

ComEd Residential Energy Star Lighting Program Metering Study: Overview of Study Protocols

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Submitted to:

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Introduction

ComEd's Residential Energy Star Lighting program provides financial incentives to customers to increase the market share of Energy Star (ES) qualified compact fluorescent lamp (CFL) bulbs sold through retail sales channels. The majority of the Residential ES Lighting program is delivered upstream (at the retailer level) which minimizes the burden on consumers, thus lowering barriers to participation, but making program participant identification (and thus evaluation) somewhat difficult. The Residential ES Lighting program accounts for more than one-third of the expected ex ante MWh impacts of ComEd's 3-year energy efficiency portfolio and thus the program is very important to meeting ComEd's energy efficiency goals.

The Navigant Consulting team will soon be launching the PY3 (6/1/2010 – 5/31/2011) evaluation of the Residential ES Lighting Program, and a key component of this PY3 evaluation is an in-home lighting metering study of 66 homes within ComEd service territory to assess how lighting is typically used by program participants. The primary goal of this data collection effort is to develop a more accurate hours-of-use (HOU) estimate for program bulbs purchased through ComEd's Residential ES Lighting Program that can be used to support the PY3 impact evaluation¹. The metering study has two main components, 1) a whole-house lighting inventory and 2) the installation of lighting logger equipment that accurately captures when the lamps are turned on and off. In addition to the estimation of an improved HOU estimate, this study will also provide other key information, such as current high efficiency lighting saturation levels and CFL storage levels, which can be used for future program planning.

Many of the study protocols that are included in this document are modeled after the recent California large scale metering study that was performed by KEMA for the California Public Utilities Commission².

¹ The existing ex ante hours-of-use estimate (2.34 hours/day), which has been used to calculate program savings to date, is based on a lighting study that was done in California in the late 1990's.

² Residential Lighting Metering Study. Prepared by KEMA for the California Public Utilities Commission (2006-2008 EM&V).

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On-site Overview

Each of the on-site visits occurring as part of this study will have two components. The first involves taking a whole-house lighting inventory of each study participant's home. This involves recording information about all light bulbs installed inside and outside of a program participant's home. The second piece is to install light metering equipment on an average of 6 CFLs per home. These meters will record when the light is turned on and off and will allow for the estimation of the annual average hours of use (HOU) for CFLs.

2.1 Home Lighting Inventory

For each lamp installed inside or outside of a home, the following characteristics will be recorded:

- Installation location (Room type)

- Fixture type (ceiling fixture, floor lamp, etc.)

- Fixture control type (by switch, dimmer, etc.)

- Wattage of bulb

- Bulb type (incandescent, CFL, halogen, LED, other)

- Bulb shape (spiral, reflector/flood, globe, a-lamp, post, candelabra, tube, other)

- Bulb features (dimmable, 3-way)

- Base type (small screw-in, pin, standard medium screw, etc.)

In addition, all lamps in storage at the time of the site visit will be inventoried. See Section 5.5 for the Lighting Inventory Forms.

2.2 Light Metering Equipment Installation

As stated above, this information will be used to estimate the average HOU across the CFLs metered as a proxy for the average HOU of ComEd's program bulbs. Where possible we

Residential Lighting Metering Study: Overview of Study Protocols

will analyze this data in combination with the lighting inventory data to calculate HOU estimates by room-type, lamp-type, fixture-type, and bulb-type³.

Meters will be installed on an average of 6 CFLs per household (up to a maximum of 10 CFLs per household). Program CFLs will always be prioritized for metering over non-Program CFLs. In order to maximize the amount of data collected as part of this effort to come up with accurate estimates of CFL HOU's within ComEd service territory, we will monitor non-Program CFLs if the number of Program CFLs within the home is less than 10. The meters will be installed by a Michaels Engineering technician and will be left in place for 6 months, at which time the technician will return to remove the metering equipment and ask any follow-up survey questions. The currently proposed schedule of activities is presented below in Table 2-1. This schedule allows for an optimal 6 months of data to be collected including both summer and winter usage extremes.

Table 2-1: Overview of Lighting Metering Study Schedule

Activity	Month	Year
Prescreen – Gen Pop Survey	May	2010
Site Visit Scheduled	June	2010
Meter Installation	June	2010
Meter Removal	January	2011

³ Note that this additional segmentation analysis will be completed only for cases where the samples sizes are deemed adequate to support such granular segmentation.

3

On-Site Visit Logistics

The following is an overview of guidelines for how site visits will be recruited, scheduled and conducted.

3.1 On-site Recruitment

Starting in the third week of May we will be completing a 500-point General Population survey with a random sample of ComEd's residential customers identified through ComEd's Residential CIS database. During this survey all customers will be asked whether or not they have purchased CFLs in the past year. If so, a series of follow-up questions will be asked regarding where they were purchased and whether or not they were discounted in order to identify ComEd Residential ES Lighting program participants. Those identified as program participants will be asked a series of questions (provided below in Section 5.1) to determine whether they would be interested in participating in this metering study, for which they would received a \$100 incentive. If we are unable to recruit an adequate sample of metering participants via the General Population survey we will then call all of the of the program participants for whom we have contact information from the in-store intercept surveys conducted earlier this year (~65 intercept survey participants provided us with contact information). If after these calls we still do not have enough customers willing to participate in the metering study we will call a random sample of coupon participants until a total of 66 homes have agreed to participate. The script for the intercept and coupon recruitment calls is provided in Section 5.2 . All recruits at this stage are considered "soft" and thus may still change their minds about their participation in the study.

3.2 On-site Scheduling

Once the onsite sample has been selected from the General Population survey (and the program participants if needed), we will start the on-site scheduling process.

Each of the pre-screened customers will be called and reminded about their participation in the General Population survey and their indicated interest in participating in the on-site survey. The customer will then be asked if they are still interested in participating.

Residential Lighting Metering Study: Overview of Study Protocols

If the customer is still interested in participating, we will review the purpose of the study and the procedure for the on-site survey. The customer will be reminded that that participation in the study qualifies them for a \$100 incentive.

The script for the on-site recruitment is provided below in Section 5.3. All recruits at this stage are considered “hard” recruits; however, it is acknowledged that the customer still has the potential to change their minds about their participation in the study.

3.3 On-site Confirmation

After the metering on-site visits have been scheduled, each of the technicians working on this data collection effort will be given a set of appointments for the on-site visits they are to make during the week within a designated portion of ComEd’s service territory. The technician will look over all information gathered about the site prior to arriving, such as the customer name and address, the type of dwelling, and any other special instructions. The technician will call each customer again on the day before the on-site visit to confirm the appointment and information given to them by the recruiters/schedulers.

3.4 Introduction

Upon arrival at a customer’s home, the on-site technician will introduce him/herself to the customer and provide the customer with the ComEd letter of association (Section 0) and the technician’s identification badge.

3.5 Customer Demographics and Lighting Inventory

Prior to starting to collect data for the lighting inventory, the technician will interview each customer about general residence characteristics and household demographics. Once this data has been collected the technician will walk through the home and complete the lighting inventory. This inventory will include information such as the room types, fixture types, bulb types and whether or not the bulbs are program/discounted bulbs purchased within the last year. The technician will also collect information about the bulbs currently in storage for future use. Section 5.5 shows a sample inventory form, and Section 5.6 presents the Inventory Protocols the technician will follow. Depending on the wishes of the participating customer, the technician can proceed to conduct the inventory unaccompanied or accompanied by a resident of the home. If they proceed unaccompanied they will ask the customer at the conclusion of the inventory which bulbs were program/discounted bulbs. This portion of the on-site visit will vary in length of time depending on the size of the home, type of fixtures in the home, and experience of the technician. This should be done efficiently in a uniform fashion, but it should not be rushed.

3.6 Meter Installation

Upon completion of the inventory, the technician will then install meters on a selection of CFLs in the home. See the Metering Protocols discussion found in Section 4 below.

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Metering Protocols

After the lighting inventory has been completed, up to 10 meters will be installed on CFLs located around the home⁴. To determine which CFLs to meter, the information collected in the Lighting Inventory will first be used to determine the total number of CFL “fixture groups”. A “**fixture group**” refers to all fixtures that are controlled by the same switch. If both CFLs and non-CFLs are being used within the same fixture group, the fixture group will be considered a CFL fixture group. If a fixture group has both Program CFLs and non-Program CFLs it will be considered a Program CFL fixture group. If a fixture group has no Program CFLs and at least one non-Program CFL it will be considered a non-Program CFL fixture group.

If installation of a meter on any fixture group prescribed to receive a meter per the protocol described in this section is determined to be technically infeasible, the technician will fully document all conditions that rendered the meter installation infeasible. If the customer objects to the technician installing a meter on any prescribed fixture group, then the technician will fully document the reasons given by the customer. See the examples below of various metering configurations.

⁴ We realized that some homes will have fewer than 6 CFLs which can be metered and thus a maximum of 10 CFLs will be metered in order to achieve an overall average of 6 meters per home.

*Residential Lighting Metering Study: Overview of Study Protocols***Table 4-1: Metering Protocol Example**

	Number of <u>Program CFL</u> fixture Groups	Total Number of <u>CFL Fixture</u> Groups	# of Meters Installed on Program CFL fixture Groups	# of Meters Installed on Non- Program CFL fixture Groups	Total Number of Meters Installed
Site1	3	5	3	2	5
Comment: Only 5 meters installed because dwelling only had 5 CFL fixture groups.					
Site2	4	10	4	6	10
Comment: All meters installed per the protocol.					
Site3	2	12	2	8	10
Comment: Home had 2 Program CFL fixture groups, 8 of 10 remaining CFL fixture groups selected					
Site4	4	8	3	4	7
Comment: Meter could not be installed on 1 CFL fixture group because it was located by the living room window.					
Site5	3	6	2	3	5
Comment: Meter could not be installed on one CFL fixture group because the customer refused.					

Based on the lighting inventory, if ten or fewer Program CFL fixture groups are present in the home, all of these Program CFL fixture groups will be metered. If fewer than 10 Program CFL fixture groups are metered, additional non-Program CFL fixture groups will be selected (based on the random selection process detailed below) up to a total of ten CFL fixture groups. For homes with fewer than ten CFL fixture groups total, all CFL fixture groups will be metered (where feasible).

Each site will be assigned a random start number based on the total number of CFL fixture groups present at the site (see Table 4-2 and Table 4-3 below). The technician will count from that point a pre-determined number of CFL fixture groups (Program or Non-Program, e.g., every 5th Program CFL fixture group) and install meters according to the protocol. The tables below present the protocol for selecting which CFL fixture groups to meter.

*Residential Lighting Metering Study: Overview of Study Protocols***Table 4-2: Random Metering Selection Protocol for Program CFL Fixture Groups**

Number of CFL Fixture Groups at Site	Random Start Number for Program CFLs	Meter Every
0-10	All bulbs metered	N/A
11-20	1-5	5th
21-30	1-8	8th
31-40	1-10	10th
41-50	1-13	13th
More than 50	1-17	17th

If the number of Program CFL fixture groups is less than 10, a similar selection protocol is used to select non-Program CFL fixture groups.

Table 4-3: Random Metering Selection Protocol for Non-Program CFL Fixture Groups

Number of CFL Fixture Groups at Site	Random Start Number for Non-Program CFLs	Meter Every
1-10	All bulbs metered	N/A
11-20	1-5	5th
21-30	1-8	8th
31-40	1-10	10th
41-50	1-13	13th
More than 50	1-17	17th

For example, assume a site has between 21 to 30 CFL fixture groups (of which 15 are Program fixture groups) and the random start number for the Program bulbs at this site is 7. The technician will go to the Lighting Inventory Form and identify the 7th Program CFL fixture group on the form. According to the protocol, the technician will then count Program CFL fixture groups from the 7th Program CFL fixture group until he/she gets to the 8th Program CFL fixture group past the random start assignment. A meter will be installed on this fixture group and then the surveyor will count again until the next 8th Program CFL fixture group is identified (counting from the beginning of the inventory of Program CFL fixture groups whenever necessary).

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Attachments

- 5.1 General Population Survey On-site Recruitment Script
- 5.2 In-store Intercept and Coupon Participant Recruitment Script
- 5.3 Scheduling Script
- 5.4 ComEd Letter of Association
- 5.5 Lighting Inventory Forms
- 5.6 Lighting Inventory Protocol
- 5.7 Lighting Metering Protocol
- 5.8 Meter Information Tracking Protocol
- 5.9 Meter Installation Protocol
- 5.10 Field Training on Customer Interaction

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5.1 General Population Survey On-site Recruitment Script

At the end of the General Population survey the following questions will be asked of all customers identified as Residential ES Lighting program participants.

LOG1. Within a few weeks we will be offering people \$100 to allow a trained technician to visit their home. The visit should take about an hour, during which time a technician will gather information on the lighting products used in your home and install metering equipment on a few of the CFLs you have recently purchased. These metering devices record the number of hours each CFL is in use each day. The meters will be installed for approximately 6 months at which time the technician will return to collect them. **BY SAYING YES, YOU ARE SIMPLY AGREEING TO BE RE-CONTACTED TO SET UP AN APPOINTMENT. DURING THE VISIT, THERE WILL BE NO ATTEMPT TO SELL YOU ANYTHING.** Would you be interested in being a part of this type of visit?

1. Yes [Continue on to R3]
2. No [Continue on to END1]
3. (Don't know) [Continue on to R2]
4. (Refused) [Continue on to END1]

[IF LOG1 = 3 ASK R2]

R2. That is okay, you do not have to decide now. Would it be OK if I have someone call you when we are scheduling these visits?

1. Yes
2. No [END1]
3. (Don't know)
4. (Refused)

[IF LOG1 =1 THEN ASK R3]

R3. Is [ADDRESS] in [CITY] still your correct address?

1. Yes
2. No
3. (Don't know)
4. (Refused)

[IF R3=2 ASK R4]

R4. Can you please give me your correct address and city?

1. [ENTER ADDRESS AND CITY]
2. (Don't know)
3. (Refused)

R5. And what is your name?

1. [ENTER NAME]
2. (Don't know)
3. (Refused)

R6. Is this the best number to reach you?

1. Yes
2. No
3. (Don't know)
4. (Refused)

[IF R6=2 ASK R7]

R7. What would be a better number?

1. [ENTER BEST NUMBER TO REACH PERSON AT]
2. (Don't know)
3. (Refused)

END1. That is all of the questions I have for you today. Thank you very much for your time.

END2. That is all of the questions I have for you today. As I said earlier, we will be scheduling these visits in the next few weeks and will call you then. Thank you very much for your time.

5.2 In-store Intercept and Coupon Participant Recruitment Script

INTRO: Hello, this is _____ from Opinion Dynamics calling on behalf of ComEd and their Smart Ideas for Your Home energy efficiency program. We are not selling anything. We are currently recruiting households who have purchased compact florescent light bulbs within the last year to participate in an important research study about household lighting. We are offering \$100 per household if you are selected to participate in this study. According to our records someone in your household purchased CFLs for your home at [STORE] in [MONTH AND YEAR] making you an eligible participant for this study. The study consists of two in-home visits. During the first visit a technician will gather information on the lighting products used in your home and install metering equipment on a few of the CFLs you have installed in your home. These metering devices record the number of hours each CFL is in use each day. The meters will be installed for approximately 6 months at which time the technician will return to your home collect them. We will pay you \$50 after the first visit and then another \$50 after the last visit, for a total of \$100

LOG1: Can we count on your participation in this important research study?

- 1 Yes
- 2 No [Attempt to convert, otherwise T&T]
- 3 Don't know [Attempt to convert, otherwise T&T]
- 4 Refused [Attempt to convert, otherwise T&T]

[IF NEEDED MORE DETAILS ON STUDY:

During the first visit, we will conduct a survey of all the lighting in your home. Also during this visit, we will be installing a few devices on some of your lights that record when they are on and when they are off. These devices are small and you will probably not even notice most of them. None of these devices will interfere with how your lights work; they will simply record information each time the light is turned on or off. You will be given a check for \$50 following the completion of this first visit.

We will then come back in approximately 6 months to remove the metering devices. You will be given a check for the final \$50 payment following the completion of this first visit.]

READ: I have just a few quick questions to insure your eligibility for this study.

Q1. Are you currently using any compact fluorescent light bulbs in any lighting fixtures inside or outside of your home?

- 1 Yes
- 2 No [Skip to 5]
- 3 Don't know [Skip to 5]

Q2. Approximately how many compact fluorescent light bulbs are you using in your home?

- 1 _____ Number of fixtures using CFLs

2 Don't know

Q3. What type of home do you live in? Is it...

- 1 A one-family home detached from any other house?
- 2 A one-family home attached to one or more houses?
- 3 A building with 2 apartments?
- 4 A building with 3 or 4 apartments?
- 5 A building with 5 or more apartments?
- 6 [DO NOT READ] Other [SPECIFY _____]
- 7 [DO NOT READ] Don't know

Q4. Counting yourself, how many people live in your household year round?

- 1 _____ Number of People
- 2 Don't know
- 3 Refused

Q5. Are any of these individuals less than 18 years of age?

- 1 Yes
- 2 No
- 3 Don't know
- 4 Refused

R3. Is [ADDRESS] in [CITY] still your correct address?

1. Yes
2. No
3. (Don't know)
4. (Refused)

[IF R3=2 ASK R4]

R4. Can you please give me your correct address and city?

1. [ENTER ADDRESS AND CITY]
2. (Don't know)
3. (Refused)

R5. And what is your name?

1. [ENTER NAME]
2. (Don't know)
3. (Refused)

R6. Is this the best number to reach you?

1. Yes
2. No

3. (Don't know)
4. (Refused)

[IF R6=2 ASK R7]

R7. What would be a better number?

1. [ENTER BEST NUMBER TO REACH PERSON AT]
2. (Don't know)
3. (Refused)

END1. That is all of the questions I have for you today. Thank you very much for your time.

END2. That is all of the questions I have for you today. As I said earlier, we will be scheduling these visits in the next few weeks and will call you then. Thank you very much for your time.

5.3 Scheduling Script

INTRO: Hello, this is _____ from Michaels Engineering calling on behalf of ComEd. We are not selling anything. Within the last few weeks you should have received a telephone call from Opinion Dynamics asking you some questions regarding your use and recent purchases of compact fluorescent light bulbs.

At the end of that call, the surveyor mentioned that we would be conducting on-site visits to gather information about residential lighting operation. This information helps ComEd understand how their program is working to better help their customers save energy.

You had indicated that you would be interested in receiving a call about these visits.

R1. Do you have 5 minutes to talk right now?

- | | |
|-----------------|--------------|
| 1. Yes | [Skip to R3] |
| 2. No | [Skip to R2] |
| 3. (Don't know) | [Skip to R2] |

[IF R1 = 2 THEN ASK R2]

R2. Would another time work well for me to call you back?

- | | |
|--|-----------------|
| 1. [Enter time and date for call-back] | [Skip to END 3] |
| 2. No | [Skip to END1] |
| 3. (Don't know) | [Skip to END4] |

For the on-site visit, we will be sending a trained technician to conduct a survey of all the lighting in your home. Also during this visit, we will be installing a few devices on some of your lights that record when your lights are turned on and when they are off. These devices are small and you will probably not even notice them. None of these devices will interfere with how your lights work; they will simply record information each time the light is turned on or off. You will be given a check for \$50 following the completion of this first visit. This visit will last about one hour.

We will then come back in approximately 6 months to remove the metering devices. You will be given a check for the final \$50 payment following the completion of this second and final visit. This visit will take less than 10 minutes.

The information that is collected from the site visits is used to develop an evaluation report for ComEd. This report will not reference any of your personal information. All information will be presented anonymously.

R3. Are you still interested in participating in this on-site survey?

- | | |
|-----------------|----------------|
| 1. Yes | [Skip to R5] |
| 2. No | [Skip to END1] |
| 3. (Don't know) | [Skip to R4] |

R4. If you would like, I can give you some time to think about it. Does another time work well for me to call you back?

1. [RECORD DATE AND TIME] [Skip to END3]
2. No [Skip to END1]
3. (Don't know) [Skip to END1]

R5. We are currently setting up times for on-site visits from [Starting Date] to [Ending Date]. Do you have any specific dates or times that work best for your schedule?

1. Yes [ENTER DATE AND TIME] [Skip to R7]
2. No [Skip to R6]
3. (Don't know) [Skip to R6]
4. (Refused) [Skip to R6]

R6. I currently have an opening at [TIME] on [DATE]. Does this time work for you?

1. Yes-[ENTER DATE AND TIME]
2. No -[REPEAT R6 WITH NEW DATE AND TIME]
3. (Don't know)
4. (Refused)

R7. Is [ADDRESS] in [CITY] still your correct address?

1. Yes
2. No [Skip to R8]
3. (Don't know)
4. (Refused)

R8. Can you please give me your correct address and city?

1. [ENTER ADDRESS AND CITY]
2. (Don't know)
3. (Refused)

R9. Is this the best number to reach you?

1. Yes
2. No [Skip to R10]
3. (Don't know)
4. (Refused)

R10. What would be a better number?

1. [ENTER BEST NUMBER TO REACH PERSON AT]
2. (Don't know)
3. (Refused)

If Appointment scheduled read END5, else if read END4;

END1. That is all of the questions I have for you today. Thank you very much for your time.

END3. That is all of the questions I have for you today. I will plan on calling you back at _____ on _____. Thank you very much for your time.

END4. That is all of the questions I have for you today. I will plan on calling you back at a later date. Thank you very much for your time.

END5. That is all of the questions I have for you today. I will plan on our technician visiting you at [ADDRESS] on [WEEKDAY], [DATE] at [TIME]. The technician will be wearing a ComEd contractor badge and will provide you with a letter of association with contact information for the ComEd representative, who you can call if you have any questions during or about the site visit. The technician will call you the day before to confirm the appointment. If for any reason this date and time will no longer work for you please feel free to call me at [PHONE NUMBER] to reschedule. My name again is [NAME]. Thank you very much for your time and your participation.

5.4 ComEd Letter of Association Metering Study and Multi-State Study

June X, 2010

<Mr/Ms> <First> <Last>
<Street Address>
<City>, IL <ZIP>

Dear <Mr/Ms> <Last>:

Thank you for agreeing to participate in a ComEd *Smart Ideas for Your Home*SM lighting study that will examine the household usage of compact fluorescent lights (CFLs) in your home.

ComEd has contracted with Michaels Engineering, an independent consultant, to conduct this study which will help ComEd and Illinois state regulators better understand CFLs' real-world performance and cost-effectiveness.

This letter is being provided to you to authenticate the credentials of the technical field specialist from Michaels Engineering who will arrive at your home on <Insert Date & Time> to install light metering equipment for the purposes of this study. This technician will carry a copy of this letter as proof of identification.

What to Expect

Upon arrival, the Michaels Engineering representative will conduct an inventory of the light bulbs in your home (both installed and in storage) and will install light metering equipment on a portion of your compact fluorescent light bulb fixtures. This metering equipment will allow us to measure the electricity consumption of the CFLs installed at your home. You need not do anything special, and should continue using your lights as you normally would.

These meters will be removed at the end of the study (in approximately six months). You will be compensated a total of \$100 for your participation in this study (a \$50 gift card today following the installation of the light metering equipment, and the remaining \$50 gift card at the conclusion of the study when the metering equipment has been removed).

The Michaels Engineering representative **will not** request any personal information and is required to be properly uniformed and to display a ComEd contractor identification badge at all times.

If you have questions or concerns about this study or about the Michaels Engineering representative who will be performing this work, please contact me directly via the telephone number or email address shown below.

ComEd thanks you for participating in this important study. We are committed to providing our customers with energy efficiency incentives, tools and tips to help them take control of their energy usage and save money.

Sincerely,

David Nichols
Principal Marketing Analyst
ComEd Energy Efficiency Services
Phone: 630.437.2418
david.nichols@comed.com

June X, 2010

<Mr/Ms> <First> <Last>
<Street Address>
<City>, IL <ZIP>

Dear <Mr/Ms> <Last>:

Thank you for agreeing to participate in a ComEd *Smart Ideas for Your Home*SM lighting study that will examine the household usage of compact fluorescent lights (CFLs) in your home.

ComEd has contracted with Michaels Engineering, an independent consultant, to conduct this study which will help ComEd and Illinois state regulators better understand CFLs' real-world performance and cost-effectiveness.

This letter is being provided to you to authenticate the credentials of the technical field specialist from Michaels Engineering who will arrive at your home on <Insert Date & Time> to conduct this study. This technician will carry a copy of this letter as proof of identification.

What to Expect

Upon arrival, the Michaels Engineering representative will conduct an inventory of the light bulbs in your home (both installed and in storage) and may ask you questions regarding your lighting usage habits and purchasing preferences.

This visit will last approximately 20 minutes, and you will be compensated with a \$50 gift card at the end of the visit.

The Michaels Engineering representative **will not** request any personal information and is required to be properly uniformed and to display a ComEd contractor identification badge at all times.

If you have questions or concerns about this lighting study or about the Michaels Engineering representative who will be visiting your home, please contact me directly via the telephone number or email address shown below.

ComEd thanks you for participating in this important study. We are committed to providing our customers with energy efficiency incentives, tools and tips to help them take control of their energy usage and save money.

Sincerely,

David Nichols
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5.5 Lighting Data Collection Forms

5.5.1 Site Information Cover Sheet

Site ID:		
Site details:		
Customer Name:		
Phone Numbers:	Home ()	Cell ()
Site Address:		
City:		Zip code:
Special Instructions:		
Appointment Details:		Field Tech:
Actual Arrival:		Departure:
Type of Heating:		Type of AC:
List of Rooms with no AC/Heat:		
# of Pgm Bulbs purchased by HH		

	Date Completed	Performed by (Initials)
Field Survey Performed:	___ / ___ / ___	___ ___
Quality Control Check:	___ / ___ / ___	___ ___
Data Entry Complete:	___ / ___ / ___	___ ___
Copy Filed:	___ / ___ / ___	___ ___

5.5.2 Data Entry Forms

The Lighting Inventory Data Entry Forms will be used to record information about each and every fixture at the site – both inside and outside the home. For all lamps, including lamps in storage, we will record the watts, the primary lamp-type (incandescent, compact fluorescent, etc.), the lamp-shape/secondary type (A-line, spiral, globe, etc.), the base type, any special features (i.e. three-way). For lamps installed in fixtures, additional information will include their room-type location and the fixture type they are installed in. The record will be by fixture group. A fixture group will be a group of identical fixtures all operated on the same switch. Most fixture groups will only have one member. However for fixtures like track lighting and recessed cans, there is often more than one identical fixture controlled by the

same switch. In this case we only need to make one record and note the number of fixtures. If the fixtures are identical and controlled by the same switch but have lamps of different lamp types, shapes, or wattage, you should denote the fixture group as 1A and 1B etc for each type of lamp installed in the fixture group.

Following are examples of the data entry forms used for this study.

At the end of each onsite visit the technician will fill out the following table after they have left the residence to confirm reasonableness of phone survey self reports.

Question		Phone Survey Response	Reasonable		Better Estimate
AMD1	Type of dwelling:		Yes	No	
D1	Own vs. Rent:		Yes	No	
Dem7	# of occupants:		Yes	No	
D5	Size of home in sq ft:		Yes	No	
D7b	Highest level of education achieved by participant:		Yes	No	
D6a	Household income level:		Yes	No	
Dem7b	Children (<18 years) living in the home:		Yes	No	
To Be completed after Tech has left residence - based on observation					
Question		Observation Estimate			
Age Estimate of bulb purchaser:					
Gender of bulb purchaser:					
# of bedrooms in house:					
# of bathrooms in house:					

Data Entry Code Sheet

In-Home Observation Codes				
Room Types		Store Types		
Bedroom	Numbered in order of use. Bedroom 1 would be the master bedroom	Code	Explanation	Examples
Basement		HI	Home Improvement	Home Depot, Lowes
Bathroom		MM	Mass Merch or discount department store	Walmart, K-Mart, Target
Closet	Closets should be numbered, if more than one present	HW	Hardware	ACE
Dining	Formal/separate dining room	WH	Warehouse	Costco, Sam's Club
Foyer	entry space	G	Grocery	Safeway, Kroger
Garage		D	Drugstore	Walgreen's, Rite Aid, CVS
Hallway		C	Convenience store	7-Eleven, Circle K
Kitchen	Including attached dining/nook area	SL	Specialty lighting or electrical store	
Office/Den		HF	Home furnishing store	Bed, Bath, and Beyond, Pottery Barn
Living space	Includes family room and living room, number in order of use	U	Utility company	
Storage	Any bulbs that are not currently installed	B	Bargain store	Dollar Store, Family Dollar
Outdoor		OS	Office supply store	Office Depot, Staples
Utility	Utility/laundry room	NP	Not Purchased	provided by family member
Other	Please specify	O	Other	
Control Types		Fixture Types		
OF	On-Off	C	Ceiling-mounted	
Dim	Dimmable	L	Floor/table lamp	
3W	3-way	T	Torchiere	
MSS	Motion/Photo Sensor with on/off switch	W	Wall-mounted	
MS	Motion or Photo Sensor (no switch)	R	Recessed	
O	Other	S	Suspended	
Socket Types		F	Ceiling fan	
S	Medium Screw Base	K	Track lighting	
P	Pin Base	HW	Other hard-wired	
GU	GU - Base	PI	Other plug-in	
C	Candelabra/Small Screw Base	G	Garage door	
O	Other	U	Under Counter	
		O	Other (describe)	
Bulb Shapes				
T	Twister/Spiral			
G	Globe			
A	A-lamp			
B	Bullet/Torpedp			
Bug	Bug Light			
S	Spot/Reflector/Flood			
C	Circline			
Tub	Tube			
O	Other			

5.6 Lighting Inventory Protocol

This Lighting Inventory Protocol is taken directly from a metering study document prepared by KEMA for the 06-08 California Residential Metering Study⁵.

When entering information about each fixture group on the Lighting Inventory Forms, surveyors will be trained to start counting the fixture groups in a clock-wise direction from the entrance where they first walk into the room. Overhead lights will be counted by the location of their switch. In the example living room below:

Fixture group “1” is the ceiling mounted fixture because in this room, the light switch is to the left when you enter the room.

Fixture group “2” is the table lamp in the far left corner of the room between the sofa and the window. It is a plug-in lamp that is not controlled by a switch.

Fixture group “3” is the table lamp in the far right corner of the room between the window and the bookcase. It is a plug-in lamp that is not controlled by a switch.

Fixture group “4” contains two wall fixtures that are controlled by the same switch.

Fixture group “5” is the table lamp in the near right corner of the room between the bookcase and the arm chair. Although it is identical to the table lamp in the far right corner near the window and the bookcase (fixture group 3), it is recorded as a different fixture group because it is controlled by its own switch.



⁵ Residential Lighting Metering Study. Prepared by KEMA for the California Public Utilities Commission (2006-2008 EM&V).

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This Lighting Metering Protocol is similar to the one used in the 2006-2008 California Residential Metering Study⁶.

Based on the lighting inventory, if ten or fewer Program CFL fixture groups are present in the home, all of these Program CFL fixture groups will be metered. If fewer than 10 Program CFL fixture groups are metered, additional non-Program CFL fixture groups will be selected (based on the random selection process detailed below) up to a total of ten CFL fixture groups. For homes with fewer than ten CFL fixture groups total, all CFL fixture groups will be metered (where feasible).

Below is an example table of randomized variables that will be found on the site information sheet and an example completed Lighting Inventory form. We will use this form to illustrate the protocols for installing lighting meters in cases where there are more than ten fixture groups in the home.

Randomized Start Variables for Unique Site Id XXX

CFL Fixture Groups	Program CFLs		Non-Program CFLs	
	Random Start Number	Meter Every	Random Start Number	Meter Every
1-10	N/A	N/A	2	3rd
11-20	4	5th	3	5th
21-30	2	8th	1	8th
31-40	6	10th	5	10th
41-50	11	13th	8	13th
More than 50	9	17th	9	17th

First we check the inventory sheet below to get the total number of CFL fixture groups in the home. This inventory shows this home has a total of 22 fixture groups (8 Program CFLs, 5 non-Program CFLs, 8 incandescent and one halogen) of which 13 are CFL fixture groups (program and non-program). Based on the table above the randomized start number for Program CFLs is 4 and Non-Program CFLs is 3. This randomized start number provides the fixture group with which to begin counting from on the inventory sheets. In this example,

⁶ Residential Lighting Metering Study. Prepared by KEMA for the California Public Utilities Commission (2006-2008 EM&V).

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there were 8 Program CFL fixture groups and 5 non-Program CFL fixture groups. To select a total of ten CFL fixture groups for metering, all 8 Program CFL fixture groups will be metered, and 2 of the 5 non-Program CFL fixture groups will be selected at random.

First meters will be installed⁷ on all 8 of the Program CFLs fixture groups (see blue circles in inventory sheets below) and then the random selection protocol will be used to select 2 of the remaining 5 non-Program CFLs to meter. Based on the number of CFL fixtures (13), the randomized start number and the meter selection protocol (from table above) metering will start with the third non-Program CFL and then select the 5th non-Program CFL past this third (in some cases selecting the 5th non-Program CFL fixture group past the third will mean the counting will wrap around and go through the fixtures again removing any previously selected fixture groups). In this example the meters will be installed on non-Program CFL fixture groups 3 (F10) and 4 (F15) (see green circles in exhibits below).

⁷ Whenever possible.

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Lighting Inventory Data Entry Form

Unique Site ID: XXX

STORED BULBS	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Lamp Information										
Number of bulbs/package	2	2	2	2	2	1	1			
Bulb Wattage	13	13	13	60	100	23	11			
Lamp Type	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF
	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG
Lamp Shape	S	S	S	A	A	U	S			
Base Type	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS
	P O	P O	P O	P O	P O	P O	P O	P O	P O	P O
Other features										
Program Bulb	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N

Unique Site ID: XXX

INSTALLED FIXTURE GROUP	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Fixture Information										
Location (Room)	B1	B1	B1	BA	L	L	L	L	L	L
Control Type	S	S	S	D	3	D	S	S	S	T
Fixture Type	L	L	C	W	L	L	L	C	W	W
Lamp Information										
Number of bulbs/fixture	1	1	1	4	1	1	1	1	1	1
Bulb Wattage	13	11	13	40	13	13	17	60	25	14
Lamp Type	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF	ICF
	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG	HLG
Lamp Shape	S	S	S	A	S	G	T	A	U	S
Base Type	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS	SM SS
	P O	P O	P O	P O	P O	P O	P O	P O	P O	P O
Other features										
Program Bulb	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Lighting Logger Installed?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Program CFL Fixture Group	P1		P2			P3	P4			
Non-Pgm CFL Fixture Group		NP1			NP2					NP3
When Obtained (CFLs Only)	1	1	1		2	3	1			4
Where Obtained (CFLs only)	MM	MM	MM		MM	MM	MM			MM

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Lighting Inventory Data Entry Form

Unique Site ID: XXX

INSTALLED BULBS	F11	F12	F13	F14	F15	F16	F17	F18	F19	F20
Fixture Information										
Location (Room)	XE	XE	XP	B2	B2	K	K	B3	B3	B3
Control Type	S	S	S	S	S	S	S	S	S	S
Fixture Type	C	W	W	W	L	K	W	L	C	C
Lamp Information										
Number of bulbs/fixture	1	2	2	1	1	3	2	1	1	1
Bulb Wattage	14	40	40	25	14	13	25	100	14	14
Lamp Type	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG
Lamp Shape	S	A	A	S	S	G	T	A	U	S
Base Type	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O
Other features										
Program Bulb	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Lighting Logger Installed?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Program CFL Fixture Group	P5					P6			P7	
Non-Pgm CFL Fixture Group					NP4					NP5
When Obtained (CFLs Only)	4				1	1			4	3
Where Obtained (CFLs only)	MM				MM	MM			MM	MM

Lighting Inventory Data Entry Form

Unique Site ID: XXX

INSTALLED BULBS	F21	F22								
Fixture Information										
Location (Room)	D	D								
Control Type	S,D	S								
Fixture Type	C	S								
Lamp Information										
Number of bulbs/fixture	2	2								
Bulb Wattage	60	13								
Lamp Type	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG	ICF HLG
Lamp Shape	A	S								
Base Type	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O	SM SS P O
Other features										
Program Bulb	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Lighting Logger Installed?	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Program CFL Fixture Group		P8								
Non-Pgm CFL Fixture Group										
When Obtained (CFLs Only)		1								
Where Obtained (CFLs only)		MM								

5.8 Meter Information Tracking Protocol

For each home we need to keep track of the meters we install. We also want more detailed information about the CFLs that we meter. For each meter installed, a row in the following form will be filled out. First, record the serial number of the logger that you are installing. Then, record the room type, fixture type, and bulb shape in the next box. You can use the same codes from the Inventory Forms for this. In the next box, write a description of where the logger and specific fixture that you are installing the logger on are located. This information will help the next technician find the logger, so the information written here needs to be very descriptive. You need to write the manufacturer and model number of the CFL. If the logger is being installed on a dimmable fixture, ask the homeowner about how they use the dimming capability and note the response. When the logger is installed and calibrated appropriately for the fixture, note the time installed and hit the reset button. Ask the homeowner for the approximate number of hours the light is used per day (don't worry if it is 0), and ask if it is used during the peak weekday hours of 1-6 p.m. Record whether or not this was a ComEd Program bulb. Do this for all lights that you are installing loggers on.

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LOGGER TRACKING INFORMATION

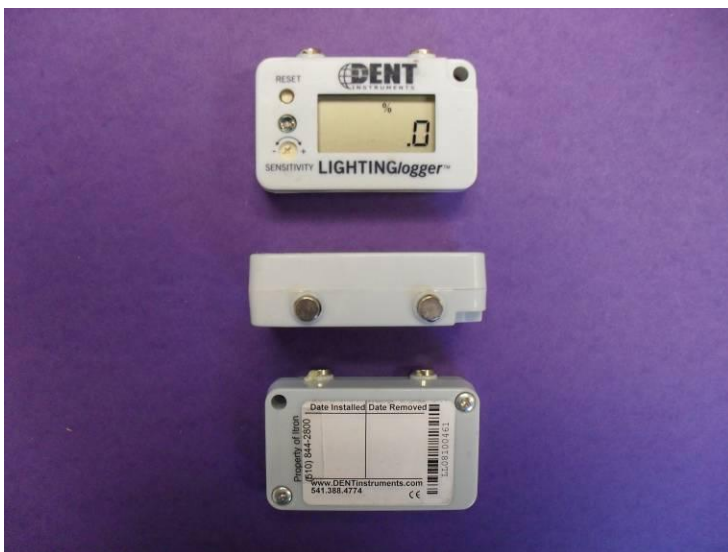
COMED SITE ID #: _____

Fixture #		_____	_____	_____	_____	_____	_____
Logger Serial Number/Type							
Room/fixture/lamp shape							
Fixture and logger location							
Manufacturer and Model #							
If Dimmable, how is the light used?							
Time installed	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM	__:__AM/PM
Approximate total hours of use/day							
Program Bulb	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Used during peak hours?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

5.9 Meter Installation Protocol

For this study, **DENT LIGHTINGlogger™** (TOUL-3G) will be utilized. The data logger is shown in Figure 1. Both the photocell sensor and adjustment screw are located on the front of the logger, as is the LED indicator panel which shows total on-time in hours, percent of time on, and a light-on indicator. These loggers are equipped with magnets that can be used to attach to the lighting fixture.

Figure 1 Dent Instruments Lighting Logger



Each logger will be installed in a manner to minimize the effects of other light sources. This would include ensuring that the light sensor is aimed toward the light source to be metered and away from any ambient or stray light sources such as lamps and windows. Often this will include installing the logger inside the light fixture. If this is the case, care must be taken to ensure that the maximum temperature rating of the logger (140° F) is not exceeded. For fluorescent lamps, this typically does not need to be considered. No incandescent fixtures will be logged as part of this study. These loggers cannot be installed in recessed can fixtures.

The loggers will typically be installed using the integrated magnet. However, if this is not possible, the logger may be installed using wire, zip-ties, or other forms of attachment. In potentially wet, dirty, or dusty locations, the logger will be placed in a plastic bag.

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5.9.1 Logger Installation Tools and Materials

Materials needed specifically for lighting logger installation include:

- ☐ Multiple copies of the ComEd Letter of Introduction and business cards. These should be left behind at every site so that if something happens with the loggers, the site contact will know who to contact.
- ☐ Extra copies of blank logger installation & verification forms
- ☐ An oversupply of loggers (in case some, despite pre-testing, don't work on-site).
- ☐ Large gallon-size zip-lock plastic bags (for storing retrieved loggers or broken CFL clean-up)
- ☐ Razor blade or sharp pocket knife (for slitting painted-over fixtures to allow access to lamps and ballasts).
- ☐ Plastic zip-ties, variety pack various lengths (4", 8", 14")
- ☐ 3M double-sided tape – 1" squares (3M-4026) and glass scraper (for removal)
- ☐ Hook & loop (i.e. velcro-type) tape
- ☐ Poster putty (removable/reusable). The best way to install a logger with putty is to put two dime to nickel sized pieces in contact with the logger and the surface.
- ☐ Electrical tape and wire nuts
- ☐ Small scissors or wire cutters (use to snip zip-ties for logger extraction)

5.9.2 Data Logger Initialization and Programming Procedures

Prior to their use in the field, data loggers need to be initialized and/or programmed. A summary of these procedures for DENT loggers is provided in this section, but the *data logger user's guides should be reviewed for additional details*. However, one rule that applies regardless of the logger type is: All loggers used for a specific site should be synched to the same computer and this procedure should be performed just prior to visiting the site.

DENT Data Logger Initialization Procedures

The following steps should be taken when programming the DENT data loggers:

1. Be sure your computer clock is set to the correct time before beginning.
2. Make sure the software installed on your machine is Smartware 2008.
3. Communications cable needed is a Dent Smartlogger USB Com Cable
4. After opening the software and plugging in a logger, choose the following:
 - A.) Logger>Logger Clock>Synchronize time to match PC
 - B.) Logger>Clear Logger Memory
5. All loggers used for a specific site must be synched to the same computer.




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DENT LL Logger Adjustment & Installation Procedures

Once the fixture locations have been decided, the following procedures should be used to properly set the logger to accurately measure lighting operation:

1. Press and hold the reset button (approximately 2 seconds) on the front of the logger until the word “rESEt” appears on the display, then immediately release the button.

NOTE: Be sure to release the reset button as soon as “rESEt” appears. Holding the reset button for more than that - approximately five seconds - will cause “CLEAR” to appear on the LCD. This function resets the internal date to **01/01/2001** and the time to **12:00 am**. If this happens while on site, you **should not use this logger** and you will need to resynchronize the logger’s date and time before it can be used.

2. The logger should be placed at or as close as possible to the location chosen.
3. **Adjust the Sensitivity.** The sensitivity adjustment screw should be all the way toward the negative (left). Slowly adjust the sensitivity screw toward the positive (right) until the sunlight -  symbol appears on the display. Note that there will be a couple second delay before the symbol appears on the display, so turn the sensitivity screw slowly and gradually to allow for this delay. When the symbol first appears, this means that the logger is now sensing the light from the measured fixture. **Once this threshold has been reached, the sensitivity screw needs to be adjusted another ~10 degrees clockwise.** NOTE: Be careful not to allow yourself to create a shadow between the measured light source and the sensor on the logger while doing this.
4. Once the sensitivity has been adjusted, place the logger in the location chosen and verify that the  remains on in the display.
5. **Testing.** Now turn OFF the fixture/s being measured and verify that the  symbol has disappeared from the display. This means the logger is no longer sensing light and will accurately measure the lighting source ON/OFF operation. If the light cannot be turned off, an easy way to test it is to face the photocell downward away from the light. Facing downward exposes the photocell to the amount of light it will see when the fixture is off.
6. Test one time further by turning ON the fixture/s and verifying that the lighting symbol appears again.
7. Record the date of install and a detailed location for the logger on the survey form.

5.10 Field Training on Customer Interactions

5.10.1 Purpose

This document outlines the procedures that must be followed when meeting ComEd customers in their homes for the purposes of data collection. Your interaction with customers will reflect on ComEd and on the Residential ES Lighting program. As a result, all interactions with customers must be courteous and professional. The success of the evaluation effort will greatly depend on establishing credibility with the customer from the first telephone contact and continuing through the first meeting and subsequent site visits.

5.10.2 Before you arrive

Recruiting

Site contact information will be provided with the sample. If any difficulties are encountered contacting the customer, the project manager should be informed and will provide assistance. Sample data may contain outdated or inaccurate contact information.

When contacting the customer, it is important to identify yourself as a consultant acting on behalf of ComEd, explain the purpose of the project to the customer, and inform them that you would like to schedule a site visit. The customer should be informed that the evaluation report will not reference any of their contact information and that they are participating anonymously.

Inform the customer that we will **not** be providing them with the results of our research on their home but will aggregate all our research together before providing results at the program level (not at the customer level) to the utility.

Cooperation with our field work is voluntary. It is appropriate to be persistent and flexible in trying to set up the field work but do not pressure customers to cooperate. If the customer is firm in not wanting to cooperate, do not pressure them to change their mind. Report all refusals to your project manager. The project manager should report all refusals to the client unless it has been determined ahead of time that this reporting is not necessary.

Verify Appointment

Reminder calls the day prior to a given appointment help ensure that no conflicts have arisen that would affect the site visit or data collection activities. Confirm address, major cross-streets, and a secondary phone number.

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Attire

Clean and appropriate for the type of work including appropriate protective equipment.

- Khaki pants or jeans without holes, no shorts or sweat pants
- Shirts with collars preferred. No logo T-shirts
- Shoes with no-slip soles
- Wear the utility badge on the outside of any clothing or outerwear so that it is easily visible
- Carry a letter of introduction with contact information

5.10.3 On-Site

Introduction

Make sure badge is visible.

Introduce yourself, your company, and “I am here on behalf of ComEd”. (Do not represent yourself as an employee of ComEd.)

Explain the purpose of the visit is to help ComEd understand how their program is working and helping customers save energy. They will use these insights to improve programs to help customers use energy wisely and save money for everyone.

Present letter of introduction with contact information.

Verify that this is a good time for the customer.

Where appropriate, offer to remove shoes or slip on shoe covers in house to minimize messes.

Safety

The goal of the onsite auditing work is to obtain a profile of lighting use that is representative of residences in ComEd service territory. The sample of homes for auditing has been selected with this in mind. While the ideal is to audit every home in the sample, as an onsite auditor you have the right to not enter a residence if for any reason you feel your safety could be compromised. Please report to your supervisor any incidences in which you did not enter a house on your list, and document the reason or reasons you did not enter the house.

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Ensure that the loggers are installed in a manner that does not pose a hazard to the installer or the customer. This would include installing loggers in an out-of-the-way location and not in a location with excessive heat buildup or electrical potential.

How To Handle Common Questions:

How will the data collected be used?

The purpose of the visit is to help ComEd understand how their program is working and help customers save energy. They will use these insights to improve programs to help customers use energy wisely and save money for everyone. We will aggregate all our research together before providing results at the program level (not at the customer level) to the utility.

Why are you here?

Describe the work you will do on-site and, if appropriate, provide the answer to the “How will the data collected be used?” question.

What did you learn?

The data I collected will be analyzed once it is aggregated with similar sites. If in the process we find any important information that you should know, we will work with the utility to get that information to you.

If it is true, you may say “everything seems to be in order.” If that is NOT true, do NOT tell that to the customer. Instead report your findings to the project manager as soon as reasonably possible.

Under no circumstance should you say anything negative about the bulbs that were purchased through the program.

If pressed for your findings state that you are operating under strict instructions not to provide the results of your research directly to the customer. If the customer wishes to have the results, you will pass them on to the utility and they will choose the appropriate course of action.

If you find a situation that represents a potential hazard, report that information to the project manager immediately.

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You broke my...

If this is true: assure the customer that you will report the problem and someone will be in contact with them soon to discuss the next steps.

If it is not true: If the customer will discuss the situation calmly, explain how you are not at fault. If the customer resists this explanation or is otherwise uncooperative, explain that you will report the situation to your manager and someone will be in contact with them soon to resolve the issue.

Regardless of the outcome of this conversation, take detailed notes on the situation and report it to your manager as soon as reasonably possible.

Other

If the schedule is running late and you will be more than 10 minutes late for the next appointment, notify them by phone.

All contact with the customer must be recorded in a file that includes the date, time, name of parties, and outline of the discussion or message.