Does information feedback from in-home devices reduce electricity use? Evidence from a field experiment
Online Appendix

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Figure A1: Concept picture of the Tapestry building

Source: Image from Jonathan Rose Companies.

**Figure A2: Tapestry building location in East Harlem**

Source: Google maps.

Figure A3: Each apartment unit's attributes

refrigerators	provided, EnergySTAR (though models vary)
dish washers	provided, EnergySTAR (though models vary)
microwaves	provided only in market-rate units
heating / air conditioning	manual control units in living rooms and bedrooms (no programmable thermostats)
clothes washers / dryers	provided in some units only, EnergySTAR two clothes washing / drying rooms in basement (all units EnergySTAR)
lighting	hard-wired EnergyStar fixtures in common areas (living, kitchen, dining, bath, halls), switched outlets in bedrooms (i.e., residents must provide)
electricity metering	units are individually metered
natural gas metering	units are NOT individually metered

Source: study authors based on observation of Tapestry building apartments.

Figure A4: Photograph of the apartment heating and cooling system control
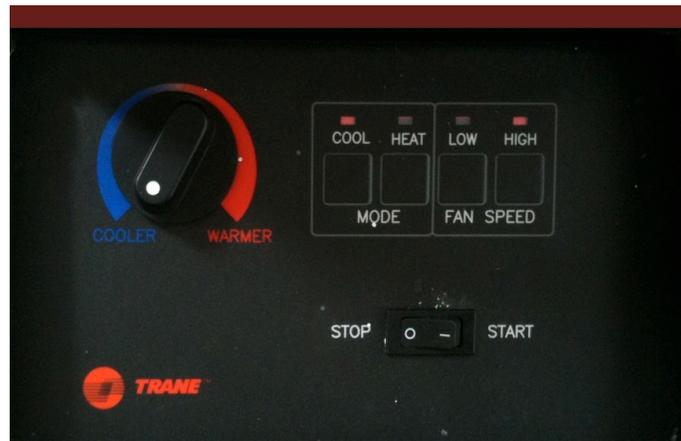
Note: The HVAC system was not connected to any Modlets given the type of system (and at the time of the experiment ThinkEco Inc. did not have a Modlet for AC units).

Source: Photograph taken in the apartment by study authors.

Figure A5: Modlet box and connection view

Source: Photographs taken by study author, Shahzeen Attari.

Figure A6: Screenshots of ThinkEco web platform
(a) Modlet home page

(b) Energy use from the mymodlet.com platform

(c) Indication when connection problems occur

SELECT ALL   SELECT NONE   ?

STATUS   LAST READING

? — - Your modlet is connected.

X — - Your modlet is temporarily not connected.

? — - Your modlet status is unknown because your gateway has not communicated with our servers in the past few minutes.

- Your device is not associated with any modlet.

(d) Example of scheduling devices

Note: devices can only be scheduled after two-week baseline period.

(e) Details on scheduling devices to go on or off

Name	StartDate	EndDate
Home plan one	11/19/2014	11/19/2015

'Always off' schedules are in effect on 0 federal holidays.

Your schedule at a glance

	12:00 am	4:00 am	8:00 am	12:00 pm	4:00 pm	8:00 pm	12:00 am
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

Customize your schedule ⓘ

		ON	OFF			ON	OFF	
Sunday	+	12:00am	End of day	−				
Monday	+	5:00am	9:00am	−	+	5:00pm	End of day	−
Tuesday	+	5:00am	9:00am	−	+	5:00pm	End of day	−
Wednesday	+	5:00am	9:00am	−	+	5:00pm	End of day	−
Thursday	+	5:00am	9:00am	−	+	5:00pm	End of day	−
Friday	+	5:00am	9:00am	−	+	5:00pm	End of day	−
Saturday	+	12:00am	End of day	−				

CANCEL   FINISHED SCHEDULING, CHOOSE DEVICES

Source: Screenshots taken by study author, Shahzeen Attari.

COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Thank you for participating in this survey! Please write as legibly as possible and answer all questions to the best of your ability. As a token of our appreciation, you will be given $10 for returning the completed forms and survey.

LIVING AT TAPESTRY

Why did you decide to move into this building? (please list all the reasons that motivated you to move here)

_____

_____

_____

What do you think it means for a building to be a "green building?" (please list everything that comes to mind)

_____

_____

_____

What are some things that you <u>like</u> about living in Tapestry? (please list everything that comes to mind)

_____

_____

_____

What are some things that you do <u>not like</u> about living in Tapestry? (please list everything that comes to mind)

_____

_____

_____

ENERGY USED BY DEVICES IN ONE HOUR

Suppose that a 100-Watt incandescent light bulb uses 100 units of energy in one hour. How many units of energy do you think each of the following devices typically uses in one hour?

Enter a number less than 100 if you think the device uses less energy than a 100-Watt bulb. Enter a number greater than 100 if you think the device uses more energy than a 100-Watt bulb. Your best estimates are fine. Please enter whole numbers with no other text (not decimals, ranges, or percent signs).

A compact fluorescent light bulb that is as bright as a 100-Watt incandescent light bulb (on)	_____
A 60-Watt incandescent light bulb (on)	_____
A desktop computer and monitor (running)	_____
A desktop computer and monitor (in sleep mode)	_____
A desktop computer and monitor (plugged in, but switched off)	_____
A laptop computer (plugged in, running)	_____
A laptop computer (plugged in, in sleep mode)	_____
A laptop computer (plugged in, but switched off)	_____
A television with rear projection (on)	_____
A cable box (on with TV off)	_____
A cable box (off by switch)	_____
A mobile phone charger (plugged in, charging a phone)	_____
A mobile phone charger (plugged in, but not charging a phone)	_____
An electric heating blanket (on)	_____
A portable space heater (on)	_____
A coffee maker (on)	_____
A coffee maker (plugged in, but switched off)	_____
A washing machine (on, with a hot wash/warm rinse cycle)	_____
A washing machine (on, with a cold wash/cold rinse cycle)	_____
An electric clothes dryer (on)	_____
One AA alkaline battery	_____

In general, how certain are you of your energy estimates above? (please check only one response)

   O   Very certain
   O   Somewhat certain
   O   Neutral
   O   Somewhat uncertain
   O   Very uncertain

USING NEW TECHNOLOGY

Imagine you are considering installing an energy monitoring system in your home that will allow you to monitor and manage energy use of every device in your home.

Please indicate how much you would like or dislike each of the following features if you were to consider using such a system in your home. (please check only one response for each device)

	Dislike very much	Dislike	Neutral	Like	Like very much
You can remotely turn any device on or off from the web	O	O	O	O	O
You can program the system to turn any devices on or off at specific times	O	O	O	O	O
You can see if you are using more or less energy than your neighbors or friends	O	O	O	O	O
You will know how much energy devices in your home are using minute-by-minute, hour-by-hour, day-by-day, etc.	O	O	O	O	O
You can access this information through a smart phone	O	O	O	O	O
On average, you can save up to 20% on your electricity bills	O	O	O	O	O
You can check if each device is functioning correctly	O	O	O	O	O
You can receive maintenance alerts for all of your devices when needed to keep them running smoothly	O	O	O	O	O
You can install the monitoring system yourself	O	O	O	O	O
You can easily move the monitoring system to a new home	O	O	O	O	O
You can turn on or off your heating and cooling system when you are not at home	O	O	O	O	O
Your monitoring system's display unit will change colors based on how much energy you are using	O	O	O	O	O
You can tell just by looking at a device how much energy it is using	O	O	O	O	O
You can always see your home's energy use on a display unit in your home	O	O	O	O	O
You can monitor your savings in terms of dollars ($)	O	O	O	O	O
You can monitor your savings in terms of electricity (Kilowatt hours, or kWh)	O	O	O	O	O
You can monitor your savings in terms of pounds of carbon dioxide emitted (CO_2)	O	O	O	O	O
You can monitor your savings in terms of acres of forests planted	O	O	O	O	O
Your electricity savings earn you points in an online game where you compete against your neighbors or friends	O	O	O	O	O

Would you want to use such an energy monitoring system in your home?
     O   Yes
     O   No

Would you buy an energy monitoring system for your home which includes all the features above?
     O   Yes   ——————————▶ How much would you be willing to spend on the system? $ _____
     O   No

BEHAVIORS

How easy or hard is it for you to recycle your household waste at Tapestry? (please check only one response)

- O Very easy
- O Somewhat easy
- O Neither easy nor hard
- O Somewhat hard
- O Very hard

What would make recycling your household waste easier at Tapestry? (please list everything that comes to mind)

_____

_____

_____

If one of your compact fluorescent bulbs (energy saving bulbs) burns out, how do you dispose of it?

_____

_____

_____

Did you know that the showerheads installed in your bathroom are low-flow (use less water than conventional showerheads)?

- O Yes
- O No

Do you like the low-flow showerheads in your apartment?

- O Yes
- O No

Do you find that you take longer showers than usual because of the low-flow showerheads?

- O Yes
- O No

Did you know that the toilets installed in your bathroom have low-flow flushes (these are dual-flush toilets that use less water than conventional toilets)?

- O Yes
- O No

Do you like the low-flow toilets in your bathroom (these are dual-flush toilets that use less water than conventional toilets)?

- O Yes
- O No

Do you find that you need to flush more than usual because of the low-flow toilets?
- O   Yes
- O   No

Do you have any comments about the low-flow showerheads and toilets?

_____

_____

_____

Which of the following are you most likely to do if your apartment is too hot or too cold? (please check <u>only one</u> response)
- O   I put up with it
- O   I open or close a window or door
- O   I change clothes (take off or put on a layer)
- O   I turn on a space heater or fan (a portable device plugged into a wall)
- O   I adjust the AC or heating (a permanent device installed in your home)

Have you ever bought <u>green electricity</u> for your current or previous home (green electricity is generated from renewable resources such as sunlight, wind, and geothermal energy)?
- O   Yes
- O   No

If you are the last person to leave your home on a cold day, do you usually leave the heater running?
- O   Yes ⟶ Why? _____
- O   No

Do you like the heating system at Tapestry?
- O   Yes
- O   No

Do you have any comments about the heating system at Tapestry?

_____

_____

_____

Do you use the green cleaning supplies available to all residents at Tapestry?
- O   Yes
- O   No
- O   Did not know they were available

How often you do engage in the following behaviors?

	Never	Not often	About half the time	Often	Always	Did not know I could
Unplug any devices in your home that are not in use	O	O	O	O	O	O
Air-dry clothes when possible instead of using a dryer	O	O	O	O	O	O
Switch off any lights that would be on all night long	O	O	O	O	O	O
Switch off any lights that would be on in an empty room	O	O	O	O	O	O
Take the stairs instead of taking an elevator (when you can)	O	O	O	O	O	O
Use only compact fluorescent bulbs instead of incandescent bulbs in your home	O	O	O	O	O	O

In the past seven days, did you have any conversations with friends or colleagues about energy or climate change issues?

- O Yes
- O No

In 2010, did you donate money to any environmental organization?

- O Yes ⟶ The organization's name: _____
- O No

How much energy do you think you use compared to the average resident at Tapestry?

- O I consume more than average
- O I consume about average
- O I consume less than average
- O I don't know

Do your friends and family expect you to turn off the lights when you are the last to leave a room?

- O Yes
- O No

Do you think it is cool to be green?

- O Yes
- O No

Do you feel guilty when you waste energy?

- O Yes
- O No

Please indicate how much you disagree or agree with the following statements:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The amount of energy I conserve will make a difference	O	O	O	O	O
I use a lot of energy in my life, so I need to conserve energy where I can	O	O	O	O	O
The benefits of conserving energy outweigh the costs of conserving	O	O	O	O	O
Many people do not conserve energy, so I need to conserve energy	O	O	O	O	O
Many people conserve energy, so I need to conserve energy too	O	O	O	O	O
No matter what other people do, I need to conserve energy	O	O	O	O	O

How often do you consider environmental impacts when considering the following purchases:

	Never	Not often	About half the time	Often	Always	Not Applicable
Renting an apartment	O	O	O	O	O	O
Renting a car	O	O	O	O	O	O
Buying a car	O	O	O	O	O	O
Buying a piece of furniture	O	O	O	O	O	O
Buying an appliance	O	O	O	O	O	O
Choosing a grocery store	O	O	O	O	O	O
Choosing what to buy at a grocery store	O	O	O	O	O	O
Ordering food at a restaurant	O	O	O	O	O	O

Do you frequently read the news online?

     O   Yes

     O   No   ————————▶   Why? _____

Do you use online banking to track your finances?

     O   Yes

     O   No   ————————▶   Why? _____

If you received online information about your energy consumption, how often would you look at it?

     O   More than once a day

     O   Once a day

     O   Once in a couple of days

     O   Once a week

     O   Once a month

     O   Never

     O   I do not have a computer to access this information

Please indicate how strongly you agree or disagree with each of the following statements:

	Completely disagree	Disagree	Somewhat disagree	Neither disagree nor agree	Somewhat agree	Agree	Completely Agree
We are approaching the limit of the number of people the earth can support.	O	O	O	O	O	O	O
Humans have the right to modify the natural environment to suit their needs.	O	O	O	O	O	O	O
When humans interfere with nature it often produces disastrous consequences.	O	O	O	O	O	O	O
Human ingenuity will insure that we do NOT make the earth unlivable.	O	O	O	O	O	O	O
Humans are severely abusing the environment.	O	O	O	O	O	O	O
The earth has plenty of natural resources if we can just learn how to develop them.	O	O	O	O	O	O	O
Plants and animals have as much right as humans to exist.	O	O	O	O	O	O	O
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	O	O	O	O	O	O	O
Despite our special abilities, humans are still subject to the laws of nature.	O	O	O	O	O	O	O
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	O	O	O	O	O	O	O
The earth is like a spaceship with very limited room and resources.	O	O	O	O	O	O	O
Humans were meant to rule over the rest of nature.	O	O	O	O	O	O	O
The balance of nature is very delicate and easily upset.	O	O	O	O	O	O	O
Humans will eventually learn enough about how nature works to be able to control it.	O	O	O	O	O	O	O
If things continue on their present course, we will soon experience a major ecological catastrophe.	O	O	O	O	O	O	O
Humans are responsible for global warming and climate change.	O	O	O	O	O	O	O
Humans do not need to change their lifestyles to address global warming and climate change.	O	O	O	O	O	O	O
My actions contribute to global warming and climate change.	O	O	O	O	O	O	O
I do not need to change my lifestyle to address global warming and climate change.	O	O	O	O	O	O	O
I am certain that global warming and climate change is really happening.	O	O	O	O	O	O	O
I cannot make a difference with regard to global warming and climate change.	O	O	O	O	O	O	O

How serious of a threat is global warming to the following groups?

	Not at all serious	Not very serious	Somewhat serious	Very serious	Don't know
You and your family	O	O	O	O	O
People in New York City	O	O	O	O	O
People in the United States	O	O	O	O	O
People in other countries	O	O	O	O	O
Plants and animals	O	O	O	O	O

If global warming will have dangerous impacts on people in the following places, when do you think it will begin to occur?

	Now	10 years	25 years	50 years	100 years	Never	Don't know
New York City	O	O	O	O	O	O	O
People around the world	O	O	O	O	O	O	O

How much do you personally worry about global warming and climate change?

- O A great deal
- O A fair amount
- O A little
- O Not at all

MATH

Please answer the following numerical questions. Please enter whole numbers or decimals with no other text (not ranges or percent signs).

Imagine that we flip a fair coin 1,000 times. What is your best guess about how many times the coin would come up heads in 1,000 flips?

_____

In the "Big Bucks Lottery," the chance of winning a $10 prize is 1%. What is your best guess about how many people would win a $10 prize if 1,000 people each buy a single ticket to "Big Bucks?"

_____

In the "ACME Publishing Sweepstakes," the chance of winning a car is 1 in 1,000. What percent of tickets to "ACME Publishing Sweepstakes" win a car?

_____

DEMOGRAPHICS

What is the approximate gas mileage of the vehicle you use most (assume your normal mix of city and highway driving)?

- O   Less than 10 miles per gallon
- O   11-14 miles per gallon
- O   15-20 miles per gallon
- O   21-25 miles per gallon
- O   26-33 miles per gallon
- O   34-40 miles per gallon
- O   41-55 miles per gallon
- O   More than 55 miles per gallon
- O   I do not know the mileage
- O   I do not own or lease a vehicle

Do you park your vehicle in the Tapestry parking lot (under the building)?

- O   Yes
- O   No
- O   I do not own or lease a vehicle

Do you use public transportation as your primary means of getting around the city?

- O   Yes
- O   No

Please write the age of every person that lives in your household:

Person 1 (you) _____
Person 2   _____
Person 3   _____
Person 4   _____
Person 5   _____
Person 6   _____
Person 7   _____
Person 8   _____

What is your sex?

- O   Female
- O   Male

How would you describe your political beliefs?

- O   Extremely liberal
- O   Liberal
- O   Slightly liberal
- O   Moderate
- O   Slightly conservative
- O   Conservative
- O   Extremely conservative

During 2010, what was your yearly household income before taxes? (your best estimate is fine)
- O Did not have an income
- O < $20,000
- O $20,000 - $50,000
- O $50,000 - $80,000
- O $80,000 - $110,000
- O $110,000 - $140,000
- O $140,000 - $170,000
- O >$170,000

What is the highest level of education that you have completed?
- O Some schooling, but no diploma or degree
- O High school diploma or GED
- O Some college
- O College degree
- O Some graduate school
- O Graduate degree

What is your apartment number?

_____

Do you have any additional thoughts about energy use or energy conservation, or any comments about the survey that you would like to share with us?

_____

_____

_____

THANK YOU! Thank you for completing this questionnaire!

[Introduction]

Hello, I am a researcher at Columbia University investigating home electricity use in the Tapestry building. We ran a study in your building that started around January of 2011, when we reached out to all apartments in the building about taking part in the study. We are doing a quick follow-up on that study and would like to ask you a few questions related to your involvement. Do you have any questions about this research effort before we begin?

Are you okay with me recording our conversation today? The recordings will help us ensure that we accurately documented your responses. These recordings will not be made public and they will be stored on a secure Columbia University server.

[Pre-screening]

1. Did you live in the Tapestry building in early 2011? Yes/No
IF YES: did you participate in this study at some point?

IF NO: Ok, Could you tell us when you moved into Tapestry?
Thank you for your time. [check for other household members]

IF YES: Great! This should only take about 5 minutes of your time. Do you have a few minutes to answer some questions now?

[Reminder and summary of informed consent]

IF NO [Request reschedule]: When would be a good time to call you back?
IF NO INTEREST IN RESCHEDULING: Ok, thanks for your time.
IF YES: Great. First I want to remind you of some details related to your participation in this study. These all were described at the beginning of the study, so I'll just provide a brief reminder. If you would like a copy of the original documentation where these points were described in more detail, just let me know.

The purpose of this study is to investigate attitudes and behaviors related to energy use. This is a brief interview and there are no foreseeable risks to participating. Do you have any questions at this point? [Move on to follow up questions]

A22

[Survey questions]

Great. We can start now:

1. When did you first move into the Tapestry building?

2. Can you describe any details of the study that was conducted in 2011 and 2012?
   Check if mentioned:
   [ ] Nothing specific
   [ ] Pizza party / info sessions
   [ ] Survey/consent packets left at apartment doors
   [ ] Filling out survey / consent forms
   [ ] Fliers in hallways / tables in lobby for survey collection
   [ ] Door hanger reminders for survey collection
   [ ] Phone contact from JRC or Think Eco about Modlet installation
           If so, when and please describe: _____
   [ ] Door hanger reminders for Modlet selection
   [ ] Modlet installations (in own apartment)
   [ ] Modlet installations (in others' apartments)
   [ ] Post-installation follow-up via ThinkEco (web access, scheduling, etc.)
   [ ] Other _____
   [ ] Other _____

   2b. Is there anything else you remember about the study?

3. Do you recall if you were contacted to have the energy feedback devices also called Modlets installed in your home?

4. Do you currently have any of these devices in your home?
   a. **IF YES:** Can you describe if and how you've used them?
   b. **IF YES:** Do you still have them?
   c. **IF YES:** Any other thoughts about the Modlets?
   d. **IF YES:** What was the installation process like?

5. Do you think differently about electricity use since the study began?
   a. **IF YES:** How so? _____

6. Do you use energy differently since the study began?
   a. **IF YES:** How so? _____

7. How often do you look closely at your electricity bill?

8. Is there anything about the study you would like the research team to be aware of?
   [ ] None

[ ] Invasive installation / process / questions
[ ] Informative
[ ] Not informative / confusing
[ ] Other

9. Do have any other comments?

A24