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A Journey Toward Sustainable Behavior: A Project To Stimulate Reduced Electricity Consumption

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A JOURNEY TOWARD SUSTAINABLE BEHAVIOR:
A PROJECT TO STIMULATE REDUCED ELECTRICITY CONSUMPTION

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A JOURNEY TOWARD SUSTAINABLE BEHAVIOR: A PROJECT TO STIMULATE REDUCED ELECTRICITY CONSUMPTION

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ABSTRACT

Housing organizations continuously face competition from other providers of low to moderate-income residential housing. That competition motivates those agencies to perpetually search for cost savings methods, which will enable them to continue providing supportive services to their residents. Additionally, the government has entrusted certain agencies with substantial funding that can inspire the organization to search for ways to demonstrate they are competent shepherds of those resources. Given that Alpha Homes' residents do not pay their electric bills, the fundamental question guiding this research was: could a housing organization significantly reduce the average tenant electricity usage through a combination of resident-focused "Education, Economic Incentives, and Evaluation"? This quasi-experiment utilized a time series model, with multiple regression, that sought to determine if any or all of the treatments created a significant reduction in tenant electricity consumption. The results show an overall significant reduction, in monthly electricity consumption, of approximately 8 percent for the Education and Economic Incentive treatment groups, and 5.7% for the group that received both treatments, which provides support for continued program implementation. These data offer policymakers an option for the providing of services for their residents.

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INTRODUCTION

Statement of the problem

Not for profit housing organizations continuously face competition from other providers of low to moderate-income residential housing. That competition motivates nonprofit and for-profit housing agencies to perpetually search for cost savings methods, which will enable those housing organizations to continue providing services to their residents. In the city of Akron, several organizations are vying for the same pool of residents. The following is a non-exhaustive list of the local housing agencies that compete: Akron Metropolitan Housing Authority (federally subsidized), Springhill Apartments (low-income tax credit program, for-profit), Summit Management (federally subsidized, for-profit). Also, East Akron Neighborhood Development Corporation (tax credits, private nonprofit), Testa Builders (federally funded, for-profit), and Rosemary Square (federally subsidized for profit). Additionally, the government has entrusted certain housing agencies with substantial funding, which can inspire the organization to search for ways to demonstrate they are competent shepherds of those resources. Akron Metropolitan Housing Authority (AMHA), a public nonprofit, that utilized Hope Six HUD funds to rebuild Elizabeth Homes, which is now known as Cascade Village. Also, AMHA secured Hope Six funding to rebuild Edgewood Homes, which they renamed Edgewood Village. The Hope Six funding for the Cascade Village and Edgewood

Village project was secured approximately 11 and 12 years ago, respectively. During the program year, Section 8, which is a HUD program, provided the federal subsidies for the agencies mentioned above (T. Fuller, personal communication, April 25, 2020).

The organization that was the focus of this research (Alpha Homes Inc.) has tenants that are on full-service-gross (FSG) leases, meaning the organization pays for all routine maintenance and utility costs. Also, the Federal Housing Administration (FHA) provides mortgage insurance for each project (T. Fuller, personal communication, April 25, 2020). The criteria for residency at each subject project is the following: low income, minimum age of 62, or being disabled. The one exception to the residency criteria is the Wooster Elderly property that does not allow anyone under the age of 62. The research projects receive federal funding through HUD's Section 8 program. In addition to the HUD and FHA funding, the city of Akron invested in the Akron based project (Wesley Tower). Since the tenants have FSG leases, there is no motivation for them to conserve, as it pertains to their utility usage. Non-conservation behavior created unusually high electric bills considering the apartment size and number of occupants.

Approximately a year prior to conducting the research, the subject organization did a review of the electric bills at Charles H. Wesley Tower (ETL), which has 107 units. At ETL, which eventually received both treatments, each apartment has an electric meter. The units are nearly identical in size (approximately 550ft^2) and have the same number of rooms (the organization is locating the floor plans for each building). Still, the electric use patterns identified in the electric bills appear relatively high. The kilowatt-hour (kWh) usage ranged from a low of 87 to a high of 1,718, which, when combined with the cost of electricity, equates to bills that ranged from $15 to $179 for one month of electric.

Accomplishing a significant reduction in overall tenant electricity consumption will save valuable dollars for the organization and provide them with additional capital to invest in the various housing developments.

After investigating electricity usage in ETL, this researcher discovered what he believes to be an overconsumption problem and saw an opportunity to make a positive impact on tenant behavior with my dissertation. Surprisingly, some programs fare better by being structurally loose, which can open a unique space for testing new ideas (Zingale, Samanta, and West, 2017). While being structurally free can spark serendipity, it is also essential to be mindful that ill-advised efforts designed to make changes that are difficult to accomplish can exacerbate the problem (Bowen, Dunn, and Kasdan, 2010). The exciting aspect of this opportunity is, if successful, this project can be generalizable to similar properties around the country and throughout the world. Some organizations resist change and have a fear of treading into the realm of the unknown (Jackson Leftwich, 2017). Luckily, Alpha Homes is very receptive to availing themselves of new opportunities. So, the possibility of bringing acclaim to the Cleveland State University, Alpha Homes, including adding to the current literature, and making a difference in the known universe has definite appeal.

Background of the organization

The Eta Tau Lambda chapter of Alpha Phi Alpha Fraternity, Inc. formed Alpha Phi Alpha Homes, Inc. (Alpha Homes) in 1966 as a non-profit housing corporation based in Akron, Ohio. The mission of Alpha Homes is to develop affordable housing for moderate to low-income families and senior citizens. Alpha Homes manage

approximately 1,750 units comprised of a mix of rentals and residential for-sale units located in Ohio and Illinois ("Alpha homes," 2015).

Why Electricity and Significance of this Proposal

There are several justifications for my interest in studying the electricity usage behavior of residential tenants who reside in Alpha Homes' properties. Fortunately, this researcher participated in a sustainability project (The Quadruple Bottom Line (PPPP), Simons, Robinson, Lee, and Bragg, 2015), which is where this researcher first developed a genuine interest in energy conservation. The premise of PPPP is that adhering to energy savings practices is beneficial to the "**P**lanet," "**P**eople," and can provide landlord "**P**rofit," as well as tenant "**P**rofit," hence the Quadruple Bottom Line (Simons et al., 2015). Additionally, this researcher served on the board of directors for Alpha Homes for over ten years and had a fiduciary responsibility to ensure the organization was as fiscally responsible as possible. Although this researcher is no longer a board member, he remains a member of the fraternity and supports the organization's mission.

Additionally, there was a cost for conducting this study. Since this researcher could not underwrite the entire bill himself, a significant assumption was me having the ability to develop adequate funding to complete the research. With sufficient funding, this researcher was able to produce more and higher quality flyers to advertise the program and offer more and better incentives for reduced electric consumption and program attendance. Proper audience motivation, or lack thereof, can change the program outcomes significantly. Lastly, while this researcher received a letter of support from the host organization (see Appendix A), another primary assumption was their continued support of this research, despite changes this researcher needed to make to adhere to proper

research methods. This researcher believes he capitalized on an opportunity to make a tremendous difference for non-profit housing authorities, which this researcher brought to fruition, with the full support of Alpha Phi Alpha Homes Inc.

Following this Introduction Chapter is the theoretical framework and literature review (Chapter II), which is supported by the conceptual framework and hypotheses (Chapter III). Chapter IV, research design, and methodology used for this research follow Chapter III. Chapter V, the Results Chapter of this research follows Chapter IV, and lastly, the discussion and conclusions are in Chapter VI. In Chapter VI, this researcher discusses his findings and how this study can benefit housing organizations both now and into the future.

CHAPTER II

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Based on the traditional neoclassical economic model of human behavior, my initial plan utilized "**E**ngineering" (i.e., technology and environmental changes through signage), "**E**conomic incentives" and "**E**valuation." This research, based on the philosophical framework of Positivism, thus quantitative, and this researcher evaluates the process using the following five domains of inquiry: 1. Ontology, 2. Epistemology, 3. Image of Man, 4. Ideology, 5. School of Thought. The positivist ontology, based on the premise there is a reality out there that is discoverable, places the researcher separate from the research (Riccucci, 2010, p. 47). According to Riccucci (2010), the ontology of the positivist includes universals that are real and exist. This research generates quantitative data that exists and would answer the following research questions: 1. Can a housing organization reduce the average tenant electricity usage through a combination of tenant focused "**E**ngineering, "**E**conomic incentives," and **E**valuation"? 2. Is it economically viable for the organization to conduct the "**3-E"** program?

The epistemology addresses an objective reality that exists outside the human mind, where knowledge should be value-neutral and achieved using deduction (Riccucci, 2010, p. 47). From the results of the data, this researcher was able to deduce whether the program reduces electricity consumption.

The positivist image of man suggests subjects of research are objectified, and the researcher behaves in a scientific manner that does not interject subjectivity. The tenant electricity consumption is measured, compared to previous data, and statistically analyzed to determine results.

The positivist's ideology is quasi-scientific, they believe science is the only way, and the goal of this research is to explain. They derive correct answers through natural science testing methods (Riccucci, 2010).

The positivist's school of thought describes an obtainable reality through empirical testing; one of the research goals is that the results are generalizable (Riccucci, 2010, p. 100). This study is unique to my host organization; however, if successful, the process could be utilized by other agencies.

Placing this research on Thorngate's clock, it is in the 2 o'clock position. In the 2 o'clock position, the analysis is general and accurate and is grounded in real observations (Lundberg, 2005, pp. 212-213). Another research strategy utilized is an unobtrusive field study, which is part of the Three-Horned Dilemma that best fits into quadrant I strategies; (Lundberg, 2005, pg. 290).

According to Congdon, Kling, and Mullainathan (2011), in the neoclassical economic model, individuals are proficient at maximizing their utility; meaning, they know what they want and what will make them happy, and their choices and preferences are consistent. Based on this theory, and presenting the residents with a likable program, it should not be a challenge filling the seats since their attendance provides them with maximum utility. Under the classic model, individuals have no difficulty realizing their desires, and there is time consistency with their preferences (Congdon et al., 2011). So,

prioritizing to attend such an outstanding program should not be a problem for the attendees. In the standard economic model, people make a decision purely in their self-interest that best secures their future (Congdon et al., 2011). So, if attending the program provides an avenue to preserve the future of the planet and offers them personal incentives for participating, then the decision to join in is straightforward. The positivist framework differs in that there is no room for emotions, value, and moral sentiment (Riccucci, 2010).

Since this researcher believes people are not automatons and that emotions, value, and moral sentiment are essential, my ultimate quasi-experimental design utilizes the behavioral economics model of human behavior. The research program used "**E**ducation," "**E**conomic incentives," and "**E**valuation." This research, based on the philosophical framework of Post positivism, which is qualitative and quantitative, evaluated the process using the following five domains of inquiry: 1. Ontology, 2. Epistemology, 3. Image of Man, 4. Ideology, 5. School of Thought. The postpositivist ontology, based on critical realism, where researchers and reality are the same. Riccucci, 2010, p. 47). Lather (1986) discusses how, ontologically, the knowledge gained by the postpositivist researcher and the research participants is inextricably linked, which Riccucci (2010) defines as the critical realism mentioned earlier. This research will generate qualitative and quantitative data that will answer my research questions, again, which are: 1. Can a housing organization reduce the average tenant electricity usage through a combination of tenant focused "**E**ngineering, "**E**conomic incentives," and **E**valuation"? 2. Is it economically viable for the organization to conduct the "**3-E"** program?

From an epistemological perspective, Lather (1986) describes a socially constituted, historically embedded, and valuation-based knowledge. Theory serves a unique function, and research illustrates (vivifies) rather than providing a truth test. Lather's (1986) description meshes with Riccucci's (2010) description of the postpositivist epistemology, which describes a reality that exists but is too complicated to be fully understood. The ideology emanates from there being numerous approaches to acquiring knowledge, and the image of man finds that people are critical cogs in the research wheel and should participate in both the construction and validation of the research (Lather, 1986). The school of thought uses Q-methodology analysis to discuss the virtues of praxis-based study, which also falls within the realm of Postpositivism (Riccucci, 2010).

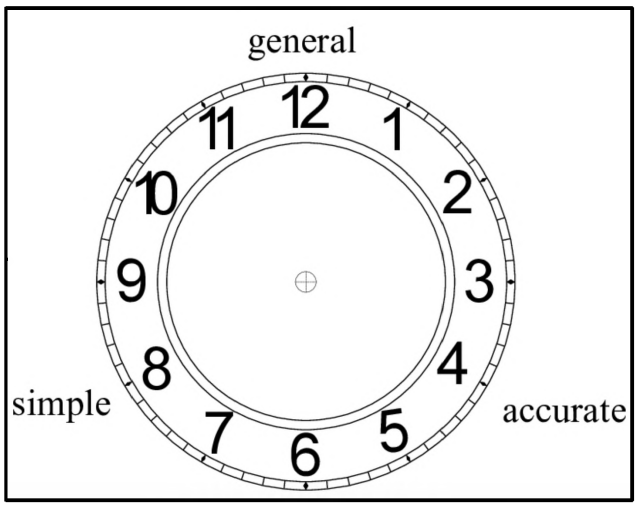

Figure 1. Thorngate's Clock

When placed on Thorngate's clock, this study is in the 10 o'clock position (see Figure 1). According to Lundberg (2005), ten o'clock research is a better model for the social sciences (pg. 215). In the ten o'clock position, you find the critical theory area,

which is both "simple" and general; however, it does have accuracy issues. Another research strategy this researcher utilized is a field experiment (education classes), which is part of the Three-Horned Dilemma, that best fits into quadrant I strategies; (Lundberg, 2005, pg. 290).

According to Congdon, Kling, and Mullainathan (2011), in behavioral economics, it is accepted that individuals are not proficient at maximizing their utility. Not maximizing efficiency means they may not know what they want or what will make them happy, and there is inconsistency in their choices and preferences. Based on this understanding, this researcher must be extra diligent in making the program appealing to garner support through attendance; because a casual view of the invitation may not be enough for prospective attendees to realize how they can maximize their utility. In behavioral economics, individuals have difficulty achieving their desires, and time consistency, with their preferences, does not exist (Congdon et al., 2011). So, to piggyback on my previous comments, the prospective attendees may have trouble prioritizing time in their schedule to attend this program, even though they are interested in participating. So, this researcher needed to create a system of constant reminders. In behavioral economics, there are countless reasons for the decisions people make, and their choices are not always in their best interest (Congdon et al., 2011). So, it is critical that the program not only focuses on personal benefits but also provide value that can be vicariously transmitted. The postpositivist framework is ideal for implementing storytelling designed to highlight values and moral sentiment (Riccucci, 2010). This structure allows me to focus on each of the 3E's present in my research. In addition to the research questions listed above, the second domain of inquiry is conducive to conducting a

comparative analysis of the program's strengths and weaknesses. This review occurs at the monthly check-up meetings, which is also an ideal time for sharing anecdotes, both positive and negative, that have resulted from their attendance.

The postpositivist domain is more likely to achieve program success because it can capitalize on the synergy generated through group participation. This domain is an inductive PNS process that is not seeking a right or wrong answer. Still, as written in Lather (1986), it is more focused on improving the lives of all involved as, together, everyone builds a better society. Everyone working as one is a real TEAM concept where together everyone achieves more!

It is shortsighted to ignore moral hazards, asymmetries of information, externalities, bounded self-control, non-standard preferences, and imperfect optimizations, which are critical behavioral concepts to consider when designing a behavioral change program. This researcher arrived at his research topic because of identifying a moral hazard; that being, tenants not suffering any perceived adverse consequences for their overconsumption of electricity. The optimal word here is perceived, so it is my job to determine if my perception of their behavior, which is a moral hazard, is correct. Because as found in Congdon et al. (2011), not understanding the actual problem can lead to faulty policies; this researcher designed a program that created consequences that were and are apparent to everyone. Moral hazards are sensitive to the dimensions of choice and preference, so it is important to note that behavioral tendencies can mitigate or exacerbate the effects of "moral hazards" (Congdon et al., 2011). If specific individuals have access to more accurate data, there is an issue described as asymmetries of information; however, behavioral economics tells us that people may not be able to utilize the data, which

eliminates the problem (Congdon et al., 2011). For program planning purposes, it is best to make every effort to keep everyone informed at the same level. Free-flowing information will help avoid the impression favoritism or us versus them mentality. According to Congdon et al. (2011), externalities can exist when individual actions affect those around them in ways not accounted for in the price system. What is critical to understand is that externalities can be either positive or negative, and those behavioral tendencies can affect how individuals respond to them (Congdon et al., 2011). The overarching point with externalities is to be aware of their potential presence and have the flexibility to respond to any adverse effects. Bonded self-control is an exciting concept that is described by Congdon et al. (2011), as not being able to implement your wants even when they are accurate and known to you. Procrastination is a real phenomenon that creates a paralysis of action; so, the reality is, individuals have more trouble acting on their desires than the standard economic model assumes (Congdon et al., 2011). With bonded self-control as a backdrop, some handholding may be necessary to move people to action. Knowing that people make decisions for reasons other than their best interest, which is an aspect of non-standard preferences, is a critical concept to embrace (Congdon et al., 2011). Also, the fact that a decision is more likely to be made to accomplish a status change versus long-term benefits is a critical concept for a program designer. Supplying program attendees with certificates or some other visible acknowledgment that set them apart from the peers could create a competitive atmosphere and increase program attendance. Lastly, the concept of imperfect optimization is the thread that binds the other ideas together. Standard economics assumes that people are optimal decision-makers when the opposite is true (Congdon et al., 2011). The authors described a scenario where

a person drove a great distance to save $5 on a $15 calculator but would not travel the same distance to save $5 on a $125 coat (Congdon et al., 2011). There is a psychological aspect to creating a successful program, but what this researcher finds most valuable is the understanding that not everyone thinks alike, so to generate enough diversity to increase program appeal is very important.

Post-Normal Science (PNS)

According to Ravetz (1997), PNS has a unique methodology that, unlike normal science that asks safety-related questions like 'what/how?' and 'how/why?'; PNS asks a question like 'what-if?' and 'what-about?' (as cited in Funtowicz & Ravetz, 2008, p. 366). My research may not appear to be safety-related. However, the wasteful use of electricity, mainly when produced by coal or water, can have a myriad of adverse effects that can and do jeopardize the safety, and dare this researcher to say, future of humanity. Funtowicz and Ravetz (2008) discuss the following three zones of inquiry: "Applied Science, Professional Consultancy, and Post-Normal Science," and places these zones between the X and Y axes, being identified as "Systems Uncertainties" and "Decision Stakes" respectively (p. 362). As seen in Figure 2, where the axes converge, is applied science and furthest from the convergence of the axes is PNS; in the Applied Science zone, simple puzzle solving will suffice when dealing with policy issues (Funtowicz & Ravetz, 2008). In the middle area, there is Professional Consultancy, which research notes for having particular expertise yet possessing the ability to adapt when faced with the unexpected (Funtowicz & Ravetz, 2008). In the PNS zone, science certainly plays a part as individuals scientifically trained will be counted on for technical issues. Still, since the

uncertainties and value loadings are high, a collaborative approach is necessary (Funtowicz & Ravetz, 2008).

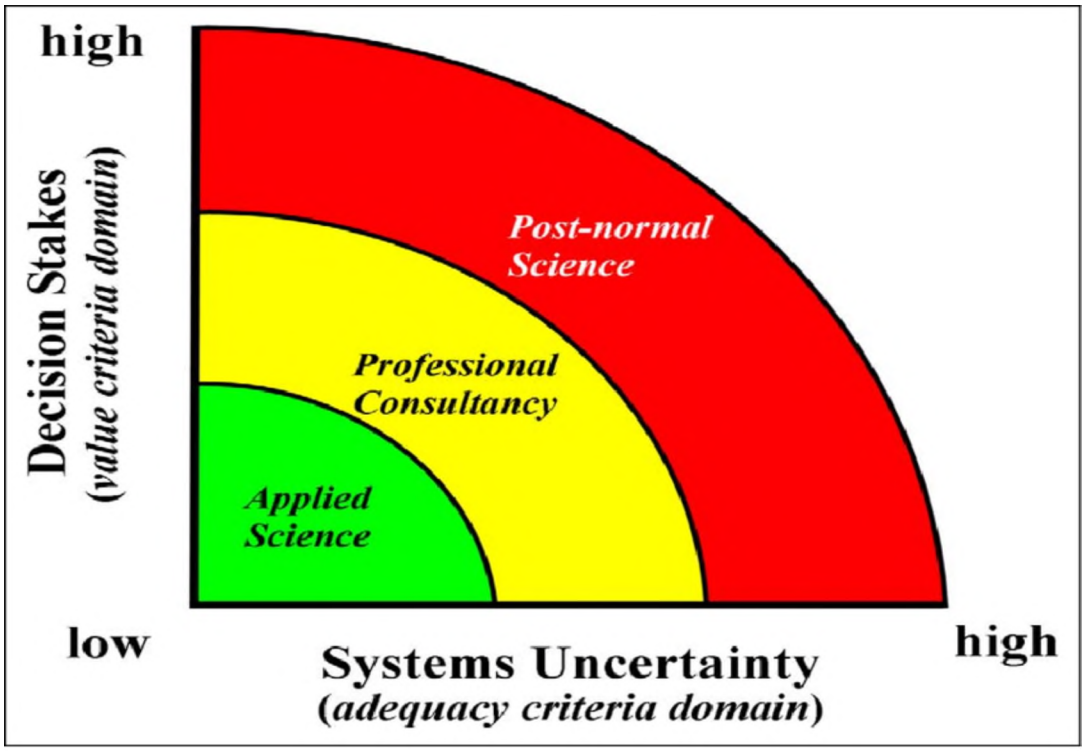

Figure 2. *A post-normal science perspective in perspective. Source: Underlying image from Funtowicz and Ravetz (1990), included with permission, criteria domains drawn from Ravetz (1971), added by the author.*

My research has aspects that fit in each zone, moving from the puzzle-solving aspects of applied science or deductive research, through the specific training and adaptability required for Professional Consultancy, and finally, the collaborative efforts found in PNS where induction is the best fit. This researcher collected historical electricity usage data that was captured in the last five years and compared it to the power usage data generated post residents attending the program (Appendix B shows sample data). The analysis of data, pre-and post-program attendance, is the deductive aspect of my research; this is where this researcher determined if electric usage has been significantly reduced and, if so, was the reduction cost-effective. This researcher

conducted classes that required specialized instructor training, which included the instructor preparing to handle the unexpected (e.g., computer glitches, microphone failure, delayed food, etc.) that could and did occur when preparing for and conducting the classes. This aspect of my research is the Professional Consulting component. Lastly, the actual classroom interaction is where the synergistic magic occurred; this is where the particular expertise of the instructor was enhanced by the collective wisdom and experience of the audience, as the group collectively addressed the reasons for, and benefits derived from conserving electricity. The classroom is an inductive PNS zone for my research, where the uncertainties and decision stakes were high.

There are several assumptions this researcher is making concerning sustainable behavior research. First, for the inductive research process to function correctly, the issue studied must have uncertainties and decision stakes that are high; this makes using PNS the best fit. However, one of the unique aspects of my research is that when the participants walk into the classroom, they may come in tabula rasa; or worse yet, they may not value sustainability at all. So, the challenge is presenting a program that instills the importance of sustainability into those who have no opinion and have sufficient material to change the minds of those who do not value sustainability or minimally take the sting out of their possible dissension. In short, this researcher must convince the participants of the high-level decision stakes involved and the uncertainties of life absent of sustainable behavior. Another primary assumption is my program successfully transmitting the value of embracing the concept of the quadruple P or PPPP, which addresses sustainable practice. The idea of there being benefits for people (P); benefits for the planet (P); profits for tenants (P); and lastly, profits for landlords (P), is an essential concept of the program

(Simons, Robinson, Lee, & Bragg, 2017). If attendees disagree with the PPPP concept, they could purposely use more electricity to show defiance; obviously, this would change the outcome significantly. This researcher heard that the fear of loss is a more significant motivator than the opportunity for gain; because of this, this researcher focused on how not adhering to sustainable practices can negatively affect the lives of those they care for deeply. Since a portion of the program required attending classes, a significant assumption this researcher made was that he would be able to inspire adequate resident attendance successfully. With my first hypothesis based on having data from residents attending the program, this researcher needed to develop creative ways to motivate participation, which created a significant enough N to conduct statistical comparisons. Also, if attendances were dismal, the usefulness of the second hypothesis, which seeks to measure consumption based on program exposure, would be limited. So, with the classes being a significant component, non-or feeble attendance would substantially weaken the research.

LITERATURE REVIEW

The literature identified seven subcategories that address organizational change, electricity-savings behaviors, and behavioral change. Additionally, this researcher included corporate social responsibility (CSR) and sustainability research since they represent a crucial component of the new practices a successful project will create.

Since there is no universally accepted definition for CSR, the term can seem somewhat nebulous. Still, for this literature review, this researcher defines it as any action designed to enhance the public good (McWilliams & Siegel, 2001). Sustainability can be equally nebulous, so this researcher describes it as the blending of economic, ecological, and social imperatives (Hanna, 2005).

Behavior Change (Administration)

The initial step in the organizational change process is realizing the need for change, paying particular attention to improved financial performance to maintain competitiveness (Erwin, 2009).

Frequently, organizations resist change because they are more comfortable with the status quo than the consequences of treading into the realm of the unknown (Jackson Leftwich, 2017). Erwin (2009) believes the next step is to communicate the organization's goal to improve its financial position, which may require the dissection of the agency's operations. Public managers have a vital role in expressing the need for organizational change, including the codification of inter-organizational structures and procedures, which includes the ability of executives to affect change (Parlea-Buzatu, 2011). After the executives and managers have embraced the need for change, they should seek support from those best positioned to bring the new plan to fruition; this

includes serving as cheerleaders for the change process (Erwin, 2009). Surprisingly, innovative ideas or programs are not necessarily well planned, they sometimes occur in the shadow of administration, and may fare better by being structurally and functionally loose, which may create the optimal space to play around with new ideas (Zingale, Samanta, and West, 2017). However, according to Bowen, Dunn, and Kasdan (2010), ill-advised efforts designed to make changes that are impossible to mold can lead to unintended results that can exacerbate the issue.

Behavior Change (Staff)

The incipient planning phase of the change process begins typically with the administration, but the literature posits how moving from planning to implementation can be exciting. According to Erwin (2009), "The transition from planning to implementing the change proved to be as challenging as the entire planning process. Developing plans and communicating them to those involved in the change process was not the same as achieving the goals" (p. 36). After finalizing the management process, another critical issue is for the executives and managers to demonstrate transparency by discussing the organization's financial position with the staff (Erwin, 2009).

It has been my experience that employees react much more favorably to new policies or processes if informed throughout the entire change process. Unfortunately, some managers, incorrectly, believe that shielding employees from paradigm-shifting information until the last possible moment, is somehow showing compassion and leadership; however, the literature is not in accord with that thinking.

During the change process, one of the most significant obstacles to success is the absence of leadership, discipline, and skills from the pivotal organizational members.

These members occupy critical roles in planning, identifying, and implementing the agreed-upon action (Erwin, 2009). The idea of maintaining an open line of employee communication bolstered by Jimmieson and White (2011), where a study demonstrated how employees who felt well informed exhibited much more supportive behaviors and actions (p.338). These behaviors and actions led to more proactive activities. Jimmieson & White (2011) describe how active staff involvement, which includes interacting with co-workers, is necessary to create the requisite enthusiasm, which inspires proactive behaviors such as sharing vitally helpful information with colleagues, supervisors, and any others who play an essential role in the change process (pg. 338). Along with active involvement, there is support for the idea that vital staff information, which informs them of opportunities for self-expression and participation in the planning process, is given in an accurate and timely manner. Communicating with the staff will assist in helping them develop supportive attitudes for the change effort (Jimmieson & White, 2011).

According to the literature, while effective communications are essential, other categories positively affect change, which Butterfield, Borgen, Amundson, & Erlebach (2010) address:

> The encouraging message from this study is that there appear to be ways of feeling, thinking, and acting that facilitate handling change well, and it is possible to learn to manage change effectively (or in more effective) ways. Counseling interventions based on the ten critical incident categories would offer initial suggestions that might aid workers who are struggling with change within their work, personal, family, and social contexts (p. 154).

Theories like effective communications, fairness, psychological contracts, trustworthiness, stress, and support are all critical to staff members; non-adherence to those items can lead to incidents that hamper the change process. They also lead to an

increase in wish list items centering on improving the managerial style and the work environment (Butterfield et al., 2010).

To complete the staff portion of the change literature is a piece that speaks to organizational commitment (OC), and can be value-based.

"Employees build effective and normative OC by connecting their values to the perceived values of their current organization, and this is more likely to happen when the organization's values lie within prosocial clusters such as vision and humanity" (Abbott, White, & Charles, 2005, p. 549).

Behavior Change (Nonprofits)

The potentially harmful effects of change, which can affect employee morale, in nonprofit organizations, which Alpha Homes is, have been widely documented and have led to the suggestion of internally and externally focused approach to change (Parsons & Broadbridge, 2004). The inclusion of an internally focused change approach, which surpasses the traditional techniques of consultation and relies on a review of organizational history to identify critical competencies, can simultaneously embrace tradition and change (Parsons & Broadbridge, 2004).

Due to Federal mandates and a desire to be more profitable, Alpha Homes must implement certain aspects of sustainability into their operation. Portney & Cuttler (2010) found the following:

> The analysis shows that the cities that are more serious about sustainability have local public officials who interact more with nonprofit organizations and are more likely to report the presence of at least one nonprofit group that supports city sustainability policies. (p. 323)

Additionally, nonprofits serve as an ideal voice to encourage the pursuit of sustainability, a voice best expressed through advocacy created through interacting with

local officials to express those views (Portney & Cuttler, 2010). In addition to serving as a voice for sustainability, there is evidence in the literature suggesting nonprofits are uniquely situated to be more efficient at spearheading change in their community than other groups (Portney & Cuttler, 2010).

Behavior Change (Sustainability)

The energy consumption literature is vast and wide-ranging; in this section, this researcher will carve out a few fundamental issues that are relevant to the sustainability issue, as it applies to individual behavior. "Changing the manner in which Western societies currently operate, use, and design the built environment could profoundly mitigate climate change concerns and offer more promising opportunities for the developing world" (Fink, 2011, p. 22). Fink (2011) states the carrot and stick approach is a fair method of accelerating energy-related retrofits in the building sector and employs a variety of measures (p.23). These measures include a progressive emissions tax (stick), energy inefficiency taxes (stick), financial incentives (carrot), performance targets, and efficiency standards (Fink, 2011).

Measuring individual behavior, in the home environment, is more complicated and requires a more diligent approach to change; when considering appliances, except lighting, there is a need to identify innovative ways to capture those behaviors, which gives rise to new methods for behavioral change (Kashif, Dugdale, & Ploix, 2013). The frequent opening and closing of the refrigerator, as well as putting hot, uncovered, and large quantities of food in the fridge, increases cycling time, which increases energy consumption (Kashif, Dugdale, & Ploix, 2013). The placing of hot, uncovered food in the refrigerator as a cause of increased electricity usage is something this researcher never

considered. That type of information was great to add to the education component of the treatment plan.

Earlier studies discovered the importance of using the information to influence household energy consumption; this info addresses the moral aspects of household energy consumption in addition to financial issues (Palm, 2013). The optimal time for an organization to introduce energy conservation features is during construction or significant rehabs (Palm, 2013). This researcher found the recent piece critical since an Alpha Homes' senior high-rise building is on the rehab schedule for the end of this year. According to Palm (2013), to achieve ambitious energy conservation goals, the entire organization must embrace the ideas and commit to making efficient energy choices whenever possible (Palm, 2013). This researcher believes sustainability is about our survival as individuals, neighborhoods, cities, states nations, and as a planet. The following excerpts from the sustainable community's literature are supportive of my belief.

An initial step in the sustainability movement is to connect those who inhabit the community with the built environment, which would undoubtedly add additional stimulus toward establishing sustainable communities, both in existing and future communities (Hadfield-Hill, 2013). Sustainability is ultimately about community survival and the establishment of a discourse, which expands the notion of sustainability, starting with original ideas and moving to powerful collective thoughts (Hanna, 2005). Authors make a compelling argument for creating sustainable communities, but what methods are useful in supporting the creation of those communities? A particular study result indicates sustainable behaviors created with low-cost methods, such as signage, with surprisingly,

simple messages are often far more efficient. "Simplicity is the ultimate sophistication" (Becker, Ayscue, Brockett, Scarola, & Kelley, 2014, p. 10). This study suggests it is best to alter cognition (behavior) and the environment (signage with motivating messages) to encourage the desired behavior, and dominate actions that support, help, reinforce, and nurture those change efforts and the targeted activities (Becker et al., 2014). The results of the recycling study identified a positive change in recycling behavior with post-treatment results indicating nearly 74% of bottles getting recycled, compared to the pre-treatment total of 27% (Becker et al., 2014).

Behavior Change (Organizational Culture)

The uniqueness of organizational cultures can affect how they handle and react to change, so understanding how to best address these cultural issues is critical to include in the change planning process.

Organizational efforts using a multifaceted approach to change, including digital media, have been successful at increasing corporate values and support; to assess broader impacts, more organizations need to conduct similar efforts (Towne Jr., Anderson, Smith, Dahlke, Kellstedt, Purcell, & Ory, 2015, pp. 4-5). One aspect of Behavior Change is possessing the ability to influence the behavior of organizational members. The literature discusses manners in which organizations digest change; two elements that affect this phenomenon are the organization's culture and organizational citizenship behavior (OCB). Research has identified that organizational effectiveness is improved when OCB, defined as actions that go beyond your usual role requirement (volunteering) that benefit the organization, is increased (Duffy & Lilly, 2013).

If building management is cognizant of the composition of their building's social network, the success of new behavioral implementations is enhanced (Anderson, Lee, & Menassa, 2014).

There is something called social marketing; the term "social" represents an ideal state reached by incentivizing the target audiences to embrace desirous program behaviors and refrain from activities that are deleterious to human health and safety (Chriss, 2015). The social marketing concept is relevant for creating program interest.

Greitemeyer & Kazemi (2008) found greater success inducing behavior change with rewards rather than with punishments, so stressing the benefits of the new behavior is vitally important for those who educate; to minimize any potential penalty (p. 256). Additionally, and perhaps more importantly, behavior change created using incentives (rewards) were more likely to be sustained after the award was no longer offered (Greitemeyer & Kazemi, 2008). This piece supports the economic incentive part of the 3-E program.

Behavior Change (Individual Energy Consumption)

According to Fujimi, Kajitani, and Chang (2016) electricity-savings behaviors that require little effort, and do not cause discomfort to the occupants, are often quite useful. Fujimi et al. (2017), divided energy-saving behavior into two categories, curtailment behaviors, which are more repetitive behaviors such as adjusting a thermostat, and efficiency behaviors that involve the one-time, replacement of an appliance to increase efficiency. In their study of household electricity energy-saving behavior, most participants were able to reduce consumption by 2-4%, and these reductions maintained for two years (Fujimi et al., 2017). It is important to note, the subjects of their research

were motivated to conserve electricity due to being faced with electricity shortages caused by an earthquake and the resulting tsunami (Fujimi et al., 2017). My research focused on curtailment behaviors because management replaces the major appliances that are the focus of the efficiency behaviors, not the residents. They utilized a regression model that found significance, minimally at the 10% level for the following actions: a reduction in watching TV, and a reduction in the use of lighting and the intensity.

Additionally, they found a reduction in the power of refrigerator cooling and the cleaning of air conditioning filters (Fujimi et al., 2017). Each of the items mentioned earlier was an area of focus in my education classes. One of the recommendations of Fujimi et al. (2017), is that someone conducts research utilizing some public information strategies, which is precisely what my study seeks to accomplish.

Research has demonstrated that one of the essential ways of creating energy savings behavior is by providing information, including feedback, to the consumers (Vassileva & Campillo, 2014). According to Vassileva and Campillo (2014), when conducting an energy-savings program for low-income individuals, it is best to utilize the information that addresses both money savings and environmental improvement. Additionally, it is crucial to assess the preferred medium (e.g., letter, email, etc.) the occupants desire to receive their electricity usage feedback (Vassileva & Campillo, 2014).

According to Asensio and Delmas (2016), emphasizing the health benefits of electricity energy-saving behavior provides a more significant long-term benefit than by highlighting the cost-saving benefits of electricity energy-saving behavior. The power of information, as it relates to message framing and electricity conservation, is a critical non-price mechanism for creating behavior change (Asensio & Delmas, 2016).

Chang, Huh, and Lee (2016) designed a study to determine if hotels could replicate the customer electricity consumption, reductions utility companies obtained utilizing electricity conservation nudges. A one-way analysis of variance (ANOVA) revealed new behavioral intentions toward conserving electricity, which was prominent when the subject received a behavioral push (Chang et al., 2016). An analysis of covariance (ANCOVA) confirmed the effectiveness of the nudge at reducing electricity consumption (Chang et al., 2016). According to Thaler and Sunstein (2009), the term nudges is a mnemonic reminder of the following six principles of good choice architecture: "iNcentives," "Understand mappings," "Defaults," "Give feedback," "Expect error," and "Structure complex choices" (Thaler & Sunstein, 2009). Researchers can draw on critical insights from behavioral economics to identify vital cognitive biases and inspirational factors that might explain why energy-related behavior often fails to be in sync with the personal values and interests of customers (Frederiks, Stenner & Hobman, 2015). According to Frederiks et al. (2015), understanding behavioral psychology can lead to more cost-effective and mass-scalable behavioral solutions that encourage sustainable energy use among consumers.

Behavior Change (Tenants)

Energy consumption research has, not surprisingly, found evidence indicating that whoever pays the heating and cooling bill is concerned about usage; in fact, those who are responsible for their heating bill are 16 percent more likely to turn down their thermostat at night. There is a similar effect for air conditioning, but the percentage reduction is not as high (Gillingham, Harding, & Rapson, 2012).

The research revealed how including humans in the energy conservation loop created a 20% reduction in heating costs and a 40% reduction in cooling demand (Zeiler, Vissers, Maaijen, & Boxem, 2014). Having the ability to isolate individual user behavior can be used as a means for optimizing comfort as it relates to energy consumption (Zeiler et al., 2014). The previous sentence leads me to believe that, whenever possible, utilities should be individually metered. According to Phillips (2012), resident's statements about the warmth and comfort of their apartments differed from the landlords. This literature highlights the difference between tenant and landlord perspectives. Central air conditioning usage, like household heating, is affected by who pays the bill, with reduced usage if the cost is the tenant's responsibility; however, the difference in usage is not as significant as with heat (Gillingham et al., 2012). The proposed treatments can be effective at generating funds to provide additional services to tenants, particularly in a nonprofit operation like Alpha Homes, whose mission is to deliver services to the residents. There are several control variables to consider when exploring tenant electricity consumption. Such as who pays the electric bill, the type of metering (individual, or master), the income level of residents, senior citizen versus non-senior, number of bedrooms and number of occupants, or area of the country. The critical tenant demographic for Alpha Homes is the senior citizen population since they represent the overwhelming majority of the tenant base. James III (2008) found the senior citizen population tends to be more concerned with their home environment than non-seniors. And find residential services more critical; this fact makes them more likely to gravitate toward maintenance-free (apartment) living, which increases their residential satisfaction (p. 434).

The variables listed serve as an example and is in no way meant to be exhaustive. Again, theory and peer-reviewed literature suggest there are differences in consumption based on who pays the bill, so logic would indicate the style of metering would affect usage as well. Alpha Homes have buildings that are individually metered and mastered; however, the fact that Alpha Homes pays all tenant utilities makes the style of metering inconsequential. There is an increasing demand to identify strategies to control energy usage; according to Zeiler et al. (2014), putting the occupant in the planning loop is of vital importance and a necessary step in the planning process. According to Palm (2013), freely sharing information that touches on more than financial aspects of energy consumption is a significant motivating factor for tenants. Palm (2013) shares the following anecdote from an occupant interview: "Interviewer: Do you think there is any way that you can influence your energy use"? M1: Of course, but I'm horrible at doing it. I can certainly do it if I put my mind to it, but we don't care." (p. 68). If tenants receive the proper information, they have reasons to care. Fink (2011) believes the building sector is where individuals have the best opportunity to mitigate environmental factors on a large scale. The mitigating of ecological factors can happen if those involved make the following implementations: information and education, financial incentives, energy services, new technologies incorporated in the design process, community social norms, and information about the natural environment (Fink, 2011). Fink's (2011) article provides support for my proposed 3-E research program. Since behaviors in the home environment, such as appliance usage, are more complicated, a more aggressive, energy consumption change process is necessary (Kashif, Dugdale, & Ploix, 2013). Early and frequent communication with employees and residents is a consistent theme throughout

the literature and should be an area of focus for any new initiative. Table 1 is a summary of the seminal research related to this project:

Table 1

A Review of Seminal Articles Related to Residential Energy Conservation

Author(s)	Countries Included	Dependent Variables	Independent Variables (S)=Significant; (N/S)=Not significant (-)/(+)=negative or positive effect	Method	Findings	Remarks About Study	Applicability to my research
O. I. Asensio and M. A. Delmas (2016)	The United States of America	Kilowatt-hour (kWh)	Apartment size: + N/S; number of adults in the home: + N/S; number of children in the home :+ S .01; building floor: + N/S; membership in environmental organizations: - N/S; Heating day: + N/S; cooling hours: - S .01; day of the week: + N/S. R^2 = .0237	A randomized controlled trial was utilized to measure the effects of two treatments on electricity consumption in 118 homes, in a residential community in Los Angeles Ca. The electricity consumption was regressed using Difference in Difference, with a control group of metered households who received their electric bills with no treatment.	A health-based framed message induced persistent energy savings behavior of 8-10% after 100 days. The more traditional, cost savings, framed message showed sharply attenuated treatment affect after two weeks and no significant difference to the control group after seven weeks.	It is remarkable how the way a message is framed can effect the outcome of message. The results of this study might be perceived by many as being counterintuitive to what most would expect.	This research is an ideal launch pad for my research plan, which seeks to identify potential synergy that may exist when the traditional cost savings benefits are combined with a health and planet focused energy-savings message.
H. S. Chang, C. Huh, and M. J. Lee (2016)	The United States of America	Electricity Nudge.	Energy Conscious and Nudge Effect (Ancova R^2 .190)	This was a scenario-based 2 X 2 factorial between subject with a control group. Four groups received treatment nudges designed to measure the effectiveness of energy-saving behavioral nudges.	(Anova) Behavioral intentions toward electricity conservation were pronounced when a nudge was given. (Ancova) The effectiveness of the nudges on electricity conservation was confirmed.	Although scenario based, this study makes clear that when given some form of motivation, humans tend to choose conservation rather than wasteful behaviors.	This study is directly applicable to my research, because my participants will receive several nudges that are energy-saving related. Another similiarity is that my participants are not responsible for, direct, payment of the electric bill.
T. Fujimi, Y. Kajitani, S. E. Chang (2016)	Japan	Electricity savings percentage.	Time-variant: number of replaced appliances, temperature, time away from home. Time-invariant: floor area, when constructed, occupant age, number of family members, ability, knowledge, and values (electricity).	The focus was household behaviors in July and August of 2014. Twelve hundred households were surveyed in Tochigi and Ibaragi prefectures in TEPCO service area and Iwate, Miyagi, and Fukushima prefectures in the THEPCO service area. The energy savings were regressed using a fixed effects model.	Most household took several energy-savings measures. Certain measure produced a 2-4% savings that persisted for two years. The effective methods were those that did not require frequent efforts or discomfort. Those energy savings measures that don't require discomfort or frequent effort can become engrained for life.	This is an interesting study because there was a silver lining to the natural disasters that precipitated the energy-saving behaviors. It shows that no matter how or why a person becomes aware of an issue, positive, life altering results are possible.	This article is germane to my research because, in my research, the education classes will create a theoretical disaster and simultaneously offer multiple (energy-saving) methods for combating the problem.
E.R. Frederiks, K. Stenner, and E. V. Hobman (2015)	Australia	Cost effectiveness	Qualitative paper etc.	Cognitive biases and behavioural anomalies: 1. Status quo 2. Satisfice 3. Loss averse 4. Risk averse 5. Sunk cost effect 6. Temporal and Spatial discounting 7. Conform to social norms 8. Rewards and Incentives 9. Free riding effect 10. Trust 11. Availability bias.	Understanding the various psychological phenomena, can make household and community responses to energy-saving interventions less surprising. This understanding can also assist in developing cost-effective and mass-scalable behavioural solutions.	It is vital to understand that actual human behavior varies dramatically from the neo-classic economic model. critical, when conducting reasearch that involves behaviour change.	This article is an important reference source for my research, because by ignoring the numerous nuances of behaviour economics, my research could doomed to suffer from many avoidable pitfalls.

CHAPTER III

CONCEPTUAL FRAMEWORK AND HYPOTHESES

According to the literature and consistent with theory, energy consumption behavior is related to who pays the bill. Gillingham, Harding, and Rapson (2012), discuss a split incentives situation where tenants who are responsible for payment of their heating bill are 16 percent more likely to lower the temperature at night. However, the landlord has no incentive to insulate the property since he or she is not paying the bill. Another split incentive exists when the owner buys appliances focusing on cost-effectiveness, which conflicts with the tenant, who pays the utility bill and is desirous of energy-efficient appliances that are costlier (Bird & Hernández, 2012). Tenants and landlords could benefit from a behavioral change program, which could improve this principal-agent problem.

This researcher displays the conceptual framework for this research project in Figure 2. It highlights electricity consumption, which is measured by kilowatt-hour usage as the dependent variable (DV) and the treatments as independent variables (IVs). In addition to the education classes, and economic incentives, this researcher added the following IVs: age, gender, years in the apartment, race, unit income, floor number, the season, apartment direction, average temperature, and mean daylight hours as controls. If a dummy variable (season, orientation, race, and gender) has a negative sign, it indicates that the variable has increased kWh usage. If the dummy variable has a positive sign, it demonstrates that the variable has decreased kWh usage. The seasons are each negative;

however, for different reasons. In summer, as the temperature increases, more kWh are used (air conditioning), conversely when the temperature decreases, as it does in winter, more kilowatt-hours (kWhs) are used (heating). If a continuous variable (daylight, income, years in the apartment, temperature, floor, and age) has a negative sign, it indicates as the variable increases, the kWh usage increases. If a continuous variable has a positive sign, it means the consumption of fewer kWhs as the variable increases. If the variable has both signs, as in apartment direction, it means at least one orientation (North, South, East, or West) is negative, and at least one is positive. In the case of gender and race, a negative sign indicates less kWh usage, and a positive sign indicates more kWh usage than the opposite gender or race. If both signs are present, it means at least one negative and positive result amongst the four buildings. For the variable age, a negative sign indicates less kWh usage for each additional year of age and has the inverse meaning for a positive sign.

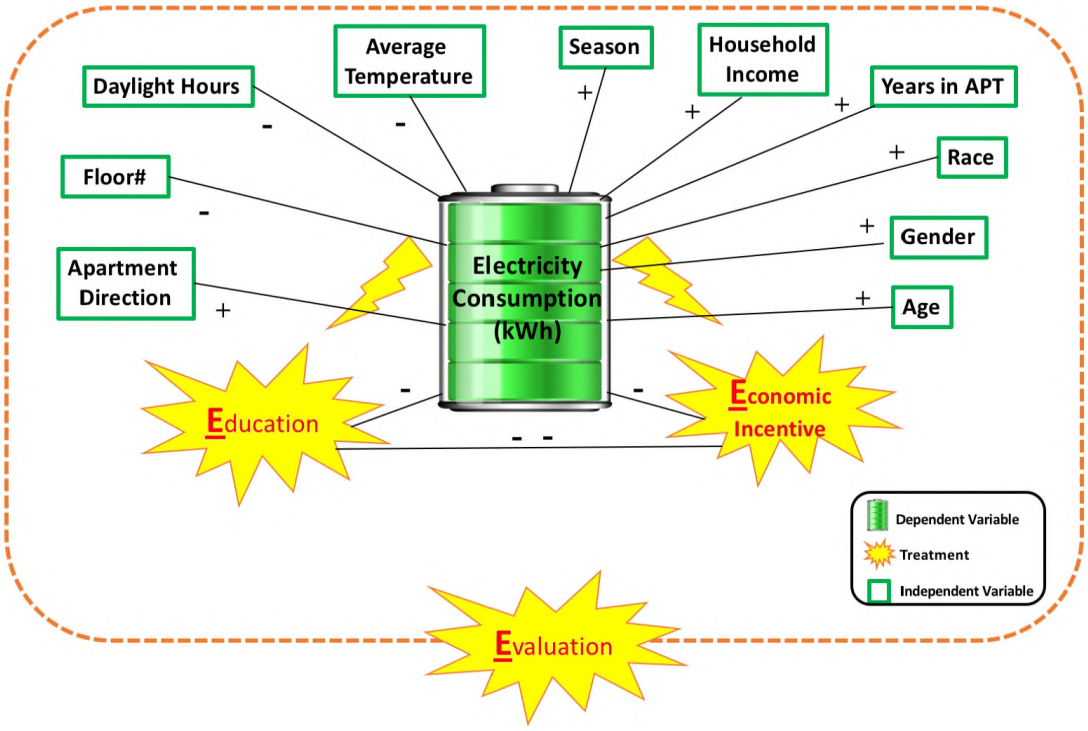

Figure 3. *The conceptual framework for this research project*

Research Questions and Hypotheses

The fundamental questions guiding this research is: can a housing organization significantly reduce the average tenant electricity usage through a combination of resident-focused "**E**ducation, **E**conomic **I**ncentives, and **E**valuation'? Also, is it economically viable for the organization to administer the treatment plan'?

After conducting the research, this researcher found the logic that told me the results would vary based on the program participants, and the treatments they received were accurate. However, the results were less straight forward than this researcher initially thought. Additionally, this researcher has the following research hypotheses, which have been gleaned from the literature and from the demonstration this researcher conducted: My hypotheses and alternative hypotheses are:

1. H_o, The proposed multiple regression models will have no explanatory value for predicting kWh usage based on various predictor variables.

H_A, The proposed multiple regression models, will be able to explain kWh usage, both positive and negative, based on various predictor variables.

2. H_o When compared to historical usage data, there will be no difference in electricity usage for residents who attend the **e**ducation classes and those who do not.

H_A, When compared to historical usage data, there will be decreased electricity usage for residents who attended the education classes.

3. H_o When compared to historical usage data, there will be no difference in electricity usage for residents who receive an **e**conomic incentive and those who do not.

H_A, When compared to historical usage data, there will be decreased electricity usage for residents who receive an economic incentive.

4. H_o When compared to historical usage data, there will be no difference in electricity consumption for those who attend an **e**ducation class and receive an **e**conomic incentive, and those who do not.

H_A, When compared to historical usage data, residents who attend an education class and receive an economic incentive will have significantly lower kWh usage than those who do not attend.

Each hypothesis has a predictive aspect, and according to Stewart (2008), when people face predicting and probability, the business that takes us to a place in our knowledge where deductive removal of errors can occur is induction. This predictive uncertainty of outcome lends itself to a more inductive, PNS approach. Funtowicz and Ravetz (2008) believe when problems are mainly involved, they lend themselves to

multiple perspectives and identify transdisciplinary research and PNS, which is naturally more inductive, as being complementary pairs.

The theoretical framework, literature review, conceptual framework, and hypotheses serve as the skeletal building blocks of this research. In Chapter IV, the reader finds critical details that are unique to this project. Additionally, Chapter IV serves as a recipe future researchers can use to reproduce this project and provide additional contributions to this area of research.

CHAPTER IV

RESEARCH DESIGN AND METHODOLOGY

This researcher believes organizational preparedness, for the change process, should not be overlooked and is a critical component of ultimate program effectiveness. With Erwin (2009) in mind, this researcher initiated the design process by meeting with the executive director and key staff and residents of Alpha Homes. The meeting with the executive director and staff helped ensure the organization possessed an adequate level of preparedness to facilitate this research project, and consistent with relevant literature. Since pivotal individuals often influence a building's social network, managers must enlist their support, which will likely positively affect the rest of the building's behavior (Anderson et al., 2014).

According to Becker et al. (2014), "Simplicity is the ultimate sophistication," this study suggests changing an individual's cognition, and the environment is the best method to encourage the desired personal behavior. Rewards don't need to be grandiose, rather simple nudges to promote the appropriate actions.

In traditional or standard science, the researcher is seeking a definitive result that rules out other possibilities. This approach is very deductive and follows a similar logic to the following: it is either a dog or a cat, it is not a dog; therefore, it is a cat (Stewart, 1997). According to Funtowicz and Ravetz (2008), in normal science, values are principally irrelevant, and uncertainties can be satisfied with some statistical tests.

However, many of today's researchers, the public, and some policymakers understand that the pursuit of certainties and complete objectivity is not a realistic outcome of certain types of research (Funtowicz & Ravetz, 2008).

Research Design

The quasi-experimental design this researcher chose to utilize is a time series model that sought to reduce tenants' electricity consumption in a low to moderate-income residential apartment setting. This researcher has full access to the electric bills from 2015 to present and will have access to all the electricity billing into the foreseeable future. The experiment collected monthly electrical usage data for the three years before implementation of the treatment, then collected monthly data for 12 months after starting the treatments.

Figure 4 is a diagram of the basis for my research design:

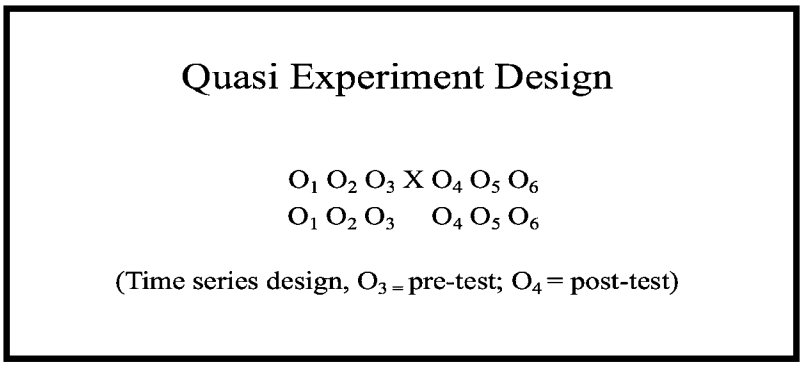

Figure 4. *Quasi-experimental time series design*

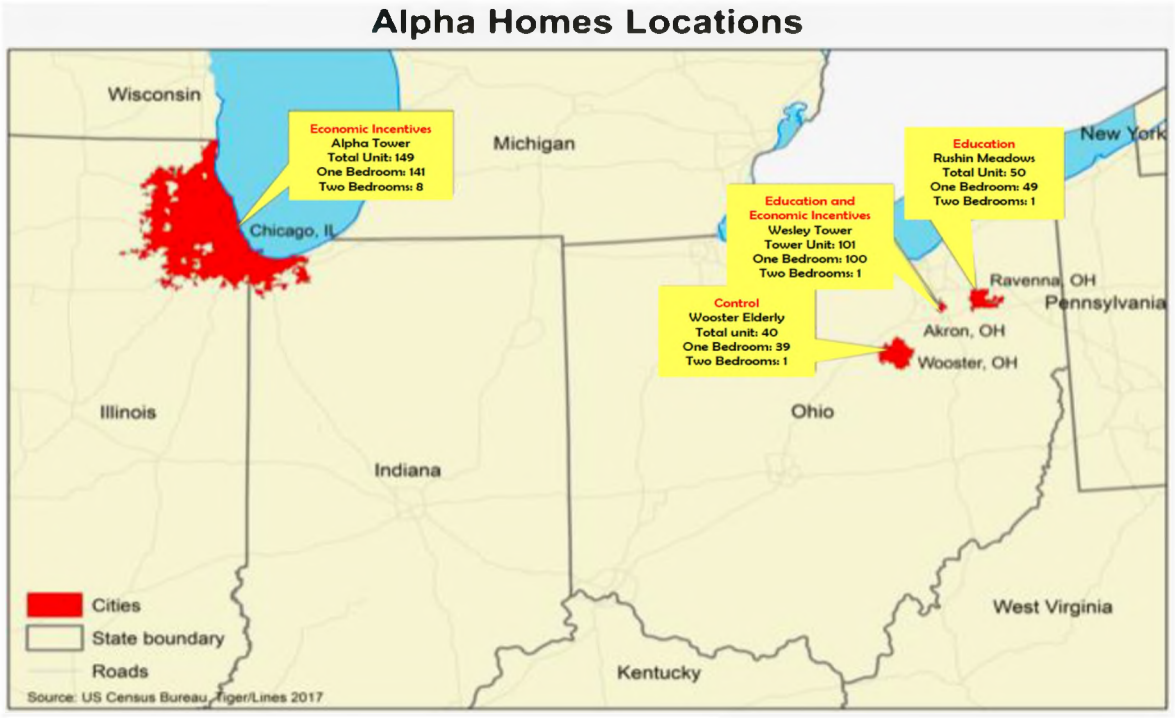

Figure 5. *Alpha Homes research project locations*

My research includes two treatments, "**E**ducation and **E**conomic incentives with **E**valuation being a continual process. This researcher conducted Education classes and distributed Economic incentives. This researcher had four buildings available to me that are individually electrically metered (IM). My Committee Chair chose the treatment and control buildings by pulling the names from a bag.

Wooster Elderly, with 40 units, served as control and did not receive either treatment. This researcher selected Rushin Meadows (50 units) for Education classes; he selected Alpha Tower (149 units) for Economic Incentives; and, he chose Wesley Tower (101 units) to receive both Education classes and Economic Incentives. This researcher utilized a random drawing to make each treatment. This researcher displays the complete treatment plan in Table 3. After establishing the control and treatment buildings, the researcher selected, randomly, to suspend treatment at one building (Alpha Tower, which

received Economic Incentives) after six months. This researcher shows a map of the building locations accompanied by descriptive details in Figure 5.

Each participant at Rushin (Education only) and Wesley (Education and Economic Incentives) took a pre-and post-test (see Appendix C). This researcher addressed the non-respondent biases by creating an easy to read, increased font-size test, and also by reading the questions to residents. The Service Coordinators assisted by checking the exams for completeness. This researcher gleaned ten questions from a pamphlet titled "MORE THAN 100 WAYS TO IMPROVE YOUR ELECTRIC BILL." The attendees at Rushin and ETL first took the Pre-test, then saw the questions and answers as part of a PowerPoint presentation. If the group received economic incentives, the person who raised their hand first, with a correct answer, won a reward. Eventually, all attendees received something. The awards were all related to electricity usage (e.g., LED light bulbs and nightlights). The researcher gave the attendees, of each class, a schedule for the monthly check-up classes, where he checked on progress and if incentives are part of their treatment, handed out prizes (e.g., gift cards, night lights, etc.) for particular categories of reduced electric consumption. The post-program monthly kWh usage totals were analyzed and shared with the attendees at the check-up meeting. There are 340 apartments in my sample, with an average vacancy rate of 6%, this equates to 319 units being available at any given time. Response rates for other less aggressively advertised, non-incentivized programs had, approximately, a 30 percent response rate, so this researcher used 30 percent as a benchmark for this project. The actual attendance (as seen in Table 2) was better than 30% in two buildings (Rushin Meadows [education] and Wesley Towers [education and economic incentives) and less for Alpha Tower (economic

incentives), in Chicago. The average of the three response rates was 33%. Since there were a de minimis number of apartments with more than one occupant, this researcher removed them from this project. Of the 340 apartments, there are less than ten with multiple occupants. It would have skewed the analysis to include the units with more than one occupant.

Table 2

The 3-E Program Response Rate

Program Response Rate	Alpha Tower (Economic Incentives)	Wesley Tower (ETL) (Ed. & Incentives)	Rushin Meadows (Education)	Wooster Elderly (Control)
Number of Apartments	149	101	50	40
Apartments - 6% Vacancy rate	140	94	47	38
Planned Attendance >= 30%	42	28	14	N/A
Actual Attendance	21	38	21	N/A
Actual Percentage	15%	40%	45%	N/A

There may be minor internal validity issues due to three of the test buildings being in or near the city of Akron. Since individual staff travel between sites, there could be some contamination. This researcher addressed the potential contamination at the preliminary team meeting. This researcher does not predict external validity issues for similar populations around the country.

While implementing the chosen E's, and post-implementation usage results are analyzed, identifying a causal relationship is likely. The techniques this researcher listed that first prepare the organization for the program implementation, are integral to success and will always be at work, albeit in the background.

All the leases are full-service gross (FSG), so currently, the residents have no incentive to conserve. This researcher believes the treatments will be the most relevant variables, as to which one or combination will be most important, this researcher thinks logic dictates the mix. Because of the inability to determine individual behavior change in the master-metered buildings, they will not be part of my dissertation; however, the organization does have a keen interest in conducting the program in those buildings as well, and this researcher will assist them with that effort.

Research Timeline

This researcher initiated his Institutional Review Board (IRB) process immediately after successfully defending my prospectus, which occurred on March 7th of 2018. This researcher received IRB approval to begin my research in early April 2018, which included a review of the Pre/Post-test, Informed Consent forms, Focus Group questions, and the Promotional Flyer. Also, in early March of 2018, this researcher scheduled a meeting with the Executive Director of Alpha Homes Inc. that included essential staff and key tenants, to explain the program and get suggestions. Next, the researcher determined an approximate budget and schedule for conducting the classes. This researcher agreed to provide the gift cards and door prizes, and Alpha Homes committed to providing the lunches and two flat-screen televisions for the raffle at the end of the program.

The researcher planned to start the first classes in mid-May, which involved posting flyers throughout the buildings and including an invitation in the monthly newsletter. This researcher asked residents to RSVP with the Service Coordinator or by calling me. The RSVP's included the resident's name, apartment number, and telephone

number. The day before commencing with classes, the registered participants received a reminder call. The reminder call served, not only as a reminder for the resident but also aided with ordering enough food and drink for each session. A visual representation of the timeline is found in Figures 6 through 8.

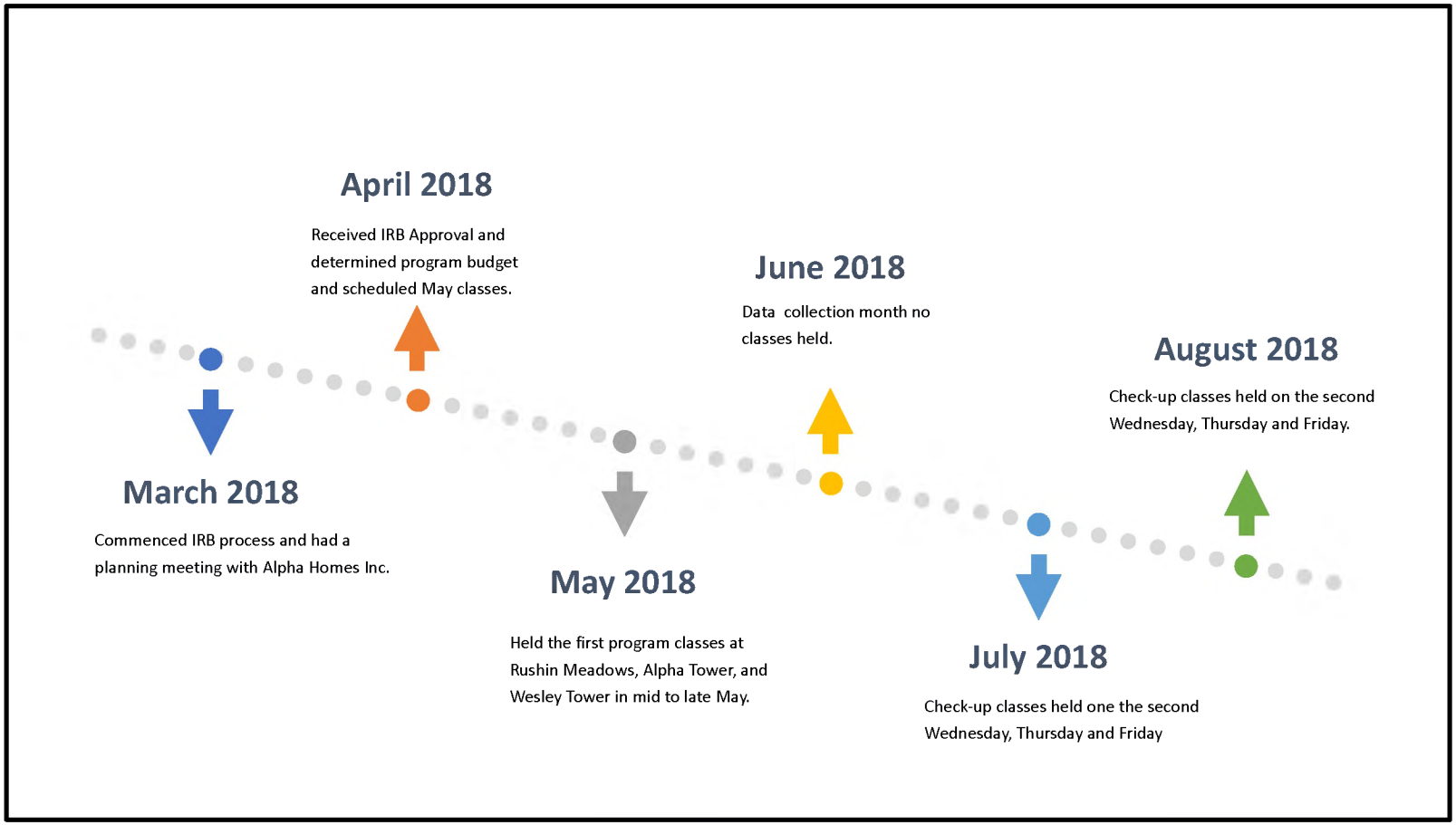

Figure 6. *The Behavioral Change 3-E Program timeline*

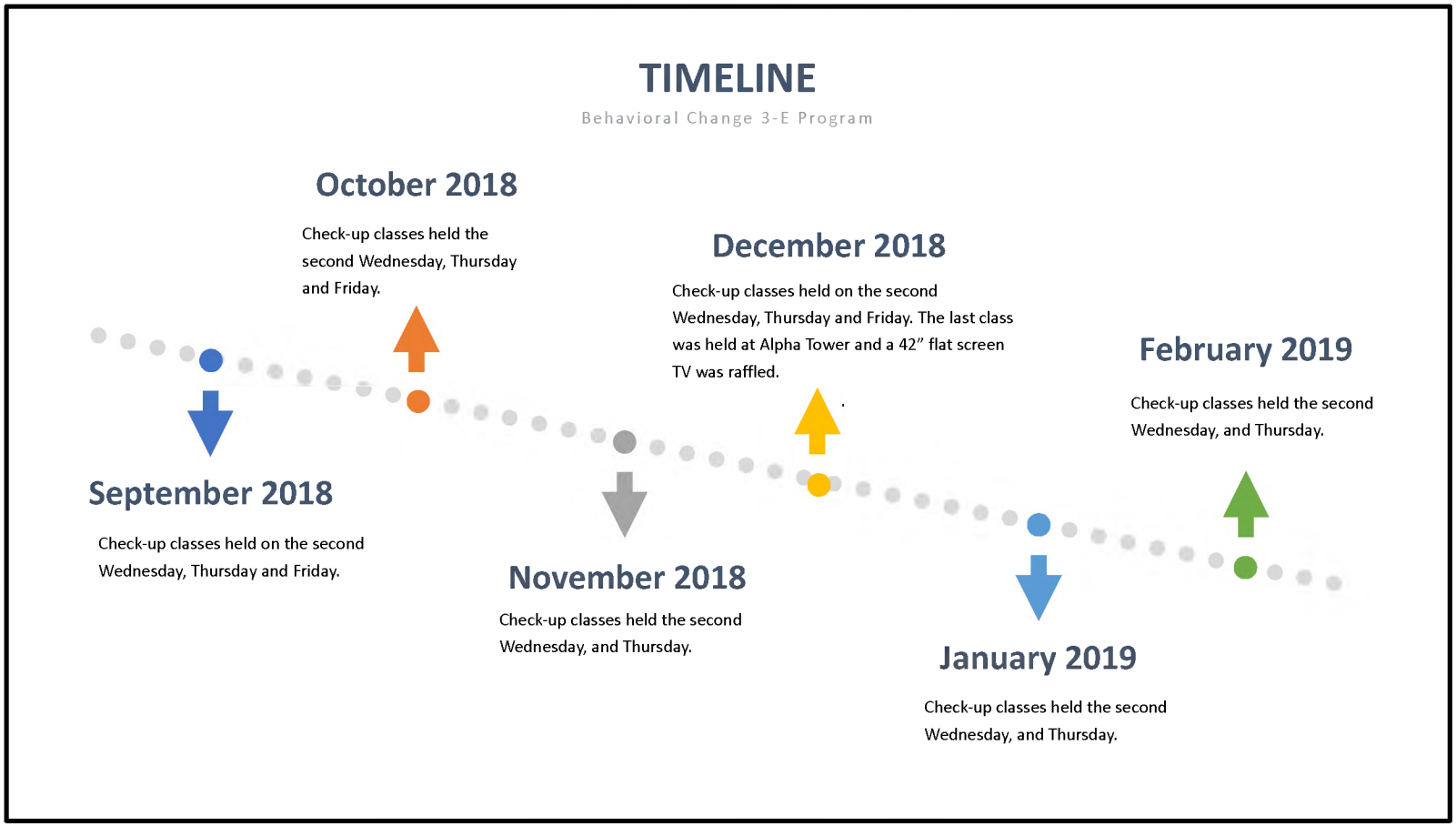

Figure 7. *The Behavioral Change 3-E Program timeline*

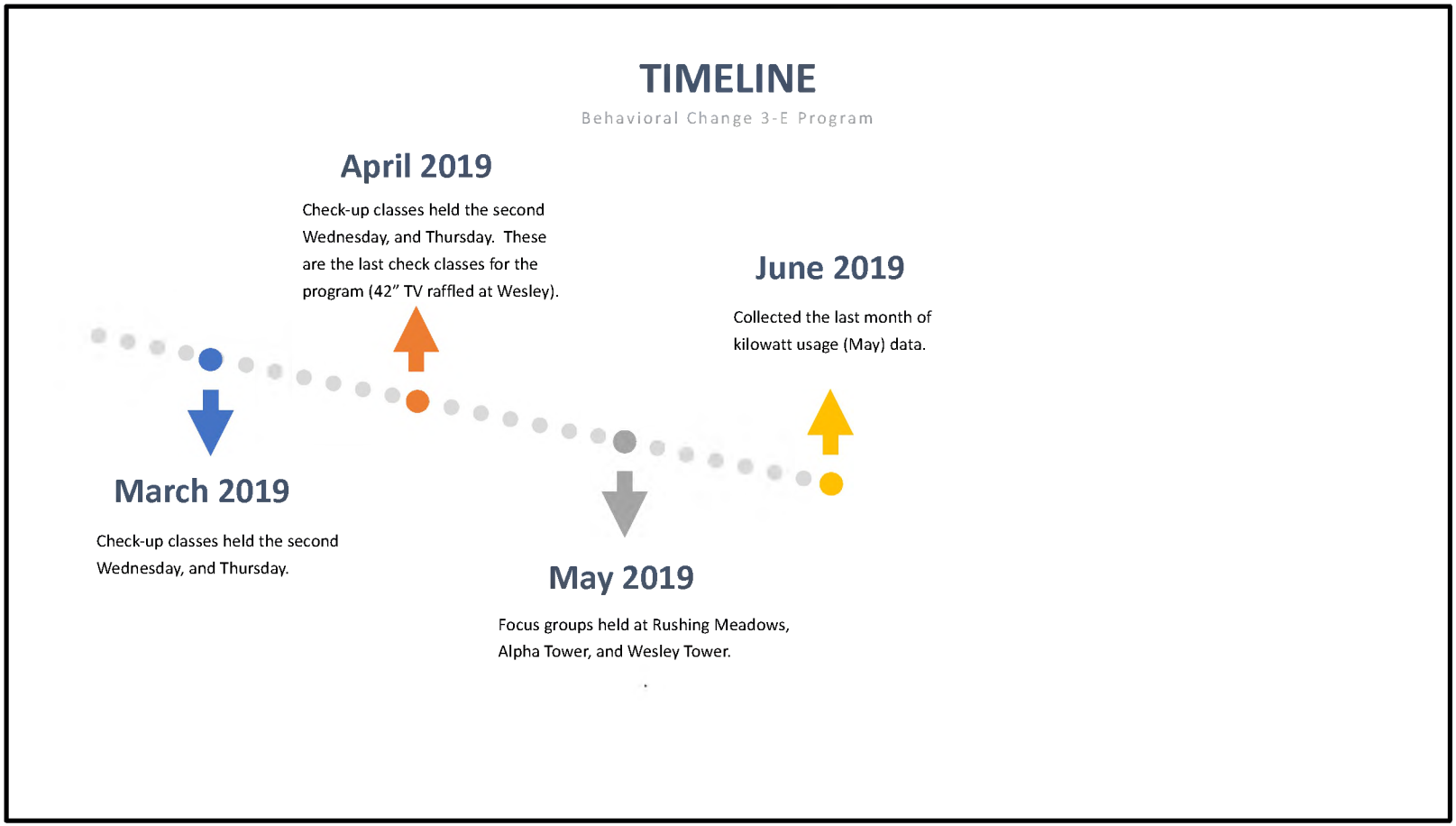

Figure 8. *The Behavioral Change 3-E Program timeline*

Table 3

The Treatment Plan for this Research Project

Research Buildings	**Building #1 Alpha Tower**	**Building #2 Wesley Tower**	**Building #3 Rushin Meadows**	**Building #4 Wooster Elderly**
Building Characteristics	**149 units (141=1Br; 8=2Br)**	**101 units (100=1Br; 1=2Br)**	**50 units (All 1Br)**	**40 units (39=1Br; 1= 2Br)**
Treatment Mix	**Economic Incentives**	**Education and Economic Incentives**	**Education**	**Control**
Education Class = Pre and Post testing	**N/A**	**X**	**X**	**N/A**
Economic Incentives received = door prizes, gift cards.	**X,D,G**	**X,D,G**	**N/A**	**N/A**
Evaluation = Monthly checkup meetings/ Bi-monthly progress reports.	**X,B,M**	**X,B,M**	**X,B,M**	**N/A**
LEGEND	**X** = Present **N/A** = Not Present	**M** = Monthly Check-Up Meetings	**B** = Monthly Program Reminder	**D** = Door Prizes **G** = Gift Cards **Br** = Bedrooms

Research Methodology

This researcher utilized a regression model with kilowatt-hour (kWh) usage as the DV. The following categories (as seen in Table 4) are IVs: daylight hours, occupant age, sex, tenure, race, income, floor, season, direction, average temperatures, daylight hours, education class attendance, and received an economic incentive. The general form of the regression equation is below:

$$\textbf{\textit{kWh usage}} = \beta_0 + \beta_1 OCCUPANT + \beta_2 SEASONAL + \beta_3 BUILDING + \beta_4 TREATMENT + \varepsilon$$

This researcher included the notation for the equation in Table 4:

Table 4

The Notation for the Vectors of the General Form Regression Equation and the Dependent Variables

Vectors	Variable Name	Variables
Occupant Characteristics	Occupant Age	This is the age of the lease holder.
	Sex	This is a dummy variable where men are given a 1 and women 0.
	Years at this Location	This is how long the lease holder has lived in the apartment.
	Race	This is a dummy variable where African Americans are given a 1 and other races 0.
	Unit Income	This is the annual income the occupant reports to management.
Seasonal Characteristics	Average Temperature	This is the average temperature for the month.
	Average Daylight Hours	This is the age of the lease holder.
	Spring	This is a dummy variable where the months of March, April and May are coded as 1 and the other months 0.
	Summer	This is a dummy variable where the months of June, July and August are coded as 1 and the other months 0.
	Winter	This is a dummy variable where the months of December, January and February are coded as 1 and the other months 0.
Building Characteristics	Floor number	This is the floor number of the occupant's apartment.
	South	This is dummy variable where South facing apartments are coded 1 and others 0.
	East	This is dummy variable where East facing apartments are coded 1 and others 0.
	West	This is dummy variable where West facing apartments are coded 1 and others 0.
Treatment Variables	Education class attended	This variable indicates the tenant attended the educational treatment class.
	Incentive received	This variable indicates the tenant received an economic incentive for participation.
DV	kWh usage	$\beta_0 + \beta_1 OCCUPANT + \beta_2 SEASONAL + \beta_3 BUILDING + \beta_4 TREATMENT + \varepsilon$
DV_Δ	kWh usage	(Current year monthly kWh usage) - (Previous year monthly kWh usage)

CHAPTER V

RESULTS

Research

This researcher compiled the tenant demographic and electricity usage data for the periods of June 2015 through May 2019 for the control building, Wooster Elderly (Wooster), the building that received the education treatment, Rushin Meadows (Rushin). He also compiled data for the building that received economic incentives, Alpha Tower (Alpha), and the building that received both treatments, Wesley Tower (ETL). Utilizing the multiple regression model, this researcher found the descriptive statistics and Pearson's correlation results in Tables 5 through 38. For each research building, this researcher starts by showing the descriptive statistics and Pearson's correlation for the years before the program year (PY) to establish the baseline. The years before the PY are June of 2015 through May of 2018. Next, this researcher looks at each building's baseline years (June 2015-May 2018) against the program year (June 2018-May 2019) for that building, which includes the treatment. Lastly, this researcher created a model with each treatment building's Program Year, combined with the Program Year of Wooster (Control).

Additionally, this researcher created a difference model for each building. In the difference model, the researcher subtracted the kWhs from the previous year from the

current year; however, the results were insignificant, or the Adjusted R-square was extremely low. This researcher shows one difference model in this section, with the remaining difference models being relegated to the appendices (see Appendix D for a summary). This researcher conducted numerous regression runs, including grouping the residents into age bands and separating program attendees from residents who did not attend the program. In some cases, grouping the residents into age bands created a stronger R-square and or improved treatment parameter estimate, which this researcher will include and discuss where appropriate. Two of the treatments included the attendees taking a 10-question pre-test and a post-test (Rushin & ETL). Where implemented, this researcher presents the results of the tests. For treatment buildings, this researcher will discuss the most promising output and include the other runs in the Appendices.

Wooster Elderly (Wooster) June 2015-May 2018 (Control)

In Wooster Elderly, which has 40 units, after eliminating vacancies and outliers, there were 756 total observations for the baseline years (before offering treatments), June 2015 through May of 2018. This researcher will highlight some of the meaningful statistics seen in table 5. The average kWh usage was 466, with minimum usage of 106 kWhs and maximum monthly usage of 1247 kWhs.

Table 5

Descriptive Statistics for Wooster Elderly Before Program Year (PY)

	N	Minimum	Maximum	Mean
KWH_Usage_per_30_days	756	106.29	1247.42	465.52
Occupant Age	756	64.00	92.00	77.94
Male	756	0.00	1.00	0.05
Tenure	756	0.36	24.32	8.46
African American	756	0.00	1.00	0.05
Unit Income	756	9480.00	20292.00	14770.33
Floor number	756	1.00	1.00	1.00
Spring	756	0.00	1.00	0.25
Summer	756	0.00	1.00	0.25
Fall	756	0.00	1.00	0.25
Winter	756	0.00	1.00	0.25
North facing	756	0.00	1.00	0.24
South facing	756	0.00	1.00	0.19
East facing	756	0.00	1.00	0.33
West-facing	756	0.00	1.00	0.24
Avg. Temp	756	23.40	75.20	51.74
Valid N (listwise)	756			

The typical occupant was nearly 78 years old, with the minimum age being 64 and the maximum being 92. Approximately 5% of the occupants are male, and the average income of the occupants is $14,770, with a range of $9,480 to $20,292. The ordinary occupant has an 8-year occupancy, with four months being the minimum tenure and 24 years being the maximum. The majority of the apartments face East (33%), followed by North and West at (24%), finally South at (19%). The monthly temperature average was 52 degrees Fahrenheit, with the minimum monthly average being 23 degrees Fahrenheit and the maximum being 75 degrees Fahrenheit.

Table 6

Pearson's Correlation for Wooster Elderly Before PY

	KWH_Usage_per_30_days	Occupant Age	Male	Tenure	African American	Unit Income	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp
KWH_Usage_per_30_days	1.00	-0.21	-0.09	0.00	-0.06	-0.22	-0.13	0.09	0.18	-0.20	0.24	-0.09	-0.13
Occupant Age**	-0.21	1.00	0.09	0.09	-0.09	0.36	0.05	-0.04	0.02	0.12	-0.17	-0.17	-0.05
Male*	-0.09	0.09	1.00	0.22	-0.05	0.04	0.00	0.00	0.00	-0.11	-0.16	-0.13	0.00
Tenure	0.00	0.09	0.22	1.00	-0.20	0.01	0.06	-0.04	0.02	-0.23	0.23	0.04	-0.05
African American*	-0.06	-0.09	-0.05	-0.20	1.00	-0.22	0.00	0.00	0.00	-0.11	-0.16	0.40	0.00
Unit Income**	-0.22	0.36	0.04	0.01	-0.22	1.00	0.00	0.00	0.00	0.25	0.19	-0.25	0.00
Spring	-0.13	0.05	0.00	0.06	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.09
Summer**	0.09	-0.04	0.00	-0.04	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.70
Winter	0.18	0.02	0.00	0.02	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.72
South facing**	-0.20	0.12	-0.11	-0.23	-0.11	0.25	0.00	0.00	0.00	1.00	-0.34	-0.27	0.00
East facing**	0.24	-0.17	-0.16	0.23	-0.16	0.19	0.00	0.00	0.00	-0.34	1.00	-0.40	0.00
West facing**	-0.09	-0.17	-0.13	0.04	0.40	-0.25	0.00	0.00	0.00	-0.27	-0.40	1.00	0.00
Avg. Temp**	-0.13	-0.05	0.00	-0.05	0.00	0.00	-0.09	0.70	-0.72	0.00	0.00	0.00	1.00

$^{**}p<.05; ^{*}p<.10$

In addition to the descriptive statistics and regression results, this researcher conducted a correlation analysis of the variables for each research building. Based on the Pearson's correlation matrix, for Wooster, in Table 6, Tenure, Summer, Winter, and East facing units are positively correlated to kWh usage, using the following scale to determine correlation strength: .00-.19 “very weak”; .20-.39 “weak”; .40-.59 “moderate”; .60-.79 “strong”; .80-1.0 “very strong.”. The strongest of those correlations were Winter and East facing units, which were .18 (very weak) and .24 (weak), respectively. These numbers indicate more kWh usage during Winter and in East facing units when compared to Fall and North facing units. The following variables were negatively correlated, with varying degrees of weakness. African American (-.06), West facing units (-.09), Males (-.09), Average Temperature (-.13), Spring (-.13), Tenant Age (-.21), South facing units (-.20), and Tenant Income (-.22). These weak or very weak negative

correlations indicate African Americans use fewer kWhs than non-African Americans; tenants in West and South facing units use fewer kWhs than units facing North or East. Additionally, men use fewer kWhs than women; and fewer kWhs are used in Spring when compared to Fall, and as tenant ages and or income increases, they use fewer kWhs of electricity. Lastly, as the ambient temperature rises, tenants use fewer kWhs of power. The full Pearson's correlation results are in Table 6.

Table 7

Wooster Regression Output for the Years Before PY

Model		Sum of Squares	df	Mean Square	Number of obs =	756
					F(12,743)	18.83
1	Regression	6576315.76	12	548026.31	Prob > F	0.00
	Residual	21619083.2	743	29097.02	R-square	0.23
					Adj R-square	0.22
	Total	28195398.9	755	37344.90	Root MSE	170.58

Table 8

Wooster Regression Output Years Before PY with Variance Inflation Factor (VIF)

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	1121.91	99.11	11.32	0.00	
Occupant Age	-3.47	1.19	-2.91	0.00	1.44
Male	-60.62	34.18	-1.77	0.08	1.38
Tenure	-1.47	1.18	-1.25	0.21	1.37
African American	-61.74	33.53	-1.84	0.07	1.32
Unit Income	-0.01	0.00	-5.38	0.00	1.52
Spring	-15.90	18.19	-0.87	0.38	1.61
Summer	140.91	21.95	6.42	0.00	2.35
Winter	13.20	25.75	0.51	0.61	3.23
South facing	-64.67	21.80	-2.97	0.00	1.90
East facing	65.48	21.48	3.05	0.00	2.67
West-facing	-51.24	22.18	-2.31	0.02	2.32
Avg. Temp	-4.07	0.82	-4.98	0.00	4.40

The result of the Multiple Regression for the baseline years (2015-2018) at Wooster Elderly, in Table 7, reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model not having, kWh usage, explanatory value. And the alternative hypothesis is accepted, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .22 indicates this model can account for approximately 22% of the variability in kWh usage. This adjusted R-square is rather robust when compared to recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016).

Moving on to individual variables, let us start by looking at occupant age. As seen in Table 8, the coefficient is a negative 3.47 and is significant at the 95% level. As the occupants' ages increase by one year, they consumed 3.47 fewer kWhs.

The occupant's gender is next. As seen in Table 8, the coefficient is a negative 60.62 and significant at the 90% level. In this building, males consume approximately 60.62 fewer kWhs per month than their female neighbors.

How long the occupant has lived in their apartment is next. As seen in Table 8, the coefficient is a negative 1.47 and not significant. In this building, the amount of time a resident has lived there does not significantly affect electricity consumption.

Moving along, next, is the race of the occupant. As seen in Table 8, the coefficient (African Americans) is a negative 61.74 and significant at the 90% level. African Americans consume approximately 62 kWhs less per month than non-African Americans.

Next is the occupant's household income. The coefficient is a negative 0.01 and significant at the 95% level. There is a negative, albeit negligible, and significant relationship between household income and kWh usage. In Wooster Elderly, for each one (1) dollar increase in income, the occupant uses .01 fewer kWhs each month, which equates to ten kWhs less for each additional $1000 of income.

Moving along, next is the apartment floor level. Since all apartments are at ground level, this researcher removed the variable from the model.

Next is the season-of-the-year variable. As seen in Table 8, the coefficient for Summer is a positive 140.91 and significant at the 95% level. In Summer, residents consume 141 kWhs more than they use in the Fall.

The next variable discussed is the direction the apartment faces. As seen in Table 8, the coefficients are a negative 64.67 (South), a positive 65.48 (East), and a negative 51.24 (West). Each coefficient is significant at the 95% level. Residents in South and

West facing units use 65 and 51 fewer kWhs a month, respectively than North facing apartments. If a resident's apartment faces East, they use approximately 65 kWhs more per month than North facing units.

Next is the average monthly temperature variable. As seen in Table 8, the coefficient is a negative 4.07 and significant at the 95% level. As the average monthly temperature rises one degree, tenants use approximately four fewer kWhs of electricity per month.

Wooster Elderly served as the control building, so residents did not receive either treatment. Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed any variable(s) that were greater than or equal to ten from the model.

Wooster PY (Control)

In Wooster Elderly (Control), for PY and the years before PY, there were 1008 observations. This researcher will highlight some of the meaningful statistics in table 9. The average kWh usage was 478, with minimum usage of 106 kWhs and maximum monthly usage of 1271 kWhs.

Table 9

Wooster PY Control and Years Before PY Descriptive Statistics

	N	Minimum	Maximum	Mean
KWH_Usage_per_30_days	**1008.00**	**106.29**	**1271.00**	478.18
Occupant Age	1008.00	64.00	93.00	78.44
Under 55	1008.00	0.00	0.00	0.00
55 to 64	1008.00	0.00	1.00	0.01
65 to 74	1008.00	0.00	1.00	0.25
75 to 84	1008.00	0.00	1.00	0.60
85 and Over	1008.00	0.00	1.00	0.15
Male	1008.00	0.00	1.00	0.05
Tenure	1008.00	-0.36	25.32	8.96
African American	1008.00	0.00	1.00	0.05
Unit Income	1008.00	9480.00	20292.00	14770.33
Spring	1008.00	0.00	1.00	0.25
Summer	1008.00	0.00	1.00	0.25
Fall	1008.00	0.00	1.00	0.25
Winter	1008.00	0.00	1.00	0.25
North facing	1008.00	0.00	1.00	0.24
South facing	1008.00	0.00	1.00	0.19
East facing	1008.00	0.00	1.00	0.33
West-facing	1008.00	0.00	1.00	0.24
Avg. Temp	1008.00	23.40	75.20	51.48
Program Year	1008.00	0.00	1.00	0.25
Valid N (listwise)	1008.00			

The typical occupant was 78 years old, with the minimum and maximum ages being 64 and the maximum being 93, respectively. Approximately 5% of the occupants are male, and the average occupant income is $14,770, with a range of $9,480 to $20,292. The ordinary occupant has a 9-year occupancy, with four months being the minimum tenure and 25 years being the maximum. The majority of the apartments face East (33%), followed by North and West at (24%), finally South at (19%). The monthly temperature

average was 51.48 degrees Fahrenheit, with the minimum monthly average being 23.4 degrees Fahrenheit and the maximum being 75.2 degrees Fahrenheit.

Table 10

Pearson's Correlation for Wooster PY Control and Years Before PY

	KWH_Usage_per_30_days	Under 55	55 to 64	65 to 74	85 and Over	Male	Tenure	African American	Unit Income	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	Program Year
KWH_Usage_per_30_days	1.00	.	-0.01	0.27	-0.07	-0.11	0.03	-0.06	-0.21	-0.14	0.09	0.16	-0.21	0.25	-0.08	-0.13	0.11
Under 55	.	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
55 to 64	-0.01	.	1.00	-0.05	-0.04	-0.02	-0.08	-0.02	-0.12	-0.05	0.03	-0.02	-0.04	-0.06	-0.05	0.04	-0.05
65 to 74	0.27	.	-0.05	1.00	-0.24	-0.13	-0.21	-0.05	-0.22	-0.01	0.01	0.00	0.01	0.10	-0.02	0.01	-0.01
85 and Over	-0.07	.	-0.04	-0.24	1.00	-0.09	-0.32	-0.09	0.30	0.05	-0.03	0.02	0.13	-0.24	-0.24	-0.04	0.08
Male	-0.11	.	-0.02	-0.13	-0.09	1.00	0.22	-0.05	0.04	0.00	0.00	0.00	-0.11	-0.16	-0.13	0.00	0.00
Tenure	0.03	.	-0.08	-0.21	-0.32	0.22	1.00	-0.20	0.01	0.05	-0.04	0.02	-0.23	0.23	0.04	-0.05	0.14
African American	-0.06	.	-0.02	-0.05	-0.09	-0.05	-0.20	1.00	-0.22	0.00	0.00	0.00	-0.11	-0.16	0.40	0.00	0.00
Unit Income	-0.21	.	-0.12	-0.22	0.30	0.04	0.01	-0.22	1.00	0.00	0.00	0.00	0.25	0.19	-0.25	0.00	0.00
Spring	-0.14	.	-0.05	-0.01	0.05	0.00	0.05	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.09	0.00
Summer	0.09	.	0.03	0.01	-0.03	0.00	-0.04	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.70	0.00
Winter	0.16	.	-0.02	0.00	0.02	0.00	0.02	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.71	0.00
South facing	-0.21	.	-0.04	0.01	0.13	-0.11	-0.23	-0.11	0.25	0.00	0.00	0.00	1.00	-0.34	-0.27	0.00	0.00
East facing	0.25	.	-0.06	0.10	-0.24	-0.16	0.23	-0.16	0.19	0.00	0.00	0.00	-0.34	1.00	-0.40	0.00	0.00
West facing	-0.08	.	-0.05	-0.02	-0.24	-0.13	0.04	0.40	-0.25	0.00	0.00	0.00	-0.27	-0.40	1.00	0.00	0.00
Avg. Temp	-0.13	.	0.04	0.01	-0.04	0.00	-0.05	0.00	0.00	-0.09	0.70	-0.71	0.00	0.00	0.00	1.00	-0.03
Program Year	0.11	.	-0.05	-0.01	0.08	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.03	1.00

In addition to the descriptive statistics and regression results, this researcher conducted a correlation analysis. Based on the Pearson's correlation matrix, for Wooster, in Table 10, the following variables are positively correlated to kWh usage: The 65 to 74 age band, Tenure, Summer, Winter, PY usage, and East facing units. The strongest of those correlations were 65 to 74, Winter, and East facing apartments, which were .27 (weak), .16 (very weak), and .25 (weak), respectively. These numbers indicate more kWh usage with the 65 to 74 age band, during Winter, and in East facing units, when compared to 75 to 84-year old's, Fall, and North facing apartments. The remaining positively correlated variables had very weak correlations and also indicated more monthly kWh usage. The following variables were negatively correlated, with varying

degrees of weakness. African American, West facing units, Males, Average Temperature, Spring, Tenant Age, South facing apartments, Tenant Income, 55 to 64, and 85 and Over. Unit income and South facing units, each at negative 21, were weak correlations, indicating less monthly kWhs usage as tenant income increased and in South facing apartments. The other negatively correlated variable was very weak correlations, African Americans use fewer kWhs than non-African Americans; tenants in West facing units use fewer kWhs than units facing North or East.

Additionally, men use fewer kWhs than women; and fewer kWhs are used in Spring when compared to the other seasons, and as tenant age increases, they use fewer kWhs of electricity. Age bands 55 to 64 and 85 and over, use fewer kWhs than the 75 to 84 age band. Lastly, as the ambient temperature rises, tenants use fewer kWhs of electricity.

Table 11

Wooster Regression Output PY Control and Years Before PY

Model		Sum of Squares	df	Mean Square	Number of obs =	1008
					F (15,992)	25.50
1	**Regression**	11735456.3	15	782363.75	Prob>F	0.00
	Residual	30430395.6	992	30675.80	R-square	0.28
					Adj-R-square	0.27
	Total	42165851.94	1007.00	41872.74	Root MSE	175.15

Table 12

Wooster Regression Output PY Control and Years Before PY with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	508.33	200.00	2.54	0.01	
Occupant Age	4.37	2.47	1.77	0.08	7.95
55 to 64	48.74	78.66	0.62	0.54	1.41
65 to 74	144.40	27.38	5.27	0	4.57
85 and Over	28.54	28.48	1.00	0.32	3.42
Male	-35.77	31.94	-1.12	0.26	1.52
Tenure	0.13	1.15	0.12	0.91	1.67
African American	-43.06	30.14	-1.43	0.15	1.36
Unit Income	-0.02	0.00	-6.84	0	1.63
Spring	-41.33	16.09	-2.57	0.01	1.60
Summer	148.40	19.58	7.58	0	2.37
Winter	-20.57	22.26	-0.92	0.36	3.06
South facing	-48.48	20.73	-2.34	0.02	2.18
East facing	109.21	21.00	5.20	0	3.23
West-facing	-3.27	21.69	-0.15	0.88	2.81
Avg. Temp	-4.79	0.69	-6.911	0	4.22
Program Year	36.64	13.34	2.748	0.01	1.10

The results of the Multiple Regression for the baseline years (2015-2018) and the PY at Wooster Elderly, in Table 11, reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model having no kWh usage explanatory value. This researcher accepts the alternative hypothesis, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .27 indicates this model can account for approximately 27% of the variability in kWh usage. This Adjusted R-square is rather robust when compared to recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas

(2016), located in Table 1, and harmonious with the R-square (.22) for Wooster's baseline years.

Moving on to individual variables first is occupant age. As seen in Table 12, the coefficient is a positive 4.37 and is significant at the 90% level. As the occupants' ages increase by one year, they consume 4.37 additional kWhs.

Moving along is the 55 to 64 age band that is a positive 48.74 and not significant. So, there is no significant difference in kWh usage between the 55 to 64 age band, and the 75 to 84 age band.

Next, is the 65 to 74 age bracket; the coefficient is a positive 144.4 and significant at the 95% level. The positive 144.4 means residents in the 65 to 74 age band use 144 additional kWhs per month than the 75 to 84 age band.

Looking at the 85 and over age band, the coefficient is a positive 28.54 and not significant. There is no significant difference in the kWh usage between the 75 to 84 and 85 and over age bands.

Next is the occupant's gender. The coefficient is a negative 35.77 and not significant. In this building, there is not a significant difference in the monthly kWh consumption of males and females.

Next is how long the occupant has lived in their apartment. As seen in Table 8, the coefficient is a positive .13 and not significant. The length of time a resident has lived in the building does not significantly affect electricity usage.

Moving along, next is the race of the occupant. As seen in Table 12, the coefficient (African Americans) is a negative 43.06 and not significant. In this building,

there is not a significant difference in the kWh consumption of African Americans and non-African Americans.

Next is the occupant's household income. The coefficient is a negative 0.02 and significant at the 95% level. There is a negative, negligible, and significant relationship between household income and kWh usage. In Wooster Elderly, for each one (1) dollar increase in income, the occupant uses .02 fewer kWhs each month.

Next is the season-of-the-year variable. As seen in Table 12, the coefficients for Spring, Summer, and Winter are a negative 41.33, a positive 148.40, and negative 20.57, respectively. Spring and Summer are significant at the 95% level; however, Winter is not significant. In Summer, residents consume 41 kWhs less than they use in the Fall, and in Summer, they use 148.5 kWhs more than they do in the Fall.

The next variable is the direction the apartment faces. As seen in Table 12, the coefficients are a negative 48.48 (South), a positive 109.21 (East), and a negative 3.27 (West). The South and East coefficients are significant at the 95% level, and the West is not significant. Hence, residents in South and East facing units use 48.5 fewer kWhs and 109 more kWhs a month, respectively, than North facing apartments. The difference in kWh usage between West and North facing apartments is not significant.

Next is the average monthly temperature variable. As seen in Table 12, the coefficient is a negative 4.79 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use approximately five fewer kWhs of electricity per month. Lastly, the PY variable is a positive 36.64, and significant at the 95% level, which indicates 36.64 additional kWhs of electricity usage during the PY year, when compared to the baseline years.

The Wooster Elderly complex, which has 40 single occupancy apartments, served as the control building. As a control, the residents did not receive either treatment. Neither did this researcher inform the residents or staff of their inclusion in this research project. The regression model had 14 independent variables that accounted for 24 percent of the variability in kWh usage. Of note, men used 76 fewer kWhs per month than women, and African Americans used 72 fewer kWhs per month than non-African Americans. During the program year, which was from June 2018 to May 2019, the residents used 55 additional kWhs of electricity per month than was used during the baseline period of June 2015 through May 2018. Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed any variable(s) that were greater than or equal to ten from the model.

Rushin Meadows (Education) June 2015-May 2018 (Building Control).

Table 13

Rushin Descriptive Statistics Building Control

Descriptive Statistics				
	N	Minimum	Maximum	Mean
KWH Used per 30 Days	1224	21.29	981.43	259.82
Occupant Age	1224	29.00	92.00	69.24
Male	1224	0.00	1.00	0.24
Tenure	1224	-0.58	28.29	7.28
African American	1224	0.00	1.00	0.03
Unit Income	1224	8820.00	21888.00	14179.21
Spring	1224	0.00	1.00	0.25
Summer	1224	0.00	1.00	0.25
Fall	1224	0.00	1.00	0.25
Winter	1224	0.00	1.00	0.25
North facing	1224	0.00	1.00	0.41
South facing	1224	0.00	1.00	0.38
East facing	1224	0.00	1.00	0.03
West-facing	1224	0.00	1.00	0.18
Avg. Temp	1224	22.40	74.30	50.89
Valid N (listwise)	1224			

Rushin was designated to receive the Education only treatment; however, since this baseline period is before the program year, it does not include the treatment. In Rushin, as seen in Table 13, there were 1224 total observations for the baseline years of June 2015 – May 2018; of those, this researcher will discuss the statistics of interest. The average kWh usage was 260, with minimum usage of 21 kWhs and maximum monthly usage of 981 kWhs. The typical occupant was 69 years old, with the extreme ages being 29 and 92. Approximately 24% of the occupants are male, and the average income of the occupants is $14,179, with a range of $8,820 to $21,888. The typical occupant has a 7-year occupancy, with six months being the minimum tenure and 28 years being the

maximum. The majority of apartments face North (41%) followed by South (38%), then West and East at 18% and 3% respectively. The monthly temperature average was 51 degrees Fahrenheit, with the minimum monthly average being 22 degrees Fahrenheit and the maximum being 74 degrees Fahrenheit.

Table 14

Pearson's Correlation for Rushin Building Control

	KWH Used per 30 Days	Occupant Age	Male	Tenure	African American	Unit Income	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp
KWH Used per 30 Days	1.00	-0.22	-0.01	0.17	0.01	-0.11	-0.23	0.39	-0.09	-0.01	-0.06	0.01	0.31
Occupant Age	-0.22	1.00	-0.36	0.18	-0.03	0.31	0.03	-0.02	0.01	-0.30	0.02	0.09	-0.03
Male	-0.01	-0.36	1.00	0.04	0.31	-0.20	0.00	0.00	0.00	0.28	-0.10	-0.08	0.00
Tenure	0.17	0.18	0.04	1.00	0.03	-0.28	0.06	-0.04	0.03	-0.30	0.20	0.11	-0.06
African American	0.01	-0.03	0.31	0.03	1.00	-0.23	0.00	0.00	0.00	0.22	-0.03	-0.08	0.00
Unit Income	-0.11	0.31	-0.20	-0.28	-0.23	1.00	0.00	0.00	0.00	-0.01	-0.15	0.12	0.00
Spring	-0.23	0.03	0.00	0.06	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.11
Summer	0.39	-0.02	0.00	-0.04	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.71
Winter	-0.09	0.01	0.00	0.03	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.72
South facing	-0.01	-0.30	0.28	-0.30	0.22	-0.01	0.00	0.00	0.00	1.00	-0.14	-0.36	0.00
East facing	-0.06	0.02	-0.10	0.20	-0.03	-0.15	0.00	0.00	0.00	-0.14	1.00	-0.08	0.00
West facing	0.01	0.09	-0.08	0.11	-0.08	0.12	0.00	0.00	0.00	-0.36	-0.08	1.00	0.00
Avg. Temp	0.31	-0.03	0.00	-0.06	0.00	0.00	-0.11	0.71	-0.72	0.00	0.00	0.00	1.00

Based on the Pearson's matrix, for the Building Control years, in Table 14, the following variables are positively correlated to kWh usage: Tenure, African American, Summer, West facing units, and Average Temperature. Summer (39) and Average Temperature (31) were the strongest of those correlations, but still considered weak; however, Summer was just short of being moderately correlated. These numbers indicate more kWh usage amongst residents who have resided in the building longer, with African Americans, and as the temperature rises. Further, more kWhs are used in Summer, when compared to Fall, and in West facing units. The following variables had negative correlations to varying degrees of weakness. Spring (-.23), age (-.22), Tenant Income (-.11), Winter (-.09), East facing units (-.06), and both Males and South facing apartments

at (-.01). These weak or very weak negative correlations indicate tenants in East and South facing units use fewer kWhs than units facing North. Additionally, men use fewer kWhs than women; also, fewer kWhs are expended in Spring and Winter, when compared to Fall. Lastly, as a tenant's age and or income increases, they use fewer kWhs of electricity.

Table 15

Rushin Regression Output for Building Control

Model		Sum of Squares	df	Mean Square	Number of obs =	1224
					F (12,1211)	43.07
1	Regression	5104719.3	12	425393.275	Prob > F	0.00
	Residual	11960783.6	1211	9876.782	R-square	0.30
					Adj R-square	0.29
	Total	17065502.9	1223	37344.90	Root MSE	99.38

Table 16

Rushin Regression Output for Building Control with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	356.82	29.01	12.30	0.00	
Occupant Age	-3.18	0.28	-11.42	0.00	1.46
Male	-44.83	7.78	-5.76	0.00	1.35
Tenure	5.79	0.56	10.32	0.00	1.33
African American	33.45	18.65	1.79	0.07	1.23
Unit Income	0.00	0.00	1.31	0.19	1.40
Spring	-28.96	8.37	-3.46	0.00	1.63
Summer	71.02	10.17	6.98	0.00	2.41
Winter	22.21	11.84	1.88	0.06	3.26
South facing	-3.88	7.13	-0.54	0.59	1.49
East facing	-87.90	17.58	-5.00	0.00	1.09
West-facing	-5.22	8.17	-0.64	0.52	1.20
Avg. Temp	1.25	0.37	3.41	0.00	4.54

The results of the Multiple Regression for the Building Control years (2015-2018), in Table 15, reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model having no kWh usage explanatory value. This researcher accepts the alternative hypothesis, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .29 indicates this model can account for approximately 29% of the variability in kWh usage. This Adjusted R-square is robust when compared to recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), located in Table 1, and exceeds the R-square (.22) for Wooster's baseline years.

Moving on to individual variables first is the occupant age. As seen in Table 16, the coefficient is a negative 3.18 and is significant at the 95% level. Thus, as the occupants' ages increase by one year, 3.45 fewer kWhs are consumed per month.

Next is the occupant's gender. The coefficient is a negative 44.83 and significant at the 95% level. So, in this building, males consume approximately 45 kWhs per month less than their female neighbors.

Next is how long the occupant has lived in their apartment. As seen in Table 16, the coefficient is a negative 5.79 and significant at the 95% level; accordingly, as tenant's tenure increases by one year, their kWh usage increases by six kWhs per month.

Moving along, next is the race of the occupant. As seen in Table 16, the coefficient (African Americans) is a positive 33.45 and significant at the 90% level. African Americans, in Rushin, consume approximately 33 and a half kWhs more per month than non-African Americans.

Next is the occupant's household income. The coefficient is zero (0) and not significant. At Rushin, household income does not significantly affect electricity consumption.

Moving along, next is the season-of-the-year variable. As seen in the Table, the coefficients for Spring, Summer, and Winter are a negative 28.96, a positive 71.02, and positive 22.21, respectively. Spring and Summer are significant at the 95% level; however, Winter is significant at the 90% level. In Summer and Winter months, residents consume 71 and 22 kWhs more respectively than they use in the Fall, and during Spring, they use 29 kWhs less per month than they do in the Fall.

The next variable is the direction the apartment faces. As seen in Table 16, the coefficients are a negative 3.88 (South), a negative 87.90 (East), and a negative 5.22 (West). East is significant at the 95% level; hence, residents in East facing units use 88

fewer kWhs per month than North facing apartments. South and West facing apartments did not have significantly different usage than North facing apartments.

Next is the average monthly temperature variable. As seen in the Table, the coefficient is a positive 1.25 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use approximately one and a quarter more kWhs of electricity.

Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed any variable(s) that were greater than or equal to ten from the model.

Rushin (Education) PY (Attendees) with Building Control

Again, the PY is from June 2018 through May of 2019. The researcher implements the treatments in this section, so it includes the pre and post-test information where applicable. The researcher based all statistics on program attendees.

Table 17

Rushin Ten question Pre & Post-test results

	Pre-test	Post-Test
N	**21**	**21**
Mean	2.1	8.24
Median	2	9
Mode	2	9
Min	0	3
Max	5	10

Table 18

Rushin Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	2.1	21	1.375	0.3
	Post Test	8.24	21	1.921	0.419

Table 19

Rushin Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre Test & Post Test	21	0.351	0.119

Table 20

Rushin Paired Samples Test

	Paired Differences						t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Test - Post T	-6.143	1.931	0.421	-7.022	-5.264	-14.578	20	0

The residents at Rushin were offered monthly education classes on electricity conservation. Each resident who attended an education class received a ten-question Pre-text. During the final education class, in May of 2019, the residents were given a Post-test, with the same ten questions. This researcher displayed the full results in Tables 17 through 20. The average number of correct answers on the Pre-test was approximately 2. At the end of the program, the average resident increased their score by seven questions, resulting in a most frequent score of 9 correct answers, which was a 7 question increase from the Pre-test. After conducting a Paired Samples T-Test, the results show that while there were no significant correlations between the individual Pre and Post -Test scores (see Table 19). The overall mean difference, as seen in Table 20, between the Pre and Post-Test scores, is significant at the 95% level.

Table 21

Descriptive Stats for the PY Attendees at Rushin

	N	Minimum	Maximum	Mean
KWH Used per 30 Days	1392	20.69	981.43	258.67
Occupant Age	1392	29.00	92.00	69.13
Under 55	1392	0.00	1.00	0.06
55 to 64	1392	0.00	1.00	0.24
65 to 74	1392	0.00	1.00	0.38
75 to 84	1392	0.00	1.00	0.23
85 and Over	1392	0.00	1.00	0.09
Male	1392	0.00	1.00	0.23
Tenure	1392	-0.58	28.29	7.48
African American	1392	0.00	1.00	0.03
Unit Income	1392	8820.00	21888.00	14098.97
Floor Number	1392	1.00	1.00	1.00
Spring	1392	0.00	1.00	0.25
Summer	1392	0.00	1.00	0.25
Fall	1392	0.00	1.00	0.25
North facing	1392	0.00	1.00	0.42
South facing	1392	0.00	1.00	0.38
East facing	1392	0.00	1.00	0.03
West-facing	1392	0.00	1.00	0.17
Avg. Temp	1392	22.40	74.30	50.74
Education Offered	1392	0.00	12.00	0.78
Valid N (listwise)	1392			

This researcher created a dummy independent variable (IV) for the education treatment for inclusion in the multiple regression model. This researcher ran the model for PY attendees against Building Control, which includes all residents in the years before the PY. This researcher ran the model using resident age as one IV, and this researcher ran the model with five age band IVs. The grouping of resident age had mixed results, which, as seen in the tables. This researcher presents the descriptive statistics in

Table 21. There were 1392 total observations; of those, this researcher will discuss the statistics of interest. The average kWh usage was 259, with minimum usage of 21 kWhs and maximum monthly usage of 981 kWhs. The typical occupant was nearly 69 years old, with the extreme ages being 29 and 92. The majority of the attendees (38%) are in the 65 to 74 age band, followed by 55 to 64 (24%), 75 to 84 (23%), over 85 (9%), and under 55 at (6%). The creation of age bands improved the R-square but had mixed results, as will be seen in the regression results on the treatment variable. Approximately 23% of the program attendees were male, and the average income of the occupants is $14,099, with a range of $8,820 to $21,888. The typical occupant has a 7.5-year occupancy, with six months being the minimum tenure and 28 years being the maximum. The majority of attendee apartments face North (42%) followed by South (38%), then West and East at 17 and 3% respectively. The monthly temperature average was 51degrees Fahrenheit, with the minimum monthly average being 22 degrees Fahrenheit and the maximum being 74 degrees Fahrenheit.

Table 22

Pearson's Correlation for Rushin PY (Attendees) with Building Control

	KWH Used per 30 Days	Occupant Age	Male	Tenure	African American	Unit Income	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	Education Offered
KWH Used per 30 Days	1.00	-0.24	0.01	0.15	0.01	-0.11	-0.24	0.41	-0.11	-0.02	-0.06	0.03	0.34	-0.13
Occupant Age	-0.24	1.00	-0.40	0.14	-0.02	0.31	0.03	-0.02	0.01	-0.29	0.02	0.09	-0.02	-0.02
Male	0.01	-0.40	1.00	0.05	0.30	-0.20	0.00	0.00	0.00	0.28	-0.09	-0.09	0.00	-0.01
Tenure	0.15	0.14	0.05	1.00	0.02	-0.25	0.06	-0.04	0.03	-0.26	0.18	0.12	-0.06	0.10
African American	0.01	-0.02	0.30	0.02	1.00	-0.22	0.00	0.00	0.00	0.21	-0.03	-0.07	0.00	-0.05
Unit Income	-0.11	0.31	-0.20	-0.25	-0.22	1.00	0.00	0.00	0.00	0.00	-0.14	0.12	0.00	-0.05
Spring	-0.24	0.03	0.00	0.06	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.10	0.13
Summer	0.41	-0.02	0.00	-0.04	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.71	-0.13
Winter	-0.11	0.01	0.00	0.03	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.71	0.04
South facing	-0.02	-0.29	0.28	-0.26	0.21	0.00	0.00	0.00	0.00	1.00	-0.13	-0.36	0.00	-0.02
East facing	-0.06	0.02	-0.09	0.18	-0.03	-0.14	0.00	0.00	0.00	-0.13	1.00	-0.07	0.00	-0.05
West facing	0.03	0.09	-0.09	0.12	-0.07	0.12	0.00	0.00	0.00	-0.36	-0.07	1.00	0.00	-0.03
Avg. Temp	0.34	-0.02	0.00	-0.06	0.00	0.00	-0.10	0.71	-0.71	0.00	0.00	0.00	1.00	-0.13
Education Offered	-0.13	-0.02	-0.01	0.10	-0.05	-0.05	0.13	-0.13	0.04	-0.02	-0.05	-0.03	-0.13	1.00

Based on Pearson's matrix in Table 22, this researcher presents the following positively correlated variables to kWh usage: Male, Tenure, African American, Summer, West facing units, and Average Temperature. Summer (.41) and Average Temperature (.34) were the strongest of those correlations. Summer is considered a moderate correlation. These numbers indicate more kWh usage amongst tenants that have lived there longer, males, and African Americans. Further, kWhs use increases in Summer, as the temperature rises, and in West facing units. The following variables have negative correlations to varying degrees of weakness: Spring at (-.24), Education Offered (-.13), Unit Income, and Winter (-.11) each. Also, East and South facing units at (-.06) and (-.02), respectively. These weak or very weak negative correlations indicate tenants in East and South facing apartments use fewer kWhs than units facing North or West. Additionally, residents use fewer kWhs in Spring and Winter. Lastly, tenants who attended education classes used less electricity, as well as tenants with higher income.

Table 23

Rushin Regression output for Rushin PY (Attendees) with Building Control

Model		Sum of Squares	df	Mean Square	Number of Obs =	1392
					F(13, 1378)	49.65
1	Regression	6406224.69	13	492786.52	Prob> F	0.00
	Residual	13675836.45	1378	9924.41	R-square	0.32
					Adj R-square	0.31
	Total	20082061.15	1391	14437.14	Root MSE	99.62

Table 24

Rushin *Regression Output for PY (Attendees) with Building Control and VIF*

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	361.53	27.09	13.35	0.00	
Occupant Age	-3.19	0.26	-12.32	0.00	1.47
Male	-43.25	7.45	-5.80	0.00	1.39
Tenure	5.54	0.53	10.40	0.00	1.26
African American	29.80	18.50	1.61	0.11	1.21
Unit Income	0.00	0.00	0.48	0.63	1.34
Spring	-29.75	7.86	-3.78	0.00	1.63
Summer	68.36	9.56	7.15	0.00	2.40
Winter	21.23	11.00	1.93	0.05	3.18
South facing	-6.17	6.58	-0.94	0.35	1.43
East facing	-89.48	17.56	-5.10	0.00	1.09
West-facing	0.07	7.73	0.01	0.99	1.20
Avg. Temp	1.45	0.34	4.25	0.00	4.45
Education Offered	-4.68	1.13	-4.16	0.00	1.05

The result of the multiple regression for the Rushin PY with Building Control (Table 23) reveals an F probability of 0, meaning the null hypothesis of this model not

having, kWh usage, and explanatory value is rejected. And the alternative hypothesis is accepted, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .31 indicates this model can account for approximately 31% of the variability in kWh usage. This adjusted R-square is rather robust when compared to recent literature, where you will find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), which are in Table 1.

Moving on to individual variables first is Occupant Age. As seen in Table 24, the coefficient is a negative 3.19 and is significant at the 95% level. Hence, in this building, older occupants consume approximately 3.19 fewer kWhs for each additional year of age.

Next is the gender Male. As seen in Table 24, the coefficient is a negative 43.25 and is significant at the 95% level. Hence, in this building, males consume approximately 43 fewer kWhs per month than their female neighbors.

Next is how long the occupant has lived in their apartment. As seen in Table 24, the coefficient is a positive 5.54 and significant, so for each additional year of tenure, the residents use approximately 5.5 additional kWhs per month.

Moving along is the race of the occupant. The coefficient (African Americans) is a positive 29.80 and not significant; however, if this researcher used a more relaxed significance level of 89%, it would be significant at near the 90% level. Accordingly, African Americans consume approximately 30 additional kWhs per month than non-African Americans.

Next is the occupant's household income. As seen in Table 24, the coefficient is 0.00 and not significant. Hence, in Rushin, household income does not significantly affect electricity usage.

Next is the season of the year variable. As seen in Table 24, the coefficients for Spring, Summer, and Winter are a negative 29.75, and a positive 68.36, and 21.23, respectively. Each is significant at the 95% level. In Spring, residents consume approximately 30 fewer kWhs per month than in the Fall; and in Summer, and Winter residents consume about 68 and 21 more kWhs of electricity, respectively than in the Fall.

The next variable is the direction the apartment faces. As seen in Table 24, the coefficients are a negative 6.17 (South), a negative 89.48 (East), and a positive .07 (West). The East coefficient is significant at the 95% level. Hence, residents in East facing units use approximately 89.5 fewer kWhs per month, than North facing apartments.

Next is the average monthly temperature variable. The coefficient is a positive 1.45 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use 1.45 additional kWhs of electricity.

Lastly, the next variable is tenants who received the Electricity Education class, which was the randomly designated treatment for Rushin residents. As seen in Table 24, the coefficient is a negative 4.68 and significant at the 95% level. Thus, the null hypothesis is rejected, which states there will be no difference in electricity consumption based on attending an education class. And accept the null hypothesis, which indicates when compared to historical usage data, there will be decreased electricity usage for residents who participated in an education class. Program attendees used approximately five fewer kWhs per month than non-program attendees.

Rushin PY (Attendees) Difference with Building Control

The result of the multiple regression, for the Rushin PY Difference with Building Control, reveals an F probability of .24, meaning failure to reject the null hypothesis of

this model not having, kWh usage, explanatory value. As seen in Table 25, the adjusted R-square of .003 indicates this model can account for less than one half of one percent of the variability in kWh usage.

Table 25

Rushin Regression output for Rushin PY (Attendees) with Building Control Difference

Model		Sum of Squares	df	Mean Square	Number of Obs =	1154
					F(13, 1140)	1.25
1	Regression	156793.35	13	12061.03	Prob> F	0.24
	Residual	11007873.72	1140	9656.03	R-square	0.014
					Adj R-square	0.003
	Total	11164667.16	1153	9,683.15	Root MSE	98.27

Table 26

Rushin Regression Output for PY (Attendees) Difference with Building Control & VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	-18.56	29.44	-0.63	0.53	
Occupant Age	-0.02	0.28	-0.06	0.95	1.47
Male	-2.75	8.11	-0.34	0.74	1.40
Tenure	0.64	0.58	1.10	0.27	1.25
African American	-13.68	20.29	-0.67	0.50	1.21
Unit Income	0	0.001	-0.21	0.83	1.33
Spring	-2.18	8.47	-0.26	0.80	1.81
Summer	-5.27	10.84	-0.49	0.63	2.36
Winter	0.12	12.35	0.01	0.99	3.61
South facing	-16.35	7.10	-2.30	0.02	1.42
East facing	11.44	19.29	0.59	0.55	1.09
West-facing	-0.96	8.39	-0.11	0.91	1.20
Avg. Temp	0.32	0.37	0.87	0.39	4.46
Education Offered	0.72	1.12	0.64	0.52	1.04

Looking at the individual difference variables first is Occupant Age. As seen in Table 26, the coefficient is a negative 0.017 and not significant. Hence, in this building, there is no significant kWh usage difference based on occupant age.

Next is the gender male. As seen in the Table, the coefficient is a negative 2.75 and not significant. Hence, in this building, there is no significant difference in kWh usage between males and their female neighbors.

Moving along is the variable how long the occupant has lived in their apartment. As seen in Table 26, the coefficient is a positive 0.64 and not significant. So, with the Difference model, there is no significant difference in kWh usage based on tenure.

Moving along is the race of the occupant. The coefficient (African Americans) is a negative 13.68 and not significant. Accordingly, in this model, there is no significant difference in kWh usage based on race.

Next is the occupant's household income. As seen in Table 26, the coefficient is 0.00 and not significant. Hence, household income does not significantly affect electricity usage.

Next is the season of the year variable. As seen in Table 26, the coefficients for Spring, Summer, and Winter are a negative 2.18, 5.27, and a positive 0.12, respectively. Each seasonal variable is not significant, so, in this model, there is no significant difference in kWh usage based on the season of the year.

The next variable is the direction the apartment faces. As seen in the Table, the coefficients are a negative 16.35 (South), a positive 11.44 (East), and a negative 0.96 (West). The South coefficient is significant at the 95% level. Hence, residents in South facing units use approximately 16 fewer kWhs per month, than North facing apartments.

Next is the average monthly temperature variable. The coefficient is a positive 0.32 and not significant. Accordingly, there is no significant difference in kWh usage based on the average monthly temperature.

Lastly, the next variable is for tenants who attended an Electricity Education class. As seen in Table 26, the coefficient is a positive 0.72 and not significant. Thus, the null hypothesis, which states there will be no difference in electricity consumption based on attending an education class, cannot be rejected. In this model, there is no significant difference in electricity usage for residents who participated in an education class and those who did not.

Alpha Tower (Economic Incentives) June 2015-May 2018 (Building Control)

Table 27

Descriptive statistics for Alpha Tower before PY

	N	Minimum	Maximum	Mean
KWH Used per 30 Days	3600	9.68	1189.41	335.91
Occupant Age	3600	49.00	99.00	71.08
Under 55	3600	0.00	1.00	0.04
55 to 64	3600	0.00	1.00	0.27
65 to 74	3600	0.00	1.00	0.33
75 to 84	3600	0.00	1.00	0.24
85 and Over	3600	0.00	1.00	0.13
Male	3600	0.00	1.00	0.33
Tenure	3600	0.32	28.90	8.86
African American	3600	1.00	1.00	1.00
Unit Income	3600	2850.00	31641.00	12147.23
Floor number	3600	2.00	16.00	9.59
Spring	3600	0.00	1.00	0.25
Summer	3600	0.00	1.00	0.25
Fall	3600	0.00	1.00	0.25
Winter	3600	0.00	1.00	0.25
North facing	3600	0.00	1.00	0.19
South facing	3600	0.00	1.00	0.24
East facing	3600	0.00	1.00	0.27
West-facing	3600	0.00	1.00	0.30
Avg. Temp	3600	24.80	75.80	52.07
Valid N (listwise)	3600			

This researcher chose Alpha Tower to receive Economic Incentives; however, since this is the analysis of the years before the program year. This researcher did not include the Economic Incentive variable. Table 27 has complete descriptive statistics for Alpha Tower. There were 3600 total observations, of which, this researcher will discuss specific statistics of interest. The average kWh usage was 336, with minimum usage of 10 kWhs and maximum monthly usage of 1189 kWhs.

The average occupant was approximately 71 years old, with the extreme ages being 49 and 99. About 33% of the occupants are male, and the average tenant income is $12,147, with a range of $2,850 to $31,641. The typical occupant has a 9-year occupancy, with four months being the minimum tenure and 29 years being the maximum. The majority of apartments face West (30%) followed by East (27%), then South and North at 24% and 19% respectively. The monthly temperature average was 52 degrees Fahrenheit, with the minimum monthly average being 25 degrees Fahrenheit and the maximum being 76 degrees Fahrenheit. As seen in Table 27, the most significant percentage of tenants (33%) are in the 65 to 74 age band, followed by 55 to 64 (27%), 75 to 84 (24%), 85 and Over (13%), and Under 55 at 4%.

Table 28

Pearson's Correlation for Alpha Tower Before PY

	KWH Used per 30 Days	Male	Tenure	African American	Unit Income	Floor number	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	Under 55	55 to 64	65 to 74	85 and Over
KWH Used per 30 Days	1	0.081	0.169	.	0.142	-0.02	-0.171	0.219	-0.008	-0.154	0.014	0.045	0.161	0.017	-0.05	0.021	0.055
Male	0.081	1	0.027	.	0.034	-0.002	0	0	0	-0.096	-0.187	0.237	0	0.081	0.073	-0.14	0.024
Tenure	0.169	0.027	1	.	0.164	-0.015	0.057	-0.041	0.024	-0.069	0.092	0.009	-0.047	-0.099	-0.393	-0.154	0.469
African American	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Unit Income	0.142	0.034	0.164	.	1	-0.029	0	0	0	0.006	-0.021	0.164	0	-0.064	-0.237	0.039	0.155
Floor number	-0.02	-0.002	-0.015	.	-0.029	1	0	0	0	-0.104	0.089	0.062	0	0.076	-0.033	0.027	-0.074
Spring	-0.171	0	0.057	.	0	0	1	-0.333	-0.333	0	0	0	-0.083	-0.03	-0.015	0.01	0.02
Summer	0.219	0	-0.041	.	0	0	-0.333	1	-0.333	0	0	0	0.687	0.021	0.011	-0.007	-0.014
Winter	-0.008	0	0.024	.	0	0	-0.333	-0.333	1	0	0	0	-0.751	-0.013	-0.007	0.004	0.009
South facing	-0.154	-0.096	-0.069	.	0.006	-0.104	0	0	0	1	-0.342	-0.368	0	-0.109	0.037	-0.047	-0.043
East facing	0.014	-0.187	0.092	.	-0.021	0.089	0	0	0	-0.342	1	-0.398	0	0.009	-0.093	-0.026	0.064
West facing	0.045	0.237	0.009	.	0.164	0.062	0	0	0	-0.368	-0.398	1	0	0.057	-0.106	0.009	0.071
Avg. Temp	0.161	0	-0.047	.	0	0	-0.083	0.687	-0.751	0	0	0	1	0.025	0.013	-0.009	-0.017
Under 55	0.017	0.081	-0.099	.	-0.064	0.076	-0.03	0.021	-0.013	-0.109	0.009	0.057	0.025	1	-0.117	-0.136	-0.075
55 to 64	-0.05	0.073	-0.393	.	-0.237	-0.033	-0.015	0.011	-0.007	0.037	-0.093	-0.106	0.013	-0.117	1	-0.42	-0.23
65 to 74	0.021	-0.14	-0.154	.	0.039	0.027	0.01	-0.007	0.004	-0.047	-0.026	0.009	-0.009	-0.136	-0.42	1	-0.269
85 and Over	0.055	0.024	0.469	.	0.155	-0.074	0.02	-0.014	0.009	-0.043	0.064	0.071	-0.017	-0.075	-0.23	-0.269	1

Based on the Pearson's matrix, in Table 28, the following variables are positively correlated to kWh usage: Male, Tenure, Unit Income, Summer, East facing units, West facing units, Average Temperature, Under 55, 65 to 74, and 85 and Over. Summer (22%), Tenure (17%), Avg. Temp (16%) and Unit Income (14%) were the strongest of those correlations but still considered very weak, except for Summer that is in the weak category. These numbers indicate that kWh usage is higher in the Summer when compared to Fall, and amongst the three age brackets listed when compared to the 75 to 84-year-old bracket. Additionally, males, tenants with longer tenure, and occupants with higher income use more kWhs of electricity. Also, kWh use increases when the temperature rises, and for those living in East, and West facing units, when compared to North facing units. The other variables, as seen in Table 28, were negatively correlated, with varying degrees of weakness. These very weak negative correlations indicate,

during the years studied, residents used fewer kWhs in the Spring, and Winter, when compared to Fall. Also, apartments on higher floors use fewer kWhs than units on lower floors, and South facing apartments use fewer kWhs than those facing North.

Table 29

Alpha Tower Regression output for Building Control

Model		Sum of Squares	df	Mean Square	Number of Obs =	3600
					F(15, 3584)	42.60
1	Regression	19285515.28	15	1562304.67	Prob > F	0.00
	Residual	108177695.4	3584	30308.21	R-square	0.15
					Adj R-square	0.15
	Total	127463210.6	3599.00	35416.29	Root MSE	174.09

Table 30

Alpha Tower Regression Output for Building Control with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	106.30	26.88	3.95	0.00	
Male	24.21	6.49	3.73	0.00	1.11
Tenure	6.75	0.63	10.68	0.00	1.67
Unit Income	0.01	0.00	8.62	0.00	1.12
Floor number	-1.02	0.68	-1.50	0.14	1.03
Spring	-33.86	8.61	-3.94	0.00	1.66
Summer	51.46	10.18	5.06	0.00	2.32
Winter	61.98	12.98	4.78	0.00	3.77
South facing	-84.03	9.31	-9.03	0.00	1.88
East facing	-33.02	9.13	-3.62	0.00	1.96
West-facing	-35.50	9.02	-3.94	0.00	2.04
Avg. Temp	2.06	0.38	5.49	0.00	4.98
Under 55	41.66	17.04	2.45	0.02	1.21
55 to 64	36.78	9.58	3.84	0.00	2.13
65 to 74	34.97	8.38	4.17	0.00	1.85
85 and Over	-8.43	10.48	-0.81	0.42	1.46

The results of the Multiple Regression for the Building Control years (2015-2018), at Alpha Tower, in Table 29, reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model having no kWh usage explanatory value. And the alternative hypothesis is accepted, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .15 indicates this model can account for approximately 15% of the variability in kWh usage. This Adjusted R-square is in line

with recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), in Table 1.

Moving on to individual variables is the gender variable Male. As seen in Table 30, the coefficient is a positive 24.21 and is significant at the 95% level. Thus, in this building, males consume approximately 24 kWhs per month more than their female neighbors.

Next is how long the occupant has lived in their apartment (Tenure). As seen in Table 30, the coefficient is a positive 6.75 and significant at the 95% level, so as a tenant's tenure increases by one year, their kWh usage increases by nearly seven kWhs per month.

Moving along is the race of the occupant. There is no racial diversity in Alpha Tower; all residents are African American, so this researcher removed the variable from the model.

Next is the occupant's household income. The coefficient is 0.01 and significant at the 95% level. Hence, for each one dollar increase in income, the tenant uses .01 kWhs more electricity.

Next is the apartment floor level. As seen in Table 30, the coefficient is a negative 1.02 and not significant. Therefore, in the Alpha Tower, for the Building Control year, there is not a significant difference in electricity usage based on the floor an apartment occupies.

Now, is the season-of-the-year variable. As seen in the Table, the coefficients for Spring, Summer, and Winter are a negative 33.86, a positive 51.46, and positive 61.98, respectively. Each season is significant at the 95% level; thus, in Summer and Winter

months, residents consume 51.5 and 62 kWhs more per month, respectively, than they use in the Fall. During Spring, tenants use 34 kWhs less per month compared to Fall usage.

The next variable is the direction the apartment faces. As seen in Table 30, the coefficients are a negative 84.03 (South), a negative 33.02 (East), and a negative 35.5 (West).

All apartment directions are significant at the 95% level. Hence, residents in South facing apartments use 84 fewer kWhs, per month, than occupants in North facing apartments. Residents in East facing apartments use 33 fewer kWhs per month than those in North facing units. And tenants in West facing apartments use 35.5 fewer kWhs per month than occupants in North facing apartments.

Next is the average monthly temperature variable. As seen in the Table, the coefficient is a positive 2.06 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use an additional two kWhs of electricity per month.

Lastly, the coefficients for the age brackets were a positive 41.66 (Under 55), 36.78 (55 to 64), and 34.97 and significant at the 95% level. Those coefficients indicate an additional 42, 37, and 35 kWh usage for each of those age brackets, respectively, when compared to the 75 to 84 age band. The 85 and Over group is a negative 8.43 and not significant.

Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed any variable(s) that were greater than or equal to ten from the model.

Alpha Tower (Economic Incentives) PY (Attendees) with Building Control

This researcher offered the residents at Alpha Tower economic incentives to conserve electricity. This researcher chose this building randomly to suspend the treatment, midway through the program, with continued monitoring. So, this researcher held the last monthly meeting in December of 2018.

Table 31

Descriptive Stats for the PY Attendees at Alpha Tower

	N	Minimum	Maximum	Mean
KWH Used per 30 Days	3852	9.68	1189.41	334.30
Occupant Age	3852	49.00	99.00	71.30
Under 55	3852	0.00	1.00	0.04
55 to 64	3852	0.00	1.00	0.26
65 to 74	3852	0.00	1.00	0.33
75 to 84	3852	0.00	1.00	0.24
85 and Over	3852	0.00	1.00	0.14
Male	3852	0.00	1.00	0.32
Tenure	3852	0.32	29.90	9.14
African American	3852	1.00	1.00	1.00
Unit Income	3852	2850.00	31641.00	12100.09
Floor number	3852	2.00	16.00	9.58
Spring	3852	0.00	1.00	0.25
Summer	3852	0.00	1.00	0.25
Fall	3852	0.00	1.00	0.25
Winter	3852	0.00	1.00	0.25
North facing	3852	0.00	1.00	0.19
South facing	3852	0.00	1.00	0.24
East facing	3852	0.00	1.00	0.28
West-facing	3852	0.00	1.00	0.29
Avg. Temp	3852	21.10	76.30	51.95
Economic Incentives Offered Attendee Only	3852	0.00	7.00	0.34
Valid N (listwise)	3852			

This researcher created a dummy independent variable (IV) for the economic incentive treatment to include in the multiple regression model. This researcher ran the model for PY attendees against Building Control, which consists of all residents in the years before the PY. This researcher ran the model using resident age as an IV, and he ran the model with five age band IVs. This researcher presents the descriptive statistics in Table 31.

There were 3852 total observations; of those, this researcher discusses the statistics of interest. The average kWh usage was 334, with minimum usage of 9.5 kWhs and maximum monthly usage of 1189.5 kWhs. The typical occupant was approximately 71 years old, with the extreme ages being 49 and 99. The majority of the attendees (33%) are in the 65 to 74 age band, followed by 55 to 64 (26%), 75 to 84 (24%), 85 and Over (14%), and Under 55 at (4%). The creation of age bands improved both the R-square and treatment coefficient, as will be seen in the regression results. Approximately 32% of the program attendees were male, and the average income of the occupants is $12,100, with a range of $2,850 to $31,641. The typical occupant has a 9.14-year occupancy, with four months being the minimum tenure and 30 years being the maximum. The majority of attendee apartments face West (29%), followed by East (28%), then South and North at 24 and 19% respectively. The monthly temperature average was 52 degrees Fahrenheit, with the minimum monthly average being 21 degrees Fahrenheit and the maximum being 76 degrees Fahrenheit.

Table 32

Pearson's Correlation for Alpha Tower PY (Attendees) with Building Control

	KWH Used per 30 Days	Male	Tenure	African American	Unit Income	Floor number	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	Economic Incentives Offered Attendee Only	Under 55	55 to 64	65 to 74	85 and Over
KWH Used per 30 Days	1.00	0.09	0.17	.	0.16	-0.03	-0.17	0.23	-0.01	-0.16	0.01	0.05	0.17	-0.06	0.02	-0.05	0.03	0.04
Male	0.09	1.00	0.01	.	0.05	-0.02	0.00	0.00	0.00	-0.10	-0.18	0.24	0.00	-0.09	0.07	0.10	-0.15	0.02
Tenure	0.17	0.01	1.00	.	0.17	-0.03	0.06	-0.04	0.02	-0.08	0.12	-0.02	-0.05	0.17	-0.09	-0.40	-0.17	0.49
African American	.	.	.	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Unit Income	0.16	0.05	0.17	.	1.00	-0.05	0.00	0.00	0.00	0.00	-0.01	0.16	0.00	-0.03	-0.07	-0.23	0.04	0.14
Floor number	-0.03	-0.02	-0.03	.	-0.05	1.00	0.00	0.00	0.00	-0.11	0.09	0.07	0.00	-0.01	0.09	-0.04	0.04	-0.09
Spring	-0.17	0.00	0.06	.	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.08	0.05	-0.03	-0.01	0.00	0.02
Summer	0.23	0.00	-0.04	.	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.69	-0.09	0.02	0.01	0.00	-0.02
Winter	-0.01	0.00	0.02	.	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.75	0.05	-0.01	-0.01	0.00	0.01
South facing	-0.16	-0.10	-0.08	.	0.00	-0.11	0.00	0.00	0.00	1.00	-0.35	-0.36	0.00	0.00	-0.11	0.04	-0.03	-0.05
East facing	0.01	-0.18	0.12	.	-0.01	0.09	0.00	0.00	0.00	-0.35	1.00	-0.40	0.00	0.06	-0.01	-0.11	-0.05	0.09
West facing	0.05	0.24	-0.02	.	0.16	0.07	0.00	0.00	0.00	-0.36	-0.40	1.00	0.00	-0.08	0.05	-0.09	0.02	0.04
Avg. Temp	0.17	0.00	-0.05	.	0.00	0.00	-0.08	0.69	-0.75	0.00	0.00	0.00	1.00	-0.12	0.02	0.01	0.00	-0.02
Economic Incentives Offered Attendee Only	-0.06	-0.09	0.17	.	-0.03	-0.01	0.05	-0.09	0.05	0.00	0.06	-0.08	-0.12	1.00	0.01	-0.06	0.00	0.09
Under 55	0.02	0.07	-0.09	.	-0.07	0.09	-0.03	0.02	-0.01	-0.11	-0.01	0.05	0.02	0.01	1.00	-0.12	-0.14	-0.08
55 to 64	-0.05	0.10	-0.40	.	-0.23	-0.04	-0.01	0.01	-0.01	0.04	-0.11	-0.09	0.01	-0.06	-0.12	1.00	-0.41	-0.23
65 to 74	0.03	-0.15	-0.17	.	0.04	0.04	0.00	0.00	0.00	-0.03	-0.05	0.02	0.00	0.00	-0.14	-0.41	1.00	-0.28
85 and Over	0.04	0.02	0.49	.	0.14	-0.09	0.02	-0.02	0.01	-0.05	0.09	0.04	-0.02	0.09	-0.08	-0.23	-0.28	1.00

Based on the Pearson's matrix in Table 32, the following variables have positive correlations to kWh usage: Male, Tenure, Unit Income, Summer, East and West facing units, Under 55, 65 to 74, 85 and Over, and Average Temperature. Summer (.23) Average Temperature and Tenure (.17) were the strongest of those correlations. Summer is considered a weak relationship, but all the remaining positive correlations are in the very weak category. These numbers indicate more kWh usage amongst tenants that have lived there longer, males, and higher-income tenants. Further, kWh use increases in Summer, as the temperature rises, and in West and East facing units. Additionally, the age bands Under 55, 65 to 74, and 85 and Over, use more electricity. The following are negatively correlated variables, to varying degrees of weakness: Spring at (-.17), South facing (-.13), Economic Incentive (-.06), 55 to 64 (-.05), and Floor number (-.03). These very weak negative correlations indicate tenants in South facing units use fewer kWhs than units

facing North, East, or West. Additionally, fewer kWhs are used in Spring, Winter, and age group 55 to 64. Lastly, tenants who received some form of Economic Incentives used less electricity.

Table 33

Alpha Tower Regression output for PY (Attendees) with Building Control

Model		Sum of Squares	df	Mean Square	Number of Obs =	3852
					F (16, 3835)	47.02
1	**Regression**	21985429.71	16	1374089.36	Prob > F	0.00
	Residual	112081902.28	3835	29226.05	R-square	0.16
					Adj R-square	0.16
	Total	134067331.98	3851	34813.64	Root MSE	170.96

Table 34

Alpha Regression Output for PY (Attendees) with Building Control and VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	110.78	25.32	4.38	0.00	
Male	24.94	6.28	3.97	0.00	1.13
Tenure	6.68	0.59	11.32	0.00	1.74
Unit Income	0.01	0.00	9.63	0.00	1.12
Floor number	-1.40	0.65	-2.14	0.03	1.04
Spring	-33.14	8.16	-4.06	0.00	1.64
Summer	54.24	9.71	5.58	0.00	2.33
Winter	59.22	12.21	4.85	0.00	3.69
South facing	-83.72	8.84	-9.47	0.00	1.88
East facing	-33.32	8.66	-3.85	0.00	1.98
West-facing	-33.67	8.63	-3.90	0.00	2.02
Avg. Temp	1.95	0.35	5.51	0.00	4.94
Economic Incentives	-6.65	2.02	-3.30	0.00	1.06
Under 55	40.80	16.10	2.53	0.01	1.22
55 to 64	35.91	9.19	3.91	0.00	2.12
65 to 74	38.35	7.99	4.80	0.00	1.86
85 and Over	-16.29	9.84	-1.66	0.10	1.51

The results of the Multiple Regression for the Alpha Tower PY (Attendees) with Building Control, found in Table 33, reveal an F probability of 0, meaning this researcher rejects the null hypothesis of this model having no kWh usage explanatory value. And the alternative hypothesis is accepted, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .16 indicates this model can account for approximately 16% of the variability in kWh usage. This Adjusted R-square is in line with recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), in Table 1.

Moving on to individual variables is the gender variable Male. As seen in Table 34, the coefficient is a positive 24.94 and is significant at the 95% level. Thus, in this building, males consume approximately 25 kWhs per month more than their female neighbors.

Next is how long the occupant has lived in their apartment (Tenure). As seen in Table 34, the coefficient is a positive 6.68 and significant at the 95% level, so as a tenant's tenure increases by one year, their kWh usage increases by nearly seven kWhs per month.

Moving along is the race of the occupant. There is no racial diversity in Alpha Tower; all residents are African American, so this researcher removed this variable from the model.

Next is the occupant's household income. The coefficient is 0.01 and significant at the 95% level. Hence, for each one dollar increase in income, the tenant uses .01 kWhs more electricity.

Continuing is the apartment floor level. As seen in Table 34, the coefficient is a negative 1.40 and significant at the 95% level. Therefore, in the Alpha Tower, as the apartment floor level increases by one, the occupants use approximately 1.5 fewer kWhs of electricity per month.

Next is the season-of-the-year variable. As seen in the Table, the coefficients for Spring, Summer, and Winter are a negative 33.14, a positive 54.24, and positive 59.22, respectively. Each season is significant at the 95% level; thus, in Summer and Winter months, residents consume 54 and 59 kWhs more per month, respectively, than they use in the Fall. During Spring, tenants use 33 kWhs less per month compared to Fall usage.

The next variable is the direction the apartment faces. As seen in Table 34, the coefficients are a negative 83.72 (South), a negative 33.32 (East), and a negative 33.67 (West). All directions are significant at the 95% level; hence, residents in South facing units use 84 fewer kWhs per month, than occupants in North facing apartments. Residents in East facing apartments use 33 fewer kWhs per month than those in North facing apartments, and tenants in West facing apartments use 34 fewer kWhs per month than occupants in North facing units.

Next is the average monthly temperature variable. As seen in the Table, the coefficient is a positive 1.95 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use an additional two kWhs of electricity per month.

The coefficients for the age brackets were a positive 40.80 (Under 55), 35.91 (55 to 64), 38.35 (65 to 74), and -16.29 (85 and Over). Each age bracket is significant at the 95% level, except for 85 and Over, which is significant at the 90% level. These numbers indicate an additional 41, 36, and 38 kWh usage for each of the positively correlated age brackets, respectively, when compared to the 75 to 84 age band. The 85 and Over group is a negative 16.29, meaning they use 16 fewer kWhs per month than the 75 to 84 age band.

Lastly, is the variable for tenants who attended a monthly program class, with the opportunity to receive a gift card as an economic incentive. As seen in Table 34, the coefficient is a negative 6.65 and significant at the 95% level. Thus, the null hypothesis is rejected, which states there will be no difference in electricity consumption based on attending an Economic Incentive program class. And accept the null hypothesis, which

indicates when compared to historical usage data, there will be decreased electricity usage for residents who attended a class. Program attendees used approximately seven fewer kWhs per month.

Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed any variable(s) that were greater than or equal to ten from the model.

ETL (Education and Economic Incentives) June 2015-May 2018 (Building Control)

The following descriptive statistics encompass the years before the PY for ETL. This researcher provides a complete list of the results in Table 35.

Table 35

ETL Descriptive Statistics for Building Control

	N	Minimum	Maximum	Mean
KWH Used per 30 Days	2268	22.00	2427.27	621.84
Occupant Age	2268	23.00	96.00	65.43
Under 55	2268	0.00	1.00	0.20
55 to 64	2268	0.00	1.00	0.23
65 to 74	2268	0.00	1.00	0.31
75 to 84	2268	0.00	1.00	0.19
85 and Over	2268	0.00	1.00	0.07
Male	2268	0.00	1.00	0.24
Tenure	2268	0.25	28.69	9.20
African American	2268	0.00	1.00	0.65
Unit Income	2268	5199.00	23763.00	10832.43
Floor number	2268	1.00	8.00	5.00
Spring	2268	0.00	1.00	0.25
Summer	2268	0.00	1.00	0.25
Fall	2268	0.00	1.00	0.25
Winter	2268	0.00	1.00	0.25
North facing	2268	0.00	1.00	0.38
South facing	2268	0.00	1.00	0.41
East facing	2268	0.00	1.00	0.10
West-facing	2268	0.00	1.00	0.11
Avg. Temp	2268	25.20	76.70	53.20
Valid N (listwise)	2268			

There were 2268 total observations, of which, this researcher will discuss specific statistics of interest. The average kWh usage was 622, with minimum usage of 22 kWhs and maximum monthly usage of 2427 kWhs. The typical occupant was approximately 65.5 years old, with the extreme ages being 23 and 96. About 24% of the occupants are

male, and the average tenant income is $10,831, with a range of $5,199 to $23,763. The typical occupant has a 9-year occupancy, with four months being the minimum tenure and 29 years being the maximum. The majority of apartments face South (41%), followed by North (38%), then West and East at 11% and 10% respectively. The monthly temperature average was 53 degrees Fahrenheit, with the minimum monthly average being 25 degrees Fahrenheit and the maximum being 77 degrees Fahrenheit. As seen in Table 35, the most significant percentage of tenants (31%) are in the 65 to 74 age band, followed by 55 to 64 (23%), 75 to 84 (19%), 85 and Over (7%), and Under 55 at 20%.

Table 36

Pearson's Correlation for ETL Building Control

	KWH Used per 30 Days	Male	Tenure	African American	Unit Income	Floor number	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	Under 55	55 to 64	65 to 74	85 and Over
KWH Used per 30 Days	1.00	0.14	0.03	0.16	-0.09	-0.08	-0.06	-0.16	0.39	-0.08	0.07	0.07	-0.40	0.02	-0.02	-0.02	0.08
Male	0.14	1.00	-0.01	0.02	0.15	0.07	0.00	0.00	0.00	-0.01	0.07	-0.08	0.00	0.26	-0.11	0.10	-0.16
Tenure	0.03	-0.01	1.00	-0.20	0.19	-0.15	0.06	-0.04	0.02	0.06	0.04	0.01	-0.05	0.07	-0.06	-0.13	0.22
African American	0.16	0.02	-0.20	1.00	-0.17	-0.21	0.00	0.00	0.00	0.01	-0.10	0.05	0.00	-0.20	0.03	0.13	0.10
Unit Income	-0.09	0.15	0.19	-0.17	1.00	0.09	0.00	0.00	0.00	-0.03	-0.07	0.11	0.00	-0.02	-0.27	0.17	0.17
Floor number	-0.08	0.07	-0.15	-0.21	0.09	1.00	0.00	0.00	0.00	0.02	-0.05	-0.10	0.00	0.06	0.07	0.11	0.02
Spring	-0.06	0.00	0.06	0.00	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.09	-0.02	0.00	-0.01	0.02
Summer	-0.16	0.00	-0.04	0.00	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.69	0.01	0.00	0.01	-0.02
Winter	0.39	0.00	0.02	0.00	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.72	-0.01	0.00	0.00	0.01
South facing	-0.08	-0.01	0.06	0.01	-0.03	0.02	0.00	0.00	0.00	1.00	-0.27	-0.30	0.00	0.04	-0.07	-0.19	0.32
East facing	0.07	0.07	0.04	-0.10	-0.07	-0.05	0.00	0.00	0.00	-0.27	1.00	-0.12	0.00	-0.03	-0.11	0.26	-0.09
West facing	0.07	-0.08	0.01	0.05	0.11	-0.10	0.00	0.00	0.00	-0.30	-0.12	1.00	0.00	-0.05	0.17	-0.13	-0.09
Avg. Temp	-0.40	0.00	-0.05	0.00	0.00	0.00	-0.09	0.69	-0.72	0.00	0.00	0.00	1.00	0.02	0.00	0.01	-0.02
Under 55	0.02	0.26	0.07	-0.20	-0.02	0.06	-0.02	0.01	-0.01	0.04	-0.03	-0.05	0.02	1.00	-0.27	-0.33	-0.14
55 to 64	-0.02	-0.11	-0.06	0.03	-0.27	0.07	0.00	0.00	0.00	-0.07	-0.11	0.17	0.00	-0.27	1.00	-0.36	-0.15
65 to 74	-0.02	0.10	-0.13	0.13	0.17	0.11	-0.01	0.01	0.00	-0.19	0.26	-0.13	0.01	-0.33	-0.36	1.00	-0.18
85 and Over	0.08	-0.16	0.22	0.10	0.17	0.02	0.02	-0.02	0.01	0.32	-0.09	-0.09	-0.02	-0.14	-0.15	-0.18	1.00

In addition to the descriptive statistics and regression results, this researcher conducted a correlation analysis of the variables. Based on the Pearson's matrix, the following variables are positive, albeit in varying degrees of weakness, correlated to kWh usage: males, tenure, African American, Winter, West and East facing apartments, and the

age bands Under 55 and 85 and Over. The strongest of those positive correlations were Winter and African American, which were .39 (nearly moderate) and .16 (very weak), respectively. These numbers indicate more kWh usage for African Americans and during Winter. There was a very weak positive correlation for Males (.14), Tenure (.03), and West and East facing apartments at .07. These very weak correlations indicate men, in the building, use more kWhs than women; tenants who have lived at the building longer use more kWhs. And tenants in West and East facing apartments use more kWhs of electricity, but the increase is de minimis. Lastly, the Under 55 and the 85 and Over age bands were at .02 and .08 respectively, which indicates these age bands using more kWhs per month than the 75 to 84 age band.

Average Temperature has a negative correlation at -.40 (moderate), and the other seven negatively correlated variables were very weak, with Summer at -.16 being the strongest of the very weak. The negatively correlated variables indicate less kWh usage in the following situations: as the temperature rises; during Summer and Spring; as personal income increases; in South facing apartments; apartments on higher floors; and for residents in the 55 to 64 and the 65 to 74 age bands. The full Pearson's correlation results are in Table 36.

Table 37

ETL Regression Output for Building Control

Model		Sum of Squares	df	Mean Square	Number of Obs =	2269
					F (13, 2255)	58.48
1	Regression	101589820.1	16	6349363.76	Prob > F	0.00
	Residual	244410603.3	2251	108578.68	R-square	0.294
					Adj R-square	0.289
	Total	346000423.4	2267	152624.80	Root MSE	329.51

Table 38

ETL Regression Output for Building Control with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	1155.12	64.97	17.78	0.00	
Male	163.72	17.76	9.22	0.00	1.20
Tenure	2.14	1.26	1.70	0.09	1.21
African American	107.23	16.47	6.51	0.00	1.29
Unit Income	-0.02	0.00	-6.92	0.00	1.34
Floor number	-5.42	3.69	-1.47	0.14	1.23
Spring	11.93	20.36	0.59	0.56	1.62
Summer	177.41	24.12	7.36	0.00	2.28
Winter	138.59	28.82	4.81	0.00	3.25
South facing	-78.95	16.52	-4.78	0.00	1.38
East facing	78.39	26.31	2.98	0.00	1.25
West-facing	109.11	24.55	4.45	0.00	1.24
Avg. Temp	-10.28	0.89	-11.50	0.00	4.32
Under 55	12.46	23.63	0.53	0.60	1.88
55 to 64	-32.801	22.598	-1.452	0.147	1.88
65 to 74	-19.081	22.19	-0.86	0.39	2.181
85 and Over	217.378	33.591	6.471	0	1.554

The result of the multiple regression, as seen in Table 37, demonstration reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model not having, kWh usage, explanatory value. And the alternative hypothesis is accepted, which

states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .289 indicates this model can account for approximately 29% of the variability in kWh usage. This adjusted R-square is rather robust when compared to recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), in Table 1.

Moving on to individual variables first is the occupant's gender. As seen in Table 38, the coefficient is a positive 164 and is significant at the 95% level. Thus, in this building, males consume approximately 164 kWhs per month more than their female neighbors.

Next is how long the occupant has lived in their apartment. As seen in Table 38, the coefficient is a positive 2.14 and significant at the 90% level, so as a tenant's tenure increases by one year, their kWh usage increases by approximately two kWhs per month.

Moving along is the race of the occupant. As seen in Table 38, the coefficient (African Americans) is a positive 107.23 and significant at the 95% level. Accordingly, African Americans consume approximately 107 more kWhs per month than non-African Americans.

Next is the occupant's household income. As seen in Table 38, the coefficient is a negative 0.02 and significant at the 95% level. Hence, there is a negligible yet negative and significant relationship between household income and kWh usage. In ETL, for each one (1) dollar increase in income, the occupant uses .02 fewer kWhs each month.

Moving along is the apartment floor level. As seen in Table 38, the coefficient is a negative 5.42 and not significant. However, by using a more lenient 85% significance

level, this coefficient would be significant and show that as the apartment floor level increased by one, the occupant would use approximately 5.5 fewer kWhs per month.

Next is the season of the year variable. As seen in Table 38, the coefficients for Spring, Summer, and Winter are a positive 11.93, 177.41, and 138.59 respectively and significant at the 95% level, for Summer and Winter. Thus, in Summer, and Winter residents consume approximately 177.5, and 138.5 more kWhs of electricity, respectively, when compared to the Fall.

The next variable is the direction the apartment faces. As seen in Table 38, the coefficients are a negative 78.95 (South), a positive 78.39 (East), and a positive 109.11 (West). Each coefficient is significant at the 95% level. Hence, residents in apartments facing South use approximately 79 fewer kWhs per month; and, residents in units facing East and West use an additional 78 and 109 kWhs per month, respectively, when compared to units facing North.

Next is the average monthly temperature variable. The coefficient is a negative 10.28 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use approximately 10.25 fewer kWh of electricity.

Lastly, the resident age bands, as seen in Table 38, the coefficients are a positive 12.46 (Under 55), 217.38 (85 and Over), and a negative 32.80 (55 to 64), and a negative 19.08 (65 to 74). The 85 and Over age group was significant at the 95% level, which indicates they use approximately 217 more kWhs per month than the 75 to 84 age band. The 55 to 64 age band would be significant by relaxing the significance level to 85%.

Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. This researcher removed Any variable(s) that were greater than or equal to ten from the model.

ETL (Education and Economic Incentives) PY (Attendees) with Building Control

The residents at ETL were offered monthly education classes, on electricity conservation, and could receive economic incentives for conserving electricity. Each resident who attended the program received a ten-question Pre-text. During the final education class, in May of 2019, the residents were given a Post-test, with the same ten questions. This researcher displays the full results in Tables 39 through 42.

Table 39

ETL 10 question Pre & Post-test results

	Pre-test	Post-Test
N	**38**	**34**
Mean	2.7	7.9
Median	3	8
Mode	1	7
Min	0	5
Max	5	10

Table 40

ETL Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	2.53	34	1.482	0.254
	Post Test	7.94	34	1.536	0.263

Table 41

ETL Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre Test & Post Test	34	0.094	0.597

Table 42

ETL Paired Samples Test

	Paired Differences						t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test - Post Test	-5.412	2.032	0.348	-6.121	-4.703	-15.531	33	0

The average number of correct answers on the Pre-test was approximately 2.7. At the end of the program, the average resident increased their score by more than five questions, resulting in a most frequent score of 7 correct answers, which was a 6 question increase from the Pre-test. After conducting a Paired Samples T-Test, the results show that while there were no significant correlations between the individual Pre and Post - Test scores (see Table 41). The overall mean difference, as seen in Table 42, between the Pre and Post-Test scores, is significant at the 95% level.

Table 43

ETL PY (Attendees) *Descriptive Statistics with Building Control*

	N	Minimum	Maximum	Mean
KWH Used per 30 Days	2496	22.00	2443.45	632.99
Occupant Age	2496	23.00	96.00	65.67
Under 55	2496	0.00	1.00	0.19
55 to 64	2496	0.00	1.00	0.24
65 to 74	2496	0.00	1.00	0.31
75 to 84	2496	0.00	1.00	0.19
85 and Over	2496	0.00	1.00	0.07
Male	2496	0.00	1.00	0.24
Tenure	2496	0.25	29.69	9.36
African American	2496	0.00	1.00	0.67
Unit Income	2496	5199.00	23763.00	10778.63
Floor number	2496	1.00	8.00	4.97
Spring	2496	0.00	1.00	0.25
Summer	2496	0.00	1.00	0.25
Winter	2496	0.00	1.00	0.25
Fall	2496	0.00	1.00	0.25
North facing	2496	0.00	1.00	0.38
South facing	2496	0.00	1.00	0.40
East facing	2496	0.00	1.00	0.10
West-facing	2496	0.00	1.00	0.12
Valid N (listwise)	2496			

The following descriptive statistics encompass the PY (Attendees), for ETL, with Building Control. This researcher provides a complete list of the results in Table 43. There were 2496 total observations, of which, this researcher will discuss specific statistics of interest. The average kWh usage was 633, with minimum usage of 22 kWhs and maximum monthly usage of 2443.5 kWhs. The typical occupant was approximately 65.7 years old, with the extreme ages being 23 and 96. About 24% of the occupants are male, and the average tenant income is $10,779, with a range of $5,199 to $23,763. The typical occupant has a 9.4-year occupancy, with four months being the minimum tenure and 29.7 years being the maximum. The majority of apartments face South (40%) followed by North (38%), then West and East at 10% and 12% respectively. The monthly temperature average was 53 degrees Fahrenheit, with the minimum monthly average being 25 degrees Fahrenheit and the maximum being 77 degrees Fahrenheit. As seen in Table 43, the most significant percentage of tenants (31%) are in the 65 to 74 age band, followed by 55 to 64 (24%), 75 to 84 (19%), 85 and Over (7%), and Under 55 at 19%.

Table 44

Pearson's Correlation for ETL PY (Attendees) with Building Control

	KWH Used per 30 Days	Male	Tenure	African American	Unit Income	Floor number	Spring	Summer	Winter	South facing	East facing	West facing	Avg. Temp	ED. & Econ. Incentives	Under 55	55 to 64	65 to 74	85 and Over
KWH Used per 30 Days	1.00	0.15	0.04	0.17	-0.10	-0.09	-0.06	-0.17	0.40	-0.08	0.07	0.08	-0.42	0.12	0.01	-0.02	-0.02	0.08
Male	0.15	1.00	-0.03	0.03	0.10	0.04	0.00	0.00	0.00	0.00	0.09	-0.07	0.00	0.02	0.25	-0.11	0.11	-0.16
Tenure	0.04	-0.03	1.00	-0.19	0.20	-0.14	0.06	-0.04	0.02	0.07	0.02	-0.02	-0.05	0.07	0.07	-0.05	-0.16	0.27
African American	0.17	0.03	-0.19	1.00	-0.16	-0.21	0.00	0.00	0.00	0.01	-0.10	0.07	0.00	0.12	-0.19	0.02	0.10	0.10
Unit Income	-0.10	0.10	0.20	-0.16	1.00	0.10	0.00	0.00	0.00	-0.03	-0.07	0.12	0.00	-0.03	-0.03	-0.27	0.17	0.20
Floor number	-0.09	0.04	-0.14	-0.21	0.10	1.00	0.00	0.00	0.00	0.03	-0.07	-0.10	0.00	-0.05	0.03	0.09	0.11	0.03
Spring	-0.06	0.00	0.06	0.00	0.00	0.00	1.00	-0.33	-0.33	0.00	0.00	0.00	-0.09	0.11	-0.02	-0.01	-0.01	0.02
Summer	-0.17	0.00	-0.04	0.00	0.00	0.00	-0.33	1.00	-0.33	0.00	0.00	0.00	0.69	-0.11	0.01	0.00	0.01	-0.02
Winter	0.40	0.00	0.02	0.00	0.00	0.00	-0.33	-0.33	1.00	0.00	0.00	0.00	-0.72	0.04	-0.01	0.00	0.00	0.01
South facing	-0.08	0.00	0.07	0.01	-0.03	0.03	0.00	0.00	0.00	1.00	-0.26	-0.30	0.00	-0.07	0.05	-0.08	-0.18	0.34
East facing	0.07	0.09	0.02	-0.10	-0.07	-0.07	0.00	0.00	0.00	-0.26	1.00	-0.12	0.00	-0.03	-0.03	-0.11	0.26	-0.09
West facing	0.08	-0.07	-0.02	0.07	0.12	-0.10	0.00	0.00	0.00	-0.30	-0.12	1.00	0.00	0.08	-0.07	0.18	-0.12	-0.10
Avg. Temp	-0.42	0.00	-0.05	0.00	0.00	0.00	-0.09	0.69	-0.72	0.00	0.00	0.00	1.00	-0.10	0.02	0.00	0.01	-0.02
ED. & Econ. Incentives	0.12	0.02	0.07	0.12	-0.03	-0.05	0.11	-0.11	0.04	-0.07	-0.03	0.08	-0.10	1.00	-0.06	0.04	-0.01	0.04
Under 55	0.01	0.25	0.07	-0.19	-0.03	0.03	-0.02	0.01	-0.01	0.05	-0.03	-0.07	0.02	-0.06	1.00	-0.27	-0.32	-0.14
55 to 64	-0.02	-0.11	-0.05	0.02	-0.27	0.09	-0.01	0.00	0.00	-0.08	-0.11	0.18	0.00	0.04	-0.27	1.00	-0.37	-0.16
65 to 74	-0.02	0.11	-0.16	0.10	0.17	0.11	-0.01	0.01	0.00	-0.18	0.26	-0.12	0.01	-0.01	-0.32	-0.37	1.00	-0.19
85 and Over	0.08	-0.16	0.27	0.10	0.20	0.03	0.02	-0.02	0.01	0.34	-0.09	-0.10	-0.02	0.04	-0.14	-0.16	-0.19	1.00

In addition to the descriptive statistics and regression results, this researcher conducted a correlation analysis of the variables. The following variables, based on the Pearson's matrix, have positive correlations to kWh usage: males, tenure, African American, Winter, West and East facing apartments, and the age bands Under 55 and 85 and Over. Lastly, the treatment variable was also positive. The strongest of those positive correlations were Winter and African American, which were .40 (moderate) and .17 (very weak), respectively. These numbers indicate more kWh usage for African Americans and during Winter when compared to the Fall. There was a very weak positive correlation for Males (.15), Tenure (.04), and West and East facing apartments at .08 and .07, respectively. These very weak correlations indicate men, in the building, use more kWhs than women; tenants who have lived at the building longer use more kWhs.

And tenants in West and East facing apartments use more kWhs of electricity when compared to North facing units. The Under 55 and the 85 and Over age bands were at .01 and .08 respectively, which indicates these age bands using more kWhs per month than the 75 to 84 age band. Finally, those who attended at least one class used more electricity than the non-attendees and the Building Control years combined.

Average Temperature has a negative correlation at -.43 (moderate), and the remaining eight negatively correlated variables were very weak, with Summer at -.17 being the strongest of the very weak. The negatively correlated variables indicate less kWh usage in the following situations: as the temperature rises; during Summer and Spring, when compared to the Fall; as personal income increases; in South facing apartments, when compared to North facing units; apartments on higher floors; and for residents in the 55 to 64 and the 65 to 74 age bands. The full Pearson's correlation results are in Table 44.

Table 45

ETL PY (Attendees) Regression Output with Building Control

Model		Sum of Squares	df	Mean Square	Number of Obs =	2496
					F (17, 2478)	68.45
1	Regression	130129510	17	7654677.07	Prob > F	.00
	Residual	277115668	2478	111830.37	R-square	0.32
					Adj R-square	0.32
	Total	407245178	2495	163224.52	Root MSE	334.41

Table 46

ETL Regression Output for PY (Attendees) with Building Control and VIF

Model		Unstandardized Coefficients		t	Sig.	
		B	Std. Error			VIF
1	(Constant)	1243.58	61.92	20.08	0.00	
	Under 55	7.26	23.06	0.32	0.75	1.85
	55 to 64	-32.16	21.85	-1.47	0.14	1.92
	65 to 74	-21.63	21.60	-1.00	0.32	2.21
	85 and Over	233.57	32.85	7.11	0.00	1.65
	Male	178.35	16.96	10.52	0.00	1.17
	Tenure	1.76	1.22	1.44	0.15	1.25
	African American	107.84	16.15	6.68	0.00	1.28
	Unit Income	-0.02	0.00	-7.31	0.00	1.35
	Floor number	-6.37	3.55	-1.79	0.07	1.23
	Spring	-1.16	19.67	-0.06	0.95	1.62
	Summer	189.46	23.40	8.10	0.00	2.29
	Winter	118.50	27.53	4.30	0.00	3.17
	South facing	-86.34	16.20	-5.33	0.00	1.40
	East facing	74.54	25.49	2.92	0.00	1.26
	West-facing	106.51	23.11	4.61	0.00	1.26
	Avg. Temp	-11.61	0.85	-13.65	0.00	4.25
	ED. and Econ. Incentives	8.06	3.23	2.50	0.01	1.07

The result of the multiple regression, as seen in Table 46, reveals an F probability of 0, meaning this researcher rejects the null hypothesis of this model not having, kWh usage, explanatory value. And the alternative hypothesis is accepted, which states this model has explanatory value, at the 0.05 (95%) level. The adjusted R-square of .315 indicates this model can account for approximately 32% of the variability in kWh usage. This adjusted R-square is rather robust when compared to recent literature, where you find adjusted R-square numbers of 19 and 2 percent, as seen in Chang et al., (2016) and Asensio and Delmas (2016), in Table 1.

Moving on to individual variables, first are the resident age bands. As seen in Table 46, the coefficients are a positive 7.26 (Under 55) and 233.57 (85 and Over), and a negative 32.16 (55 to 64), and -21.63 (65 to 74). The 85 and Over age group was significant at the 95% level, which indicates they use approximately 233.5 more kWhs per month than the 75 to 84 age band. The 55 to 64 age band would be significant by relaxing the significance level to 85%.

Next is occupant gender; as seen in Table 46, the coefficient is a positive 178.35 and is significant at the 95% level. Thus, in this building, males consume approximately 178 more kWhs per month than their female neighbors.

Next is how long the occupant has lived in their apartment. As seen in Table 46, the coefficient is a positive 1.76 and is not significant. However, by using a more relaxed significance level of 85%, tenure would be significant and show that for each additional year of tenure, an occupant uses 1.76 additional kWhs per month.

Moving along is the race of the occupant variable. As seen in Table 46, the coefficient (African Americans) is a positive 107.84 and significant at the 95% level. Accordingly, African Americans, in this building, consume approximately 108 more kWhs per month than non-African Americans.

Next is the occupant's household income. As seen in Table 46, the coefficient is a negative 0.02 and significant at the 95% level. Hence, there is a negligible yet negative and significant relationship between household income and kWh usage. In ETL, for each one (1) dollar increase in income, the occupant uses .02 fewer kWhs each month.

Moving along, next is the apartment floor level. The table shows, the coefficient is a negative 6.37 and significant at the 90% level. Therefore, in ETL, as the apartment floor level increased by one, the occupants use approximately 6.4 fewer kWhs per month.

Next is the season of the year variable. As seen in Table 46, the coefficients for Spring, Summer, and Winter are a negative 1.16 (not significant) and a positive 189.46 and 118.50, respectively. Summer and Winter are significant at the 95% level. Thus, in Summer, and Winter residents consume approximately 189.5 and 118.5 more kWhs of electricity, respectively, when compared to the Fall.

The next variable is the direction the apartment faces. As seen in Table 46, the coefficients are a negative 86.34 (South), a positive 74.54 (East), and a positive 106.51 (West). Each coefficient is significant at the 95% level. Hence, residents in apartments facing South use approximately 86 fewer kWhs per month; and, residents in units facing East and West use an additional 74.5 and 106.5 kWhs per month, respectively, when compared to units facing North.

Next is the average monthly temperature variable. The coefficient is a negative 11.61 and significant at the 95% level. Accordingly, as the average monthly temperature rises one degree, tenants use approximately 11.61 fewer kWhs of electricity.

Lastly, is the Education and Economic Incentives treatment variable. As seen in Table 46, the coefficients are positive 8.06 and significant at the 95% level. Thus, this researcher rejects the null hypothesis, stating when compared to historical usage data, there will be no difference in electricity consumption for those who attend an **e**ducation class and receive an **e**conomic incentive, and those who do not. And accept the alternative hypothesis, which states there will be a significant difference in usage for program

attendees. The program attendees used 8.06 additional kWhs when compared to the non-attendees and Building Control years. This result is the opposite of expectations; however, this researcher addresses a confounding issue discovered midway through the program in the discussion. While this researcher includes more details of the confounding issue in the discussion section, this researcher discovered ETL is an all-electric building, unlike the other three, which have gas heat. Also, a rehab project created higher than usual heating needs.

Additionally, this researcher ran a variance inflation factor (VIF) to determine if there were multicollinearity issues. And this researcher removed any variable(s) that were greater than or equal to ten from the model.

Focus Group Results

In the last month of this research project, this researcher recruited participants for three focus groups, one from each treatment building. The residents are critical components of this project, getting their opinions about the strengths and weaknesses of this research project, as well as ways to improve upon what they received, is vital to this research. Each focus group contained six residents, for a total of 18 residents. At each building, this researcher chose three participants who successfully reduced their electricity consumption and three participants who were not as successful. This researcher recruited the focus group participants, with the assistance of the Service Coordinator. The Resident meetings took approximately one hour to complete, which included a box lunch provided by Alpha Homes.

Additionally, this researcher interviewed each building's Service Coordinator on the same day but separated from the residents. At Rushin Meadows, this researcher

interviewed the Project Manager along with the Service Coordinator. The Service Coordinator meetings took approximately 20 minutes to complete. This researcher asked for and received permission to make an audio recording of each session, which he transcribed and included in the appendices. This researcher removed all names to maintain confidentiality.

This researcher utilized an open-ended format and asked the following questions:

1. What aspect of the program was most impactful?
2. What aspect of the program was the least impactful?
3. Why do you feel you were successful or unsuccessful?
4. Have you heard about other, Alpha Homes, buildings participating in this project?
5. Which of the incentives was most important to you?
6. Has your electricity conservation knowledge improved?

After transcribing the audio recording (found in Appendix ?, ?, ?), this researcher calculated the number of responses to each question and this researcher rated the responses using the following scale: very good = 2; good = 1; neutral = 0; bad = -1; and very bad = -2. This researcher enlisted the assistance of two friends to rate the questions and instructed them to discuss any question or questions scored two or more points apart. Since they rated each question within a point of each other's rating, discussions were not necessary. Lastly, this researcher asked them to identify representative responses to each question. This researcher included the representative responses in the respective tables.

Rushin Meadows (Education) Focus Group

Rushin Service Coordinator and Project Manager

Table 47

Rushin Service Coordinator focus group results

Rushin Meadows' Service Coordinator and Project Manager				
Questions	Responses	Rater 1	Rater 2	Representative Responses
1. What aspect of the program was most impactful?	2	4	4	The residents having knowledge of what they are or aren't doing.
2. What aspect of the program was least impactful?	2	4	4	The repetition of the program was not liked by some residents.
3. Why do you feel some tenants were successful or unsuccessful?	2	4	3	If some tenants didn't see anything in it for them, they stopped coming.
4. Have you heard about other, Alpha Homes' buildings participating?	2	4	4	Yes, Tom mentioned it, but I don't know which buildings.
5. Which of the incentives was most important to you?	N/A	N/A	N/A	N/A
6. Has your electricity conservation knowledge improved?	2	4	4	Yes, I stopped using the space heater in my office.
Total	**10**	**20**	**19**	
Mean	**2**	**4**	**3.8**	
Per Response Mean	**N/A**	**2**	**1.9**	

On the day of the Rushin focus group, this researcher met with the Service Coordinator and Project Manager 30 minutes before meeting with the residents, in the Service Coordinator's office. This researcher received their permission to record the session then proceeded to ask the planned questions. Since the Rushin resident did not receive economic incentives, this researcher omitted question five. Also, item three was changed slightly, by extracting "you" and adding "some tenants," to elicit their opinions about their residents' outcomes. As seen in Table 47, the Service Coordinator and the Project Manager answered each question. Rater 1 judged each response very good, while Rater 2 judged each response, except item 3, very good. Rater 2 graded the response to question three as good. The combined mean results, for each answer, were 4 and 3.8 for Rater 1 and Rater 2, respectively, which, when divided by the two respondents, equate to a mean score of 2 (very good) for Rater 1 and 1.9 (near very good) for Rater 2. See Table 47 for the full results and sample responses.

Rushin Residents

Table 48

Rushin Meadows Resident focus group results

Rushin Meadows' Residents				
Questions	**Responses**	**Rater 1**	**Rater 2**	**Representative Responses**
1.What aspect of the program was most impactful?	6	11	11	I didn't realize how much electric I was using until you showed us!
2. What aspect of the program was least impactful?	5	10	8	Seeing the dam in California, since I live in Ohio.
3.Why do you feel you were successful or unsuccessful?	6	12	9	Attending this course every month made me successful.
4. Have you heard about other, Alpha Homes' buildings participating?	6	12	12	No others.
5. Which of the incentives was most important to you?	N/A	N/A	N/A	N/A
6. Has your electricity conservation knowledge improved?	6	12	12	"Oh yes, because I never knew nothing about electricity."
Total	**29**	**57**	**52**	
Mean	**5.8**	**11.40**	**10.40**	
Per Response Mean	**N/A**	**1.97**	**1.79**	

After meeting with the Service Coordinator and Project Manager, this researcher met with the Residents in the project's community room. There were six residents in attendance; three were very successful in reducing their electricity consumption, and three who were less successful. This researcher received permission to make an audio recording of the session, then proceeded to ask the planned questions; as with the Service Coordinator and Project Manager focus group, this researcher omitted question five since these residents did not receive an economic incentive. As seen in Table 48, each resident answered all questions except question three, which had one resident response missing. There were 29 total responses, with Rater 1 and Rater 2 grading them at 57 and 52 points, respectively. Dividing the scores by the total responses, this researcher arrives at a per response, mean of 1.96 for Rater 1 and 1.79 for Rater 2, which are both close to very good. See the full results, for the residents, and sample responses in Table 48.

Alpha Tower (Economic Incentives) Focus Group

Alpha Tower Service Coordinator

Table 49

Alpha Tower Service Coordinator focus group results

Alpha Towers' Service Coordinators				
Questions	Responses	Rater 1	Rater 2	Representative Responses
1.What aspect of the program was most impactful?	1	2	2	Coming up here and finding out they could be rewarded.
2. What aspect of the program was least impactful?	1	2	2	I don't think there was anything that was not impactful.
3.Why do you feel some tenants were successful or unsuccessful?	1	2	2	It was based on attendance and some being motivated by the incentives.
4. Have you heard about other, Alpha Homes' buildings participating?	1	2	2	No, I haven't heard of any other buildings participating.
5. Which of the incentives was most important to you?	1	2	2	The gift cards were most important to the residents.
6. Has your electricity conservation knowledge improved?	1	2	2	I became more conscious to turn the lights off when not in the room.
Total	**6**	**12**	**12**	
Mean	**1**	**2**	**2**	
Per Response Mean	**N/A**	**2.00**	**2.00**	

After driving to Chicago, this researcher first met the Service Coordinator, in her office, approximately an hour before meeting with the residents. After receiving permission to make an audio recording of the meeting, this researcher proceeded to ask the planned questions. Question three was changed slightly, by extracting "you" and adding "some tenants," to obtain her opinion concerning the residents' performance. As seen in Table 49, the Service Coordinator answered each question. Both Rater 1 and Rater 2 graded all the responses as very good. The combined score, for all items, was 12 for both Raters. So, when this researcher divided the total for all questions for each Rater by the total responses, two was the resulting per response score, which equates to very good. See Table 49 for the full results and sample responses.

Alpha Tower Residents

Table 50

Alpha Tower Resident focus group results

Alpha Towers' Residents				
Questions	**Responses**	**Rater 1**	**Rater 2**	**Representative Responses**
1. What aspect of the program was most impactful?	6	11	12	Seeing our usage helped to keep it down.
2. What aspect of the program was least impactful?	6	12	12	Nothing comes to mind, all of it was useful.
3. Why do you feel you were successful or unsuccessful?	5	10	8	Because I unplugged things I was not using.
4. Have you heard about other, Alpha Homes' buildings participating?	6	12	12	No, I haven't.
5. Which of the incentives was most important to you?	6	10	10	The light bulbs and gift cards.
6. Has your electricity conservation knowledge improved?	6	11	9	Yes, I learned if I'm not using it to turn it off.
Total	**35**	**66**	**63**	
Mean	**5.8**	**11**	**10.5**	
Per Response Mean	**N/A**	**1.89**	**1.80**	

After meeting with the Service Coordinator, this researcher met with the Residents in the community room. There were six residents in attendance; three were very successful in reducing their electricity consumption, and three who were less successful. This researcher received permission to make an audio recording of the session, then proceeded to ask the planned questions. As seen in Table 50, each resident answered all questions except item three, where one resident chose not to respond. There were 35 total responses, with Rater 1 and Rater 2 grading them a 66 and 63, respectively. Dividing the scores by the total responses, the researcher arrives at a per response, mean of 1.89 for Rater 1 and 1.80 for Rater 2; clearly, both near being rated very good. See the full results and sample responses in Table 50.

Wesley Tower (Education and Economic Incentives) Focus Group

Wesley Tower Service Coordinator

Table 51

Wesley Tower Service Coordinator focus group results

Wesley Towers' Service Coordinator				
Questions	Responses	Rater 1	Rater 2	Representative Responses
1.What aspect of the program was most impactful?	1	2	2	The interaction between the tenants and the PowerPoint presentation.
2. What aspect of the program was least impactful?	1	2	2	I can't think of anything that would be considered not impactful.
3.Why do you feel some tenants were successful or unsuccessful?	1	2	2	Some people have a I don't care mindset.
4. Have you heard about other, Alpha Homes' buildings participating?	1	2	2	No, I haven't heard of any other participants.
5. Which of the incentives was most important to you?	1	2	2	They like the lunch, but if I have to pick one I'd say the gift cards.
6. Has your electricity conservation knowledge improved?	1	2	2	Not sure it improved, but it made me think more about my usage.
Total	6	12	12	
Mean	1	2	2	
Per Response Mean	N/A	2.00	2.00	

For the Wesley Tower Focus Group, this researcher first met with the Service Coordinator, in her office, approximately a half-hour before meeting with the residents. After receiving permission to make an audio recording of the meeting, this researcher proceeded to ask the planned questions. Question three was changed slightly, by extracting "you" and adding "some tenants," to obtain her opinion concerning the residents' performance. As seen in Table 51, the Service Coordinator answered each question. Both Rater 1 and Rater 2 graded each response as very good. The combined results for each item were 12 for both Raters. So, when the total for all questions, for each Rater, was divided by the total responses, two was the resulting per response score, which equates to very good. See Table 51 for the full results and sample responses.

Wesley Tower Residents

Table 52

Wesley Tower Resident focus group results

Wesley Towers' Residents				
Questions	Responses	Rater 1	Rater 2	Representative Responses
1.What aspect of the program was most impactful?	6	10	12	The most impact was the lecture you gave us, with practical solutions.
2. What aspect of the program was least impactful?	6	9	12	The fact that we could not get more people to attend.
3.Why do you feel you were successful or unsuccessful?	6	11	10	I was successful because I unplugged a lot of things I wasn't using.
4. Have you heard about other, Alpha Homes' buildings participating?	5	10	10	I haven't heard anything.
5. Which of the incentives was most important to you?	5	9	10	The gift cards.
6. Has your electricity conservation knowledge improved?	6	11	11	Yes, definitely.
Total	34	60	65	
Mean	5.7	10	10.8	
Per Response Mean	N/A	1.76	1.91	

After meeting with the Service Coordinator, this researcher met with the Residents in the community room. There were six residents in attendance; three were very successful in reducing their electricity consumption, and three who were less successful. After receiving permission to make an audio recording of the session, this researcher proceeded to ask the planned questions. As seen in Table 52, four residents answered each item, and five of the six residents answered two questions. There were 34 total responses, with Rater 1 and Rater 2 scoring them at 60 and 65, respectively. Dividing the scores by the total responses, the researcher arrives at a per response, mean of 1.76 for Rater 1 and 1.91 for Rater 2; clearly, both near the very good rating. See the full results and sample responses in Table 52.

The following chapter is a discussion and analysis of the results of this project. The section covers the contribution this project has to current literature and provides answers to the research questions and hypotheses.

CHAPTER VI

DISCUSSION AND CONCLUSIONS

Research Questions and Hypotheses

This quasi-experiment sought to answer two fundamental questions. The first being, could a housing organization significantly reduce the average tenant electricity usage through a combination of resident-focused education, economic incentives, and evaluation? Secondly, is it economically viable for the organization to administer the treatment plan? This research provided answers for both research questions; however, the answer to question two is not straight forward and requires a more nuanced discussion that will occur later in this chapter.

As seen in Table 53, the answer to the first research question is yes, since the education and economic incentive treatments produced a significant reduction in kWh usage. Yet, when combined, the education and economic incentive treatments produced a confounding result that this researcher will discuss later on in this chapter.

The theory driving this research is that a significant monthly kWh reduction will be obtained by providing the residents of Alpha Homes' with an education program, designed to elicit reduced electricity consumption, or by offering economic incentives for reducing electricity consumption. Additionally, theory dictates that by combining both treatments, there would be a synergistic effect, creating the greatest, monthly, kWh

reduction. The four null hypotheses, found in Table 53, are a more detailed summation of the theory mentioned previously.

Table 53

Research question summary

Research Questions	Rushin (Education)	Alpha (Economic Incentives)	ETL (Both)	Wooster (Control)
1. Can a housing organization significantly reduce the average tenant electricity usage through a combination of resident-focused Education, Economic incentives, and evaluation?	Yes	Yes	No	N/A
2. Is it economically viable for the organization to administer the treatment plan?	Yes	Yes	No	N/A

Table 54

Research hypotheses and outcomes

	Hypotheses	Rushin (Ed.)	Alpha (Incentives)	ETL (both)	Wooster (Control)
1. H_o	The models will have no explanatory value for predicting kWh usage based on various predictor variables.	Rejected Prob > F = 0.00	Rejected Prob > F = 0.00	Rejected Prob > F = 0.00	Rejected
2. H_o	There will be no difference in electricity usage for residents who attend the **e**ducation classes and those who do not.	Rejected -4.68 Sig. 0.00	N/A	N/A	N/A
3. H_o	There will be no difference in electricity usage for residents who receive an **e**conomic incentive and those who do not.	N/A	Rejected -6.65 Sig. 0.00	N/A	N/A
4. H_o	There will be no difference in electricity consumption for those who receive both treatments.	N/A	N/A	Rejected 8.06 Sig. 0.01	N/A

The first null hypothesis states the regression models developed for this research will not have explanatory value, for predicting kWh usage, based on the various predictor variables. As seen in Table 54, in three of the research buildings, the null hypothesis was rejected because the model explained kWh usage, both positive and negative, based on the predictor variables. In the fourth building (ETL), the regression model predicted kWh usage, but not in the direction expected; thus, this researcher failed to reject the null hypothesis

The second null hypothesis, as seen in Table 54, addresses the education class randomly chosen for the residents of Rushin Meadows. Again, theory expected residents who attended the education class, which discussed electricity conservation benefits for the people, planet, and profit for residents and landlords, to have, on average, lower electricity consumption than their neighbors who did not attend a class. The regression output supported the theory, so this researcher was able to reject the null hypothesis based on attendees having significantly lower monthly electricity usage. Additionally, the literature supports this finding, where it states the sharing of information that touches on more than financial aspects of energy consumption is a significant motivating factor for tenants (Palm, 2013).

The third null hypothesis, also found in Table 54, applies to the residents from Alpha Tower in Chicago, who had an opportunity to receive economic incentives for attending monthly meetings. Theory expected lower monthly kWh consumption for residents who participated in the monthly meetings. The results of the regression analysis supported the argument, as there was a significant reduction in monthly kWh usage by meeting attendees. Additionally, the residents of Alpha Tower were selected, randomly, to have the economic incentive opportunity withdrawn after six months. Yet, their monthly kWh reduction was the greatest amongst the three treatments. Germane to the research at Alpha Tower, is that behavior change created using rewards is more likely to persist after the award has been removed (Greitemeyer & Kazemi, 2008). This researcher discusses the persistence of the behavior change induced by the economic incentives during the discussion addressing the answer to research question two.

The fourth null hypothesis, in Table 54, addresses the residents of Wesley Tower who were selected, randomly, to receive both Education and Economic incentives. During the monthly checkup classes, this researcher began to notice something unusual about ETL's kWh usage. Despite receiving both education classes and economic incentives, they were using much more electricity than the other treatment buildings and Wooster control. They were using approximately 200 to 400 additional kWhs each month. The usage seemed to worsen as the weather started getting cold, which prompted me to share the data with the Executive Director of Alpha Homes. In January of 2019 is when this researcher received information that would skew the results from ETL.

When this researcher developed his research plan, he asked Alpha Homes for buildings with individual electric meters, for each apartment, and gas heating. While ETL is individually metered, the units are all-electric. The common areas having gas heat caused the administration to assume that gas heated the individual units. So, this researcher was attempting to analyze a building with a significant difference. In addition to ETL being all-electric, the organization received government funding, and the green light to begin a building rehabilitation project, which started November of 2018, which was five months into my research. According to the residents, the construction created air drafts that required them to use more heat than usual, ergo the increase in kWh usage.

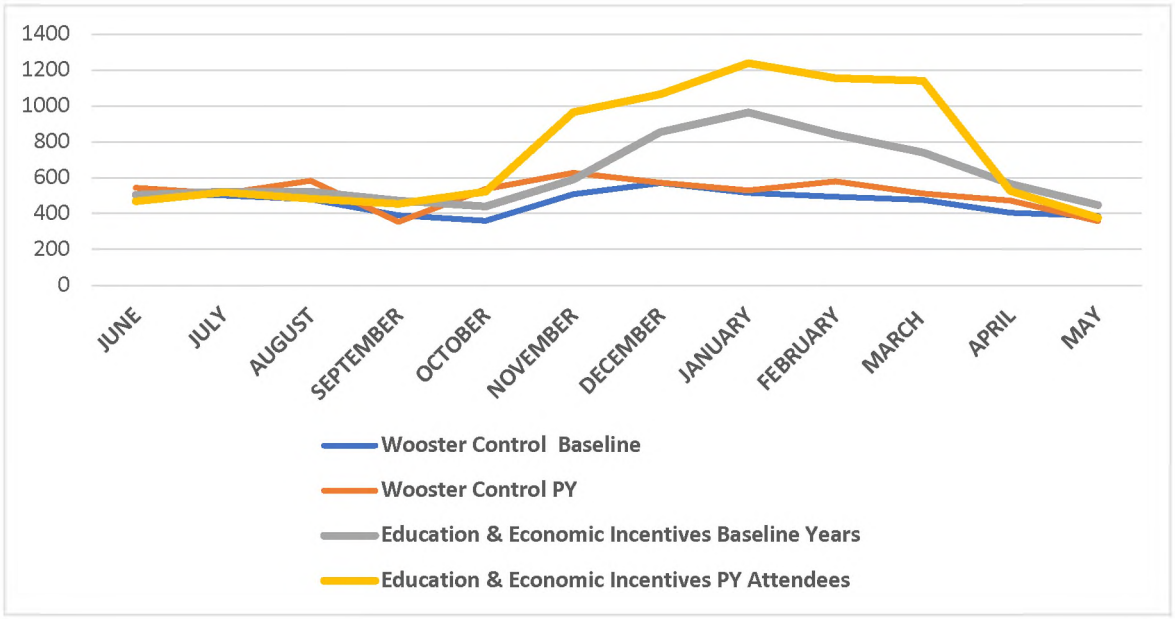

Figure 9. ETL attendees and Wooster kWh usage for the baseline and program year(s)

This researcher considered eliminating ETL from the research project, but since the residents were so motivated, and there was an investment of time and money, it continued. Figure 9 shows that in April and May when residents needed less heat, they reduced their usage when compared to the baseline years. So, it appears the theory that states those receiving both treatments will use fewer kWhs than those receiving none may be working, but there is not enough data to make a statistical analysis.

Ultimately, as seen in Table 54, this researcher rejected the null hypothesis since there was a difference in kWh usage for residents who received both treatments; however, it was different than what theory predicts.

Research question two asks, is it economically viable for the organization (Alpha Homes Inc.) to administer the treatment plan? To answer question two, first look at Wooster Control (in Wooster Ohio) to get a picture of the cost/savings associated with doing nothing.

Table 55

Wooster (Control) additional kWh usage costs

Wooster Elderly 40 Units	Program Year	Monthly kWh cost	Yearly kWh cost
Significant kWh Usage	36.64	$2.20	$26.38
kWh cost Per 40 Units	1465.6	$87.94	**$1055.23**

After controlling for the various independent variables for the Program Year, at Wooster, as seen in Table 12, there was a significant difference of 36.64 kWhs per unit, per month, which equals an 8% increase in electricity cost at Wooster Elderly, when compared to the baseline years of 2015-2018. As seen in Table 55 and based on an electricity cost of $0.06 per kWh, the additional monthly, per unit, usage equates to $2.20, or $26.38 per year. Since Wooster has 40 units, this represents an increased cost of $1055.23 during the program year. As a reminder, as control, the residents of Wooster Elderly did not know this researcher monitored their electricity usage.

Table 56

Rushin (Education) kWh usage savings for program Attendees and Non-Attendees

Rushin Meadows 50 Units	Program Year vs. Baseline Years of kWh usage	Monthly kWh savings	Per Individual & Total Yearly kWh savings
Individual attendee monthly kWh reduction (21)	-4.68	$0.28	$3.37
Individual non-attendee monthly kWh reduction (29)	-0.55	$0.03	$0.40
kWhs Per 21 attendees	-98.28	$5.90	**$70.76**
kWhs Per 29 non-attendees	-15.95	$0.96	**$11.48**
Total Cost/Savings			**$ 82**

The first program economic viability discussion addresses Rushin Meadows (in Ravenna, Ohio), which received the education treatment. The attendees, as seen in Table 24, experienced a significant 4.68 monthly kWh reduction when compared to the baseline years, which equates to a $70.76 savings for the year.

Table 57

Probable Attendee kWh Annual Cost Increase Absent the Education Program

Attendees	Rushin (Education) (21)	Alpha (Economic Incentives) (21)	ETL (Education & Economic Incentives) (38)
Baseline Years kWh Usage	259.82	335.91	621.84
Baseline + 8%	280.61	362.78	671.59
Program Year Usage	258.67	334.30	632.99
kWh Difference	21.94	28.48	38.60
Monthly cost/savings per unit	**$1.32**	**$1.71**	**$2.32**
Annual cost/savings	**$332**	**$431**	**$1,056**

Furthermore, using the 8% increase at Wooster as the baseline for PY kWh usage, logic dictates that had Rushin not received the education program, they would have experienced an 8% monthly kWh increase as well. Looking at Table 57, the researcher

finds that an 8% increase in Rushin's baseline years usage, equates to a 21.94 monthly kWh decrease per program attendee. Thus, if Alpha Homes had not offered the education program, for the Rushin residents, it would have cost them $332 in additional kWh usage for the 21 attendees.

Table 58

Probable Non-Attendee kWh Annual Cost Increase Absent the Education Program

Non-attendees	Rushin (29)	Alpha (128)	ETL (63)
Baseline Years kWh Usage	259.82	335.91	621.84
Baseline + 8%	280.61	362.78	671.59
Program Year Usage	**277.71**	**342.18**	**628.95**
kWh Difference	-2.90	-20.60	-42.64
Monthly cost/savings per unit	**$0.17**	**$1.24**	**$2.56**
Annual cost/savings	**$60**	**$ 1,899**	**$1,934**

In addition to the attendee savings, there was a collateral benefit achieved by the non-attendees. As seen in Table 56, the non-attendees accomplished a .55 monthly kWh reduction, when compared to the baseline years. That reduction equates to a $.40 monthly savings per non-attendee or an annual savings of $11.48. However, there were additional savings. As seen in Table 58, had the education program not existed, and the non-attendee residents of Rushin had an 8% increase in kWh usage experienced by Wooster control, the non-attendees would have saved 2.90 kWhs each month. The 2.90 kWh is $0.17 per non-attendee unit per month which, when multiplied by the 29 non-attendee units and 12 months, equates to an additional cost of $60.46 for Alpha Homes.

Table 59

The 3-E Program Budget for Rushin Costs and Savings

Description	Rushin Costs and Savings	Alpha Homes' Portion	Researcher Costs for Rushin
42" TV's (none)	$0.00	$0.00	$0
Promotional Flyers	($25.00)	($25.00)	$0
LED Bulbs (none)	$0.00	$0	$0.00
Night Lights (none)	$0.00	$0	$0.00
Power strips (none)	$0.00	$0	$0.00
Lunch for (Monthly Classes)	($584.00)	($584.00)	$0
Focus Group Box Lunches	($83.00)	($83.00)	$0
Gas (Chicago)	$0.00	$0	$0.00
Tolls (Chicago)	$0.00	$0	$0.00
Gift cards (none)	$0.00	$0	$0.00
Attendee PY savings	$71.00	$71.00	$0.00
Attendee no program savings	$332.00	$332.00	$0.00
Non-attendee PY savings	$11.00	$11.00	$0.00
Non-attendee no program savings	$60.00	$60.00	$0.00
Total Cost	($218.00)	($218.00)	$0.00

Table 59 is a detailed breakdown of the costs and benefits associated with conducting the 3-E program, both for this researcher and Alpha Homes, at Rushin. As seen in the table, when the actual savings of $82.25, from Table 56, are considered, and the extra costs that would have occurred (seen in Tables 57 and 58) had the 3-E program not existed are combined, the overall cost of conducting the program at Rushin Meadows was $218, or less than $20 per month.

Although outside the scope of my research, Alpha Homes received another benefit from conducting this program. The organization reduced its electricity consumption in the common areas of the facility, like the community and laundry rooms that exceed the kWhs they saved through resident kWh usage reduction. Since this dissertation monitored individual kWh usage, this researcher did not include the kWh usage data received from the community and laundry room electric meters.

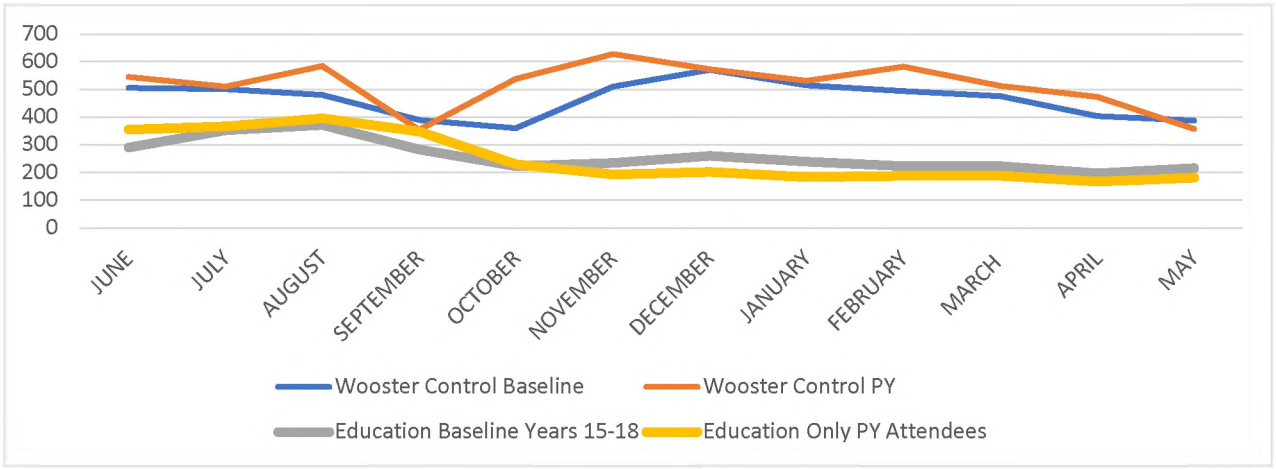

Figure 10. *Rushin attendees and Wooster kWh usage for the baseline and program year(s)*

So, the answer to question two, for Rushin Meadows, is, yes, it was economically viable. Again, one of the missions of Alpha Homes Inc. is to provide services for its residents. Thus, at the cost of less than $20 per month for a program that provided lunch for their residents and valuable information that will not only benefit the residents, but anyone they choose to share their knowledge with is well worth the expenditure. Also, most certainly, the savings did not stop when the monthly meetings ceased. The previous statement has support in the literature, where a study found that households maintained electricity energy-saving behaviors for two years (Fujimi et al., 2017). Additionally, this researcher graphically displays the savings at Rushin in Figure 10. Figure 10 depicts the

Rushin PY usage dipping below the baseline years, in October, and continuing through the conclusion of the project.

Table 60

Alpha kWh Usage Savings for Program Attendees

Alpha Tower 21 Attendees	Program Year	Monthly kWh cost	Yearly kWh cost
Individual attendee monthly kWh reduction	-6.65	$(0.40)	$(5)
kWhs Per 21 Attendees	-139.65	$(8.38)	$(101)
128 Non-attendee kWh increase	3.86	$30	$356
Total Cost/Savings			**($255)**

The second program economic viability discussion addresses Alpha Towers (in Chicago, Illinois) that received economic incentives. The attendees, as seen in Table 60, experienced a significant 6.65 monthly kWh reduction, when compared to the baseline years, which equates to a $101 savings for the year. Also, in Table 60, the non-attendees experienced a significant increase of 3.86 kWhs per month when compared to the baseline years. The non-attendee increase equates to an additional cost of $356, during the PY.

Again, using the 8% increase at Wooster as the baseline for PY kWh usage, logic dictates that had Alpha Towers not received the offer of economic incentives, they would have experienced an 8% monthly kWh increase as well. Looking at Table 57, the researcher finds that an 8% increase in Alpha's baseline years usage, equates to a 28.48 monthly kWh decrease for resident program attendees. Thus, if Alpha Homes had not offered the economic incentive program, for the Alpha Tower residents, it would have cost Alpha Homes $430.66 in additional kWh usage for the 21 attendees.

As seen in Table 58, there were additional savings. During the program year, the non-program attendee kWh usage was 342.18, which had the economic incentive program not existed, and the non-attendee residents of Alpha had the same 8% increase in kWh usage experienced by Wooster control, would have been 362.78. The 362.78 equates to a monthly kWh savings of 20.60 per non-attendee, which, when multiplied by the $0.06, equals $1.24 per apartment per month. When the $1.24 is multiplied by 12, it equals $14.88 annual savings per unit, which, when multiplied by the 128 non-attendee units, the result is a savings of $1898.75.

Table 61

The 3-E program budget for Alpha Towers

Description	Alpha Costs and Savings	Alpha Homes' Portion	Researcher Costs for Alpha
One 42" TV	($250.00)	($250.00)	$0
Promotional Flyers	($25.00)	($25.00)	$0
50 LED Bulbs (Dollar Store)	($50.00)	$0	($50.00)
50 Night lights (Dollar Store)	($50.00)	$0	($5000)
Power strips	($40.00)	$0	($40.00)
Lunch for (Monthly Classes)	($282.00)	($282.00)	$0
Focus Group Box Lunches	($83.00)	($83.00)	$0
Gas (Chicago)	($616.00)	$0	($616.00)
Tolls (Chicago)	($574.00)	$0	($574.00)
Gift cards	($420.00)	$0	($420.00)
Attendee PY savings	$101.00	$101.00	$0.00
Attendee no program savings	$431.00	$431	$0.00
Non-attendee PY cost	($356.00)	($356.00)	$0.00
Non-attendee no program savings	$1,899.00	$1,899	$0.00
Total Cost	**($315)**	**$1,434**	**($1,750)**

Table 61 is a detailed breakdown of the costs and benefits associated with conducting the 3-E program, at Alpha Tower, for this researcher and Alpha Homes. As seen in the table, when the actual savings of $101, from Table 60, are considered, and the extra costs that would have occurred (seen in Tables 57 and 58) had the 3-E program not existed are combined, the overall benefit of conducting the program at Alpha Towers was

$1434, for the PY. By contributing this researcher's costs to Alpha Homes, then it cost the organization $315, or approximately $26 per month for the program year.

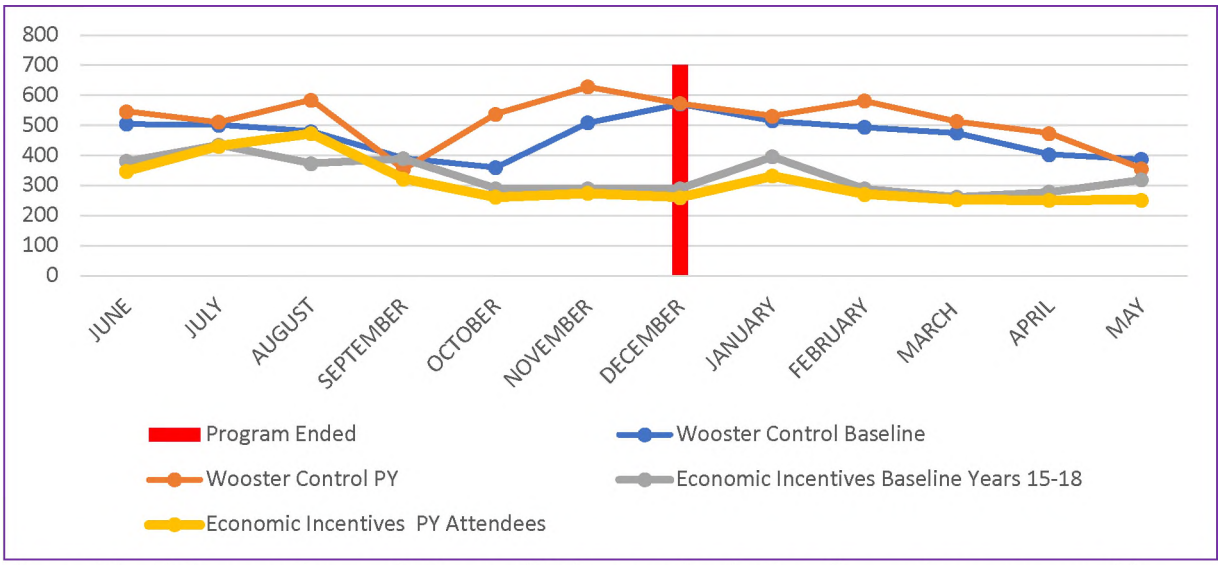

Figure 11. Alpha attendees and Wooster kWh usage for the baseline and program year(s)

So, the answer to question two, for Alpha Towers, is yes, it was economically viable. Once more, one of the missions of Alpha Homes Inc. is to provide services for its residents. This way, at the cost of $25 per month, which includes this researcher's expenses, for a program providing lunch for their residents and valuable information that will not only benefit the residents, but anyone they choose to share their knowledge with is well worth the expenditure. Also, most certainly, the savings did not stop when the monthly meetings ceased, a fact that this researcher tested by removing the incentives after seven months. In Figure 11, it is clear to see that the PY savings remained after the program ceased. The savings appear to be expanding at the end of the PY. Additionally, the literature supports the continuance of savings, since behavior change created using incentives (rewards) were more likely to be sustained after the award was no longer offered (Greitemeyer & Kazemi, 2008).

Table 62

ETL Additional kWh Usage Cost for Program Attendees

Wesley Tower 38 Attendees	Program Year	Monthly kWh cost	Yearly kWh cost
Significant Attendee kWh Usage for 1 unit	8.06	$0.48	$5.80
kWhs Per 38 Attendees	306.28	$18.38	$220.52
Non-attendee kWh Usage	Not sig.	N/A	N/A
Total Cost/Savings			**$221**

The last program's economic viability discussion addresses Wesley Tower (in Akron, Ohio) that received education and economic incentives. The attendees, as seen in Table 62, used an additional 8.06 kWhs each month when compared to the baseline years, which equates to an additional cost of $221 for the year. The non-attendee PY usage was not significantly different than their usage during the baseline years, and there was no savings or extra cost.

However, by using the 8% increase at Wooster as the baseline for PY kWh usage, logic dictates that had Wesley Tower not received the offer of education and economic incentives, they would have experienced an 8% monthly kWh increase as well. Looking at Table 57, the researcher finds that an 8% increase in Wesley's baseline years usage, equates to a 38.60 monthly kWh decrease for the program attendees. Thus, if Alpha Homes had not offered the economic incentive program, for Wesley's residents, it would have cost Alpha Homes $1056 in additional kWh usage for the 38 attendees.

As seen in Table 58, there were additional savings. During the program year, the non-program attendee average kWh usage was 628.95. Had the economic incentive program not existed, and the non-attendee residents of Wesley experienced the same 8%

increase in kWh usage as Wooster control, the kWh usage would have been 671.59. The 671.59 equates to a monthly kWh savings of 42.64 per non-attendee, which, when multiplied by the $0.06, equals $2.56 per apartment per month. When the $2.56 is multiplied by 12, it equals a $30.72 annual savings per unit, which, when multiplied by the 63 non-attendee units, results is a savings of $1934.02.

Table 63

The 3-E Program Budget for Wesley Tower

Description	ETL Costs and Savings	Alpha Homes' Portion	Researcher Costs for ETL
One 42" TV's	($250.00)	($250.00)	$0
Promotional Flyers	($25.00)	($25.00)	$0
50 LED Bulbs (Dollar Store)	($50.00)	$0	($50.00)
50 Night lights (Dollar Store)	($50.00)	$0	($50.00)
Power strips	($40.00)	$0	($40.00)
Lunch for (Monthly Classes)	($584.00)	($584.00)	$0
Focus Group Box Lunches	($83.00)	($83.00)	$0
Gas (Chicago)	$0.00	$0	$0.00
Tolls (Chicago)	$0.00	$0	$0.00
Gift cards	($660.00)	$0	($660.00)
Attendee PY savings/Costs	($221.00)	($221.00)	$0.00
Attendee no program savings	$1,056.00	$1,056.00	$0.00
Non-attendee PY savings	$0.00	$0.00	$0.00
Non-attendee no program savings	$1,934.00	$1,934.00	$0.00
Total Cost	**$1,028.00**	**$1,828.00**	**($800.00)**

Table 63 is a detailed breakdown of the costs and benefits associated with conducting the 3-E program, at Wesley Tower, both for this researcher and Alpha Homes. As seen in Tables 57 and 58, and included in Table 63, when the extra costs that

would have occurred had the 3-E program not existed are combined, Alpha Homes save $1828 for the program year. Including this researcher's expenses, the savings amount to $1028.

Hence, the answer to question two, for Wesley Tower, is yes, it was economically viable. Once more, one of the missions of Alpha Homes Inc. is to provide services for its residents. Thus, conducting this program saved the organization $1,828 and increased its ability to offer additional services to its residents. Additionally, once the rehabilitation project is complete, with the elimination of the construction-related heating issues, this researcher believes the savings will be in line with the other treatment buildings, which means the savings will be more significant. As seen in Figure 9, the program attendee kWh usage drops below the baseline years' usage in April and appears to match the usage of Wooster (control) in May. As a reminder, the ETL May kWh usage includes heat, and the Wooster kWh usage does not involve heat.

Table 64

Total Program Costs and Savings Summary

Description	Rushin Costs	Alpha Costs	ETL Costs	Researcher Total Costs
Two 42" TV's	$0.00	($250.00)	($250.00)	$0.00
Flyers for all buildings	($25.00)	($25.00)	($25.00)	$0.00
100 LED Bulbs (Dollar Store)	**$0.00**	$0.00	$0.00	*($100.00)*
100 Night lights (Dollar Store)	$0.00	*$0.00*	*$0.00*	*($100.00)*
Power strips	$0.00	$0.00	$0.00	($80.00)
Lunch for (Monthly Classes)	($584.00)	($282.00)	($584.00)	$0.00
Focus Group Box Lunches	($83.00)	($83.00)	($83.00)	$0.00
Gas (Chicago)	$0.00	$0.00	$0.00	($616.00)
Tolls (Chicago)	$0.00	$0.00	$0.00	($574.00)
Gift cards	$0.00	$0.00	$0.00	($1,080.00)
Attendee PY savings	$71.00	$101	($221.00)	$0.00
Attendee no program savings	$332.00	$431	$1,056.00	$0.00
Non-attendee PY savings/cost	$11.00	($356)	N/S	$0.00
Non-attendee no program savings	$60.00	$1,898	$1,934.00	$0.00
Sub-Total	**($218.00)**	**$1,434.00**	**$1,827.00**	($2,550.00)
Total Cost/Savings				**$493.00**

Table 64 shows all costs and savings associated with the 3-E program, which results in a surplus of $493 for Alpha Homes Inc. In actuality, when you add the $2550 contributed by this researcher, Alpha Homes' bottom line improves by $3043 for the PY. Also, looking at the end of the PY, in Figures 9, 10, and 11, it appears the savings are continuing beyond the PY, which creates additional savings for Alpha Homes Inc.

Message framing is the theory that holds this research together. The power of information, as it relates to message framing and electricity conservation, is a critical non-price mechanism for creating behavior change (Asensio & Delmas, 2016). In addition to the economic incentives offered (positive frames), tapping into how the overuse of electricity can negatively affect the environment by showing drought images and the melting of areas that should be frozen (negative frames) was a significant motivator. Also, taking the residents' feelings out of the equation and having them consider their children or grandchildren's future was hugely impactful and may have prompted reduced electricity consumption behaviors due to feelings of guilt.

This research proved the theories espoused by behavioral economics. It was evident that many of the tenant's actions were not in their best interest. There were times when residents would not come to the meeting, even after being offered a free meal. The refusal of the free lunch is of particular interest because the Service Coordinator informed this researcher that some of the individuals who turned down the meal have difficulty affording food.

In addition to the financial benefits, the results of the focus group demonstrate how motivated the resident attendees are to not only continue the program but to make attendance mandatory. The Executive Director of Alpha Homes has received program

feedback from the Service Coordinators and various residents and is aware of the value, both financial and psychological, the 3-E program created. The Executive Director and this researcher are currently in discussions concerning the best method to continue the program.

Future program recommendation

This research is titled "A Journey Toward Sustainable Behavior: A project to stimulate reduced electricity consumption." The analysis of the data associated with this project demonstrates the successful stimulation of reduced resident electricity consumption in the three treatment buildings connected with this research. However, this research has not answered which treatment or combination of treatments this researcher should continue to utilize in the future.

In an attempt to answer which treatment or combination of treatments, this researcher should implement going forward, this researcher will enter into the realm of speculation.

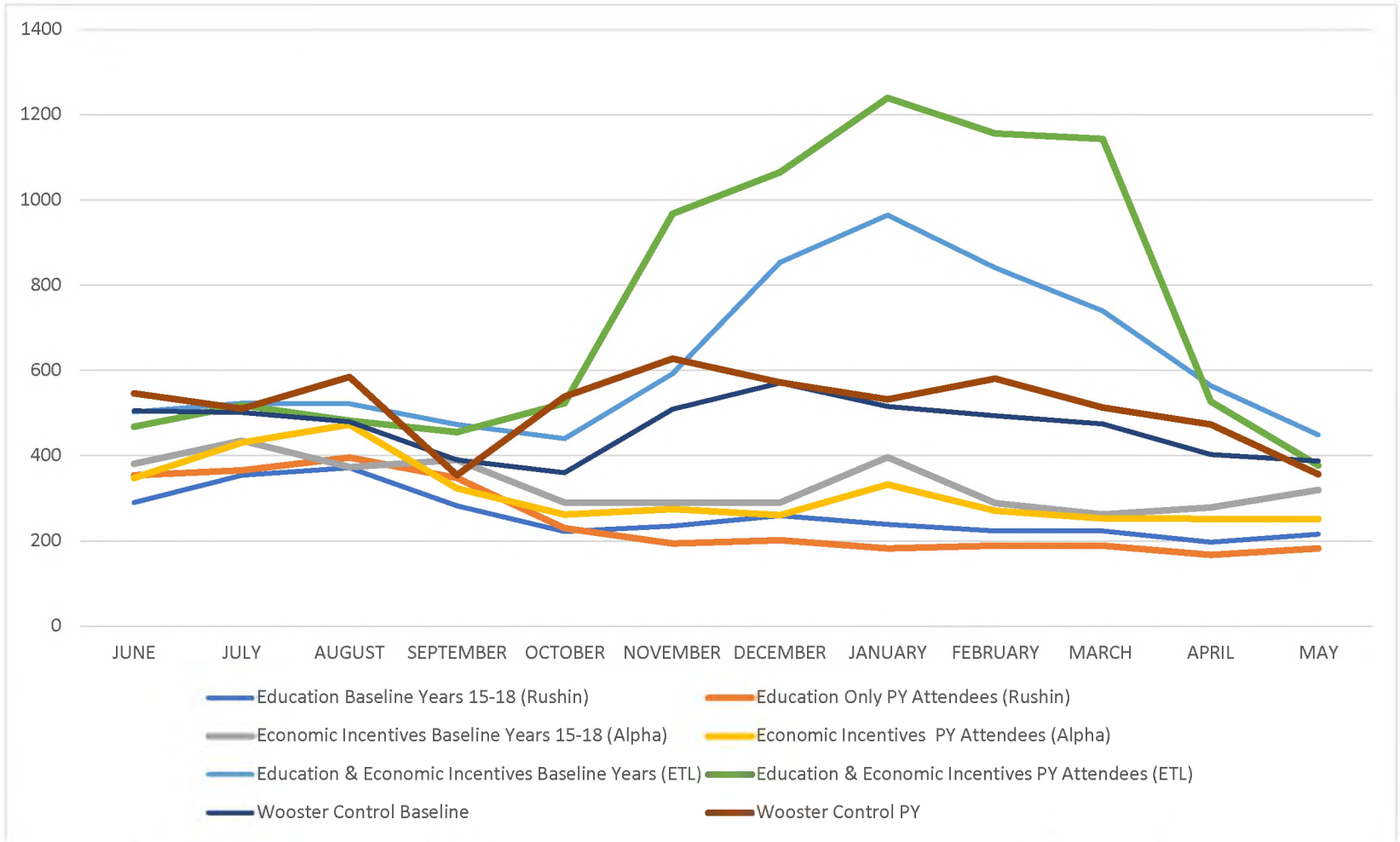

Figure 12. *The 3-E program kWh usage for the program year attendees and the baseline years for each of the research sites*

Figure 12 depicts the kWh usage for the PY and baseline years. Due to the unusual circumstances that occurred at ETL, which are displayed graphically in Figure 12, the discussion of which treatment or combinations of treatments to use moving forward will focus on Rushin and Alpha.

As seen in Figure 12, the program effect, at Alpha, develops in September, which is when the gold, PY usage, line drops below the grey, baseline years, line, and stays below for the remainder of the PY.

Also, as seen in Figure 12, the program effect, at Rushin, develops in October, which is when the orange, PY usage, line drops below the dark blue, baseline years, line, and stays below for the remainder of the PY.

The 4.68 and 6.65 monthly kWh reduction for Rushin and Alpha, respectively, would seem to make the answer clear that choosing the economic incentives, which Alpha received, would be the treatment to use. There are other factors to take into account, such as the effect the program had on the non-attendees. And the costs versus savings that were discussed earlier in this chapter. Also, are the benefits of one treatment more likely to persist and or attract new participants, and is the answer to that question dependent on unique resident characteristics, such as the race, gender, mean age, or mean income of the residents?

First, the populations of Alpha (Economic Incentives) and Rushin (Education) are racially dissimilar. Alpha is 100% African American, and Rushin has two African Americans out of 50 residents (4%). Also, geographically they are approximately 336 miles apart, with Alpha being in Chicago Illinois and Rushin in Ravenna, Ohio.

Table 65

Mean Ages for Alpha and Rushin Program Attendees

	Building	N	Mean	Std. Deviation	Std. Error Mean
AGE	1	21	70.14	12.084	2.637
	2	21	74.05	11.582	2.527

Table 66

Independent Samples t-test for Program Attendees' Age at Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	0.19	0.666	-1.069	40	0.291	-3.905	3.653	-11.287	3.477
Equal variances not assumed			-1.069	39.928	0.291	-3.905	3.653	-11.287	3.478

As seen in Table 65, the mean age for the Rushin (1) and Alpha (2) attendees is 70 and 74, respectively. While there is an apparent four-year difference, by looking at Table 66, we see the P-value of .291 is not statistically significant. However, before making a decision on which treatment to choose, for future programs, it is necessary to test the means of each building's entire population, to make sure the program attendees are representative of the whole building.

Table 67

Mean Ages for all Residents of Alpha and Rushin

	Building	N	Mean	Std. Deviation	Std. Error Mean
AGE	1	43	71.26	12.458	1.9
	2	110	73.42	10.474	0.999

Table 68

Independent Samples t-test for the Ages of all Residents of Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	0.477	0.491	-1.087	151	0.279	-2.162	1.989	-6.093	1.768
Equal variances not assumed			-1.007	66.465	0.317	-2.162	2.146	-6.447	2.122

When the ages of the entire resident population of Alpha and Rushin are analyzed, Tables 67 and 68, the mean difference in age between the two buildings is approximately two years. With a P value of .279, it is also not significant. So, whatever treatment this researcher chooses for future programs, must not be based on the mean resident age difference between the two buildings.

The next resident characteristic to test, which could be a treatment selection factor, is the mean income of the program attendees, and for each building's entire population.

Table 69

Mean Income for Alpha and Rushin Program Attendees

	Building	N	Mean	Std. Deviation	Std. Error Mean
Income	1	21	14285	3836.78284	837.25466
	2	21	11427	4127.16087	900.62034

Table 70

Independent Samples t-test for Program Attendees' Income at Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	0.63	0.432	2.324	40	0.025	2858.09524	1229.67978	372.8197	5343.37077
Equal variances not assumed			2.324	39.789	0.025	2858.09524	1229.67978	372.40904	5343.78143

As seen in Table 69, the program attendees at Rushin (1) receive approximately $2,900 more annual income than the program attendees from Alpha (2). In Table 70, the P-value of .025 indicates the income difference between the two groups is statistically significant. So, the difference in income could be a factor in the treatment decision process; however, this researcher must test the entire population of each building before making that determination.

Table 71

Mean Income for all Residents of Alpha and Rushin

	Building	N	Mean	Std. Deviation	Std. Error Mean
Income	1	43	14311	4346.44093	662.82603
	2	110	12374	5555.3729	529.68402

Table 72

Independent Samples t-test for the Income of all Residents of Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.374	0.243	2.052	151	0.042	1936.85074	943.7103	72.26895	3801.43253
Equal variances not assumed			2.283	97.457	0.025	1936.85074	848.47128	252.96984	3620.73164

Looking at Table 71, the average resident at Rushin (1) receives approximately $2,000 more annual income than the residents of Alpha (2). The P-value of .042, in Table 72, indicates the income difference between the two building populations is statistically significant and is a potential factor in the treatment decision process.

The final resident variable test is the gender of the program attendees and the entire resident populations of Alpha and Rushin.

Table 73

Gender Percentage for Alpha and Rushin Program Attendees

	Building	N	Mean	Std. Deviation	Std. Error Mean
Gender	1	21	0.19	0.402	0.088
	2	21	0.33	0.483	0.105

Table 74

Independent Samples t-test for Program Attendees' Income at Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	4.419	0.042	-1.041	40	0.304	-0.143	0.137	-0.42	0.134
Equal variances not assumed			-1.041	38.735	0.304	-0.143	0.137	-0.42	0.135

As seen in Table 73, 19% of the Rushin (1) program attendees are male, and 33% of the program attendees at Alpha (2) are male. The P-value of .304, in Table 74, is not significant, so based on this data, gender should not be a treatment decision factor. After testing both building's entire population, this research can determine if gender should be a treatment decision factor.

Table 75

Gender Percentage for all Residents of Alpha and Rushin

	Building	N	Mean	Std. Deviation	Std. Error Mean
Gender	1	43	0.23	0.427	0.065
	2	110	0.33	0.471	0.045

Table 76

Independent Samples t-test for Gender of all Residents of Alpha and Rushin

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the Difference	
								Lower	Upper
Equal variances assumed	6.381	0.013	-1.146	151	0.254	-0.095	0.083	-0.258	0.069
Equal variances not assumed			-1.196	84.096	0.235	-0.095	0.079	-0.252	0.063

As seen in Table 75, 23% of Rushin's (1) residents are male, and 33% of the residents of Alpha (2) are male. Table 76 shows a P value of .254, which is not significant, meaning gender should not be a treatment decision factor.

The numbers tell this researcher that geography, resident race, and resident income are all factors that could be part of the treatment decision tree. Still, another **visual representation of this research program could assist in the decision process.**

Table 77

Attendee PY Monthly kWh Percent Change for each Treatment Building

	Baseline years kWh usage	Program Year kWh usage	Percent Change
Rushin	259.82	258.67	-0.4%
Alpha	335.91	334.3	-0.5%
ETL	621.84	632.99	1.8%

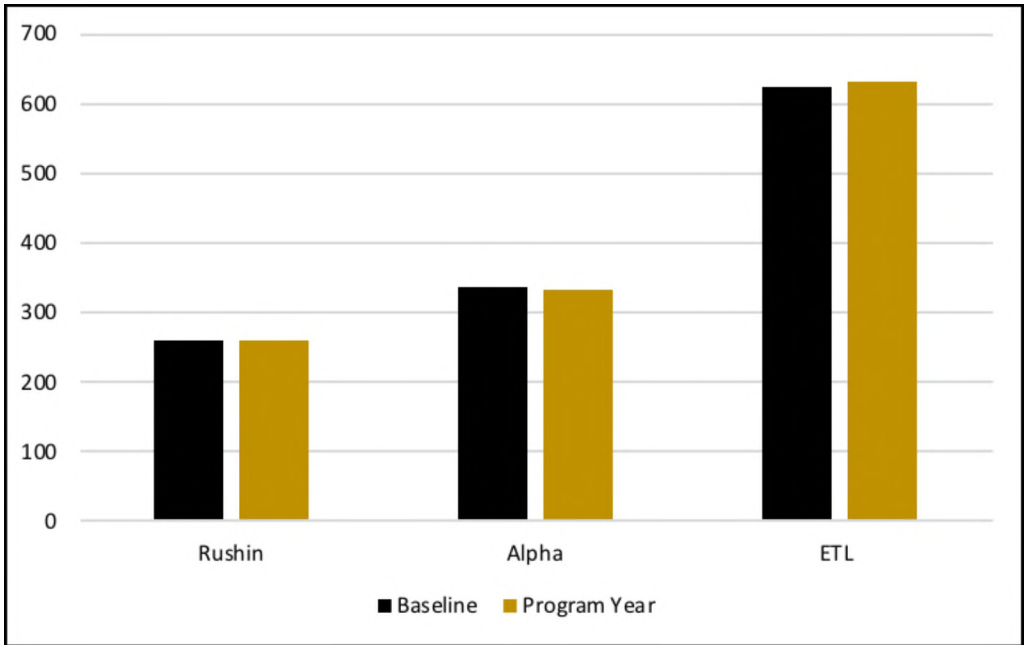

Figure 13. *Attendee monthly kWh percent change at each treatment building*

Now, looking at Table 77, there is a slight reduction in PY monthly kWh usage for program attendees at Rushin (Education) and Alpha (Economic Incentives), which this researcher visually demonstrates in the column chart in Figure 13. Each building's program attendees reduced their monthly kWh usage by approximately a half percent. The similarities in program results, at Alpha and Rushin, continue as seen in the results of

program attendee monthly kWh usage when compared to the 8% monthly kWh usage increase that occurred at Wooster (control) during the program year.

Table 78

Attendee PY kWh Usage Compared to the Baseline Years Plus 8%

	Baseline + 8%	Program Year	Percent Change
Rushin	280.61	258.67	-7.8%
Alpha	362.78	334.30	-7.9%
ETL	671.59	632.99	-5.7%

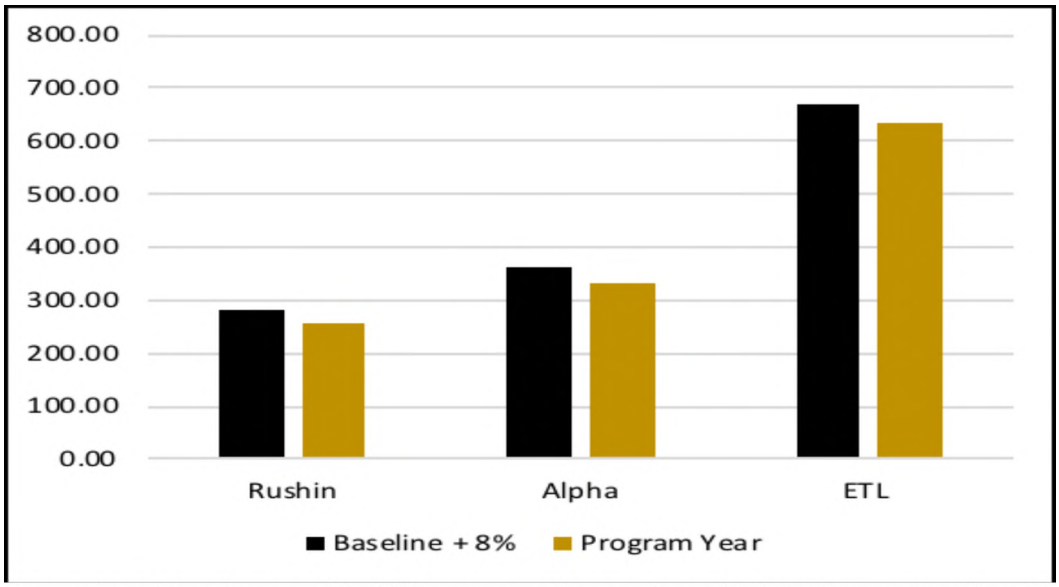

Figure 14. *Attendee monthly kWh percent change from the baseline years plus 8%*

As seen in Table 78 Rushin (Education) and Alpha (Economic Incentives), program attendees experienced a 7.8% and 7.9% reduction in kWh usage, when compared to the baseline years plus the 8% monthly kWh increase at Wooster (control).

However, when this researcher analyzed the behavior of the residents who chose not the attend the programs, a determinate materialized that could factor in this researcher's ultimate future program treatment decision.

Table 79

Non-attendee PY Monthly kWh Percent Change for Each Treatment Building

	Baseline years kWh usage	Program Year kWh usage	Percent Change
Rushin	259.82	277.71	6.9%
Alpha	335.91	342.18	1.9%
ETL	621.84	628.95	1.1%

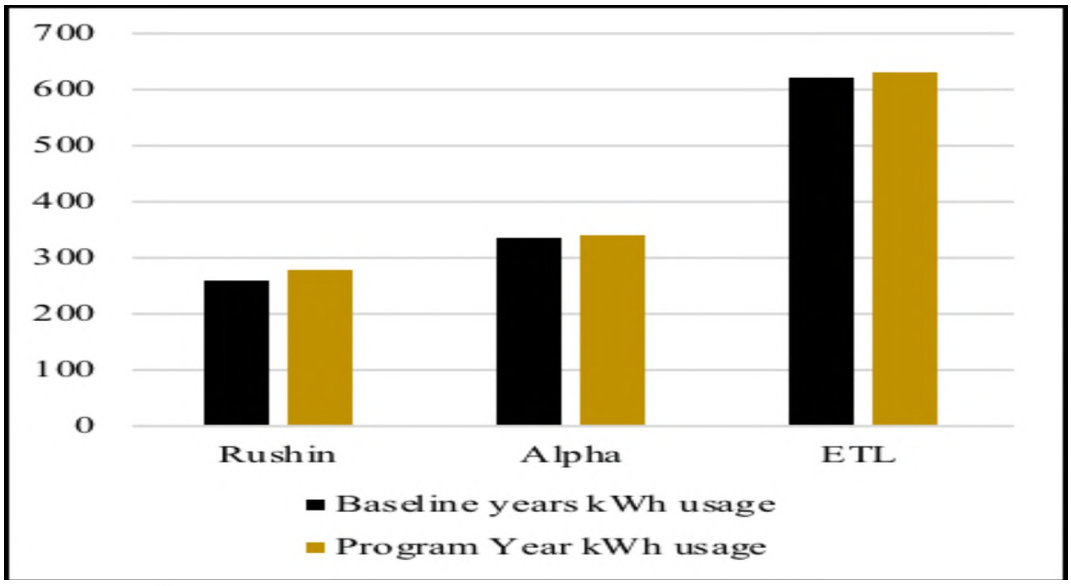

Figure 15. *Non-attendee PY monthly kWh percent change at each treatment building*

Table 79 shows monthly kWh usage percent changes that 6.9%, 1.9%, and 1.1% for Rushin, Alpha, and ETL, respectively. This researcher displays the monthly kWh increases in Figure 15.

This researcher's first impression of the non-attendee data is that non-attendees at Rushin (Education) seem not to benefit as much as the non-attendees at Alpha (Economic Incentives) or ETL (Education and Economic Incentives).

Table 80

Non-attendee PY kWh Usage Compared to the Baseline Years Plus 8%

	Baseline + 8%	Program Year	Percent Change
Rushin	280.61	277.71	-1.0%
Alpha	362.78	342.18	-5.7%
ETL	671.59	628.95	-6.3%

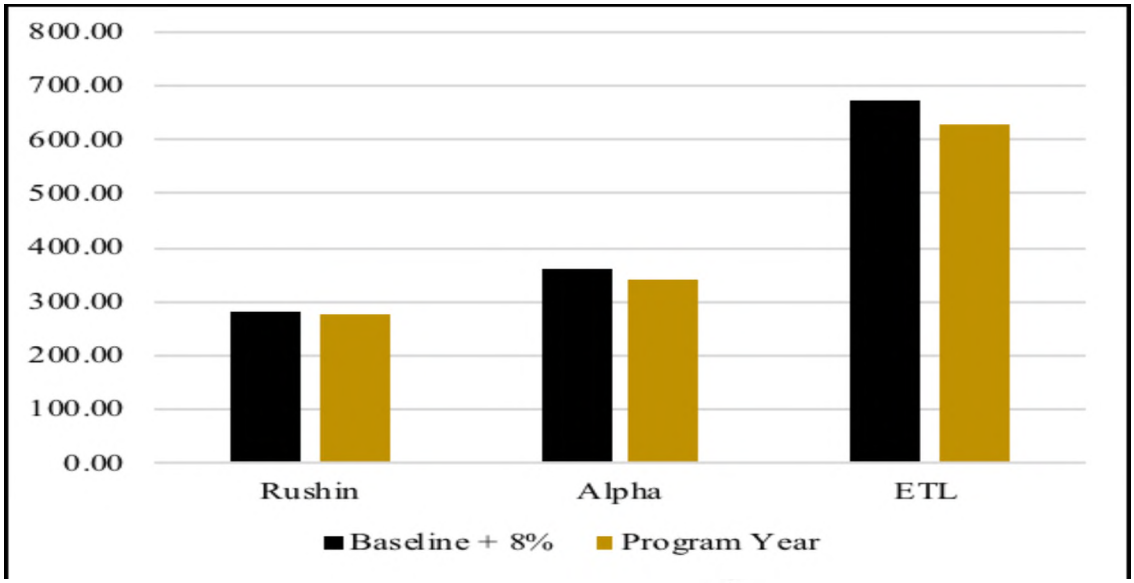

Figure 16. *Non-attendee monthly kWh percent change from the baseline years plus 8%*

The non-attendee percent changes, as seen in Table 80, in Alpha and Rushin, are -5.7% and -1.0%, respectively. The -1% figure for Rushin's non-attendees is nearly a 7% reduction from the percent change for the Rushin Program attendees.

After a review of all the data, this researcher believes the treatment of choice for future programs is economic incentives. There are multiple reasons for making this determination. First, the focus group participants at both sites that received economic incentives (Alpha and ETL) indicated the incentives were a motivating factor. Also, since attendance was mandatory to receive the economic incentives, the service coordinators would place a note under a resident's door indicating they would have won a $20 gift card had they been present. Additionally, there is support in the literature where

this researcher found that behavior change created using incentives (rewards) was more likely to be sustained after the award was no longer offered (Greitemeyer and Kazemi, 2008).

In Alpha Tower, which received economic incentives, the economic incentives ceased after seven months, yet the residents of Alpha had the most substantial, kWh usage, percentage reduction during the program year. Furthermore, when you look at Figure 12, it is clear the benefits obtained during the Program Year will likely continue beyond the Baseline year. The question is, how long will be reduced consumption be maintained? Based on the comments from the discussion group, at a minimum, the program attendees developed reduced electricity consumption behaviors that have become their new normal. So, while the benefits may fade to some degree without a re-infusion of education, in Rushin and ETL, or economic incentives, Alpha and ETL, this researcher believes the monthly kWh reductions will likely extend beyond the two years found in the literature and may continue indefinitely. Lastly, when economic incentives are involved, the residents educate themselves on electricity saving behavior, and they receive tips from the service coordinators through the building's newsletter and other creative mechanisms.

So, for all the reasons stated above and the general game show like quality the awarding of the gift cards creates, this researcher's recommendation to the Executive Director of Alpha Homes Inc. is to offer gift cards and other economic incentives. The incentives serve as carrots of motivation in the electricity conservation programs. Also, while a .005% reduction in monthly kWh usage for the program attendees, when compared to the baseline years, may seem de minimis, the overall 8% reduction in

monthly kWh usage when compared to the control building, can have substantial policy and financial impacts for non-profit and potentially for-profit housing organizations. The Executive Director and this researcher are excited about planning for and conducting future programs.

Literature Contribution

This research project contributes to multiple aspects of the existing literature. First, it fits squarely in the behavior change literature that addresses electricity consumption. In particular, it adds a quasi-experiment that has a quantitative and qualitative component addressing curtailment behaviors. The research is more evidence of how "iNcentives," "Understand mappings," "Defaults," Give feedback, "Expect error," and "Structure complex choices" (nudges) can bring positive results. Also, since the residents of the four buildings used for this research have an average age of nearly 71 (70.75) years old, this project also adds to the senior citizen energy consumption literature that addresses explicitly tenants who are not responsible for paying their electric bill.

This research also provides additional material for the literature that addresses behavior change in non-profit organizations. Specifically, how this project affected the organizational culture as it relates to employee buy-in and support for the project.

The success of this program would not have been possible without the support of critical administrative staff members, as well as the maintenance staff of Alpha Homes. The service coordinators took it upon themselves to assist the residents in identifying ways to reduce electricity consumption and added electricity savings tips to their monthly newsletter. Also, the maintenance staff was very responsive to the tenant's requests for

assistance with weather stripping, refrigerator coil cleanings, and various other electricity savings measures.

Additionally, this research adds to the sustainability literature. While there was a financial aspect to this project, the finances were incidental to the benefits that could be derived by the planet, and people. The profits for the residents and landlords were considered an ancillary benefit.

Furthermore, this research adds to the behavior change literature that addresses the administration. Alpha Homes Inc. saw the potential benefits this project could provide and were not afraid to tread into the realm of the unknown (Jackson Leftwich, 2017).

Lastly, this research adds to the social marketing literature, which represents an ideal state that is possible to reach when incentivizing a group to adopt desirous behaviors and eliminate activities that are harmful to human health, and safety (Chriss, 2015).

Limitations

When conducting research, generally speaking, there will be limits to the proposed plan and the outcome. This research was limited by the availability of buildings and by the residents who chose to participate. Additionally, while Alpha Homes Inc. was gracious with financial support, there were limits to that support. Also, there was a personal financial investment involved in conducting this research that was limited by my economic situation. Furthermore, there were a couple program attendees, at each location, who appeared to be disabled. So, another limitation was not creating an independent variable for disabled residents, but the Health Insurance Portability and

Accountability Act created an insurmountable obstacle. Lastly, this research had time limitations. There were many lessons learned during this research that will substantially benefit future researchers, and those researchers will leave lessons for the researchers who follow them on the eternal journey to provide a benefit to people, the planet, and profit for the tenants and building owners.

According to Erwin, the initial step in the organizational change process is realizing the need for change, paying particular attention to improved financial performance to maintain competitiveness (Erwin, 2009). Through their financial support of my research, Alpha Homes demonstrated their need and willingness to identify ways to reduce their utility costs. The outcome of this year-long effort yielded results that are both encouraging and puzzling. This researcher conducted four unique quasi-experiments that he will discuss separately and as a whole. As seen in Fujimi et al. (2017), energy conservation efforts are divided into two categories, efficiency and curtailment behaviors. Efficiency behaviors, which involve the one-time replacement of appliances, are being conducted by Alpha Homes and pre-date my research. However, this researcher did seek to gain access to their appliance replacement schedule. Still, while their records do show the number of new appliances they purchase, it, unfortunately, does not indicate which units received the latest devices. Alpha Homes Inc. is in the process of changing their record-keeping, which gives them the ability to track and reflect where and when they install new appliances. The second category is curtailment behaviors, which I address with my research.

Conclusion

As a not-for-profit organization, this researcher believes Alpha Homes can derive tremendous benefit from the 3-E program; however, the program needs a few adjustments to achieve maximum viability. There was a real buzz concerning the gift cards at both Wesley and Alpha Tower. So, this researcher believes by offering three gift cards each month alone, without the TV and Lunch, would attract just as many residents and, over time, likely elicit even greater participation.

The findings of this research are generalizable the senior not-for-profit context to any agency that operates low to moderate-income housing, particularly to housing agencies that receive some government funding. If a program provides a service to the organization's residents and improves the agency's balance sheet, the agency should implement the plan.

However, this researcher believes there is equal value for market-rate housing agencies. By offering this program to residents who are responsible for paying their electric bill, the agency would create goodwill with the residents, and the savings generated can serve as justification for rental increases. For instance, if, on average, the building electricity costs are down 10%, then there would be room to raise the rents 5% without negatively affecting the tenants. Additionally, having lower electric utility costs increases the value of the building for resale purposes.

During the focus groups, making attendance mandatory was the most common suggestion from each group. Also, while the resident kWh reduction does not currently reflect financial viability, alone, there was a collateral benefit that was much more substantial. Due to the efforts of the Service Coordinators, the community rooms that are

on a separate meter experienced a significant reduction in kWh usage, which equated to considerable cost savings, and is another reason Alpha Homes is interested in continuing the program.

According to research, emphasizing the health benefits of electricity saving behavior will provide more long-term and significant benefits than is generated by highlighting cost-savings benefits (Asensio & Delmas, 2016). That point was made abundantly clear within each education group. Also, the idea of there being a benefit for the people, planet, as well as profit for the tenant and landlord is a critical aspect of the program (Simons, Robinson, Lee, & Bragg, 2017).

This research was a journey toward sustainable behavior; a project to stimulate reduced electricity consumption, which this researcher accomplished, but only scratched the surface of what future research will and can achieve.

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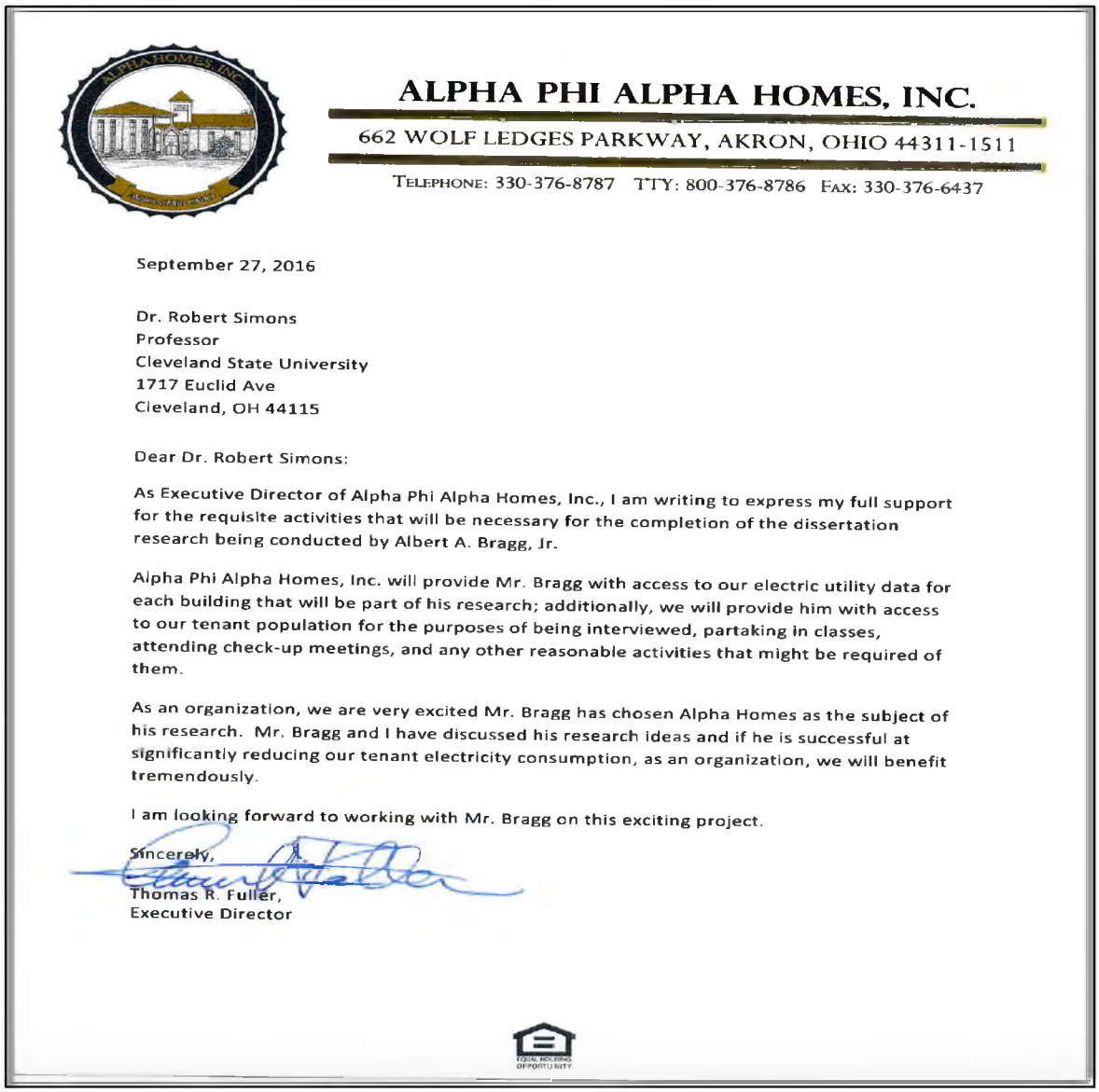
Appendix A

Letter of support from Alpha Homes



ALPHA PHI ALPHA HOMES, INC.

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TELEPHONE: 330-376-8787 TTY: 800-376-8786 FAX: 330-376-6437

September 27, 2016

Dr. Robert Simons
Professor
Cleveland State University
1717 Euclid Ave
Cleveland, OH 44115

Dear Dr. Robert Simons:

As Executive Director of Alpha Phi Alpha Homes, Inc., I am writing to express my full support for the requisite activities that will be necessary for the completion of the dissertation research being conducted by Albert A. Bragg, Jr.

Alpha Phi Alpha Homes, Inc. will provide Mr. Bragg with access to our electric utility data for each building that will be part of his research; additionally, we will provide him with access to our tenant population for the purposes of being interviewed, partaking in classes, attending check-up meetings, and any other reasonable activities that might be required of them.

As an organization, we are very excited Mr. Bragg has chosen Alpha Homes as the subject of his research. Mr. Bragg and I have discussed his research ideas and if he is successful at significantly reducing our tenant electricity consumption, as an organization, we will benefit tremendously.

I am looking forward to working with Mr. Bragg on this exciting project.

Sincerely,

Thomas R. Fuller,
Executive Director

Appendix B

A portion of the Alpha Homes data set

Building	Unit	Service year	Service Month	KWH Used per 30 Days	Occupant Age	Under 55	55 to 64	65 to 74	75 to 84	85 and Over	Male	Tenure	African American	Unit Income	Floor Number	Spring	Summer	Fall	Winter	Difference from the Previous Year	North facing	South facing	East facing	West facing	Avg. Temp	Education Offered
RUSHIN	34	2015	6	514	88	0	0	0	0	1	0	5	0	$14,124.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	35	2015	6	324	54	1	0	0	0	0	1	3	0	$9,924.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	36	2015	6	415	75	0	0	0	1	0	0	6	0	$10,260.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	37	2015	6	223	81	0	0	0	1	0	0	4	0	$21,888.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	38	2015	6	240	89	0	0	0	0	1	0	25	0	$9,036.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	40	2015	6	94	65	0	0	1	0	0	0	2	0	$14,484.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	42	2015	6	507	54	1	0	0	0	0	0	13	0	$12,572.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	43	2015	6	415	65	0	0	1	0	0	0	0	0	$15,108.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	45	2015	6	279	64	0	1	0	0	0	0	-1	0	$8,868.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	46	2015	6	155	82	0	0	0	1	0	0	3	0	$19,491.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	48	2015	6	531	53	1	0	0	0	0	0	18	0	$9,038.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	49	2015	6	270	68	0	0	1	0	0	1	5	0	$15,204.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	50	2015	6	230	70	0	0	1	0	0	0	4	0	$16,115.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	52	2015	6	287	88	0	0	0	0	1	0	7	0	$20,280.00	1	0	1	0	0		1	0	0	0	72.6	0
RUSHIN	53	2015	6	212	81	0	0	0	1	0	0	3	0	$18,480.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	54	2015	6	359	58	0	1	0	0	0	0	8	0	$16,807.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	55	2015	6	419	80	0	0	0	1	0	0	9	0	$11,820.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	56	2015	6	291	54	1	0	0	0	0	0	3	0	$16,476.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	58	2015	6	300	60	0	1	0	0	0	1	0	0	$16,944.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	59	2015	6	458	71	0	0	1	0	0	0	5	0	$14,652.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	63	2015	6	134	73	0	0	1	0	0	0	3	0	$9,060.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	65	2015	6	259	70	0	0	1	0	0	0	-1	0	$19,386.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	66	2015	6	198	77	0	0	0	1	0	1	18	0	$12,168.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	67	2015	6	186	71	0	0	1	0	0	0	4	0	$15,361.00	1	0	1	0	0		0	0	0	1	72.6	0
RUSHIN	69	2015	6	310	57	0	1	0	0	0	1	9	0	$15,814.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	70	2015	6	289	69	0	0	1	0	0	0	4	0	$20,909.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	72	2015	6	271	77	0	0	0	1	0	0	7	0	$17,372.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	74	2015	6	254	66	0	0	1	0	0	1	7	1	$8,820.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	75	2015	6	210	55	0	1	0	0	0	0	0	0	$9,407.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	76	2015	6	123	68	0	0	1	0	0	1	2	0	$11,640.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	77	2015	6	754	29	1	0	0	0	0	1	7	0	$11,338.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	78	2015	6	416	69	0	0	1	0	0	0	3	0	$19,500.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	79	2015	6	186	56	0	1	0	0	0	0	0	0	$9,061.00	1	0	1	0	0		0	1	0	0	72.6	0
RUSHIN	83	2015	6	197	69	0	0	1	0	0	0	12	0	$10,686.00	1	0	1	0	0		0	0	1	0	72.6	0

Appendix C

The Pre and Post test

The Answers May Be Shocking
Pre-Test

Name: _____

Circle the correct answer to the following questions.

1. Using compact fluorescent or LED bulbs reduces electricity usage for lighting by what?

a. 75%

b. 55%

c. 45%

d. 35%

2. In winter, lowering your thermostat 3 degrees will reduce your heating bill by what?

a. 3%

b. 6%

c. 9%

d. 12%

3. Air leaks can be responsible for what percent of the energy used for heating and cooling?

a. 1-15%

b. 16-24%

c. 25-40%

d. 41-56%

4. A microwave oven uses how much less power than a conventional oven?

   a. 10%

   b. 20%

   c. 40%

   d. 50%

5. Lowering your water heater temperature from 140°F to 120°F will reduce your water heating energy bill by more than what?

   a. 5%

   b. 10%

   c. 15%

   d. 20%

6. How much less hot water do we use in a shower versus a bath?

   a. 20%

   b. 30%

   c. 40%

   d. 50%

7. Compact fluorescent light bulbs last how much longer than regular bulbs?

   a. 2-4 times

   b. 5-7 times

   c. 8-10 times

   d. 12-14 times

8. Electronics consume what percentage of their total electricity usage when they are turned off?

   a. 75%

   b. 55%

   c. 35%

   d. 44%

9. Leaving a computer on all day cost how much per year?

a. $25

b. $50

c. $75

d. $100

10. Programmable thermostats can save how much money per year?

a. $50

b. $75

c. $125

d. $150

**** The answers are in bold and italics, the students will not see this***

Appendix D

A Summary Table of Unused Regression Runs

Table D1. Summary table of unused regression runs for Wooster Elderly and Rushin Meadows

BUILDINGS	TREATMENT	APPENDIX	REASON NOT USED
Wooster Elderly	Control	E	This contains all year 2015-19; I decided to compare the PY separately.
Wooster Elderly	Control	F	This Difference model has and adjusted R square of less than 2%, which is of little value.
Wooster Elderly	Control	G	This is the PY but at the time I did not have access to the 2015 data, which I obtained later.
Rushin Meadows	Education	H	This is a difference model prior to the PY (2015-18) for Rushin that has an adjusted R square of less than a percent.
Rushin Meadows	Education	I	This is a PY run with building control for Rushin prior to getting the 2015 data.
Rushin Meadows	Education	J	This is a difference model without the PY that has an adjusted R square of just three percent.

Table D2. Summary table of unused regression runs for Alpha Tower and Wesley Tower

BUILDINGS	TREATMENT	APPENDIX	REASON NOT USED
Alpha Tower	Economic Incentives	K	This is an example of an Alpha Tower run with a VIF that was above 10, so that variable was removed.
Alpha Tower	Economic Incentives	L	This is a difference model with an anemic adjusted R square of less than half a percent.
Alpha Tower	Economic Incentives	M	This is a building control run that did not have age bands. In this case, adding age bands improved the adjusted R square.
Wesley Tower	Education & Economic Incentives	N	This is a building control run that did not have age bands. Adding age bands improved the adjusted R square
Wesley Tower	Education & Economic Incentives	O	This is a building control difference model with an adjusted R square of two percent, which is not much explanatory value.
Wesley Tower	Education & Economic Incentives	P	This is a PY attendee difference model with an adjusted R square of less than three percent.

Appendix E

Wooster Control all Years

Table E1. Wooster (Control) all years, including the PY Regression Output

Model		Sum of Squares	df	Mean Square	Number of obs =	1008
					F(15,992)	22.56
1	**Regression**	10725648.8	15	715043.254	Prob>F	0.00
	Residual	31440203.1	992	31693.753	R-squared	0.25
					Adj-R-squared	0.24
	Total	42165851.9	1007	41872.7427	Root MSE	178.03

Table E2. Wooster (Control) all years, including the PY Regression Output with VIF

Unstandardized Coefficients				t	Sig.	Collinearity
	B	Std. Error	Beta			VIF
(Constant)	1166.197	88.745		13.141	0	
Occupant Age	-3.717	1.086	-0.114	-3.423	0.001	1.487
Male	-74.442	30.903	-0.078	-2.409	0.016	1.377
Tenure	-1.709	1.073	-0.052	-1.592	0.112	1.415
African American	-73.875	30.315	-0.077	-2.437	0.015	1.326
Unit Income	-0.013	0.002	-0.203	-5.983	0	1.527
Spring	-32.79	16.332	-0.069	-2.008	0.045	1.591
Summer	149.89	19.997	0.317	7.496	0	2.385
Winter	-16.574	22.778	-0.035	-0.728	0.467	3.094
South facing	-70.669	19.712	-0.136	-3.585	0	1.905
East facing	75.192	19.419	0.173	3.872	0	2.665
West facing	-44.439	20.046	-0.093	-2.217	0.027	2.318
Avg. Temp	-4.876	0.713	-0.39	-6.843	0	4.31
Year Dummy 2016-17	43.458	15.943	0.092	2.726	0.007	1.516
Year Dummy 2017-18	37.993	16.15	0.08	2.352	0.019	1.555
Year Dummy 2018-19	83.727	16.391	0.177	5.108	0	1.602

Appendix F

Wooster Control all Year Difference

Table F1. Wooster (Control) 2015-2019 difference model including the PY regression output

Model		Sum of Squares	df	Mean Square	Number of obs =	861
					F(15,845)	1.77
1	**Regression**	802566.329	15	53504.422	Prob>F	0.04
	Residual	25560836	845	30249.51	R-squared	0.03
					Adj-R-squared	0.01
	Total	26363402.3	860	30655.119	Root MSE	173.92

Table F2. Wooster all 2015-2019 difference model including the PY regression output with VIF

Unstandardized Coefficients				t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	105.08	94.697		1.11	0.267	
Occupant Age	-0.132	1.148	-0.005	-0.115	0.909	1.469
Male	-42.743	32.666	-0.052	-1.308	0.191	1.377
Tenure	0.424	1.135	0.015	0.373	0.709	1.398
African American	-2.207	32.045	-0.003	-0.069	0.945	1.326
Unit Income	0	0.002	0.008	0.191	0.848	1.527
Spring	-23.384	17.807	-0.061	-1.313	0.189	1.868
Summer	38.85	22.381	0.092	1.736	0.083	2.443
Winter	-52.707	24.776	-0.133	-2.127	0.034	3.43
South facing	-24.425	20.837	-0.055	-1.172	0.241	1.905
East facing	1.504	20.527	0.004	0.073	0.942	2.665
West facing	-16.905	21.19	-0.041	-0.798	0.425	2.318
Avg. Temp	-2.092	0.748	-0.199	-2.797	0.005	4.421
Year Dummy 2016-17	58.094	21.349	0.151	2.721	0.007	2.686
Year Dummy 2017-18	24.071	21.401	0.063	1.125	0.261	2.699
Year Dummy 2018-19	56.96	21.617	0.148	2.635	0.009	2.753

Appendix G

Wooster Control PY Difference Model

Table G1. Wooster (Control) PY difference model regression output

Model		Sum of Squares	df	Mean Square	Number of obs =	861
					F(13,847)	1.34
1	**Regression**	531168.728	13	40859.13	Prob>F	0.18
	Residual	25832233.6	847	30498.51	R-squared	0.02
					Adj-R-squared	0.01
	Total	26363402.3	860	30655.12	Root MSE	174.64

Table G2. Wooster (Control) PY difference model regression output

Unstandardized Coefficients				**t**	**Sig.**	**Collinearity**
	B	Std. Error	Beta			VIF
(Constant)	127.231	94.303		1.349	0.178	
Occupant Age	-0.127	1.149	-0.005	-0.111	0.912	1.459
Male	-42.772	32.795	-0.052	-1.304	0.193	1.377
Tenure	0.428	1.136	0.015	0.377	0.706	1.388
African American	-2.177	32.17	-0.003	-0.068	0.946	1.325
Unit Income	0	0.002	0.008	0.189	0.85	1.525
Spring	-31.662	17.239	-0.082	-1.837	0.067	1.737
Summer	33.375	22.37	0.079	1.492	0.136	2.42
Winter	-52.586	24.547	-0.133	-2.142	0.032	3.339
South facing	-24.407	20.919	-0.055	-1.167	0.244	1.905
East facing	1.512	20.61	0.004	0.073	0.942	2.665
West facing	-16.902	21.277	-0.041	-0.794	0.427	2.318
Avg. Temp	-1.787	0.741	-0.17	-2.41	0.016	4.31
Program Year	22.4	13.356	0.058	1.677	0.094	1.043

Appendix H

Rushin PY Difference Model

Table H1. Difference model for Rushin prior to PY 2015-2018 regression out

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**986**
					F(12,973)	1.40
1	Regression	147599.15	12	12299.929	Prob>F	0.16
	Residual	8560481.81	973	8798.029	R-squared	0.02
					Adj-R-squared	0.005
	Total	8708080.96	985	8840.69133	Root MSE	93.80

Table H2. Difference model for Rushin prior to PY 2015-2018 regression output with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	-45.917	30.684	-1.496	0.135	
Occupant Age	0.206	0.293	0.704	0.482	1.461
Male	0.553	8.183	0.068	0.946	1.35
Tenure	0.987	0.592	1.667	0.096	1.319
African American	-11.894	19.616	-0.606	0.544	1.231
Unit Income	0.001	0.001	0.614	0.54	1.4
Spring	4.412	8.811	0.501	0.617	1.862
Summer	-8.815	11.271	-0.782	0.434	2.336
Winter	4.099	13.034	0.314	0.753	3.804
South facing	-12.441	7.501	-1.659	0.098	1.489
East facing	16.464	18.484	0.891	0.373	1.093
West facing	-2.056	8.592	-0.239	0.811	1.202

Appendix I

Rushin PY Output minus 2015 Data

Table I1. PY regression output prior to receiving 2015 data

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**672**
					F(14,657)	27.48
1	Regression	3478466.42	14	248461.89	Prob>F	0.00
	Residual	5941122.09	657	9042.80	R-squared	0.37
					Adj-R-squared	0.36
	Total	9419588.5	671	14038.13	Root MSE	95.09

Table I2. PY regression output prior to receiving 2015 data with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	334.525	46.635	7.173	0	
Occupant Age	-1.949	0.518	-3.759	0	1.663
Male	-22.957	11.54	-1.989	0.047	1.666
Years lived at this location	6.307	1.154	5.466	0	1.52
Unit Income	-0.004	0.001	-3.065	0.002	1.127
Spring	-40.844	11.383	-3.588	0	1.806
Summer	71.218	13.307	5.352	0	2.467
Winter	12.783	15.166	0.843	0.4	3.205
South facing	2.469	9.27	0.266	0.79	1.466
West facing	53.882	12.151	4.434	0	1.343
Avg. Temp	1.309	0.465	2.819	0.005	4.462
Education Offered	-4.78	2.432	-1.966	0.05	4.79
Year Dummy 6/16 - 5/17	-10.063	10.471	-0.961	0.337	1.528
Year Dummy 6/17 - 5/18	-45.032	10.829	-4.158	0	1.634
Year Dummy 6/18 - 5/19	-9.451	19.374	-0.488	0.626	5.23

Appendix J

Rushin PY Difference Model

Table J1. Rushin PY difference model regression output

Model	**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**574**
				F(14,559)	2.31
Regression	337150.84	14	24082.20	Prob>F	0.00
Residual	5830196.65	559	10429.69	R-squared	0.06
				Adj-R-squared	0.03
Total	6167347.49	573	10763.26	Root MSE	102.13

Table J2. Rushin PY difference model regression output with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	-1.808	55.098	-0.033	0.974	
Occupant Age	-0.318	0.603	-0.528	0.598	1.654
Male	7.381	13.41	0.55	0.582	1.666
Years lived at this location	-1.299	1.341	-0.969	0.333	1.473
Unit Income	-6.60E-05	0.001	-0.048	0.962	1.127
Spring	1.472	13.924	0.106	0.916	2.209
Summer	-17.232	16.11	-1.07	0.285	2.447
Winter	0.541	18.32	0.03	0.976	3.626
South facing	-3.647	10.772	-0.339	0.735	1.466
West facing	4.048	14.12	0.287	0.774	1.344
Avg. Temp	0.398	0.538	0.739	0.461	4.444
Education Offered	-8.318	2.745	-3.031	0.003	5.072
Year Dummy 6/16 - 5/17	9.934	15.656	0.635	0.526	2.793
Year Dummy 6/17 - 5/18	-15.978	15.849	-1.008	0.314	2.862
Year Dummy 6/18 - 5/19	83.486	26.196	3.187	0.002	7.818

Appendix K

Alpha Output with Bad VIF

Table K1. Alpha Tower PY regression output

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**4860**
					F(18,4841)	68.280
1	**Regression**	39031927.2	18	2168440.40	Prob>F	0.000
	Residual	153740772	4841	31758.06	R-squared	0.202
					Adj-R-squared	0.200
	Total	192772700	4859	39673.33	Root MSE	178.208

Table K2. Alpha Tower PY regression output with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	358.138	25.721	13.924	0	
Under 55	12.615	21.238	0.594	0.553	1.971
55 to 64	8.569	16.157	0.53	0.596	5.781
65 to 74	26.558	15.851	1.675	0.094	8.255
75 to 84	-39.312	16.434	-2.392	0.017	8.896
85 and Over	-33.257	17.231	-1.93	0.054	5.461
Male	23.943	6.32	3.789	0	1.181
Tenure	5.323	0.499	10.669	0	1.451
African American	0.281	27.097	0.01	0.992	17.812
Unit Income	0.004	0.001	7.409	0	1.177
Floor number	-1.719	0.678	-2.536	0.011	1.891
Spring	-35.608	7.536	-4.725	0	1.629
Summer	71.639	9.019	7.943	0	2.334
Winter	42.203	11.084	3.808	0	3.525
South facing	-77.301	8.138	-9.499	0	1.793
East facing	-7.644	7.769	-0.984	0.325	1.897
West facing	-23.921	7.858	-3.044	0.002	1.901
Avg. Temp	0.7	0.325	2.156	0.031	4.731

Appendix L
Alpha PY Difference Model

Table L1. Alpha Tower PY difference model regression output

Model		Sum of Squares	df	Mean Square	Number of obs =	4009
					F(16,3992)	1.970
1	**Regression**	623872.045	16	38992.00	Prob>F	0.012
	Residual	79016751.6	3992	19793.78	R-squared	0.008
					Adj-R-squared	0.004
	Total	79640623.7	4008	19870.4151	Root MSE	140.690

Table L2. Alpha Tower PY difference model regression output with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	17.166	19.151	0.896	0.37	
Under 55	1.698	15.101	0.112	0.91	1.123
55 to 64	11.339	7.653	1.482	0.139	1.649
65 to 74	12.262	5.92	2.071	0.038	1.519
85 and Over	2.342	7.116	0.329	0.742	1.296
Male	6.03	5.509	1.094	0.274	1.174
Tenure	-0.29	0.419	0.692	0.489	1.35
Unit Income	0	0	0.942	0.346	1.16
Floor number	-0.128	0.59	0.217	0.828	1.91
Spring	-0.361	6.548	0.055	0.956	1.834
Summer	17.807	8.428	2.113	0.035	2.408
Winter	16.54	9.951	1.662	0.097	3.98
South facing	-9.67	7.012	1.379	0.168	1.76
East facing	-1.863	6.712	0.277	0.781	1.882
West facing	-8.23	6.74	1.221	0.222	1.84
Avg. Temp	-0.206	0.282	-0.73	0.466	4.939
Alpha Economic Incentives Offered Attendee Only	-7.208	7.875	0.915	0.36	2.118

Appendix M

Alpha PY Output Minus Age Bands

Table M1. Alpha Tower Prior to PY regression output without age bands

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**3600**
					F(12,3587)	51.55
1	**Regression**	18747656	12	1562304.67	Prob>F	0.00
	Residual	108715555	3587	30308.212	R-squared	0.15
					Adj-R-squared	0.14
	Total	127463211	3599	35416.2853	Root MSE	174.09

Table M2. Alpha Tower Prior to PY regression output without age bands

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	214.975	32.382	6.639	0	
Occupant Age	-1.058	0.369	-2.864	0.004	1.799
Male	23.027	6.414	3.59	0	1.08
Tenure	6.078	0.636	9.556	0	1.683
Unit Income	0.005	0.001	8.5	0	1.094
Floor number	-1.031	0.681	-1.513	0.13	1.031
Spring	-33.305	8.619	-3.864	0	1.655
Summer	51.553	10.196	5.056	0	2.315
Winter	62.229	13.002	4.786	0	3.765
South facing	-89.256	9.284	-9.614	0	1.867
East facing	-38.443	9.077	-4.235	0	1.929
West facing	-39.634	9.009	-4.399	0	2.025
Avg. Temp	2.058	0.377	5.46	0	4.98

Appendix N

Wesley Output Minus Age Bands

Table N1. Wesley Tower prior to program year regression output no age bands

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**2268**
					F(13,2254)	68.13
1	**Regression**	97622484.3	13	7509421.87	Prob>F	0.00
	Residual	248425789	2254	110215.523	R-squared	0.282
					Adj-R-squared	0.278
	Total	346048273	2267	152645.908	Root MSE	331.99

Table N2. Wesley Tower prior to program year regression output no age bands with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	1010.535	69.829	14.472	0	
Occupant Age	1.309	0.563	2.324	0.02	1.245
Male	165.398	17.697	9.346	0	1.172
Tenure	3.562	1.245	2.86	0.004	1.159
African American	124.761	15.913	7.84	0	1.186
Unit Income	-0.012	0.002	-5.861	0	1.234
Floor number	-5.669	3.56	-1.592	0.111	1.124
Spring	12.691	20.497	0.619	0.536	1.621
Summer	176.529	24.304	7.263	0	2.276
Winter	139.629	29.014	4.812	0	3.248
South facing	-48.766	15.218	-3.204	0.001	1.155
East facing	293.802	58.247	5.044	0	1.091
West facing	99.571	23.876	4.17	0	1.142
Avg. Temp	-10.242	0.901	-11.373	0	4.319

Appendix O

Wesley Difference Model

Table O1. Wesley Tower difference model regression output without age bands

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**1828**
					F(13,1814)	3.82
1	**Regression**	6677026.5	13	513617.42	Prob>F	0.00
	Residual	244233102	1814	134637.87	R-squared	0.03
					Adj-R-squared	0.02
	Total	250910128	1827	137334.50	Root MSE	366.93

Table O2. Wesley Tower difference model regression output without age bands with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	283.783	85.704	3.311	0.001	
Occupant Age	-1.416	0.693	-2.043	0.041	1.242
Male	5.861	21.778	0.269	0.788	1.17
Tenure	3.843	1.541	2.494	0.013	1.156
African American	74.547	19.618	3.8	0	1.188
Unit Income	-0.001	0.003	-0.405	0.686	1.235
Floor number	4.401	4.384	1.004	0.316	1.126
Spring	-15.219	25.193	-0.604	0.546	1.844
Summer	65.738	32.246	2.039	0.042	2.316
Winter	-141.297	36.851	-3.834	0	3.682
South facing	-39.23	18.732	-2.094	0.036	1.155
East facing	60.437	71.732	0.843	0.4	1.091
West facing	-52.556	29.321	-1.792	0.073	1.142
Avg. Temp	-4.436	1.095	-4.051	0	4.404

Appendix P

Wesley PY Difference Model

Table P1. Wesley Tower PY Attendee difference model regression output

Model		**Sum of Squares**	**df**	**Mean Square**	**Number of obs =**	**2056**
					F(17,2038)	4.38
1	**Regression**	9363541.01	17	550796.53	Prob>F	0.00
	Residual	256409411	2038	125814.24	R-squared	0.04
					Adj-R-squared	0.027
	Total	265772952	2055	129329.90	Root MSE	354.70

Table P2. Wesley Tower PY Attendee difference model regression output with VIF

	Unstandardized Coefficients		t	Sig.	
	B	Std. Error			VIF
(Constant)	257.3	71.085	3.62	0	
Male	7.286	19.789	0.368	0.713	1.17
Tenure	3.722	1.443	2.579	0.01	1.26
African American	77.459	19.002	4.076	0	1.29
Unit Income	-0.003	0.002	-1.216	0.224	1.371
Floor number	7.336	4.134	1.774	0.076	1.219
Spring	-33.708	22.834	-1.476	0.14	1.801
Summer	60.222	29.289	2.056	0.04	2.339
Winter	-155.852	32.943	-4.731	0	3.519
South facing	-38.091	18.404	-2.07	0.039	1.324
East facing	63.184	70.88	0.891	0.373	1.142
West facing	-33.901	26.727	-1.268	0.205	1.243
Avg. Temp	-4.886	0.981	-4.981	0	4.31
ETL Education and Economic Incentives Offered PY Attendees Only	2.453	3.447	0.712	0.477	1.065
Under 55	24.453	26.989	0.906	0.365	1.815
55 to 64	-76.589	25.474	-3.007	0.003	1.889
65 to 74	-36.921	24.864	-1.485	0.138	2.139
85 and Over	-69.271	37.329	-1.856	0.064	1.727

Appendix Q

Rushin Meadows Focus Group

Rushin Service Coordinator (SC) and Project Manager (PM) and Al Bragg (AB)

AB: Okay, we are now recording. This my first question; we've been doing this program for a year, what in your opinion was most impactful?

PM: "The residents having the knowledge, the actual knowledge of what they're doing or weren't doing that's causing the utilities to be high or low. I think that some of them really appreciated knowing what they could do to help."

SC-2: "I would agree with that, I think that that's been really helpful."

"And it helped me know, you know, what we can do here at the property, at the office. You know things that I can do, and small things make a big difference."

"Yeah, Dan and I have been doing a lot of brainstorming of things that we can do to help keep the utilities low. Such as, if we have to, we would like to upgrade the appliances when someone moves out so that they are not twenty or thirty years old. That did not go over so well, but we deal with that later. At every move out of all of the units, we are putting in weather stripping, caulking the windows, around the air conditioners, just little things, changing over different bulbs and…"

AB: Okay, were you doing the things, you just mentioned, before the program or did the program spur that on?

SC-2: "the program increased the occurrence, and it made us do it more quickly."

PM: "Barb and I actually talked about new move in's having a similar program, because the ones that are here, you know, that came to the program no this stuff now, but new people coming in don't necessarily know the information."

AB: Question two, what aspect of the program was least impactful?

PM: "I guess, the things that I heard about why people, came to the first meeting then they didn't come back, or they went to a couple and didn't come back. From what I understood, it was they did not like the repetition. I guess maybe that would be the least impactful."

AB: Okay, so the repetition, the PowerPoint being the same?

SC-2: "Right."

AB: Did you know that was by design?

SC-2 "Yes, because you have to hear things several times to learn the information, so I understand that, but a lot of people did not. They heard it once, and they were done."

AB: Question three, why do you feel some tenants were successful and or unsuccessful? Just to add to this question, if the tenants wanted to know what their electricity consumption was, and I believe 100 percent of them did, I would let them know at the monthly meetings.

So, they were all aware of what they were using. So, again, why do you think some were successful, and some less successful?"

SC-2: "With most of the residents, if they can't see anything in it for them, then that's a reason they'd stopped coming."

AB: Okay, so they didn't see a direct or immediate benefit?

SC-2: "Right."

PM: "Can you repeat the question"?

AB: The question is, why do you feel some people were successful and the others not successful?"

PM: "Well based on hearing a lot of the things, I think a lot of people made improvements. I don't know that I saw a lot of people being totally unsuccessful they all bought things, weather some were more successful than others, I'm not sure."

AB: Now for question four, I think I know the answer to this, have you heard of other Alpha Homes' buildings participating in this project?

PM: "Yes, I know there are other buildings, I can't name them, but there are others."

SC-2: "Yes. Tom has made mention, but which buildings I'm not sure."

AB: Question five, has your electricity knowledge improved since the program began?

SC-2: "Yes, definitely."

PM: "Definitely."

SC-2 "Yes, I quit using my space heater in the office." (laughter) "I'm just saying it did impact me, so I am trying to save. And actually, my light on my shredder, I actually just discovered this year, because I kept plugging it in and I would forget to unplug it, then I noticed another setting. I just have to move it over one more notch and it turns itself off and the little light goes off. So, I don't have to unplug it."

SC-2 "Yes, so I can just turn it off. So, I'm trying to conserve that way. So, it has impacted me, when I leave my office, I make sure I turn off my lights."

"For my house, I had my husband order me one of those thermostat covers, because I have a teenager who thinks that as soon as she walks in the house the air conditioner

should come on, so I'll be doing that and I'm watching what she's doing with like, the water, and other things."

"I have to laugh because when the AC comes on, I shut it off. I cannot stand air conditioning, so if we don't run the air conditioning at all, I'm good."

AB: Finally, is there anything you'd like to add?

PM: "No, I can't think of anything."

SC-2: "No, that's it."

Rushin Residents (R-1 through R-6) and Al Bragg (AB)

AB: We are here at Rushin Meadows doing the focus group for some of those that have done really well, at reducing electricity, and also some that have had some challenges. We have six questions for the six of you who have graciously chosen to accept the invitation. If you want to add something else that's up to you.

AB: We are going to start with R-1 for the first question, so everybody else can think about this question. Feel free to jump in if you like, just please give your name before your comment. We started this program a year ago, boy how time flies.

AB: So, my first question, this is for everyone and we'll start with R-1, what aspect of the program was most impactful to you?

R-1: "Let's see, oh my God. There's a few things."

R-4: "Uhm, for me it's I didn't realize how much electric I was using until you told us what the kilowatt hours were and how much we were using. And then seeing how much I did use, then cutting down on that electric to see how far down I went. I was like, I didn't

realize how much electricity you use just having things plugged in. I didn't realize how much electric I was actually using, until I seen [sic] my electric in writing."

R-6: "I didn't know, I didn't know about the six-plug device, you know what I mean?"

AB: The power strip?

R-6: "Yeah, I didn't realize that, I turned off the tv, by unplugging it, cause [sic] I didn't know I used electricity just being plugged in."

AB: That's right, 75 percent of the electricity is used when it's turned off. That's a tremendous amount isn't it?

R-3: "Oh, I'm Claudia, I think the same as R-4. I was really surprised at unplugging all that stuff that I had. Cause the first thing we had and talked about unplugging, I went home and unplugged everything, and I thought, okay, we are going to save energy and things like that. And a lot of people may think it's inconvenient to have unplugged and when you use it you have to plug it back in, but realistically, like, I told R-6, I don't use it every day and that, my curling iron, I don't use every day. So, you're really not, it's a matter of, a little bit of a change of life."

R-5: "It was a big change of life to me." (laughter)

R-5: "Mine was basically purchasing the light bulbs and using the power strips."

R-1: "Cathy, I had a question, then I dropped it."

R-1: "I had these curly queues, cause [sic] you talked about these curly queues light bulb."

AB: "Yes, compact florescent."

R-1 "I had them in my bathroom, in my living room, in my lamps and I like those more than I liked the regular, 50-watt, 60-watt, 80-watt bulbs.

R-2 “That surprised me that the TV holds the power even with it turned off. And I have mine unplugged in the strip, but my phone and my tv both are plugged into that.”

R-4: And also, those heaters, I use those in the wintertime. I did not realize how much electric I used. I put those away and I haven’t used them sense.”

AB: Okay, question two, what aspect of the program was least impactful?

R-6: “I wouldn’t know.”

R-1: “I wouldn’t know either.”

R-3: I think mine was unplugging my computer. I mean turning the power strip off of my computer and my tv that concerned me because I was concerned that may that, it wouldn’t boot up again, and that I’d run into problems. So, I haven’t walked over that bridge yet to see if it’s actually going to happen.”

AB: “So, in other words you are saying that some of the things that were suggested, you were a little apprehensive doing them?

R-3: “Just those two things really everything else was fine. Like I said, you know, it’s a life change. I don’t use my curing iron all the time so what’s the point of having it plugged in all the time. Same with my toaster oven and my smoothie machine. You know, what do I use it, once a week or something like that?”

AB: R-4, you said one of the biggest things was not knowing, you didn’t know all this stuff, correct?

R-4: “Correct, I didn’t know any of this until I came down.”

R-4: “Yes, and you can actually see the difference.”

R-2: "Well I've always used the energy saving light bulbs and energy saving appliances. I'm R-2, Because my brother taught this in class in college and I learned a lot of stuff from him. I had already started some of this stuff."

R-4: I used to leave things plugged in even though they were on, until I came down to the meeting and found out, I unplugged things."

R-1 "And then, for my living room lights, when I go to bed, I unplug them. I unplug all the lamps. Yeah, because I got miniature night lights. I have one in the kitchen and one in the bathroom so that way it, I can see."

R-3: I think the least impactful thing was seeing the dam in California. That really, in Ohio here, has no impact on me."

AB: Question 3, why do you feel you were successful or unsuccessful reducing electricity.

R-1: "I was successful because I got a lot out of being here every day and you telling us the wattage use and whoever else and tells you to get a power strip and all that. I liked it. I totally understand. I don't understand mostly everything, but I can understand most stuff. I can understand most of the stuff, but not all of it."

R-5: "And I like my flames" (laughter) when you informed me just how much them flames were costing that's when I decided to unplug the whole thing.

AB: Did you see your electricity usage go down?

R-5: "Oh yes, definitely. Big time."

R-5: "I didn't know them [sic] flames was [sic] costing that much."

AB: "But once you found that out how much the flames were costing; how did you feel about unplugging them? Did you feel deprived? Did you feel like oh man this is terrible; I don't have my flames?

R-5: "Yeah, in a way, yes, but if I wanted to gain and use the knowledge you gave, I felt it necessary to unplug my flames."

AB: Well let me ask you this, if you were to never to see me again, would you continue to unplug your flames, or would you use them again next year?

R-5: "I won't use them again."

R-3: "I think even having these, this course that we had, made us, who was here, more conscious about what we were doing about unplugging, and things like that, because I'd go buy them and say oh gee, I should unplug that, and things like that."

R-6: "I know it made me more aware of what I was doing and what I shouldn't do."

R-5: "I agree with them."

R-1: "I agree with the same thing, cause [sic} I didn't know."

R-2: "Yeah, a lot of the things you brought up in I realized, but I didn't realize how devastating it was to do as what you described."

AB: Okay, so you knew but you didn't know the degree to which you could save or how much it can cost you to do some of those things?

R-4: "After the program got going, it got fun to see how good you can do the next month. The competing It's competition with myself."

AB: Question four, and this may be really quick, have you heard about other Alpha Homes' buildings participating in this project?

R4: "No."

R-6: "No."

R-1: "No."

R-2: "No."

R-5: "No others."

R-3: "No."

AB: Very good, so we will move on to question five. Well, since question five doesn't apply to you, I'm going to move on to question six.

AB: Okay, question six and feel free to give as much detail as you like. Has your electricity conservation knowledge improved, and if so how?

R-3: "Definitely, I was always under the impression, you know, it's plugged in it's okay, I'm not using electricity because I'm not using the item, but coming to these finding out that even though it's plugged in, I'm still using electricity, which is very informative to me."

R-4: "I agree with Claudia."

R-5: "I agree, there were things that, that, you had showed us and taught us I had no idea how extreme my usage was, and to know that knowledge and be able to cut down the way I did it helped me extremely."

R-6: "Yeah, I feel the same way, I learned a lot. I didn't know."

R-1: "Oh, yes it has, because I never knew nothing about electricity. I mean I knew it, but I didn't know the specifics about it and how it works and how it's supposed to save money and all this other stuff, but I really enjoyed it, I learned a lot and I hope we do this again."

R-2: "Well, I learned a lot because when you combined with the global warming and our aspects of our electric, what we use and what we can save, and that makes a big difference for all of us."

AB: Okay ladies, is there anything else you'd like to add?

R-3: "It was a good, it would be real great if we could get more people to get interested and I go out and tell them and that and they say "oh, it's the same thing all the time, why should we go?"

R-6: "I'd like to see when you actually move in here and you sign the agreement and everything that this be mandatory. Mandatory seems a harsh word, but it should be mandatory that you have to attend six of these classes. I don't think it's asking the tenants a lot to come over and find out about this. I mean this is for their benefit including ours."

Appendix R

Alpha Tower Focus Group

In the last month of this research project, I recruited participants for three focus groups, one from each treatment building, of 18 residents. I chose three participants who successfully reduced electricity consumption and three participants who were not as successful, to participate in each focus group. The focus group participants, for each building, were recruited through phone calls, with the assistance of the building's Service Coordinator. The meetings took approximately one hour to complete. Alpha Homes provided lunch for all participants. The Service Coordinators, and, in one case, building manager were interviewed apart from the residents. I recorded each session and included the transcribed results here. All names were removed to maintain confidentiality.

I utilized an open-ended format, where the following questions were asked:

1. What aspect of the program was most impactful?
2. What aspect of the program was least impactful?
3. Why do you feel you were successful or unsuccessful?
4. Have you heard about other, Alpha Homes, buildings participating in this project?
5. Which of the incentives was most important to you?
6. Has your electricity conservation knowledge improved?

Alpha Service Coordinator (SC) and Al Bragg (AB)

AB: Okay, we are taping. I basically have six questions. They may not all apply to you, so we'll just deal with the ones that do.

SC: "Ok."

AB: "First question. You know we started the program a year ago, what aspect of it was most impactful in your opinion?"

SC: "I think the most effective was, uhm, I think them coming up here and them finding out they could be rewarded for saving energy."

AB: "Okay great. Question number two, what aspect of the program was least impactful?

SC: "The least impact uhm, I don't think there was anything that was not impactful. It even helped me conserve energy at home. It was very motivational."

AB: Okay, so it gave you motivation to want to do things yourself?

SC: "Yes it did."

AB: "Great, question three, why do you feel some tenants were successful or unsuccessful?

SC: "I think it was based on how often they attended; it was clear some people were motivated by the incentives"!

AB: Very good. Question four, have you heard of any other buildings in Alpha Homes participating in this program? Any other Alpha Homes" sites?

SC: "Not that I know of, because this is the only one in Chicago."

AB: Do you know of any sites anywhere else doing this?

SC: "No, I don't, no."

AB: Okay, question four, which incentive do you believe was the most important for the residents?

SC: "The most important incentive for the residents was the gift cards."

AB: The gift cards?

SC: "Yeah and the TV. I think they enjoyed coming in here with the chance to win a little, you know."

AB: "Okay, alright, very good. Question five, has your electricity knowledge or the tenants' electricity knowledge improved?

SC: "I think so. I think so, cause [sic], uhm, I've heard a couple of them talk about ways that they are going to try to save energy."

SC: "Yeah, for me, I think it helped me to be more conscious to turn the lights off when I'm not in the room. Also, unplugging my items when I'm not using them. So, yeah."

AB: Very nice, any questions of me?

SC: "Nope, no questions."

Alpha Residents (R-1 through R-6) and Al Bragg (AB)

AB: Hello everyone, just to bring everyone back into focus, I started my research here last May, which is when we had the first meeting. I have been looking at your electricity consumption for a whole year now. Your building was randomly chosen to stop the program, after six months to see if any benefit that was derived continued, or just what would happen after the program was over. So, I am to talk to you concerning your thought about the program. Some of you, in this room, were very successful at reducing your electricity consumption, and some were less successful.

I have six questions that I'm going to ask you, okay? I would like everyone to answer each of the six questions. However, if you don't have an answer, that is fine, I do not want you to feel forced to answer. share that with us.

I will ask one favor, because it is so loud in here, when you answer say your name first and I'll give you the recorder, so that you can make your comments.

AB: Alright, here is the first question, what aspect of the program was most impactful to you. So, what part of the program did you learn most from or benefited you the most? Who would like to start us off with an answer?

AB: Okay, R-1.

R-1: "Yes, uh, what I thought about the program is that it showed us how to keep our energy down by looking at our light bill. That's what I learned about it."

AB: Okay, she said she learned how to keep her energy down, by looking at her light bill; who is next?

R-3: "I agree with R-1 on that one."

R-2: I feel the same way

R-6: I agree also.

R-5: "Agreed"

R-6: "I agree too."

R-5: "I do not burn lights when I'm not in a room."

R-1 "Neither do I."

R-4"Yes, during the day there is [sic] no lights. A night, only the bathroom."

R-3 "Well this is R-3, if the lights are not needed, they are not used until my family comes around, they're the ones using them."

AB: Now, question two. What part of the program, was least impactful?

R-3: "Nothing comes to mind, all of it was helpful."

R-1: "Yes, I'm R-1, I agree with R-3."

R-2: "I agree with R-3. This is R-2."

R-5: "I agree with her."

R-6: "Me too."

R-4: "I do too, I'm R-6."

AB: So, tell me for question three, individually, why do you think you were more, or less successful reducing electricity consumption? We start with R-1."

"I'm R-1, I think I was successful because you did a good job coming here and letting us know about our electricity."

AB: "Okay R-2 your turn."

R-2: "I was successful because I listened to what our Service Coordinators taught us."

R-5: "Uhm, I turned off the things they told us to turn off when they're not in use, or to unplug. All that is what my family needs to hear." (laughter)

AB: "Okay, so your family caused you to use a little more electricity?

R-5: "Yep, a little bit more."

R2: "Now I agree with her because there is a lot of things like unplugging things when you are not using them. Mine stays plugged up, but then after talking to the coordinators after class, I started unplugging a lot of things. And I hope that helped"

R-6: "I just never used a lot of electricity. I'm just usually in one room or another, then if it's light outside I don't need it. I got the sunlight."

R-4: "We'll I've always been careful of, if I don't need a light, I don't have it on."

AB: Okay, so you've always been that way?

R-4: "Yeah."

AB: Did this program make you even more conscious about that?

R-4: "Yeah."

AB: Now question four, have you heard about any other Alpha buildings doing this program?"

R-1: "No

R-6: "No."

R-4: "No"

R-2: "Me neither."

R-3: "No I haven't."

R-5: "Nope."

AB: So, that sounds like no one has?

All residents answered in the affirmative.

AB: Question five, which of the incentives was most important to you?

R-1: "We'll all of them meant a lots to me."

AB: All of them meant a lot to you? None were more important than the other?"

R-1: "No, cause [sic] I learned a lots [sic]. It helped me a lots [sic]."

AB: R-5, what about you?

R-5: "Gift cards."

R-4: "Well I got, received light bulbs."

AB: Alright, so the light bulbs were important for you?

R-4: "Yes."

R-6: "Light bulbs."

R-3: "Light bulbs and gift cards."

AB: So how are the light bulbs working for you guys?

R-2 "Great, they last a long time too.

AB: Ok now, last question. Has your electricity conservation knowledge improved? I'll start with R-1.

R-1 "Yes, it improved with us because we don't have to pay a light bill for one."

R-3: "A big improvement and plus, you know, I learned not to burn lights just like I have to pay the bill you know? I don't burn a light all day and night, only the bathroom and the bedroom."

AB: Ok, very good. R-2, did you learn anything?

R-2: "I learned that I did not have to pay the light bill, I didn't keep unnecessary lights on that it helped my pocket."

R-4: "Well, I learned that if I'm not using it don't turn it on and a phrase that my mother used to always say get Edison out of my pocket!" (laughter)

R-5: "Well you know what, I learned a lot."

R-6: "Like I said, a lot of things I used to didn't do, but after coming to one class, this my second one, I learned to unplug things when not in use. Well, I love a dark apartment so only one light."

R-6: "I use night lights in the bathroom, and I use the overhead light over the sink."

AB: Very good; okay ladies, that's all the questions I have. I do certainty appreciate you guys coming up today.

AB: Any questions of me before we finish?

R-5: "So, will this be your last time coming here"?

AB: Sadly, yes it will!

Appendix S

Wesley Tower Focus Group

In the last month of this research project, I recruited participants for three focus groups, one from each treatment building, of 18 residents. I chose three participants who successfully reduced electricity consumption and three participants who were not as successful, to participate in each focus group. The focus group participants, for each building, were recruited through phone calls, with the assistance of the building's Service Coordinator. The meetings took approximately one hour to complete. Alpha Homes provided lunch for all participants. The Service Coordinators, and, in one case, building manager were interviewed apart from the residents. I recorded each session and included the transcribed results here. All names were removed to maintain confidentiality.

I utilized an open-ended format, where the following questions were asked:

1. What aspect of the program was most impactful?
2. What aspect of the program was least impactful?
3. Why do you feel you were successful or unsuccessful?
4. Have you heard about other, Alpha Homes, buildings participating in this project?
5. Which of the incentives was most important to you?
6. Has your electricity conservation knowledge improved?

ETL Coordinator (SC) and Al Bragg (AB)

AB: Question one, what aspect of the program was most impactful?

SC: "I guess, the interaction between the tenants and the PowerPoint presentation. Even though the presentation was the same each month, I think that was good, because people need to see something multiple times for it to sink in. It also gave them ample opportunity to ask questions."

AB: Question two, what aspect of the program was least impactful?

SC: I can't think of anything that would be considered not impactful.

AB: Question three, why do you think some people were not successful at reducing electricity usage?

SC: "I heard comments like if I need to have my fan on, I'm going to turn it on, I don't care. Some have the mindset, that they're going to use whatever they need, whenever they need it. When you have to pay for something yourself, you think differently.

AB: Question four, have you heard about any other Alpha Phi Alpha Homes' building participation in this program?

SC: "Actually No, I haven't had the privilege of talking to any of my counterparts."

AB: Question five, which of the incentives was most important?

SC: "The gift cards, while they like the lunch if I had to pick one, I'd say the gift cards."

AB: Question six, has your electricity knowledge improved?

SC: "I don't know if it improved, but it made me think about it more. There may have been some things I had forgotten, that I would hear you emphasize; things I may have heard, who knows, four or five years ago but it's not affecting you. More than anything it reminded me; it did make me more aware.

AB: Is there anything you would like to add?

SC: No, I really do believe if there is an opportunity for you to continue or expand, it could benefit many of the tenants. They just have to hear things over and over again.

AB: What if attendance was mandatory, a few times a year?

SC: "I think that would be a great thing! This could benefit them tremendously and they would see the benefit if they were forced to attend. Yes, that would be great"!

ETL (R-1 through R-6) and Al Bragg (AB)

AB: Alrighty everyone, we are here at the Wesley tower focus group and of course you guys know me, I'm Al Bragg you are?

AB: "Alright, we have six people here who have participated, for the last year, in the electricity conservation program. I have six questions I'm going to ask, so it shouldn't take long."

AB: The first question I'd like everybody to answer is what aspect of the program, was most impactful?

R-2: "I think a lot was the presentation because, especially the pictures that you were showing of the differences of the before and after, and how it will affect all of us."

AB: Okay, very good!

AB: R-1, what do you think was most impactful?

R-1: "The most important thing is that the lecture that you give [sic] us on the practical solutions

AB: Do you mean the PowerPoint presentation?

R-1: "Yes, the presentation."

R-3: “Same with me too.”

R-4 “The test was impactful.”

R-5 “Changing the planet.”

R-6 “I think the same thing as she said, the pictures really. One having snow one not, one having water and one not having water.”

AB: So, those pictures that I showed as part of the PowerPoint and what happens when you waste electricity?

R-6: “Yes.”

AB: Right, and of course we use water to generate electricity some so that can certainly be a problem.

AB: Okay, next question everyone. What aspect of the program was least impactful. So, I guess the part that you couldn’t wrap your arms around. We will go in reverse.”

R-6: “I’m trying to think.”

R-6 “I’m not sure.”

R-4: “Can you think of anything?”

R-2 Yeah, I have an idea, but I’m not sure. It was the fact that we could not get more people from the building to participate.”

R-5: “That’s good.”

R-4: “So, they can be informed too.”

AB: So, the lack of attendance you view as a problem?

R-2; “Right it does.”

R-4: “It affects the whole building.”

R-2: “This is my opinion. My opinion is if you hadn’t been offering free food, a free tv and free prizes and a gift card, wouldn’t nobody [sic} have been here.”

R-5: “Wouldn’t nobody[sic] have been here.” (laughter)

R-5: “This building honey, that’s the truth.”

R-6: “But you know what, the last twenty-three years I’ve lived here no matter what they have hardly anybody shows up. It’s the same few people. There’s about eight, nine ten of us that come to everything. And the others don’t come to nothing[sic].”

R-4: “See what you was [sic} saying, it impacts all of us, ….and the ones that went missing they don’t get that same information.”

R-5: “Whether it’s food or not…”

AB: That’s a good point.

R-5: “They don’t care, they ain’t [sic] interested, I don’t care if you have a million dollars.”

R-2: “They impact the whole.”

R-5: “Well they would come if it’s a million dollars involved, but buy food and drink, they don’t care nothing [sic] about that, especially if it’s on their check day. If it’s on the check day you can forget it.”

R-1: “I say this about America, all these things we don’t have in Africa. Especially not where I’m from. Some people come here just to lecture us on our safety, they won’t come”

R-1: “They won’t’ come.”

R-1: “It’s an opportunity and people won’t come.”

R-3: “About half the people won’t come.”

R-1: “It’s not in Africa. You don’t have all this, this privilege.”

R-4: “So, what he’s saying unless it’s food…people won’t come”

R:2 “And even then, half the time…they won’t come”

R-1: “And those people who come… I like people to come.”

R-2: “The biggest crowd you had was the day you gave away the tv.”

R-5: “Yes, yes it was. That is the truth. We knew everybody was going to show then.”

R-4: “The biggest crowd.”

R-1: “I can see a simple man…who cannot see a single person without this.”

R-5: “That is the only reason why one resident came was for the tv, if it wasn’t for that he wouldn’t have came [sic].”

AB: Okay, that’s interesting.

R-5: “You can take the horse to the water, but you can’t make him drink.”

R-5: “That is the way it is though.”

R-1: “I would never miss a meeting.”

AB: Okay, great conversation, question three. Some of you, as I said, were successful in reducing electricity. Some of you were not as successful. I just want to ask why do you think you had whatever success you think you had? Why do you think you were successful? If you weren’t as successful as you could have been, why do you think that was? So, I want you to think about has your electricity usage changed since I started? Is it the same? If it’s the same, why? If it’s changed either up or down why? So, I’d like you to talk about that.”

R-5: “Mine changed, cause [sic] I unplugged that tv and unplugged all that stuff at night. Microwave all that stuff, even my computer, my laptop, I unplugged that. Everything.”

R-1: "The reason that, why you lecture us, it's up to us to practice. When you put all this into practice it changes. You see if we don't put this into practice, we just come for nothing."

R-1: "I've done this in the bedroom and with my water. When I want to bathe, in the bathroom. Before, I used to leave all devices on."

R-2: "I unplugged everything, almost everything."

R-5: "The refrigerator you gotta [sic] leave that on."

R-2: "Yeah, leave the refrigerator on. Leave the stove on cause of, you can't put that on a…power strip"

R-5: "Yeah you gotta [sic] leave…you can't unplug that."

AB: R-3 what, if anything, have you done different?

R-3: "I make sure my, my, all my stuff turn off."

AB: When did you start doing that?

R-3: "Last night." (laughter)

AB: R-4, what about you?

R-4: "I did it because I unplug everything. I tried to anyway. The bathroom light, everything that I have that use electricity, I tried…."

R-5: "I left my night light on because I can't sleep in no dark, bunk that. I left that night light on. Somebody left a mirror down here and it got a ring on it, like a light and I left that bathroom from where you can see, and I left that on all the time because it doesn't use as much electricity as that light on the wall."

R-6: “Well I think mine electricity was worse, number one because I’m cold all the time, so I always have my heat on full blast and the other thing is last year at this time I had a different scooter it took it two hours to charge, this one takes eight hours to charge.”

R-5; “Oh God, she could very well save electricity.”

R-2: “See that’s another thing that I did too, I didn’t turn my heat on.”

R-5: “Oh, I didn’t either because, you know, I was too hot. It be too hot. I can’t sleep in no hot house.”

R-4: “Me neither.”

R-5: “I didn’t turn no heat on if it was cool cause my house stay [sic] hot all the time.”

R-5: “But, I didn’t but no air on too because it wasn’t hot enough to put no air on.”

AB: Alright, question number four to each of you. Have you heard about other Alpha Homes buildings’ participating in this project?”

R-2: “Only from you today.”

R-5: “I haven’t heard before today.”

R-4: “Just from you today.”

R-1: “I haven’t heard anything.”

R-3: “for me nothing.”

AB: Okay, so now, question five. You guys received some incentives, what was the greatest incentive for you guys? I’m not saying you wouldn’t have come anyway, but what incentive really meant the most to you”?

R-5: “That gift card I got.”

R-5: “Yeah”!

R-4: “It was just getting to know things, about electricity, I didn’t know about.”

AB: So, you were more interested in the information?

R-4: “Yes.”

R-3: “The gift cards.”

R-1: “The knowledge.”

R-5: “Well I liked the information, but the gift card too.”

R-6: “Probably lunch.” (laughter).

R-4: “I know that’s right.”

R-5: “Oh yeah, some people come for the lunch and the water.”

AB: That’s fair!

R-5: “The truth is the light.”

R-5 “Amen.”

AB: Now the last question, be honest, has your electricity conservation knowledge improved?

R-1: “Mine has improved.”

R-2: “Absolutely”!

R-3: “Yes”

R-4: “I tried to, but I babysit kids.”

R-5: “I know mine has improved.”

R-6: “Yes, definitely.”

AB: Is there anything else you’d like to add?

R-4: “Oh, and I wanted to tell you, I used them [sic] plugs you told us about, uh power strips.”

R-4: “I babysit my niece and nephew, they’re two and three.”

R-2: “There is something and it’s right here but it’s not coming.”

R-2: “Well what I would like to see is, I mean, first of all I know a lot of the people that came even though it was informational and really good for us to learn it, I’d like more people to apply it to their lives. And I would like to find a solution for that. And then maybe a solution to get more people to come.”

R-4: “Good luck”!

AB: Well, I spoke with Service Coordinator before I talked to you guys. What do you think about making it mandatory?

R-3: “Yep”

R-2: “I think it would be fantastic.”

R-1: “I would come.”

R-5: “Whew, I would love that.”

R-4: “That would be great, could I bring the kids I’m babysitting”?

R-6: “Oh yeah”!

R-2: “I think that makes wonderful sense, making it mandatory. The only thing is what would be the consequences if you didn’t come?