions at Atrium Health were geared at large-scale retrofits, technology replacement, and fault analytics software, with little heed given to the many behavioral inefficiencies. For example, as patient comfort and care is the primary mandate for all healthcare workers, overriding set points in the Building Automation System was a common intervention to alleviate patient hot/cold complaints - at great cost to building efficiency (Cowan et al. 2017). The *Energy Connect* pilot focused on teaching frontline staff to acknowledge the behavioral aspects of energy efficiency - which led to electricity savings of up to 12% in some pilot buildings.

From this pilot it also became apparent that there was a lack in training frontline staff such as commercial building operators and energy managers in behavior change and behavioral approaches to demand response. The *Energy Connect* program manager moved from Atrium Health to the Independent Electricity Systems Operator (IESO) of Ontario, Canada. There, she took the lessons from *Energy Connect*, particularly around the importance of training commercial frontline staff on behavior change, and contracted See Change Institute (SCI) to develop a BEST (*Behavior, Energy & Sustainability Training*) course.

Course Development

We conducted an initial needs and opportunities assessment for the course, which forms the basis of the See Change Process *Discover* phase (Rotmann et al. 2020). Two key methods were used for this assessment: (1) *landscape analysis* of similar courses and relevant literature, and (2) in-depth *stakeholder interviews* with 13 potential course participants and observers.

In our landscape analysis, we reviewed sixteen (16) IESO energy efficiency training courses - only one (*$elling Energy*, by Mark Jewel) included behavior as a topic. We also reviewed three prominent behavior change training courses[1] and found that none of them specifically targeted commercial frontline energy staff.

Our literature search also identified gaps in education and training opportunities for energy professionals. Kandpal and Broman (2014) focused on education and training gaps in the renewable energy sector, citing trends that can help shape and guide similar challenges in energy efficiency. In developing technical training courses with behavioral change components, they suggest to remain flexible and allow for future improvements, seek input from the industry, provide learning materials, and provide a balance between theory and practice.

In our in-depth interviews, stakeholders reported barriers related to energy managers being trained as engineers and thus less focused on the human / behavioral elements of energy use / savings. Several talked about issues with resources not having the right knowledge, tools, or time to implement behavioral interventions. Leadership buy-in (or lack thereof) was also regarded as a crucial element in empowering energy managers and guaranteeing success.

We then began to *design* the course and also conducted additional pre-course surveys to *define* our course participants and their goals for the course. From this research, we learned that there was very high demand - the course sold out fast, and there was public interest beyond our target audience (commercial energy managers from Ontario). We had several commercial sectors represented, although most course participants came from municipalities and school boards, with smaller clusters from health and real estate sectors. Nearly half of the participants were energy managers, while the other half were a mix of building operators, sustainability managers, company leaders / managers, or something else. Even though it was regarded as best practice (from our stakeholder interviews) to have two people per organization - one with technological, one with managerial background - few organizations complied with this request. Only three organizations sent more than one person and not a single one had two people complete the course. As such, we are unable to assess the impact of the number of attendees per organization on course performance in this study. Our pre-course survey showed that most participants had high levels of energy knowledge, but knew little about behavioral interventions. Their expectations of the course content were also very varied, and we tried to refine the course to match as many expectations as we could.

Finally, we reviewed our final course curriculum with IESO staff to get pilot feedback and set up an evaluation for *deployment*. Evaluation methods are further described in the course evaluation section below.

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[1] Courses reviewed included those offered by Doug McKenzie Mohr, BJ Fogg, and Mark Jewel.

Course Curriculum

A variety of training courses for energy managers are offered throughout Canada. The Ontario Systems Operator, IESO, provides financial support for organizations in the province to send their staff to such courses. While these courses are quite useful to improve energy literacy and troubleshoot technology solutions, they have a clear gap: most do not focus on the human side of energy use - that is, individual and corporate behavior of management and staff.

IESO invited SCI to develop and pilot a course for energy managers to fill this gap. Called *Behavior, Energy and Sustainability Training* (BEST), it is designed to help energy / facilities management and other staff to achieve energy savings as well as measurable co-benefits (e.g., improved teamwork, productivity and self-confidence). The course aim is to empower, engage and educate energy and facilities managers to better understand not only their building system, but their wider 'socio-ecosystem' they operate in. The course consisted of a two-day in-person workshop followed by five online coaching sessions. The curriculum is based on See Change's *Behavior Change Process* (Karlin et al. *in prep*; see Figure 1).
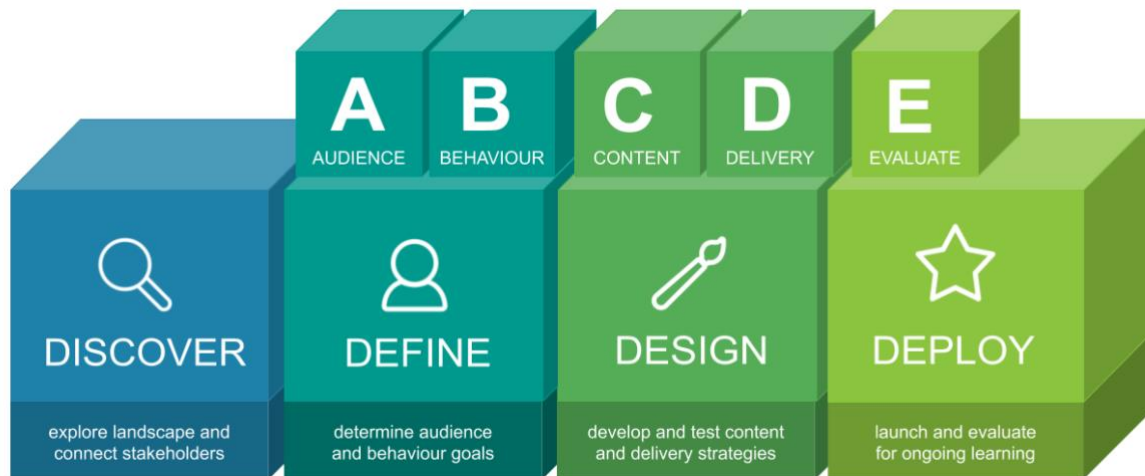

Figure 1. See Change Behavior Change Process. *Source*: Karlin et al. *in prep*

On Day 1, participants explored the ABCDE building blocks of behavior change: **Audience, Behavior, Content, Delivery** and **Evaluation**. The lecture component focused on behavioral science theory. Learnings from each section were embedded by worksheets, where attendees did self-work using examples based on their own background or organization. Topics included:
- Developing SMART project goals
- Audience segmentation
- Targeting behaviors to optimize energy savings
- Content strategies and message framing techniques
- Selecting delivery messengers and mediums that work
- Evaluating process and impacts, including co-benefits

On Day 2, the course introduced a fictional case study, and participants worked through the following process stages in small group activities (similar sectors were seated together):

1. **Discover** - Explore landscape and connect stakeholders
   Methods include stakeholder mapping and content analysis
2. **Define** - Determine audience and behavioral goals
   Methods include surveys, interviews, focus groups, and ethnography
3. **Design** - Develop and test content and delivery strategies
   Methods include usability testing and AB experiments
4. **Deploy** - Launch and evaluate for ongoing learning
   Methods include process and outcome evaluation

After the in-person workshop, we held five weekly online coaching sessions for 90 minutes each. These sessions were open to all course participants, and we invited them to send us prepared materials of their own behavioral interventions or methodologies (e.g., surveys, action plans, meeting agendas, focus groups), which they had learned about in the course. These were sent around before each online meeting, and then discussed in a webinar live-coaching format. We collected all coaching minutes and course materials in a document, which was made available to all participants.

Course Evaluation

A course evaluation was undertaken to measure the success of the course and identify opportunities to improve delivery, as well as to determine whether it would be of value for more people in the future. Objectives and metrics were based on the Kirkpatrick Evaluation Model (Kirkpatrick and Kirkpatrick 2016).
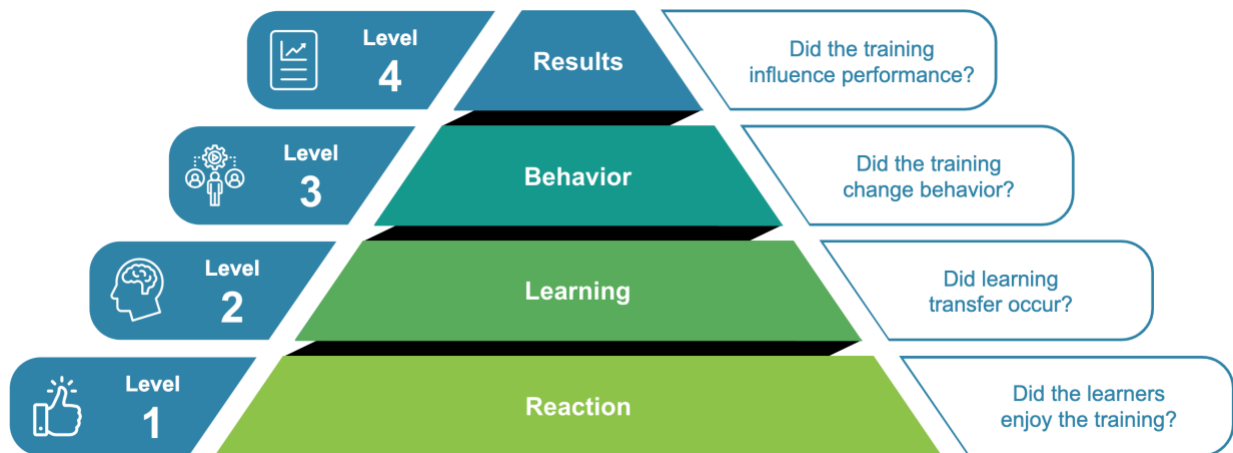

Figure 2. Kirkpatrick Evaluation Model. *Adapted from*: Kirkpatrick and Kirkpatrick (2016).

As this diagram shows, the amount of data and analysis decreased as participants moved from reaction (Level 1) up through learning, behavior, and into results (Level 4).
The following data collection methods were used for our course evaluation.

- **Pre-course Survey.** A pre-course survey was sent 3 weeks before the course to registered participants. The survey included a knowledge pre-assessment, questions measuring attitudes, perceptions, and interests in behavioral approaches, and goals for the training.
- **Workshop Evaluation.** A written evaluation was completed by participants and observers at the end of the in-person workshop, in paper-and-pencil format. The evaluation assessed feedback on the content, activities, and instructors.
- **Participant Pledges.** Following the workshop, participants were also asked to fill in a form with up to three pledges, to keep one copy, and share the other copy with us.
- **Online Course Debrief.** This debrief was completed during the last online session. It consisted of 5 semi-structured questions designed for feedback and reflection.
- **Post-Course Survey.** This survey was sent via email after course completion. It included a knowledge and attitude post-assessment (matching the pre-), and final course feedback.
- **Observer Feedback.** Some observers were interviewed, using a semi-formal structure, following the course. Others provided written feedback via email to the program funders.

Course Outcomes

38 people attended the course, 28 as participants, and 9 as observers (pre-post surveys were limited to course participants). Results from all data collection methods were synthesized, and are presented here by course objective. Given the small sample size (of 28 course participants), we did not have sufficient statistical power to conduct any inferential analysis (e.g., paired t-tests or regression analyses). As such, all statistics presented are descriptive in nature.

Reaction

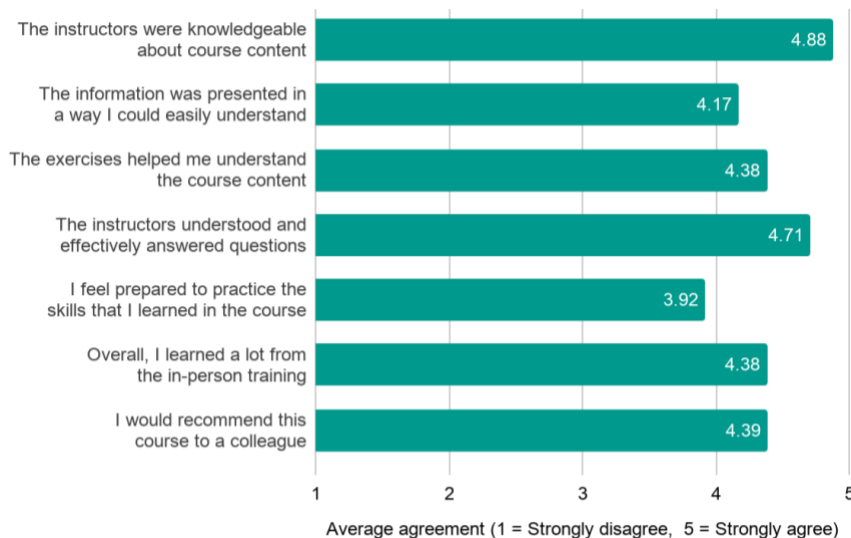Participants reported being satisfied with the course, with an average rating of 4.4.

Figure 3. Workshop responses on reaction to course

Course Content. The course content generally received high praise, with many participants saying that it was very useful and something they had never seen offered before. Some noted the amount of content, and suggested paring back, so less material is covered more thoroughly.

- "Felt content could have been more spread over 3 days. Two days worked though, thanks very much, I really enjoyed it!"

The amount of behavioral science theory in the course received mixed reviews. Some found it to be a great strength of the course, whereas others indicated a preference for less rigor, and more translation into practical examples and suggestions.

- "The content provided a huge volume of research which demonstrated the vast body of knowledge from which we can draw on to meet our specific and unique energy management objectives."

Interactivity. Several participants appreciated the interactive nature of the exercises, and requested more of them (vs. lecture content). Participants also enjoyed being grouped by sector so that they could engage with people in similar jobs and roles. One observer suggested the addition of a third trainer, so that individual tables could receive more attention during activities.

- "The workbook was excellent. The activities were thoughtful, relevant, useful and engaging."

Sector-specificity. Participants enjoyed being seated in similar sector groups. Some suggested more sector-specific activities, or even designing course modules for individual sectors.

- "How it was organized by sector-helped stimulate good participation and conversation during trading exercises and breaks, creating stronger peer group too."

Course Preparation. Participants enjoyed the pre-survey, suggesting that it raised interest in the course, and served as a teaser. A couple suggested a pre-course reading or webinar to prepare students on what they will be working on, since the material is so new to most.

- "Providing some pre-source prep material on what we will be answering on the first day would be helpful or providing some pre-reading (think about those questions)."

Online Coaching. Unique to this course was the 5-week online coaching component following the in-person workshop, which was attended by about half of the course attendees. General feedback for the online coaching sessions was highly positive. The two primary suggestions for the online coaching were to encourage more attendance, and to maintain it for longer.

- "Online coaching for me was the best part of this course."
- "I think this component is key to making sure what people learn is used to take action."

Learning

Participants reported knowledge gain on a number of topics following the in-person course, and the post-course survey. There was a slight improvement in participants' self-assessment of how prepared they felt to take these new skills to save energy in their workplace ($\delta = 2\%$), which increased even further after the online coaching ($\delta = 9\%$). The question *Overall, I learned a great deal from this course,* also increased by 4% from the workshop to the end of the course. Many participants commented that the course taught them how to apply behavioral insights to their work. Participants also learned how to apply theories and scientific methodologies to areas they previously had not connected to behavior change.

- "Although I was familiar with behavior change theory I hadn't yet thought about applying it to my current work. Now it's the first thing I think about."
- "I think that this course has really given me some more tools and confidence in that part of my work."

Comparing the pre-post self-assessments of knowledge, we saw an average increase of 33% (from 8.3% on *knowing energy use in their organization,* to 58% on *how to design a behavior change program*).
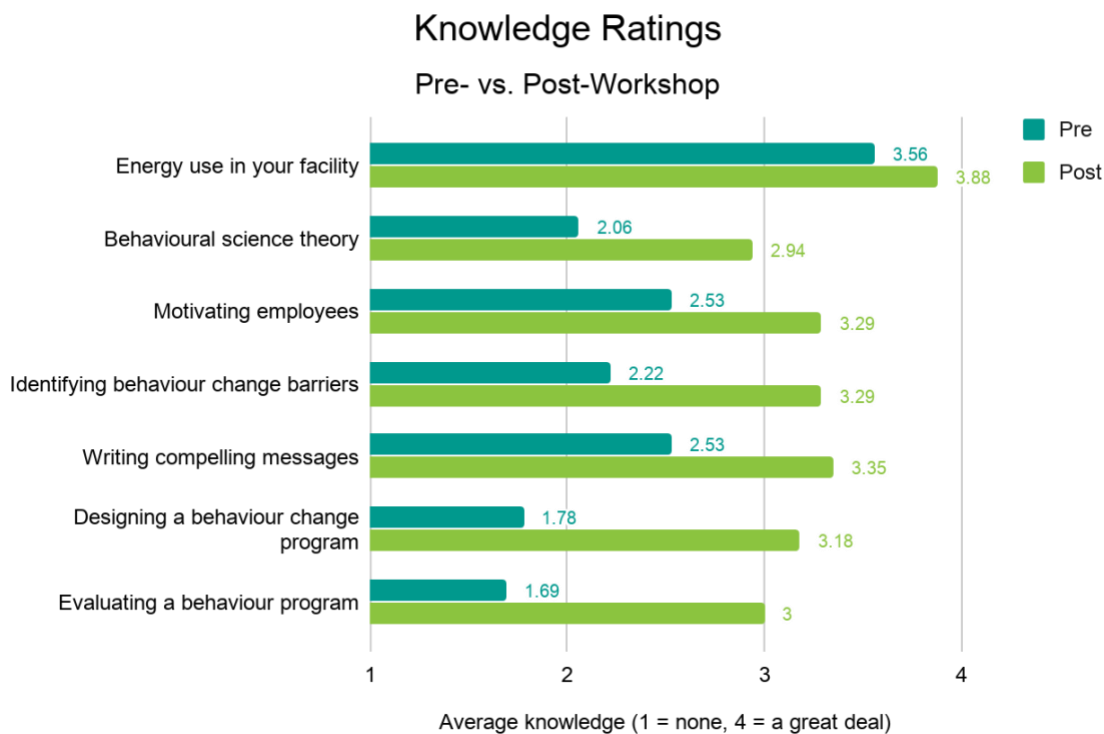

Figure 4. Pre-post knowledge ratings for course

Behavior

Over 60% of course participants reported that they took one or more actions as a result of this course. Many responses mentioned developing and implementing new programs, or altering existing programs or strategies to reflect what they have learned in the course.

- "I would not have reframed the survey questions without the BEST course and I feel they are much better now than what I originally had. I'm also going to pre-test some of the questions to ensure they are right for my audience."
- "I realized my people were 'surveyed to death', so instead of just doing another survey with them, I'm doing a 'lunch and learn' and focus groups. I'm also developing an idea around 'greening the holidays' to take advantage of the timing of them."

Participants' self-confidence in their ability to use behavioral approaches in their work increased from an average of 3.84 in the pre-survey to 4.18 in the post-survey, and several reported a newfound confidence and desire to share what they learned with others. Participants also reported several changes in the way they relate to others at work.

- "I struggle with certain negative behaviors with our Energy Team - I have been identifying these behaviors and looking at ways to engage and motivate these individuals; I will be applying these strategies to the team over the coming months."
- "Understanding a bit more of the culture of my workplace has really helped me reach out to people. I've also changed the way that I do a few tasks in my day to day work to include others a bit more and help them to feel included and invested in my processes."

Results

The online coaching sessions provided an opportunity for participants to report on, and get support with implementing programs in their workplaces. These included behavior change interventions, two large-scale surveys that went out to 100+ organizations, environmental plans for governing boards, focus groups, prize draws and pledges, obtaining leadership buy-in, and forming eco committees. The first results that participants reported was an improvement in the information they received from their efforts engaging their colleagues.

- "We did a staff open house and instead of just standing there waiting to be asked, I created a booth with lots of climate change information, and a prize draw. I didn't realize how much I could learn from just listening to people! ... I did some audience segmentation and broke them down into roles and demographics to learn more about them. I had no idea I could get that many insights to help me better do my job!"
- "I really think about how people answer questions now and it helps me to get a huge amount of information that I really didn't realize that I was getting before. In the past I have struggled with the implementation of certain projects and processes and I think that this course has really given me some more tools and confidence in that part of my work."

As a result, several participants reported receiving buy-in or approvals that they felt had been lacking or not possible before the course.

- "My proposal has been pre-approved by senior management and will be presented in January for final approval. Management requested I create a new policy to ensure all staff understand their roles and responsibilities. This course really helped me achieve all that."
- "When I first went to the BEST course, I had no buy-in to do behavior change in my organization. After I returned, my manager was happy to listen to my ideas and asked me to write a proposal."

While formal data collection ended two months after the in-person workshop, and one month after completing online coaching, these results do not extend to actual energy savings. Such attribution of building energy use is a key issue in any training like this, as well as behavioral approaches to energy efficiency in general. The *Energy Connect* program is a good example of the complexity, and importance of collecting quantitative and qualitative data to prove causality between the behavioral intervention and actual energy savings (Cowan, 2017; 2018). While measuring end use energy savings was beyond the scope of this study, this could be an issue for any training sponsored by an energy utility or similar actor.

Discussion

This pilot course served to fill an identified market gap, and improve commercial energy professionals' literacy in behavioral science theory and techniques. The needs assessment findings identified a clear gap in behavioral training for commercial energy managers, and high interest in the course further proved out the market opportunity for professional training on how to design, implement and evaluate behavior change interventions. Evaluation results identified positive feedback in terms of course reaction, self-reported learning and behavioral outcomes, and tangible results when course participants returned to work to apply their learnings. Specific lessons we learned from this pilot include the following:

1. The topic of *how to apply behavioral insights into real-life practice* was new for most attendees. Not all could follow the strong science component equally well, and different learning styles meant that it was important to find a balance between lectures, stories and worksheet exercises that help embed the new knowledge.
2. The *high diversity in our target audience* suggests opportunities to develop courses that are sector-specific (e.g., for municipalities vs. schools vs. healthcare) and apply to different types of energy actors (building operations, energy managers, sustainability advisors, and leadership).
3. *Course content should be highly interactive*, and embed behavioral theory into practice that can be applied to the participants' real-life situations. While many energy efficiency courses are lecture-based and highly technical, adding in behavioral best practices - such as sharing stories and interactive exercises - can increase engagement and learning outcomes. Experimenting with newer teaching strategies, such as online coaching of prepared participant material relevant to the participants, led to some of the most enthusiastic feedback.
4. It is important to *empower and train this particular audience* as they have the most influence over their organizations' energy use (Cowan et al. 2017). This includes teaching them how to talk to different stakeholders, from all parts within

their organization, and also external stakeholders (e.g., customers, regulators and vendors). Following a robust social science and design thinking process, and collecting quantitative and qualitative insights to support each step will guide them to design and implement behavioral interventions they can show to have measurable outcomes.

Members of the project team have begun working to develop new iterations of the course within the US Federal government, as well as within the City of Toronto. Learnings from this pilot, such as creating pre-course content to focus on practical learnings in the face-to-face component, will be applied in both instances, and we are exploring additional ways to share this type of training with as many energy managers as possible. In order to scale the course, a "train the trainers" model is being explored, and we are collaborating with several other organizations that offer energy efficiency training to ensure that behavioral approaches are taught alongside the more traditional topics within Strategic Energy Management (SEM) programs.

There is a clear, global need to realize underexplored energy efficiency and conservation potential in the commercial sector. In addition to commercial sector saving opportunities, there is a lot of interest in behavior change, and there is a lot of scientific knowledge that can be applied to real life. We hope that this paper provided the background, justification, inspiration, and a case study to inspire more courses like this in the future.

Acknowledgements

References

Chester, M., Rosenblum, A., Rotmann, S., and B. Karlin. 2020. *Commercial Energy Behaviour Opportunities Assessment*. Los Angeles: See Change Institute.

Cowan, K., Sussman, R., Rotmann, S. and R. Cox. 2017. *Subtask 11 Real-life case studies: Designing a Behaviour Change Programme for Hospital Facilities Staff*. Wellington: IEA DSM Programme Task 24.

Cowan, K., Sussman, R., Rotmann, S. and E. Mazzi. 2018. It's Not my Job: Changing Behavior and Culture in a Healthcare Setting to Save Energy. *ACEEE Summer Study: Monterey.*

Dietz, T., Gardner, G.T., Gilligan, J., Stern, P.C., and M.P. Vandenbergh. 2009. Household actions can provide a behavioral wedge to rapidly reduce U.S. carbon emissions. *Proceedings of the National Academy of Sciences* 106 (44).

_____. 2019. *Table 5.1. Sales of Electricity to Ultimate Customers: Total by End-Use Sector, 2009 - December 2019 (Thousand Megawatthours)*. https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_01

Erhardt-Martinez, K. 2016. Behavior-based Energy Savings Opportunities in Commercial Buildings: Estimates for Four U.S. Cities. *ACEEE Summer Study: Monterey.*

Hong, T., Yan, D., D'Oca S. and C.-F. Chen. 2017. *Ten Questions Concerning Occupant Behavior in Buildings: The Big Picture.* California: Lawrence Berkeley National Laboratory.

Janda, K.B., Rotmann, S., Bulut M., and S. Lenander. 2017. Advances in green leases and green leasing: Evidence from Sweden, Australia, and the UK. *eceee Summer Study: Hyéres.*

Kandpal, T.C. and L. Broman. 2014. Renewable energy education: A global status review. *Renewable and Sustainable Energy Reviews* 34: 300–324.

Karlin, B., Forster, H., Zaval, L., Rotmann, S., and R. Ford. *in prep*. Applying Behavioral Science to Energy Programs. *Working paper prepared for the Users TCP by IEA: HTR Annex.*

Kirkpatrick, J. D., and W.K. Kirkpatrick. 2016. *Kirkpatrick's four levels of training evaluation.* Association for Talent Development.

Orfanedes, L., Dethman, L. and J. Lalos. 2016. Charting the Future: How to Use Customer Engagement Strategies to Ensure Energy Savings and Persistence. *ACEEE Summer Study: Monterey.*

Paone, A. and J-P. Bacher. 2018. The Impact of Building Occupant Behavior on Energy Efficiency and Methods to Influence It: A Review of the State of the Art. *Energies* 11, 953.

Tam, V.W.Y., Almeida, P. and K. Le. 2018. Energy-Related Occupant Behaviour and Its Implications in Energy Use: A Chronological Review. *Sustainability* 10, 2635.

Tools of Change. 2018. *Energy Connect*. https://www.toolsofchange.com/en/case-studies/detail/718