EEB HUB Energy Efficient Buildings Hub

REPORT

Budget Period 2
SubTask 6.4
Deliverable 32 Report

January 2013

6.4 Subtask 6.4: Building Occupants and Energy Efficiency.

SOPO Deliverable #32: Social media and Serious Games behavior intervention

Serious games are game-like simulations of real-world activities and events used to train or educate users. While entertainment can be a useful side-product, the object in this study is to use user engagement in games to bring about behavior change. Energy saving *Serious games* interventions make no changes to building fabric but achieve energy saving through educating and changing behavior through emotional attachment and rewards. Concurrent measurement of occupant behavior examines impacts on well-being and productivity alongside energy-saving behavior.

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Deliverable and Status:

Sub-Task	Deliverable #	BP2 Deliverable	% Complete
6.4	32	Report assessing the impact of social networking and serious games among building occupants on energy efficiency, including deployment of the Energy Chickens game	100%

Behavioral Intervention "Energy Chickens": A Serious Game to Reduce Plug Load Energy Usage.

Background

Social Media

Virtual Pet games have been effective in changing behavior in fields such as medicine and commerce through the engagement and commitment that emerges from the social bonds between players and their "pets." The Energy Chickens Internet-based game developed in this project depicted chicken pets that responded to energy use detected via plug load monitors deployed in the workplace. Data management tools captured the energy use data that was streamed via cell modems or the Internet so that the game provided feedback to occupants by assigning healthy chickens to energy savers and declining chickens to energy over-users. Game embellishments deployed over an extended time period in the main study sites sought to reinforce and embed energy-saving behavior.

Methods

Study Participants

Pilot Studies

Preliminary work included two pilot studies conducted in two buildings on University Park campus at the Pennsylvania State University. Each of the two pilot studies included approximately 10 participants.

Primary Study

The main study was conducted at the Princeton Plasma Physics Laboratory (PPPL) in Princeton NJ. The study at PPPL was implemented in two phases. The first phase consisted of plug load monitoring followed by the Energy Chickens game phase.

The plug load outlet sensor monitoring phase originally consented 69 occupants of the Lyman Spitzer and Modular 6 buildings at PPPL. Of the 69 participants in the outlet sensor phase, 8 people were assigned to the CMU dashboard study and the remaining participants were subsequently recruited for the Behavioral Intervention "Energy Chickens". Of those, 42 participants completed the Behavioral Intervention "Energy Chickens".

Plug Load Measurement

Energy consumption data were collected from approximately 5 outlet sensors in each of the 69 participant offices (Figure 1). The first month of data collection served as a baseline period prior to the start of the Energy Chickens game. Energy consumption data were collected during the Energy Chickens game for approximately 12 weeks. Data collection is scheduled to continue through mid-March, 2013 and will serve as a post-game period to determine the persistence of energy saving behaviors.

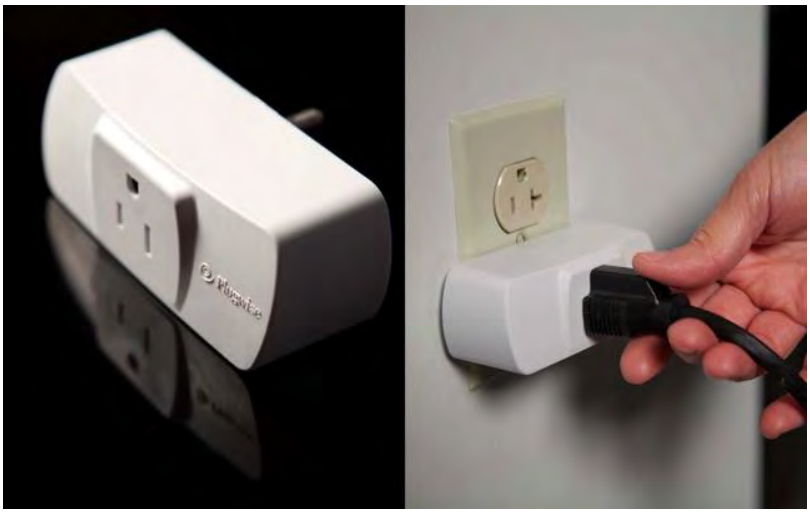

Figure 1: Plugwise outlet sensors used for plug load monitoring.

Up to five appliances in each office were connected to Plugwise outlet sensors with a final deployment of 374 sensors. Devices ranged from desktop computers to pencil sharpeners, phone chargers and foot warmers. Each Plugwise device sends energy data wirelessly and is collected by a central computer (Figure 2). This computer collects the information through a Plugwise USB stick. The information is collected by Plugwise software. Another program running on the same computer, updating every 4 seconds, extracts the data from the Plugwise program and uploads that information onto a MySQL database running on a Penn State server. That database can be queried through a custom built API (interface) where by database requests for energy use information are created via a web interface. Daily comparisons of past and current energy usage provide the raw data for the Energy Chickens game.

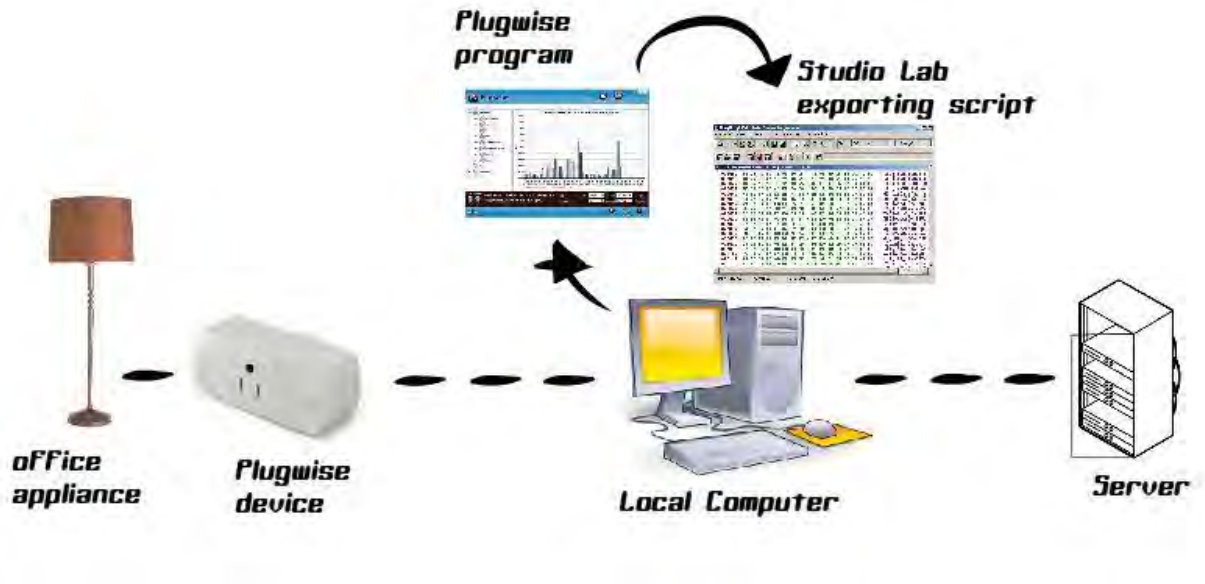

Figure 2: Schematic of Energy Chickens hardware and software interface.

Penn State Occupant Assessments

Occupant assessments were made during baseline, throughout the Behavioral Intervention "Energy Chickens" and during a follow-up period. Valid and reliable measures of worker well-being and productivity drawn from the health sciences and business literatures are employed in the assessment protocol and integrated with daily surveys to address day-to-day and within-day variations. The use of standardized, peer-evaluated and field-validated instruments relieves EEB researchers of the necessity to perform such quality checks on the instruments in use. Importantly, this strategy also enables EEB findings to be readily compared with the outcomes of other studies.

Assessments included traditional pre- and post- intervention surveys administered online that took about 10-15 minutes to complete (Appendix 1 and 2) as well as Ecological Momentary Assessments (EMAs) that are brief cell-phone surveys given two times per day, that capture occupant responses, in real-time in the workplace, with minimal intrusion (Figure 3). EEB leads in breaking ground with new assessment approaches and is a source of training for others embarking on similar studies.

The daily surveys were administered during a one week baseline period and for additional one week periods throughout the three month Energy Chickens game. A final week of daily surveys will be administered during a three month post follow-up period. See "Appendix 3: PSU Outlet Sensor Participant Study Guide" and "Appendix 4: PSU Energy Chickens Participant Study Guide" for details about daily surveys.

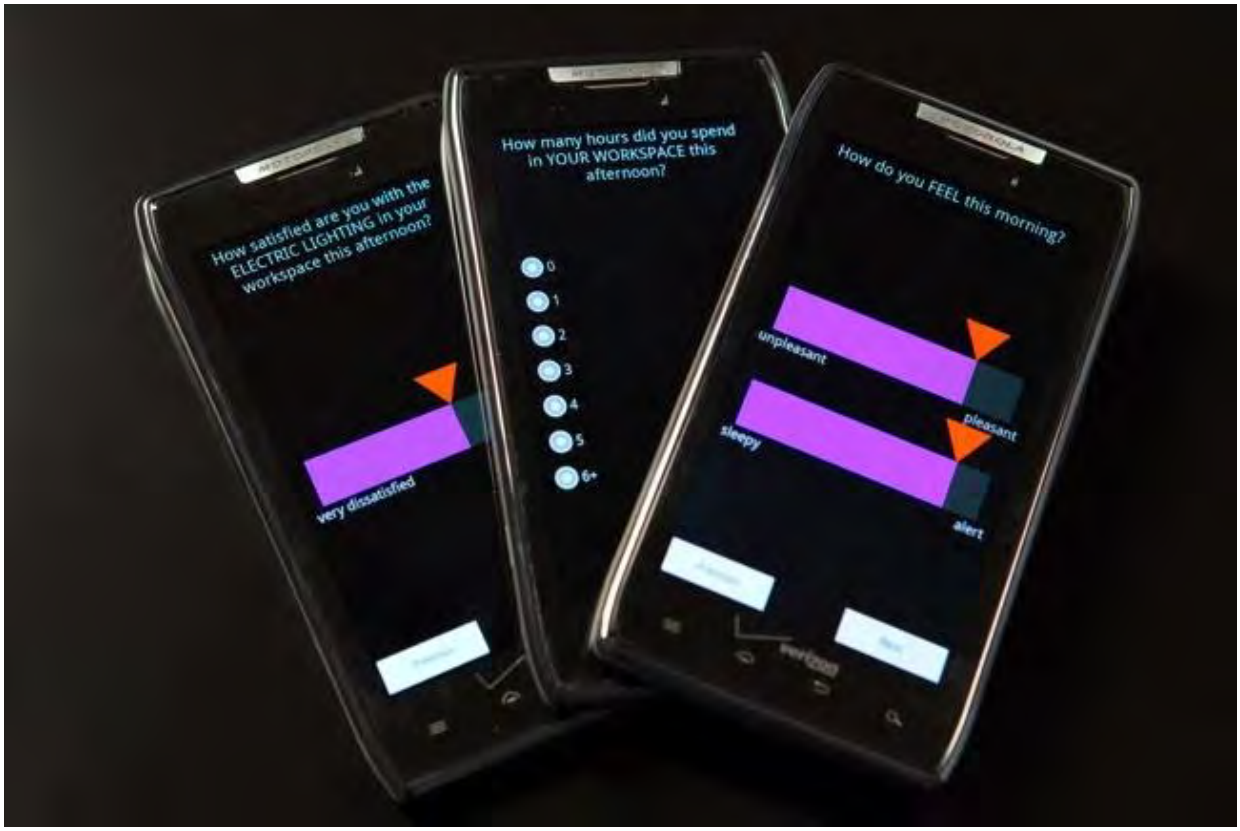

Figure 3: Ecological Momentary Assessments via smart phone daily surveys.

Penn State Behavioral Intervention (Energy Chickens)

The Energy Chickens game was designed to reduce plug load energy consumption using a serious game interface to engage, educate, and change the energy use behavior of building occupants.

The Energy Chickens game works as a virtual pet/game that references a participant's actual energy consumption habits. Participants were assigned a flock of chickens under their care. Each chicken represents an appliance or piece of equipment in their office. Energy usage data is collected through energy sensors and accessed by the game through an online server. The initial data collection period was used by the game as a baseline reference. Throughout the duration of the game participants were encouraged to save energy by turning off their appliances and equipment when not in use. Energy usage during the game was compared to

baseline. If a participant reduced their energy consumption for a specific device that chicken would begin to grow larger, laying more and more eggs that could be collected and traded for accessories on their farm. If energy consumption increased compared to baseline chickens would become sick and would not lay eggs (Figure 4).

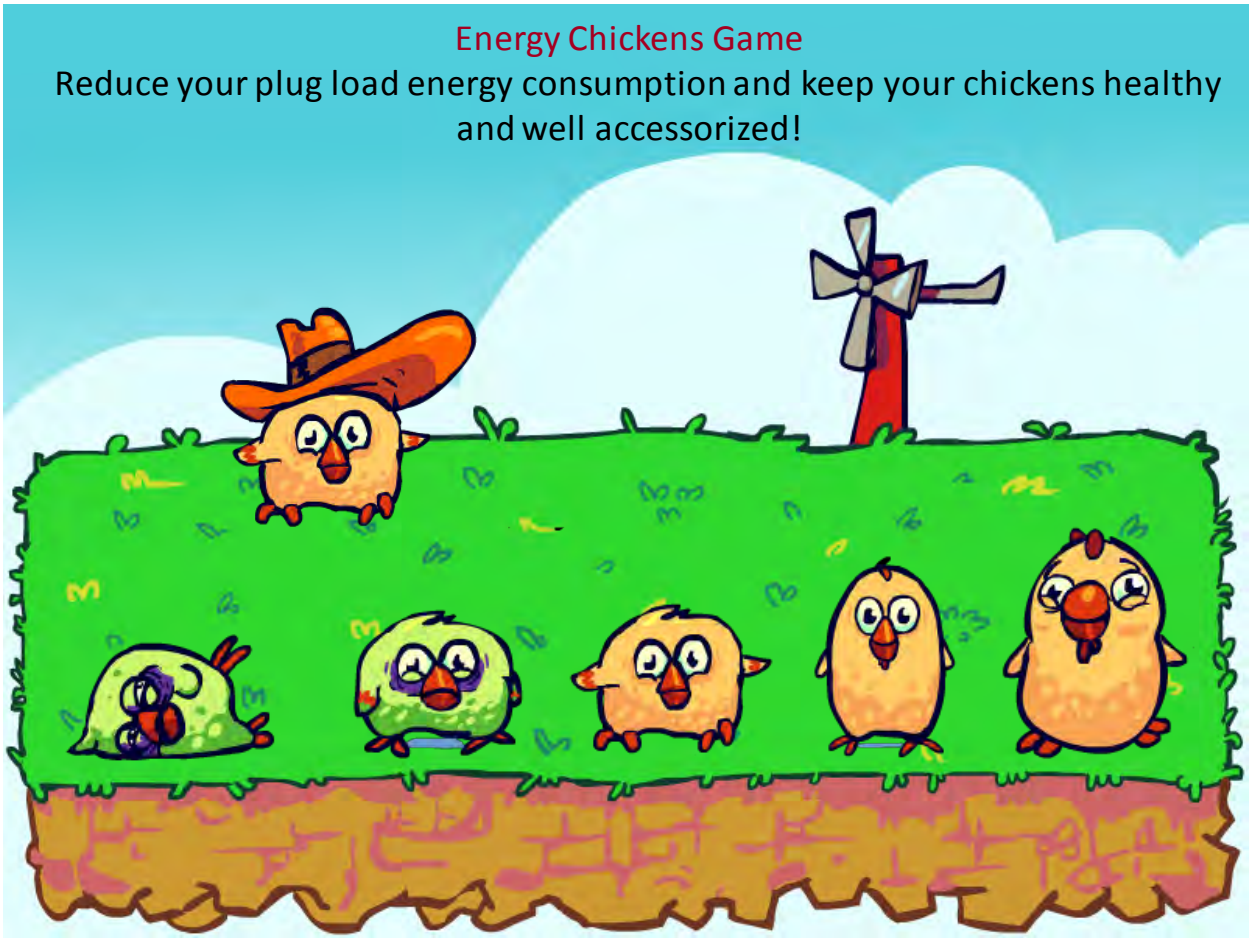

Figure 4: Energy Chickens barn yard.

At the time of deployment, we introduced participants of the Outlet Sensor study to the Energy Chickens game (see Appendix 5: PSU-Energy Chickens Game User's Manual).

The behavioral intervention includes occupant engagement in the serious game "Energy Chickens" as well as an awareness campaign that includes Energy Chickens stickers, an Energy Chickens pledge to reduce energy consumption as well as a series of posters aimed at reducing plug load energy consumption (Appendix 6: PSU-Plug Load Energy Conservation

Awareness Campaign). The poster series includes 12 customized posters that were developed by the Penn State team to increase awareness of plug load energy consumption and phantom (vampire) loads, and a campaign to encourage occupants to "turn it off". The posters were rotated weekly to keep the message fresh and to increase occupant engagement.

Penn State Energy Chickens Game Results

Pilot Studies

Preliminary outcomes from the Energy Chickens game based on the pilot work on the University Park campus suggested that 20-60% energy savings across users was attainable (Figure 5-6).

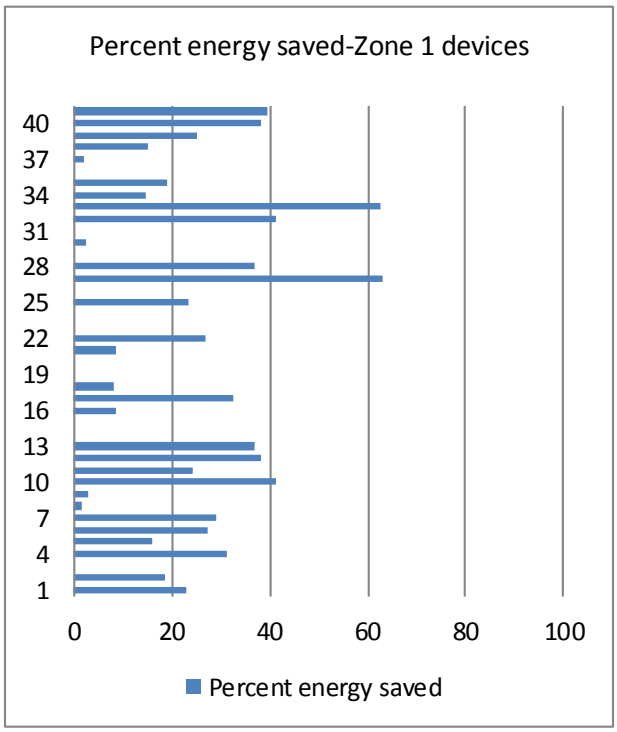

Figure 5

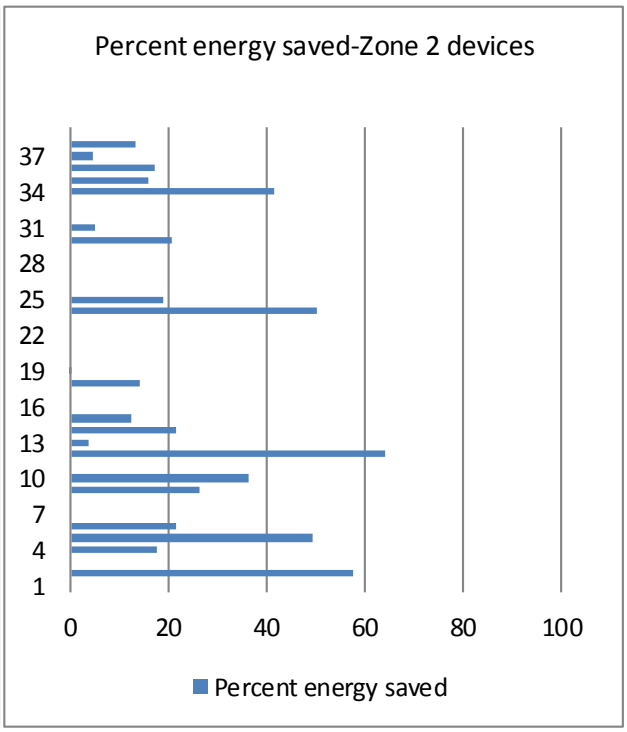

Figure 6

The purpose of the pilot study was to shake-down the operational challenges before the full study was deployed. Zeroes in the charts above represent missing data--this pilot study uncovered numerous challenges both on the technical and human sides of the project. On the

technical side, variations in the distances traveled by radio frequency (RF) signals collecting data from the plugload devices presented challenges in the placement and effectiveness of equipment. This problem was compounded by the unreliability of cell phone service that led to data being dropped or delayed when the cell modems used to communicate data back to our servers lost signal. Finally, hardware or software challenges on the small form-factor Windows servers deployed at field locations led to failures of those devices to maintain a reliable data stream.

On the human side, the challenge of establishing baseline energy usage against which to measure improvements is daunting in offices where peoples' jobs take them away from their office frequently, they take vacations or they move from one workspace to another. The data reported above (Figures 5, 6) attempt to adjust for those variations that naturally occurred in the course of our pilot study.

The contrast between "adjusted" and "high average" reporting of data is illustrated in Figure 7. "High average" reflects the best daily low use of any device whereas "adjusted" indicates that known interruptions by travel and sickness etc. are taken into account. The savings we have reported are based on the more conservative "adjusted" numbers, although for this pilot study we don't really know how conservative those numbers are. If turning off a device each evening or before a vacation is a new energy-saving behavior, then the savings achievable may indeed approach the high numbers seen in the left chart.

At the time of the pilot study we had not developed a metric to capture a summary of by-individual energy use that takes into account the different energy demands of appliances. The data reported in Figure 8, then, are no more than an indication that there is potential to save that is in the hands of individuals—and, more importantly, that all are participating.

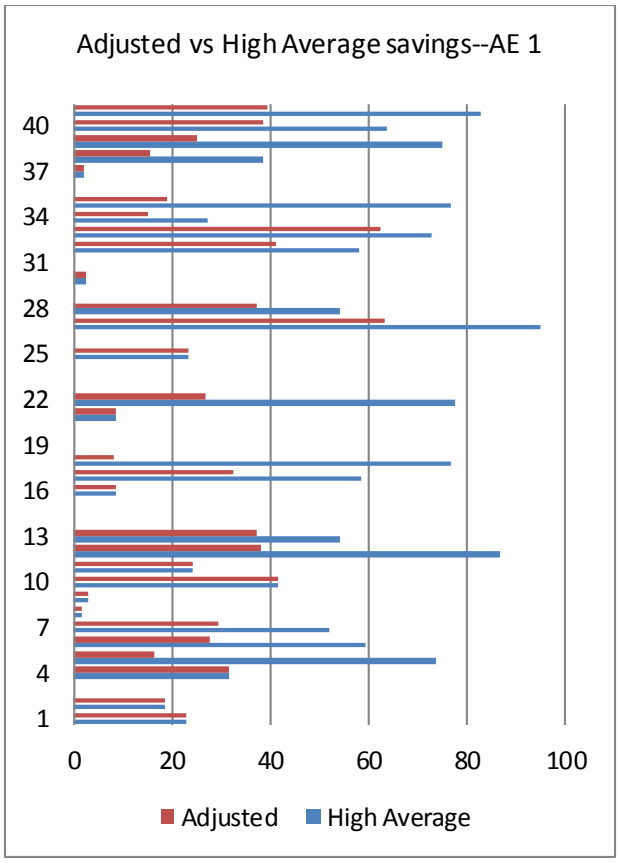

Figure 7

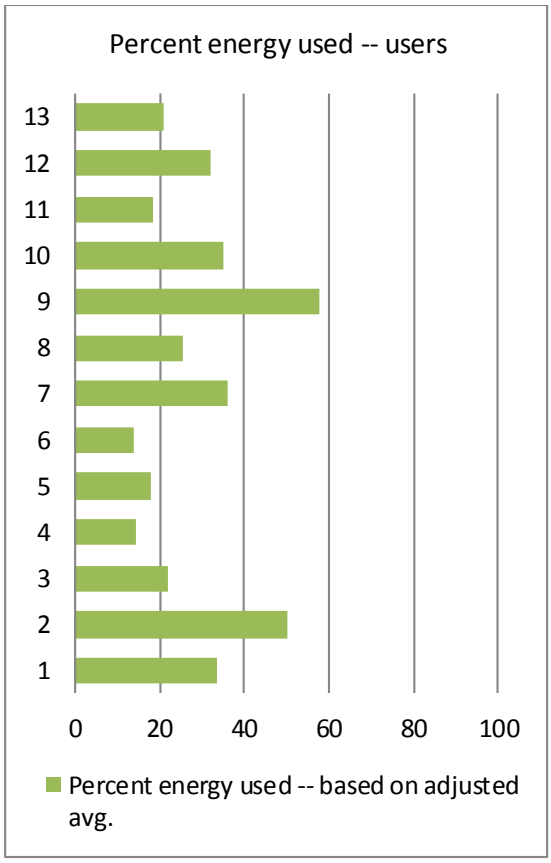

Figure 8

Primary Study Results

Overall Energy Saving

Overall comparisons were made between average daily energy usage during baseline and during the Behavioral Intervention "Energy Chickens". Participation in the Energy Chickens game resulted in a 21% reduction in average daily energy usage (Figure 9).

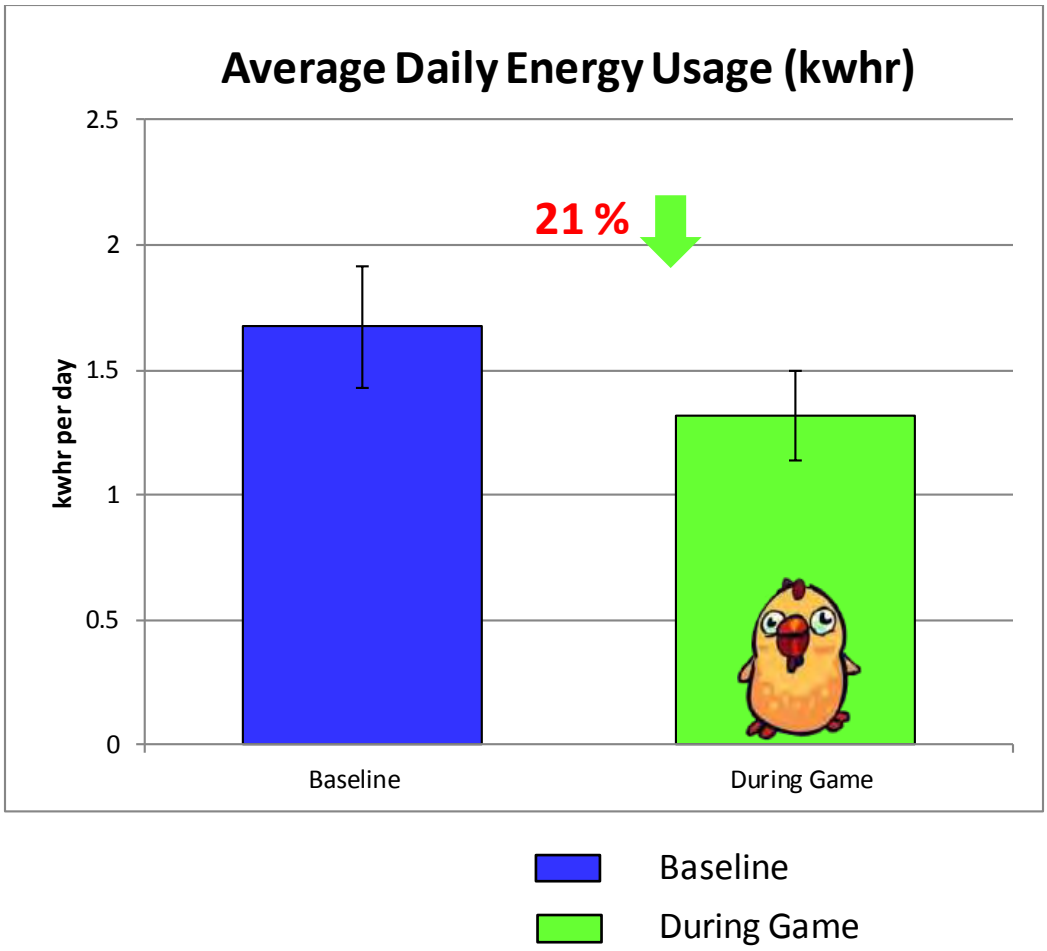

Figure 9: Average Daily Energy Usage.

Work Day vs Non-Work Day Energy Saving

Subsequent comparisons were made between baseline and Energy Chicken game days based on "work" and "non-work" days. Participation in the Energy Chickens game resulted in a 34% reduction in average daily energy usage on non-work days and a 15% reduction in average daily energy usage on work days (Figure 10).

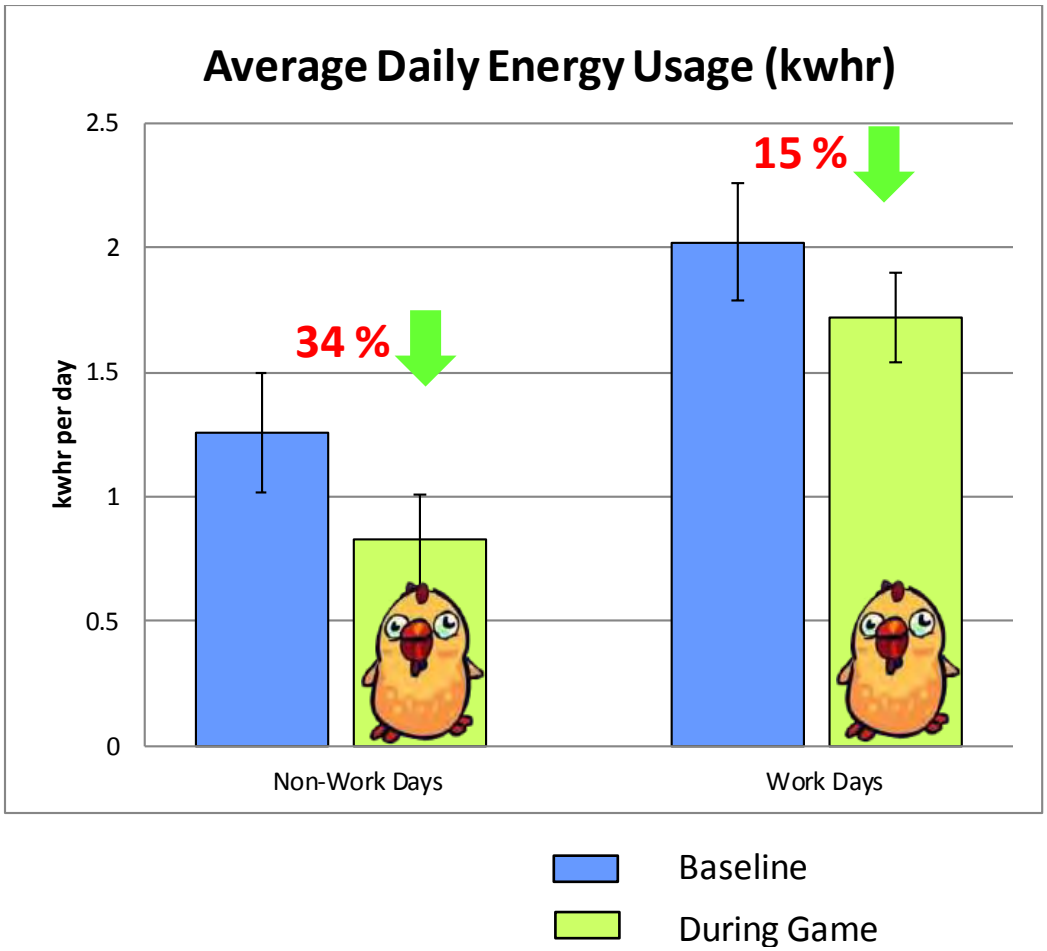

Figure 10: Average daily energy usage during non-work days and work days.

Participant Game Evaluation

Participants were asked to evaluate the Energy Chickens game at the conclusion of the behavioral intervention. Of those that responded, 69% of participants indicated that the game helped them be more energy conscious, 54% indicated that the game provided accurate information about their energy usage, 73% felt the game was easy to understand and 50% were satisfied with the game (Figure 11).

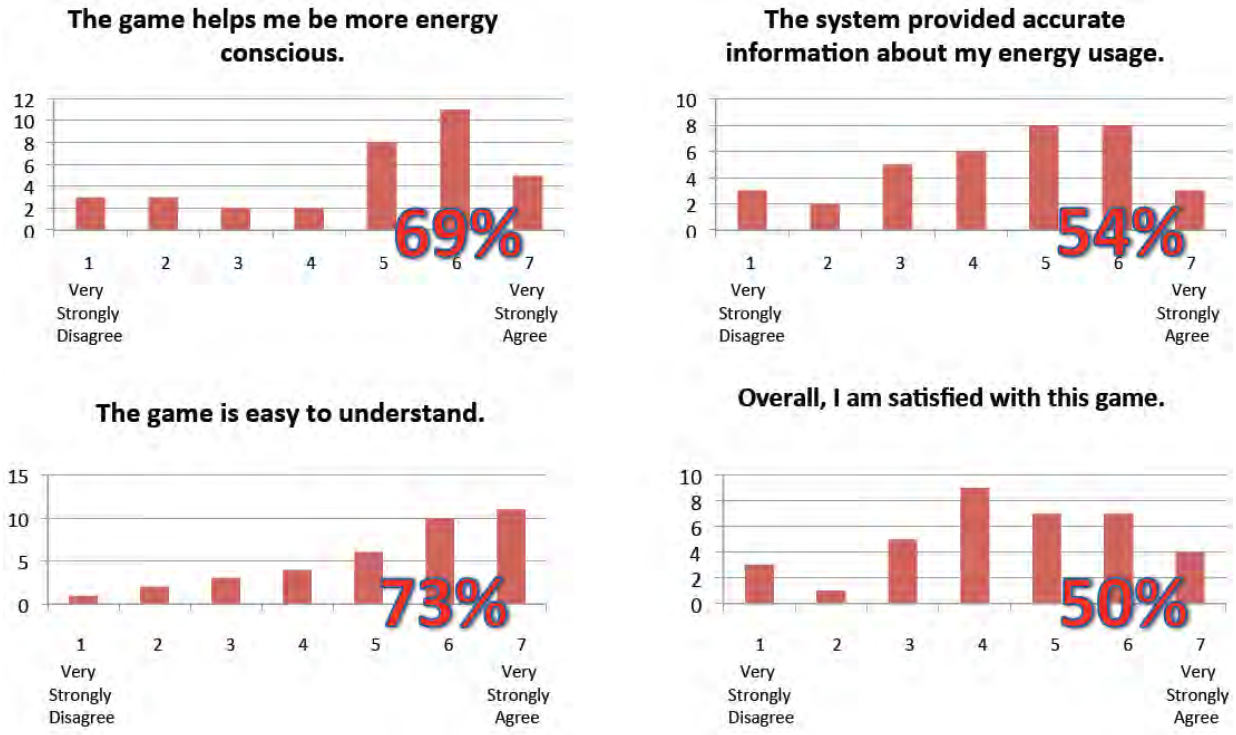

Figure 11: Energy Chickens game evaluation.

Open-ended questions were also used, to probe Likes, Dislikes and General Comments:

General comments:

"I am happy to have participated in the energy chicken game. Having to check on my chickens and take the surveys increased my awareness of my energy usage. This made me mindful to turn things off at the end of the day which I did not do before, but now I will continue to do."

"taking the daily survey could be bothersome when the cell phone rings and you are at the middle of something, but with some time management to superpose the time of the survey with light activity, this is not an issue. / / Due to roof work in our building at our level in the recent months, answers to questions involving the evaluation of noise have been affected (my office is very close to the working area). / / I have to confess that - in an effort to earn eggs - I have stopped connecting to my desktop from home at night and also stopped working during the weekend. The quality of my life and of my work have improved, since I now try to maximize the time I spend in the office and use to weekend to do work that does not require a computer, like reading scientific papers."

"I feel that once I got to a point that I could not turn off anything else to save electricity my chickens did not stay the same but would get sick. If I took a day off one week the next week my chickens would be sick because I used more energy when I was in the following week. This

does not make sense. When I am here I need to use my equipment and when I take time off that should be accounted for. Just a thought."

Likes:

- "influenced my thinking about energy saving"
- "made thinking about energy use fun"
- "a clever approach to changing behavior"
- "watching the chickens grow because I saved energy!!!"
- "Buying things for my yard with the savings!!!"
- "makes you aware of your energy use"
- "makes you think about ways to save energy"
- "Posters advertised were very helpful in learning how to save energy."
- "It did make me more conscious about turning things off when I was out of the office."
- "The surveys were quick and easy."
- "The phone alarm made it easy to remember to take the survey."
- "Dena and Zoe were always very helpful and prompt to answer all the questions I had!!"

Dislikes:

- "Chicken health changes often unexplained, went from a dead chicken to a healthy chicken in 1 day, I do not know why."
- "initial data for energy usage was determined in summer, game was played in fall when energy usage rises."
- "re-adjusts baseline every week - this is misleading after holidays or travel"
- "Many little glitches"
- "It seemed like there were a lot of problems with the game/phones, which makes me question the veracity of the results."
- "I wish the mountain view mode included some stats, and that we could see other mountains"
- "Did not report the correct usage"
- "kind of silly"
- "had no clear goal versus a benchmark such as levels of achievement or competition other than accumulating stuff and the stuff would require energy to make and maintain."
- "The game kept changing/messing up the scores."
- "The game kept getting harder and harder even though there are only so many ways one can save energy."

While there are a number of negative comments, they should be placed in context. The energy-use monitoring phase of this study, commencing in September 2012, inadvertently coincided with a time period when federal employees were taking accumulated vacation, providing significant challenges in establishing baseline usage. Then, as the Energy Chickens game was launched, hurricane Sandy brought substantial disruption to the lives of PPPL including

complete power shut-downs, forced absences by employees with damaged homes and excess use of chargers etc. in the work place while people had no electricity at home.

In addition, having clear records of peoples' energy use illuminated misunderstandings on the part of energy users. For example, substitution of a new computer monitor may not save energy if the new one is bigger and more powerful than the old.

Conclusions

Recent reports of energy use in high efficiency buildings indicates that as much as 50% of commercial office electricity use is consumed by plug load devices. That figure is likely to rise with the increasing use of computer-based devices, multiple displays and attendant peripherals on workstations. 20% saving against that figure without the necessity to invest in physical plant changes has clear advantage to business owners. Work to be conducted in BP 3 will address the persistence of energy-saving behaviors and energy savings.

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Appendices:

Appendix 1: PSU Pre-Intervention Online Survey

Appendix 2: PSU Post-Intervention Online Survey

Appendix 3: PSU Outlet Sensor Participant Study Guide

Appendix 4: PSU Energy Chickens Participant Study Guide

Appendix 5: PSU Energy Chickens Game User's Manual

Appendix 6: PSU Plug Load Energy Conservation Awareness Campaign

Appendix 7: PSU Serious Games for Energy Saving Presentation

Appendix 8: PPPL Newsletter Featuring Energy Chickens

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Energy Chickens (Pre-Intervention Survey)

Q1.1 Building Occupant Survey

To start this survey, please click on the "next" button at the bottom of the page.

This survey is being conducted by the Energy Efficient Buildings (EEB) Hub, a U.S. DOE Energy Innovation Hub led by Penn State University. This is a collaborative project with investigators from Penn State University, Carnegie Mellon University, the Polytechnic Institute of New York University, and the Princeton Plasma Physics Laboratory.

Purpose of the Study: The purpose of this study is to evaluate plug load energy monitoring sensors and to assess plug load electricity energy usage in commercial office buildings and the interplay between energy sensors and building occupant behavior and how the office environment affects individuals' productivity, mood and well-being.

Time: The length of time required to complete this survey is 10-15 minutes.

Confidentiality: The information collected in this survey will remain CONFIDENTIAL and will not be shared with your employer. Personally identifying information will be deleted immediately at the conclusion of the study and after compensation is delivered.

If you have any questions or concerns, feel free to contact the project coordinator:

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Q2.1 Background information (Work Related)

Q2.2 On a typical day, how much of your work day do you spend on the following activities? (enter percentages; your answers should total 100%)

_____ Computer work (1)
_____ Paper work (2)
_____ Telephone (3)
_____ In person contact (4)
_____ Other (5)

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q3.1 Background Information (Personal Workspace)

Q3.2 What type of lighting do you have in your workspace? (Please check all that apply)

- ❑ Overhead lighting flush with the ceiling (1)
- ❑ Overhead lighting suspended from the ceiling (2)
- ❑ Desk lamp with fixed arm (3)
- ❑ Desk lamp with adjustable arm (4)
- ❑ Floor lamp (5)
- ❑ Under-cabinet task light (6)
- ❑ Other (please specify) (7) _____

Q3.3 Does natural light from the sun or sky provide general lighting in your workspace?

- ❍ Yes (1)
- ❍ No (2)

Q4.1 Qualities of the Indoor Environment Lighting

Q4.2 How satisfied are you with the ELECTRIC LIGHTING in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q4.3 Indicate your agreement with the following statements. They refer to the TOTAL AMOUNT OF LIGHT, from all sources, including electric lights and daylight through windows:

	Very Strongly Disagree(1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree(7)
I am satisfied with the amount of light on my work surface. (1)	❍	❍	❍	❍	❍	❍	❍
I am satisfied with the amount of light for reading printed materials. (2)	❍	❍	❍	❍	❍	❍	❍
I am satisfied with the amount of light for computer work. (3)	❍	❍	❍	❍	❍	❍	❍

Q4.4 We would like to know more about your desired amount of lighting. On the scale below, where 100 is the maximum possible light to your workspace (all lights on full, shades open on a bright day) and 0 is complete darkness, please use the top arrow to indicate the amount of light you typically have at midday (noon) and the bottom arrow to indicate how much light you would like to have, at the same time of day.

_____ Amount of light you HAVE: (1)
_____ Amount of light you WANT: (2)

Answer If We would like to know more about your desired amount of l... Amount of light you HAVE: Is Empty Or We would like to know more about your desired amount of l... Amount of light you WANT: Is Empty

Q4.5 Do you want to leave this question without moving the slider?If No, please go back and answer the question.

- ❍ Yes (1)

Answer If Do you want to leave this question without moving the sli... Yes Is Selected

Q4.6 If you did not move the slider, please select from the following:

- ❍ I want to skip this question. (1)
- ❍ My answer choice is "50". (2)

Q4.7 Overall, the quality of lighting (electric lighting plus daylight, if applicable) in my workspace has a negative effect on my productivity.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Strongly Disagree:Very Strongly Agree (1)	❍	❍	❍	❍	❍	❍	❍

Q4.8 Daylighting

Q4.9 Overall, how satisfied are you with the daylighting in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q4.10 From where you sit in your workspace, how satisfied are you with the access to a view of outside?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q5.1 Lighting Glare (Electric Light and Daylight) Glare is unwanted light, either associated with a bright light source in your field of view or reflected glare that reduces the contrast of what you are trying to see.

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q5.2 Electric Lighting Glare Indicate your agreement with the following statements:

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The amount of DIRECT glare from the electric lighting is bothersome. (1)	❍	❍	❍	❍	❍	❍	❍
The amount of REFLECTED glare (such as on your computer screen or work surfaces) caused by the electric lighting is bothersome. (2)	❍	❍	❍	❍	❍	❍	❍

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q5.3 Daylight Glare Indicate your agreement with the following statements:

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The amount of DIRECT glare from the windows is bothersome. (1)	❍	❍	❍	❍	❍	❍	❍
The amount of REFLECTED glare (such as on your computer screen or work surfaces) from the windows is bothersome. (2)	❍	❍	❍	❍	❍	❍	❍

Q6.1 Lighting Controls (Electric Light and Daylight)

Q6.2 How satisfied are you with your ability to adjust each of the following features in your workspace?

	Very Dissatisfied (1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied (7)
Electric lighting (1)	❍	❍	❍	❍	❍	❍	❍
Daylighting (2)	❍	❍	❍	❍	❍	❍	❍

Q6.3 What do you do if the lighting (electric and daylight) in your workspace is a problem? (Check all that apply)

- ❑ Adjust window blinds or shades (1)
- ❑ Adjust computer monitor (2)
- ❑ Turn my overhead lighting on or off with a switch (3)
- ❑ Adjust the level of my overhead lighting with a dimmer (4)
- ❑ Turn on/off a free-standing desk (task) light (5)
- ❑ Turn on/off an under-cabinet (task) light (6)
- ❑ Turn on/off a floor lamp (7)
- ❑ Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace (8)
- ❑ Other (please specify) (9) _____
- ❑ There is nothing I can do (10)
- ❑ Not relevant - the lighting is never a problem (11)

Answer If What do you do if the lighting (electric and daylight) ... Adjust window blinds or shades Is Selected Or What do you do if the lighting (electric and daylight) ... Adjust computer monitor Is Selected Or What do you do if the lighting (electric and daylight) ... Turn my overhead lighting on or off with a switch Is Selected Or What do you do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off a free-standing desk (task) light Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off an under-cabinet (task) light Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off a floor lamp Is Selected Or What do you do if the lighting (electric and daylight) ... Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace Is Selected Or What do you do if the lighting (electric and daylight) ... Other (please specify) Is Selected

Q6.4 To improve the lighting in your workspace, how often do you...

	Hourly (1)	Daily (2)	Weekly (3)	Monthly (4)	A few times a year (5)
If What do you do if the lighting (electric and daylight) ... Adjust window blinds or shades Is Selected Adjust window blinds or shades (1)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Adjust computer monitor Is Selected Adjust computer monitor (2)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn my overhead lighting on or off with a switch Is Selected Turn my overhead lighting on or off with a switch (3)	❍	❍	❍	❍	❍
If What do you	❍	❍	❍	❍	❍

do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected Adjust the level of my overhead lighting with a dimmer (4)					
If What do you do if the lighting (electric and daylight) ... Turn on/off a free-standing desk (task) light Is Selected Turn on/off a free-standing desk (task) light (5)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn on/off an under-cabinet (task) light Is Selected Turn on/off an under-cabinet (task) light (6)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn on/off a floor lamp Is Selected Turn on/off a floor lamp (7)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Notify management (my supervisor, main office or facilities dept.)	❍	❍	❍	❍	❍

to adjust the lighting in your workspace Is Selected Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace (8) If What do you do if the lighting (electric and daylight) ... Other (please specify) Is Selected Other (please specify) (9)	❍	❍	❍	❍	❍

Answer If What do you do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected

Q6.5 Does the dimmer control the overhead light in your workspace only?

- ❍ Yes (1)
- ❍ No, it also controls overhead light in other occupants' workspace (2)

Q6.6 If you are able to control the dimmer, how do you use it to adjust the light level of the overhead light?

- ❍ I do not have a dimmer. (1)
- ❍ I do not use the dimmer. (2)
- ❍ I do not have control over the dimmer. (3)
- ❍ I set the dimmer at the highest level at the beginning of the day. (4)
- ❍ I set the dimmer at a lower level at the beginning of the day and do not change it again. (5)
- ❍ I change the dimmer level throughout the day. (6)
- ❍ I set it occasionally and then leave it alone for days or weeks. (7)

Answer If If you are able to control the dimmer, how do you use it ... I do not have a dimmer. Is Not Selected Or If you are able to control the dimmer, how do you use it ... I do not use the dimmer. Is Not Selected

Q6.7 How do you like the dimmer level for the overhead light?

- ❍ The highest level is still too dim for me. (1)
- ❍ The highest level is the appropriate light level for me. (2)
- ❍ A lower level is the appropriate light level for me. (3)

Q6.8 Where on this scale would you like the dimmer on the overhead light(s) to be set, if 100 is the highest level and 0 is off?

_____ Dimmer Setting: (1)

Answer If Where on this scale would you like the dimmer on the over... Dimmer Setting: Is Displayed And Where on this scale would you like the dimmer on the over... Dimmer Setting: Is Empty

Q6.9 Do you want to leave this question without moving the slider?If no, please go back and answer the question.

- ❍ Yes (1)

Answer If Do you want to leave this question without moving the sli... Yes Is Selected

Q6.10 If you did not move the slider, please select from the following:

- ❍ I want to skip this question. (1)
- ❍ My answer choice is "50". (2)

Q6.11 How much do you Agree or Disagree with the following statements?

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)	N/A (-999)
It is easy to figure out how the lighting systems work here in order to adjust them. (1)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to figure out how the window & shade systems work here in order to adjust them. (2)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to figure out how the occupancy sensors work. (3)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to find ways to override or adjust the occupancy sensors. (4)	❍	❍	❍	❍	❍	❍	❍	❍

Q7.1 Air Quality

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q7.2 How satisfied are you with the following attributes related to environmental quality of your workspace?

	Very Dissatisfied(1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied (7)
Air movement (1)	❍	❍	❍	❍	❍	❍	❍
Air freshness (odors, staleness) (2)	❍	❍	❍	❍	❍	❍	❍
Humidity (too wet or too dry) (3)	❍	❍	❍	❍	❍	❍	❍

Q7.3 How satisfied are you with the overall AIR QUALITY (e.g., movement, humidity, freshness) in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q7.4 How satisfied are you with your ability to adjust the air quality (air flow, freshness) in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q8.1 Temperature

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q8.2 How satisfied are you with the following attributes of your workspace?

	Very Dissatisfied(1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied(7)
Heating (1)	❍	❍	❍	❍	❍	❍	❍
Cooling (2)	❍	❍	❍	❍	❍	❍	❍

Q8.3 How frequently do you experience the following environmental conditions in your workspace?

	Daily (1)	1-3 Days/week (2)	1-3 Days/month (3)	Almost never (4)
Temperature too hot (1)	❍	❍	❍	❍
Temperature too cold (2)	❍	❍	❍	❍

Q8.4 How satisfied are you with your ability to adjust the temperature in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q8.5 Which of the statements below best describes your situation? (check only 1)

- ❍ I have control of a thermostat that controls just my workspace. (1)
- ❍ I share control of a thermostat that controls my workspace as well as that of others. (2)
- ❍ The thermostat that controls my workspace is controlled others. (3)
- ❍ There is no thermostat that controls my workspace. (4)

Q8.6 If the temperature in your workspace is too hot or too cold, what do you usually do? (Check all that apply)

- ❑ Adjust thermostat (1)
- ❑ Adjust floor air vent (diffuser) (2)
- ❑ Adjust portable fan (3)
- ❑ Adjust room air conditioner unit (4)
- ❑ Adjust air vent in wall or ceiling (5)
- ❑ Adjust ceiling fan (6)
- ❑ Adjust permanent heater (7)
- ❑ Adjust portable heater (8)
- ❑ Open or close windows (9)
- ❑ Adjust window blinds or shades (10)
- ❑ Open or close door to interior space (11)
- ❑ Open or close door to exterior space (12)
- ❑ Dress in layers/adjust clothing (13)
- ❑ Notify management (my supervisor, main office or facilities dept.) (14)
- ❑ Other (please specify (15) _____
- ❑ There is nothing I can do (16)
- ❑ Not relevant - I never need to adjust temperatures (17)

Answer If If the temperature in your workspace is too hot or ... Adjust thermostat Is Selected Or If the temperature in your workspace is too hot or ... Adjust floor air vent (diffuser) Is Selected Or If the temperature in your workspace is too hot or ... Adjust portable fan Is Selected Or If the temperature in your workspace is too hot or ... Adjust room air conditioner unit Is Selected Or If the temperature in your workspace is too hot or ... Adjust air vent in wall or ceiling Is Selected Or If the temperature in your workspace is too hot or ... Adjust ceiling fan Is Selected Or If the temperature in your workspace is too hot or ... Adjust permanent heater Is Selected Or If the temperature in your workspace is too hot or ... Adjust portable heater Is Selected Or If the temperature in your workspace is too hot or ... Open or close windows Is Selected Or If the temperature in your workspace is too hot or ... Adjust window blinds or shades Is Selected Or If the temperature in your workspace is too hot or ... Open or close door to interior space Is Selected Or If the temperature in your workspace is too hot or ... Open or close door to exterior space Is Selected Or If the temperature in your workspace is too hot or ... Dress in layers/adjust clothing Is Selected Or If the temperature in your workspace is too hot or ... Notify management (my supervisor, main office or facilities dept.) Is Selected Or If the temperature in your workspace is too hot or ... Other (please specify Is Selected

Q8.7 To improve the temperature in your workspace, how often do you...

	Hourly (1)	Daily (2)	Weekly (3)	Monthly (4)	A few times a year (5)
If If the temperature in your workspace is too hot or ... Adjust thermostat Is Selected Adjust thermostat (1)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Adjust floor air vent (diffuser) Is Selected Adjust floor air vent (diffuser) (2)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Adjust portable fan Is Selected Adjust portable	❍	❍	❍	❍	❍

fan (3)					
If If the temperature in your workspace is too hot or ... Adjust room air conditioner unit Is Selected	❍	❍	❍	❍	❍
Adjust room air conditioner unit (4)					
If If the temperature in your workspace is too hot or ... Adjust air vent in wall or ceiling Is Selected	❍	❍	❍	❍	❍
Adjust air vent in wall or ceiling (5)					
If If the temperature in your workspace is too hot or ... Adjust ceiling fan Is Selected	❍	❍	❍	❍	❍
Adjust ceiling fan (6)					
If If the temperature in your workspace is too hot or ... Adjust permanent heater Is Selected	❍	❍	❍	❍	❍
Adjust permanent heater (7)					
If If the temperature in your workspace is too hot or ... Adjust portable heater Is Selected	❍	❍	❍	❍	❍
Adjust portable heater (8)					
If If the	❍	❍	❍	❍	❍

temperature in your workspace is too hot or ... Open or close windows Is Selected Open or close windows (9)					
If If the temperature in your workspace is too hot or ... Adjust window blinds or shades Is Selected Adjust window blinds or shades (10)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Open or close door to interior space Is Selected Open or close door to interior space (11)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Open or close door to exterior space Is Selected Open or close door to exterior space (12)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Dress in layers/adjust clothing Is Selected Dress in layers/adjust clothing (13)	❍	❍	❍	❍	❍

If If the temperature in your workspace is too hot or ... Notify management (my supervisor, main office or facilities dept.) Is Selected Notify management (my supervisor, main office or facilities dept.) (14)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Other (please specify Is Selected Other (please specify) (15)	❍	❍	❍	❍	❍

Q8.8 How much do you Agree or Disagree with the following statement?

	Very Strongly Disagree(1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree(7)	N/A (-999)
It is easy to figure out how the heating, cooling and ventilation systems work here in order to adjust them. (1)	❍	❍	❍	❍	❍	❍	❍	❍

Q9.1 Taking all things into consideration, how satisfied are you with the indoor environment in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q9.2 How satisfied are you with the building overall?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q9.3 If you have any additional comments on how workspace and building features affect your work, please type in the text box below.

Q10.1 Work Performance

Q10.2 About how many hours altogether did you work at this job in the last full 7-day calendar week?

Number of hours: (1)

Q10.3 How many hours does your manager expect you to work in a typical 7-day calendar week? (If it varies, estimate the average)

Number of hours: (1)

Q10.4 On a scale of 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate the usual performance of most workers in a job similar to yours?

- ❍ Worst Performance 0 (0)
- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ Top Performance 10 (10)

Q10.5 Using the same 0 to 10 scale, how would you rate your overall performance on the days you worked during the past 4 weeks?

- ❍ Worst Performance 0 (0)
- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ Top Performance 10 (10)

Q10.6 How satisfied are you with the effect of the environmental conditions (such as lighting and temperature) on your overall work performance?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Appendix 1: PSU Pre-Intervention Online Survey (Deliverable 32)

Q11.1 Please rate the following statements in terms of how well they describe how you feel.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
In general, I am satisfied with my job. (1)	❍	❍	❍	❍	❍	❍	❍

Q12.1 Resource Conservation in Buildings

Q12.2 Please indicate how much you agree or disagree with the following statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
I feel it is very important for me to save energy. (1)	❍	❍	❍	❍	❍	❍	❍

Q13.1 How satisfied are you with your current energy usage in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q13.2 How often have you engaged in energy saving actions in the last 3 months (e.g. turning off your computer, monitor, task light,or other appliances and/or equipment in your office when they were not needed)?

- ❍ Never (1)
- ❍ Less than Once a Month (2)
- ❍ Once a Month (3)
- ❍ 2-3 Times a Month (4)
- ❍ Once a Week (5)
- ❍ 2-3 Times a Week (6)
- ❍ Daily (7)

Q14.1 Background Information (Personal)

The following questions are about you. The answers to these questions will help us to further understand who our respondents are. Your responses to these and all questions will be held completely confidential. If you are uncomfortable about answering any of these questions please feel free to refrain from answering.

Q14.2 What is your sex?

- ❍ Female (1)
- ❍ Male (2)

Q14.3 What is your age?

Q14.4 Which of these categories represents your race/ethnic background? (Mark all that apply to you)

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Hispanic, Latino (5)
- ☐ Other (6)
- ☐ I do not wish to share (-999)

Q15.1 End of Survey

If you are satisfied with your responses to the survey please click on the "Submit" button below.

Please note that you will not be able to return to the survey once you click on "Submit".

We really appreciate the time and effort you spent in answering this questionnaire.

Thank you!!

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Energy Chickens (Post-Intervention Survey)

Q1.1 Building Occupant Survey (Post-Energy Chickens Game)

To start this survey, please click on the "next" button at the bottom of the page.

This survey is being conducted by the Energy Efficient Buildings (EEB) Hub, a U.S. DOE Energy Innovation Hub led by Penn State University. This is a collaborative project with investigators from Penn State University, Carnegie Mellon University, the Polytechnic Institute of New York University, and the Princeton Plasma Physics Laboratory.

Purpose of the Study: The purpose of this study is to evaluate plug load energy monitoring sensors and to assess plug load electricity energy usage in commercial office buildings and the interplay between energy sensors and building occupant behavior and how the office environment affects individuals' productivity, mood and well-being.

Time: The length of time required to complete this survey is 10-15 minutes.

Confidentiality: The information collected in this survey will remain CONFIDENTIAL and will not be shared with your employer. Personally identifying information will be deleted immediately at the conclusion of the study and after compensation is delivered.

If you have any questions or concerns, feel free to contact the project coordinator:

Dena Lang
105B Stuckeman Building
Landscape Architecture
Pennsylvania State University
University Park, PA 16802
(814) 865-5732
EMAIL: DenaLang@psu.edu

Q2.1 Qualities of the Indoor Environment Lighting

Q2.2 How satisfied are you with the ELECTRIC LIGHTING in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q2.3 Indicate your agreement with the following statements. They refer to the TOTAL AMOUNT OF LIGHT, from all sources, including electric lights and daylight through windows:

	Very Strongly Disagree(1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree(7)
I am satisfied with the amount of light on my work surface. (1)	❍	❍	❍	❍	❍	❍	❍
I am satisfied with the amount of light for reading printed materials. (2)	❍	❍	❍	❍	❍	❍	❍
I am satisfied with the amount of light for computer work. (3)	❍	❍	❍	❍	❍	❍	❍

Q2.4 We would like to know more about your desired amount of lighting. On the scale below, where 100 is the maximum possible light to your workspace (all lights on full, shades open on a bright day) and 0 is complete darkness, please use the top arrow to indicate the amount of light you typically have at midday (noon) and the bottom arrow to indicate how much light you would like to have, at the same time of day.

_____ Amount of light you HAVE: (1)
_____ Amount of light you WANT: (2)

Answer If We would like to know more about your desired amount of l... Amount of light you HAVE: Is Empty Or We would like to know more about your desired amount of l... Amount of light you WANT: Is Empty

Q2.5 Do you want to leave this question without moving the slider?If No, please go back and answer the question.

- ❍ Yes (1)

Answer If Do you want to leave this question without moving the sli... Yes Is Selected

Q2.6 If you did not move the slider, please select from the following:

- ❍ I want to skip this question. (1)
- ❍ My answer choice is "50". (2)

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q2.7 Overall, the quality of lighting (electric lighting plus daylight, if applicable) in my workspace has a negative effect on my productivity.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Strongly Disagree:Very Strongly Agree (1)	❍	❍	❍	❍	❍	❍	❍

Q2.8 Daylighting

Q2.9 Overall, how satisfied are you with the daylighting in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q2.10 From where you sit in your workspace, how satisfied are you with the access to a view of outside?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q3.1 Lighting Glare (Electric Light and Daylight) Glare is unwanted light, either associated with a bright light source in your field of view or reflected glare that reduces the contrast of what you are trying to see.

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q3.2 Electric Lighting Glare Indicate your agreement with the following statements:

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The amount of DIRECT glare from the electric lighting is bothersome. (1)	❍	❍	❍	❍	❍	❍	❍
The amount of REFLECTED glare (such as on your computer screen or work surfaces) caused by the electric lighting is bothersome. (2)	❍	❍	❍	❍	❍	❍	❍

Q3.3 Daylight Glare Indicate your agreement with the following statements:

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The amount of DIRECT glare from the windows is bothersome. (1)	❍	❍	❍	❍	❍	❍	❍
The amount of REFLECTED glare (such as on your computer screen or work surfaces) from the windows is bothersome. (2)	❍	❍	❍	❍	❍	❍	❍

Q4.1 Lighting Controls (Electric Light and Daylight)

Q4.2 How satisfied are you with your ability to adjust each of the following features in your workspace?

	Very Dissatisfied (1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied (7)
Electric lighting (1)	❍	❍	❍	❍	❍	❍	❍
Daylighting (2)	❍	❍	❍	❍	❍	❍	❍

Q4.3 What do you do if the lighting (electric and daylight) in your workspace is a problem? (Check all that apply)

- ❑ Adjust window blinds or shades (1)
- ❑ Adjust computer monitor (2)
- ❑ Turn my overhead lighting on or off with a switch (3)
- ❑ Adjust the level of my overhead lighting with a dimmer (4)
- ❑ Turn on/off a free-standing desk (task) light (5)
- ❑ Turn on/off an under-cabinet (task) light (6)
- ❑ Turn on/off a floor lamp (7)
- ❑ Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace (8)
- ❑ Other (please specify) (9) _____
- ❑ There is nothing I can do (10)
- ❑ Not relevant - the lighting is never a problem (11)

Answer If What do you do if the lighting (electric and daylight) ... Adjust window blinds or shades Is Selected Or What do you do if the lighting (electric and daylight) ... Adjust computer monitor Is Selected Or What do you do if the lighting (electric and daylight) ... Turn my overhead lighting on or off with a switch Is Selected Or What do you do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off a free-standing desk (task) light Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off an under-cabinet (task) light Is Selected Or What do you do if the lighting (electric and daylight) ... Turn on/off a floor lamp Is Selected Or What do you do if the lighting (electric and daylight) ... Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace Is Selected Or What do you do if the lighting (electric and daylight) ... Other (please specify) Is Selected

Q4.4 To improve the lighting in your workspace, how often do you...

	Hourly (1)	Daily (2)	Weekly (3)	Monthly (4)	A few times a year (5)
If What do you do if the lighting (electric and daylight) ... Adjust window blinds or shades Is Selected					
Adjust window blinds or shades (1)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Adjust computer monitor Is Selected					
Adjust computer monitor (2)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn my overhead lighting on or off with a switch Is Selected					
Turn my overhead lighting on or off with a switch (3)	❍	❍	❍	❍	❍
If What do you					

do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected Adjust the level of my overhead lighting with a dimmer (4)					
If What do you do if the lighting (electric and daylight) ... Turn on/off a free-standing desk (task) light Is Selected Turn on/off a free-standing desk (task) light (5)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn on/off an under-cabinet (task) light Is Selected Turn on/off an under-cabinet (task) light (6)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Turn on/off a floor lamp Is Selected Turn on/off a floor lamp (7)	❍	❍	❍	❍	❍
If What do you do if the lighting (electric and daylight) ... Notify management (my supervisor, main office or facilities dept.)	❍	❍	❍	❍	❍

to adjust the lighting in your workspace Is Selected Notify management (my supervisor, main office or facilities dept.) to adjust the lighting in your workspace (8) If What do you do if the lighting (electric and daylight) ... Other (please specify) Is Selected Other (please specify) (9)	❍	❍	❍	❍	❍

Answer If What do you do if the lighting (electric and daylight) ... Adjust the level of my overhead lighting with a dimmer Is Selected

Q4.5 Does the dimmer control the overhead light in your workspace only?

- ❍ Yes (1)
- ❍ No, it also controls overhead light in other occupants' workspace (2)

Q4.6 If you are able to control the dimmer, how do you use it to adjust the light level of the overhead light?

- ❍ I do not have a dimmer. (1)
- ❍ I do not use the dimmer. (2)
- ❍ I do not have control over the dimmer. (3)
- ❍ I set the dimmer at the highest level at the beginning of the day. (4)
- ❍ I set the dimmer at a lower level at the beginning of the day and do not change it again. (5)
- ❍ I change the dimmer level throughout the day. (6)
- ❍ I set it occasionally and then leave it alone for days or weeks. (7)

Answer If If you are able to control the dimmer, how do you use it ... I do not have a dimmer. Is Not Selected And If you are able to control the dimmer, how do you use it ... I do not use the dimmer. Is Selected

Q4.7 How do you like the dimmer level for the overhead light?

- ❍ The highest level is still too dim for me. (1)
- ❍ The highest level is the appropriate light level for me. (2)
- ❍ A lower level is the appropriate light level for me. (3)

Q4.8 Where on this scale would you like the dimmer on the overhead light(s) to be set, if 100 is the highest level and 0 is off?

_____ Dimmer Setting: (1)

Answer If Where on this scale would you like the dimmer on the over... Dimmer Setting: Is Displayed And Where on this scale would you like the dimmer on the over... Dimmer Setting: Is Empty

Q4.9 Do you want to leave this question without moving the slider?If no, please go back and answer the question.

- ❍ Yes (1)

Answer If Do you want to leave this question without moving the sli... Yes Is Selected

Q4.10 If you did not move the slider, please select from the following:

- ❍ I want to skip this question. (1)
- ❍ My answer choice is "50". (2)

Q4.11 How much do you Agree or Disagree with the following statements?

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)	N/A (-999)
It is easy to figure out how the lighting systems work here in order to adjust them. (1)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to figure out how the window & shade systems work here in order to adjust them. (2)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to figure out how the occupancy sensors work. (3)	❍	❍	❍	❍	❍	❍	❍	❍
It is easy to find ways to override or adjust the occupancy sensors. (4)	❍	❍	❍	❍	❍	❍	❍	❍

Q5.1 Air Quality

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q5.2 How satisfied are you with the following attributes related to environmental quality of your workspace?

	Very Dissatisfied(1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied (7)
Air movement (1)	❍	❍	❍	❍	❍	❍	❍
Air freshness (odors, staleness) (2)	❍	❍	❍	❍	❍	❍	❍
Humidity (too wet or too dry) (3)	❍	❍	❍	❍	❍	❍	❍

Q5.3 How satisfied are you with the overall AIR QUALITY (e.g., movement, humidity, freshness) in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q5.4 How satisfied are you with your ability to adjust the air quality (air flow, freshness) in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q6.1 Temperature

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q6.2 How satisfied are you with the following attributes of your workspace?

	Very Dissatisfied(1)	(2)	(3)	(4)	(5)	(6)	Very Satisfied(7)
Heating (1)	❍	❍	❍	❍	❍	❍	❍
Cooling (2)	❍	❍	❍	❍	❍	❍	❍

Q6.3 How frequently do you experience the following environmental conditions in your workspace?

	Daily (1)	1-3 Days/week (2)	1-3 Days/month (3)	Almost never (4)
Temperature too hot (1)	❍	❍	❍	❍
Temperature too cold (2)	❍	❍	❍	❍

Q6.4 How satisfied are you with your ability to adjust the temperature in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q6.5 Which of the statements below best describes your situation? (check only 1)

- ❍ I have control of a thermostat that controls just my workspace. (1)
- ❍ I share control of a thermostat that controls my workspace as well as that of others. (2)
- ❍ The thermostat that controls my workspace is controlled others. (3)
- ❍ There is no thermostat that controls my workspace. (4)

Q6.6 If the temperature in your workspace is too hot or too cold, what do you usually do? (Check all that apply)

- ❑ Adjust thermostat (1)
- ❑ Adjust floor air vent (diffuser) (2)
- ❑ Adjust portable fan (3)
- ❑ Adjust room air conditioner unit (4)
- ❑ Adjust air vent in wall or ceiling (5)
- ❑ Adjust ceiling fan (6)
- ❑ Adjust permanent heater (7)
- ❑ Adjust portable heater (8)
- ❑ Open or close windows (9)
- ❑ Adjust window blinds or shades (10)
- ❑ Open or close door to interior space (11)
- ❑ Open or close door to exterior space (12)
- ❑ Dress in layers/adjust clothing (13)
- ❑ Notify management (my supervisor, main office or facilities dept.) (14)
- ❑ Other (please specify (15) _____
- ❑ There is nothing I can do (16)
- ❑ Not relevant - I never need to adjust temperatures (17)

Answer If If the temperature in your workspace is too hot or ... Adjust thermostat Is Selected Or If the temperature in your workspace is too hot or ... Adjust floor air vent (diffuser) Is Selected Or If the temperature in your workspace is too hot or ... Adjust portable fan Is Selected Or If the temperature in your workspace is too hot or ... Adjust room air conditioner unit Is Selected Or If the temperature in your workspace is too hot or ... Adjust air vent in wall or ceiling Is Selected Or If the temperature in your workspace is too hot or ... Adjust ceiling fan Is Selected Or If the temperature in your workspace is too hot or ... Adjust permanent heater Is Selected Or If the temperature in your workspace is too hot or ... Adjust portable heater Is Selected Or If the temperature in your workspace is too hot or ... Open or close windows Is Selected Or If the temperature in your workspace is too hot or ... Adjust window blinds or shades Is Selected Or If the temperature in your workspace is too hot or ... Open or close door to interior space Is Selected Or If the temperature in your workspace is too hot or ... Open or close door to exterior space Is Selected Or If the temperature in your workspace is too hot or ... Dress in layers/adjust clothing Is Selected Or If the temperature in your workspace is too hot or ... Notify management (my supervisor, main office or facilities dept.) Is Selected Or If the temperature in your workspace is too hot or ... Other (please specify Is Selected

Q6.7 To improve the temperature in your workspace, how often do you...

	Hourly (1)	Daily (2)	Weekly (3)	Monthly (4)	A few times a year (5)
If If the temperature in your workspace is too hot or ... Adjust thermostat Is Selected Adjust thermostat (1)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Adjust floor air vent (diffuser) Is Selected Adjust floor air vent (diffuser) (2)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Adjust portable fan Is Selected Adjust portable	❍	❍	❍	❍	❍

fan (3)					
If If the temperature in your workspace is too hot or ... Adjust room air conditioner unit Is Selected	❍	❍	❍	❍	❍
Adjust room air conditioner unit (4)					
If If the temperature in your workspace is too hot or ... Adjust air vent in wall or ceiling Is Selected	❍	❍	❍	❍	❍
Adjust air vent in wall or ceiling (5)					
If If the temperature in your workspace is too hot or ... Adjust ceiling fan Is Selected	❍	❍	❍	❍	❍
Adjust ceiling fan (6)					
If If the temperature in your workspace is too hot or ... Adjust permanent heater Is Selected	❍	❍	❍	❍	❍
Adjust permanent heater (7)					
If If the temperature in your workspace is too hot or ... Adjust portable heater Is Selected	❍	❍	❍	❍	❍
Adjust portable heater (8)					
If If the	❍	❍	❍	❍	❍

temperature in your workspace is too hot or ... Open or close windows Is Selected Open or close windows (9)					
If If the temperature in your workspace is too hot or ... Adjust window blinds or shades Is Selected Adjust window blinds or shades (10)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Open or close door to interior space Is Selected Open or close door to interior space (11)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Open or close door to exterior space Is Selected Open or close door to exterior space (12)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Dress in layers/adjust clothing Is Selected Dress in layers/adjust clothing (13)	❍	❍	❍	❍	❍

If If the temperature in your workspace is too hot or ... Notify management (my supervisor, main office or facilities dept.) Is Selected Notify management (my supervisor, main office or facilities dept.) (14)	❍	❍	❍	❍	❍
If If the temperature in your workspace is too hot or ... Other (please specify Is Selected Other (please specify) (15)	❍	❍	❍	❍	❍

Q6.8 How much do you Agree or Disagree with the following statement?

	Very Strongly Disagree(1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree(7)	N/A (-999)
It is easy to figure out how the heating, cooling and ventilation systems work here in order to adjust them. (1)	❍	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q7.1 Taking all things into consideration, how satisfied are you with the indoor environment in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q7.2 How satisfied are you with the building overall?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Q7.3 If you have any additional comments on how workspace and building features affect your work, please type in the text box below.

Q8.1 Work Performance

Q8.2 About how many hours altogether did you work at this job in the last full 7-day calendar week?

Number of hours: (1)

Q8.3 How many hours does your manager expect you to work in a typical 7-day calendar week? (If it varies, estimate the average)

Number of hours: (1)

Q8.4 On a scale of 0 to 10, where 0 is the worst job performance anyone could have at your job and 10 is the performance of a top worker, how would you rate the usual performance of most workers in a job similar to yours?

- ❍ Worst Performance 0 (0)
- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ Top Performance 10 (10)

Q8.5 Using the same 0 to 10 scale, how would you rate your overall performance on the days you worked during the past 4 weeks?

- ❍ Worst Performance 0 (0)
- ❍ 1 (1)
- ❍ 2 (2)
- ❍ 3 (3)
- ❍ 4 (4)
- ❍ 5 (5)
- ❍ 6 (6)
- ❍ 7 (7)
- ❍ 8 (8)
- ❍ 9 (9)
- ❍ Top Performance 10 (10)

Q8.6 How satisfied are you with the effect of the environmental conditions (such as lighting and temperature) on your overall work performance?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q9.1 Please rate the following statements in terms of how well they describe how you feel.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
In general, I am satisfied with my job. (1)	❍	❍	❍	❍	❍	❍	❍

Q10.1 Resource Conservation in Buildings

Q10.2 Please indicate how much you agree or disagree with the following statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
I feel it is very important for me to save energy. (1)	❍	❍	❍	❍	❍	❍	❍

Q11.1 How satisfied are you with your current energy usage in your workspace?

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)
Very Dissatisfied:Very Satisfied (1)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q11.2 How often have you engaged in energy saving actions in the last 3 months (e.g. turning off your computer, monitor, task light,or other appliances and/or equipment in your office when they were not needed)?

- ❍ Never (1)
- ❍ Less than Once a Month (2)
- ❍ Once a Month (3)
- ❍ 2-3 Times a Month (4)
- ❍ Once a Week (5)
- ❍ 2-3 Times a Week (6)
- ❍ Daily (7)

Q11.3 Over the past 3 months, how often did you check on your “energy chickens”?

- ❍ Never (1)
- ❍ Less than Once a Month (2)
- ❍ Once a Month (3)
- ❍ 2-3 Times a Month (4)
- ❍ Once a Week (5)
- ❍ 2-3 Times a Week (6)
- ❍ Daily (7)
- ❍ 2-3 Times a Day (8)

Q12.1 Study Evaluation

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.2 Please evaluate your participation in this study:

	Not at all (1)	Slightly (2)	Moderately (3)	Extremely (4)
How likely would you be to participate in a similar study again? (1)	❍	❍	❍	❍
Was your participation in this study a burden? (2)	❍	❍	❍	❍
Did your participation in this study interfere with your daily activities? (3)	❍	❍	❍	❍
Did you find any benefits of regularly reflecting on how you felt in response to the daily assessments? (4)	❍	❍	❍	❍

Q12.3 Please provide any additional comments you wish related to the research study. These could include any aspect of the study including the surveys (initial, daily surveys, and final), the use of survey deployment technologies, or the effects of the Energy Chickens game that you noticed.

Q12.4 Energy Chicken Game User Evaluation

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.5 Usefulness Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The game helps me be more energy efficient. (1)	❍	❍	❍	❍	❍	❍	❍
The game helps me be more energy conscious. (2)	❍	❍	❍	❍	❍	❍	❍
The game helped me learn about my energy usage. (3)	❍	❍	❍	❍	❍	❍	❍
I expect the game will help me be better at saving energy. (4)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.6 Ease of Use Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The game is easy to understand. (1)	❍	❍	❍	❍	❍	❍	❍
I can use the game without written instructions. (2)	❍	❍	❍	❍	❍	❍	❍
I can use the game successfully every time I try. (3)	❍	❍	❍	❍	❍	❍	❍
I feel comfortable using this game. (4)	❍	❍	❍	❍	❍	❍	❍
Overall, I am satisfied with how easy it is to use this game. (5)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.7 Ease of LearningPlease rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
1 (1)	❍	❍	❍	❍	❍	❍	❍
It is easy to learn to use the game. (2)	❍	❍	❍	❍	❍	❍	❍
Exploring new features by trial and error was easy. (3)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.8 Satisfaction Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
I would recommend the game to a friend. (1)	❍	❍	❍	❍	❍	❍	❍
The game is fun to use. (2)	❍	❍	❍	❍	❍	❍	❍
I like the interface of this game. (3)	❍	❍	❍	❍	❍	❍	❍
Playing the game is satisfying. (4)	❍	❍	❍	❍	❍	❍	❍
Overall, I am satisfied with this game. (5)	❍	❍	❍	❍	❍	❍	❍
I expect to interact with the game numerous times. (6)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.9 Screen Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
Reading characters on the screen is easy. (1)	❍	❍	❍	❍	❍	❍	❍
The icons on the game screen are informative. (2)	❍	❍	❍	❍	❍	❍	❍
The organization of information is very clear. (3)	❍	❍	❍	❍	❍	❍	❍
Help messages on the screen were helpful. (4)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.10 Terminology and System Information Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The use of language is consistent throughout the game. (1)	❍	❍	❍	❍	❍	❍	❍
The instructions prior to the start of the game were clear. (2)	❍	❍	❍	❍	❍	❍	❍
Position of messages on the screen was consistent. (3)	❍	❍	❍	❍	❍	❍	❍
The information (such as online help, on-screen messages, and other documentation) provided with this game is clear. (4)	❍	❍	❍	❍	❍	❍	❍
5 (5)	❍	❍	❍	❍	❍	❍	❍

Appendix 2: PSU Post-Intervention Online Survey (Deliverable 32)

Q12.11 System Capabilities Please rate your agreement with these statements.

	Very Strongly Disagree (1)	(2)	(3)	(4)	(5)	(6)	Very Strongly Agree (7)
The system is reliable. (1)	❍	❍	❍	❍	❍	❍	❍
On startup, my energy data loads quickly. (2)	❍	❍	❍	❍	❍	❍	❍
The system provided accurate information about my energy usage. (3)	❍	❍	❍	❍	❍	❍	❍

Q12.12 List the most negative aspect(s) of the game:

Negative aspect #1: (1)
Negative aspect #2: (2)
Negative aspect #3: (3)

Q12.13 List the most positive aspect(s) of the game:

Positive aspect #1: (1)
Positive aspect #2 (2)
Positive aspect #3 (3)

Q12.14 Please provide additional feedback related to the Energy Chickens game:

Q13.1 End of Survey

If you are satisfied with your responses to the survey please click on the "Submit" button below.

Please note that you will not be able to return to the survey once you click on "Submit".

We really appreciate the time and effort you spent in answering this questionnaire.

Thank you!!

PENNSTATE 1855

Princeton Plasma Physics Laboratory
Electricity Outlet Sensor Study

eebHUB Energy Efficient Buildings Hub

Energy Efficient Buildings Hub,

a U.S. DOE Energy Innovation Hub led by

The Pennsylvania State University.

STUDY MEMBER GUIDE

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Table of Contents

Introduction to Study

Welcome to the Electricity Outlet Sensor Study being conducted at the Princeton Plasma Physics Laboratory (PPPL) by researchers at The Pennsylvania State University in collaboration with researchers at the Princeton Plasma Physics Lab, Carnegie Mellon University and the Polytechnic Institute New York University. This research project is part of the U.S. Department of Energy's Energy Efficient Buildings Hub (EEB Hub).

The purpose for conducting a research study in your building is to evaluate plug load electricity energy usage in commercial office buildings and the interplay between energy usage and building occupant satisfaction and well-being. We will be collecting energy use data for the electrical devices you use at your desks by using sensors that plug into electrical outlets and power strips. Your contributions in providing this data will help to increase our understanding of the impact of energy efficient technologies on occupant health, well-being, and satisfaction. The benefits to you include the opportunity to express your opinion about the indoor environment including conditions related to lighting, air quality, temperature, noise, and privacy.

Our Penn State team comprises faculty in Architectural Engineering, Landscape Architecture, Biobehavioral Health, and Human Development and Family Studies, all with experience conducting these kinds of studies. We are working closely with Keith Rule, at PPPL, to ensure that all technical and participant-related aspects of the study are vetted before implementation.

We are members of the Energy Efficient Buildings Hub (EEB Hub) headquartered at the Navy Yard in Philadelphia funded by the Department of Energy (DOE). The Hub's efforts are focused on the development of the Navy Yard as a global center for research, development, demonstration, and deployment on energy efficient buildings. For more information about the EEB initiative please visit http://eebhub.org/.

Thank you for your contributions to this study!

Sincerely,

Brian Orland, Principal Investigator & Dena Lang, Ph.D., Project Coordinator, with investigators Kevin Houser, Ph.D., Nilam Ram, Ph.D., Joshua Smyth, Ph.D., & the Research Team at the Pennsylvania State University.

Contact information

If at any time throughout the study you have any questions or concerns, please feel free to call our Project Coordinator, Dena Lang. We are best able to answer questions between 8 AM and 7 PM. If we are unable to respond to your call immediately, please leave a message with your phone number so that we can respond as soon as possible.

Contact the Project Coordinator

Dena Lang, Ph.D.
Office telephone: (814) 865-5732
Cell phone: (814) 574-0104
Email: DenaLang@psu.edu

Office Address:
Dept. of Landscape Architecture
105B Stuckeman Family Building
The Pennsylvania State University
University Park, PA 16802

Mailing Address:
Dept. of Landscape Architecture
121 Stuckeman Family Building
The Pennsylvania State University
University Park, PA 16802

Informed Consent

Title of Project: Electricity Outlet Sensor Study

You are being asked to participate in a research study for the Department of Energy's Energy Efficient Buildings Hub (EEB Hub) at the Philadelphia Navy Yard. This study is being conducted by researchers at The Pennsylvania State University in collaboration with researchers at the Princeton Plasma Physics Lab, Rutgers University, Carnegie Mellon University and the Polytechnic Institute New York University; however, it is part of a larger project conducted by the EEB Hub. The EEB Hub is made up of a number of universities and companies from industry. While any identifiable information from this particular study will only be accessible to the principal investigator and project coordinator listed below, other partners on the larger project may access de-identified data.

Purpose of the Study: We are conducting a research study in your building to evaluate plug load energy monitoring sensors and to assess plug load electricity energy usage in commercial office buildings and the interplay between energy sensors and building occupant behavior. Plug loads are the energy used by plug-in devices in the office. The study is evaluating different ways to study energy consumption and if and how changes in the office environment affect individuals' productivity, mood and well-being. Because the results of the study could be affected if the full purpose is known prior to your participation, the purpose of the study cannot be explained to you at this time. You will have an opportunity to receive a complete explanation of the purpose following completion of the study.

Procedures to be followed: Sensors will be used to measure the electricity use of the equipment and appliances in your office and common areas. Each appliance/equipment will plug into a sensor and the sensor will plug into the wall outlet or power strip. During the first month of electricity monitoring you will be asked to complete a short (<1 minute) survey on the Friday of each week indicating how many hours/day you were in your office. Towards the end of the first month of electricity monitoring, you will also be asked to complete short (1-2 minute) daily surveys twice a day (before lunch and at the end of the work day) for one week. These surveys will be administered either online or on a mobile device provided by the researches for the duration of the study. You may refuse to answer any questions you feel are intrusive.

Statement of Confidentiality: All information will remain secure, confidential and will not be shared with your employer. Personally identifying information will be deleted immediately at the conclusion of the study and once compensation is delivered. Identifying information will be collected from participants to: (1) identify physical office location and personal equipment and appliances, (2) install outlet sensors, (3) monitor energy usage data, and (4) to contact you if you win the compensation drawing. Actual participant generated survey data will only be identified by a random id number. During the collection of the energy usage data, the data will include your office number and will be accessible to the principal investigator, study coordinator, and research assistants. This is required to monitor data

collection to ensure that the sensors are working properly and to trouble shoot if any problems occur. Once the data collection is complete, office numbers will be replaced with random ID numbers. When completing surveys online please note that your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties. For the collection of the daily smart phone survey data, a separate random ID will be assigned to each participant. The only key linking participants to both random ID numbers will be maintained and secured in locked file cabinets and/or in password protected computers by the principal investigator, Brian Orland, and the study coordinator, Dena Lang, to ensure that no other research staff has access to this information. Penn State's Office for Research Protections, the Institutional Review Board, and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this project.

Discomforts and Risks: There are no foreseeable discomforts or risks to participation in this study.

Benefits: There are no direct benefits, but you may find it interesting to learn how much energy your appliances and equipment use. The benefits to society include increasing our understanding of the energy use associated with plug load equipment and appliances in a commercial office setting.

Duration/Time: The total length of energy monitoring will be 7 months, but your involvement is limited to brief survey responses each Friday of the first 4 weeks and two daily surveys during 1 week of the first month.

Right to Ask Questions: If you have any questions, complaints, or concerns about this research, feel free to contact the following. You can also call these individuals if you feel this study has harmed you.

Research Coordinator: Dena Lang, 121 Stuckeman Family Building, University Park, PA 16802
Tel: 814-865-5732 or Email: DenaLang@psu.edu

Principal Investigator: Brian Orland, 121 Stuckeman Family Building, University Park, PA 16802
Tel: 814-865-6315, Email: boo1@psu.edu.

If you have any questions, concerns, problems about your rights as a research participant or would like to offer input, please contact The Pennsylvania State University's Office for Research Protections (ORP) at (814) 865-1775. The ORP cannot answer questions about research procedures. Questions about research procedures can be answered by the research team.

Voluntary Participation: Your decision to be in this research study is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.

Compensation: Your name will be entered into drawings for 5 - $100 gift cards. Your chances of winning will be increased based upon the number of surveys that you complete. Each survey completed correctly will equate to another name entry. Total payments within one calendar year that exceed $600 will require Penn State University to report these payments to the IRS annually. This may require you to claim the compensation that you receive for participation in this study as taxable income. If one person wins a combined total of more than $300, payment must be made by check and the winner will need to provide his/her Social Security number.

Eligibility to Participate: To be eligible to participate in this study, you must be at least 18 years of age and work at least half time at **_____**.

If you agree to take part in this research study as outlined above, please provide your first and last name and give your informed consent below.

Name: _____ _____
First Name Last Name

Informed Consent* ☐ I consent.

* Please indicate if you consent to participate in this study by checking the consent box. Then provide your contact information below. Completion and submission of this survey implies your consent to participate in this research.

If you do not consent, please exit the questionnaire now.

Office Address: _____ (Office/Cubicle #)

Work Phone: _____ Email: _____

Please print off or keep a copy of this form for your records.

This informed consent form was reviewed and approved by The Pennsylvania State University's Institutional Review Board (IRB# 40020 Doc. #1001) on 07/27/2012. It will expire on 07/26/2013. (J. Mathieu).

Study Overview

During the first month of electricity monitoring you will be asked to complete a short (<1 minute) survey on the Friday of each week indicating how many hours/day you were in your office. Towards the end of the first month of electricity monitoring, you will also be asked to complete short (1-2 minute) daily surveys twice a day (before lunch and at the end of the work day) for one week. If you will be out of the office during the scheduled daily survey week of September 10-14 (Figure 1), the study coordinator will make alternate arrangements for you to complete the daily surveys upon your return to your office.

Study Survey Schedule						
Su	**Mo**	**Tu**	**We**	**Th**	**Fr**	**Sa**
					Aug. 17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	Sept. 1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22

Sensor Installation
Weekly Office Hours Survey
Smart Phone Deployment and Training
Twice Daily Surveys
Twice Daily Surveys and Weekly Office Hours Survey

Figure 1: Outlet sensor research study timeline.

Weekly Online Office Hours Survey

The weekly office hours survey is administered online and takes < 1 minute to complete. Each Friday during the first month of the study you will be emailed a website link that you will use to access the weekly survey. This survey is used to determine how many hours you occupy your office each day (Figure 2). Each week the survey link that is emailed to you is unique for that week.

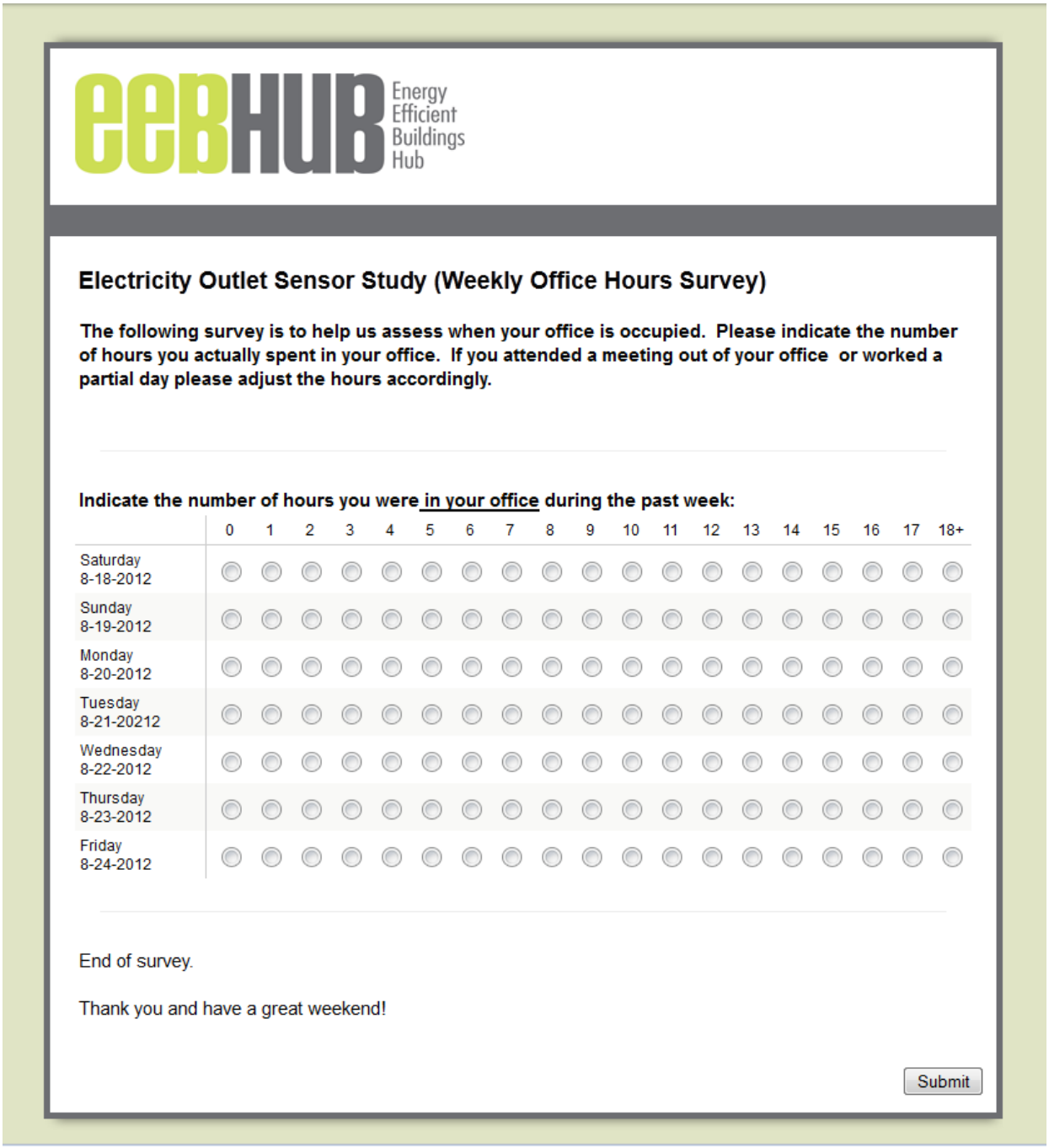


Figure 2: Weekly Office Hours survey.

Daily Surveys Overview

During the fourth week of the study (September 10-14), you will be asked to take two brief surveys each day, one before lunch and another at the end of the work day. These daily surveys will aid in our understanding of the relationship between energy usage and building occupant satisfaction with the indoor environment and general health and well-being. The surveys are administered on a smart phone that is issued to you for use during the study.

Using the study phone looks like regular activity, so you shouldn't feel out of place filling out the surveys on the phone. Your personal data on the survey phone is encrypted prior to uploading to the server. At the conclusion of the study your data will be completely removed from the survey phone.

Each phone has been assigned a unique identification number to protect your privacy when answering surveys; please do not share phones with other study participants.

Please record the survey phone unique identification number: _____
(located on the back of phone)

Survey Beep Schedule

Before the daily surveys begin, you will choose a beeping schedule so that a time for answering the surveys will best fit into your workday. Based on this choice, the phone will beep at two times throughout the day. When the phone rings (which will sound like Vivaldi's "Spring"), you will answer and the survey will launch. Each survey will take about 1-3 minutes to complete, but the application will close automatically after 30 minutes if you do not complete it in a timely fashion.

We have provided five beeping schedules to choose from to customize the beeping schedule to fit with your personal schedule. If an occasion arises where answering the survey at the pre-determined time creates a negative consequence to your work day, you may manually launch and complete individual surveys later. However, please save this method for outlying circumstances and not a replacement method for reprogramming your beeping schedule.

Please select one of the following schedules that best fits with your work day. Please note that the beep schedule is set prior to the start of the surveys and cannot be changed by you.

Smart Phone Beeping Schedule Selection:	**Before Lunch**	**End of work day**
1)	11:00 am	4:00 pm
2)	11:30 am	4:30 pm
3)	12:00 pm	5:00 pm
4)	12:30 pm	5:30 pm
5)	1:00 pm	6:00 pm

Record your selection here: _____.

Overview of Droid Razr Smart Phone Used in this Study

Smart Phone Basics for your Droid Razr

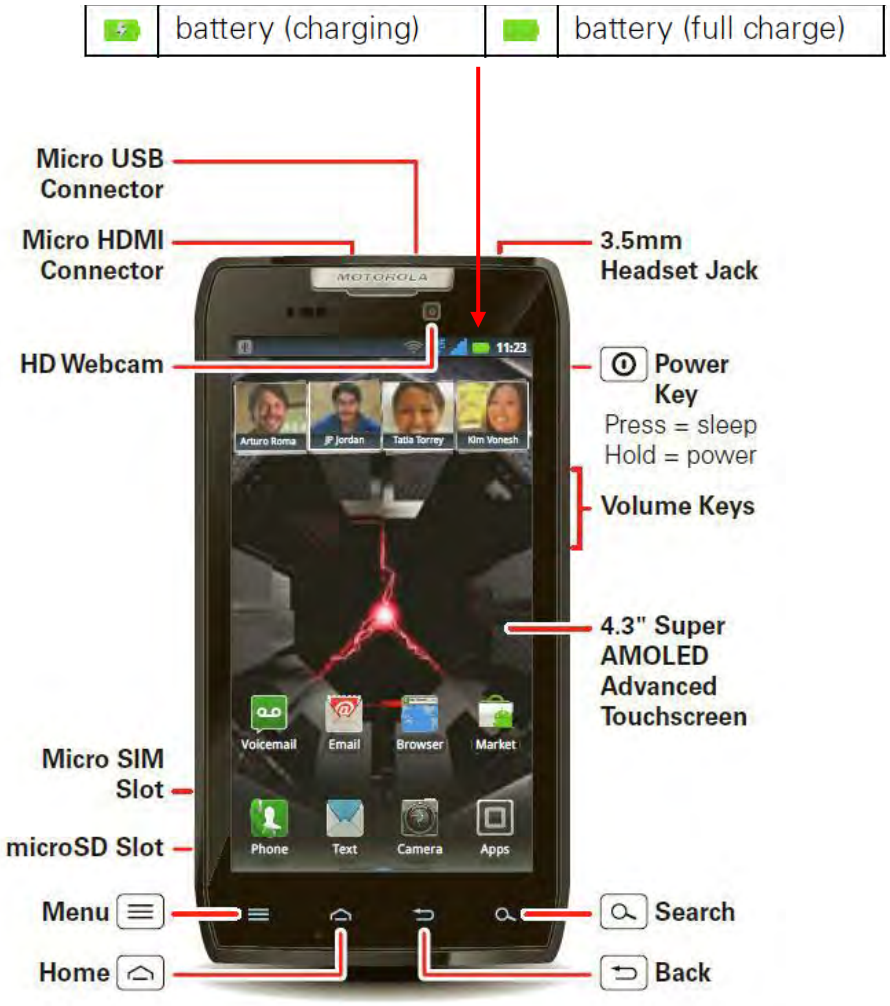
The image below contains a labeled diagram of the Smartphone you were assigned. You will likely not use most of the features illustrated here, but it provides the general layout of the device for your reference.

To charge, plug the Micro USB (charger) into the connection at the top of the device.

The **on/off** button can be found on the upper-right side edge of the phone.

The **volume keys** are on the right side below the on/off button.

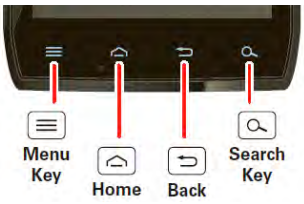
Additional and more advanced features are described in section "**Additional Information on Smartphone Features**"(pages 41-43).



Basic phone care and use

The smart phone in this study, a Motorola Droid Razr, although somewhat durable, is an expensive piece of technology and requires proper care. Please take note of the following:

- Please keep your study phone with you so that you can complete the surveys if you are out of the office.
- Check the charge on your battery daily and charge your phone when necessary.
- On the back of the phone you will find a Penn State Survey Research Center (SRC) label that identifies the phone. The phone number provided on this label is for the SRC and is only intended to be used in case the device is lost. Participants should not contact this number directly.
- Please leave the study sticker on the back of the phone intact. This helps us track the phones we have in use.
- Do not use anything other than your finger to navigate on the screen of your phone in order to avoid scratches to the screen.
- Keep the phone clean and dry. Your phone should not get wet due to the electronic circuitry.
- Avoid dropping, sitting on, or throwing your phone.
- Do not leave the phone in your car overnight. Avoid leaving the phone in extreme heat or cold temperatures, or direct sunlight for long periods of time.
- Do not paint or write on your phone.
- You are responsible for caring for your study phone. We expect the phone to be returned in appropriate working order.
- Do **NOT** access any applications (other than the surveys) or areas of the phone, including changing settings (except for volume).
- If you accidentally get to a page that you do not think you should be on, press the "Home" key to return to the main menu.
- You should **NOT** install automatic updates to software on your study issued smart phone. If an automatic update request appears on the study phone you should select the option to exit the automatic update without installing it.



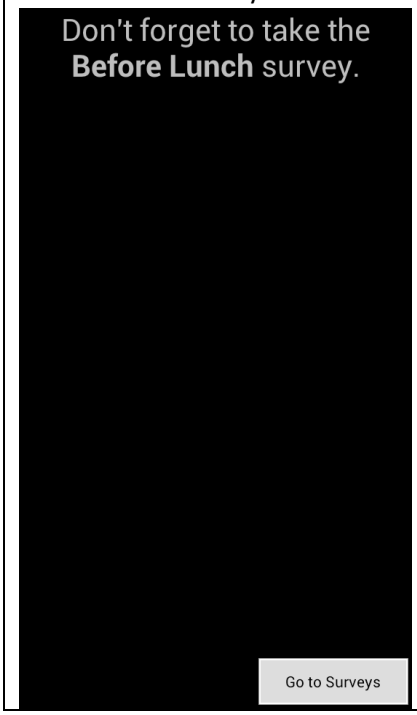
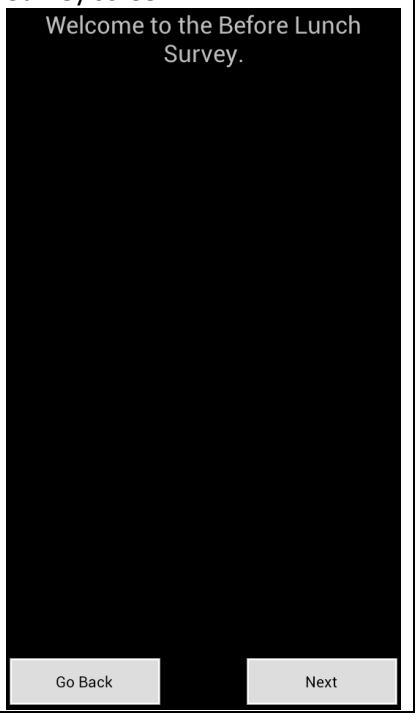
- If you accidentally install an automatic update and begin to experience problems with the surveys please contact the study coordinator: DenaLang@psu.edu .
- If you need to turn off your study phone, press and hold the power button on the top right side until the phone options prompt is displayed and select power off.
- Please ensure that you do not select other features located on this prompt. If you accidentally select airplane mode the Verizon connectivity will be turned off. To turn off airplane mode, press and hold the power button on the top right side until the phone options prompt is displayed and touch "Airplane mode" to turn it off.

Automated Prompt of the Daily Surveys

The “Before Lunch” and “End of Work” surveys will be given every day (Monday through Friday) for the week of September 10-14, 2012. The before lunch and end of work beep schedules are based on the schedules you selected. When the phone beeps (survey ring tone) you will have 30 minutes to respond to the survey. If you are unable to respond within 30 minutes the survey will time out. The phone will continue to beep for thirty minutes until it times out. If you start the survey but take more than 30 minutes to complete the survey will also time out. Once the survey has timed out, you have the opportunity to complete the “Before Lunch” survey by manually launching the survey (see next section “Manually Launching Surveys”).

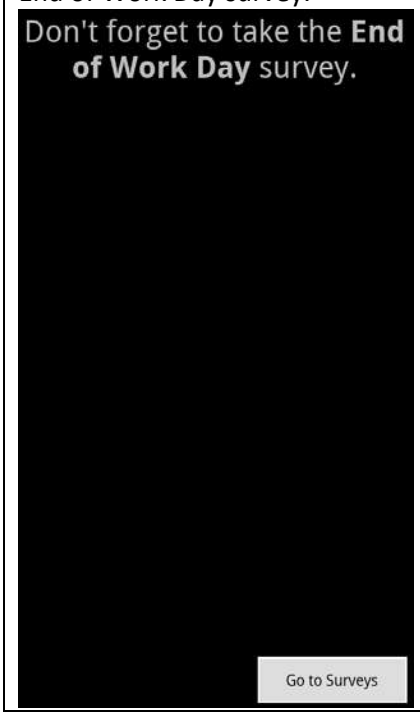
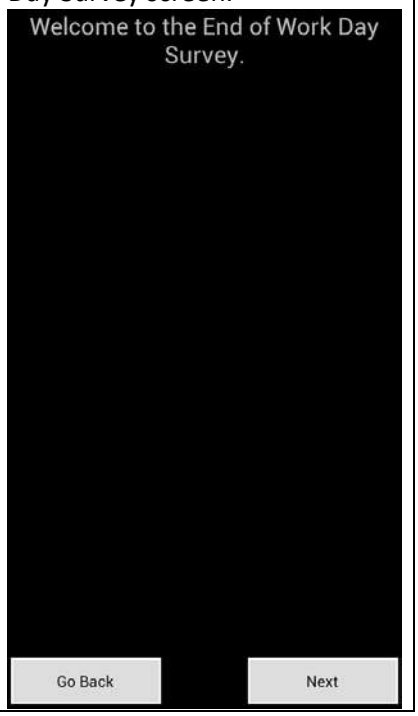
When the “Before Lunch” survey automatically launches your phone will beep and you will see screen “a” in Table 1. Touch “Go to Surveys” in the lower right corner of the screen and the display will progress to screen “b”. You will then touch “Before Lunch” and the display will progress to screen “c”. Please check your selection, if you do not see the “Welcome to the Before Lunch Survey” you can select “Go Back” to return to the previous screen and correct your selection. To enter the “Before Lunch” survey touch “Next” in the bottom right corner of screen “c”. Please note,“Before Lunch” is not highlighted in blue until you touch your survey selection and then only briefly as it progresses to screen “c”.

Table 1: Automated prompt for “Before Lunch” survey.

a) Automated prompt screen for Before Lunch survey.	b) Survey selection screen.	c) Welcome to the Before Lunch Survey screen.
		

When the “End of Work Day” survey automatically launches your phone will beep and you will see screen “a” in Table 2. Touch “Go to Surveys” in the lower right corner of the screen and the display will progress to screen “b”. You will then touch “End of Work Day” and the display will progress to screen “c”. Please check your selection, if you do not see the “Welcome to the End of Work Day Survey” you can select “Go Back” to return to the previous screen and correct your selection. To enter the “End of Work Day” survey touch “Next” in the bottom right corner of screen “c”. Please note, “End of Work Day” is not highlighted in blue until you touch your survey selection and then only briefly as it progresses to screen “c”.

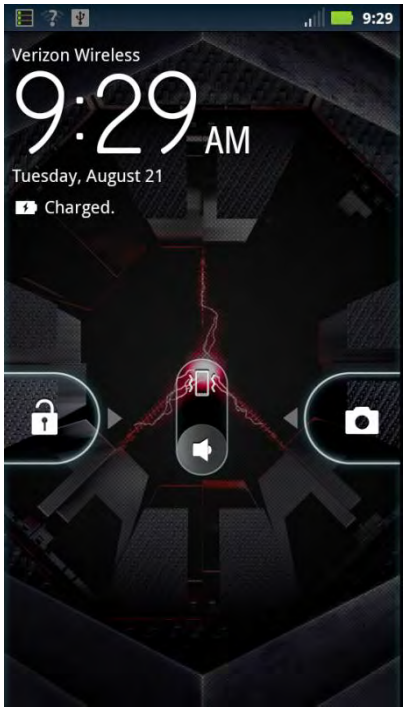
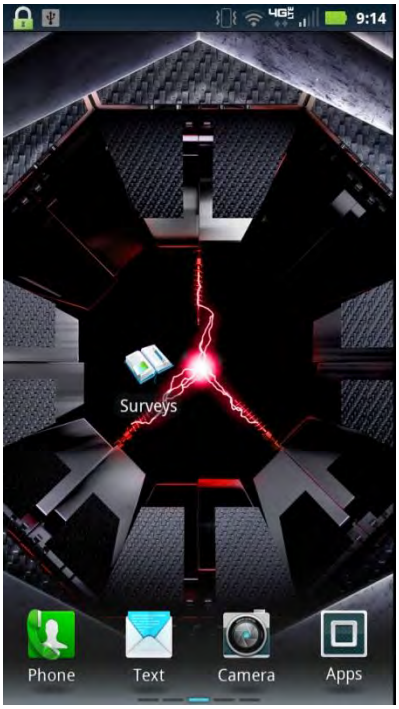
Table 2: Automated prompt for “End of Work Day” survey.

a) Automated prompt screen for End of Work Day survey.	b) Survey selection screen.	c) Welcome to the End of Work Day Survey screen.
		

How to Manually Launch a Missed Daily Surveys

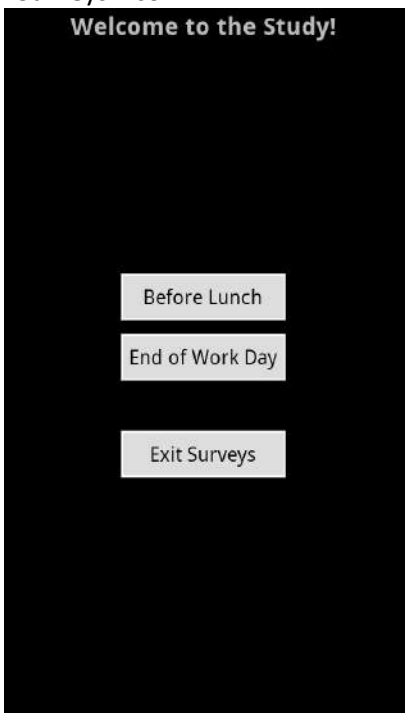
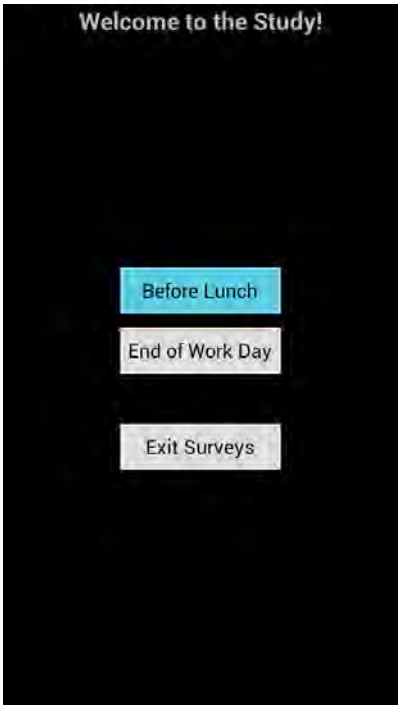
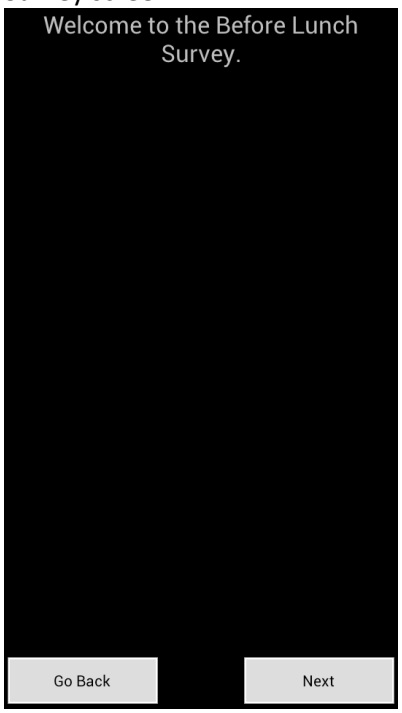
If you are unable to complete either the “Before Lunch” or “End of Work Day” survey before it times out you can manually launch the survey at a more convenient time. Turn on your smart phone using the power button located at the top right of the device. Quickly press and release this button to turn on the display. The screen shown in Table 3a is the primary screen you see on your phone when you first turn it on. To obtain access to the home screen, lightly touch the padlock symbol on the left side and slide your finger gently to the right. As you unlock the phone the display will change to the screen in Table 3b. When the phone is unlocked you will see the home screen shown in Table 3c.

Table 3: Manual Launch of Daily Surveys.

a) Phone display when phone is first turned on.	b) Phone display as you unlock the phone.	c) Home screen with survey folder in the middle of screen.
		

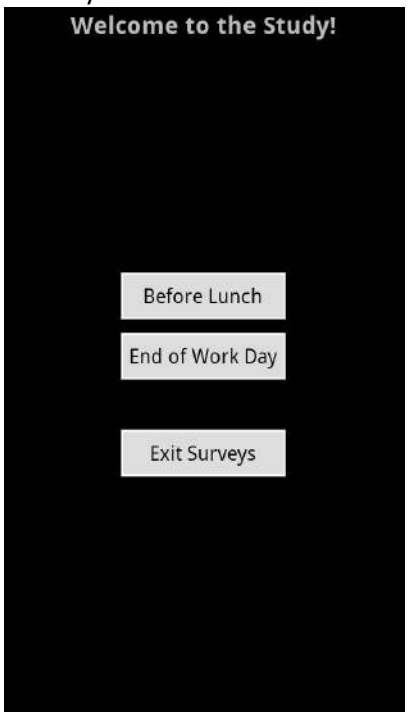
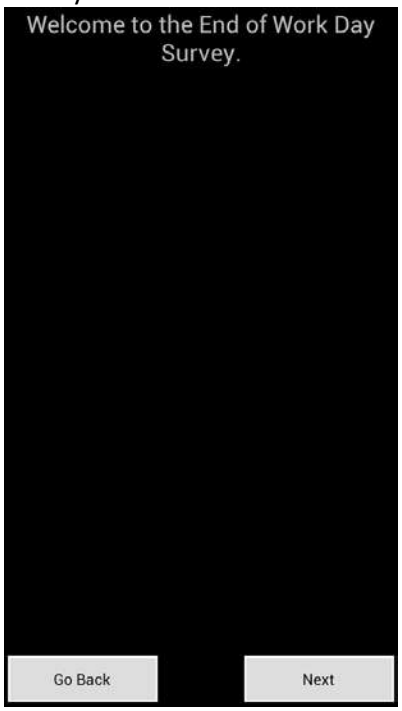
To manually launch the surveys, touch the “Surveys” folder icon in the center of the home screen. Once you touch the “Surveys” folder the “Welcome to the Study” screen will be displayed (Table 4a). To take the Before Lunch survey, touch “Before Lunch” and the display will briefly change to 4b and then progress to “4c”. Please check your selection, if you do not see the “Welcome to the Before Lunch Survey” you can select “Go Back” to return to the previous screen and correct your selection. To enter the “Before Lunch” survey touch “Next” in the bottom right corner of screen “c”.

Table 4: Selecting Before Lunch survey when manually launching surveys.

a) Screen display after touching “Surveys” icon.	b) Survey selection screen.	c) Welcome to the Before Lunch Survey screen.
		

To manually launch the “End of Work Day” survey, touch the “Surveys” folder icon in the center of the home screen. Once you touch the “Surveys” folder the “Welcome to the Study” screen will be displayed (Table 5a). To take the End of Work Day survey, touch “End of Work Day” and the display will briefly change to 5b and then progress to “5c”. Please check your selection, if you do not see the “Welcome to the End of Work Day Survey” you can select “Go Back” to return to the previous screen and correct your selection. To enter the “End of Work Day” survey touch “Next” in the bottom right corner of screen “c”.

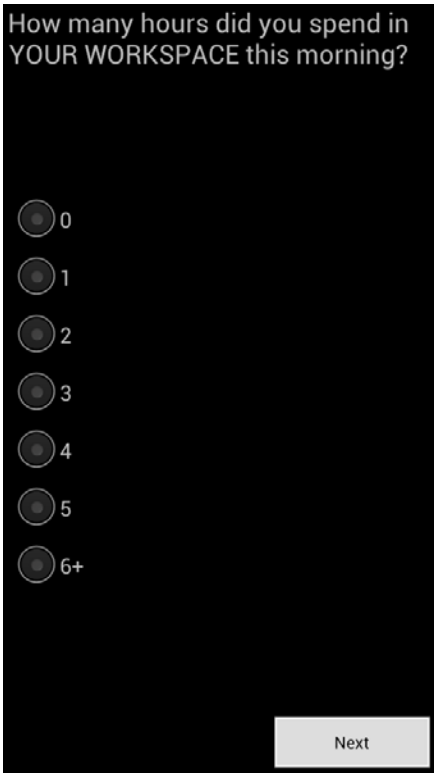
Table 5: Selecting End of Work Day survey when manually launching surveys.

a) Screen display after touching “Surveys” icon.	b) Survey selection screen.	c) Welcome to the Before Lunch Survey screen.
		

If at any time during the study you feel you took the wrong survey or you have any questions, please contact the Project Coordinator, Dena Lang at DenaLang@psu.edu or (814) 865-5732. You will be provided the opportunity to complete all surveys correctly and completely, regardless of any error throughout the study.

The Before Lunch Survey Questions

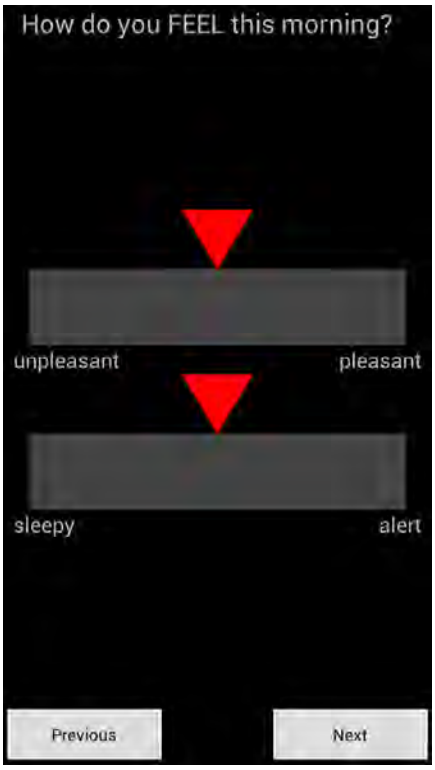
This survey will be given before lunch (Monday through Friday) during the week of September 10-14, 2012. The before lunch beep schedule is based on the schedule you selected. When the phone beeps (survey ring tone) you will have 30 minutes to respond to the survey. If you are unable to respond within 30 minutes the survey will time out. If you start the survey but take more than 30 minutes on any given screen the survey will also time out. Once the survey has timed out, you have the opportunity to complete the "Before Lunch" survey by manually launching the application. Ideally you should complete the "Before Lunch" survey within 30 minutes of the scheduled beep. The data are date and time stamped and you will only be given credit for completing the "Before Lunch" survey if it is completed within two hours before or after your scheduled beep.



Select the button that corresponds to the number of hours you spent <u>in your personal workspace</u> this morning (up to this moment). Do not include time spent at work but out of your personal workspace. Then touch the "Next" button in the lower right corner.

Anytime a question is left unanswered this window will appear. If you did not mean to leave the question blank then touch the "No" button and answer the question. If you wish to leave the question blank then confirm this response by touching "Yes".

Select the button that corresponds to the total number of hours you worked this morning (up to this moment), regardless if you were in your personal workspace or not. Then touch the "Next" button in the lower right corner.



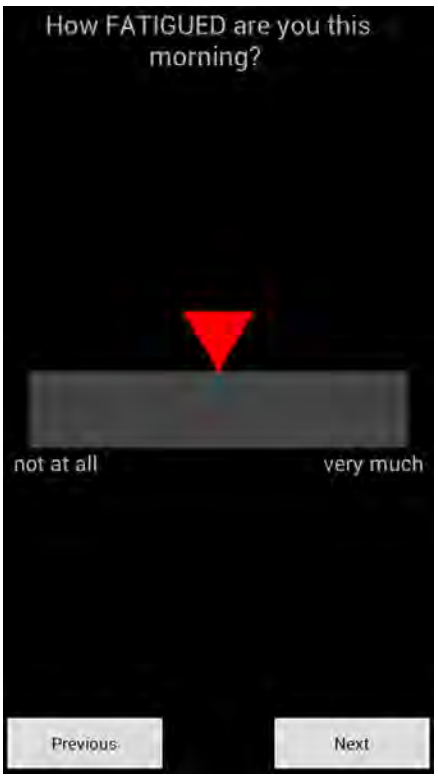
Rate how you FEEL this morning. This should be a general judgment of how you felt over the morning hours. To answer these slider questions, you may slide your finger anywhere in this range and you will see the portion to the left of your finger turn blue. Where you lift your finger is where your answer will remain. This is a two part question, touch the bar between "Unpleasant" and "Pleasant" and select how you feel in the range labeled "Sleepy" and "Alert." Touch "Next" to continue.

Indicate within this range how you are feeling physically this morning. Touch the bar between "Very Poor" and "Very Good" to answer. Touch "Next" to continue.

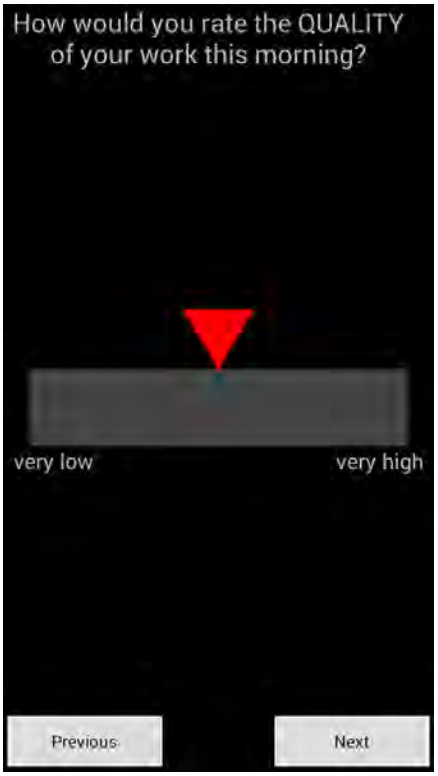
Indicate how you are feeling mentally this morning, including your mental health, general mood, and ability to think. Touch the bar between “Very Poor” and “Very Good” to answer. Touch “Next” to continue.

Consider if you are having difficulty concentrating this morning and indicate the degree of difficulty within the provided range. Touch the bar between “Not at all” and “Very much” to answer. Touch “Next” to continue.

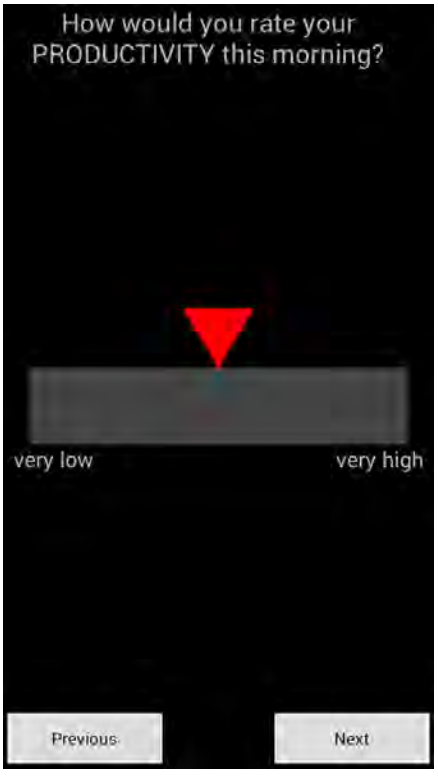
Rate how stressed you are feeling this morning. Touch the bar between “Not at all” and “Very Much.” Touch “Next” to continue.



Indicate how tired or lethargic you are feeling this morning. Touch the bar between “Not at all” and “Very Much.” Touch “Next” to continue.



Next, rate the quality of your work this morning. Touch the bar in between “Very low” or “Very High.” Please remember that your answers on this and related questions are confidential! Touch “Next” to continue.



Rate how productive you feel you have been this morning. Touch the bar in between “Very low” and “Very High.” Touch “Next” to continue.

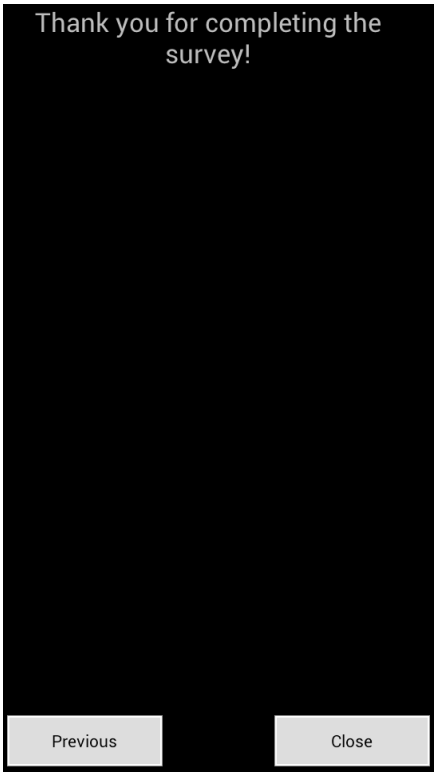
Indicate how satisfied you feel about your job this morning. Touch the bar in between "very dissatisfied" or "very satisfied." Touch "Next" to continue.

Indicate how satisfied you are with the air quality in your workspace this morning. Air quality includes air movement, humidity, and freshness. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

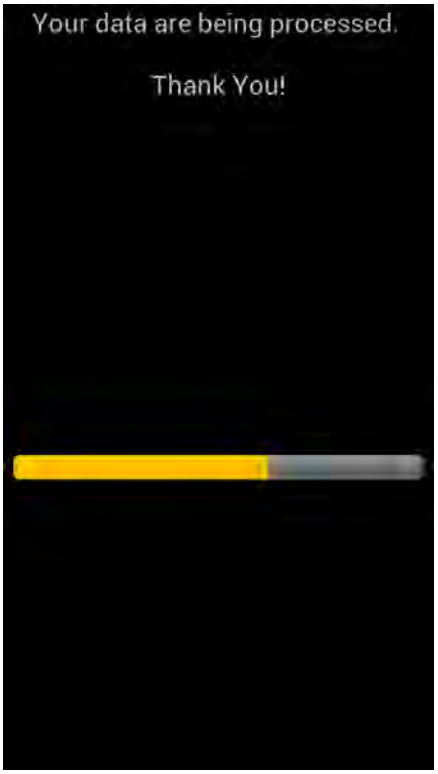
Indicate how satisfied you are with the temperature in your workspace this morning. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

Indicate how satisfied you are with the noise level in your workspace this morning. Include in your evaluation mechanical noise and noise from conversations. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

Indicate how satisfied you are with the electric lighting in your workspace this morning. Do not include daylight in your evaluation. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.



This screen signifies that you are at the end of the "Before Lunch" survey. Touch "Close" and your data will be sent to the Penn State Survey Research Center's server. You will see one remaining screen while your data are processed.



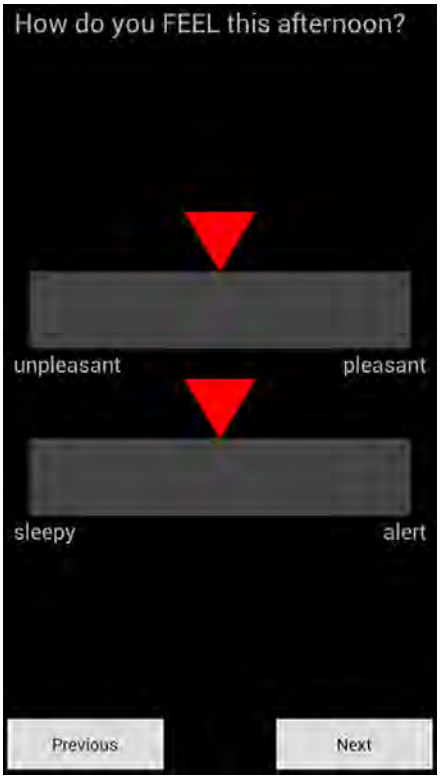
This final screen appears while your data are transferred to the server. This screen automatically closes and resets the application to the first screen. You do not need to worry about a bad connection or an interruption in transferring the data. All data are stored on the phone and if there is an interruption in data transfer or you have a bad connection the data transfer will be initiated again when the next survey is activated.

The End of Work Day Survey Questions

This survey will be given at the "End of Work Day" (Monday through Friday) during the week of September 10-14, 2012. The "End of Work Day" beep schedule is based on the schedule you selected. When the phone beeps (survey ring tone) you will have 30 minutes to respond to the survey. If you are unable to respond within 30 minutes the survey will time out. If you start the survey but take more than 30 minutes on any given screen the survey will also time out. Once the survey has timed out, you have the opportunity to complete the "End of Work Day" survey by manually launching the application. Ideally you should complete the "End of Work Day" survey within 30 minutes of the scheduled beep. The data are date and time stamped and you will only be given credit for completing the "End of Work Day" survey if it is completed within two hours before or after your scheduled beep.

Select the button that corresponds to the number of hours you spent <u>in your personal workspace</u> this afternoon (up to this moment). Do not include time spent at work but out of your personal workspace. Then touch the "Next" button in the lower right corner.

Select the button that corresponds to the total number of hours you worked this afternoon (up to this moment), regardless if you were in your personal workspace or not. Then touch the "Next" button in the lower right corner.



Rate how you FEEL this afternoon. This should be a general judgment of how you felt over the afternoon hours. To answer these slider questions, you may slide your finger anywhere in this range and you will see the portion to the left of your finger turn blue. Where you lift your finger is where your answer will remain. This is a two part question, touch the bar between "unpleasant" and "pleasant" and select how you feel in the range labeled "sleepy" and "alert." Touch "Next" to continue.

Indicate within this range how you are feeling physically this afternoon. Touch the bar between “very poor” and “very good” to answer. Touch “Next” to continue.

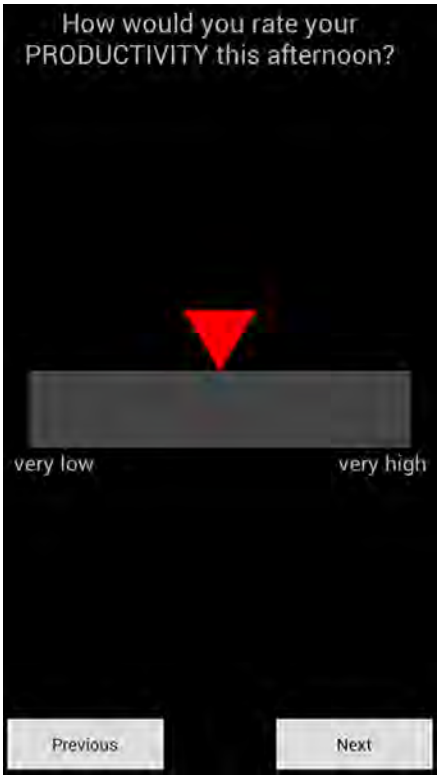
Indicate how you are feeling mentally this afternoon, including your mental health, general mood, and ability to think. Touch the bar between “very poor” and “very good” to answer. Touch “Next” to continue.

Consider if you are having difficulty concentrating this afternoon and indicate the degree of difficulty within the provided range. Touch the bar between “not at all” and “very much” to answer. Touch “Next” to continue.

Rate how stressed you are feeling this afternoon. Touch the bar between “not at all” and “very much.” Touch “Next” to continue.

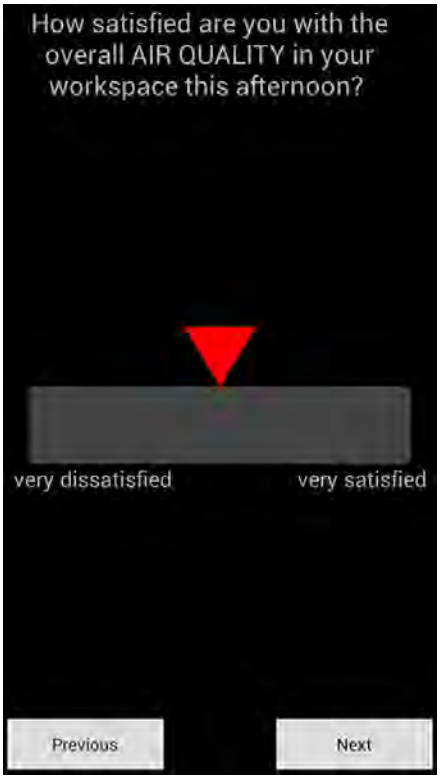
Indicate how tired or lethargic you are feeling this afternoon. Touch the bar between “not at all” and “very much.” Touch “Next” to continue.

Next, rate the quality of your work this afternoon. Touch the bar in between “very low” or “very high.” Please remember that your answers on this and related questions are confidential! Touch “Next” to continue.

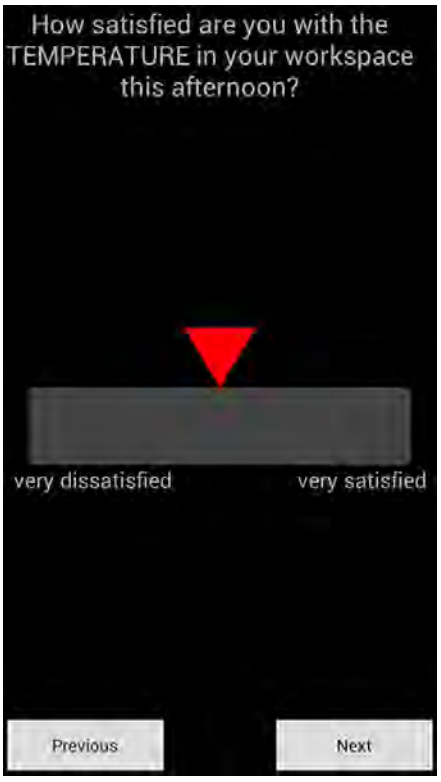


Rate how productive you feel you have been this afternoon. Touch the bar in between “very low” and “very high.” Touch “Next” to continue.

Indicate how satisfied you feel about your job this afternoon. Touch the bar in between “very dissatisfied” or “very satisfied.” Touch “Next” to continue.



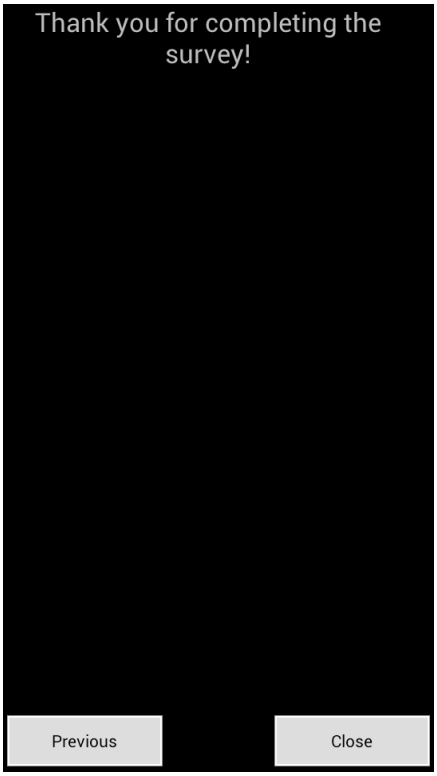
Indicate how satisfied you are with the air quality in your workspace this afternoon. Air quality includes air movement, humidity, and freshness. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.



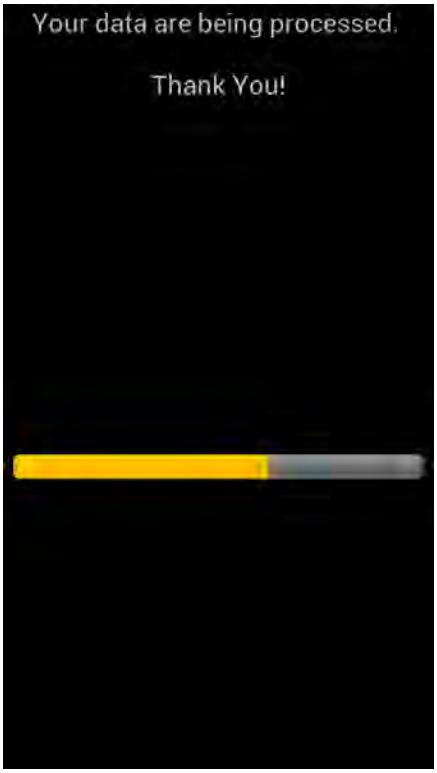
Indicate how satisfied you are with the temperature in your workspace this afternoon. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

Indicate how satisfied you are with the noise level in your workspace this afternoon. Include in your evaluation mechanical noise and noise from conversations. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

Indicate how satisfied you are with the electric lighting in your workspace this afternoon. Do not include daylight in your evaluation. Touch the bar between "very dissatisfied" and "very satisfied." Touch "Next" to continue.



This screen signifies that you are at the end of the "End of Work Day" survey. Touch "Close" and your data will be sent to the Penn State Survey Research Center's server. You will see one remaining screen while your data are processed.



This final screen appears while your data are transferred to the server. This screen automatically closes and resets the application to the first screen. You do not need to worry about a bad connection or an interruption in transferring the data. All data are stored on the phone and if there is an interruption in data transfer or you have a bad connection the data transfer will be initiated again when the next survey is activated.

Frequently Asked Questions

FAQs pertinent to the study participation issues

How much compensation will I receive?
Your name will be entered into drawings for five $100 gift cards. Your chances of winning will be increased based upon the number of surveys that you complete. Each survey completed correctly will equate to another name entry. Total payments within one calendar year that exceed $600 will require Penn State University to report these payments to the IRS annually. This may require you to claim the compensation that you receive for participation in this study as taxable income. If one person wins a combined total of more than $300, payment must be made by check and the winner will need to provide his/her Social Security number.

How long will this study last?
Plug load energy consumption data will be collected for 7 months. You will actively participate during the first 4 weeks. You will complete short online surveys each week indicating the number of hours you occupied your office each day. Additionally, you will complete short twice daily surveys on your study smart phone for one week.

Can I use the smartphone for personal use?
No. A passcode has been installed to block the use of all applications on the smartphone, except the surveys for the present study. Study smartphones do **not** have a voice or data service plan. You will be liable for costs incurred if you hack into the applications pre-installed on the phone. Please **do not** use the smartphone for texting or calls that incur costs, such as donations to the Red Cross.

What happens if I miss a question?
A screen will appear automatically asking you if you intended to skip that question. If you intended to skip the question, select "Yes" and move on to the next question. If you unintentionally skipped the question, select "No" and you will be returned to the previous question.

How many questions can I miss?
You can miss or skip as many as you choose; however, we would like you to answer as many questions as possible. It actually takes more touches to skip questions than to answer them!

What if I forgot my phone at home for the day?
Retrieve your phone as soon as possible and resume your daily survey responses. If you forget the phone for the entire day, make sure you still fill out the "End of Work" survey at the end of the day.

What if my phone is stolen? What happens if my phone breaks? What happens if I lose my smartphone or charger?
Please call the Project Coordinator, Dena Lang, at (814) 865-5732 to discuss your next step.

What do I do at the end of the daily smart phone survey week?
The study coordinator or research assistant will pick up the study phone during the week following the daily survey week. After you complete the "End of Work Day" survey on the Friday of the survey week and your survey data has uploaded, you should turn off your phone to avoid unnecessary beeping.

What happens to my phone after I turn it in?
After you return your phone it will be reset and all personal information will be removed.

FAQs pertinent to the Smartphone related issues

What if the phone runs out of battery life and I have not completed a survey?
If your smartphone runs out of battery life, please recharge it as soon as possible and complete the survey while it is charging or after it is fully charged. Please remember to plug the phone into the charger every night so you can avoid this problem.

What if the screen "freezes" in the middle of a survey?
If the phone freezes while you are in the middle of a survey, please restart the phone by pressing the power button, and re-enter the survey from the beginning.

My phone has stopped beeping. Is something wrong with the phone?
There are a few possible reasons why the beeps are not occurring:

1. The phone battery is dead and the phone will not turn on. Please charge the phone for at least one hour and then power the phone back up.

2. The phone was powered off. This can happen if you get into the "Phone options" prompt by holding down the power button and then pressed "Power off." Please power up the phone by holding down the power button until the screen turns back on and the phone begins "rebooting".

Will beeps only work if the phone currently has Verizon service?
The beeping feature does not rely on the phone's cell service provider. The beeps will work correctly whether you currently have cell service or not.

What happens if I don't have phone service when I complete a survey? Are these data lost?
No, when a survey is completed (or "times out"), all of the data are saved on the phone, regardless of whether there is phone service or not. This means that even if a phone is not activated with Verizon, the data are still stored on the phone. These data that were saved to the phone when the phone did not have service will be sent to the server the next time a survey is completed, assuming that the phone is in a service area at that time.

Are there any cases where beep assessment data are not sent to the server even though subsequent assessment data are sent to the server?

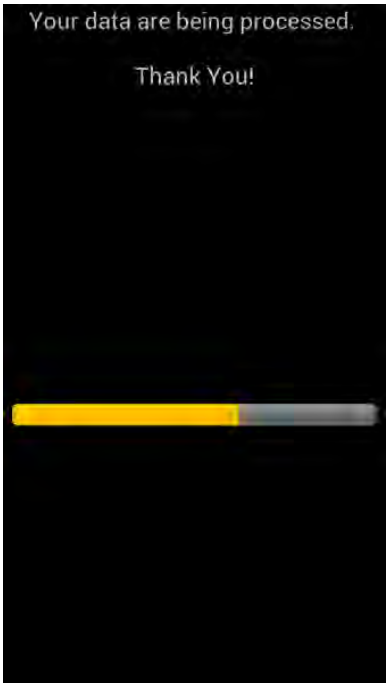
Yes. This can happen if the phone was fully powered down by the participant during times when beeps should have occurred. Assessment data (both beeped and non-beeped data) can also be lost if you power down the phone during a survey before it is completed.

What happens if the phone is fully powered down at the time a beep is expected to occur?

Beeps cannot occur and assessment data cannot be collected when the phone is turned off.

The phone is stuck on the data upload screen seen below. How do I fix this?

If the phone seems to be taking more than two minutes on the data upload screen, you will need to reboot the device. To do this, power down the phone by holding down the power button and then pressing the "Power off" option on the prompt. Wait about 10 seconds until the phone is completely off and then hold the power button down again until the screen turns on. Wait about a minute until the home screen is showing again.



If the phone was stuck on the upload screen, it is likely that the last assessment was not sent to the server. However, the data will always save to the phone's storage so the assessment was not lost. The next time the data upload screen closes successfully, the assessment that did not upload earlier should now be sent to the server.

What do I do if I receive a message asking to update the smartphone software?

You should NOT install automatic updates to software on your study issued smart phone. Android and Verizon periodically issues software updates that can be installed on the smartphone. If an automatic update request appears on the phone while you are participating in this study, you should select the option to exit the automatic update without installing it. The reason we recommend that you not install updates is that installing the update could change the appearance or function of the phone settings and programs, including the surveys.

What do I do if I receive an "Error in onCreate()" message?

This error message is likely to occur when the survey is manually launched while the phone is plugged into the USB port on a computer. If you see the error message in the figure to the right, simply touch "Close Program," unplug the phone from your computer, and manually launch the survey again.

What do I do if I receive "Cool Down" messages?

In very limited circumstances, such as where your phone has been exposed to extreme heat, you may see "Cool Down" messages. To avoid possible damage to your battery and phone, you should follow these instructions until the phone is within its recommended temperature range. When your phone is in "Cool Down" mode, only emergency calls can be made.

Questions and Concerns

For all questions or concerns about the study, a change in your participation status, or equipment issues, please contact Dena Lang, PhD., the Project Coordinator, at any of the following methods. Please note that email and voice mail will be monitored daily during the data collection for the study. When leaving a voice message, please leave a phone number where you can be reached for a response once the message is received.

Project Coordinator:
Dena Lang
Email: DenaLang@psu.edu
Office Phone: (814) 865-5732
Cell Phone: (814) 574-0104

Using Your Smartphone

How to turn on the device:

The power button for the Smartphone is located on the right edge of the device near the top. Quickly press and release this button to turn the screen on or off.

If the screen does not come on, the phone battery may be depleted. Refer to the following section "How to Charge the Smartphone".

How to charge the Smartphone:

Plug in the device and charge it **EACH NIGHT**. Connect the phone to a power outlet using the USB charger. The light above the top of the screen should remain green while the phone is plugged in.

If the battery has died, the phone needs to be connected for several minutes before it will have enough battery power to turn on again. However, it may take several hours to fully recharge the phone.

After recharging the phone, press and release the power button to turn the phone on again.

How to increase/decrease Smartphone volume:

The Smartphone contains a long sliding button on the right side of the device. Push this button up to increase the volume by one tick and pull this button down to decrease the volume by one tick.

As you alter the volume settings, you will see a popup on the screen that indicates the current volume settings on the device. This indicator also reflects whether vibration is currently enabled on the device. Note that changing the volume on the device will affect the volume of the reminder beeps.

Appendix: Additional Information on Smartphone Features

The smartphone issued to you for use during the study has been customized to meet the needs of the study and many of the applications have been disabled. Additionally, some of the following features may not be available on your study phone.

Volume & Battery

ADJUST VOLUME

Press the volume keys to change ring volume (in the home screen) or earpiece volume (during a call).

When playing music or video files, press the volume keys to adjust media volume.

ROTATE THE SCREEN

When you turn your smartphone, the touchscreen can rotate to stay right-side up:

Find it: Menu > **Settings** > **Display** > **Auto-rotate screen**

BATTERY TIPS

Want to extend your battery life? Try these:

- Use the Smart Actions app to manage smartphone settings and help minimize battery use. For more information, touch > **Smart Actions**, then touch Menu > **Help**.
- To turn off background data transfers, touch Menu > **Settings** > **Data manager** > **Background data**.
- To turn off Bluetooth™ power, touch Menu > **Settings** > **Wireless & networks** > **Bluetooth**.
- To turn off Wi-Fi power, touch Menu > **Settings** > **Wireless & networks** > **Wi-Fi**.

Touchscreen

TOUCHSCREEN ON/OFF

Your touchscreen is on when you need it and off when you don't.

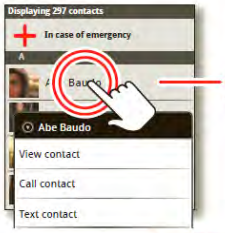
- To make your touchscreen sleep or wake up, just press Power.
- When you hold the smartphone to your ear during calls, your touchscreen sleeps to prevent accidental touches.
- To change how long your smartphone waits before the screen goes to sleep automatically, touch Menu > **Settings** > **Display** > **Screen timeout**.
- To make the screen lock when it goes to sleep, see "**SCREEN LOCK**" on page 53. To unlock the screen, press Power, then drag to the right.

Note: Your touchscreen might stay dark if the sensor just above it is covered. Don't use covers or screen protectors (even clear ones) that cover this sensor.

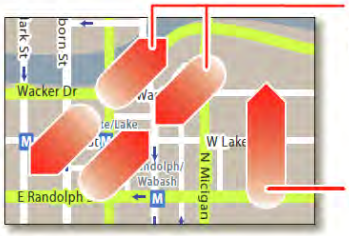
TOUCH TIPS

It's all in the touch:

- **Touch:** Choose an icon or option.
- **Touch & Hold:** Show options.
- **Drag:** Scroll or move slowly.
- **Flick:** Scroll or move quickly.
- **Zoom:** Slide fingers apart or together to zoom in or out on Google Maps™, web pages, or photos.



Touch & hold to show options.



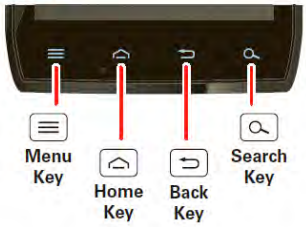
Slide two fingers apart or together to zoom in or out.

Drag or flick to scroll.

KEY TIPS

MENU, HOME, BACK, & SEARCH

Touch Home to close any menu or app and return to the home screen. In the home screen, touch and hold Home to show the most recent apps used, then touch an app to open it.



Touch Menu to open menu options.

Touch Back to go back.

Touch Search for text search, or touch and hold for voice search.

POWER KEY MENU

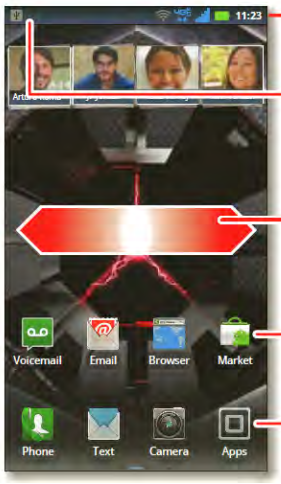
Press and hold Power to open the power key menu, where you can turn off your smartphone (**Power off**), turn off all wireless connections and put the phone into low-power **Sleep** mode, or turn **Airplane mode** or **Silent mode** on and off.

HOME SCREEN

quick access to the things you need most

QUICK START: HOME SCREEN

The *home screen* gives you all your latest information in one place. It's what you see when you turn on the smartphone or touch Home from a menu. It's basically like this:



Phone Status Bar

Notifications
Drag this bar down to see details.

Flick left or right to see more panels of widgets & shortcuts.

Shortcuts
Touch to open.

Open the app menu.

Note: Your home screen might look a little different.

The home screen extends left and right to give you more room for adding shortcuts, widgets, and more. Flick the home screen left and right to see more *panels* or to add widgets or shortcuts.

Tip: From the home screen, touch Home to see thumbnails of the five home screen panels. Touch a thumbnail to go to the panel.

USE & CHANGE YOUR HOME SCREEN

On your home screen, *shortcuts* are icons that open your favorite apps, web bookmarks, contacts, mail labels, or music playlists. *Widgets* show you news, weather, messages, and other updates.

To see other panels of shortcuts and widgets, flick the home screen left or right. Or, touch Home and touch a thumbnail to go to the panel.

- To **open** something, touch it. Touch Home to return to the home screen.

  Tip: When you open a widget, touch Menu to see any options or settings (you can choose accounts for

Common Symbols

	network (full signal)		3G (fast data)
	network (roaming)		4G (fastest data)
	network (no connection)		GPS active
	Wi-Fi in range		Wi-Fi connected
	Bluetooth™ on		Bluetooth connected
	USB connected		sync
	downloading		warning
	active call		missed call
	airplane mode		microSD card
	new text message		alarm set
	new email		calendar
	new voicemail		music
	vibrate		speakerphone on
	sound off		call mute
	battery (charging)		battery (full charge)

Notes Page/Suggestions and Questions:

The EEB Hub and Penn State would like to thank you for your participation in the Energy Sensor Study at PPPL!

PENNSTATE 1855

Princeton Plasma Physics Laboratory

Energy Chickens Study

eebHUB Energy Efficient Buildings Hub

Energy Efficient Buildings Hub,

a U.S. DOE Energy Innovation Hub led by

The Pennsylvania State University.

STUDY MEMBER GUIDE

Visit us on the web! http://www.eebhub.org/

Table of Contents

Introduction to Study

Welcome to the Energy Chickens Game being debuted at the Princeton Plasma Physics Laboratory (PPPL) by researchers at The Pennsylvania State University in collaboration with researchers at the Princeton Plasma Physics Lab, Carnegie Mellon University and the Polytechnic Institute New York University. This research project is part of the U.S. Department of Energy's Energy Efficient Buildings Hub (EEB Hub).

Your participation in the Electricity Outlet Sensor study had another purpose that we could not disclose to you until now, as it may have influenced your energy use. The first month of using the outlet sensors was to capture your typical energy usage for appliances and equipment in your office. This was the first phase of a larger study. Phase two comprises a structured program aimed at reducing plug load energy consumption. The purpose of the program is to encourage you to develop energy saving behavior by using a social-media oriented game-like interface "Energy Chickens" that provides an opportunity to visualize your energy consumption.

Energy Chickens works as a virtual pet/game that references your actual energy consumption habits. You are given virtual chickens, each representing an appliance or piece of equipment in your office. If you reduce your energy consumption for a specific device that chicken will begin to grow larger, laying more and more eggs that can be collected and traded for accessories for your farm. If you use more energy the chicken will become sick and will not lay eggs. Energy Chickens does not require a large time commitment. You are encouraged to check on your chickens just once a day, but this usually takes less than a minute.

Thank you for your contributions to this study!

Sincerely,

Brian Orland, Principal Investigator & Dena Lang, Ph.D., Project Coordinator, with investigators Kevin Houser, Ph.D., Nilam Ram, Ph.D., Joshua Smyth, Ph.D., & the Research Team at the Pennsylvania State University.

Contact information

If at any time throughout the study you have any questions or concerns, please feel free to call our Project Coordinator, Dena Lang. We are best able to answer questions between 8 AM and 7 PM. If we are unable to respond to your call immediately, please leave a message with your phone number so that we can respond as soon as possible.

Dena Lang, Ph.D.
Office telephone: (814) 865-5732
Cell phone: (814) 574-0104
Email: DenaLang@psu.edu

Office Address:
Dept. of Landscape Architecture
105B Stuckeman Family Building
The Pennsylvania State University
University Park, PA 16802

Mailing Address:
Dept. of Landscape Architecture
121 Stuckeman Family Building
The Pennsylvania State University
University Park, PA 16802

Informed Consent

The Pennsylvania State University

Title of Project: Energy Chickens Game Study

You are being asked to participate in a research study for the Department of Energy's Energy Efficient Buildings Hub (EEB Hub) at the Philadelphia Navy Yard. This study is being conducted by researchers at The Pennsylvania State University in collaboration with researchers at the Princeton Plasma Physics Lab, Carnegie Mellon University and the Polytechnic Institute New York University; however, it is part of a larger project conducted by the EEB Hub. The EEB Hub is made up of a number of universities and companies from industry. While any identifiable information from this particular study will only be accessible to the principal investigator and project coordinator listed below, other partners on the larger project may access de-identified data.

1. **Purpose of the Study:** We are conducting a research study in your building to evaluate an interface (Energy Chickens Game) designed to help reduce plug load electricity energy usage in commercial office buildings. Plug loads refer to the energy used by plug-in devices in the office. The study is evaluating different ways to promote energy saving and if and how the office environment affects individuals' productivity, mood and well-being.
2. **Procedures to be followed:** Sensors will be used to measure the electricity use of the equipment and appliances in your office and common areas. Each appliance/equipment will plug into a sensor and the sensor will plug into the wall outlet or power strip. The Energy Chickens Game uses the electricity consumption data and makes comparisons of your daily consumption to your baseline consumption that was measured prior to the start of the Energy Chickens Game (during the "Electrical Outlet Sensor Study"). To play the game you will be asked to log into your Energy Chickens account once a day to check on the health of your chickens. This should take less than a minute per day. (Please refer to the Energy Chickens Game Training Manual for a complete overview of the game.) You will be asked to complete several surveys throughout the study. Some of the surveys will be administered on the web and others will be administered using smart phones provided for your use during the study. You may refuse to answer any questions you feel are intrusive.

   Prior to the start of the Energy Chickens Game:

   - At the beginning of the study you will be asked to complete an initial survey where you provide demographic information and information about the furnishings and lights in your working space, and your general perceptions. The initial survey will take about 10-15 minutes to complete.

   During the Energy Chickens Game (about 3 months in duration):

   - During one week of each month, you will be asked to complete brief twice daily surveys (prior to lunch and at the end of the work day) about your mood, productivity, perceptions of the lighting, and how you interacted with the energy chickens game. These surveys take about one or two minutes to complete and will be administered on a smart phone (3 weeks total).

After the Energy Chickens Game:

- You will also be asked to complete a Post- Energy Chickens survey that will take about 10-15 minutes to complete.
- 2-3 months after the end of the Energy Chickens game, you will be asked to complete the twice daily surveys for a final week.

3. **Statement of Confidentiality:** All information will remain secure, confidential and will not be shared with your employer. Personally identifying information will be deleted immediately at the conclusion of the study and once compensation is delivered.

   Identifying information will be collected from participants to: (1) identify physical office location and (2) to contact you if you win the compensation drawing. Actual participant generated survey data will only be identified by a random id number. During the collection of the electricity consumption data, the data will include your office number and will be accessible to the principal investigator, study coordinator, and research assistants. This is required to monitor data collection to ensure that the sensors are working properly and to trouble shoot if any problems occur. Once the data collection is complete, office numbers will be replaced with random ID numbers. When completing surveys online please note that your confidentiality will be kept to the degree permitted by the technology used. No guarantees can be made regarding the interception of data sent via the Internet by any third parties.

   For the collection of the daily smart phone survey data, a separate random ID will be assigned to each participant. The only key linking participants to both random ID numbers will be maintained and secured in locked file cabinets and/or in password protected computers by the principal investigator, Brian Orland, and the study coordinator, Dena Lang, to ensure that no other research staff has access to this information.

   Penn State's Office for Research Protections, the Institutional Review Board, and the Office for Human Research Protections in the Department of Health and Human Services may review records related to this project.

4. **Discomforts and Risks:** There are no foreseeable discomforts or risks to participation in this study.
5. **Benefits:** There are no direct benefits to you, but you may find it interesting to learn how much energy your appliances and equipment use and in some similar studies participants have used the daily surveys to increase their self-awareness and found them rewarding. The benefit to your employer is the potential for energy use reduction. The benefits to society include increasing our understanding of the energy use behavior associated with plug load equipment and appliances in a commercial office setting.
6. **Right to Ask Questions:** If you have any questions, complaints, or concerns about this research, feel free to contact the following. You can also call these individuals if you feel this study has harmed you.

   Principal Investigator: Brian Orland, 121 Stuckeman Family Building, University Park, PA 16802

   Tel: 814-865-6315, Email: brianorland@psu.edu.

   Research Coordinator: Dena Lang, 121 Stuckeman Family Building, University Park, PA 16802

   Tel: 814-865-5732 or Email: DenaLang@psu.edu

If you have any questions, concerns, problems about your rights as a research participant or would like to offer input, please contact The Pennsylvania State University's Office for Research Protections (ORP)

at (814) 865-1775. The ORP cannot answer questions about research procedures. Questions about research procedures can be answered by the research team.

7. **Voluntary Participation:** Your decision to be in this research study is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer. Refusal to take part in or withdrawing from this study will involve no penalty or loss of benefits you would receive otherwise.
8. **Compensation:** Participants will receive compensation depending on their level of participation with a maximum of $75. You will receive $10 each for the pre- and post- 10-15 minute surveys. You will also receive $10 each week that you complete at least 8 of the 10 daily surveys within a two hour time period from the scheduled smart phone reminder. If you complete the pre- and post- surveys and at least 32 of the 40 daily surveys within the two hour time period you will receive an additional bonus of $15. This means you could receive a total of $75 for participating in both web-based and daily smart phone surveys. If you choose to end your participation early, you will receive prorated compensation, regardless of whether you complete the study. For example, if you participate in the initial survey, and one week of daily surveys, before leaving the study, you will receive $20.

   Please note: Total payments within one calendar year that exceed $600 will require the University to report these payments to the IRS annually. This may require you to claim the compensation that you receive for participation in this study as taxable income. In order to receive your compensation, you will be required to complete a Penn State Visit form and provide your social security number.
9. **Eligibility to Participate:** To be eligible to participate in this study, you must be at least 18 years of age, work at least half time in the study building, and have participated in the Electrical Outlet Sensor Study that collected baseline energy usage data.

If you agree to take part in this research study as outlined above, please provide your first and last name and give your informed consent below.

Name: _____ _____

First Name Last Name

Informed Consent* ☐ I consent.

* Please indicate if you consent to participate in this study by checking the consent box. Then provide your contact information below. Completion and submission of this survey implies your consent to participate in this research.

If you do not consent, please exit the questionnaire now.

Please provide your contact information:

Office Address (Office/Cubicle #): _____

Work Phone: _____

Email: _____

Please print off or keep a copy of this form for your records.

This informed consent form was reviewed and approved by The Pennsylvania State University's Institutional Review Board (IRB# 39795, Doc. #1003) on 09/05/2012. It will expire on 09/04/2013. (J. Mathieu).

Study Overview

During the first week of the study you will be emailed a website link to an online survey. This survey includes questions related to demographics and more extensive assessments of the indoor environment and your health, well-being and productivity. The baseline survey will take about 10 minutes to complete.

After two months of engagement with the Energy Chickens game, you will take a second web based survey with similar questions as well as an opportunity to evaluate the Energy Chickens game.

Throughout the Energy Chickens study you will take 4 weeks of twice daily surveys that are very similar to the surveys that you took during the Electricity Outlet Sensor study. The survey weeks are October 22-26, November 12-16, December 18-22, and March 18-22 (Figure 1). If you will be out of the office during the scheduled daily survey weeks, the study coordinator, Dena Lang, will make alternate arrangements for you to complete the daily surveys upon your return to your office.

Energy Chickens Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1-Oct	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			
				1-Nov	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	
						1-Dec
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
					1-Mar	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Smart Phone Surveys
Pre-Energy Chickens Game Web Survey
Post-Energy Chickens Game Web Survey

Figure 1: Energy Chickens study timeline.

Survey Beep Schedule

The survey phone is currently set to the beep schedule that you chose for the Energy Sensors study. If you would like to change the schedule you can do so at this time.

Please select one of the following schedules that best fits with your work day.

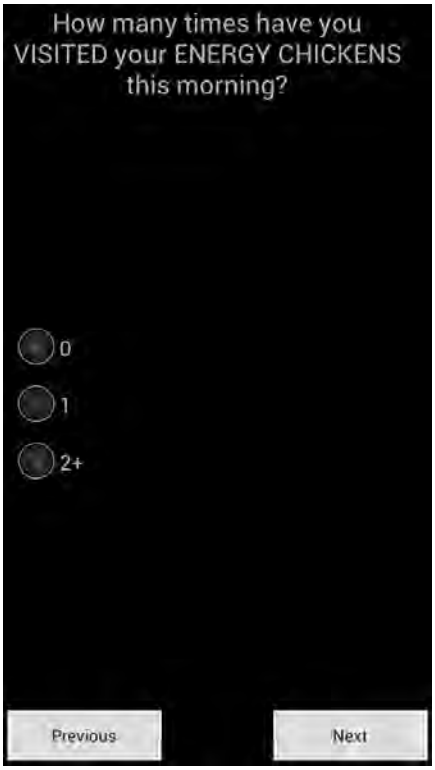
Smart Phone Beeping Schedule Selection:	**Before Lunch**	**End of work day**
1)	11:00 am	4:00 pm
2)	11:30 am	4:30 pm
3)	12:00 pm	5:00 pm
4)	12:30 pm	5:30 pm
5)	1:00 pm	6:00 pm

Record your selection here: _____.

Additional Before Lunch Daily Survey Questions

The before lunch daily survey will include all of the questions from the Electricity Outlet Sensor Study as well as three additional questions related to the Energy Chickens game:

Indicate how satisfied you feel about the health of your energy chickens this morning. Touch the bar in between "very dissatisfied" and "very satisfied." Touch "Next" to continue.



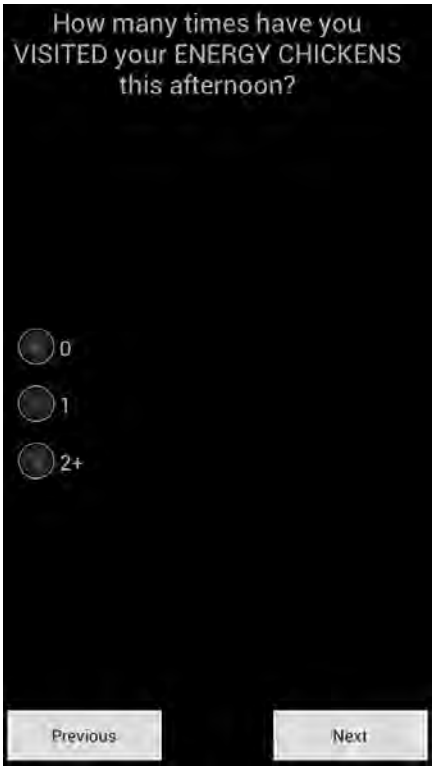
Indicate how many times you have visited your energy chickens this morning. Touch "Next" to continue.

Indicate how satisfied you feel about your energy use this morning. Touch the bar in between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

Additional End of Work Day Daily Survey Questions

The end of work daily survey will include all of the questions from the Electricity Outlet Sensor Study as well as three additional questions related to the Energy Chickens game:

Indicate how satisfied you feel about the health of your energy chickens this afternoon. Touch the bar in between "very dissatisfied" and "very satisfied." Touch "Next" to continue.



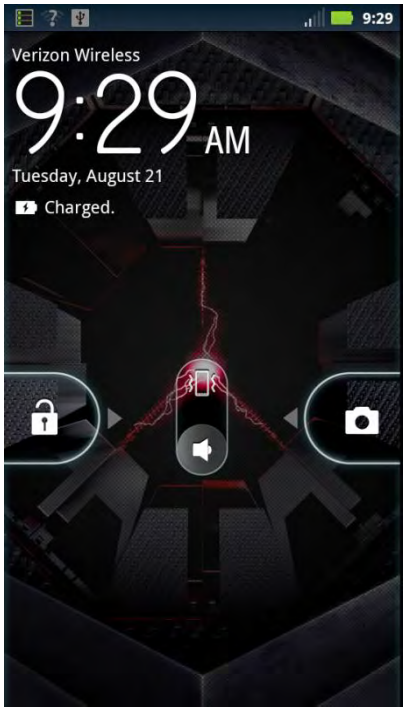
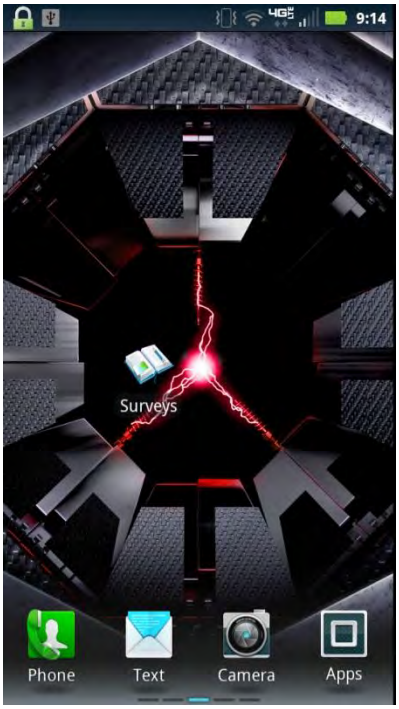
Indicate how many times you have visited your energy chickens this afternoon. Touch "Next" to continue.

Indicate how satisfied you feel about your energy use this afternoon. Touch the bar in between "very dissatisfied" and "very satisfied." Touch "Next" to continue.

How to Manually Launch a Missed Daily Surveys

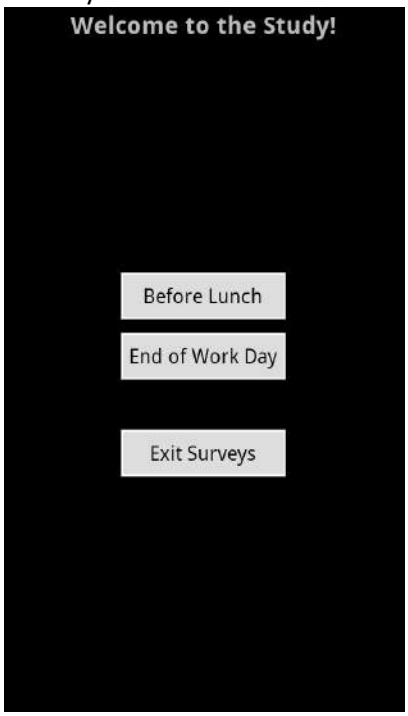
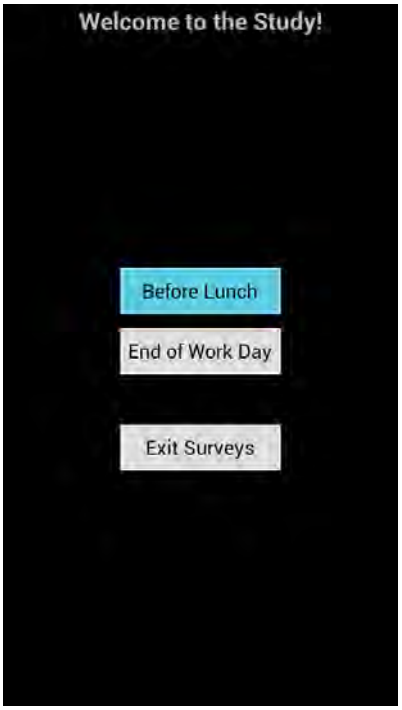
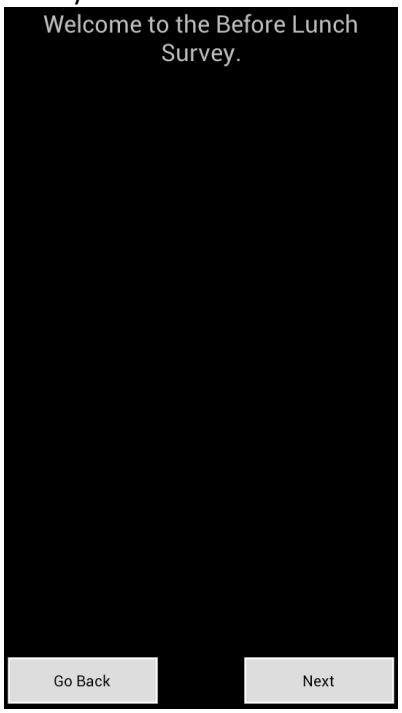
If you are unable to complete either the “Before Lunch” or “End of Work Day” survey before it times out you can manually launch the survey at a more convenient time. Turn on your smart phone using the power button located at the top right of the device. Quickly press and release this button to turn on the display. The screen shown in Table 3a is the primary screen you see on your phone when you first turn it on. To obtain access to the home screen, lightly touch the padlock symbol on the left side and slide your finger gently to the right. As you unlock the phone the display will change to the screen in Table 3b. When the phone is unlocked you will see the home screen shown in Table 3c.

Table 1: Manual Launch of Daily Surveys.

a) Phone display when phone is first turned on.	b) Phone display as you unlock the phone.	c) Home screen with survey folder in the middle of screen.
		

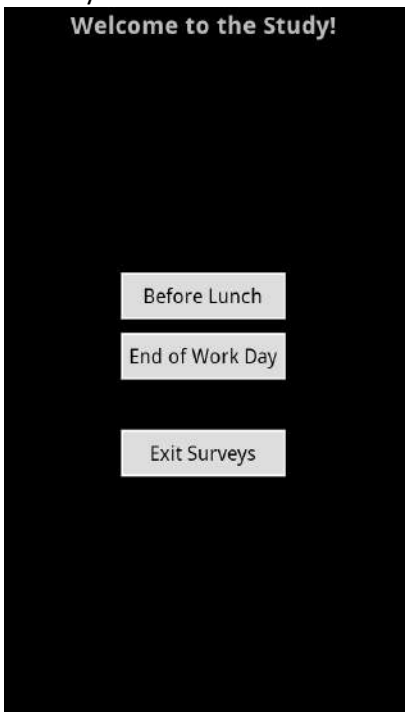
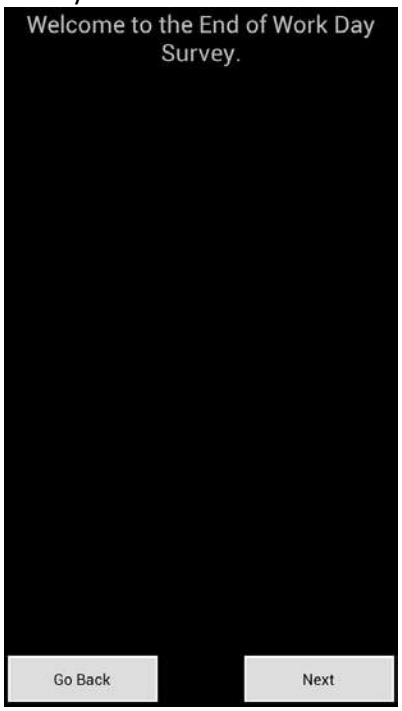
To manually launch the surveys, touch the “Surveys” folder icon in the center of the home screen. Once you touch the “Surveys” folder the “Welcome to the Study” screen will be displayed (Table 4a). To take the Before Lunch survey, touch “Before Lunch” and the display will briefly change to 4b and then progress to “4c”. Please check your selection, if you do not see the “Welcome to the Before Lunch Survey” you can select “Go Back” to return to the previous screen and correct your selection. To enter the “Before Lunch” survey touch “Next” in the bottom right corner of screen “c”.

Table 2: Selecting Before Lunch survey when manually launching surveys.

a) Screen display after touching “Surveys” icon.	b) Survey selection screen.	c) Welcome to the Before Lunch Survey screen.
		

To manually launch the "End of Work Day" survey, touch the "Surveys" folder icon in the center of the home screen. Once you touch the "Surveys" folder the "Welcome to the Study" screen will be displayed (Table 5a). To take the End of Work Day survey, touch "End of Work Day" and the display will briefly change to 5b and then progress to "5c". Please check your selection, if you do not see the "Welcome to the End of Work Day Survey" you can select "Go Back" to return to the previous screen and correct your selection. To enter the "End of Work Day" survey touch "Next" in the bottom right corner of screen "c".

Table 3: Selecting End of Work Day survey when manually launching surveys.

a) Screen display after touching "Surveys" icon.	b) Survey selection screen.	c) Welcome to the Before Lunch Survey screen.
		

If at any time during the study you feel you took the wrong survey or you have any questions, please contact the Project Coordinator, Dena Lang at DenaLang@psu.edu or (814) 865-5732. You will be provided the opportunity to complete all surveys correctly and completely, regardless of any error throughout the study.

Notes Page/Suggestions and Questions:

The EEB Hub and Penn State would like to thank you for your participation in the Energy Chickens Game at PPPL!

Welcome to the Energy Chickens Game

eebHUB Energy Efficient Buildings Hub

a U.S. DOE Energy Innovation Hub

led by Penn State University

USER MANUAL

Welcome to Energy Chickens!

Thank you for agreeing to participate in this game that enables you to explore, understand and modify your energy usage.

Introduction to the "Energy Chickens" Game

Energy Chickens works as a virtual pet/game that references your actual energy consumption habits. You will be assigned a flock of chickens under your care. Each chicken represents an appliance or piece of equipment in your office or shared space. Energy usage data is collected through energy sensors and accessed by the game through an online server. For several weeks prior to the start of the Energy Chickens game, energy use was monitored by tracking the energy consumption of the electrical appliances and equipment in your office and shared space. This data is then used by the game as a baseline reference. Throughout the duration of the game, you will be encouraged to save energy by turning off appliances and equipment when they are not in use. Energy usage during the game will be compared to the baseline data. If energy consumption for a specific device is reduced, that chicken will begin to grow larger and lay more eggs that can be collected and traded for accessories on your farm. But chickens need to be watched closely! If more energy is used compared to baseline data, chickens will become sick and will not lay eggs (Figure 1).

Figure 1: Health stages of your energy chickens.

Physical Appearance of the Energy Chickens

- Each appliance or piece of equipment is represented in the game by an "energy chicken".
- With each appliance, as you save energy your chickens grow and become healthier. As more energy is consumed, chickens begin to get smaller, turn green, and become sick and lethargic. There are 3 growing/sick stages or "levels" and the size and health of the chicken determines the number of eggs that it will lay. (Table 1).
- A chicken moves up or down a level(s) after 3 consecutive days of energy saving or over consumption (Table 2).
- Each day when you log into the game, chickens will enter the barnyard, their status will be updated, and their appearance will change accordingly. When the chicken upgrades/downgrades, you can see the process happen (it will look like the chicken is growing/shrinking on the screen when you first log in each day).

Appearance of Energy Chicken is tied to energy saving and energy consumption.				
Level -2	**Level -1**	**Baseline**	**Level +1**	**Level +2**
				

Table 1. Energy Chicken Levels

Changing Levels Within the Game		
Each day, energy consumption is compared to the baseline data. For each chicken, if the energy usage has decreased the chicken will receive a  and if energy usage has increased the chicken will receive a  .		
1 day of energy saving:		
3 consecutive days of energy saving:		Energy chicken moves up 1 level
1 day of increased energy use:		Energy chicken's cheeks begin to turn green
3 consecutive days of increased energy use:		Energy chicken moves down one level

Table 2. Energy Chicken Level Changes

How to Play the Game: "Energy Chickens"

Energy Chickens User Login

The first step is to log in to the game. Energy Chickens works via an Internet browser using the following link: seriousgames.psu.edu/energychickens. The link and your unique 4 digit numerical login pin that you use to play Energy Chickens are in your participant pamphlet. When you first visit the energy chickens website you will see this login page:

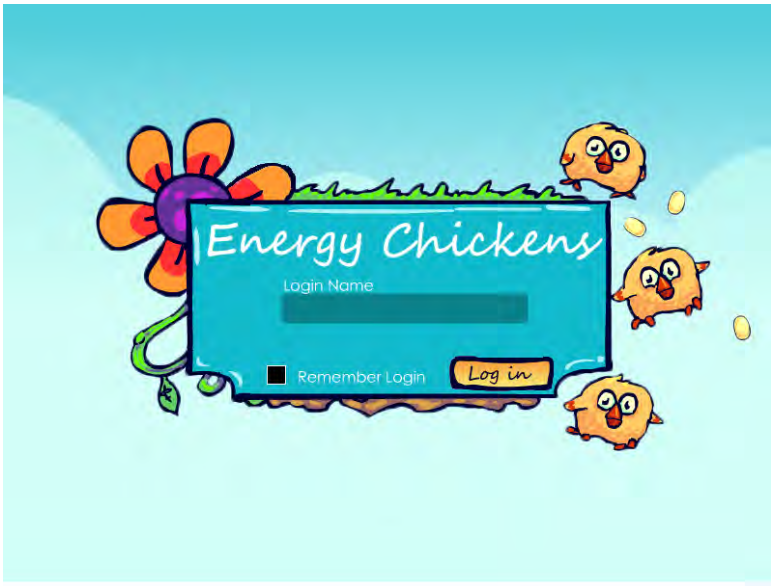


Figure 2. Energy Chickens Login Screen.

You login using your pin, and to make life easier as you check on your chickens' progress you can **check the black box**, "Remember login".

Procession of Chickens into Your Farm Yard

Next, one by one with each click of the mouse you will see a chicken slide across on the display for each individual plug-in appliance that is assigned to you. Each chicken that appears will display how much energy was used or saved during the previous day each chicken will tell you whether it used more or less energy over the past day, relative to the baseline energy use that was collected prior to the start of the game (Figure 3). Your average energy use will determine how many eggs your chickens lay, and thus the rewards you earn. You can **click to continue and examine the energy use of each appliance** that is assigned to you.

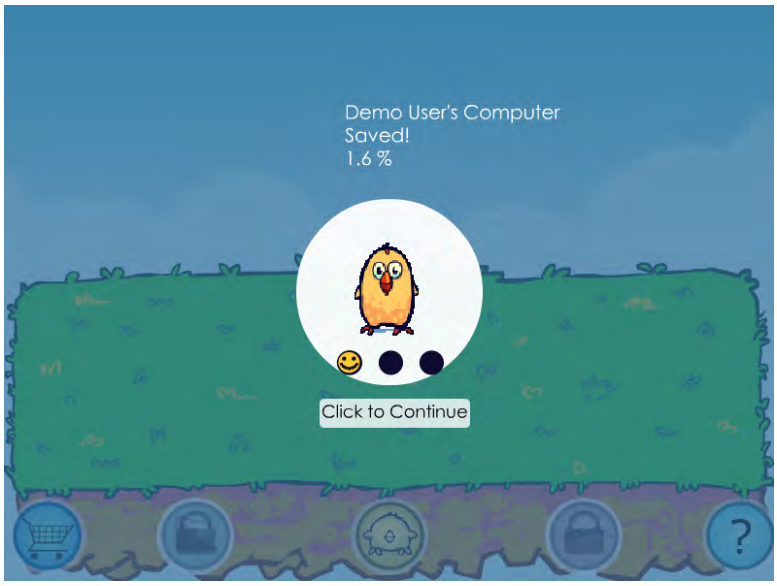


Figure 3. Energy Chicken screen for a typical appliance/equipment.

As **each device is clicked through**, the amount of energy saved for that device over the previous day is displayed as % change as well as represented by a sad or smiley face below the chicken to show cumulative days, up to 3, of energy saving or over-use. A chicken moves up or down a level(s) after 3 consecutive days of energy saving (3 smiley faces) or over consumption (3 sad faces).

After all the devices have been clicked through, the amount of eggs that were laid over the previous day is displayed (Figure 4). The user again **clicks to continue** through to the next screen.

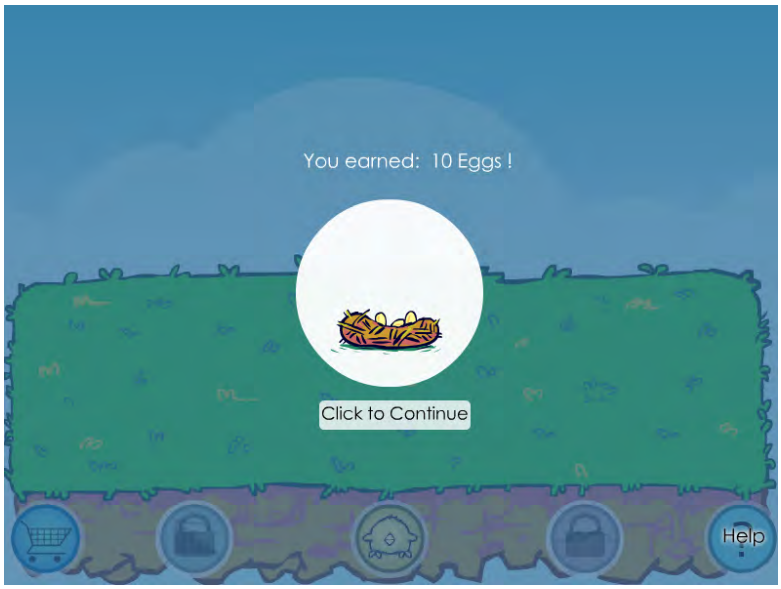


Figure 4. Energy Chickens nest with total eggs earned over the last day.

After the next click, a screen will be displayed that shows the device for which you were able to save the most energy as well as the overall energy saved during the time since you last logged in (Figure 5). The user should then **click to continue.**

Figure 5. Summary screen.

NOTES:

1. You'll have a chance to verify that your chickens are correctly assigned to your electrical appliances before the game starts. Your assigned appliances are also listed in your participant pamphlet. During the course of the game, if it is necessary to relocate, disconnect or replace any of your appliances please let us know so that you don't get cheated out of the eggs you should earn.

2. During baseline data collection we corrected for weekends and vacation days and other widespread anomalies. We will continue to correct for such anomalies as the game continues to ensure you are rewarded appropriately.

   If you experience any problems please contact the project coordinator: Dena Lang, DenaLang@psu.edu, 814-865-5732.

Congratulations, you are now the care-giver for a small flock of chickens anxious to lay eggs as you save energy. As you gain eggs you'll be able to keep track of your improving energy use, and also use the eggs you earn to buy hats for the chickens or make improvements to the barnyard.

Energy Chickens Home Screen

Next, you will be on the energy chickens home screen (Figure 6), which will allow you to collect your eggs and to **click on the chickens** to display current energy usage and other information about your chickens.

Collecting Eggs

The chickens lay eggs just once a day. You can check on them once a day or let them go for a day or two without checking but if you do not collect your eggs for that day you will miss out on them. They keep on laying as long as you keep saving energy. **Clicking on the nest** will collect all of the eggs for the day, making them appear in the score tally window at the top right. The Score is a count of all the eggs you have earned over the course of the game. "Eggs" is the number of unspent eggs you have – eggs you can use to buy accessories for your chickens and barnyard.

Figure 6. Energy Chickens home screen.

Information Window for Each Energy Chicken

When you click on a chicken, an information window will be displayed:

- The first line in the info window displays the percentage of energy saved. The energy consumption for the past day is compared to the baseline data to determine whether or not energy was saved.
- The second line shows the current energy usage for that appliance (in watts (W)). Occasionally, the real time usage will not be available and in that case a message will be displayed asking the participant to check back in a few minutes. If an appliance is turned off at the time of starting the game that chicken will be sleeping.

- The third line shows the chicken's level or "size". The chickens will begin at level 0. **If you save energy three consecutive days in a row the chicken will level up and it will grow and lay more eggs, which allows for the purchase of more accessories**. If more energy is consumed than average for three consecutive days the chicken will level down making it sicker. Smiley faces at the bottom of the window indicate how many days in row the participant has saved energy and sad faces indicate over-consumption days compared to the baseline data.

Game Buttons

There are currently 5 buttons along the bottom of the Energy Chicken game screen, not all of these buttons are available at the start of the Energy Chickens game. Features that are locked appear translucent. As you progress in the game more features are unlocked.

Using Eggs to Purchase Chicken and Barnyard Accessories

As soon as you have earned enough eggs you can buy accessories for your farm by clicking on the shopping cart button in the lower left corner of the screen. When the **shopping cart button is clicked**, two other icons will pop up, which allow you to use your eggs to purchase items to accessorize their farm and chickens. The hat icon allows you to purchase different hats to accessorize your chickens, and the flower icon allows you to purchase flowers and other items to accessorize your barnyard. If you put the mouse over each hat you will see its name and price. Eggs can be used to purchase hats by clicking on the hat and then clicking on your chicken.

When the **hat icon is clicked**, the hat store will be displayed (Figure 7). There are numerous different hats that may be purchased, all of which have different prices. In this example the fez has been selected, a less expensive hat. Other hats include the sailor hat for 30 eggs or the cowboy hat for 50 eggs. To purchase a hat, click on it and then on the chicken you wish to have the hat, or click and drag the hat into place

Figure 7. Hat store.

When the flower icon is clicked, the barnyard improvement store will be displayed (Figure 8). There are numerous different accessories that may be purchased, all of which have different prices. Flowers and fence posts are modestly priced; fruit bushes and gnomes are more costly. The store inventory will be expanded as the game gets further advanced. You will have the opportunity to purchase more advanced and interesting accessories as a way to personalize their farms. To purchase a flower or gnome, click on it and then on the location in the barnyard for the accessory, or click and drag it into place.

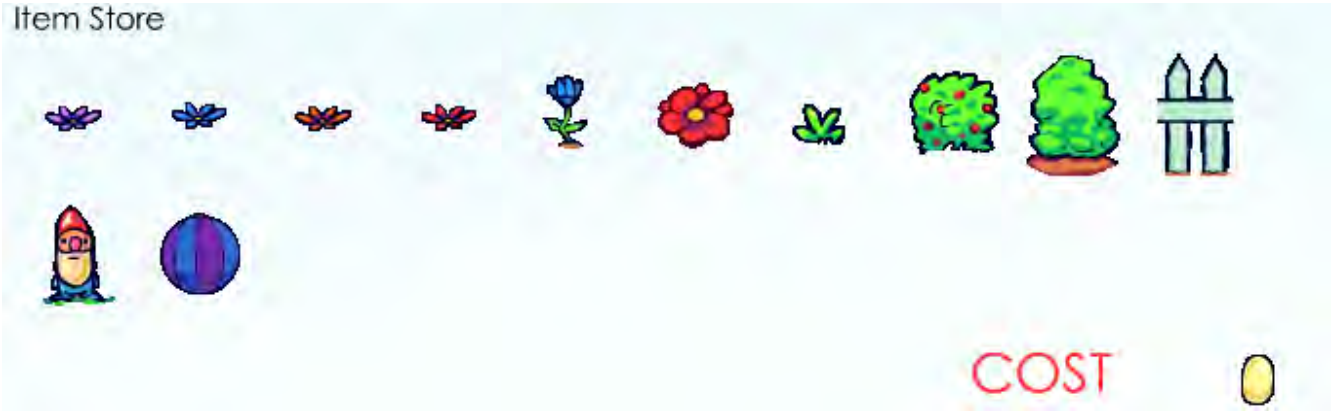


Figure 8. Barnyard improvement store.

The home button, which **can be clicked at any time,** resets everything on the screen, and returns the user to the home screen. You can also click this button to collect your eggs for the day instead of clicking the nest.

Clicking the question mark (help button) allows you to get tutorials/other important information about using energy chickens.

Additional Features for Successful Barnyard Managers

After successfully achieving a specific score, the "Graph" and "Mountain View" buttons become active. The graph button gives Energy Chicken participants a graphical representation (Figure 9) of their energy usage, as well as the energy usage of other people in the office with various time increments (hourly, daily, weekly, monthly). Only the energy usage data is presented, participant identification is not displayed in the graph.

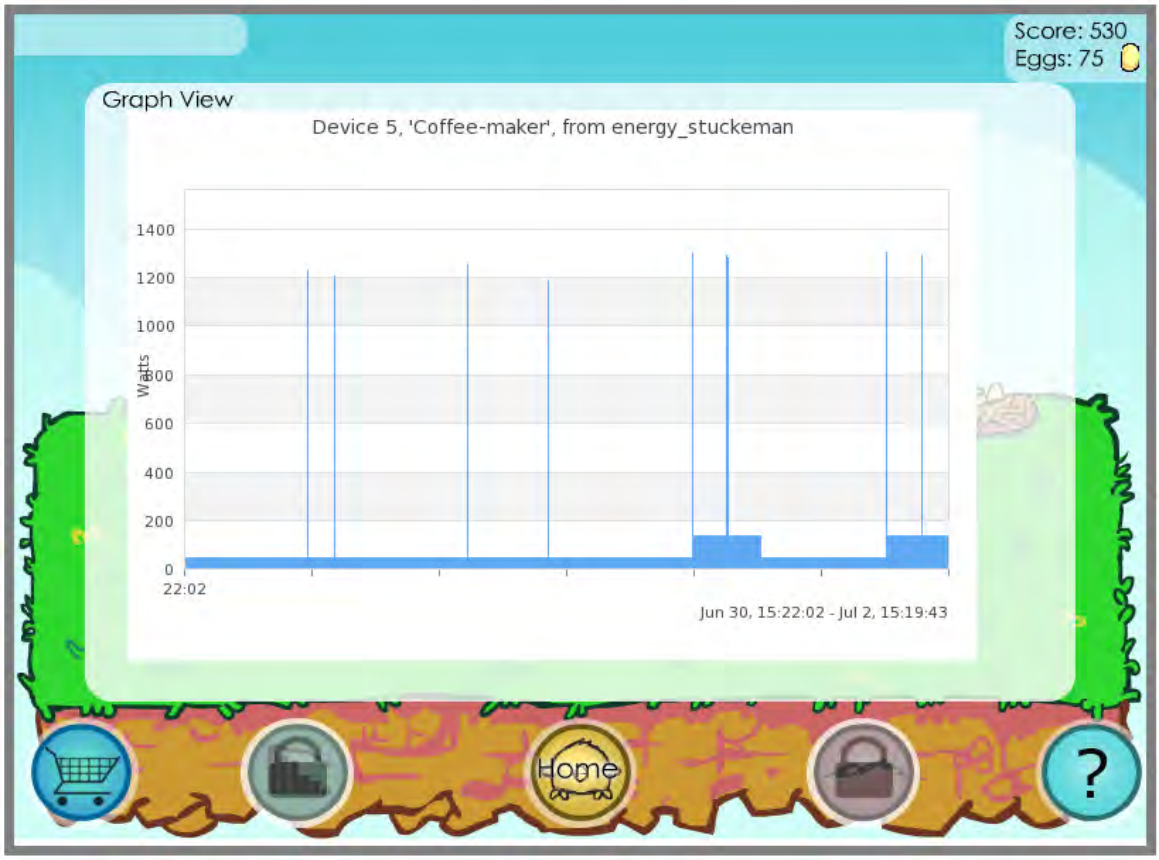


Figure 9. Graphical representation of the energy consumption of an appliance.

The mountain button allows you to zoom out to see different views ranging from your own farm to all of the chickens from the farms of other participants on the same mountain (in your group) (Figure 9), or a mountain range with several mountains (several different groups). There is no interaction with the chickens in this level, just the ability to view how other chickens are doing. Your identification is not provided, only the energy consumption data is displayed to allow participants to compare their energy usage with that of other participants.

Figure 10. Mountain view (team view).

That's it! That is all there is to energy chickens, enjoy the game, and save energy!

PENNSTATE

Behavioral Intervention (Energy Chickens)

eebHUB Energy Efficient Buildings Hub

Energy-Efficient Buildings Hub

a U.S. DOE Energy Innovation Hub

led by Penn State University.

PLUG LOAD ENERGY CONSERVATION AWARENESS CAMPAIGN