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Examining Employees' Perceptions of Energy Conservation Behaviors in Office Settings

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by

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ABSTRACT

The estimates for potential energy and greenhouse gas (GHG) savings in office buildings are significant. Reports show that energy wasting behavior in office buildings such as computers being left on at night and on weekends result in billions of dollars lost annually and GHG's being emitted needlessly. The estimated potential for energy savings ranges from 20 to 50 percent. Despite the potential for significant energy savings, a review of the literature revealed that there are relatively few studies of energy conservation interventions in office buildings. Most of the research on energy conservation has been done in households. There is agreement in the field of energy conservation that providing behavioral interventions based on evidence and theory could be instrumental in tapping the potential energy savings and GHG reductions in office buildings.

The purpose of this quantitative study was to examine employee attitudes and perceptions of energy conservation as well as the prevalence of energy conservation behaviors among faculty and staff at a Midwestern University. This study demonstrates the use of two theoretical constructs, Ajzen's Theory of Planned Behavior and Vroom's Expectancy Theory, to examine employee attitudes and perceptions of energy conservation in an office setting in order to recommend HRD interventions designed to reduce energy use and associated GHG emissions. The study revealed a high degree of awareness of issues related to energy consumption as well as positive attitudes toward the environment in general and toward energy conservation specifically. In addition, there is a high degree of endorsement of the University's energy conservation goals. The study demonstrated that energy conservation attitude and endorsement of the University's goal are significantly correlated with energy behavior. The data on energy conservation behaviors revealed opportunities for improvement in specific areas such as turning off computers and monitors at the end of the day. The study also found that faculty and staff differ in three areas: energy issue awareness, perceived behavioral control, and outcome expectancy.

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Chapter One

INTRODUCTION

Sustainability of earth's life support systems is a broad topic encompassing issues related to water, waste, biodiversity and toxin loading. For the purposes of this study, the focus is on one aspect of earth's life support system, global warming, and energy consumption as one of the leading sources of greenhouse gases that cause global warming.

Status of the Issue

Energy Conservation and Earth's Life Support System

World population is predicted to reach 9 billion people by the year 2050 (United Nations, 2011). Instead of being a cause for celebration, this prediction was greeted soberly by world leaders who recognized the challenges of meeting the physical needs of the world's ever-growing population. At the same time that global population grew, affluence increased, resulting in increased consumption as more countries joined the industrialized world and standards of living rose (Myers & Kent, 2003). Examples of consumption include car ownership, increased consumption of transportation fuels (Leung, Li & Low, 2011; Skeer & Wang, 2007), use of electric lighting, the ability to heat and cool homes, and the use of other time saving appliances.

These consumption changes have been perceived to be positive in terms of improving quality of life for people around the world. However, these changes have also been suggested to have created significant environmental consequences (Myers & Kent, 2003). The combination of rising population and affluence has placed increasing pressure on eco-systems and for the first time in history, has the capacity to alter the earth's life-support systems (Rockstrom, Noone, Persson, Chapin, Lambin, & Lenton, 2009). Rockstrom et al. (2009) asserted that the earth had entered a new era, the Anthropocene, and stated that "[t]he exponential growth in human activities is raising concern that further pressure on the Earth System could destabilize critical biophysical systems and trigger abrupt or irreversible environmental changes that would be deleterious or even catastrophic for human well-being" (p. 2).

The accumulation of GHG's in the atmosphere leads to global warming and climate change as a result of overpopulation and overconsumption. The United Nations Intergovernmental Panel on Climate Change has reported that GHG emissions have been rising and the Earth's atmosphere is warming at an alarming rate (Barker et al., 2007). It is anticipated that global average CO2 concentrations will exceed the safe upper limit of 350 PPM and reach 400 PPM by 2016 (NOAA, 2012). Just as observations of CO2 in the Earth's atmosphere have increased over time, temperature change has also been observed with 10 of the last 12 years being the hottest on record according to the US Environmental Protection Agency (NOA, 2013).

Human Energy Behavior

Scientists have agreed that slowing global warming will require a massive reduction in GHG emissions (Bernow, Cory, Dougherty, Duckworth, Kartha, Ruth, & Goldberg, 1999; Hansen, Sato, & Ruedy, 2012). The most prevalent source of GHG emissions has been documented as the burning of fossil fuels for transportation and electricity generation. The U.S. Department of Energy (2010) reported that energy for operating buildings including heating, cooling, lighting, and plug loads, accounted for 40 percent of U.S. primary energy consumption and 40 percent of U.S. GHG emissions with the residential sector accounting for 22 percent and commercial buildings accounting for 18 percent.

Pacala and Socolow (2004) suggested that the scientific, technical, and industrial know-how already exists to solve the carbon and climate problem for the next half century through "stabilization wedges". Stabilization wedges are GHG reduction options that emphasize switching to alternative energy sources and alternative fuels, increased energy efficiency, and reducing energy consumption through energy conservation (Pacala & Socolow, 2004). Energy efficiency is defined as using less energy to achieve the same output or level of service (Lawrence Berkeley National Laboratory, n.d.) and includes energy savings achieved through technical solutions including modifications to structures and equipment such as adding insulation, sealing building envelopes, installing high efficiency heating, ventilation and cooling (HVAC) systems, energy efficient lighting such as light emitting diodes or LED's, and energy monitoring and control systems. Energy conservation is achieved through behavioral changes such as changing thermostat settings, turning off lights and unplugging appliances when not in use (Lawrence Berkeley National Laboratory, n.d.).

Schipper, Bertlett, Hawk & Vin (1989) suggested that wasted energy by occupants of offices and households could be as high as 50 percent of total energy consumption, indicating that efforts to change energy behavior could play a significant role in reducing GHG emissions. Dietz, Gardner, Gilligan, Stern, and Vandenbergh (2009) showed that implementation of 17 different behavioral actions could reduce U.S. household GHG emissions by 20 percent. Experiments using feedback and information provision reduced electricity use by 5 to 20 percent (Stern 1992; Fischer 2008). Behavioral interventions aimed at households have been shown to be cost effective in reducing energy use and reducing GHG emissions because they involve little investment (Alcott & Mulainathan, 2010). Studies of behavioral interventions in household settings have demonstrated the effectiveness of commitment, goal setting, individual and comparative feedback, and normative messaging (Abrahamse, Steg, Vlek & Rothengatter, 2005; Delmas, Fischlein & Asensio, 2013; Ehrhardt-Martinez, Donnelly, & Laitner, 2010; Fischer, 2008).

The National Research Council (2010) reported that routine behavior of building occupants was a contributing factor to energy consumption in office buildings. The Alliance to Save Energy (2009) suggested that turning off computers at the end of the day would prevent 15 million tons of CO_2 emissions annually and save $2.8 billion each year. Webber's (2006) study revealed that only one third of computers were turned off at the end of the day. Energy audits of office buildings in southern Africa showed that 56 percent of building energy was consumed during non-working hours representing a significant opportunity for energy savings (Masoso & Grobler, 2010). Energy conservation can help employers meet their goals to reduce GHG emissions and save money if employers can engage their employees in energy conservation behaviors.

Peer education (Carrico & Reimer, 2011), building-level feedback and goals (Carrico & Reimer, 2011; Staats, van Leeuwen & Wit, 2000); individual feedback (Murtagh, Nati, Headley, Gatersleben, Gluhak, Imran & Uzzell 2013); comparative feedback and goals (Sierro, Bakker, Dekker & Van den Bergh, 1996); visual prompts (Sussman & Gifford, 2012); and provision of information (Staats, Van Leeuwen, & Wit, 2000) have proven to be effective behavioral interventions in office settings. Behavioral interventions can be cost effective. One study demonstrated that peer education cost $500 per month per 1000 participants and saved $15 for every $1 spent, while feedback cost $600 per month per 1000 participants and saved $32 for every $1 spent (Carrico & Reimer, 2011).

Challenges in Energy Conservation

There are several challenges to promoting energy conservation in office buildings including the non-visible nature of electricity (Burgess & Nye, 2008; Costanzo, Archer, Aronson & Pettigrew, 1986; Egan, 2002), low levels of energy knowledge (Attari, DeKay, Davidson &

Bruin, 2010; Bittle, Rochkind & Ott, 2009; Dewaters and Powers, 2011; Kempton, Harris, Keith & Weihl, 1985; Lutzenhiser, 1993; & NEETF, 2002), lack of information about building energy use (Seligman & Darley, 1977; Wilhite & Ling, 1995), lack of financial incentives to save (Lo, Peters & Kok, 2011; Murtagh et al., 2013; Sierro et al., 1996) and overcoming existing energy consumption habits (Kok, Ho, Peters & Ruiter, 2011). Successful intervention programs and strategies are needed to address these challenges. Energy consumption feedback to building occupants is one strategy that has been used to overcome some of these challenges (Carrico & Reimer, 2011; Murtagh et al., 2013; Sierro et al., 1996; Staats, Van Leeuwen, & Witt, 2000). Kok et al. (2011) listed the use of prompts and visual cues, mobilizing social norms, modeling the desired behavior, goal setting, feedback, commitment, and rewards that were demonstrated to be effective in promoting pro-environmental behaviors.

Limited Energy Conservation Research in the Workplace

Despite the fact that 18 percent of GHG emissions in the U.S. are attributable to office buildings (U.S. Department of Energy, 2010), and energy conservation has been estimated to reduce energy consumption and associated emissions by 20 to50 percent (Dietz et al., 2009; Schipper et al., 1989), energy conservation in office buildings remains relatively unstudied. There are few studies of energy conservation in organizations in the literature (Carrico & Reimer, 2011; Lutzenhiser, 1993; Murtagh et al., 2013; Scherbaum, Popovich & Finlinson, 2008; Stern, 2011). Scherbaum et al. (2008) suggested that behavioral change among employees has been overlooked in organizations, resulting in missed opportunities to reduce energy use and GHG emissions.

Sierro et al. (1996) demonstrated the use of comparative feedback and energy savings goals to change energy behavior and successfully reduce energy consumption in an organization.

Most office buildings include offices and shared spaces such as break rooms, conference rooms, and restrooms. Sussman and Gifford (2012) demonstrated the use of behavioral prompts to influence building occupants to turn-off lights in unoccupied restrooms in university office and classroom buildings. Murtagh et al. (2013) demonstrated significant reductions in energy consumption by providing individual energy feedback to office occupants, and individual attitude toward reducing energy use was the only individual factor significantly correlated to actual energy savings. Staats, Van Leeuwen and Wit (2000) used an informational intervention to change building occupant behavior with regard to radiator use and thermostat settings that resulted in a six percent reduction in gas consumption over two years. In another study, peer education and energy feedback were used to achieve four percent and seven percent reduction respectively in energy consumption in university office buildings (Carrico & Reimer, 2011).

GHG Reduction Efforts and Organizations

Organizations and institutions are under increasing pressure from stakeholders to reduce their GHG emissions (Almihoub, Mula & Rahman, 2013). Colleges and universities have implemented a variety of initiatives designed to reduce their GHG emissions. As of 2013, there are 679 signatories to the American College and University Presidents' Climate Commitment. By signing the climate commitment, academic institutions pledge to achieve carbon neutrality by mid-century. Signatories agree to adopt a variety of measures to reduce GHG emissions, including measures that reduce energy consumption. Many have crafted climate action plans that spell out how they plan to achieve carbon neutrality (http://www.presidentsclimatecommitment.org/signatories, accessed November 9, 2013). Efforts to reduce GHG emissions are not limited to higher education. In 2012, 405 companies on the Global 500 voluntarily reported their carbon emissions (Carbon Disclosure Project, 2012). As of

August 2008, over 850 mayors from 50 states had signed the US Conference of Mahors Climate Protection Agreement (Tang, Brody, Quinn, Cheng & Wei, 2010).

Engaging building occupants in conserving energy represents a low-cost option for achieving savings of 20 percent or more (Dietz et al. 2009; Schipper et al., 1989). Lutzenhiser (1993) found that energy illiteracy is a key factor influencing individuals "willingness and ability to conserve" (p. 252). DeWaters & Powers (2011) define energy literacy in terms of three domains: the cognitive domain which includes broad energy content knowledge, the affective domain which includes attitudes and values, and the behavioral domain which includes daily actions and decisions related to energy use.

Workplace training programs can be designed to address cognitive, affective or behavioral learning goals (Silberman, 1990). Human Resource Department staff play an important role in helping their organizations achieve their environmental goals and objectives (Wirtenberg, Harmon, Russell & Fairfield, 2007). They are "likely the only department that is professionally trained to change the attitudes of executives, managers, and employees" (Liebowitz, 2010, p. 51). Silberman (1990) pointed out that other interventions may be as beneficial or more beneficial than training. Hughes, Preyan and Collier (2010) asserted that engaging university stakeholders played an important role in the university's ability to achieve its diversity goals by helping them see how their actions impacted diversity outcomes. The same phenomenon may be at work with respect to energy conservation as it relates to stakeholder engagement and perceptions.

Problem Statement

Kok et al. (2011) asserted that often energy conservation interventions “are not systematically developed and/or not well-described which impedes program replication or larger scale dissemination beyond the intervention trial" (p. 2). A systematic, evidence-based approach to the design, implementation and evaluation of energy-related behavior change initiatives could benefit the energy conservation field (Kok et al., 2011; Steg & Vlek, 2009). Stern (2011) advocated for the importance of "behaviorally sound design principles" that can be applied to programs and interventions to promote energy conservation in households and organizations (p. 310). In order to develop effective intervention strategies aimed at occupants in office buildings, the first step is to gain an understanding of their current energy knowledge, energy behaviors and attitudes toward energy conservation. In addition, it is important to understand the extent to which employees value organizational energy conservation goals and the extent to which they believe that their behavior impacts the outcome of those goals. It is also important to assess employee's perceived behavioral control with regard to energy conservation in office settings.

Purpose

The purpose of this study is to assess the current energy knowledge, attitudes and behaviors of employees at a university in order to identify strategies and interventions that can be tailored to the needs of this particular audience in order to effectively promote energy conservation on campus. The university is one of 679 signatories to the College and University Presidents' Climate Commitment and has pledged to achieve carbon neutrality by mid-century. The first step in meeting the requirements of the climate commitment was to establish the University's baseline energy consumption and GHG emissions. Subsequently, the University entered into an energy savings performance contract with a firm specializing in building energy efficiency. Building retrofits included installing energy efficient lighting and occupancy sensors, changing vent hoods in laboratories, replacing motors and other equipment with energy efficient models, etc.

In the first full year of measurement and verification under the energy performance savings contract, the University has reduced its energy consumption by 43 million kilowatt hours, saving $4.55 million dollars and avoiding 18,800 metric tons of CO_2 emissions, equivalent to planting 15,500 acres of forest or taking 4,000 cars off the road annually (University of Arkansas Energy Savings Project Summary). The University saved enough energy to power 3,950 homes for one year. These savings are impressive and have been achieved through the energy efficiency measures outlined above. Despite these efforts, base energy consumption remains stubbornly at 6 megawatt hours, and the University's energy management team has expressed an interest in trying to reduce base load through behavioral initiatives that address choices made by faculty, staff, and students. A recent report estimates that a reduction of 10 percent in energy consumption would result in an additional savings of $750,000 annually (University of Arkansas Electricity Benchmark Report). With the exception of a residential energy efficiency challenge aimed at students living in residence halls in the spring of 2013, the University has not engaged in systematic efforts to promote energy conservation behaviors among faculty, staff and students (Personal communication with UA Sustainability Director).

Before undertaking energy conservation initiatives that engage faculty and staff, it is important to understand faculty and staff attitudes toward the environment in general and toward energy specifically. It is also important to gage current energy conservation behaviors and awareness of climate change and energy issues. At the present time, it is unknown whether training, energy feedback, commitment devices or simple policy changes would be most effective in helping the University reach its energy goals. Without this information, the University would be ill-advised to develop an awareness training program or an energy education training module. The information collected in this study may be used to inform University choices and investments to promote energy conservation.

What is unknown is the level of energy awareness among faculty and staff including content knowledge, energy attitudes, and energy behavior. In addition, it is unknown the extent to which faculty and staff endorse the University's energy conservation goals and the extent to which the faculty and staff feel that their actions can impact the outcome of the University's energy conservation goals. Faculty and staff may have heard of climate change but not know the extent to which the University is engaged in helping to reduce climate change. This study will examine university employees' energy awareness, energy attitudes, energy behaviors, endorsement of the university's energy conservation goals, and their perception of their ability to impact the university's energy conservation goals. The results of this study may be used to inform the selection of intervention strategies to promote energy conservation on campus.

Research Questions

This study will address the following research questions:

1. What is the level of awareness of issues related to energy consumption?
2. What is the attitude of faculty and staff toward the environment and energy conservation?
3. To what extent do faculty and staff endorse the University's energy conservation goals and believe that their choices impact those goals?
4. To what extent do faculty and staff believe that they can control their energy consumption at work?
5. To what extent do faculty and staff engage in energy conservation behaviors?

Theoretical Framework

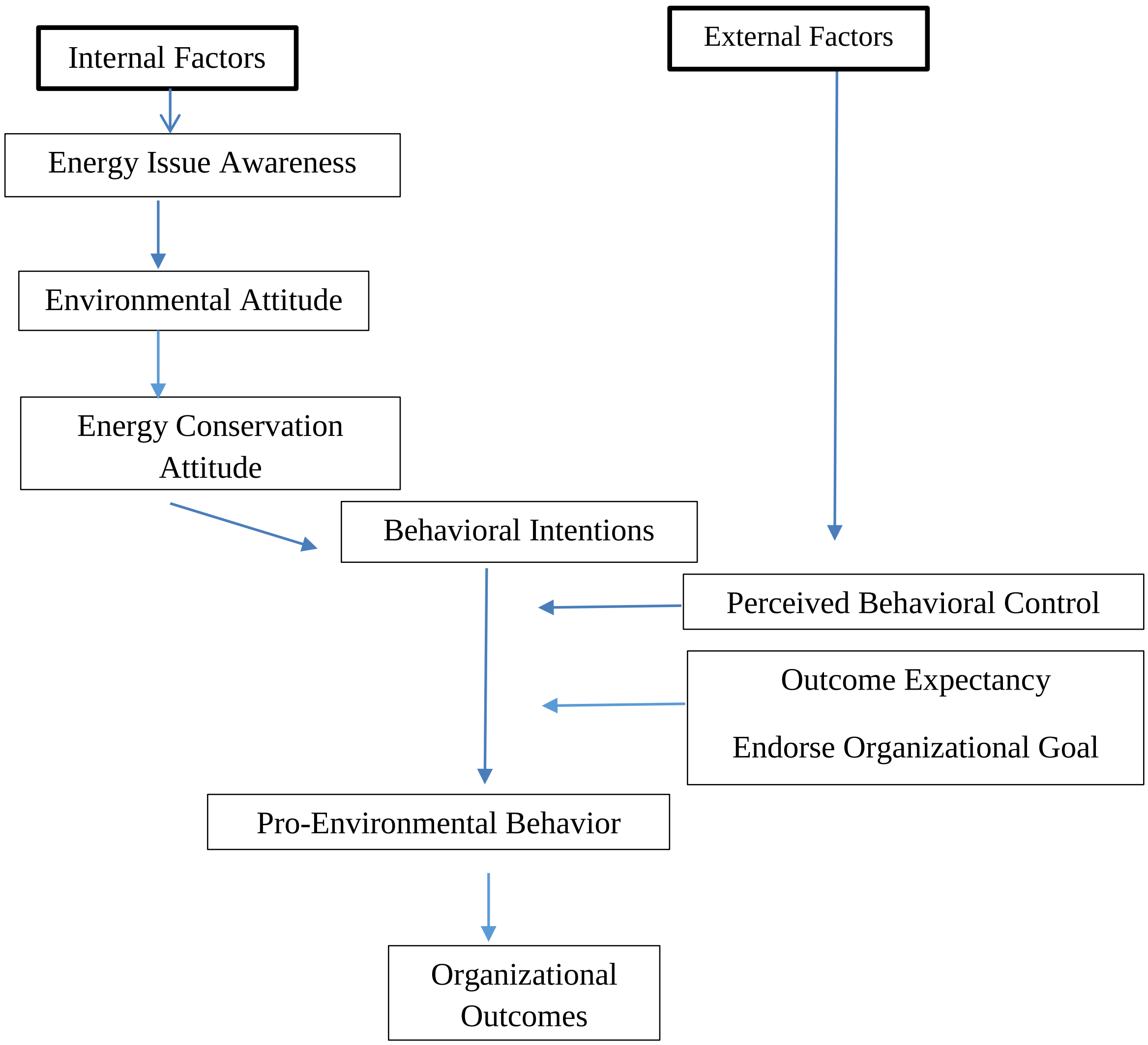
It has been acknowledged that pro-environmental behavior is an extremely complex phenomenon and difficult to capture within a single theoretical framework (Bamberg & Moser, 2007; Jackson, 2005; Kollmuss & Agyeman, 2012). The literature on pro-environmental behavior is built on several theories that address the internal and external factors that influence human behavior. Among these are the Theory of Planned Behavior (TPB) (Ajzen & Fishbein, 1980) and Expectancy Theory (Vroom, 1995). Scherbaum et al. (2008) asserted that "understanding the individual-level factors that impact employee energy-conservation behaviors at work is imperative if effective interventions are to be developed" (p. 832). The Theory of Planned Behavior includes internal factors that have been demonstrated to influence pro-environmental behavior including issue awareness, environmental attitudes in general, and attitudes toward specific behaviors (Ajzen & Fishbein, 1980; Bamberg & Moser, 2007; Staats, 2003). The Theory of Planned Behavior also addresses external factors of pro-environmental behavior such as the presence of barriers or enablers in a given context by assessing the individual's perception of behavioral control (perceived behavioral control) (Ajzen & Fishbein, 1980; Bamberg & Moser, 2007). This study will measure employee attitudes toward the environment, attitudes toward specific energy conservation behaviors, awareness of energy and climate issues, and perceived behavioral control.

Expectancy theory may be used to examine another aspect of the individual/organization relationship regarding pro-environmental behavior in general and energy conservation behavior in particular. Increasingly, organizations and institutions are establishing goals to reduce energy consumption and GHG emissions (Carbon Disclosure Project, 2012; American College and University Presidents Climate Commitment, 2013). Several studies have shown that employee behavior is a contributing factor in energy consumption and wasted energy (Alliance to Save Energy, 2009; Webber, 2006; Masoso & Grobler, 2010). Interventions aimed at changing employee energy behavior can be used to meet organizational or institutional energy and GHG goals. Studies have shown that changing energy behavior among employees can be effective in reducing energy consumption and greenhouse gas emissions (Carrico & Reimer, 2011; Staats, ven Leeuwen & Witt, 2000; Murtagh et al., 2013; Sussman & Gifford, 2012). In the case of diversity, Hughes, Preyan and Collier (2010) demonstrated that it is important to understand the extent to which employees value the institution's goals and the extent to which employees feel that they can influence the achievement of those goals. Bandura (1997, 2000) discussed the importance of collective outcome expectancy beliefs which he defined as beliefs about a group's ability to perform an action and produce desired outcomes. This phenomenon may also be important with respect to achieving organizational energy conservation goals through interventions aimed at changing employee behavior. This study will measure the extent to which employees value the organization's energy and GHG emission reduction goals and the extent to which they feel that their behaviors can influence the outcomes of the organization's goals.

Figure 1 depicts the modification of Ajzen's model of planned behavior to best suit this study. This study emphasizes the integration of both internal determinants of pro-environmental behavior and the organizational context where those behaviors occur. The difference in this version of the model is that it is not focused exclusively on perceived behavioral controlas a mediator of behavioral intentions and behavior. Aspects of Vroom's expectancy theory are used to examine the interaction between the internal and external factors that contribute to pro-environmental behavior in office settings.

Figure 1

Proposed Integration of Internal and External Determinants of Pro-Environmental Behavior in Organizational Contexts



Significance of the Study

In order for higher education institutions and other organizations to fully achieve their carbon emissions reduction goals, their ability to engage their employees in energy conservation behaviors is essential. In addition to universities that typically have campuses with multiple buildings, other entities may also find this study useful. Municipal governments frequently have multiple buildings under their jurisdiction including city administration buildings, police and fire stations, public libraries, community centers and other facilities. School districts typically have a building inventory that includes elementary schools, middle schools, one or more high schools, athletic facilities, and administrative buildings. Many corporations report their carbon emissions to the Carbon Disclosure Project and have set voluntary carbon reduction goals (Carbon Disclosure Project, 2012). Some corporations also have "campuses" comprised of multiple buildings in a single city, or will have single buildings in many different cities. All of these entities have an interest in managing energy consumption as a way to control costs. Any organization that has established goals around reducing its energy consumption and carbon emissions may also find this study useful.

Given that the potential for energy savings from energy conservation behaviors in the work place is largely untapped, the challenge for employers of all types is how to engage their employees in reducing energy consumption and associated GHG emissions. The problem is that employers lack vital information about their employees with respect to energy. In order to design and implement effective interventions, employers must first determine the current level of energy awareness, attitudes, and behaviors among their employees. Similar to establishing baseline energy consumption for a building before implementing energy efficiency retrofits, employers should establish a baseline for employee energy knowledge, attitudes and behaviors in order to select behavioral interventions. Human Resource Development (HRD) professionals and other employee development professionals can benefit from the results of this study to inform the selection of effective behavioral intervention techniques.

Limitations

One of the limitations of the study is the use of self-reported behavioral data instead of real-time observations of energy-conservation behaviors. There are over 4000 employees distributed across nearly 100 buildings, and those employees make energy consumption decisions multiple times each day. It is beyond the scope of this study to observe actual behaviors.

Another limitation is that social norms have been demonstrated to influence a wide range of pro-environmental behaviors (Cialdini, Reno, & Kallgren, 1990; Goldstein, Cialdini & Griskevicius, 2008; Alcott, 2011) and are indirectly relevant to employees' energy conservation behaviors but are beyond the scope of this study.

An additional limitation is the generalizability of the study. This study focuses on one population at a Midwestern University. Lo et al. (2011) found similarities and differences when comparing energy conservation challenges and opportunities across private corporations, a university, and a non-governmental organization. Readers are cautioned against making generalizations from this study about other organizations.

Operational Definition of Key Terms

American College and University Presidents' Climate Commitment (ACUPCC): "is a 'high-visibility effort' to address global warming (global climate disruption) by creating a network of colleges and universities that have committed to neutralize their GHG emissions and accelerate the research and educational efforts of higher education to equip society to re-stabilize the earth’s climate. " (In *Wikipedia*. Retrieved February 2014. https://en.wikipedia.org/wiki/American_College_%26_University_Presidents%27_Climate_Commitment.)

Climate Action Plan: A climate action plan is a comprehensive document that outlines an entity’s response to climate change, tailored to the entity's specific circumstances. Climate action plans normally include a detailed emission inventory, baseline and projected emissions, a discussion of the potential impacts of climate change on the entity's resources, opportunities for emission reductions, emission reduction goals, and an implementation plan. (Abadie, Ortiz, Galarraga & Markandya, 2013).

Climate Neutrality: “For the purposes of the ACUPCC, climate neutrality is defined as having no net GHG (GHG) emissions, to be achieved by minimizing GHG emissions as much as possible, and using carbon offsets or other measures to mitigate the remaining emissions.” (Retrieved from the Association for the Advancement of Sustainability in Higher Education website, paragraph 5, February 2014. http://www.presidentsclimatecommitment.org/about/commitment/faqs).

Climate Change: Climate change refers to any significant change in measures of climate such as temperature, precipitation, or wind, lasting for an extended period of time. (U.S. Environmental Protection Agency, Glossary of Climate Change Terms, Retrieved February 2014. http://www.epa.gov/climatechange/glossary.htmlhttp://www.epa.gov/climatechange/glossary.html

Climate Change Factors: Climate change may result from both natural and human-made factors such as changes in the sun’s intensity or slow changes in the Earth’s orbit around the sun;

natural processes within the climate system (e.g. changes in ocean circulation); and human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.) (Environmental Protection Agency website, Retrieved February 2014, from http://www.epa.gov/climatechange/Downloads/Climate_Change_Science_Facts.pdf)

Energy Efficiency: Energy efficiency and energy conservation are often confused. Energy efficiency refers to doing the same work or providing the same level of service while using less energy. Energy efficiency usually entails technological improvements or structural improvements that require less energy for example compact fluorescent light bulbs versus incandescent light bulbs (Lawrence Berkeley National Laboratories, Retrieved February 2014, from http://eetd.lbl.gov/ee/ee-1.html.)

Energy Conservation: Energy conservation means reducing the amount of energy consumed by going without a service, usually through behavioral choices such as changing thermostat settings or powering down appliances when not in use (Lawrence Berkeley National Laboratories, Retrieved February 2014, from http://eetd.lbl.gov/ee/ee-1.html).

Energy Literacy: The term energy literacy includes a "citizenship understanding" of energy that includes cognitive, affective and behavioral dimensions. "An energy literate individual is one who has a sound conceptual knowledge base as well as a thorough understanding of how energy is used in everyday life, understand the impact that energy production and consumption have on all spheres of our environment and society, is sympathetic to the need for energy conservation and the need to develop alternatives to fossil fuel-based energy resources, is cognizant of the impact that personal energy-related decisions and actions have on the global community, and – most importantly – strives to make choices and exhibit behaviors that reflect these attitudes with respect to energy resource development and energy consumption." (DeWaters & Powers, 2011, p. 2)

Global Warming: Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. It is primarily caused by increasing concentrations of greenhouse gases that can occur as a result of human activities. (U.S. Environmental Protection Agency, Glossary of Climate Change Terms, Retrieved February 2014, from http://www.epa.gov/climatechange/basics/#happening).

Greenhouse Gas (GHG): Any gas that absorbs infrared radiation in the atmosphere. GHG's include, but are not limited to, water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). (U.S. Environmental Protection Agency, Glossary of Climate Change Terms, Retrieved February 2014, from http://www.epa.gov/climatechange/glossary.html)

Pro-environmental behavior (PEB): (synonym: environmentally significant behavior or ESB). "Pro-environmental behavior means behavior that consciously seeks to minimize the negative impact of one's action on the natural and built world (e.g. minimize resource and energy consumption, use of non-toxic substances, reduce waste production." (Kollmuss & Agyeman, 2012, p. 240).

Renewable Energy: The term renewable energy generally refers to electricity supplied from renewable energy sources, such as wind and solar power, geothermal, hydropower, and various forms of biomass which are continuously replenished on the Earth. (U.S. Environmental

Protection Agency, Glossary of Climate Change Terms, Retrieved February 2014, from http://www.epa.gov/climatechange/glossary.html).

Stabilization Wedge: an activity that reduces GHG emissions to the atmosphere in order to stabilize the climate by 2054. Energy efficiency and energy conservation represent one of seven stabilization wedges (Pacala & Socolow, 2004).

Chapter Two

LITERATURE REVIEW

The literature review includes literature on the role of Human Resources Development in addressing sustainability in organizations, research related to energy conservation in organizations, and research on the internal and external determinants of pro-environmental behavior. Internal factors include environmental attitudes in general as well as specific attitudes related to energy conservation, energy knowledge, energy behaviors, organizational identity, goal endorsement, and outcome expectancy. External factors include perceived social norms and perceived barriers or enablers in the organizational setting. It is important to measure these factors in the target population in order to design effective interventions and to establish a baseline against which the effectiveness of interventions can be evaluated.

In order to identify studies to inform this research, searches were conducted using EBSCOHost, Google Scholar, Science Direct and Wiley Online Library for the following search terms: energy conservation, energy conservation behaviors, energy conservation in the workplace, energy literacy, environmental attitudes, human resources development and sustainability, motivating energy conservation behaviors, self-efficacy and energy conservation, social norms and energy conservation, pro-environmental behavior, theory of planned behavior and sustainable behavior, theory of planned behavior and pro-environmental behavior.

Human Resources Development and Sustainability

"The many small actions and decisions that all members of an organization make in their everyday work can accumulate to large improvements in the environmental impacts of the organization" (Perron, Cote, & Duffy, 2006, p. 553). This is especially true when the focus is achieving energy efficiency and GHG reduction goals. Studies have shown that two-thirds of computers in 11 office buildings in a California city were left on at the end of the work day (Webber, 2006), and 56 percent of the energy used in South African businesses was consumed at night when workers were presumably not present (Masoso & Grobler, 2010). Perron et al. (2006) suggest that in order for organizations to become more sustainable, they must adopt an "environmental culture where the entire organization must reorient its attitudes and behaviours to be committed to achieving new goals" (p. 552). Stern (2011) noted that the routine behavior of building occupants impacts energy consumption and GHG emissions, and that the behavioral sciences can be instrumental in changing employee behavior. Jackson (2005) asserted that "behavior change is fast becoming the Holy Grail of sustainable development" (p. xi). The question is how to change the behavior of hundreds or even thousands of employees?

The HRD department plays a vital role in efforts to change employee behavior as it is the only department with staff who are professionally trained to change attitudes and behaviors that promote a culture of sustainability within an organization (Liebowitz,2010).The human resource function within an organization can be instrumental in creating a culture of sustainability (Wirtenberg, at al., 2007). Daily and Huang (2001) included management support, training, employee empowerment, teamwork, and rewards as human resources factors that may be leveraged to support organizational sustainability goals and initiatives. Management commitment, employee empowerment, rewards, and feedback have been identified as key elements in encouraging pro-environmental behavior in employees (Govindarajulu & Daily, 2004). Ramus and Steger (2000) concluded that values, norms, attitudes and behaviors that promote environmental stewardship must be supported by management. In addition, it is essential to communicate organizational goals with respect to environmental performance

(Ramus & Steger, 2000). Setting challenging yet feasible goals enhances employee performance (Latham & Locke, 2007).

Liebowitz (2010) observed that "more and more people are passionate about environmental stewardship, and appreciate the opportunity to obtain training in this area" (p. 54). HRD staff can provide training in "eco-friendly" topics such as recycling, green building materials, energy conservation and water reduction. As organizations set sustainability goals, HRD can provide training to support employees across the organization in acquiring the skills and knowledge required to meet those goals. Successful implementation of environmental initiatives requires employee training (Govindarajulu & Daily, 2004) which can range from environmental management workshops to company-wide awareness raising initiatives (Perron et al., 2006). Without sufficient training, employees may be unable or unwilling to support the organization's environmental initiatives (Govindarajulu & Daily, 2004). Education and training are also essential to fostering a sustainable culture by raising employee awareness of the need for environmental programs, increasing employee adaptability, and instilling a proactive attitude (Govindarajulu & Daily, 2004.) Training should be provided to employees through the organization in order to enhance their ability to abide by sustainability policies (Govindarajulu & Daily, 2004).

Given the relatively untapped potential to reduce costs and GHG emissions through energy conservation, employers may find it beneficial to implement programs designed to encourage energy conservation behaviors. Silberman (1990) suggested that program developers should address cognitive, affective and behavioral components. Steg and Vlek (2009) noted that a variety of strategies can be used to change behavior including information strategies that raise awareness of environmental issues and pro-environmental behaviors and structural strategies that reduce barriers to pro-environmental behaviors. Steg and Vlek (2009) listed information and education, prompting, modelling, behavioral commitments, feedback and rewards as some of the strategies that can be used to influence pro-environmental behavior. In the quest for reducing carbon emissions and costs associated with energy use, the question becomes how to change employees' energy behaviors, and the Human Resources Department is the unit with the expertise to help employees gain the knowledge, attitudes and skills necessary to achieve organizational energy goals.

Energy Conservation Interventions in the Workplace

Many researchers have acknowledged that there are few studies of energy conservation in organizations in the literature (Carrico & Reimer, 2011; Lutzenhiser, 1993; Murtagh et al., 2013; Scherbaum et al., 2008; Stern, 2011). While there are few studies published in the literature about energy conservation in office settings, it is instructive to review the existing studies for insights into what is being done and the degree to which it is effective. The following studies demonstrate that efforts to change energy-related behaviors can be effective.

Scherbaum et al. (2008) suggest that behavioral change among employees has been overlooked in organizations, resulting in missed opportunities to reduce energy use and GHG emissions. Sierro et al. (1996) demonstrated the use of comparative feedback and energy savings goals to change energy behavior and successfully reduce energy consumption in an organization. Most office buildings include offices and shared spaces such as break rooms, conference rooms and restrooms. Sussman & Gifford (2012) demonstrated the use of behavioral prompts to influence building occupants to turn-off lights in unoccupied restrooms in university office and classroom buildings. Murtagh et al. (2013) demonstrated significant reductions in energy consumption by providing individual energy feedback to office occupants. Individual attitude toward reducing energy use was the only individual factor significantly correlated to actual energy savings (Murtagh et al., 2013). Staats, Van Leeuwen and Wit (2000) used an informational intervention to change building occupant behavior with regard to radiator use and thermostat settings that resulted in a six percent reduction in gas consumption over two years. In another study, peer education and energy feedback were used to achieve four percent and seven percent reduction respectively in energy consumption in university office buildings (Carrico & Reimer, 2011). Matthies, Kastner, Klesse and Wagner (2011) studied the effectiveness of energy behavior interventions based on psychological theory in a German university.

In addition to the studies listed above, Lo et al. (2011) conducted a qualitative study within four organizations selected on the basis of the organizational focus – a non-governmental organization or NGO, a university, and two commercial companies. Interviews conducted with managers and general employees in the four organizations regarding energy conservation opportunities revealed several salient factors including energy conservation awareness, energy attitudes, self-efficacy, social norms, habitual energy behaviors, and perceived barriers that affected behavioral control. Overall, the employees underestimated their impact on total energy consumption in their organization. The authors offered four conclusions regarding possible solutions: 1) connect energy conservation interventions to work quality and efficiency; 2) offer skills-training in energy conserving work routines, changing work procedures and norms; 3) provide feedback to increase employee awareness of their behavior and its consequences; and 4) initiate interventions to change social norms (Lo et al., 2011).

Determinants of Pro-Environmental Behavior in the Workplace

Jackson (2005) argued that “making sense of behavior inevitably requires a multi-dimensional view which incorporates both internal and external elements” (p. 113). The determinants of pro-environmental behavior in the workplace can be separated into two categories: 1) determinants internal to the individual including psychological determinants such as issue awareness, attitudes, personal norms, self-efficacy, and existing behaviors, and 2) determinants external to the individual such as organizational goals with respect to the environment and the extent to which employees endorse or value those goals, the extent to which employees believe that they can influence the achievement of organizational goals, the presence of social norms with respect to pro-environmental behaviors, and perceived organizational factors such as policies, procedures and structural factors that either promote or inhibit pro-environmental behavior.

This study will examine the internal factors related to pro-environmental behaviors that are present among faculty and staff at a mid-western University. In addition, the study will examine faculty and staff endorsement of the university's energy conservation goals and perceptions of their ability to impact the outcomes of those goals. The theoretical frameworks that will be used include the Theory of Planned Behavior (Ajzen & Fishbein, 1980) and Expectancy Theory (Vroom, 1995).

Internal Determinants of Pro-environmental Behavior

Pro-environmental behaviors include a wide range of behaviors such as recycling, using alternative transportation, and purchasing "green" products. Energy conservation behaviors may be considered pro-environmental behaviors because they are associated with a reduction in GHG emissions, the chief contributor to global warming. In 1987, Hines, Hungerford and Tomera conducted a meta-analysis of 128 pro-environmental behavior studies and identified several determinants of pro-environmental behavior including knowledge of issues, knowledge of action strategies, environmental attitudes, locus of control, verbal commitment and individual sense of responsibility (as cited in Kollmuss & Agyeman, 2012). Hines and colleagues found the following mean correlations between four psychosocial variables and pro-environmental behavior: pro-environmental attitudes, r=.38 (9 studies); locus of control/self-efficacy, r=.37 (15 studies); felt moral obligation to behave in a pro-environmental way, r=.33 (6 studies); and behavioral intention, r=.49 (6 studies) (as cited in Bamberg & Moser, 2007).

Twenty years later, Bamberg & Moser (2007) conducted a meta-analysis of 46 research studies involving 57 samples in order to test a theoretical model integrating various psycho-social determinants of pro-environmental behavior in order to better understand the interplay between knowledge, attitudes, behavior constraints, social norms, behavioral intentions, and behavior. They found eight factors that influence pro-environmental behaviors: awareness of the problem or issue, attribution of responsibility, social norms, feelings of guilt, perceived behavioral control, pro-environmental attitude, personal moral norm, and behavioral intention. The goal of their study was to test an integrated model of the determinants of pro-environmental behavior, bringing together the Theory of Planned Behavior and Schwartz's Norm Activation Model. They found that the integrated model had greater explanatory power. In the combined model, moral norm became the third predictor of behavioral intentions instead of social norms.

Their results mirrored Hines, Hungerford and Tomera (1987). Using 17 studies, they found a correlation of r = .42 between attitude and pro-environmental behavior (Hines et al. found a correlation of .38 using 9 studies). Bamberg and Moser (2007) found a mean correlation of r = .30 between PBC and pro-environmental behavior in 18 studies (compared to r = .37 between locus of control and pro-environmental behavior in Hines et al.). The mean correlation between moral norm and pro-environmental behavior was measured at r = .39 using 11 studies (compared to r = .33 for moral obligation in Hines et al.). Finally, for behavioral intention and pro-environmental behavior, Bamberg and Moser (2007) found a mean correlation of $r = .52$ based on 15 studies (compared to $r = .49$ in Hines et al.).

Bamberg and Moser's (2007) meta-analysis confirmed that behavioral intention explains 27% of the variance in pro-environmental behavior. Together, perceived behavioral control, attitude and moral norm explained 52% of the variance in the behavioral intention construct, the most immediate predictor of behavior. Four factors explained 58% of the variance in moral norm: problem awareness, internal attribution, feelings of guilt, and social norms (Bamberg & Moser, 2007). In addition, they found that social norm is directly associated with PBC and attitude.

Bamberg and Moser's (2007) findings confirm three primary influences on behavioral intentions as outlined in Ajzen's Theory of Planned Behavior. First, attitude does not directly determine behavior but only affects behavior indirectly via behavioral intentions. Second, that situational constraints are important as individuals take into account their perceived behavioral control in addition to their attitude with regard to a particular behavior. Finally, social norms also impact pro-environmental behavior indirectly through behavioral intentions.

Bamberg and Moser (2007) stress the primary role that issue awareness and knowledge play. They note that "in the field of pro-environmental behavior, the awareness of and knowledge about environmental problems are probably important cognitive pre-conditions for the development of moral norms" (p. 15).

> "Our results underline the role of awareness of and knowledge about environmental problems as a second important indirect determinant of pro-environmental behavior. Awareness/Knowledge is not only associated with the internal attribution of responsibility, social norms and feelings of guilt, but also directly influences the degree

> of PBC over as well as the attitude toward choosing a pro-environmental behavior" (p. 22).

In short, awareness/knowledge plays an important role as an indirect determinant of pro-environmental behavior. Awareness/knowledge impacts attribution of responsibility, social norms, guilty, attitude and directly influences PBC. They point out, however, that knowledge is a necessary, but not sufficient, pre-condition for the development of pro-environmental norms and attitudes (Bamberg & Moser, 2007).

Based on the meta-analysis by Bamberg and Moser (2007) this study proposes to collect the following data related to internal determinants of pro-environmental behavior: Issue awareness/knowledge, environmental attitude, attitude toward energy conservation, and existing energy conservation behaviors.

Issue awareness. Knowing that an environmental problem exists and knowing what to do about it are important pre-conditions for pro-environmental behavior. Bamberg& Moser (2007) found that knowledge is a necessary but not sufficient precondition for developing pro-environmental moral norms and attitude. Data will be collected to assess faculty and staff awareness of climate change and energy use as a chief cause of climate change.

Attitudes. Attitudes are defined as an enduring positive or negative feeling about a person, issue or object (Kollmuss & Agyeman, 2012). Attitudes can directly influence pro-environmental behavior, although the impact may be small (Kollmuss & Agyeman, 2012). Ajzen and Fishbein (1980) pointed out that the correlation between attitude and behavior is weak when they are measured at different levels of specificity. According to Ajzen's Theory of Planned Behavior (TPB), attitudes shape behavioral intentions which are the most immediate determinant of behavior. Ajzen and Fishbein (1980) found that attitudes do not determine behavior directly, but indirectly by shaping behavioral intentions. They found that the specificity with which attitudes and behaviors are measured is important. When attitudes are measured broadly (do you care about the environment?) and behaviors are measured narrowly (do you recycle?), the correlation between attitude and behavior is weak. Instead, the researcher must measure the attitude toward specific behaviors. For this reason, attitude will be measured at two levels in this study. Environmental attitude will be measured using a short 10-item version of the New Ecological Paradigm instrument (Dunlap, VanLiere, Mertig & Jones 2000), and energy attitudes in particular will be measured using a scale adapted from DeWaters and Powers (2011).

Energy behavior. Staats (2003) noted that “there is much truth in the statement that the best predictor of future behavior is past behavior” (p. 196) and that this statement can be applied to pro-environmental behavior. Data will be collected on the extent to which current employees engage in energy conservation behaviors using an instrument adapted from Carrico and Reimer (2011). The behaviors include turning off lights, powering down computers, and turning off or unplugging other office equipment when not in use. This data will also be examined relative to other variables such as the extent to which employees perceive that their behaviors influence university energy consumption (Outcome Expectancy) and their perceived behavioral control (PBC) with regard to energy choices in the workplace.

External Determinants of Pro-environmental Behavior

Guagnano, Stern & Dietz (1995) found that the incidence of pro-environmental behavior is a function of the interaction between internal and external factors. Clark, Kotchen and Moore (2003) stated that “Guagnano, Stern & Dietz’s model suggests that attitudinal factors and external conditions act jointly to influence behavior. Specifically, external conditions affect the strength of attitude-behavior relationships” (p. 239). Guagnano et al. (1995) found that strong, positive external conditions increase the likelihood that an attitude will result in a particular pro-environmental behavior. The converse is also true: a strong, negative external condition decreases the influence of attitudes on pro-environmental behaviors (Guagnano et al., 1995). Guagnano et al. argue that a "broader, context-sensitive theory is necessary because both external conditions and psychological interventions are sometimes used to change real behavior" (p. 715).

One such organizational factor is the establishment of an organizational goal such as achieving climate neutrality or the publication of an organizational climate action plan which make up a part of the overall organizational context (Lo et al., 2011; Ramus & Steger, 2000). It is important to understand the extent to which employees value the goal of climate neutrality and the degree to which they perceive that their actions can impact a reduction in energy consumption. Two theoretical frameworks that address external factors that are relevant to energy conservation in the workplace are Expectancy Theory, which posits a relationship between the degree to which employees value a goal and their perception of their ability to influence the outcome as predictors of actual effort, and the Theory of Planned Behavior, in particular the construct of Perceived Behavioral Control.

Perceived Behavioral Control. Kaiser, Wolfing, and Fuhrer (1999) suggested that Ajzen's (1980) Theory of Planned Behavior is particularly useful in predicting pro-environmental behavior because it measures contextual constraints on behavior that are beyond the individual's control. Ajzen (1980) posits that behavior is moderated by perceived behavioral control or the perception that one has the ability to perform the behavior. The theory recognizes that "contextual factors may facilitate or constrain" pro-environmental behavior (Steg & Vlek, 2009). Ajzen and Madden (1986) determined that when perceived behavioral control is low, the relationship between behavioral intention and behavior is weak. Conversely, when perceived behavioral control is strong, the intention-behavior relationship is strengthened. Heath and Gifford (2002) confirmed the interaction of perceived behavioral control and behavioral intention in a study of the use of public transportation among college students. Intention to use public transportation and perceived behavioral control accounted for 65.8% of the variance in bus-riding behavior among the students (Heath & Gifford, 2002).

Perceived behavioral control has also been demonstrated to mediate the attitude-behavior relationship. One may have knowledge of the need to recycle and a positive attitude toward recycling, but if there are no recycling receptacles available, perceived behavioral control may be low, resulting in a lack of actual recycling behavior. Schultz and Oskamp (1996) found that perceived behavioral control (effort required to recycle) mediated the attitude-behavior relationship: environmental concern was significantly related to recycling behavior in a context that required a high degree of effort. When barriers were removed and recycling behaviors were easier to perform, participants with low or moderate environmental concern engaged in recycling (Schulz & Oskamp, 1996).

Similar dynamics may also affect energy conservation behaviors in the workplace. Making it easier for employees to perform energy conservation behaviors may strengthen the intention-behavior relationship and reduce the impact of the attitude-behavior relationship on actual behaviors.

Goal Value & Outcome Expectancy. Expectancy theory (Vroom, 1995) addresses individual motivation to exert effort to achieve a goal or outcome and that individuals will engage in activities that they believe they can perform and which will produce a desired or valued outcome. In the context of climate action planning and energy conservation, the extent to which employees value energy conservation would align with the goal value aspect of the theory. The extent to which employees feel that their efforts can influence the outcome aligns with the outcome expectancy aspect of the theory. When employees value the goal and feel that their efforts will influence the outcome, they will be motivated to perform the tasks required according to expectancy theory (Vroom, 1995). Measuring the extent to which University employees value the University's conservation goals as well as the extent to which they feel that their efforts will influence the outcomes is important in terms of developing future energy conservation interventions. These two measures can identify possible points of intervention, whether to strengthen goal value or to enhance outcome expectancy.

Chapter Three

METHODOLOGY

This chapter discusses the methods and procedures used in this study. It describes the target population and site, the selection of instrument items used in the study, the data collection procedures and the statistical analyses of the data. This study is being undertaken as part of the planning process for initiating one or more behavioral interventions aimed at reducing energy consumption and GHG emissions in support of the climate neutrality goals of a Midwestern University. It is important to better understand the target population and the presence (or absence) of key factors that could influence the selection of interventions and the overall success of the program. For the purposes of this study, data will be collected on internal and external factors related to energy conservation behavior in office settings.

Research Design

This study is a descriptive research study whose purpose is "to describe systematically the facts and characteristics of a given population of interest, factually and accurately" (Isaac & Michael, 1995, p. 50). The survey research method was used to gather information about faculty and staff at a 4-year public institution in the Midwest to assess energy knowledge, behaviors, and attitudes as well as employees' perceptions of the University's energy conservation goals and the employees' ability to impact energy conservation on campus. This study uses quantitative methods and descriptive statistics to calculate frequencies, means and standard deviations for the study variables. Statistical tests are used to determine whether significant differences exist based on role (faculty/staff). The relationship between determinants of pro-environmental behavior and energy conservation behaviors among employees is examined using correlation techniques. These analyses may be used to inform the selection of behavioral interventions to promote energy conservation among faculty and staff. The variables included in the study are energy issue awareness, environmental attitude, energy conservation attitude, goal endorsement, outcome expectancy, perceived behavioral control, energy behavior and conservation motivation. Additional variables include demographic variables such as age, sex, role, education, college and number of years employed at the University.

Description of Target Population and Institutional Site

This Midwestern University became the 80th signatory to the ACUPCC in 2007, pledging to achieve carbon neutrality by 2040. The University enrolls 27,000 students and employs over 4,000 faculty and staff. The campus is comprised of more than 87 buildings with a total of 5.2 million heated and cooled square feet of educational, housing, athletics, and auxiliary space. The target population for this study are the 4,000-plus faculty and staff employed by this Midwestern University.

Sampling Technique

A sample size greater than 353 is needed in order to achieve 95 percent confidence that the sample is representative of the population of 4300 University employees (Isaac & Michael, 1995). The survey will be emailed to all faculty and staff members listed in the University's Global Contact list in Microsoft Outlook. The survey instrument will be administered electronically using Qualtrics software over a six week period to collect a minimum of 353 completed surveys. If the desired number is not achieved, a follow-up notification will be sent to potential participants.

In order to further investigate the representativeness of the sample as a basis for making valid inferences, the characteristics of the sample population will be compared to known characteristics of the population as a whole (Ferguson & Takane, 1989). If the sample shows no bias on known characteristics such as gender and role, it may be regarded as representative of the population (Ferguson & Takane, 1989).

Instrument

The instrument was developed after a review of the literature revealed several studies that contained instruments that covered different aspects of the current study. The instrument includes demographic variables as well as measures for energy issue awareness, environmental attitude, energy conservation attitude, energy behaviors, goal value, outcome expectancy, and perceived behavioral control (see instrument in Appendix A).

Awareness of climate and energy issues. Knowledge about an issue influences behavior relative to the issue (Bamberg & Moser, 2007; Lutzenhiser, 1993). It is unknown whether faculty and staff are aware of the University's goal to reduce its GHG emissions through energy efficiency and energy conservation. The level of awareness of energy and climate issues among faculty and staff is also unknown. The instrument includes ten questions designed to assess the level of energy issue awareness among faculty and staff. The first item asks respondents if they have read the University's energy conservation goals and if so, by what media the goals were transmitted. The remainder of the items were adapted from a survey instrument used by Clark et al. (2003) to assess motivations among participants in a green energy program reflecting awareness of environmental, health, and global warming benefits of energy choices. In this study, the adapted items were used to assess employee awareness of issues related to energy use and their motivation for conserving energy.

Environmental attitude. Pro-environmental attitudes are correlated with pro-environmental behaviors to some extent (Bamberg & Moser, 2007). For the purposes of this study, environmental attitude will be measured by the New Ecological Paradigm (NEP) (Dunlap et al., 2000) instrument. The NEP consists of 15 items measuring five facets of environmental concern. The internal reliability of the NEP has been well documented and established with Cronbach's alpha of 0.83 (Dunlap et al., 2000). Predictive validity has been established by correlating NEP scores with pro-environmental behaviors (.31), perceived seriousness of world ecological problems (.61), support or pro-environmental policies (.57) and perceived seriousness of state and community air and water pollution (.45) (Dunlap et al., 2000). Clark, Kotchen and Moore (2003) modified the NEP to use 10 items instead of 15 to assess participation in a green energy program. The 10-item version of the NEP had a Cronbach's alpa of 0.80 indicating a high degree of internal consistency reliability. For the purposes of this study, the short version of the NEP as adapted by Clark et al. (2003) will be used.

Energy conservation attitude. Attitudes have been demonstrated to be determinants of pro-environmental behaviors (Bamberg & Moser, 2007). Ajzen and Fishbein (1980) pointed out that in order to find a high correlation between attitude and behavior it is necessary to measure the attitude toward the particular behavior. Energy attitude will be measured using four items from a 10-item subscale developed by DeWaters and Powers (2008). The internal consistency reliability of the 10-item affective subscale is 0.83 as measured by Cronbach's alpha (DeWaters & Powers, 2011). The four items were selected based on their relevance to work-place settings. Participants will be asked to report the extent to which they agree or disagree with each statement.

Energy Conservation Goal Endorsement. Three items will be used to measure the extent to which participants endorse the University's goal to conserve energy. The items were borrowed from Carrico and Reimer (2011). The items refer to personal energy use as well as items that refer to the whole campus. Cronbach's alpha for the three-item scale was 0.80.

Outcome expectancy. Outcome expectancy refers to the belief that one's behavior will lead to a particular outcome (Vroom, 1995). For the purposes of this study, outcome expectancy refers to the individual's perception that employee actions to conserve energy will contribute to a decrease in the University's overall energy consumption. These items were adapted from Carrico and Reimer (2011). Carrico and Reimer adapted the items from Steg, Dreijerink, and Abrahamse (2005). Steg et al. (2005) measured the internal consistency of the items to be alpha = 0.80.

Perceived Behavioral Control. The extent to which individuals perceive that they have behavioral control mediates the relationship between behavioral intentions and behaviors (Ajzen & Madden, 1986). When perceived behavioral control is strong, there is a high degree of correlation between behavioral intentions and behaviors (Ajzen & Madden, 1986; Heath & Gifford, 2002). Conversely, when perceived behavioral control is weak, there is a weak correlation between behavioral intention and actual behaviors (Ajzen & Madden, 1986; Heath & Gifford, 2002). The sixth scale, Perceived Behavioral Control was constructed of three items that included both self-efficacy and controllability (Ajzen, 2002). The first item, "It would be easy for me to reduce the amount of energy I use at work" was adapted from Heath and Gifford, (2002). The second item, "I feel that I have control over the amount of energy I use at work" was adapted from Ajzen (2002). The third item, "I would do more to save energy if I knew how," was borrowed from Dewaters and Powers (2008), Reliability for this scale was not available from previously published studies.

Four addition items will be used to explore conditions on the campus of the Midwestern University as a result of the University's energy efficiency efforts such as the installation of occupancy sensors and thermostats with limited temperature control range in offices and classrooms and how these structural interventions are perceived by employees relative to their control of energy consumption.

Energy behavior. Before implementing initiatives encouraging energy conservation, it is important to assess the current frequency with which employees engage in these behaviors. To measure energy conservation behaviors, participants will be asked to report on behaviors related to lighting, computer use, and the use of other office equipment and plug loads. These ten items (See Appendix B) were borrowed from Carrico and Reimer (2011).

Demographic Variables

In addition to data on internal and external variables related to pro-environmental behavior, this study will collect data for seven demographic variables: age, gender, education, number of years employed at the university, role (faculty or staff), ethnicity, and college or administrative unit where the employee is located within the University. Age is slightly (-.11) correlated with NEP with younger adults being more pro-environmental than older adults (Dunlap et al., 2000). Gender appears to play a role in pro-environmental attitudes and behavior. Zelezny, Chua & Aldrich (2000) found that women report higher levels of environmental concern and greater participation in pro-environmental behaviors, though the effect of gender on NEP was small. Education is also slightly correlated (.10) with NEP where more education is associated with higher NEP scores (Dunlap et al., 2000). The number of years that an individual has been employed at the Midwestern University will be collected as a factor that may be correlated with endorsement of the University's energy conservation goals. Data will also be collected on role (faculty or staff). The demographic data for the sample will be compared to the known demographic data for University employees to determine if the sample is representative of the population (Ferguson & Takane, 1989). This data can also be analyzed to examine differences between faculty and staff that may be useful to develop targeted intervention strategies.

Validity and Reliability of Instrument

The survey instrument included items to measure three internal determinants of pro-environmental behavior (Energy Issue Awareness, Environmental Attitude, and Energy Conservation Attitude) and three external determinants of pro-environmental behavior (Perceived Behavioral Control, Goal Endorsement, and Outcome Expectancy). The instrument was comprised of five scales that have been demonstrated to be valid and reliable in previous studies. These included scales for issue awareness (Clark et al. 2003), environmental attitude (Dunlap et al., 2000; Clark et al., 2003), energy conservation attitude (DeWaters & Powers, 2008), goal endorsement (Carrico & Reimer, 2011), and outcome expectancy (Steg et al., 2005). The sixth scale, Perceived Behavioral Control was constructed of three items that included both self-efficacy and controllability (Ajzen, 2002). Reliability for this scale was not available from previously published studies. In addition to the measured variables, the instrument included a series of questions about daily energy choices and behaviors, as well as motivations to save energy at work and demographic variables. The six sub-scales and the demographic variables served as independent variables.

The instrument was assessed for content validity by experts in the field including board members of an energy-focused trade association, LEED (Leadership in Energy and Environmental Design) certified professionals, as well as University energy experts. The expert panel provided content validity for the survey instrument measured by agreeing that the items measured the content the instrument intended to measure.

A pilot test of the instrument was conducted to establish content validity, readability, and reliability. The instrument was distributed to 40 individuals between March 31, 2014 and April 15, 2014. Twenty-five pilot surveys were returned. The pilot participants provided valuable feedback regarding response choices by noting that in some cases there is no thermostat in a work space or that some individuals choose to work by natural daylight and therefore report never turning off lights when leaving their work space. The final version of the instrument was modified to include additional response choices for energy behaviors to gain a more accurate reporting of behaviors that impact the university's energy use.

In addition to suggestions regarding response choices, one participant in the pilot study pointed out that some employees do not come to campus five days a week. Some faculty and staff are only on campus two to three days a week. The result is that an individual who reports turning off office lights or adjusting a thermostat two days out of two is performing the desired pro-environmental behavior at the same consistency (100%) as the individual who comes to campus five days per week and reports turning off lights five days out of five (100%). In order to measure specific energy conservation behaviors with greater precision, participants were asked "How many days in a typical work week are you in your office or work space." (See appendix B for the final version of the instrument.)

Reliability of the six sub-scales used in the survey was measured using Cronbach's alpha. Four scales demonstrated good internal consistency in the pilot phase of the study: Energy Issue Awareness (0.86), Environmental Attitude (NEP) (0.91), Outcome Expectancy (0.87), and Energy Conservation Attitude (0.81). An acceptable level for internal consistency was achieved for Endorse Goal (0.68).

Perceived Behavioral Control using all three items demonstrated poor internal consistency with Cronbach's alpha of 0.41. When the item "I would do more to save energy if I knew how" was excluded from the analysis, Cronbach's alpha was calculated at .63. Because only two items were used, reliability was re-assessed using correlation. The two items were positively correlated with Pearson's $r(25) = .46$, $p < .05$. The two items include self-efficacy (It would be easy for me to reduce the amount of energy I use at work) and control (I feel that I have control over the amount of energy I use at work.) The two-item version of Perceived Behavioral Control will be used for analysis and reporting in this study.

Data Analysis

The data will be analyzed using SPSS. The demographic characteristics of the sample will be calculated and compared to known demographic characteristics of the population to determine the extent to with the sample is representative of the population. Sample means will be calculated and reported for Pro-Environmental Attitude (NEP), Energy Attitude, Energy Issue Awareness, Goal Value, Outcome Expectancy, and Perceived Behavioral Control. This analysis may indicate the extent to which awareness training or other types of interventions may be indicated to increase issue awareness, energy attitudes, the endorsement of energy conservation goals, outcome expectancy, and perceived behavioral control. This analysis may also be used to establish a baseline against which the effectiveness of future interventions may be measured.

In order to examine potential differences among faculty and staff, the data for environmental attitude, energy attitude, energy issue awareness, goal value, outcome expectancy and perceived behavioral control will be analyzed to determine if there are significant differences based on the independent variable of role. These analyses may reveal differences that call for the use of different interventions for faculty and staff.

Frequency distributions will be calculated for energy behaviors for the sample as a whole in order to determine the extent to which energy conservation behaviors are currently being practiced. In order to understand the relationship between energy conservation behaviors and other characteristics, correlation coefficients will be calculated between energy conservation behavior and environmental attitude, energy attitude, energy issue awareness, and perceived behavioral control. Table 1 summarizes the study research questions, theoretical constructs and related items on the instrument.

Table 1

Research Questions, Theoretical Constructs and Instrument Items

Research Question	**Theoretical Construct**	**Variables**	**Survey Items**
1. What is the level of awareness of the University's energy conservation goals and awareness of issues related to energy consumption?	Issue Awareness	1. Have employees read the University's energy goals? 2. What is the level of awareness of energy use and climate change? 3. What is the level of awareness of health and environmental impacts of energy use?	1-10
2. What is the attitude of employees toward the environment and toward energy conservation?	Energy Attitude	1. To what extent do employees hold pro-environmental attitudes as measured by the New Ecological Paradigm (NEP)?	11-20
		2. To what extent do employees have positive attitude toward energy conservation?	21-24
	Energy Conservation Attitude		
3. What is the level of endorsement of the University's energy goals and the degree to which employees feel that they can influence those goals?	Endorse Goal	1. To what extent do faculty and staff endorse the University's energy conservation goals?	25-27
	Outcome Expectancy	2. To what extent do faculty and staff believe that their actions impact the university energy conservation goals?	28-31
4. To what extent do University employees perceive that they have behavioral control over their energy use at work?	Perceived Behavioral Control	1. Perceptions of how easy/difficult it is to save energy at work. 2. Perceptions of the degree of control employees have over energy use. 3. Perceptions of the impact of energy efficiency retrofits on behavioral control.	32-35
5. To what extent do University employees engage in energy conservation behaviors at work and what is the relationship between energy attitudes, issue awareness, and other variables on energy behavior?	Energy Behavior	1. What is the frequency of energy conservation behaviors among faculty and staff? 2. What is the relationship between energy attitude and energy behavior? 3. What is the relationship between issue awareness, goal endorsement and other variables with energy behavior?	39-50
	Motivation		51-52
	Demographic Variables	Role, Sex, Age, Education, Ethnicity, Length of Employment	53-60

Chapter Four

FINDINGS

Sample Size, Demographics and Response Rate

The survey was distributed via email to 4,300 faculty and staff members listed in the University's Global Contact list from mid-April to mid-May 2014. Informed consent was implied and obtained by the completion of the questionnaire. Responses were recorded anonymously, and the information collected will be kept confidential to the extent allowed by law and by University policy.

Survey responses were received from 677 employees for a response rate of 15.7%. Once the 677 responses were collected, they were examined for complete and sufficient data. Responses with missing data where a section of the survey was not answered or an item on the survey was not completed were not included in the statistical analyses. Of those who started the survey, 544 completed the instrument for a response rate of 12.7% for completed surveys. Based on a population size of 4,300, a sample of 353 completed surveys is needed for a 5% margin of error and a 95% confidence interval (Isaac & Michael, 1995). The sample size of 544 exceeds the required sample size of 353 by 191 and is thus deemed sufficient for statistical analysis and accuracy. With a sample size of 544, the confidence level is 95% that the sample statistics fall within + or – 5% of the population statistic for the target population. Because the sample was of sufficient size by mid-May, no follow-up emails were sent. Data was analyzed using SPSS.

As shown in Table 2, the majority of the respondents (n=342, 62%) were female. The survey respondents were highly educated with 61% holding a master's degree or higher. The majority of the respondents (74%) have been employed at the university for four or more years, with 41% working 11 or more years for the institution. The majority of the respondents (68%) were staff, 29% were faculty, and 2% were graduate students or other. Respondents were predominantly Caucasian (88%), followed by Asian or Pacific Islander (3%), African American (2%), and Hispanic or Latino (1%).

Table 2

Demographic Characteristics of Study Sample.

Item	No.	%	Item	No.	%
Role			**Sex**		
Faculty	158	29	Male	206	38
Staff	376	68	Female	342	62
Grad Student/Other	15	2			
Age			**Tenure at U of A**		
18-29	48	9	0-3 years	141	26
30-39	130	24	4-10 years	182	33
40-49	108	20	11-19 years	107	19
50-59	162	29	20+ years	119	22
60+	103	19			
Ethnicity			**Education Level**		
Hispanic/Latino	6	1	High School Diploma	36	7
Black/African American	10	2	Associate Degree	40	7
Native American	3	1	Bachelor's Degree	134	24
Asian/Pacific Islander	14	3	Master's Degree	172	31
White	477	88	Doctoral Degree	167	30
Other	4	1			
Prefer not to disclose	30	6			

The target population of university employees is comprised of 71% staff and 29% faculty. In the sample, 68% were staff, 29% were faculty, and 2% were graduate students or other. Additionally, it is known that the target population is 52% male and 48% female, while the sample respondents were 38% male and 62% female, suggesting that women may be overrepresented in the sample. Finally, it is known that the target population is 89% Caucasian, 5% African American and 4% Asian or Pacific Islander. The sample population is 88% Caucasian, 2% African American, and 3% Asian, with 6% who preferred not to disclose their ethnicity. Table 3 summarizes the comparison of the study sample with the target population.

Table 3

Comparison of Sample to Target Population of University Employees by Sex, Role, Ethnicity.

	Sex		Role		Race/Ethnicity				
	M	F	Faculty	Staff	Caucasian	African-American	Asian	Hispanic/Latino	Not Disclosed
Sample	.38	.62	.29	.68	.88	.02	.03	.01	.06
Population	.48	.52	.29	.71	.89	.05	.04	.03	

In order to confirm reliability of the scales used to measure the variables, the reliability coefficients were re-calculated using the data collected from study participants. Reliability coefficients calculated from pilot data and actual study data are presented in Table 4. The two-item scale for Perceived Behavioral Control was assessed for internal consistency using correlation with Pearson's $r(568) = .48$, $p < .01$ for the study sample, $r(25) = .46$, $p < .05$ for the pilot group. The difference in the reliability scores of the variables between the pilot group and the study sample may be a function of the composition of the two groups with the pilot group comprised of individuals who work in energy related fields, while the study sample consists of employees whose work and expertise is not focused on energy on a daily basis.

Table 4

Cronbach's Alpha and Pearson's r for Measured Variables on Pilot and on Actual Data.*

Variable	Pilot	Actual
Energy Issue Awareness (EIA)	0.86	0.88
Environmental Attitude (NEP)	0.91	0.80
Energy Conservation Attitude (ECAtt4)	0.81	0.66
Endorse Goal (GOAL)	0.68	0.83
Outcome Expectancy (OutExp)	0.87	0.72
Perceived Behavioral Control (PBC)*	0.46**	0.48***

*Note: The * designates Pearson's r. ** p < .05. *** p < .01.*

Of the 677 participants who started the survey, 544 completed it for an 80% completion rate. Because this is a descriptive study, the researcher chose to use as much of the data as possible, by reporting results for variable means and frequency of behaviors for all study participants regardless of whether or not they competed the entire survey. This resulted in n's ranging from 560 to 630. When conducting parametric tests such as Spearman's Rho for correlation and Mann-Whitney U tests, the analysis was completed using only the responses that were complete. If a participant did not complete all of the items for a variable such as the NEP or PBC, that participant's response was excluded from the analysis. This resulted in n's ranging from 520 to 534. A summary of the reliability, means, and standard deviations for the independent variables is presented in Table 5.

Table 5

Measured Variable Statistics.

				Range					
Variable	n	Alpha	No. Items	Potential	Actual	M	Mode	SD	Skew
EIA	630	0.88	8	8-40	10-40	36.05	40	4.89	-1.55
NEP	586	0.80	10	10-50	17-50	37.46	39	6.73	-.39
ECAtt	593	0.66	4	4-20	10-20	18.55	20	1.97	-1.63
PBC	568	0.48*	2	2-10	2-10	6.34	8	1.93	-.22
GOAL	591	0.83	3	3-15	3-15	12.51	15	2.33	-.91
OutExp	584	0.72	4	4-20	4-20	15.29	16	3.03	-.76

*Note: The * designates Pearson's r.*

Research Question 1: What is the level of energy issue awareness among employees?

Participants were asked if they had ever read the University's energy conservation goals, to which 80% responded "no". When asked how the University's energy conservation goals were communicated, 66% responded that the goals were not communicated at all, while the remaining 34% indicated that the goals had been communicated in a variety of ways as shown in Table 6. Participants were able to select more than one method of communication.

Table 6

Communication Method Cited by Employees for University Energy Goals.

E-mail	Website	Social Media	Traveler	UA Newswire	Dept. Meeting	Staff Meeting	Campus Meeting
14%	12%	1%	2%	12%	5%	7%	2%

Energy Issue Awareness (EIA) was assessed using eight items measured on a five point Likert scale that included the impact of energy use on eco-system health, human health, global warming, energy security, and fiscal stewardship. Possible scores ranged from a low of 8 to a high of 40. The mean EIA score was 36.05 with a standard deviation of 4.89. The median score was 38 and the mode was 40, indicating that the distribution was negatively skewed. A Shapiro-Wilk test for normality confirmed that the data was not normally distributed, W = .801, p = .000.

Table 7

Energy Issue Awareness (EIA) Scores

EIA Score	Frequency	Percent
10	1	.2
13	1	.2
16	1	.2
20	3	.5
21	5	.8
22	3	.5
23	3	.5
24	8	1.3
25	2	.3
26	6	1.0
27	6	1.0
28	7	1.1
29	19	3.0
30	16	2.5
31	20	3.2
32	33	5.2
33	32	5.1
34	30	4.8
35	29	4.6
36	35	5.6
37	31	4.9
38	43	6.8
39	60	9.5
40	236	37.5
Total	630	100.0

The vast majority of employees (90%) strongly agreed or agreed somewhat that climate change is happening, 84% strongly agreed or agreed somewhat that energy use contributes to climate change, and 82% strongly agreed or agreed somewhat that the university should address climate change. Employees recognized the impact of energy use on ecosystems with 91%

strongly agreeing or agreeing somewhat that energy use contributes to air and water pollution that harm ecosystems. Employees were also aware of the impact of energy use on human health with 88% agreeing strongly or somewhat that energy use contributes to air and water pollution that harms human health. Employees recognized the adverse impacts of wasting energy with 80% strongly or somewhat agreeing that wasting energy contributes to the depletion of energy resources and reduces energy security. Ninety-five percent strongly agreed or agreed somewhat that wasting energy puts a burden on the University's financial resources. Employees did not view energy use as harmless with 91% strongly disagreeing or disagreeing somewhat with the statement that energy use is not a cause for concern. Responses are summarized in Table 8.

Table 8

Energy Issue Awareness Item Responses

	Percent						
	SA	AS	N	DS	SD	N	M
Climate change occurring	68.4	21.7	6.2	2.6	1.1	626	1.46
University should address climate change	53.4	28.3	12.1	4.0	2.2	629	1.73
Energy use causes climate change	58.9	25.0	10.7	4.0	1.4	627	1.64
Energy use harms eco-system health	64.4	26.2	7.2	1.9	0.3	627	1.48
Pollution from energy harms human health	63.2	25.2	8.6	2.5	0.5	628	1.52
Wasting energy depletes resources	76.3	19.6	3.0	1.1	0.0	629	1.29
Wasting energy wastes financial resources	73.9	21.0	4.1	0.8	0.2	628	1.32
Energy use is harmless	2.4	1.4	5.1	19.7	71.4	630	4.56

SA = Strongly agree, AS = Agree somewhat, N = Neither agree nor disagree, DS = Disagree Somewhat, SD = Strongly Disagree

Research Question 2: What is the attitude of faculty and staff toward the environment and toward energy conservation?

Participants demonstrated a positive environmental attitude as measured by the short version of the New Ecological Paradigm (NEP) scale. The 10-item scale was also measured on a five-point Likert scale yielding a range of possible scores from 10 to 50. The sample mean was 37.46 with a standard deviation of 6.732. The sample median was 38 and the sample mode was 39, indicating that the distribution was negatively skewed. A Shapiro-Wilk test confirmed that the NEP data for the sample was not normally distributed, W = .981, p = .000. The distribution of scores for Environmental Attitudes is shown in Table 9.

Table 9

Environmental Attitude (NEP) Score

NEP Score	Frequency	Percent	NEP Score	Frequency	Percent
17	1	.2	34	31	5.3
18	2	.3	35	26	4.4
19	3	.5	36	28	4.8
20	3	.5	37	33	5.6
21	2	.3	38	30	5.1
22	2	.3	39	37	6.3
23	6	1.0	40	32	5.5
24	3	.5	41	29	4.9
25	4	.7	42	27	4.6
26	9	1.5	43	27	4.6
27	7	1.2	44	26	4.4
28	14	2.4	45	23	3.9
29	11	1.9	46	26	4.4
30	20	3.4	47	18	3.1
31	30	5.1	48	13	2.2
32	22	3.8	49	10	1.7
33	24	4.1	50	7	1.2
			Total	586	100.0

The sample population also measured high on Energy Conservation Attitude (ECAtt). The 4-item ECAtt scale was measured on a 5-point Likert scale and had a possible range of 5 to 20 points. The mean ECAtt score for the sample was 18.55, standard deviation was 1.97. The median was 19 and the mode was 20, indicating that the distribution was negatively skewed. A Shapiro-Wilk test for normality confirmed that the distribution was not normal, W = .757, p = .000. The distribution of Energy Conservation Attitude scores is presented in Table 10.

Table 10

Energy Conservation Attitude (ECAtt) Score

ECAtt Score	Frequency	Percent
10	2	.3
11	3	.5
12	8	1.3
13	4	.7
14	10	1.7
15	20	3.4
16	50	8.4
17	39	6.6
18	75	12.6
19	96	16.2
20	286	48.2
Total	593	100.0

Research Question 3: To what extent do faculty and staff endorse the University's energy conservation goals and believe that their choices impact those goals?

Faculty and staff endorsement of the University's goal to reduce its energy use was measured using three items. The possible scores on the Endorse Goal (EndGoal) scale range from a low of 3 to a high of 15. The sample mean for EndGoal was 12.51 with a standard deviation of 2.332. The median score was 13 and the mode was 15, indicating that the distribution was negatively skewed. A Shapiro-Wilk test for normality confirmed that the distribution was not normal, W = .888, p = .000. The distribution of Endorse Goal scores is presented in Table 11.

Table 11

Endorse Goal (GOAL) Score

GOAL Score	Frequency	Percent
3	1	.2
4	1	.2
5	2	.3
6	2	.3
7	2	.3
8	21	3.6
9	34	5.8
10	61	10.3
11	54	9.1
12	102	17.3
13	70	11.8
14	64	10.8
15	176	29.8
Total	591	100.0

Outcome expectancy, or the extent to which faculty and staff believe that employee efforts to save energy can affect the outcome of the University's energy conservation efforts was measured using four items on a 5-point scale. Scores range from a low of 4 to a high of 20. The sample had a mean Outcome Expectancy score of 15.29 with a standard deviation of 3.03. The median and the mode were 16, indicating that the distribution was skewed in the negative direction. A Shapiro-Wilk test for normality confirmed that the distribution for Outcome Expectancy was not normal, W = .952, *p* = .000. The distribution of Outcome Expectancy scores is presented in Table 12.

Table 12

Outcome Expectancy Score

Expectancy Score	Frequency	Percent
4	3	.5
7	3	.5
8	7	1.2
9	7	1.2
10	15	2.6
11	26	4.5
12	46	7.9
13	35	6.0
14	58	9.9
15	71	12.2
16	114	19.5
17	65	11.1
18	43	7.4
19	43	7.4
20	47	8.0
Total	584	100.0

Research Question 4: To what extent do faculty and staff believe they control their energy use at work?

Perceived behavioral control measures the extent to which faculty and staff believe that they have control over their energy use in the workplace. Perceived Behavioral Control (PBC) was measured using two items: "It would be easy for me to reduce the amount of energy I use at work" and "I feel that I have control over the amount of energy I use at work." Scores ranged from 2 to 10, M = 6.34, SD = 1.93. A Shapiro-Wilk test for normality revealed that the distribution for Perceived Behavioral Control was not normal, $W = .948$, $p = .000$. Table 13 presents the distribution of PBC Scores.

Table 13

Perceived Behavioral Control (PBC) Score

PBC Score	Frequency	Percent
2.00	19	3.3
3.00	14	2.5
4.00	91	16.0
5.00	56	9.9
6.00	121	21.3
7.00	63	11.1
8.00	150	26.4
9.00	28	4.9
10.00	26	4.6
Total	568	100.0

Perceived Behavioral Control, Energy Retrofits, and Energy Behavior

A series of four questions related to recent energy efficiency measures and policies such as lighting controls, thermostat controls and computer management policies may provide some insight on Perceived Behavioral Control scores for this sample. For example, in response to “The energy efficiency retrofits increase my ability to control my energy use at work”, only 59 of 379 participants strongly agreed with this statement and 125 agreed somewhat. Over half (51%) of the participants were ambivalent (neither agree nor disagree) or disagreed with the statement. As a result, the mean score for this item was 3.21 on a scale of 1 to 5.

When asked about the thermostat controls, 64% of the respondents strongly agreed or agreed somewhat with the statement “It is difficult for me to help the university save energy through my control of thermostat settings.” The mean for this item was 2.25 on a scale of 1 to 5.

Thermostat controls as a way to reduce energy use at work had the lowest mean score of the four items related to energy retrofits or computer power management.

With regard to turning off computers as a way to conserve energy, 54% of respondents strongly agreed or agreed somewhat with the statement “My computer is left on so that system upgrades and backup can be performed on nights and weekends.” The mean score for this item was 2.79 on a scale of 1 to 5. This result demonstrates that most employees believe that there is an administrative or technical mandate for not powering down computers at the end of the day. This may or may not accurately reflect campus policies with regard to computer power management.

As for turning off lights, the occupancy sensors that turn lights off after 15 minutes of inactivity may be inadvertently responsible for employees failing to turn off lights. In response to the item “I don’t need to turn off the lights when leaving a room because the lights go out automatically,” 50.5% of respondents disagreed or strongly disagreed with the statement, which means that almost half of the respondents may rely to some extent on the occupancy sensors to turn off lights. The mean score for this item was 3.21 on a scale of 1 to 5, only marginally better than for the other items.

These items reveal opportunities for the university to address misperceptions related to lighting and thermostat controls as well as computer management best practices in order to improve energy conservation behaviors among employees and perhaps enhance perceived behavioral control scores related to employees and energy use. Table 14 summarizes employee responses regarding energy efficiency improvements and employee control over energy use.

Table 14

Employee Perceptions of Energy Efficiency Measures and Impact on Behavioral Control

	Percent						
	SA	AS	N	DS	SD	N	M
Energy efficiency retrofits increase control of energy use (RC)	15.6	32.9	23.2	13.2	15.0	379	3.21
No need to turn off lights; occupancy sensors do it for me	20.0	21.4	8.0	18.8	31.8	425	3.21
It is difficult to save energy through thermostat control	42.7	21.4	13.7	11.9	10.2	452	2.25
Computer is left on for backup and upgrades	27.4	33.3	10.6	10.2	25.2	500	2.79

Research Question 5: To what extent do faculty and staff engage in energy conservation behaviors at work and what is the relationship between attitude and other employee attributes and behavior?

It is important to examine the frequency of the various behaviors as reported by the participants to look for patterns of behavior that might be encouraged or discouraged as a way to increase energy savings on campus. The survey instrument included seven behaviors of interest at two discrete points during a workday: Computer Off End of Day, Monitor Off End of Day, Lights Off End of Day, Adjust Thermostat End of Day, Computer Off Mid-day, Lights Off Mid-day, Power Down Shared Equipment. The survey also asked participants about their use of additional lights and type of light bulbs used, as well as other pieces of office equipment or other appliances that they use in their work space which are employee choices that impact energy use on campus.

Computer off End of Day. Among employees who have a computer in their office or workspace, 60% report always turning it off at the end of the day, while 22% report never turning off their computer at the end of the day. The remaining 15.5% of employees report turning off their computers inconsistently at the end of the day as shown in table 15.

Table 15

Computer Off End of Day

Computer Off EOD	Frequency	Percent
Always	330	59.7
1 day/week	20	3.6
2 days/week	13	2.4
3 days/week	16	2.9
4 days/week	36	6.5
Never	121	21.9
Don't know how	17	3.1
Total	553	100.0

M**onitor off End of Day**. Turning off computer monitors at the end of the day is practiced by 55% of employees, while 29% report that they never turn off their computer monitor at the end of the day. The remaining 14% report turning off their computer monitor at the end of the day inconsistently.

Table 16

Monitor Off End of Day

Monitor Off EOD	Frequency	Percent
Never	161	29.3
1 day/week	33	6.0
2 days/week	9	1.6
3 days/week	23	4.2
4 days/week	14	2.5
5 days/week	300	54.5
Don’t know how	10	1.8
Total	550	100.0

Lights off End of Day. The majority (61%) of employees report turning off the lights in their workspace at the end of the day. An additional 6.5% report working by natural light and not turning the lights on. Combined, 67.5% of employees report that they are making an effort to save energy by turning off lights. Almost 20% of employees rely on the occupancy sensors to automatically turn the lights off after they leave their workspace. The remaining 13.3% of employees leave lights on at the end of the day for one or more days per week. Of these, almost half (6.7%) report that there is no light switch in their workspace as shown in Table 17.

Table 17

Lights Off End Of Day

Lights Off EOD	Frequency	Percent
I did not turn the lights on	36	6.5
1 day/week	6	1.1
2 days/week	7	1.3
3 days/week	7	1.3
4 days/week	14	2.5
5 days/week	339	61.0
The lights go out automatically	107	19.2
No light switch	37	6.7
Don’t know how	3	.5
Total	556	100.0

Lights off Mid-Day. When leaving their workspace to go to class, to lunch or to attend a meeting, 27.5% of employees report turning off lights 100% of the time. An additional 21% selected “not applicable.” Almost one fourth (24.6%) of employees reported that they never turn the lights out when leaving their workspace at mid-day. The remaining 26.9% report leaving the lights on between 25% and 75% of the time when they leave during the middle of the day. Over half (51.5%) report inconsistently turning off lights or never turning off lights at mid-day, representing an opportunity for improvement.

Table 18

Lights Off Mid-day

Lights Off Mid-day	Frequency	Percent
Always	153	27.5
N/A	117	21.0
75%	82	14.7
50%	28	5.0
25%	39	7.0
Never	137	24.6
Total	556	100.0

Computer Off Mid-Day. Unfortunately, the item regarding powering down computers during extended mid-day absences was poorly worded. Instead of "How often do you power down your *primary* computer and monitor (including sleep or hibernate modes) when you leave your desk for an extended period of time such as to go to lunch, teach a class, attend a meeting or run an errand", the question read "How many times do you power down your *laptop*". Only 304 of the 550 respondents answered this question indicating that almost 250 of the respondents felt that this question did not apply to them. Referring to the item that asks about computer equipment, those who opted not to answer the question were those who reported having a desktop computer. Had this question been worded differently and used the expression "primary computer", an additional 244 respondents might have responded to this item and the results might provide better information with which to assess mid-day energy choices related to computer power management. Table 19 summarizes the frequency that employees report turning off their computers when leaving their office for an extended period of time at mid-day.

Table 19

Computer Off Mid-day

Computer Off Mid-day	Frequency	Percent
Always	103	18.8
25%	59	10.8
50%	25	4.6
75%	26	4.7
Never	85	15.5
Don't know how	6	1.1
Not Applicable	244	44.5
Total	548	100.0

Power Down Shared Equipment. Shared equipment may include photocopy machines and printers, classroom podium equipment, or other items. Only 12% of employees report powering down shared office equipment when not in use. An additional 31.7% of employees responded that this was not applicable to them. Almost one-third (30.9%) reported that they never power down shared office equipment. The remaining 25.4% report turning off shared office equipment 25% to 75% of the time.

Table 20

Power Down Shared Equipment

Power Down Shared Equipment	Frequency	Percent
Always	66	12.0
N/A	175	31.7
75%	36	6.5
50%	14	2.5
25%	30	5.4
Never	231	41.8
Total	552	100.0

Adjust Thermostat. With regard to adjusting thermostats at the end of the day to save energy 182 (33%) of participants responded that their thermostat was not adjustable, 160 responded (29%) that there was no thermostat in their workplace and 177 (32%) responded that they never adjusted the thermostat. Only 37 respondents out of 556 (6.7%) reported that they adjusted the thermostat at the end of the day.

Table 21

Adjust Thermostat End of Day

Adjust Thermostat	Frequency	Percent
1-5 days	37	6.7
No Thermostat	160	28.8
Not Adjustable	182	32.7
Never	177	31.8
Total	556	100.0

Inventory of Additional Lights. In addition to overhead lights, 38% of participants reported having additional lights in their office or workspace. One additional lamp or task light was reported by 36% of participants (196), two lamps or task lights was reported by 17% (93) of participants, and 10.4% (57) reported having three lamps or task lights. Compact florescent light bulbs were reported in 124 fixtures. Incandescent light bulbs, the least energy efficient bulbs, were reported in 83 fixtures. Halogen bulbs were reported in 28 fixtures, and light emitting diodes or LED's in 20 fixtures.

Inventory of Plug Loads. Plug loads consist of various items that are powered by electricity and are plugged in to wall outlets or sockets. This may include office equipment such as printers, document scanners, calculators, and computers. It may also include other items such as phone chargers, i-pad chargers, battery chargers, paper shredders, clocks, fans, space heaters, refrigerators, microwave ovens, coffee pots, radios and televisions. Desktop printers were the most frequently reported item by 424 participants (82%). Document scanners were reported by 155 participants (30%). Phone chargers were reported by 208 participants (40%). Items such as mini-refrigerators (34%), coffee pots (31%) and radios (10%) were also reported. Participants reported having items related to temperature and the comfort of work spaces such as fans (28%) and space heaters (31%). A variety of other items, some work-related such as calculators, laminators, and other equipment, as well as televisions, microwave ovens, toasters, digital photo frames and battery chargers were voluntarily reported.

Comparing Faculty and Staff: Mann-Whitney U-test for Independent Means

In order to better understand the two target audiences in this study, faculty and staff, a series of tests for independent means was conducted for Energy Issue Awareness, Environmental Attitude (NEP), Energy Conservation Attitude, Endorse Goal, Outcome Expectancy, Perceived Behavioral Control, and Energy Behavior. In order to conduct this analysis, an overall Energy Behavior Score was calculated by adding the score for each of the following behaviors: Computer Off End of Day, Monitor Off End of Day, Lights off End of Day, Lights off Mid-Day, Power Down Shared Equipment and Adjust Thermostat. Energy saving behaviors such as turning off lights and computers were assigned a low score while energy wasting behaviors were assigned a high score. Because the data was not normally distributed, a non-parametric test was indicated. The Mann-Whitney U-test was used to examine the difference between faculty and staff on the various scales. The tests revealed that there is no significant difference between faculty and staff on Environmental Attitude (NEP), Energy Conservation Attitude, endorsement of the university's energy conservation goal (Endorse Goal), or Energy Behavior. Significant differences were found between faculty and staff for Energy Issue Awareness, Perceived

Behavioral Control, and Outcome Expectancy. Table 22 lists medians, ranges, U-test statistic and probabilities for faculty and staff for each of the variables.

Table 22

Measured Variable Medians, Ranges, and U-Test Statistics by Role

	Faculty		Staff		Mann-Whitney Test	
	Median	Range	Median	Range	*U*	*p*
Energy Issue Awareness***	39	17	38	27	24588	0.001
Environmental Attitude (NEP)	38	32	38	33	27280	0.29
Energy Conservation Attitude	20	8	19	10	28449	0.41
Perceived Behavioral Control*	6	8	6.5	8	24971	0.013
Endorse Goal	13	10	13	15	28845	0.59
Outcome Expectancy**	15	13	16	16	25430	0.008
Energy Behavior	11	24.5	10.5	26.5	27796	0.70

*$p < .05$. ** $p < .01$. ***$p < .001$

Significant differences between faculty and staff were revealed in their level of Energy Issue Awareness, Perceived Behavioral Control, and Outcome Expectancy. A Mann-Whitney test confirmed that scores for Energy Issue Awareness were significantly higher for faculty (Mdn = 39) compared to staff (Mdn = 38), $U = 24588$, $p = .001$, indicating a higher level of energy issue awareness among faculty. This finding indicates that training for staff might include content related to the impacts of energy use as a way to increase their energy awareness scores.

Faculty and staff also differed in their level of perceived behavioral control. A Mann-Whitney test indicated that scores for Perceived Behavioral Control were higher for staff (Mdn = 6.5) than for faculty (Mdn = 6), $U = 24971$, p = .013. This finding suggests that strategies to enhance faculty perceptions of behavioral control over energy use might be beneficial in achieving the university's energy conservation goals.

Faculty and staff also differed on Outcome Expectancy. A Mann-Whitney test indicated that scores for Outcome Expectancy were higher among staff (Mdn = 16) than among faculty (Mdn = 15), $U = 25429$, $p = .008$. Interventions aimed at increasing Outcome Expectancy among faculty may enhance the university's efforts to conserve energy.

Motivation to Conserve Energy

In an attempt to understand motivations for energy conservation, participants were asked to rank order seven different motivations for the university to conserve energy, giving the most important reason a 1 and the least important reason a 7. The lowest score is assigned to the motivation that participants most frequently ranked as the number one reason for the University to conserve energy. In this case, most important motivation to conserve energy was to reduce air pollution from energy production to improve the health of ecosystems (2.86). The second most important reason to conserve energy was to reduce greenhouse gas emissions that cause global warming and climate change (2.90). Reducing air pollution from energy production to improve air quality for area residents was ranked third overall (3.18). Saving money on the university's energy bills was ranked fourth by participants (3.45). Enhancing national energy security was ranked 5^{th} as a reason to save energy (4.68). Enhancing the university's reputation for environmental leadership ranked 6^{th} as a reason for the university to conserve energy (4.89). The least important reason to conserve energy was to give faculty, students and staff a sense of pride (5.83).

When the same motivations to conserve energy were rated by the participants in terms of their importance, from very important to not important at all, the results shifted slightly among the top four reasons. The top four reasons to conserve energy were clustered close together as follows: Ecosystem Health (1.27), Air Quality (1.30), Save Money (1.40) and Reduce

Greenhouse Gas Emissions (1.42). The relative importance of the remaining three choices dropped off significantly: Enhance Energy Security (1.66), University Reputation (1.99), and Pride (2.33). Table 23 presents a summary of employee ratings and rankings for motivation.

Table 23

Motivation to Conserve Energy by Rank Order and Importance Rating

Motivation to Conserve Energy	Rank Order	Importance Rating
Ecosystem Health	1	1
Air Quality & Human Health	2	3
Save Money	3	4
Reduce GHG Emissions	4	2
Energy Security	5	5
University Reputation	6	6
Sense of Pride	7	7

In order to determine if faculty and staff differed in terms of motivations for conserving energy, a t-test for independent means was conducted to assess seven motivations: Ecosystem Health, Air Quality, Save Money, Reduce Greenhouse Gas Emissions, Enhance Energy Security, University Reputation for Environmental Leadership, and Pride. The only significant difference between faculty and staff ratings of motivations to save energy was found for "Give faculty, staff and students a sense of pride." Scores for "pride" were significantly higher for staff ($M = 2.76$, $SD = .863$) compared to faculty ($M = 2.51$, $SD = .989$), $t(528) = -2.94$, $p < .01$. This finding suggests that communicating a sense of pride in the university's success in meeting its energy savings goals is more motivating to staff than it is to faculty. Although this motivation was rated the least important by both faculty and staff, communications that give staff a sense of pride in helping the university achieve its energy conservation goals may be an effective tool in motivating staff to save energy.

Correlations Between Independent Variables and Energy Behavior

Correlation coefficients were calculated for the study variables: Energy Issue Awareness, Environmental Attitude, Energy Conservation Attitude, Endorse Goal, Outcome Expectancy, Perceived Behavior Control, and Energy Behavior. Because the distributions for the variables are not normally distributed as demonstrated by Shaprio-Wilks tests, Spearman's Rho was used to test for correlation among variables. The variables exhibited a strong degree of collinearity and were significantly correlated with one another at the $p < .01$ level as presented in Table 24.

Although the measured variables were highly correlated with one another, only two of the variables were significantly correlated with energy conservation behavior. Energy Conservation Attitude (ECAtt) was negatively correlated with Energy Behavior Score, Spearman's *rho*(542) = -.089, $p = .019$. This result is consistent with previous research that demonstrated that attitudes toward specific pro-environmental behaviors are better predictors of behavior than general measures of environmental attitude (Ajzen & Fishbein, 1980). The negative correlation is to be expected because low energy behavior scores indicate the desired energy saving behavior while scores for the other variables such as Energy Conservation Attitude or Environmental Attitude are scored in the opposite direction.

Endorse Goal was negatively correlated with Energy Behavior Score, Spearman's *rho*(542) = -.115, $p = .004$. Due to the large number of correlations, the Bonferroni approach was used to calculate a corrected significance level of .0024 (.05/21). Using this criterion, neither Energy Conservation Attitude nor Endorse Goal are significantly correlated with Energy Behavior Score. Bamberg and Moser (2007) found a mean correlation of $r = .42$ between attitude and pro-environmental behavior. Carrico and Reimer (2011) found that energy conservation behavior was significantly correlated with employees' endorsement of organizational energy conservation goals. While the correlations in this study are not significant when using the stricter Bonferroni criterion, the previous studies cited lend support for recommending that the University pursue intervention and communication efforts aimed at maintaining or strengthening energy conservation attitude and/or endorsement of the university's energy conservation goals as they may contribute to enhanced energy conservation behavior among faculty and staff.

Table 24

Correlation among Measured Variables

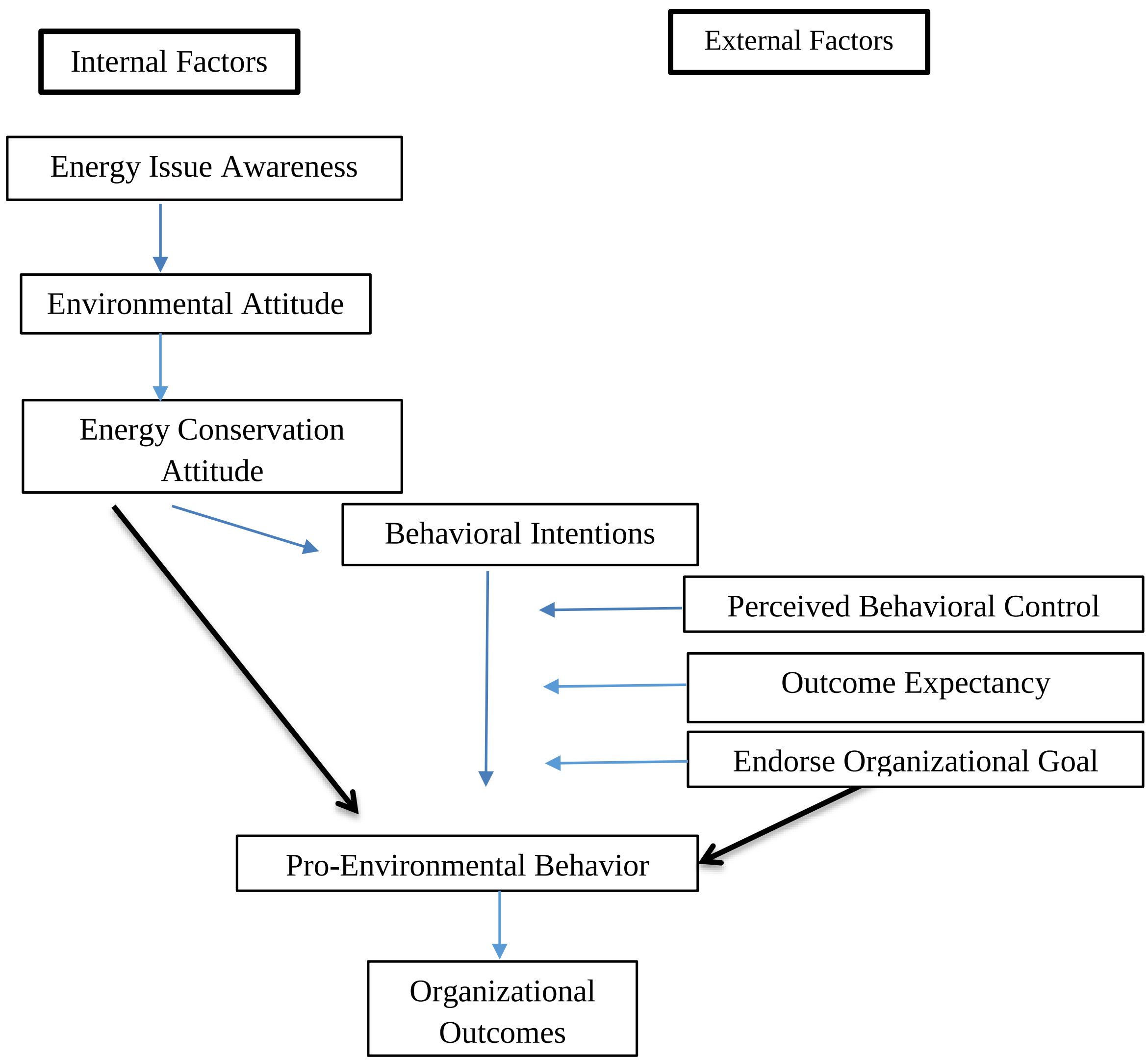
Independent Variables	Measured Variables	Alpha	M	SD	1	2	3	4	5	6	7
	1. EIA	0.88	36.05	4.89	1.00						
	2. NEP	0.80	37.46	6.73	.584**	1.00					
	3. ECAtt	0.66	19.55	1.97	.442**	.458**	1.00				
	4. PBC	0.65	6.34	1.93	.104**	.133**	.185**	1.00			
	5. GOAL	0.83	12.51	2.33	.501**	.509**	.525**	.328**	1.00		
	6. Outcome Expectancy	0.72	15.29	3.03	.174**	.207**	.413**	.356**	.319**	1.00	
Dependent Variable	7. Energy Behavior		11.2	5.57	-.025	-.041	-.089*	-.052	-.115**	-.051	1.00

*$p < .05$ (1-tailed). ** $p < .01$ (1-tailed)

The results found in this study support modifying Figure 1 with the addition of bold lines to illustrate the relationship between energy conservation attitude (ECAtt) and energy behavior, and the relationship between endorsement of the University's energy conservation goal (GOAL) and energy behavior as shown in Figure 2. This study did not examine behavioral intentions as a separate construct, so the proposed model needs additional validation of the relationships.

Figure 2

An Integrated Model for Selecting HRD Interventions to Promote Pro-Environmental Behavior in Organizational Contexts



Chapter Five

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to assess the current level of energy issue awareness, energy attitudes and energy behaviors among university employees using Ajzen's Theory of Planned Behavior and Vroom's Expectancy Theory. The results of the study may be used to identify strategies and interventions that are grounded in theory, evidence-based, and can be tailored to the needs of the target audience to promote energy conservation on campus. As such, this study also demonstrates the use of behavioral theory as a basis for selecting targeted interventions to promote energy conservation in an office setting.

This study was a descriptive study whose objective is to systematically describe the characteristics of a given population with regard to energy-related knowledge, attitudes, and behaviors. The survey instrument consisted of items designed to assess three internal determinants of pro-environmental behavior (Energy Issue Awareness, Environmental Attitude, Energy Conservation Attitude), three external determinants of pro-environmental behavior (Perceived Behavioral Control, Endorsement of Goal, and Outcome Expectancy), and the prevalence of current energy behaviors among employees at a Midwestern University. Demographic data included role (faculty or staff), sex, race, education, and number of years employed at the University. The survey was distributed to all faculty and staff via email.

Once the data were collected, mean scores were calculated and reported for Energy Issue Awareness, Environmental Attitude, Energy Conservation Attitude, Perceived Behavioral Control, Endorse Goal, and Outcome Expectancy. In addition, an Energy Behavior Score was calculated based on discrete behaviors such as powering down computers and monitors, turning off lights, and adjusting thermostats. Frequency data was reported for specific behaviors. Examination of the data revealed that the scores were not normally distributed. As a result, non-parametric tests were used in the analysis of the data. The relationship between internal and external determinants of behavior and energy behavior score was examined using Spearman's Rho. Instead of T-tests for independent means, the data were analyzed using the Mann-Whitney U-test to determine if differences exist between faculty and staff that might impact decisions regarding training or other interventions.

As was noted previously, the distributions of scores for the study variables were not normally distributed. Distributions for Energy Issue Awareness, Environmental Attitude, Energy Conservation Attitude, Perceived Behavioral Control, Endorse Goal and Outcome Expectancy were negatively skewed. High mean scores indicate that this sample already demonstrates a high degree of energy issue awareness, a positive energy conservation attitude, a strong endorsement of the institution's energy conservation goals, and a high degree of outcome expectancy.

There are three possible explanations for high mean ratings on these variables. First, the high mean scores and negative skew may be a function of the nature of the target audience, a highly educated group (61% hold a master's degrees or higher). Education is positively correlated with environmental attitudes as measured by the New Ecological Paradigm (Dunlap et al. 2000), and NEP scores are positively correlated with pro-environmental behavior and pro-environmental attitudes (Dunlap et al., 2000). In this study, all of the variables were highly correlated with one another. Second, scores may have been high due to social response bias and positive wording of items. Third, mean scores may have been high due to self-selection with those employees who are most interested in energy participating in the survey. As a result of the non-normal distribution of the study variables, non-parametric tests were used to analyze the data.

Another limitation of this study is the use of self-reported energy behavior. Individuals may have a tendency to over-report positive or socially desirable behaviors, in this case energy conservation behaviors. Energy behaviors were not confirmed by observation or other means.

This study was limited to faculty and staff at one university. While the results from the sample may be generalizable to the target population, they are not generalizable to other institutions or organizations.

Data collection began on April 17, 2014 and continued through May 15, 2014. Survey data was received from 677 employees, with completed surveys available for 544 employees. Sample demographic statistics were compared to known statistics for the target population to determine the representativeness of the sample. The sample was made up of 68% staff and 29% faculty compared to the target population which is comprised of 71% staff and 29% faculty. The sample was 88% Caucasian compared to 89% for the target population. African American participation in the sample was 2% compared to 5% for the target population. Six percent of participants did not disclose their race. The majority of the sample was female (62%) compared to 52% female in the target population suggesting that females are over-represented in the sample. The sample is of sufficient size to achieve a 5% margin of error with a 95% confidence level.

Study Results and Recommendations for Program Design

Study participants exhibited high mean scores for Energy Issue Awareness (M = 36.05; max = 40), Environmental Attitude (M = 37.46; max = 50), Energy Conservation Attitude (M = 18.55; max = 20), and Endorse Goal (M = 12.41; max = 15). High mean scores may reflect bias in the sample, or could be an accurate reflection of the degree of awareness and concern about energy use and its consequences among university employees. If it is the latter, it bodes well for more proactive measures to engage employees in energy conservation efforts, especially in light of the fact that most employees (66%) do not report being aware of the university's energy conservation goals. To the extent that these variables accurately reflect the target audience as a whole, the results indicate a population that is ripe for engagement on this issue.

Research Question 1: What is the level of energy issue awareness among employees?

The first take-away from the study is that despite the university having signed the American College and University Presidents' Climate Commitment in 2007 and having made significant progress in reducing energy consumption through lighting upgrades and energy efficiency retrofits, the majority of university faculty and staff (80%) indicated that they had not read the university's conservation goals. However, when asked how the university's energy conservation goals had been communicated, only 66% responded that the goals had not been communicated at all. The remaining 34% indicated that the goals had been communicated through a variety of channels. In order to achieve increased traction in leveraging employee behavior as a key component in achieving the university's energy goals, the university should consider taking steps to increase the percentage of employees who have not only read the goal, but also know what the goal is. This may include sharing UA's energy goal via multiple channels including email, UA headlines, staff meetings, and departmental meetings. The university should consider providing energy feedback to building occupants to help raise awareness of energy consumption in office settings (Carrico & Reimer, 2011; Sierro et al., 1996; Staats, van Leeuwen & Wit, 2000). The instrument should be modified in follow-up studies to assess the effectiveness of communication and other interventions to include an open-ended question asking participants to articulate the University's energy conservation goal to as a way to better assess employees' understanding and knowledge of the institution's energy goals.

Study participants demonstrated a high mean score for Energy Issue Awareness. Examining responses to items related to issue awareness revealed that the vast majority of participants (90%) strongly agreed or agreed somewhat that climate change is happening, 84% strongly agreed or agreed somewhat that energy use contributes to climate change, and 82% strongly agreed or agreed somewhat that the university should address climate change. However, when examining the mean scores for each of the Energy Issue Awareness items as shown in Table 8, the two items with the highest mean scores were 1.73 for "The University should address climate change," and 1.64 for "Energy use contributes to greenhouse gas emissions that cause climate change," indicating that there is room to strengthen support for these two statements. A Mann-Whitney test demonstrated that as a group, faculty scored significantly higher for Energy Issue Awareness (Med = 39) than did staff (Med = 38), $U = 24588$, $p < .001$. In order to increase energy issue awareness among staff, training and other interventions aimed at staff should include content related to energy use and its consequences, particularly as they relate to greenhouse gas emissions and climate change.

Research Question 2: What is the attitude of faculty and staff toward the environment and toward energy conservation? Participants demonstrated a positive environmental attitude as measured by the short version of the New Ecological Paradigm (NEP) scale. The 10-item scale was also measured on a five-point Likert scale yielding a range of possible scores from 10 to 50. The sample appears to reflect an environmental attitude that is strongly positive (M = 37.46) and is consistent with environmental attitudes for individuals who participated in a green energy program. Clark et al (2003) measured environmental attitude of participants in a green energy program using the same 10-item NEP instrument and found that participants had a mean NEP of 37.84 with a standard deviation of 7.32 while non-participants had a mean NEP of 33.93 with a standard deviation of 6.9. That the mean NEP score of the university sample is comparable to that of participants in a green energy program may be explained in part by education levels. Previous research has indicated that education is correlated with NEP with well-educated adults more likely to endorse an ecological worldview (Dunlap et al, 2000). The sample in this study is highly educated with 61% holding a master's degree or higher. NEP scores and Education Level were significantly correlated for this sample, Pearson's r (542) = .093, $p < .05$. The environmental attitude of University employees may be a function of whom the University hires and their level of education more so than a result of any training or other interventions. Because environmental attitude indirectly determines pro-environmental behavior via behavioral intentions (Bamberg & Moser, 2007), the University may want to administer the NEP before and after HRD interventions aimed at promoting energy conservation or other pro-environmental behaviors as a way to assess the impact of HRD interventions on environmental attitude.

Previous research has demonstrated that the specificity with which environmental attitudes is important in linking attitudes to behaviors (Ajzen & Fishbein, 1980). In the present study, correlation among the variables was explored using Spearman's Rho. Energy Conservation Attitude was significantly correlated with Energy Behavior, r_s (542) = -.089, $p < .05$. The sample demonstrated a positive Energy Conservation Attitude with a mean of 18.55 on a scale of 4 to 20. Because Energy Conservation Attitude was significantly correlated with Energy Behavior in this study, the University should take steps to maintain current energy conservation attitude levels among faculty and staff. The University might consider using endorsements from top leadership such as the chancellor and other high visibility leaders as a way to maintain high energy conservation attitude levels among employees (McKenzie-Mohr &

Smith, 1999). The University may also use public acknowledgement for energy leadership by individuals, departments, buildings, or the campus as a whole as a way foster positive energy conservation attitudes.

Research Question 3: To what extent do faculty and staff endorse the University's energy conservation goals and believe that their choices impact those goals? Despite the fact that the university's energy conservation goals are unknown to most faculty and staff, they still exhibit a high degree of endorsement for the university's energy conservation goal (M = 12.51; max = 15). In this study, endorsement of the University's energy conservation goal was significantly correlated with energy behavior, r_s (542) = -.115, $p < .01$. The emphasis of HRD should be on maintaining this level of support for the University's energy conservation goals. Ramus and Steger (2000) noted that values, norms, attitudes and behaviors that promote environmental stewardship must be supported by management. In the case of the University, this might include having the Chancellor and other top university officials make an energy savings pledge and encouraging others to do the same as a way to demonstrate management support. Written pledges are more effective than verbal pledges (Pardini & Katzev, 1984), and public pledges are more effective than private pledges (Pallak, Cook, & Sullivan, 1980). The Chancellor might publicly acknowledge energy reductions in buildings or energy saving ideas by faculty and staff as a way to raise the visibility and the importance of energy conservation on campus.

Outcome expectancy is the extent to which employees believe that their actions impact the achievement of organizational goals. The challenge with energy conservation and other environmental goals is that outcomes are determined by the aggregate actions of the group rather than any one person, and the impact on the environment is small and difficult to observe

(Carrico, 2009). A Mann-Whitney U-Test revealed that there was a significant difference between faculty and staff for Outcome Expectancy, $U = 25430$, $p < .01$. Staff exhibited a higher median score for outcome expectancy (Med = 16) than faculty (Med = 15). This outcome is somewhat surprising, but may reflect the nature of staff positions and staff use of and responsibility for various pieces of office equipment. Further research is needed to explore the source of the difference as well as opportunities to enhance outcome expectancy among faculty. Focus group research could be used to better understand outcome expectancy beliefs among faculty and staff.

Energy feedback to building occupants is one strategy that has been used to engage employees in energy conservation in the work place (Murtagh et al., 2013; Sierro et al., 1996; Staats, Van Leeuwen, & Witt, 2000). Energy feedback at the building-level connects the actions of building occupants to energy outcomes. The University may want to consider using data-driven displays as a way of engaging faculty who are accustomed to doing research and dealing with data. Carrico & Reimer (2011) examined the use of feedback combined with goal setting and peer education to reduce energy use in a university setting. Carrico and Reimer (2011) demonstrated that although building-level energy feedback had no significant impact on outcome expectancy scores among employees, it was effective in reducing energy consumption by 7% when used alone and by 9% when used in combination with peer education. Establishing goals has been used to motivate behavior (Latham and Locke, 2007). Becker (1978) demonstrated that a challenging goal of 20% energy reduction combined with energy feedback resulted in significant energy savings. The University should consider combining a challenging energy reduction goal with energy feedback as a way to motivate energy conservation among faculty and staff.

Research Question 4: To what extent do faculty and staff believe that they control their energy use at work? Perceived Behavioral Control is the extent to which individuals feel that they have control over energy use at work. Scores on the two-item version of the PBC scale range from 2 – 10. The sample mean was 6.34 with a mode of 8. The ceiling effect is not as strong for PBC as for other study variables. The score on this scale is not as high as has been demonstrated on the other scales in the survey indicating that there may be an opportunity to focus intervention efforts on strengthening employees' perceptions of the extent to which they control energy use in their workspace.

Staff exhibited a higher median score for perceived behavioral control (Md = 6.5) than faculty (Md = 6), $U = 24971$, $p < .05$. This outcome is somewhat surprising, but may reflect the nature of staff positions and staff use of and responsibility for various pieces of office equipment. Further study is needed to explore the source of the difference as well as opportunities to enhance perceived behavioral control among faculty. Focus group research could be used to better understand perceived barriers to energy conservation on campus, as well as steps that could be taken to improve employee perceptions of behavioral control over energy consumption. Computer policies, thermostat controls and occupancy sensors are specific items of interest that should be explored in a focus group based on the results of this study. Training content should include instructions on powering down equipment, thermostat and lighting controls as a way to strengthen perceived behavioral control.

Research Question 5: To what extent do faculty and staff engage in energy conservation behaviors at work and what is the relationship between attitude and other employee attributes and behavior? With respect to energy behaviors, on the positive side, study participants reported turning off their computers at the end of the day (60%), and turning off their computer monitors at the end of the day (60.5%). These findings suggest that there is still room for improvement since 40% of the sample reported that they never or infrequently engage in these behaviors. Fully 24.5% report never turning off their computer at the end of the day. If this proportion is applied to the 4,300 employees at the University, an astonishing 1,000-plus computers may be left on overnight, on weekends, and over extended holidays, representing a significant energy burden for the campus. The remaining 15.5% of employees report turning off their computers inconsistently at the end of the day. There may be some confusion among employees regarding IT policies and requirements to leave computers on in order for computer back-up and software patches to be run. In response to the statement "My computer is left on so that system upgrades and backup can be performed on nights and weekends," 54% of participants strongly agreed or agreed somewhat with the statement. The mean score for this item was 2.79 on a scale of 1 to 5. Some employees may be instructed to leave their computers on at night. Some faculty may be conducting research or running computer models that require their computers to be left on overnight. Focus groups may be used to explore computer power management behavior and ways to encourage a greater percentage of employees to power down at the end of the day.

Opportunities for improvement were also revealed with respect to turning off lights. Sixty-one percent of employees reporting turning off lights at the end of the day, however only 27.5% consistently turn off lights when leaving their office or workspace in the middle of the day. Sussman and Gifford (2012) demonstrated the use of behavioral prompts to influence building occupants to turn-off lights in unoccupied restrooms in university office and classroom buildings. Behavioral prompts placed over light switches may serve as a reminder to turn out lights when leaving for mid-day meetings, classes, or other purposes.

Powering down shared equipment is another area with room for improvement. Shared equipment may include photocopy machines and printers, classroom podium equipment, or other items. Only 12% of employees report powering down shared office equipment when not in use. An additional 31.7% of employees responded that this was not applicable to them. Almost one-third (30.9%) reported that they never power down shared office equipment. The remaining 25.4% report turning off shared office equipment 25% to 75% of the time. The instrument did not ask participants why they don't power down shared equipment. There may be a variety of reasons in different settings to explain this behavior. In the classroom, a faculty member may be reluctant to power down the podium if he or she is unsure of whether additional classes are scheduled in that classroom. Likewise, staff may hesitate to power down shared printers, copiers or other equipment if they think that colleagues may be working late and may need the equipment. Exploring reluctance to power down shared equipment in a focus group might help to identify reasons for this behavior and solutions that would encourage individuals to engage in this behavior.

Thermostats also appear to be a source of confusion or lack of control. Roughly one-third responded that their thermostat was not adjustable (33%), that there was no thermostat in their workspace (29%) or that they never adjusted their thermostat (32%). Only 37 respondents out of 556 (6.7%) reported that they adjusted the thermostat at the end of the day. These results may be explained at least in part by the fact that 68% of participants strongly agreed or agreed somewhat with the statement "It is difficult for me to help the university save money through my control of thermostat settings." This item had the lowest mean score at 2.25 among four items designed to explore the relationship between energy efficiency improvements and employee perceived behavioral control. Sixty-eight percent of the participants strongly agreed or agreed somewhat with this statement. Given the low score for thermostat control as a way to save energy and the fact that 33% believe that their thermostat is not adjustable, it may be beneficial to develop a simple step-by-step guide designed to help faculty and staff understand how thermostat controls work and the degree to which they are able to exercise control over temperature in their work space. Training materials should include instructions for operating thermostat controls. In addition, behavioral prompts may be an effective tool for reminding employees to power down equipment and turn off lights. Behavioral prompts have been demonstrated to encourage repetitive behaviors such as closing blinds to control temperature (McKenzie-Mohr & Smith, 1999).

In addition to behaviors, participants reported having a variety of energy using appliances in their offices such as desktop printers (82%), phone chargers (40%) mini-fridges (34%), coffee pots (31%), and space heaters (31%). These plug loads add to the energy burden of the institution. Based on the number and type of items reported by survey participants, plug loads represent an opportunity for reducing energy use on campus. The university may find it beneficial to implement policies related to plug loads as a way to reduce energy consumption. Interventions aimed at reducing energy consumption should address plug loads and how to reduce them. This may include addressing barriers such as lack of faculty and staff kitchen areas, policies, educational materials about plug loads and their impact on energy use, and communication strategies to encourage “unplugging”. The university may also consider implementing technological and infrastructure changes that obviate the need for personal refrigerators and printers such as shared equipment in a lounge area or a document printing station.

Over one-third of participants (38%) also reported having additional task lighting in their workspace. Of these fixtures, 56% had energy saving compact fluorescent or LED bulbs. The remaining 44% had high energy incandescent or halogen bulbs. Distributing compact florescent light bulbs to office occupants in exchange for incandescent bulbs may also be a cost-effective way to reduce energy use on campus.

Motivation to Conserve Energy. Understanding how employees evaluate various motivations for reducing energy consumption at work may be useful in framing energy conservation messages aimed at faculty and staff, as well as in developing content for training or other interventions. Of the seven motivations for the university to conserve energy, a T-test revealed that there was no difference in the ratings by faculty and staff in six areas: eco-system health, human health, saving money, enhancing national energy security, enhancing the university's reputation for environmental leadership, and reducing greenhouse gas emissions. There was one statistically significant difference between faculty and staff for motivation to conserve energy: to give faculty, staff and students a sense of pride, $p = .042$. Knowing that institutional pride is important to staff, the university might consider interventions and strategies that emphasize pride in the university's energy conservation accomplishments. This might include seeking recognition as a leader in energy conservation among regional institutions or seeking external validation via rankings such as Sierra Club's Cool Universities, *Princeton Review's* Green University rankings, or certification by the Association for the Advancement of Sustainability in Higher Education

Practical Applications and Selecting Intervention Strategies

This study demonstrates the use of Ajzen's Theory of Planned Behavior and Vroom's Expectancy Theory as a preliminary step to aid in understanding the target audience in order to develop training and other interventions aimed at promoting energy conservation in office settings. The diagnostic value of these theories lies in systematically defining key characteristics of the target population that are related to energy conservation such as issue awareness, environmental attitudes, perceived behavioral control, and endorsement of organizational energy conservation goals. The results reveal opportunities for training and other interventions to help the organization achieve its energy conservation goals through effective employee engagement. The selection and design of interventions such as training, communication, policy and incentives may be made with greater confidence by starting with a sound theoretical foundation and a data-supported understanding of the unique characteristics of the target population.

Workplace training programs can be designed to achieve cognitive, affective or behavioral learning goals (Silberman, 1990). There are a variety of tools and intervention strategies that have been used to promote energy conservation in various settings including provision of energy consumption feedback, goal setting, peer education, energy saving competition, commitment devices, incentives, behavioral prompts, and endorsement by respected individuals (McKenzie-Mohr & Smith, 1999). Kok et al. (2011) listed the use of prompts and visual cues, mobilizing social norms, modeling the desired behavior, goal setting, feedback, commitment, and rewards that were demonstrated to be effective in promoting pro-environmental behaviors.

Commitment devices or pledges have been used to promote a variety of pro-environmental behaviors from recycling to saving energy or using public transit (Burn & Oskamp, 1986; McKenzie-Mohr & Smith, 1999). Commitment devices are more effective when they are written (Pardini & Katzev, 1984) and when they are made public (Pallak, Cook & Sullivan, 1980). Sussman and Gifford (2012) demonstrated the use of behavioral prompts to influence building occupants to turn-off lights in unoccupied restrooms in university office and classroom buildings. Luyben (1984) used behavioral prompts to remind faculty to adjust their blinds to save energy resulting in 66% of faculty adopting the behavior compared to 10% at baseline. Energy consumption feedback to building occupants has been demonstrated to be effective in reducing energy consumption (Carrico & Reimer, 2011; Murtagh et al., 2013; Sierro et al., 1996; Staats, Van Leeuwen, & Witt, 2000). Becker (1978) demonstrated the effectiveness of combining feedback with a challenging goal in achieving significant energy savings. Table 25 summarizes the internal and external determinants used in this study and selected HRD interventions that have been demonstrated to be effective in promoting energy conservation in office settings.

Table 25

Recommended HRD Interventions Based on Study Findings.

Determinant of Pro-Environmental Behavior	**Desired Outcome**	**HRD Interventions**
Energy Issue Awareness	Increase awareness of UA's energy goals	Communicate goals via multiple channels; Provide building-level Energy Feedback; Public recognition based on energy savings and contributions to university's energy conservation goals.
Energy Issue Awareness	Increase EIA scores among staff	Training content and communication includes consequences of energy use.
Environmental Attitude (NEP)	Monitor	Use NEP to assess environmental attitudes Pre/Post HRD Interventions
Energy Conservation Attitude	Maintain	Management support from Chancellor and other leaders; public recognition of energy conservation achievement.
Endorse Goal	Maintain	Tap "pride" motivation by seeking external validation of university success in energy conservation; Pledge by Chancellor; Acknowledge energy accomplishments.
Outcome Expectancy	Increase among faculty Maintain among staff	Focus groups to explore expectancy; Energy feedback.
Perceived Behavioral Control	Increase among faculty Maintain among staff	Focus group to explore barriers and solutions.
Behavior	Increase energy saving behaviors	Behavioral prompts; remove barriers; Thermostat and computer training; Pledge; Set challenging goal.

Recommendations for Future Research

Based on the findings in this study, the following recommendations are offered for future research:

1. The instrument in this study was developed by the researcher and comprised of scales used in previous studies. All of the scales showed strong internal consistency using Cronbach's alpha with the exception of Energy Conservation Attitude and Perceived Behavioral Control. This study represents a single use of these scales with a particular population. Repeated use of the scales with other target populations is warranted to assess the reliability of scales.
2. Replicating this study using samples from several universities or from different types of organizations that have made carbon reduction commitments would help to confirm the usefulness of this approach as a preliminary step to developing training and other interventions aimed at promoting pro-environmental behavior in office settings.
3. Using qualitative methods to supplement quantitative analysis would allow for greater insight into variables such as outcome expectancy and perceived behavioral control. Focus groups could be conducted to better understand the prevalence of mini-refrigerators, microwave ovens, and other appliances in office spaces. Focus groups could also be used to explore the reasons that faculty and staff hesitate to power down shared equipment.
4. This study relied on self-reported behavior data. Future studies would be strengthened by adding an observation component to confirm the extent to which various energy conservation behaviors are practiced.

5. This study focused on individuals' energy issue awareness, attitudes, perceptions and energy behaviors in an organizational context. Additional research is needed to explore barriers and facilitators of energy conservation behavior that exist within the organization. For example, additional research is needed to explore the impact of the physical, technological and policy attributes of the organization on behavior and perceived behavioral control. Focus groups could examine the impact of occupancy sensors to encourage or discourage energy-saving behavior, or the impact of centralized thermostat controls on perceived behavioral control among employees. Focus groups could also be used to examine employee perceptions of computer power management policies and their impact on behavior. The results of such study may be used to inform training and communication strategies to enhance perceived behavioral control.
6. From a theoretical perspective, future research may be strengthened by incorporating more elements of Ajzen's Theory of Planned Behavior such as social norms and behavioral intentions. Bamberg and Moser's (2007) meta-analysis integrated Ajzen's Theory of Planned Behavior and Schwartz's Norm Activation Model. In their model, moral norm replaced social norm as a predictor of pro-environmental behavior. Incorporating moral norms may provide additional insight into effective strategies for human resource development professionals.
7. Future research should also examine the impact of training and other interventions on energy use in office settings. Bamberg and Moser (2007) emphasize the need for "direct experimental test of the causal processes postulated by theoretical frameworks" and field experiments that manipulate variables that determine motivation to conserve energy as well as energy conservation behaviors. Similar to Carrico and Reimer (2011), mixed

methods should be used in order to examine the impact of the interventions on issue awareness, attitudes and behavioral intentions, as well as on behavior, and ultimately on energy use by including energy consumption metrics in the analysis.

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Appendix A: Energy Awareness and Conservation Instrument

Energy Issue Awareness – U of A's energy goals and issues related to energy use

1. Have you ever read the University of Arkansas' energy conservation goals? Yes No
2. In what way were the goals communicated to you? Select all methods.
    a. E-mail
    b. Website
    c. Social Media – Facebook, Twitter, Instagram
    d. The Traveler
    e. Newswire
    f. Departmental meeting
    g. Staff meeting
    h. University Wide meeting

To what extent do you believe that:

SA AS U DS SD

3. Climate change is occurring. (Leiserowitz)
4. The University of Arkansas should address climate change.
5. Energy use contributes to greenhouse gas emissions that cause climate change. (Leiserowitz)
6. Energy use contributes to air and water pollution that harm ecosystems. (Clark, Kotchen, & Moore)
7. Energy use contributes to air and water pollution that harms human health. (Clark, Kotchen & Moore)
8. Wasting energy contributes to the depletion of our energy resources and reduces our energy security. (Clark, Kotchen, & Moore)
9. Wasting energy puts a burden on financial resources.
10. Energy use is harmless and not a cause for concern.

World View/Pro-Environmental Attitude-New Ecological Paradigm – modified (Clark et al, 2003, modified from VanLiere & Dunlap)

SA SWA U SWD SD

11. The balance of nature is very delicate and easily upset.
12. Plants and animals have as much right as humans to exist.
13. Humans will eventually learn enough about how nature works to control it.
14. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.
16. Humans were meant to rule over the rest of nature.
17. The earth is like a spaceship with very limited room and resources
18. Human ingenuity will insure that we do not make the earth unlivable.

19. We are approaching the limit of the number of people the earth can support.
20. The balance of nature is strong enough to cope with the impacts of modern industrial nations.

Energy Conservation Attitude (DeWaters & Powers – had 6 EC items; 4 items were most relevant to energy use in office settings. One was about home appliances and one was about transportation.)

21. Saving energy is important. (#7) SA SWA U SWD SD
22. I don't need to worry about turning the lights or computers off because the University pays for the electricity. (#9)
23. Americans should conserve more energy (#10)
24. We don't have to worry about conserving energy because new technologies will be developed to solve energy problems for future generations (#11)

Value Energy Conservation Goal (Carrico & Reimer, 2011)

SA SWA U SWD SD

25. The University of Arkansas should do more to save energy.
26. I am concerned about the amount of energy that the University of Arkansas uses.
27. I would like to reduce the amount of energy that I personally use at University of Arkansas.

Outcome Expectancy – Individual's belief in ability to impact institutional energy goal (Carrico & Reimer, 2011).

SA SWA U SWD SD

28. The amount of energy U of A uses depends more on what the university administration decides than on the practices of employees and students.
29. Whether or not I personally reduce the amount of energy I use will have no real impact on the amount of energy that the U of A uses.
30. My personal actions can reduce UA's level of energy consumption.
31. By changing our behavior, employees like me can reduce UA's energy consumption.

Perceived Behavioral Control

32. It would be easy for me to reduce the amount of energy I use at work. SA SWA U SWD SD (Heath & Gifford, 2002) (It would be difficult for me to reduce the amount of energy I use at work.)
33. I feel that I have control over the amount of energy I use at work. SA SWA U SWD SD
34. Has your workspace been retrofitted for energy efficiency? Yes No

    If so, to what extent do you agree with the following statements:

    a. The energy efficiency retrofits increase my ability to control my energy use at work. (The energy efficiency retrofits help me to save energy at work.)

b. I don’t need to turn out the lights when leaving a room because the lights go out automatically after 15 minutes.
c. It is difficult to save energy because I have little or no control over the thermostat settings.
d. The university requires that computers be left on at night and on weekends in order to back-up systems and implement software upgrades.

35. I would do more to save energy at work if I knew how. (DeWaters & Powers)

Computer Use – Desk Top (Carrico & Reimer, 2011)

36. Do you have the energy-saving setting on your computer turned on? Y N Don’t Know
37. During the previous work week (Monday through Friday):
    - How many times did you power down your computer (including sleep or hibernate) before leaving fork for the day? (0-5 days)
    - How many days did you turn off your computer monitor(s) (including automatic shut-off) before leaving work for the day (0-5 days)

Computer Use – Laptop

38. During the previous work week (Monday – Friday)
    - How many times did you leave your laptop running at work after you left for the day (0-5 days)
    - How often do you power down your laptop (including sleep or hibernate modes) when you left your desk for an extended period of time such as to go to lunch or to attend a meeting or run an errand? (almost never, about 25% of the time, about 50% of the time about 75% of the time, or almost always).
    - If you have an external monitor hooked up to your laptop, how often did you turn this off at the end of the day? (0-5 days)

Light Use

39. Do you personally have lights in your office or on your desk in addition to the ceiling lights? N Y
40. If so, please indicate how many.
41. What types of bulbs are used? Incandescent, compact fluorescent, halogen, LED, don’t know
42. During the previous work week (M-F):
    - How many days did you turn off the lights in your office or desk before leaving at the end of the day (0-5)
    - How many days did you turn off the lights in your office or desk before leaving for an extended period of time during the workday such as to go to lunch, attend a meeting, or run an errand? (almost never, about 25% of the time, 50% of the time, 75% of the time, almost always.)

Heating & Cooling

43. During the previous work week (Monday – Friday)
    - How many days did you adjust your thermostat before leaving work so that the heat/air-conditioning would run less while you were not there? (0-5) or N/A

Office Equipment

44. Do you have appliances or equipment in your office, lab or workspace that you use such as a coffee maker, fan, space heater, scanner, radio, phone charger or personal printer?
    - How many
    - How many of these appliances currently unplugged? (plugged in?)
45. During the previous work week (Monday – Friday), how often did you turn off office or lab equipment when you were finished using it? (almost never, 25% of the time, 50 % of the time, 75% of the time, almost always.)

Motivation to Conserve Energy (modified from Clark et al, 2003)

46. Rank order the following reasons for the university to save energy from 1 (most important) to 7 (least important).

a. Reduce air pollution from energy production to improve the health of natural ecosystems.
b. Reduce air pollution from energy production to improve air quality for NWA residents.
c. Save money by reducing the University's utility bills.
d. Enhance energy security for the nation.
e. Enhance the university's reputation for environmental leadership.
f. Give faculty, students and staff a sense of pride.
g. Reduce the greenhouse gas emissions that cause global warming and climate change.

Demographics

47. Age	18-29	30-39	40-49	50-59	60+
48. Gender	M	F			
49. Education	HS	Associates	BS/BA	Masters	Ph.D./JD/MD
50. Role	Staff	Faculty			
51. # Years at UA	>1 – 3	4-10	11-20	20+	

52. College/Unit Fulbright, Walton, Engineering, Bumpers, Education, Architecture, Law, Grad, Student Affairs, Finance and Administration, Alumni, Athletics
53. In what building is your office located? ________________________

Appendix B: Energy Awareness and Conservation Instrument (Final)

Energy Issue Awareness – U of A's energy goals and issues related to energy use

1. Have you ever read the University of Arkansas' energy conservation goals? Yes No
2. In what way were the goals communicated to you? Select all methods.
    a. E-mail
    b. Website
    c. Social Media – Facebook, Twitter, Instagram
    d. The Traveler
    e. Newswire
    f. Departmental meeting
    g. Staff meeting
    h. University Wide meeting

To what extent do you believe that:

SA SWA U SWD SD

3. Climate change is occurring. (Leiserowitz)
4. The University of Arkansas should address climate change.
5. Energy use contributes to greenhouse gas emissions that cause climate change. (Leiserowitz)
6. Energy use contributes to air and water pollution that harm ecosystems. (Clark, Kotchen, & Moore)
7. Energy use contributes to air and water pollution that harms human health. (Clark, Kotchen & Moore)
8. Wasting energy contributes to the depletion of our energy resources and reduces our energy security. (Clark, Kotchen, & Moore)
9. Wasting energy puts a burden on financial resources.
10. Energy use is harmless and not a cause for concern. (Reverse coded)

World View/Pro-Environmental Attitude-New Ecological Paradigm – modified (Clark et al, 2003, modified from VanLiere & Dunlap)

SA SWA U SWD SD

11. The balance of nature is very delicate and easily upset.
12. Plants and animals have as much right as humans to exist.
13. Humans will eventually learn enough about how nature works to control it. (RC)
14. The so-called "ecological crisis" facing humankind has been greatly exaggerated. (RC)
15. If things continue on their present course, we will soon experience a major ecological catastrophe.
16. Humans were meant to rule over the rest of nature. (RC)
17. The earth is like a spaceship with very limited room and resources
18. Human ingenuity will insure that we do not make the earth unlivable. (RC)

19. We are approaching the limit of the number of people the earth can support.
20. The balance of nature is strong enough to cope with the impacts of modern industrial nations. (RC)

Energy Conservation Attitude (DeWaters & Powers – had 6 EC items; 4 items were most relevant to energy use in office settings. One was about home appliances and one was about transportation.)

21. Saving energy is important. (#7) SA SWA U SWD SD
22. I don't need to worry about turning the lights or computers off because the University pays for the electricity. (#9) (Reverse coded)
23. The University of Arkansas should conserve energy (#10)
24. We don't have to worry about conserving energy because new technologies will be developed to solve energy problems for future generations (#11) (Reverse coded)

Value Energy Conservation Goal (Carrico & Reimer, 2011)

SA SWA U SWD SD

25. The University of Arkansas should do more to save energy.
26. I am concerned about the amount of energy that the University of Arkansas uses.
27. I would like to reduce the amount of energy that I personally use at University of Arkansas.

Outcome Expectancy – Individual's belief in ability to impact institutional energy goal (Carrico & Reimer, 2011).

SA SWA U SWD SD

28. The amount of energy U of A uses depends more on what the university administration decides than on the practices of employees and students. (Reverse Coded)
29. Whether or not I personally reduce the amount of energy I use will have no real impact on the amount of energy that the U of A uses. (Reverse Coded)
30. My personal actions can reduce UA's level of energy consumption.
31. By changing our behavior, employees like me can reduce UA's energy consumption.

Perceived Behavioral Control

32. It would be easy for me to reduce the amount of energy I use at work. SA SWA U SWD SD (Heath & Gifford, 2002)
33. I feel that I have control over the amount of energy I use at work. SA SWA U SWD SD
34. Has your workspace been retrofitted for energy efficiency? Yes No

    If so, to what extent do you agree with the following statements:

    a. The energy efficiency retrofits increase my ability to control my energy use at work. (Reverse coded)

b. I don’t need to turn out the lights when leaving a room because the lights go out automatically after 15 minutes.
c. It is difficult to save energy because I have little or no control over the thermostat settings.
d. The university requires that computers be left on at night and on weekends in order to back-up systems and implement software upgrades.

35. I would do more to save energy at work if I knew how. (DeWaters & Powers)
36. It is my intention to save energy while I am at work.
37. My intention is strengthened when I see others saving energy.
38. I am willing to change my daily routines to save energy at work to help the university.

Computer Use – Desk Top (Carrico & Reimer, 2011)

39. The following items pertain to energy use on campus and refer to your office or workspace. Which of the following arrangements best describes the computer(s) that you use in your office or workspace? (Desk Top only, Lap Top with Docking Station, Desk Top and Lap Top, More than one desk top, no computer).
40. Do you have the energy-saving setting on your computer turned on? Y N Don’t Know
41. How many days in a typical work week are you in your office or work space? (1-5)
42. During a typical work week (Monday through Friday):
    - How many times did you power down your primary computer (including sleep or hibernate) before leaving fork for the day? (0-5 days, don’t know how)
    - How many days did you turn off your primary computer monitor(s) (including automatic sleep mode) before leaving work for the day (0-5 days, don’t know how)
    - How many days do you turn off or power down your secondary computer before leaving work for the day. (0-5 days, don’t know how)
    - If you have an external monitor hooked up to your secondary computer, how often do you turn this off at the end of the day (0-5 days, don’t know how, no monitor)

Computer Use – Laptop

43. During a typical work week (Monday – Friday)
    - How often do you power down your laptop (including sleep or hibernate modes) when you leave your desk for an extended period of time such as to go to lunch or to attend a meeting or run an errand? (almost never, about 25% of the time, about 50% of the time about 75% of the time, or almost always).
      (Note: this question should have read: How many times do you power down your primary computer when you leave your desk for an extended period of time.)

Light Use

44. Do you personally have lights in your office or on your desk in addition to the ceiling lights? N Y
45. If so, please indicate how many.

46. What types of bulbs are used? Incandescent, compact fluorescent, halogen, LED, don't know
47. During a typical work week (M-F):
    - How many days did you turn off the lights in your office or desk before leaving at the end of the day (0-5, 0 days – I didn't turn the lights on, there is no light switch, I don't know how to work the light switch, the lights go out automatically after I leave)
    - How many days did you turn off the lights in your office or desk before leaving for an extended period of time during the workday such as to go to lunch, attend a meeting, or run an errand? (almost never, about 25% of the time, 50% of the time, 75% of the time, almost always.)

Heating & Cooling

48. During a typical work week (Monday – Friday)
    - How many days did you adjust your thermostat before leaving work so that the heat/air-conditioning would run less while you were not there? (0-5) or N/A

Office Equipment

49. Do you have appliances or equipment in your office, lab or workspace that you use such as a coffee maker, fan, space heater, scanner, radio, phone charger or personal printer?
    - How many
    - How many of these appliances currently unplugged? (plugged in?)
50. During a typical work week (Monday – Friday), how often did you turn off office or lab equipment when you were finished using it? (almost never, 25% of the time, 50 % of the time, 75% of the time, almost always.)

Motivation to Conserve Energy (modified from Clark et al, 2003)

51. Rank order the following reasons for the university to save energy from 1 (most important) to 7 (least important).
52. Rate each reason as very important, somewhat important, not very important, Not at all important.

h. Reduce air pollution from energy production to improve the health of natural ecosystems.
i. Reduce air pollution from energy production to improve air quality for NWA residents.
j. Save money by reducing the University's utility bills.
k. Enhance energy security for the nation.
l. Enhance the university's reputation for environmental leadership.
m. Give faculty, students and staff a sense of pride.
n. Reduce the greenhouse gas emissions that cause global warming and climate change.

Demographics

53. Age 18-29 30-39 40-49 50-59 60+
54. Gender M F
55. Education HS Associates BS/BA Masters Ph.D./JD/MD
56. Race (optional) Hispanic or Latino, Black or African American, Native American or American Indian, Asian or Pacific Islander, White, Other, Prefer not to disclose
57. Role Staff Faculty
58. # Years at UA >1 – 3 4-10 11-20 20+
59. College/Unit Fulbright, Walton, Engineering, Bumpers, Education, Architecture, Law, Grad, Student Affairs, Finance and Administration, Alumni, Athletics
60. In what building is your office located? ________________________

Appendix C: Institutional Review Board Protocol Approval

November 18, 2014

MEMORANDUM

TO: Michele Halsell
Claretha Hughes

FROM: Ro Windwalker
IRB Coordinator

RE: PROJECT MODIFICATION

IRB Protocol #: 14-03-633

Protocol Title: *Examining Employees' Perceptions of Energy Conservation Behaviors in Office Settings*

Review Type: EXEMPT EXPEDITED FULL IRB

Approved Project Period: Start Date: 11/18/2014 Expiration Date: 04/07/2015

Your request to modify the referenced protocol has been approved by the IRB. **This protocol is currently approved for 677 total participants.** If you wish to make any further modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.
Please note that this approval does not extend the Approved Project Period. Should you wish to extend your project beyond the current expiration date, you must submit a request for continuation using the UAF IRB form "Continuing Review for IRB Approved Projects." The request should be sent to the IRB Coordinator, 210 Administration.
For protocols requiring FULL IRB review, please submit your request at least one month prior to the current expiration date. (High-risk protocols may require even more time for approval.) For protocols requiring an EXPEDITED or EXEMPT review, submit your request at least two weeks prior to the current expiration date. Failure to obtain approval for a continuation *on or prior to* the currently approved expiration date will result in termination of the protocol and you will be required to submit a new protocol to the IRB before continuing the project. Data collected past the protocol expiration date may need to be eliminated from the dataset should you wish to publish. Only data collected under a currently approved protocol can be certified by the IRB for any purpose.
If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.

Appendix D: Institutional Review Board Approval Letter

April 21, 2014

MEMORANDUM

TO: Michele Halsell
Claretha Hughes

FROM: Ro Windwalker
IRB Coordinator

RE: PROJECT MODIFICATION

IRB Protocol #: 14-03-633

Protocol Title: *Examining Employees' Perceptions of Energy Conservation Behaviors in Office Settings*

Review Type: EXEMPT EXPEDITED FULL IRB

Approved Project Period: Start Date: 04/21/2014 Expiration Date: 04/07/2015

Your request to modify the referenced protocol has been approved by the IRB. **This protocol is currently approved for 341 total participants.** If you wish to make any further modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.
Please note that this approval does not extend the Approved Project Period. Should you wish to extend your project beyond the current expiration date, you must submit a request for continuation using the UAF IRB form "Continuing Review for IRB Approved Projects." The request should be sent to the IRB Coordinator, 210 Administration.
For protocols requiring FULL IRB review, please submit your request at least one month prior to the current expiration date. (High-risk protocols may require even more time for approval.) For protocols requiring an EXPEDITED or EXEMPT review, submit your request at least two weeks prior to the current expiration date. Failure to obtain approval for a continuation *on or prior to* the currently approved expiration date will result in termination of the protocol and you will be required to submit a new protocol to the IRB before continuing the project. Data collected past the protocol expiration date may need to be eliminated from the dataset should you wish to publish. Only data collected under a currently approved protocol can be certified by the IRB for any purpose.
If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.