

**GREENING WORK STYLES:  
AN ANALYSIS OF ENERGY BEHAVIOR PROGRAMS  
IN THE WORKPLACE**

**Shui Bin**

**January 2012**

**Report Number B121**



## CONTENTS

List of Tables .....	iii
List of Figures .....	iii
List of Boxes .....	iii
Glossary.....	iv
Acknowledgments.....	iv
Executive Summary.....	v
Setting the Tone .....	vi
Building a Team .....	vii
Employing Communication Tools.....	vii
Deploying Key Engagement Techniques .....	vii
What Are the Take-Home Messages from this Report? .....	viii
1. Introduction.....	1
1.1 Commercial Buildings and Related Energy Use .....	1
1.2 A Brief Review of Energy Behavior Research .....	1
1.3 The Definition of Work Styles, Green Work Styles, and Greening Work Styles .....	2
2. Case Studies of Energy Behavior Programs in the Workplace.....	3
2.1 Research Scope and Selection of Case Studies .....	3
2.2 “Green the Capitol” at the U.S. House of Representatives (2007 to 2012, U.S.) .....	4
2.3 The “Tenant Energy Management Program” at the Empire State Building (2009–2013, U.S.).....	6
2.4 “Conservation Action!” at BC Hydro (2006–2007, Canada).....	7
2.5 MEMPR Behavior Campaign in a Provincial Governmental Building (2008, Canada) .....	8
2.6 “TLC-Care to Conserve” at University Health Network (2007–2010, Canada).....	9
2.7 Summary .....	10
3. An Analysis of Strategies for the Development of Energy Behavior Programs in the Workplace.....	12
3.1 Setting the Tone .....	12
3.2 Building a Team .....	16
3.3 Employing Communication Tools.....	18
3.4 Deploying Key Engagement Techniques .....	23

4.	Policy Implications .....	27
4.1	Costs and Benefits of Energy Behavior Programs .....	27
4.2	Development of an Evaluation Framework for Energy Behavior Programs.....	29
4.3	Institutional Buildings, the Best Candidate for Energy Behavior Programs? .....	30
4.4	Integration of Energy Behavior Components into DOE's Building Initiatives .....	30
5.	Conclusions.....	31
	References.....	33

## LIST OF TABLES

Table 1. Five Case Studies in This Report.....	4
Table 2. Lighting Campaign in the MEMPR Behavior Campaign .....	8
Table 3 A Brief Summary of Case Studies.....	11
Table 4. Peer Champion in Energy Behavior Programs .....	18
Table 5. Use of Information Channels by Case Study .....	19
Table 6 Use of Feedback in Case Studies .....	25
Table 7. Cost and Benefit Items of an Energy Behavior Program .....	28

## LIST OF FIGURES

Figure 1. Primary Energy Use and Annual Growth Index by Sector, 1980–2007.....	1
Figure 2. Strategies for the Development of an Energy Behavior Program in the Workplace .....	12
Figure 3. Logo of "Green the Capitol".....	16
Figure 4. Logo of "TLC-Care to Conserve".....	16
Figure 5. My Green Office .....	20
Figure 6 A Prompt in the TLC Case .....	21
Figure 7. A Collection of On-line Prompts and Stickers for Energy Conservation .....	21
Figure 8. Poster Examples in Reviewed Energy Behavior.....	22
Figure 9. The EPRI Categorization of Feedback.....	24

## LIST OF BOXES

Box 1. Examples of Behavior-side of Green Work Styles .....	3
Box 2. What Did They Say? .....	5
Box 3. Upper Management Support in Energy Behavior Programs.....	14
Box 4. Program Committees in Energy Behavior Programs .....	17
Box 5. The Floor Challenge at Conservation Action at BC Hydro.....	26
Box 6. Rewards in Energy Behavior Programs .....	27

## **GLOSSARY**

AOC	Architect of the Capitol
BC	British Columbia
BC Hydro	BC Hydro and Power Authority
Btu	British thermal unit
CAO	The Office of the Chief Administrative Officer
CBSM	Community-based social marketing
DOE	The U.S. Department of Energy
DSM	Demand-side management
EPRI	Electric Power Research Institute
MEMPR	The Ministry of Energy, Mines and Petroleum Resources
TLC	Thermostats, Lights, and Controls
TWH	Toronto Western Hospital
UHN	The University Health Network
VOC	volatile organic compounds

## **ACKNOWLEDGMENTS**

I am greatly indebted to many people who were very generous of their time and insights: Susan Mazur-Stommen and Jennifer Thorne Amann at ACEEE, Dave Hunt and Elizabeth Malone at Pacific Northwest National Laboratory, Tianzhen Hong and Christopher Payne at Lawrence Berkeley National Laboratory, Paul Stern at National Academy of Sciences, Jacob Straus at Library of Congress, and Christine Gustafson at BC Hydro. Their careful reviews and insight greatly improved the report. I would like to thank Gregor Irvine-Halliday for his editing and very helpful inputs. Renee Nida helped make this report publishable in a timely way.

The idea of this report was initiated by Steven Nadel. He provided important guidance on the direction for this report. There were numerous discussions between Steve and me, which helped shape what this report looks like now. Without his support and guidance, this report would not exist. I owe him a big and loud thank you.

## EXECUTIVE SUMMARY

Occupying 80 billion square feet and consuming roughly 20 percent of total U.S. energy use in 2010, commercial buildings have the fastest growth rate for energy use in the U.S. of any end-use sector (the other sectors being residential buildings, transportation, and industry). The federal government has invested heavily in the establishment of a series of energy efficiency initiatives that target research, development, and deployment of advanced technologies for the commercial buildings sector, as well as job creation. Energy behavior programs, which can play a significant role in improving building energy efficiency, remain largely absent from the current initiatives.

This report focuses on energy behavior programs in the workplace, which are designed and conducted by building owners and renters to reduce building energy use through change in employees' attitudes and behaviors. The energy savings attributed to the reviewed energy behavior programs vary from 4% (savings from a standalone behavior program) to nearly 75% (savings from a comprehensive project in which a behavior program is a component).

The report is structured as a review of five case studies (Section 2), as listed in Table ES-1, from which general strategies for the development of energy behavior programs for the commercial sector are drawn (Section 3), and policy implications are discussed (Section 4).

**Table ES-1. Five Case Studies in This Report**

	U.S.	Canada
Government	"Green the Capitol" at U.S. House of the Representatives	Behavior Campaign in a Provincial Government Building
Government-Owned Utility		"Conservation Action!" at BC Hydro
Public Research University-Owned Hospital		"TLC-Care to Conserve" at University Health Network of University of Toronto
Historical, Landmark Building	"Tenant Energy Management Program" at Empire State Building	

"Green the Capitol" (2007–2008) is a successful top-down energy program implemented by the U.S. House of Representatives. "The House of Representatives must lead by example, and it is time for Congress to act on its own carbon footprint," declared then Speaker of the House of Representatives Nancy Pelosi in 2007. The development and application of the "Green My Office" Web site is one of the highlights of the project. It provides an excellent template for developing similar Web-based behavior change tracking tools.

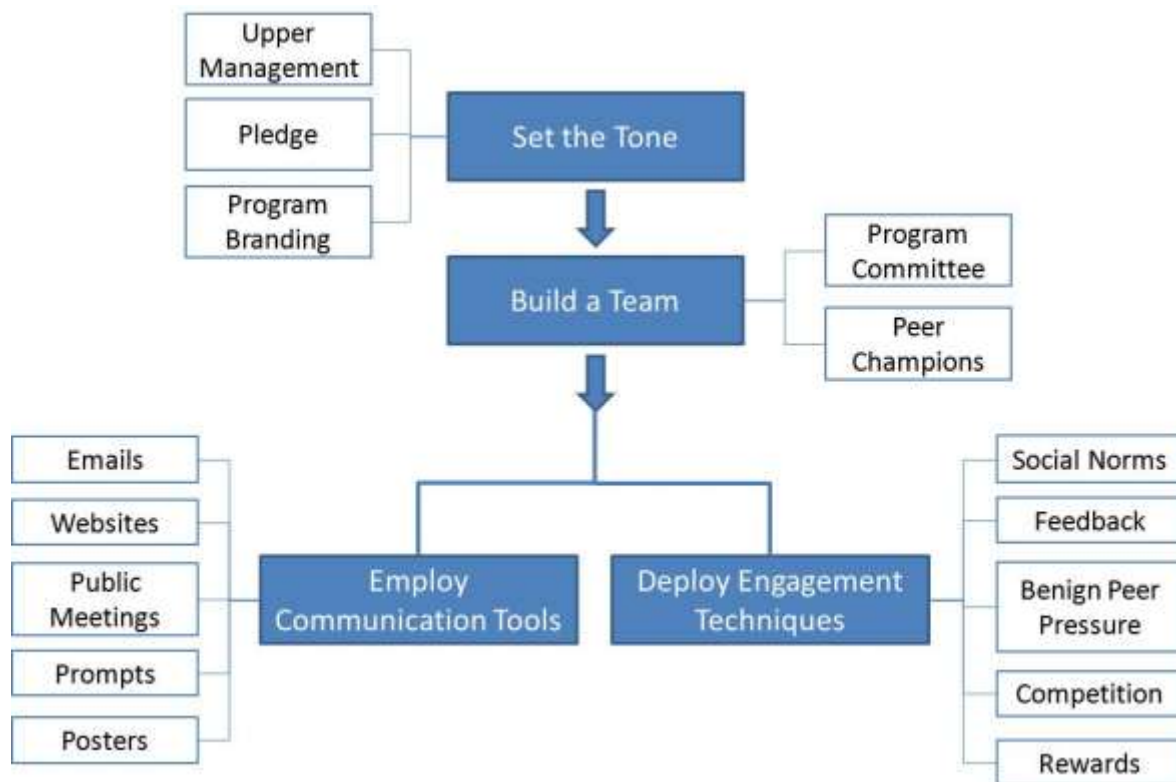
The Empire State Building is currently conducting a highly-publicized ongoing retrofit program (2008–2013). The program, which incorporates an energy behavior component, also serves to raise public awareness of the potential of similar retrofits, particularly for high-end office buildings and/or older landmark buildings.

Both the energy behavior program at BC Hydro (2007) and the behavior campaign of the Ministry of Energy, Mines and Petroleum Resource (MEMPR) of British Columbia (2008) aggressively sought to change energy conservation cultures in the workplace. BC Hydro integrated the results of energy reduction into employees' and management's annual performance management structure, which in turn determined their annual bonuses, thus creating a potent incentive mechanism for participation.

In addition to the BC Hydro and MEMPR cases, the “TLC-Care to Conserve” program (2007–2010) at the University Health Network of the University of Toronto is an example of the application of community-based social marketing (CBSM). The TLC’s attention-getting banners and posters (substituting the iconic images of “Rosie the Riveter” and “Uncle Sam” with generic hospital staff images in the same context) used humor and historical association to engage participants and deliver program messages.

The five cases share four common strategies that contribute to successful energy behavior programs: (1) setting the tone; (2) building a team; (3) employing communication tools; and (4) deploying key engagement techniques, as presented in Figure ES-1.

**Figure ES-1. Strategies for the Development of an Energy Behavior Program in the Workplace**



### Setting the Tone

Workplaces, like any institution, have their own internal sets of rules and norms. Within this “mini-society,” **upper management** (Section 3.1.1) has a critical role to play in inculcating the value-set of the organization among employees. Upper management can incentivize and sanction activities within their sphere of oversight, and often stand as representative of the values and beliefs of the group as a whole. Energy behavior programs in the workplace that fail to garner the support of organizational leadership are unlikely to succeed.

In each of the reviewed case studies, upper management made a public **pledge** to reduce building energy use that effectively set the overall tone for the project (Section 3.1.2). As illustrated by the reviewed case studies, organizational pledges made in public often lead to an organizational action taking place. The visibility of personal pledges should consider the opinions of program participants, as suggested by the TLC case.

Some energy behavior programs employ program **branding** as a means of communication with both participants and the public (Section 3.1.3). A good branding for an energy behavior program should



blend the messages of business identity and program theme into an attention-getting logo or a short phrase, which may help establish not only the identity of the program, but also create an emotional attachment among program participants and external audiences. Among the reviewed cases, “Green the Capitol” and the TLC were seen to be the most effective in branding their energy programs.

## Building a Team

A successful energy behavior program in the workplace is often the product of intensive teamwork. **Program committees** (Section 3.2.1) consisting of key stakeholders within the organization are convened to head up an energy behavior program, after which the committee is placed in charge of project development, coordination, and communication. Some program committees invite an outside party to be a committee member, or even to take charge of program design, development, and management. For example, the TLC project committee contracted a consulting company to develop and manage its energy behavior program.

**Peer champions** (Section 3.2.2) are either volunteers (e.g., “Conservation Floor Captains” in the case of BC Hydro) or are selected by the program committee from building occupants (e.g., “Green Office Representatives” in the “Green the Capitol” program, “Conservation Champions” and “Conservation Floor Captains” in the MEMPR program, and “Social Market Champions” in the TLC program). These peer champions act as points of contact between various onsite stakeholders and help to promote the concept of energy conservation and associated desirable attitudes across the organization through their ongoing interaction with other building occupants.

## Employing Communication Tools

Communication is an activity that conveys information to a target audience. There is a wide range of online and offline communication tools from which to choose; **Emails and Web Sites** (Section 3.3.1); **Public Meetings** (Section 3.3.2); **Prompts** (Section 3.3.3), and **Posters** (Section 3.3.4).

Each of the reviewed programs employed e-mail and Web sites—two online communication channels—as the main communication tools to reach participants. These programs also used more traditional methods to deliver program messages at key program events (e.g., public meetings) and in the workplace (e.g., posters). The use of prompts is reported exclusively in the three reviewed Canadian programs, which represent CBSM applications, a popular social marketing theory developed and widely propagated in Canada.

## Deploying Key Engagement Techniques

An energy behavior program in the workplace above all requires sustained engagement with building occupants. The reviewed energy behavior programs employed several common engagement techniques.

**Social norms** (Section 3.4.1), a very popular approach employed in all of the cases reviewed, invoke principles of right action that are binding upon members of a group and which serve to guide, control, or regulate proper and acceptable behavior. Social norms have been widely discussed as an important approach in the promotion of pro-environment values, attitudes, and behaviors. **Feedback** (Section 3.4.2), as employed in “Green the Capitol”, the Empire State Building, and the MEMPR case, offers information to people about the consequence of their actions. Researchers have long realized that feedback was a more effective strategy than exclusively relying upon information, motivation, or monetary incentives. **Benign peer pressure and competition** (Section 3.4.3), employed in the BC Hydro and the MEMPR cases, refers to the influence of a peer group on its members with respect to changes in attitudes and behavior deemed preferable in a working environment. **Rewards** (Section 3.4.4), employed in the three Canadian cases, are compensation for a desirable behavior. Rewards send positive signals to those rewarded, thereby reinforcing a desirable behavior during the learning process.

## **What Are the Take-Home Messages from this Report?**

Energy behavior programs in the workplace share several common strategies. Most notable is the degree to which the support of upper management, which is strongly stressed in all of the reviewed cases, proves to be critical to the development and success of an energy behavior program in the workplace.

Due to the lack of a cost-benefit analytical approach and the absence of an evaluation framework suitable for application to existing energy behavior programs, such programs have been inadequately studied, and are thus often omitted from current efforts to promote building energy efficiency.

This report suggests that the energy research community, energy efficiency professionals, and policy decision makers should work together to develop an improved evaluation framework to better document, study, and evaluate energy behavior programs. Program administrators should consider the integration of energy behavior programs into their building energy efficiency initiatives, which would help promote the development and deployment of advanced technologies in a more conservation-conscious environment. Moreover, government and utilities at every level should consider leading by example by implementing their own energy behavior programs, as such efforts would promote a culture of energy conservation in their workplaces and beyond.

## 1. INTRODUCTION

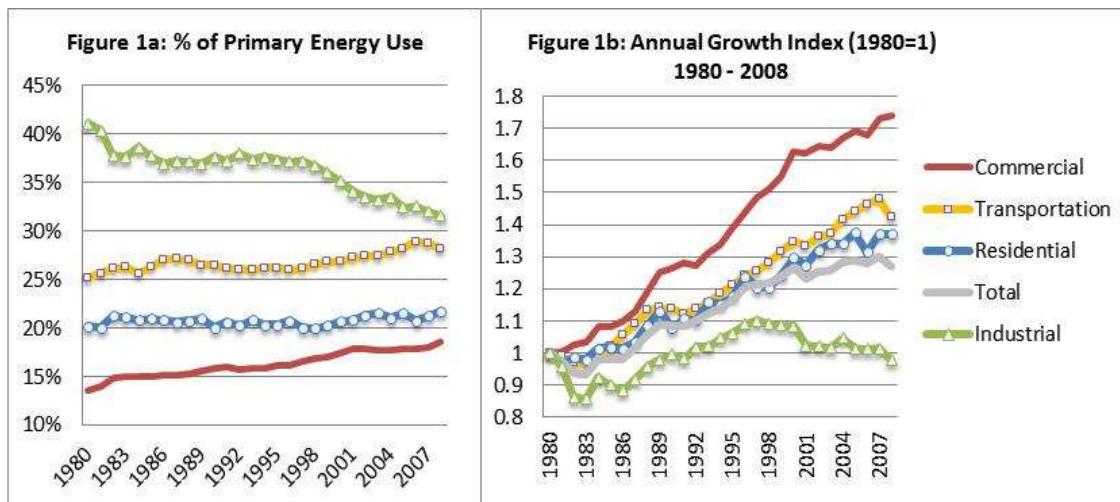
The role of energy behavior in the residential and commercial sectors has been a semi-regular area of interest for the energy research community since the oil crises in the 1970s. In the last five years, the community has not only rekindled its interest in this area, but also has become dedicated to the idea of applying the insights of social science to the more effective deployment of energy efficiency projects and programs.

This report analyzes energy behavior programs in the workplace: Section 1 is an introduction to commercial buildings and related energy use in the United States, a brief review of energy behavior research, and the research scope of the report; Section 2 reviews selected energy efficiency behavior programs in the commercial sector in the U.S. and Canada; Section 3 analyzes development strategies and key engagement techniques shared by the reviewed programs; and Sections 4 and 5 examine policy implications and conclusions, respectively.

### 1.1 Commercial Buildings and Related Energy Use

Commercial buildings are one of the four major energy end-use sectors, accounting for 18% of total U.S. energy consumption in 2009 (see Figure 1). Over the last three decades, commercial energy use has grown at an annual rate of 2%, which is more than the annual growth in the transportation (1.3%), residential (1.1%), and industrial (-0.1%) sectors, the last of which actually declined over this period (U.S. Energy Information Administration 2011).

**Figure 1. Primary Energy Use and Annual Growth Index by Sector, 1980–2007**



Source: U.S. Energy Information Administration 2011

There were 4.9 million commercial buildings in 2003, occupying 71.6 billion square feet of floor space (U.S. Energy Information Administration 2008). Of the fourteen primary types of commercial buildings, offices make up the highest percentage of total floor space (17%), total number of commercial buildings (17%) and commercial building energy use (19%).

### 1.2 A Brief Review of Energy Behavior Research

The energy crises of the 1970s triggered research interest in energy consumption behavior, bringing social science into the analysis of energy issues to augment traditionally employed economic and engineering approaches.

The new focus on culture, lifestyles, social psychology, and household management proved fruitful: the National Research Council (1982) published a report to address the behavioral and social aspects of energy use and production; Stern and Aronson (1984) edited a fine book on the human dimensions of energy use; while Kempton and Neiman (1987) compiled a collection of case studies of household energy use that utilized a variety of social science research methodologies. Most of these early studies looked into energy use behaviors at the residential individual and/or household level (Yates and Aronson 1983; Stern and Aronson 1984; Bernard et al. 1987; Kempton and Neiman 1987; Lutzenhiser 1993).

There was also some discussion of the linkage between organization and energy use—Stern and Aronson (1984) analyzed the characteristics of energy use in organizations as well as the impact of intermediaries on organizations' energy use. Widman et al. (1984) discussed behavior-based conservation strategies such as the role of information in institutional settings. Concurrently, many studies of energy consumption in commercial buildings focused on organizational investment decision making relating to energy efficiency (Goitein 1989; Cebon 1992; DeCanio 1993).

The rapid development of demand-side management (DSM) in the late 1980s and early 1990s attracted a great deal of attention from the energy research community. In hindsight, the study of the social and behavioral aspects of building energy use in DSM-related projects would have been of great value. The DSM-related studies could have been developed to include experimentation and the application of social science theories in energy research; however, few DSM studies discussed and analyzed projects using these perspectives.

In the late 1990s and early 2000s, global warming and carbon emissions were important research themes in the energy research community. The majority of studies and research during this period focused on the human dimensions of global change, climate change, and sustainability (Stern et al. 1997; National Research Council 1999; Dietz and Stern 2002), while a handful of advocates addressed the integration of social science into energy research (Lutzenhiser and Shove 1999).

Since the mid-2000s, possibly due to increasing media coverage of climate change, soaring energy prices and rising public awareness of the issue, or a natural maturation of energy thinking nurtured by research undertaken over the last three decades, there has been an emerging trend of strong research interest in applying social and behavioral science to energy and environmental research and projects (Wilson and Dowlatabadi 2007; Ehrhardt-Martinez 2008; Owens and Driffill 2008; Allcott and Mullainathan 2010; Ehrhardt-Martinez and Laitner 2010; Stern and Kasperson 2010; McKenzie-Mohr 2011). The revitalized interest in social and behavioral sciences has remained heavily oriented towards the residential sector, but recently discussion has also moved in the direction of commercial buildings (Brown and Cole 2008; Ehrhardt-Martinez and Laitner 2010). For example, Payne (2006, p. 11) discussed how commercial users respond to utility bills. Friedrich et al. (2010, p. 64) identified several best practice behavior programs in the commercial sector.

### **1.3 The Definition of Work Styles, Green Work Styles, and Greening Work Styles**

A research topic in the study of household behavior and its impact on energy use and carbon emissions in recent decades has been lifestyles, or ways of living (Schipper and Meyers 1992; Hidetoshi 1996; Weber and Perrels 2000; Rick 2003; Shui and Dowlatabadi 2005; Feng et al. 2009). However, there are few studies explicitly focusing upon specific ways of working, or work styles, and their related impacts on building energy use.

Work styles refer to a bundle of attitudes and behaviors in the workplace. It often refers to one's work attitude and behavior towards his/her assigned tasks, management, and colleagues, among other things. A particular work style may come about as a consequence of business activities, building types, rules defined by upper management, and the general workplace culture. These factors have direct and indirect impacts on energy use in the workplace.

In this report, “green work styles” refer to attitudes and behaviors favorable to energy conservation at work. A list of green work styles for equipment and lighting use is presented in Box 1. The “greening” of work styles refers to efforts or activities that encourage building occupants to adopt attitudes and behaviors of energy conservation, which is also the primary objective of energy behavior programs.

### **Box 1. Examples of Behavior-Side of Green Work Styles**

Concerning equipment use:

- Turn off your monitor when not in use, even if it is only for 15 minutes
- Enable ENERGY STAR® power settings on your computer
- Turn off photocopiers during off-hours
- Turn off machines and equipment when not needed
- Turn off printers and other office machines when they are not in use
- When laptops and cell phones are not being charged, unplug their chargers

Concerning lighting use:

- Turn off lights when areas are not in use
- Turn off your lights when you leave your office/cubicle, and in other unoccupied areas such as copy rooms, break rooms, conference rooms, and restrooms
- Make use of the sun
- Adjust blinds to deflect heat in the summer and to retain heat during the winter
- Adjust lighting levels to match needs at different times
- Full lighting may not be necessary when performing several tasks, such as presentations, cleaning, or stocking
- Use dimmers and controls (if available) to turn down lighting, or use the lights required for the task (e.g., task lighting)

Source: rewritten based on Power Smart Tips at Work (BC Hydro 2008)

The next section reviews five energy behavior projects that attempt to develop or foster green work styles of building occupants at workplace.

## **2. CASE STUDIES OF ENERGY BEHAVIOR PROGRAMS IN THE WORKPLACE**

### **2.1 Research Scope and Selection of Case Studies**

This report focuses on the review and analysis of energy behavior programs that are developed and implemented by building occupants and/or owners to reduce building energy use through changes in the behavior of building occupants in the workplace.

Five energy behavior programs were identified as case studies (see Table 1). Three were from Canada and two from the U.S. These studies were selected from conference papers from sessions of the Human Dimension of Energy Use Panel of the ACEEE Summer Study on Energy Efficiency in Buildings for the years 1998 to 2010; from presentations at the Behavior, Economy, and Climate Change Conference from 2008 to 2011; and from conversations with noted building energy experts.

**Table 1. Five Case Studies in This Report**

	U.S.	Canada
Government	"Green the Capitol" at U.S. House of the Representatives	Behavior Campaign in a Provincial Government Building
Government-Owned Utility		"Conservation Action!" at BC Hydro
Public Research University-Owned Hospital		"TLC-Care to Conserve" at University Health Network of University of Toronto
Historical, Landmark Building	"Tenant Energy Management Program" at Empire State Building	

## 2.2 "Green the Capitol" at the U.S. House of Representatives (2007–2012,<sup>1</sup> U.S.)

### 2.2.1 Program Background & Measured Results

The "Green the Capitol" initiative was developed in the House of Representatives. This included not only House-controlled functions on the House side of the U.S. Capitol building, but also the four House office buildings and other House side projects (Straus 2011). The initiative covers a mixed set of office and supporting facilities, including the U.S. Capitol built in 1793. The main campus in D.C. houses 7,000 staff and occupies some 6.1 million square feet of floor space. There are 3,000 additional staff supporting the House working across the country. The total energy use of the D.C. campus reached 809 billion Btu in 2006 (Diamond et al. 2008; Hromalik 2010).

With strong support from key senior leadership, the U.S. House of Representatives launched the "Green the Capitol" Initiative in March 2007. The goals of the Initiative included: (1) becoming carbon neutral within 18 months; (2) reducing energy use by 50% in ten years; and (3) becoming a model of sustainable operations (Diamond et al. 2008). The Initiative pushed a comprehensive package aimed to reduce energy use, waste, and the carbon footprint of the House by relighting the Capitol Dome with compact fluorescent light bulbs, installing low volatile organic compounds (VOC) carpets, and switching the Capitol power plant to natural gas. Behavioral components included the promotion of a newly developed online tool named "My Green Office" and other behavior change activities such as carpooling, commuting by bicycle, and recycling (Straus 2009).

Eighteen months after launch, "Green the Capitol" had reduced the institution's carbon footprint by 74% (Straus 2009).

### 2.2.2 Project Activities Related to Energy Behavior Change

In April 2009, the Office of the Chief Administrative Officer (CAO) launched a project to promote greening participants' offices. The initiative created an internal interactive Web-based tool called "My Green Office." The Web site collected information provided by participants about the behavior choices made in their offices to reduce energy use, carbon emissions, landfill waste, and energy expenditure, reporting back to the participants feedback regarding savings in the above categories at both the level of the participants' offices and more broadly at the level of the entire House (CAO 2010).

<sup>1</sup> The "Green the Capitol" initiative will formally end in 2012. This section about the "Green the Capitol" is mainly based on the three reports published in 2008, 2009 and 2010, respectively, and focused on the "Green the Capitol" initiative conducted in House of Representatives and the "main campus."

More than 100 trained CAO and Architect of the Capitol (AOC) employees provided in-office consultations and follow-up technical services to staff. Some staff members volunteered to be “Green Office Representatives” in offices that participated in the initiative. These volunteer representatives functioned as a point of contact for charting their offices’ progress and keeping the CAO office updated.

One of the successes of the “Green the Capitol” initiative was the voluntary participation of district offices that were not part of the initial target audience (CAO 2010).

### 2.2.3 Key Messages from the Project

Program participants credited the success of the “Green the Capitol” initiative mainly to the strong support voiced by then House senior leadership and the determination of upper management to lead by example (Straus 2009; Hromalik 2010), see Box 2.

#### Box 2. What Did They Say?

"The House of Representatives must lead by example, and it is time for Congress to act on its own carbon footprint."

Speaker Nancy Pelosi, April 19, 2007

"Improving energy efficiency is the most effective first step that any organization can take to make a positive effect on the world we live in and that we leave to our children and grandchildren."

House Majority Leader Steny Hoyer, April 19, 2007

"..... Perhaps more important is what the program represents: a fundamental transformation of perspective and behavior. The House is changing the way it does business."

Chief Administrative Officer Daniel P. Beard, January 8, 2010

### 2.2.4 Comments

“Green the Capitol” is a well-managed energy project implemented in governmental office buildings. Its success was a product of strong support from upper management, good coordination across departments, and reasonable reduction goals set jointly by the CAO and a national laboratory that provided solid technical research.

“My Green Office” is an excellent example of an energy behavior project that targeted building occupants. This project categorized behavior changes into “core actions” (which are considered easy to complete, such as “recycle bottles, cans, and plastics” and “use compact fluorescent bulbs”) and “stretch actions” (which are not as easy to complete, such as “adjust your thermostat +/- 2 degrees”). The project Web site provided a track record of actions taken by participating offices and feedback featuring estimated savings of energy (and dollars) and reductions in solid waste. The information not only allowed participants to visualize the actual impact of behavior changes, but also further personalized the project, which helped improve participants’ commitment to the project.

Among the five case studies, the design and implementation of the “My Green Office” Web site is particularly worthy of note, as it provides a good template for developing similar Web-based tracking tools, which could serve as effective interactive tools for use with participants in other energy behavior programs.

Another of the initiative's successes was the participation of district offices that were not among the project's initial target group. Given that the project was implemented by the leadership of the federal government in the nation's capitol, the project also represents an instance of leadership by example.

## **2.3 The "Tenant Energy Management Program" at the Empire State Building (2009–2013, U.S.)**

### **2.3.1 Program Background & Measured Results**

The Empire State Building (<http://www.esbnyc.com/>), a historical landmark built in 1931, is a multi-tenant building with 2.7 million square feet and annual energy consumption of 238 billion Btu (Rocky Mountain Institute 2010).

In April 2009, a retrofit program was launched at the Empire State Building and undertaken by a project team including the Clinton Climate Institute, Jones Lang LaSalle, Rocky Mountain Institute, Johnson Controls Inc., and Empire State Building Operations. The retrofit program aims to reduce energy use by 38% and lead to annual energy savings valued at \$4.4 million (Empire State Building Company 2009). The program identified eight economically viable projects, including direct digital control of tenant lighting, daylighting and plug loads, variable air volume air-handling units, retrofit chiller plant, improved windows, tenant energy management program, radiant barrier, and tenant demand control ventilation (Rocky Mountain Institute 2011).

### **2.3.2 Project Activities Related to Behavior Changes**

Launched in April 2009, the project incorporated an intensive planning process that lasted the greater part of a year and included bi-weekly team meetings and the internal development of a sustainability scoreboard as well as a tenant engagement initiative. The Rocky Mountain Institute studied the role of occupant comfort requirements, system design characteristics, changed operating schedules, and incentives in building energy use.

The proposed tenant energy program has four components: (1) establishing electric sub-metering for each tenant so that tenants can monitor their individual energy use; (2) identifying key building personnel to act as the face of the program, and the designation of a point of contact at the suggestion of each tenant; (3) providing online training and an introduction to best practices for tenants to guide them in reducing their carbon footprints; and (4) documenting and reporting (Jones Lang LaSalle 2011)

### **2.3.3 Key Messages from the Project**

Jones Lang LaSalle, a global real estate services firm with a leading sustainability services program, has been the program manager. The firm concluded that maximizing cost-effective energy and carbon reduction requires a whole-system and life-cycle perspective. Developing solutions for reducing energy use and carbon footprint requires collaborative efforts from all key stakeholders (Jones Lang LaSalle 2011).

The Rocky Mountain Institute (2010), one of the five team members, suggested that project preparation time could have been reduced through more efficient coordination and communication among key stakeholders.

### **2.3.4 Comments**

Compared to other energy efficiency projects, the Empire State Building retrofit enjoys unparalleled intensive media coverage and thus helps raise public awareness of the impact of green building practices. This retrofit project addressed the role of occupants' comfort in the context of balancing energy efficiency and the financial impact of measures undertaken, which is unique among reviewed cases.



The Tenant Energy Management Program, which is the behavior component of the overall retrofit project, is still in the development and early implementation stage. It will be interesting to return to this program in the future and assess its progress, particularly in the areas of meter-based feedback and incentives.

## **2.4 “Conservation Action!” at BC Hydro (2006–2007, Canada)**

### **2.4.1 Program Background & Measured Results**

British Columbia (BC) is a province located on the west coast of Canada. BC Hydro and Power Authority (<http://www.bchydro.com>) is BC's largest electric utility company. In order to encourage its employees to conserve energy in the workplace, BC Hydro initiated a pilot program titled Conservation Action! in 2006. The pilot program aimed to save energy through changing building occupants' behavior. By the end of the first year, the pilot program reduced electricity consumption by over 5% through behavior changes (Gustafson and Longland 2008).

The Conservation Action! program started as a pilot program at the main building occupied by its Power Smart Department; however, its success quickly led to a company-wide roll-out. .

### **2.4.2 Project Activities Related to Behavior Change**

The Conservation Action! pilot initiated a variety of behavior projects (Gustafson and Longland 2008):

- The appointment of volunteer Conservation Floor Captains who helped provide leadership and information for other occupants;
- The Floor Challenge was an energy-saving competition between floors that was undertaken with the final results qualifying the most successful participants for awards and public recognition;
- The Cubicle Tune Up involved trained staff visiting building occupants at their work cubicles, identifying energy-saving opportunities and providing related guidance for the set-up/configuration of occupants' office space;
- The Turn It Off campaign used posters and stickers to target manual switch and electric appliances and equipment; and
- Green Tips were also e-mailed to all employees on a weekly basis.

### **2.4.3 Key Messages from the Project**

Gustafson and Longland (2008) from BC Hydro concluded there were three guiding principles for the success of the Conservation Action! project: (1) a positive, action-oriented approach (focusing on what people can do and providing simple messages describing specific actions); (2) strong management support and commitment; and (3) the engaging and empowerment of volunteers and employees (volunteers served as effective assistants that were able to work on specific project activities). They also concluded that,

.....behavior change is not only effective but also creates a culture that facilitates the adoption of technical measures.

### **2.4.4 Comments**

Conservation Action! at BC Hydro focused on establishing an energy conservation culture in the workplace through energy behavior programs targeting building occupants. The program leveraged the participation of building occupants and carried out project activities by utilizing Community-Based Social Marketing (CBSM) techniques such as persuasion, influence, motivation, commitment, prompts, norms, communication, and incentives.

A unique feature of Conservation Action! was the integration of energy reduction performance into employees' and management's annual performance review structure, which determines the size of annual bonuses (along with other performance metrics).

## 2.5 MEMPR Behavior Campaign in a Provincial Governmental Building (2008, Canada)

### 2.5.1 Program Background & Measured Results

The Ministry of Energy, Mines and Petroleum Resources (MEMPR, <http://www.gov.bc.ca/ener>) is the BC government ministry responsible for the administration and regulation of energy resources.

In 2008, MEMPR signed an agreement with BC Hydro to reduce its electricity use by 9% by 2009, by 20% by 2020, and to be carbon neutral by 2010. Since 2008, MEMPR has developed employee engagement initiatives to build a culture of energy conservation (Owen et al. 2010).

By 2009, MEMPR's total electricity consumption was reduced by 12% compared to its 2007 level. The reduction could be attributed to a series of energy behavior programs, integrated with limited investment in technology and retrofitting (Owen et al. 2010).

### 2.5.2 Project Activities Related to Behavior Change

MEMPR's behavior campaign consisted of two sections: a year-long employee engagement program and a one-week lighting campaign.

The year-long employee engagement program contained three energy behavior initiatives aimed at building a culture of energy conservation in the workplace: (1) The Green Team initiative invited a team of "green-minded" individuals to meet regularly to identify energy-reduction opportunities; (2) The Workstation Tune Ups initiative asked employees to reduce their energy use in the workplace by completing a list of tasks; and (3) The Green Pledge initiative encouraged employees to voluntarily make a pledge to achieve reduction of energy use, waste, and carbon emissions.

The one-week lighting campaign targeted three floors of the MEMPR main building: on the fourth floor an automatic daylight dimming system was installed, on the fifth floor 85 individual light switches (one for each work space on this floor) were installed, while the sixth floor was used as the baseline of a pre-retrofit condition. The Lighting Campaign is summarized in Table 2.

**Table 2. Lighting Campaign in the MEMPR Behavior Campaign**

# of Floor	Technical Measure Installed?	Other Information	Weekly Lighting Energy Savings
4 <sup>th</sup> floor	One automatic daylight system installed	The Energy Efficiency Branch of MEMPR is located on the 4 <sup>th</sup> floor. This group of participants was highly engaged in the campaign.	12.6%
5 <sup>th</sup> floor	85 individual light switches installed	The 5 <sup>th</sup> floor was encouraged to turn off their office lights during lunch on one day; participants received an e-mail reminder concerning this Earth Hour activity.	12.0%
6 <sup>th</sup> floor	No lighting measures installed		2.4%

The campaign determined the baseline lighting energy consumption and set a goal of electricity savings of 10%. Each floor received tailored information about energy conservation and suggested

actions, and their energy use was metered in real time and presented on a dashboard. The fifth floor conducted an “Earth Hour” style event one day, encouraging employees to turn off lighting during lunch hour. Real-time feedback was provided through the week (Owen et al. 2010).

### **2.5.3 Key Messages from the Project**

The project utilized a number of CBSM tools to promote energy conservation in the workplace, including communication, feedback, prompts, appeals to norms, and empowering champions. The project found that dramatic energy reduction from the lighting campaign did not continue after the campaign despite the presence of real-time feedback, thus it is inferred that it takes time for new energy conservation behaviors to become permanent (Owen et al. 2010).

The project also concluded that “employee engagement targeting behavior changes can deliver measurable reduction in energy consumption, over and above technological measures (e.g., installing light switches and dimmable ballasts with photo sensors)” (Owen et al. 2010).

### **2.5.4 Comments**

The MEMPR behavior campaign is an energy behavior program that applied CBSM tools to promote energy conservation in the workplace. The unique feature of this case was the program’s provision of real-time feedback reporting actual energy use information to participants. In addition, the case provided explicit energy-saving information from energy behavior programs (e.g., the lighting campaign).

The author of this report is concerned that the lighting campaign was too short in duration to permit solid conclusions to be drawn. In addition, the non-homogenous nature of the participants on each floor (i.e., the Energy Efficiency Branch is located on the fourth floor, with very motivated and engaged participants) also affects the energy saving results recorded in Table 2 and relevant project conclusions.

One interesting finding from Table 2 suggests that the combination of behavior and technology (e.g., the use of installed occupant switches on the fifth floor) would lead to much higher savings than behavior change alone (as was the case on the sixth floor).

## **2.6 “TLC-Care to Conserve” at University Health Network (2007–2010, Canada)**

### **2.6.1 Program Background & Measured Results**

The University Health Network (UHN, <http://www.uhn.ca/applications/iNews/default.aspx>), affiliated with the University of Toronto, is a medical center consisting of three teaching hospitals including Toronto Western Hospital (TWH).

In 2007, UHN received funding to develop a comprehensive energy management, employee engagement and technology deployment program in its three hospitals over three years. The program, called Thermostats, Lights and Controls (TLC)—Care to Conserve, comprised six components: (1) social marketing, (2) employee engagement, (3) operator training, (4) retro-commissioning, (5) comprehensive energy plans, and (6) detailed energy audits and retrofits.

In year one, the TLC program resulted in a 3.9% reduction in energy consumption in TWH. In year two, the energy savings at TWH improved to 4.2% (Adamson 2010) .

### **2.6.2 Project Activities Related to Behavior Change**

The target energy behaviors in TLC included turning off monitors and computers when stepping away from workstations, turning off electronics and appliances when not in use, and turning off task lighting.

Important information channels in the TLC program included stickers, posters, banners, and e-mail as well as face-to-face kick-off and follow-up meetings. CBSM tools were heavily employed to engage all hospital staff to participate in project activities (such as simple changes in energy use related behaviors) to reduce energy consumption, including program branding, program pledges, and social marketing champions. Building occupants were encouraged to provide their ideas for improving the TLC program, some of whom were rewarded for their input.

### 2.6.3 Key Messages from the Project

Adamson (2010), who was hired from a consulting company to play the role of project manager for the TLC project, concluded that the following key factors contributed to the success of the energy behavior initiatives:

- **Peer champions:** “The use of peer champions to spread the message is extremely beneficial as it saves time and resources and provides information and prompts from a trusted and credible source.”
- **Pilots in clinics and office areas:** “Selecting the office areas and clinics as the initial pilot sites also contributed to the success of the campaign as this allowed the materials to be tested in a more receptive environment.”
- **Successful posters and banners:** “The success of the campaign was also due in part to the materials that were employed, in particular the large, highly visible and visually appealing posters and banners. The simplicity and consistency of the message was also an important factor in the success of the campaign. All materials reinforced the same basic actions of turning off lights, computers and personal appliances.”
- **Behavior or components embedded in a comprehensive and integrated program:** “The behavioral components (social marketing and employee engagement) of the TLC program have saved large amounts of energy and reduced GHG emissions in just the first two years of implementation. This potential is only enhanced by incorporating these components into a larger, more comprehensive energy management and engagement program which includes more technical energy saving measures such as RCx, training and audits and retrofits.”

### 2.6.4 Comments

The project employed comprehensive social marketing tools to promote energy conservation through behavior change by building occupants. The program branding helped not only create an identity that distinguished this project from others, but also enabled its target audience to associate their activities with the project activities. The use of peer champions created opinion leaders and messengers, helping to spread energy conservation attitudes and behaviors to peers. The innovative use of visually appealing banners (replacing Rosie the Riveter with generic hospital staff images) created a sense of historical association and humor.

## 2.7 Summary

All five cases reviewed in this chapter feature programs implemented in recent years, which may indicate a new and increasing interest in energy behavior programs conducted by building occupants. All illustrate the importance of strong support from the upper management for energy behavior programs. Three of five reviewed cases (including the BC Hydro case, the MEMPR case, and the TLC case) included the application of CBSM tools in the development of their energy behavior programs.

The reported energy savings from behavior programs was varied (see Table 3). “Green the Capitol” and the Empire State Building cases belonged to different comprehensive energy programs that include technology replacement and purchase, and other energy efficiency approaches. The energy savings from energy behavior programs were not reported separately from the comprehensive

programs. Though the TLC case was a part of a comprehensive energy program, the energy savings from its energy behavior component was estimated to be 4.2% for the first two project years.

The BC Hydro case and the MEMPR case were the only two stand-alone energy behavior programs aimed specifically to create a culture of energy conservation in the workplace. The BC Hydro case produced a 5% reduction in electricity use by the end of the first year. In a week-long lighting campaign of the MEMPR case, a floor that used manual switches of lighting produced a 12% electricity reduction that week.

**Table 3. A Brief Summary of Case Studies**

#	Program Names	Project Year	Program Names in the Report	Behavior Program Only?	Project Savings
1	Green the Capitol	2007–2012	The “Green the Capitol” case	No. It falls under a comprehensive project targeting sustainability in the workplace, along with reduction in energy use, carbon emissions, and waste.	[Total project savings] Within 18 months of its launch, there was a 74% reduction in carbon emissions through the use of energy-efficient equipment and products, changes in fuel types, and behavior changes.
2	Tenant Energy Management Program	2009–2013	The “Empire State Building” case	No. It is a component of a large retrofit project.	[Total project savings] It is estimated that the retrofit project (including tenant energy management program) will reduce energy use by 31%.
3	Conservation Action!	2007	The BC Hydro case	Yes. It aims to create a culture of energy conservation.	[Savings from the energy behavior program only] The project produced a 5% reduction in electricity use by the end of the first year.
4	Employee Engagement Program	2008	The MEMPR case	Yes. It aims to create a culture of energy conservation.	[Savings from the energy behavior program only] During a week-long lighting campaign, a floor that used manual lighting switches reduced electricity consumption by 12%.
5	TLC—Care to Conserve	2007–2010	The TLC case	No. It is one of six projects under the same program. The other projects focus on technological means of energy saving.	[Savings from the energy behavior component only] The TLC case led to a 4.2% energy saving during the first two years.

### 3. AN ANALYSIS OF STRATEGIES FOR THE DEVELOPMENT OF ENERGY BEHAVIOR PROGRAMS IN THE WORKPLACE

A key factor necessary for a successful energy behavior program in the workplace is the effective engagement of building occupants in energy conservation. All five reviewed cases shared common or similar strategies in the development of their energy behavior programs, particularly in the engagement of building occupants. These strategies included setting the tone, building a team, employing communication channels, and deploying engagement techniques (see Figure 2).

**Figure 2. Strategies for the Development of an Energy Behavior Program in the Workplace**



#### 3.1 Setting the Tone

Before developing an energy behavior program, it is important to ask the following questions:

- As an organization what are our expectations from this project?
- Is this type of behavior program also in line with the mission of our business?
- How will it impact operations?
- Who should run this program?
- Is there wide-spread support for such an initiative?
- What energy behaviors will be targeted? How much energy could be saved? What are the costs?

Anyone who is interested in developing a behavior program can raise and attempt to answer these questions; however, it may be reasonable to speculate that the answers from upper management may matter the most for the implementation of this behavior program.

Every workplace has its rules and norms and it is upper management (Section 3.1.1) that is ultimately responsible for developing and supervising the enforcement of these rules and norms. Upper management's stance and willingness to pledge (Section 3.1.2) their support lays the groundwork for successful program implementation. Some energy behavior programs also employ program branding (Section 3.1.3) to communicate the "tone" to participants and the public.

### **3.1.1 Upper Management**

In the workplace, not every member of an organization has equal influence on decision making and the behavior of staff. A business environment is built by defining the vision and purpose of the business (often explicitly or implicitly profit oriented), the organizational structure, and the corporate culture. Conformity and compliance to norms and/or obedience to authority are regarded as an important component of one's professional ethics.

Obtaining support from upper management is the initial step in "setting the tone" for an energy behavior program. As upper management is the most powerful group in the workplace, its buy-in is critical: without the full support of upper management, it is highly unlikely that an energy behavior program targeting building occupants could take off in the first place. The announcement of unequivocal support from the top motivates employees to participate in programs, because employees would view support from the top as validation of the importance of the program among upper management (to whom they answer). Moreover, the support of upper management helps mobilize human and financial resources to support the program, expedites coordination of working relationships and schedules between involved parties, and can facilitate the removal of any institutional and organizational barriers, all of which are crucial to the success of an energy behavior program in the workplace.

All of the case studies addressed the significance of "support from the top" in the development and success of their energy behavior programs. The top officials (i.e., occupying the highest or second most senior positions in their organizations) publicly expressed their strong support for the program. In addition, some organizations included a top official as a member of the program committee responsible for program development and implementation (e.g., the BC Hydro case), and some organizations internalized the support of upper management in their management process (e.g., the MEMPR case). Box 3 presents the various ways in which upper management supported the energy behavior programs discussed in the case studies.

### **Box 3. Upper Management Support in Energy Behavior Programs**

In the case of “Green the Capitol,” then House Speaker Nancy Pelosi and House Majority Leader Steny Hoyer (the two highest ranking officials in the House) called for the launch of the “Green the Capitol” initiative, and directed Chief Administrative Officer Daniel Beard to provide recommendations and research plans (Diamond et al. 2008; Hromalik 2010).

The Empire State Building Company, the building owner, is one of five members of this historic retrofit program. “Sustainability” is regarded as a positive selling point for the company in its efforts to attract large tenants to the Empire State Building. The new market positioning and rebranding of the Empire State Building indicates the strong support of the building’s ownership.

The “Conservation Action!” energy behavior program was fully integrated into the organizational structure at various levels at BC Hydro. For example, (1) high-level management established a steering committee, and assigned two senior managers to work on the initiative. (2) The performance of staff in the initiative was formally included in BC Hydro’s annual performance measurements. (3) Upper management attended project-related lunch meetings, and encouraged employees to volunteer for the initiative’s activities (Gustafson and Longland 2008).

In the “Employee Engagement Program” at MEMPR, the Deputy Minister launched the energy behavior program at a public meeting to raise the awareness of the program. Building a culture of energy conservation was not only a program goal, but was also integrated into the Ministry’s strategic planning and management process. For example, new employees will be introduced to the program during their initial orientation at MEMPR (Owen et al. 2010).

The TLC case involves the most comprehensive communication tools and engagement techniques among five reviewed case. The four-year project span and the employee engagement is the evidence of the strong support and committeemen from upper management.

#### **3.1.2 Pledge**

A pledge is a binding promise to perform specific action(s) or achieve specific goals. According to commitment and consistency theory, people are more likely to honor their commitment if they pledge, orally or in writing, their commitment to an idea or goal (Feldman 1998). There are two types of pledges: organizational pledges vs. personal pledges.

Based on the cases reviewed, organizational pledges made in public seem more likely to lead to actual action. It may be reasonable to speculate that an organization’s public pledge acts as a public announcement on behalf of the organization, which ties in strongly with its reputation, brand, and self-image, assets that are expensive to build and maintain. Upper management, once it has offered its pledge in a public forum, is more likely to provide its full support and commitment to a program.

Personal pledges made in public often lead to a higher rate of actual action than would otherwise be the case (Feldman 1998), though personal pledges alone (i.e., not made in a public fashion) do not guarantee actual action.

Foot-in-the-door techniques have been discussed as an instrument of pledge and compliance that seeks to encourage participants to change their behavior by meeting a modest request. Freedman and Fraser (1966) stated that “..... once someone has agreed to a small request he is more likely to comply with a larger request.” Foot-in-the-door techniques have not only been applied to marketing practices (e.g., a free sample of a product, a test drive for a car), but also studied and applied in promoting energy conservation and environmental behaviors (Scott 1977; Katzev and Johnson 1984). For example, Pallak et al. (1980) paid home visits to two groups of households, one group of



participants was asked to make a verbal commitment to participate in an energy saving program, while another group of participants agreed to provide their names for publication in a report about their participation in the energy saving project. The energy savings from the second group (that made a public pledge) were about 10 to 20 percent higher than its previous level.

All of the reviewed energy behavior programs employed pledges as an important public relations instrument to publicize a (new) program, and more importantly to engage organizational/personal participation through organizational/personal commitment. The contents of pledges varied from program to program. For stand-alone energy behavior programs with an aim of building a culture of energy conservation (e.g., the BC Hydro and MEMPR cases), the content of the pledges did not contain specific quantitative savings in energy use. For behavior programs which were part of a larger comprehensive energy efficiency initiative (e.g., the “Green the Capitol” and TLC cases), pledges often included specific targets for energy saving. In addition, all of the organizational pledges were made through a series of public events such as press releases and internal meetings.

Besides an organizational pledge, the TLC case also sought employees’ personal pledges. For example, staff members were asked to voluntarily sign the pledge on a large laminated poster placed in a high-traffic lobby area. To encourage staff to sign the pledge, senior managers signed the pledge on the prominently placed poster (Adamson 2010).

Organizational pledges should be publicly visible, while the visibility of a personal pledge should consider the opinions of program participants. The “TLC” case revealed that some participants expressed discomfort with regards to the public display of their personal pledges. Later, the personal pledges were communicated through e-mails (Adamson 2010).

### 3.1.3 Program Branding

Branding is a process for creating an identity for a product (Aacker 1996). Solid program branding will give a program long-term value, enabling its target audience to more readily associate with the campaign, participate in its implementation and sustain its results (Basu and Wang, 2009). ENERGY STAR<sup>®</sup> is one of most successful examples of energy efficiency program branding. ENERGY STAR has not only expanded from its original focus on lighting to a variety of commercial and residential equipment and buildings, but has also become a brand for general energy efficiency: manufacturers seek to enroll in the ENERGY STAR labeling program, while the success and visibility of ENERGY STAR in the marketplace has increased consumer awareness of the advantages of products featuring its logo.

In an energy behavior program, a successful program branding may help connect and motivate participants, encourage a heightened sense of loyalty to the program and allow participants to better identify with the program, while also delivering the program message to both participants and external audiences.

In the case of “Green the Capitol,” its program branding includes a program name (Green the Capitol) and a logo (see Figure 3). The logo contains graphics of a green leaf and the Capitol building, which helps not only reflect the program name and message in a clear and simple fashion, but also to establish a public image for the program.

In the TLC case study, the program team designed its brand to have three parts: (1) a program name (TLC—Thermostats, Lights and Controls), (2) a logo with the program name and a tag line (Figure 4), and (3) a package of program materials (Adamson 2010). The acronym “TLC” is not only about the program contents (thermostats, lights and controls), but also representing the same acronym for “tender loving care.” Moreover, the tag line “Care to Conserve” was developed to neatly combine two program themes, healthcare and energy conservation, into one short phrase. It communicates the program message in a very clear and concise way: it tells the viewer who is doing the program (healthcare staff), what they are doing (conservation), why (caring for conservation) and how (taking care to use energy resources efficiently).



**Figure 3. Logo of "Green the Capitol"**



**Figure 4. Logo of "TLC-Care to Conserve"**

A good branding strategy for an energy behavior program should blend the messages of business identity and program theme into an attention-inviting logo and/or a short phrase, which may help establish not only the identity of the program, but also create an emotional attachment among program participants and external audiences towards the energy behavior program.

## **3.2 Building a Team**

An energy behavior program in the workplace is the product of teamwork. A program committee (Section 3.2.1) often acts as the actual leadership of an energy behavior program, which is in charge of project development, coordination, and communication. Peer champions (Section 3.2.2), selected from building occupants (or building occupants who volunteer to play the role), work as points of contact between building occupants and the program committee. These champions are the “ground troops” in the implementation of an energy behavior project.

### **3.2.1 Program Committee**

An organization is often structured to manage relevant business activities and communicates through arranged patterns (Feldman 1998). How does the management and communication of an energy behavior program fit into the larger preexisting organizational structure? All of the reviewed programs created a new organizational node, i.e., a program committee, to solve this issue (Box 4).

A program committee is the leadership of an energy behavior program that is in charge of program design, organization, coordination, and implementation. In order to facilitate coordination among stakeholders who often belong to different departments, key stakeholders are invited to form the program committee.

Administrative power is another important factor contributing to the effectiveness of the program committee. A program committee with adequate power is better able to coordinate and organize cross-department activities, and implement the project activities along the way. The support of upper management would also be of great assistance to the program committee, giving the committee power.

#### Box 4. Program Committees in Energy Behavior Programs

Under the direct instruction of the House Speaker, the CAO office, which is responsible for the administrative functions of the House (such as human resources, information resources, payroll, finance, procurement, and other business services), took on the role as the program committee of the “Green the Capitol” program.

In the BC Hydro case, the upper management assigned two senior managers to a steering committee and allowed two program coordinators to each allocate one day per week to the initiative.

The TLC project team consisted of (1) UHN staff from its Energy and Environment Department and energy teams at each of the three hospitals, and (2) external consultants such as IndEco Strategic Consulting, Finn Projects and the University of Toronto Sustainability Office. The UHN team was to design and implement the program. IndEco took the central role in designing, implementing, and coordinating and managing the project (Adamson 2010).

Other key factors for running an effective program committee include maintaining close contact with peer champions and keeping both upper management and building occupants informed and engaged.

### 3.2.2 Peer Champion

A wealth of social psychological research suggests that person-to-person diffusion of ideas is more likely to be effective than information delivered by media (Yates and Aronson 1983), while the use of peers as behavior models was more effective in promoting conservation behavior than relying exclusively on prompts (Aronson and O'Leary 1983). The presence of peer champions creates an environment conducive to the spread of information and adherence to desirable norms (Widman et al. 1984).

In an energy behavior program, peer champions are the people who voluntarily take a strong interest in the adoption and diffusion of energy conservation attitudes and behavior, though they may also be selected by the program committee (Table 4). Although given different titles in each of the energy behavior programs, peer champions typically serve as points of contact between building occupants and the program committee, acting as opinion leaders, role models, messengers, ground troops and change advocates. They play an essential role in propagating key energy conservation concepts and attitudes throughout an organization through their continuous interaction with other building occupants.

In the case of the TLC program, Adamson (2010) remarks that “the use of peer champions to spread the message is extremely beneficial as it saves time and resources and provides information and prompts from a trusted and credible source.” Assessing the MEMPR case, Owens and Driffill (2008) concluded that the use of champions played a significant role in shaping the attitudes and behavior of their colleagues.

**Table 4. Peer Champion in Energy Behavior Programs**

Program Name	Name of Peer Champion in the Program	Selection	Work Contents
"Green the Capitol"	"Green Office Representatives"	A designated lead in each of the Representatives' staff offices	Helped educate and encourage colleagues to take greening actions; charted progress on the My Green Office site; updated CAO office coordinators on their offices' participation in the program
The BC Hydro case	"Conservation Floor Captains"	Volunteers from building occupants	Provided credible information and local leadership for employees and served as a source of informal feedback to initiative coordinators
The MEMPR case	"Conservation Champions"	Building occupants who contribute to energy conservation behavior change in the workplace	Took exemplary actions to save energy and reduce waste, spread the word about conservation activities, and helped inspire people to adopt new habits
	"Conservation Floor Captains"	Volunteer representatives from a participating floor of the building	Helped reinforce the desired actions through personal contact, provided credible, local leadership, acted as an information resource for employees, and provided a mechanism for informal feedback to initiative coordinators
The TLC case	"Social Market Champions"	(1) Building occupants who are keen to participate in the program and/or well-known experts in their work area (e.g., floor or department); (2) Staff who are members of the hospital's environmental team working on the floor or in the department	Helped in the implementation of the social marketing component of energy projects, including disseminating program materials, providing feedback to the project team and leading by example

### 3.3 Employing Communication Tools

Communication is an activity that conveys information to a target audience. Target audiences need to understand why they should do something, the impact of their behaviors, and how they can best go about doing something (Widman et al. 1984). Hence, the informational contents of an energy behavior program should be credible, simple, specific, and positive (e.g., fun).

All of the reviewed case studies employed a wide range of communication tools to deliver information to their target audiences (Table 5). The online tools put to use include e-mail and Web sites (Section 3.3.1), while offline tools include public meetings (Section 3.3.2), prompts (Section 3.3.3), and posters and banners (Section 3.3.4).

**Table 5. Use of Information Channels by Case Study**

Cases	Online		Offline		
	Email	Web Sites	Public Meetings	Prompts / Stickers	Posters / Banners
“Green the Capitol”	X	X	X	N.A.	X
The Empire State Building	X	X	X	N.A.	N.A.
The BC Hydro case	X	X	X	X	X
The MEMPR Case	X	X	X	X	X
“TLC-Care to Conserve”	X	X	X	X	X

Note: N.A. refers to information not available from the existing literature of the reviewed energy behavior programs.

### 3.3.1 E-mail and Web Sites

Email is the most common means of communication in the workplace as it is quick, direct, cost-free, and convenient. On any given workday an employee may spend more time checking and writing e-mails than talking to his colleagues. The contents of e-mails relating to energy behavior programs cover all aspects of project information: (1) project introduction, (2) notices for upcoming meetings and project activities, (3) project surveys, (4) feedback, (5) project progress reports, and (6) weekly/monthly green tips.

Web sites are powerful online tools used to present project information and engage building occupants in energy behavior programs. Unlike e-mail, Web sites offer the advantage of a single location with flexible formats and designs where more information (such as project information, updated news, participant feedback, and green tips) can be stored and displayed.

In the MEMPR case, the Ministry’s intranet site featured profiles of “Conservation Champions” and information related to specific energy conservation activities; e.g., turning off boardroom lights and using task lighting after hours (Owens and Driffill 2008).

“Green the Capitol” runs an internal online “My Green Office” to remind participants of “things we’ve done,” “things in progress,” and “things to do” (see Figure 5). This Web site is a good example of effective Web design:

- The heading section contains the project information with the logo of “Green the Capitol” and a large-font “My Green Office”. The use of the logo rather than text leaves more space on the Web pages for other information.
- Well-chosen images often speak louder than words in Web design. People usually pay greater attention to images than to text (Vandelay Website Design 2008). On the Web site of “My Green Office,” there is a large picture taken from a participant’s office, with marks indicating “things to do,” “things in progress,” and “things we’ve done.” To the right of this picture, a column with three boxed frames provides further information on these three subjects.
- The color of the Web site is green, which is consistent with the logo and theme of the project.

Figure 5. My Green Office



### 3.3.2 Public Meetings

A public meeting is a public social marketing event that can serve to announce endorsements by upper management, publicize program information, report progress, answer possible questions from meeting participants, and received/provide encouragements and comments from/to peers.

All of the reviewed energy behavior programs used public meetings to launch energy behavior programs (such as kick-off meetings), announce upper management's support and program pledge(s), and to provide updates of the projects' progress.

"Lunch and Learn" is a format for public meetings reported in the BC Hydro case (Gustafson and Longland 2008). Building occupants were able to obtain useful knowledge on energy efficiency while enjoying a free meal during their lunch breaks.

In order to improve the efficiency and effectiveness of public meetings, a program committee often sends e-mail reminders before a meeting followed by a meeting memo afterwards. Providing meeting materials (such as promotional packages for the project and update reports) before the meeting also helped participants familiarize themselves with program-related information.

### 3.3.3 Prompts

A prompt is a special type of note, a visual reminder or cue for action(s) to be completed. Wildman, Simmons et al. (1984) suggested that prompts could be more effective if they "(1) gave specific

information regarding the requested behavior, (2) were considered important by the target audience, (3) were given frequently or presented in different ways, (4) were located near the place where the activity would take place, and (5) were attention-getting.”

All three reviewed Canadian cases documented the use of prompts as one of their information channels, an indication of the influence of community-based social marketing (CBSM) advocated by McKenzie-Mohr, a Canadian researcher. McKenzie-Mohr (2011) listed prompts as one of the tools available for community-based social marketing. He explained that people need to be reminded to do the things they might otherwise forget. Figure 6 shows a prompt used in the TLC program to encourage viewers to turn off lights. Figure 7 presents similar turn-off prompts collected from Web sites, which may offer some references for interested readers.

**Figure 6. A Prompt in the TLC Case**



**Figure 7. A Collection of On-line Prompts and Stickers for Energy Conservation**



Source: <http://www.awarenessideas.com/Energy-Decals-s/10.htm>

### 3.3.4 Poster

As a popular traditional communication channel, posters have been used in all of the reviewed case studies, except for the Empire State Building case.

“Green the Capitol” and the TLC case used posters to call for specific actions, such as scheduling a green consultation (Figure 8A), submitting project ideas (Figure 8B), or sending a positive, encouraging message for participation (Figure 8C). All of these posters were designed to deliver specific information (which is featured explicitly in the poster) using an effective poster design. For example, congressional staff in the “Green the Capitol” (Figure 8A) are represented by a dark suited female with a green leaf cloth pin in the place of the customary American flag lapel pin. A “Green the Capitol” logo is located at the bottom right of the poster. The TLC posters (Figures 8B and 8C) featured the familiar wartime icons of the U.S. Army’s Uncle Sam in his iconic “I want you” pose (Figure 8B) and the equally famous Rosie the Riveter’s “We can do it” (Figure 8C), with hospital staff in their working clothes substituted for Uncle Sam and Rosie.

Compared to a prompt, a text-oriented poster can deliver more information. For example, the BC Hydro floor challenge initiative used posters to display the floor challenge results, the coming month’s activities, opportunities for participation, and new energy conservation tips (Owen et al. 2010).

**Figure 8. Poster Examples in Reviewed Energy Behavior**





### 3.4 Deploying Key Engagement Techniques

An energy behavior program in the workplace seeks to encourage building occupants to conserve energy through active engagement. There are several engagement techniques shared by the reviewed energy behavior programs: social norms (Section 3.4.1), feedback (Section 3.4.2), benign peer pressure and competition (Section 3.4.3), and rewards (Section 3.4.4).

#### 3.4.1 Social Norms

As defined by Merriam-Webster, a norm is a principle of right action binding upon the members of a group and serving to guide, control, or regulate proper and acceptable behavior. Social norms have been widely discussed as an important approach to promote pro-environment values, attitudes and behaviors (Stern and Aronson 1984; Widman et al. 1984; Stern 1985; National Research Council 1999; McKenzie-Mohr 2000; Ehrhardt-Martinez 2008, p. 84).

The reviewed energy behavior programs suggest that many elements are linked to the use of social norms.

- **Upper management** (Section 3.1.1) is a powerful group in the workplace that sometimes develops and enforces workplace norms. The endorsement of particular norms by upper management often motivates employees to conform to them, thus helping to establish new norms in the workplace. As noted by all of the studies reviewed, support from upper management for a specific program or action can be of great assistance in the promotion of energy behavior programs. Indeed, it is one of the most important factors in the establishment and promotion of a culture of energy conservation in the workplace.
- **Peer champions** (Section 3.2.2) are another important instrument in the establishment of norms in an organization. Peer champions are positively publicized for their embodiment of desired attitudes and behaviors. They not only personify organizational approval of new norms, but also actively distribute them through social learning and information diffusion processes.
- **Benign peer pressure and competition** (Section 3.4.3) refer to the tendency of a peer group to pressure its members to conform to the norms of that group. The introduction of benign peer pressure may lead to friendly competition within the organization, and thereby help promote desired norms. For example, Conservation Action at BC Hydro conducted a friendly energy conservation competition between participating floors (Gustafson and Longland 2008).
- **Rewards** (Section 3.4.4) provide monetary or non-monetary incentives for completion of desired actions. Providing incentives helps in the promotion of desired social norms by sending a clear positive signal of social (organizational) approval for specific behaviors.

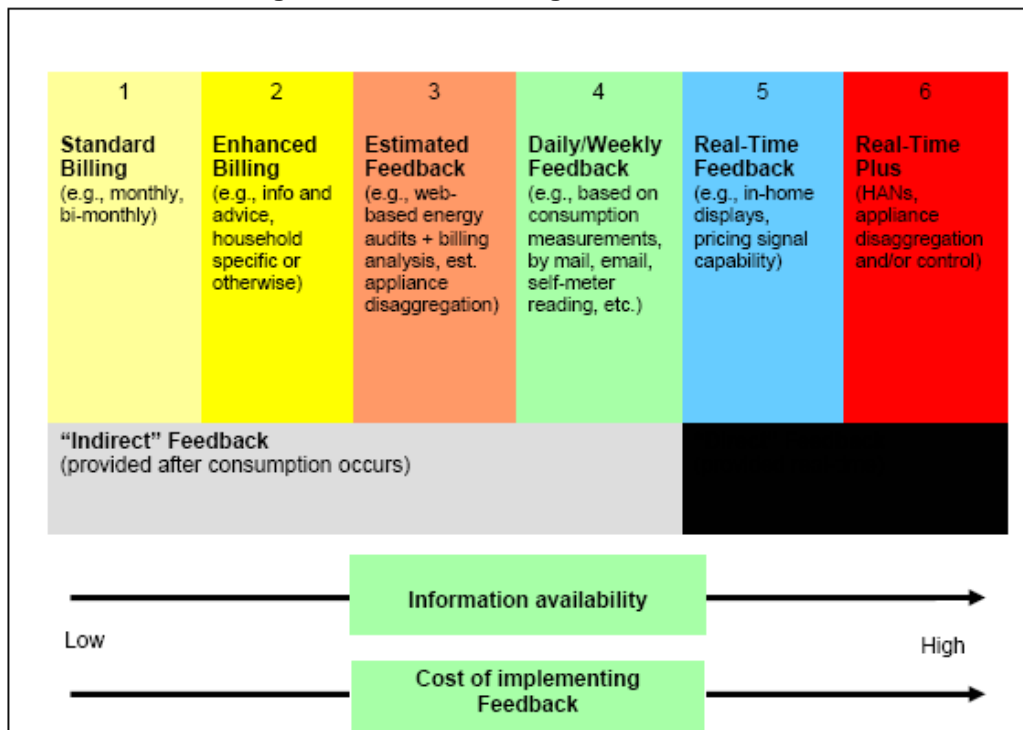
#### 3.4.2 Feedback

Feedback provides information to participants about the consequences of their actions. The Electric Power Research Institute (EPRI) categorized feedback into six groups, including standard billing, enhanced billing, estimated feedback, daily/weekly feedback, real-time feedback, and real-time plus (Wu et al. 2007). Direct feedback (real-time and real-time plus in Figure 9) provides more information to recipients but incurs higher costs.

Researchers have long realized that feedback was a more effective strategy than exclusively relying upon information, motivation, or monetary incentives (Aronson and O'Leary 1983; Yates and Aronson 1983; IEA 2007). Based on a review of an international sample of 61 primary research studies of 57 feedback initiatives, Laitner and Ehrhardt-Martinez (2011) concluded that depending on the type of feedback employed, the average household electricity saving from feedback ranges from 4 to 12%.

Note that the current research on feedback are all focused on the residential sector and that there has been little research on the impact of feedback on individual occupant behavior in the workplace.

**Figure 9. The EPRI Categorization of Feedback**



Source: EPRI (2007)

Three of the reviewed energy behavior programs reported the use of feedback in their programs (see Table 6).

Both the Empire State Building case and the MEMPR case provided real-time feedback information through sub-meters installed in each accounting unit (a tenant unit in the Empire State Building case, and on each floor in the MEMPR case). The Empire State Building case offered more comprehensive feedback information, including individual tenant's live and historical energy use data, comparison with other tenants, and norms. The MEMPR case provided participants with actual electricity use information during its lighting campaign.

The "Green the Capitol" case provided estimated real-time feedback on the saving of energy and of reductions in waste and carbon emissions, based on participants' self-reporting. A unique feature of the feedback information of this case was the inclusion of both individual and group feedback. Widman et al. (1984) speculated that the combination of both individual and aggregated feedback could be quite effective in encouraging energy reduction.

In terms of feedback format, the MEMPR program provided access both online and on a dashboard, while the other two programs studied made use of only one of the two formats to deliver feedback information.

**Table 6. Use of Feedback in Case Studies**

		“Green the Capitol”	The Empire State Building Case	The MEMPR Case
Contents	Feedback Contents	Savings in dollars, energy, water, and reductions in waste	Live information on energy use, comparison charts, sustainability tips and updates	Electricity saved
	Estimated or Actual Impacts	Estimated	Actual	Actual
	Meter Installed or Other Means	Estimated by means of an algorithm	Sub-metered for each tenant unit	Sub-metered on each floor and reported through the use of Pulse Energy software
	Feedback Frequency	Real-time	Real-time	Real-time
Format	Individual, Group, and Norm?	Individual and group feedback	Individual (current and history), other tenants, and norm	Group (each floor)
	Information Format	Online personal account in intranet (web-based)	Online and a digital dashboard	A digital dashboard
Cost-Benefit	Whether Effective or Not for Energy Savings	N.A.	N.A.	Very effective in the week when the experiment was implemented; however, the saving did not continue afterwards.
	Cost of Implementing Feedback	N.A.	The total capital cost was \$365,000 for the meter installation. The annual energy savings is projected to be \$396,000 from behavior change project activities.	N.A.
	Savings from Feedback	N.A.		20% reduction of electricity use in the experiment week

Note: N.A. refers to the related information not available from the existing literature provided by the reviewed energy behavior programs.

The cost-effectiveness of a feedback program and the durability of the behavior change brought about by the feedback are two important issues to consider when evaluating feedback programs (Widman et al. 1984). The three case studies gave very limited information or none at all regarding these two issues.

### 3.4.3 Benign Peer Pressure and Competition

Peer pressure refers to the influence exercised by a peer group on members' attitudes and behaviors, thus encouraging members to conform to norms favored by the peer group. In a firm, upper management sometimes makes use of benign peer pressure to encourage preferred attitudes and actions. For example, when a manager reports the project progress of a group in a meeting, benign peer pressure is felt by members of the group.

Competition refers to rivalry between two or more parties striving for the same objective. The parties could be different firms, or different groups within the same firm. The latter is called internal competition. Matsuo (2005), who studied Japanese sales departments, argued that the management of internal competition plays an important role in creating and sharing knowledge in these organizations.

The reviewed cases intentionally (such as the Floor Challenge presented in Box 5) or unintentionally (such as having a public meeting to report progress by each department) introduced benign peer pressure and internal competition into their energy behavior programs.

#### **Box 5. The Floor Challenge at Conservation Action at BC Hydro**

The Floor Challenge was a friendly competition between the floors in the building. Points were awarded in three categories: electricity reduction, waste reduction, and participation. The initiative tracked the monthly performance in each of the three categories, and displayed monthly and cumulative points on a Celebration Board. The initiative also communicated monthly floor challenge updates electronically and in person to all employees. At the end of the year, the initiative announced winners and awards (Gustafson and Longland 2008).

The Floor Challenge Initiative made use of several characteristics of benign peer pressure and internal competition: (1) clear objectives and a scoring system, which helped building occupants know what indicators were being measured, (2) transparent tracking, which made measurement accountable, (3) public display of monthly performance to all employees, which created benign peer pressure and internal competition between floors, and (4) rewards, which provided a positive signal to building occupants, thereby encouraging desired behaviors.

In a working environment benign peer pressure and competition are common among individuals, teams, and departments within the same firm. The effective use of the two techniques in an energy behavior program can help to quickly establish and diffuse new norms of energy conservation in a firm, or even among firms if they implement the same energy behavior programs.

#### **3.4.4 Rewards**

A reward is a return on or compensation for a desirable behavior. A reward sends a positive signal that reinforces a desirable behavior during a learning process. As social learning theory suggests, people model their own behavior by observing others who have been rewarded or punished (Bandura 1974, 1976)

Rewards can be financial; however, respect, visibility, credibility and authority are equally or even more sought as rewards in a working environment. Box 6 presents some rewards featured in the cases of the reviewed energy behavior programs.

### Box 6. Rewards in Energy Behavior Programs

**Floor Challenge** (the BC Hydro case) announced its winner at the end of the year, with a grand prize consisting of a VIP ticket at a Vancouver Canadians baseball game and a barbecue for the winners (Gustafson and Longland 2008).

**Conservation Champion Recognition Program** (the BC Hydro case) allowed employees to recognize each other for exemplary actions that save energy and reduce waste. A recognition card had two components: one part was posted on a white board in a common area on their floor and the other part was given to the employee being recognized. At the end of each month, the cards were collected and a random draw was held for a \$25 gift card (Gustafson and Longland 2008).

**Recognition and rewards** (the TLC case) are important parts of the energy behavior component of the TLC case. The program called for staff to share their ideas for project improvements, and publicized their names in the hospital newsletter. Staff who submitted an idea were eligible to enter into a draw for a prize. The UHN project team also rewarded those staff who submitted the most innovative ideas (Adamson 2010).

## 4. POLICY IMPLICATIONS

### 4.1 Costs and Benefits of Energy Behavior Programs

An organization usually conducts a cost-benefit analysis before deciding to invest in a proposed project. An energy behavior program could be regarded by an organization as an investment activity, since development and implementation require the organization's financial resources to support staff time and purchase equipment and there is an expectation of a return on the investment in the form of lower costs.

What would a cost-benefit analysis of an energy behavior program look like? Table 7 presents a list of key cost and benefit items of an energy behavior program.

**Table 7. Cost and Benefit Items of an Energy Behavior Program**

Cost Items	Benefit Items
<ul style="list-style-type: none"> <li>• labor costs, such as key members of the project committee, upper management involvement in public events, and employees' time allocated to project activities;</li> <li>• Web site development costs (e.g., the "Green the Capitol" program) and posters (e.g., the TLC case); Prompts?</li> <li>• equipment purchase and installation costs (e.g., automatic sensors) and meters (e.g., the Empire State Building case, and MEMPR case); and</li> <li>• monetary rewards (e.g., the MEMPR case) and other miscellaneous costs (such as printing costs and food incentives in public events).</li> </ul>	<ul style="list-style-type: none"> <li>• savings in energy expenditures;</li> <li>• creating a "green image" for the organization by reducing energy use and its carbon footprint;</li> <li>• building a culture of energy conservation within an organization;</li> <li>• producing spill-over impacts; and</li> <li>• incurring lower program costs the most of time compared to many other energy efficiency programs (e.g., retrofits).<sup>2</sup></li> </ul>

**Among the key cost items of an energy behavior program,** the labor cost varies by program. For example, the TLC case hired a consulting company to develop the program and manage its program committee, while the project committee of the MEMPR case consisted of "green minded" volunteers recruited from building occupants.

Purchase and installation costs of equipment and meters could be the largest part of project expenses in energy behavior programs, especially for a meter-based feedback project; therefore a feedback project should carefully conduct a cost-benefit analysis prior to the launch of such a project.

**Among the key benefits of an energy behavior program,** the spill-over impacts may be manifested in two ways: other parts of the organization, which were not initially targeted in the energy behavior program, may see the success of the program and later elect to actively participate in the program (e.g., the district office that participated in "My Green Office" initiative in the "Green the Capitol" project).

Another possibility is a change in participants' own thinking and activities: following participation in the program they may become more active in their own energy-saving practices. They may reduce their home energy use, actively participate in, or even organize energy conservation programs in their communities. They may act as agents for change outside of the organization, with the diffusion of energy conservation behavior in other settings leading to indirect reduction of energy expenditure, energy use and carbon emissions.

From the breakdown of the cost and benefit items of an energy behavior program, it is clear that the cost items are more easily expressed in monetary terms, while the majority of the benefit items are more intangible and therefore more difficult to measure in quantitative terms, such as the emergence of a culture of energy conservation, the establishment of a green image, and spill-over impacts.

The difficulties of measuring and quantifying benefits of energy behavior programs often lead to the absence of cost-benefit analysis in energy behavior programs (e.g., "Green the Capitol," the BC Hydro case, the MEMPR case, and the TLC case), or a cost-benefit analysis which only reports and

---

<sup>2</sup> Note that there are some simple control adjustment measures that are virtually no cost that can achieve savings greater than those cited in this report.

compares quantitative values (e.g., the Empire State Building case). The quantification problem may lead to energy behavior programs being undervalued in the mainstream energy-efficiency initiatives advocated by federal and state governments.

There is a clear need for the energy research community, policy decision makers, and energy professionals to develop a cost-benefit assessment framework for energy behavior programs, particularly for the assessment of the less tangible benefits of energy behavior programs. An accounting of these benefits is the most important and also the most difficult aspect of the evaluation of energy behavior programs.

Meanwhile, the lack of such an accounting framework should not be considered an obstacle to policy decision makers and upper management of companies seeking to promote energy behavior programs in the workplace. The low-cost nature of energy behavior programs poses little risk to the profitability of enterprises and involves few disruptions to operations or work schedules. Conversely, these programs could bring valuable benefits to the workplace (e.g., a green image, improved ethics, and reduced energy expenditures), and more broadly to homes, communities and society at large.

## **4.2 Development of an Evaluation Framework for Energy Behavior Programs**

All of the reviewed case studies provided a very useful introduction to how energy behavior programs are carried out in a wide variety of working environments; however, few of the case studies provided detailed evaluations of the programs. Most even lacked documentation of the costs and energy savings of the studied energy behavior programs. This missing information includes but is not limited to the following:

- the persistence of energy savings from behavior changes;
- attitude and behavior changes resulting from energy behavior programs;
- evaluation of the impact of a variety of information channels (e.g., the effectiveness of e-mail, Web sites, public meetings, etc.); and
- an assessment of engagement techniques (e.g., social norms, feedback, benign peer pressure, rewards, etc.)

The absence of any evaluation framework for energy behavior programs may explain the lack of the evaluation information needed to assess the effectiveness of these programs, a substantial shortcoming that may lead to their exclusion from other, more technologically-focused energy efficiency programs.

To address this deficiency, an evaluation framework could be developed that would involve four distinct types of evaluations:

- Direct impact evaluations measure the tangible and easily quantified impact of energy behavior programs, such as program costs, reductions in energy use, energy expenditures, and carbon emissions.
- Indirect impact evaluations focus on the intangible benefits of energy behavior programs, such as positive effects upon professional ethics, company image, and spill-over impacts on participants' homes and communities.
- Attitude and behavior impact evaluations concern the impact of energy behavior programs on the attitudes and behaviors of participants, particularly the impact of components such as the use of information channels and engagement techniques.
- Process evaluations assess the entire process of program development, including the management of program committees, peer champions, and the effectiveness of branding.

There is an urgent need for the energy research community, energy efficiency professionals, and policy decision makers to work together to develop an appropriate evaluation framework for energy behavior programs. Such a framework would provide a valuable tool in the documentation and analysis of ongoing energy behavior programs, while offering the promise of a future roadmap for the improvement of energy behavior programs in their application to a variety of living and working environments.

### **4.3 Institutional Buildings, the Best Candidate for Energy Behavior Programs?**

Institutional buildings, according to [thefreedictionary.com](http://thefreedictionary.com), are buildings used by established organizations or foundations, particularly those dedicated to education, public service, or culture.

During the case selection process, it was a surprise that there were so few case studies of energy behavior programs, with nearly all of them falling under the category of “institutional buildings”—with the Empire State Building a notable exception: the “Green the Capitol” program was implemented in government buildings, the MEMPR case in a Canadian provincial government agency that is responsible for energy policy and regulation, while BC Hydro is closely tied to the BC government<sup>3</sup>, and the TLC program at UHN is similarly linked to the University of Toronto, which is a publicly-funded university.

In addition, it seems that all of the reviewed cases share other certain common traits:

- All of them publicly displayed strong interest in promoting energy efficiency and sustainability;
- Upper management demonstrated extraordinary support for the programs;
- Employees, or at least a portion of employees, were highly motivated and passionate about the cause;
- All of them own the buildings in which the programs were implemented;
- There is a very close interaction between building occupants and a built environment, i.e., building occupants spent a great deal of working time in the buildings; and
- There is a very close interaction between building occupants, i.e., a large proportion of building occupants spent significant amounts of time in the workplace.

Are institutional buildings the best candidates for energy behavior programs?

The answer is not a simple “yes.” Any building owner and occupant who fit the above six traits, or at least the majority of them could be regarded as good candidates for an energy behavior program.

One conclusion we may safely make is that some institutions in the U.S. and Canada are willing to take the lead in promoting energy behavior programs. Government offices at federal, state, county and city levels are all good candidates for low-cost energy behavior programs, and thus for setting an example for others to follow.

### **4.4 Integration of Energy Behavior Components into DOE’s Building Initiatives**

The U.S. Department of Energy (DOE) is currently running several programs and initiatives to promote building energy efficiency in a wide range of commercial buildings. These initiatives could offer opportunities for the integration of energy behavior components into existing programs and initiatives.

---

<sup>3</sup> The government of British Columbia owns BC Hydro. BC Hydro reports to the BC Ministry of Energy, Mines and Petroleum Resources (MEMPR).



The Better Buildings Challenge (<http://www4.eere.energy.gov/challenge/>) encourages leading organizations (corporate and community) to make substantial commitments to building energy efficiency. Its Web site states that partners would “develop an organization-wide plan to achieve energy goals” though no specific information is provided. Inclusion of “greening the work styles” of building occupants in their list of project activities could be beneficial to Better Buildings Challenge projects.

The Commercial Building Energy Alliances aim to improve building energy efficiency in key industries (such as retailers [http://www1.eere.energy.gov/buildings/alliances/retailer\\_energy\\_alliance.html](http://www1.eere.energy.gov/buildings/alliances/retailer_energy_alliance.html), commercial real estate [http://www1.eere.energy.gov/buildings/alliances/commercial\\_real\\_estate.html](http://www1.eere.energy.gov/buildings/alliances/commercial_real_estate.html), and hospitals [http://www1.eere.energy.gov/buildings/alliances/hospital\\_energy\\_alliance.html](http://www1.eere.energy.gov/buildings/alliances/hospital_energy_alliance.html)) through advanced technologies and strategies. The current Alliances seem to focus exclusively on development and deployment of advanced technologies and materials. The Alliances could also develop energy behavior programs by industry and share experiences through the existing Alliances’ network.

The inclusion of energy behavior components in the current building energy efficiency initiatives would increase the spread of energy behavior programs, increase total project impact and promote the adoption of energy-saving technology in a conservation-conscious environment.

## 5. CONCLUSIONS

This report studies workplace-based energy behavior programs that have been developed and implemented by building occupants and/or owners seeking to reduce building energy use through changes in occupants’ behavior. The report also provides an in-depth analysis on the common strategies used by these energy behavior programs to engage participants.

The report is structured as a review of five case studies, including “Green the Capitol” in the U.S. House of Representatives, the “Tenant Energy Management Program” in the Empire State Building, “Conservation Action!” at BC Hydro, a behavior change campaign undertaken at the BC Ministry of Energy, Mines and Petroleum Resources, and the “TLC-Care to Conserve” program at the University Health Network of the University of Toronto.

Four common intervention approaches were used in the reviewed energy behavior programs: (1) setting the tone with the strong support of upper management, (2) building a team with a project committee and peer champions on board, (3) utilizing communication tools to reach target audiences, and (4) engaging building occupants by means of social norms, feedback, benign peer pressure and competition, as well as through performance-linked rewards.

The report discussed the costs and benefits of energy behavior programs, but found that few programs have performed an adequate job of documenting and analyzing cost and benefit-related information. The difficulty of measuring and quantifying (sometimes intangible) benefits of energy behavior programs could be the main reason that energy behavior programs have been neglected in current, more technologically driven initiatives.

In addition, a lack of evaluation information in the current energy behavior programs inhibits a better understanding of key aspects of these programs, such as the hypothesized persistence of energy savings resulting from behavior changes. Similarly, this current lack of evaluation data also limits opportunities for assessing the effectiveness of the various information channels and engagement techniques in the promotion of a culture of energy efficiency. Thus there is clearly a need for the energy research community, policy decision makers, and energy professionals to work together to develop an evaluation framework (including a cost-benefit assessment approach) for energy behavior programs.

The DOE has been actively promoting building energy efficiency through an array of building initiatives. Though the existing initiatives have integrated many important components (e.g.,

technology, building materials, and finance), the inclusion of energy behavior components would create a more conservation-conscious environment in which to promote the adoption of energy-saving technology, while increasing the scope and scale of the impact of these programs through the existing network of building initiatives.

Some institutions in the U.S. and Canada are undoubtedly willing to take the lead in promoting energy behavior programs. Government offices at federal, state, county, and city levels are all appropriate candidates for low-cost energy behavior programs. By instituting such programs they could play an important role in the promotion of energy efficiency by setting an example for others to follow, and by helping to establish a culture of energy conservation both in the workplace and beyond.

## REFERENCES

- Aacker, D.A. 1996. *Building Strong Brands*. New York, N.Y.: The Free Press.
- Adamson, S. 2010. "Using TLC to Reduce Energy Use." In *Proceedings of the 2010 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Allcott, H. and S. Mullainathan. 2010. "Behavior and Energy Policy." *Science* **327**(5970): 1204-1205.
- Aronson, E. and M. O'Leary. 1983. "The Relative Effectiveness of Models and Prompts on Energy Conservation: A Field Experiment in a Shower Room." *Journal of Environmental Systems* **12**: 219-224.
- Bandura, A. 1974. "Behavior Theory and the Models of Man." *American Psychologist* **29**(12): 859-869.
- . 1976. *Social Learning Theory*. Prentice Hall.
- BC Hydro. 2008. "Power Smart Tips for Work." [http://www.bchydro.com/etc/medialib/internet/documents/psbusiness/pdf/business\\_power\\_smart\\_employee\\_awareness\\_power\\_smart\\_tip1.Par.0001.File.business\\_power\\_smart\\_employee\\_awareness\\_power\\_smart\\_tip1.pdf](http://www.bchydro.com/etc/medialib/internet/documents/psbusiness/pdf/business_power_smart_employee_awareness_power_smart_tip1.Par.0001.File.business_power_smart_employee_awareness_power_smart_tip1.pdf). Vancouver, B.C., Canada: BC Hydro.
- Bernard, J.T., M. Lemieux, and S. Thivierge. 1987. "Residential Energy Demand : An Integrated Two-Levels Approach." *Energy Economics* **9**(3): 139-144.
- Brown, Z. B. and R. J. Cole. 2008. "Engaging Occupants in Green Building Performance: Addressing the Knowledge Gap." In *Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- [CAO] Office of the Chief Administrative Officer. 2010. *Enabling a Green Workforce—Building a Culture of Sustainability in the House (A Progress Report)*. Washington D.C.: Office of the Chief Administrative Officer.
- Cebon, P. B. 1992. "Twixt Cup and Lip Organizational Behaviour, Technical Prediction and Conservation Practice." *Energy Policy* **20**(9): 802-814.
- DeCanio, S. J. 1993. "Barriers within Firms to Energy-Efficient Investments." *Energy Policy* **21**(9): 906-914.
- Diamond, R., C. Payne, and G. Scherling. 2008. "Greening the U.S. House of Representatives." In *Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Dietz, T. and P. C. Stern, Eds. 2002. *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Washington, D.C.: The National Academies Press.
- Ehrhardt-Martinez, K. 2008. *Behavior, Energy, and Climate Change: Policy Directions, Program Innovations, and Research Paths*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Ehrhardt-Martinez, K. and J. A. Laitner, Eds. 2010. *People-Centered Initiatives for Increasing Energy Savings*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Empire State Building Company. 2009, 2011. "Sustainability and Energy Efficiency." from [http://www.esbnyc.com/sustainability\\_energy\\_efficiency.asp](http://www.esbnyc.com/sustainability_energy_efficiency.asp).

- Feldman, R. S. 1998. *Social Psychology*. Upper Saddle River, N.J.: Prentice Hall.
- Feng, K., K. Hubacek, and G. Dabo. 2009. "Lifestyles, Technology and CO<sub>2</sub> Emissions in China: A Regional Comparative Analysis." *Ecological Economics* **69**(1): 145-154.
- Freedman, J. L. and S. C. Fraser. 1966. "Compliance Without Pressure: The Foot-in-The-Door Technique." *Journal of Personality and Social Psychology* **4**(2): 195-202.
- Friedrich, K., J. Amann, S. Vaidyanathan, and R. N. Elliott. 2010. *Visible and Concrete Savings: Case Studies of Effective Behavioral Approaches to Improving Customer Energy Efficiency*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Goitein, B. 1989. "Organizational Decision-Making and Energy Conservation Investments." *Evaluation and Program Planning* **12**(2): 143-151.
- Gustafson, C. and M. Longland. 2008. "Engaging Employees in Conservation Leadership." In *Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-efficient Economy.
- Hidetoshi, N. 1996. "Lifestyle Change and Energy Use in Japan: Household Equipment and Energy Consumption." *Energy* **21**(12): 1157-1167.
- Hromalik, N. 2010. "The U.S. House of Representatives as a Model of Sustainability." *Behavior, Energy & Climate Change Conference*. Sacramento, Calif.
- [IEA] International Energy Agency. 2007. *Mind the Gap—Quantifying Principal-Agent Problems in Energy Efficiency*, 224. International Energy Agency.
- Jones Lang LaSalle. 2011. *A Landmark Sustainability Program for the Empire State Building*. [http://www.ap.joneslanglasalle.com/SiteCollectionDocuments/United%20States/JLL\\_Empire\\_State\\_Building\\_Project\\_Plan.pdf?utm\\_source=LandingPage&utm\\_medium=LandingPage&utm\\_term=ProjectPlan&utm\\_campaign=EmpireStateBuilding](http://www.ap.joneslanglasalle.com/SiteCollectionDocuments/United%20States/JLL_Empire_State_Building_Project_Plan.pdf?utm_source=LandingPage&utm_medium=LandingPage&utm_term=ProjectPlan&utm_campaign=EmpireStateBuilding).
- Katzev, R. D. and T. R. Johnson. 1984. "Comparing the Effects of Monetary Incentives and Foot-in-the-Door Strategies in Promoting Residential Electricity Conservation." *Journal of Applied Social Psychology* **14**(1): 12-27.
- Kempton, W. and M. Neiman, Eds. 1987. *Energy Efficiency: Perspectives on Individual Behavior*. Washington, D.C.: American Council for an Energy-Efficient Economy
- Laitner, J. A. and K. Ehrhardt-Martinez. 2011. "The Human Dimensions of the Growing Energy and Climate Imperatives." [www.aceee.org/files/pdf/conferences/30th/building/Laitner.pdf](http://www.aceee.org/files/pdf/conferences/30th/building/Laitner.pdf). Washington, D.C.: American Council for an Energy-Efficient Economy
- Lutzenhiser, L. 1993. "Social and Behavioral Aspects of Energy use." *Annual Review of Energy and the Environment* **18**: 247-289.
- Lutzenhiser, L. and E. Shove. 1999. "Contracting Knowledge: The Organizational Limits to Interdisciplinary Energy Efficiency Research and Development in the US and the UK." *Energy Policy* **27**(4): 217-227.
- Matsuo, M. 2005. *The Role of Internal Competition in Knowledge Creation: An Empirical Study in Japanese Firms*. Bern, Switzerland, Peter Lang.
- McKenzie-Mohr, D. 2000. "Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing." *Journal of Social Issues* **56**(3): 543-554.

- . 2011. *Fostering Sustainable Behavior—Community-based Social Marketing*. New Society Publishers.
- National Research Council. 1982. *Behavioral and Social Aspects of Energy Consumption and Production: Preliminary Report*. Washington, D.C.: The National Academies Press.
- . 1999. *Human Dimensions of Global Environmental Change: Research Pathways for the Next Decade*. Washington, D.C.: The National Academies Press.
- Owen, T., A. Pape-Salmon, et al. 2010. "Employee Engagement and Energy Information Software Supporting Carbon Neutrality." In *Proceedings of the 2010 ACEEE Summer Study on Energy Efficiency in Buildings*. Washington, D.C.: American Council for an Energy-Efficient Economy.
- Owens, S. and L. Drifill. 2008. "How To Change Attitudes and Behaviours in the Context of Energy." *Energy Policy* **36**: 4412-4418.
- Pallak, M. S., D. A. Cook, et al., Eds. 1980. "Commitment and Energy Conservation.: *Applied Social Psychology Annual*. Beverly Hills, Calif.: Sage.
- Payne, C. 2006. *The Commercial Energy Consumer: About Whom Are We Speaking?* Washington, D.C.: Lawrence Berkeley National Laboratory.
- Rick, D. 2003. "A Lifestyle-Based Scenario for US Buildings: Implications for Energy Use." *Energy Policy* **31**(12): 1205-1211.
- Rocky Mountain Institute. 2010. *Project Case Study: Empire State Building*. Rocky Mountain Institute.
- . 2011. "Greening the Empire State Building." <http://bet.rmi.org/rmi-news/greening-the-empire-state-building.html>. Rocky Mountain Institute.
- Schipper, L. and S. Meyers. 1992. *Energy Efficiency and Human Activity: Past Trends, Future Prospects*. Cambridge University Press.
- Scott, C. A. 1977. "Modifying Socially-Conscious Behavior: The Foot-in-the-Door Technique." *Journal of Consumer Research* **4**(3): 156-164.
- Shui, B. and H. Dowlatabadi. 2005. "Consumer Lifestyle Approach to US Energy Use and the Related CO<sub>2</sub> Emissions." *Energy Policy* **33**(2): 197–208.
- Stern, P., Ed. 1985. *Energy Efficiency in Buildings: Behavioral Issues*. Washington, D.C.: The National Academies Press.
- Stern, P. C. and E. Aronson, Eds. 1984. *Energy Use: the Human Dimension*. New York: Freeman.
- Stern, P. C., T. Dietz, et al., Eds. 1997. *Environmentally Significant Consumption: Research Directions*. Washington, D.C.: The National Academies Press.
- Stern, P. C. and R. E. Kasperson, Eds. 2010. *Facilitating Climate Change Responses: A Report of Two Workshops on Insights from the Social and Behavioral Sciences*. Washington, D.C.: The National Academies Press.
- Straus, J. R. 2009. *Administering Green Programs in Congress: Issues and Options*. Washington, D.C.: Congressional Research Service.
- Straus, J. R. (Congressional Research Service). 2011. Personal communication.

- U.S. Energy Information Administration. 2008. "Overview of Commercial Buildings, 2003." *Commercial Building Energy Consumption Survey*. Retrieved August 31, 2011. <http://www.eia.gov/emeu/cbecs/cbecs2003/overview1.html>.
- U.S. Energy Information Administration. 2011. "Table 2.1a Energy Consumption by Sector, 1949–2009." *Annual Energy Review*. Retrieved August 31, 2011. <http://205.254.135.24/totalenergy/data/annual/txt/ptb0201a.html>.
- Vandelay Website Design. (2008). "Issues Involved with Website Communication." <http://vandelaydesign.com/blog/design-process/website-communication>.
- Weber, C. and A. Perrels. 2000. "Modelling Lifestyle Effects on Energy Demand and Related Emissions." *Energy Policy* **28**(8): 549-566.
- Widman, R., B. Simmons, et al. 1984. *Behavioral Approaches to Energy Conservation in Organizations: A Selected Review of the Literature*, 21. Chicago: The University of Michigan.
- Wilson, C. and H. Dowlatabadi. 2007. "Models of Decision Making and Residential Energy Use." *Annual Review of Environment and Resources* **32**: 169–203.
- Wu, Y., C. Liu, et al. 2007. *Study on China Building Energy Management System*. Beijing, China: Construction Industry Publishing House.
- Yates, S. M. and E. Aronson. 1983. "A Social Psychological Perspective on Energy Conservation in Residential Building." *American Psychologist* **38**(4): 435-444.