

Memorandum

To: IL NTG Coordination – C&I Work Group
From: Opinion Dynamics Corporation
Date: December 23, 2015
Re: Example Enduse Technology Questions for Spillover Engineering Analysis

Below, we provide example survey questions that might be used to gather engineering information to support estimation of spillover savings. Note that this document includes the enduse technology modules only. These questions would be asked after it has been established that there is spillover for that type of enduse. This document does not include any of the screening questions necessary to establish that spillover exists.

LIGHTING MODULE

EQL1. What types of lighting upgrades did you make? [MULTIPLE RESPONSE, UP TO 5] (Read options)

1. Linear fluorescent light fixtures, for example T5s or T8s
2. Compact fluorescent lamps or CFLs
3. LED light fixtures
4. LED exit signs
5. Occupancy Sensors
6. Daylighting Controls
7. Delamping (If needed: Removed lights and did not install replacements)
00. Or another type of lighting (specify)
96. (Didn't install any lighting equipment) [SKIP TO HVAC MODULE]
98. (Don't know)
99. (Refused)

[LOOP THROUGH SOL1-SOL9 FOR EACH MEASURE SELECTED IN EQL1]

I have a few more questions about the <EQL1 RESPONSE> that you [READ IF EQL1=1-6: installed; READ IF EQL1=7: completed] without receiving an incentive from <UTILITY>.

[SKIP TO SOL7 IF EQL1=7]

SOL1. How many <EQL1 RESPONSE> did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

[SKIP TO SOL5a IF EQL1= 5,6]

SOL2. What is the average wattage of the <EQL1 RESPONSE> you installed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

[ASK IF EQL1=1,2,3,00]

SOL3. What equipment did these <EQL1 RESPONSE> replace?

1. (Linear fluorescent T12)
2. (Linear fluorescent T8)
3. (Incandescent)
4. (CFL)
5. (Metal Halide)
00. (Other, specify)
96. (Nothing/not a retrofit)
98. (Don't know)
99. (Refused)

SOL4a. And were these <EQL1 RESPONSE> installed inside, outside, or in a refrigerated space?

1. Inside
2. Outside
3. Refrigerated space
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SOL4a=1]

SOL4b. Is the inside space heated, cooled, or both?

1. Heated
2. Cooled
3. Both
8. (Don't know)
9. (Refused)

[ASK IF EQL1=5,6, ELSE SKIP TO SOL6]

SOL5a. What are the <EQL1 RESPONSE> controlling? [MULTIPLE RESPONSE, UP TO 3]

1. Linear fluorescent lighting
2. Compact fluorescent lighting (or CFLs)
3. LED lighting
00. (Other: Specify)
98. (Don't know)
99. (Refused)

[ASK IF EQL1=5,6 AND SOL5a<>98,99]

SOL5b. How many fixtures are being controlled? [NUMERIC OPEN END, 98=Don't know, 99=Refused]

SOL5c. On average, how many lamps or bulbs does each fixture contain? [NUMERIC OPEN END, 998=Don't know, 999=Refused]

SOL5d. What is the average wattage of these lamps that are being controlled? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

[ASK IF EQL1=4]

SOL6. Were the LED exit signs single sided, double sided or both?

1. Single sided

- 2. Double sided
- 3. (Some single, some double sided)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

[ASK IF EQL1=7]

SOL7. What type of lighting did you remove? [MULTIPLE RESPONSE, UP TO 3] (Prompt, if necessary)

- 1. (T12s) (If needed: Linear fluorescent lighting)
- 2. (T8s) (If needed: Linear fluorescent lighting)
- 00 (Other, specify)
- 98 (Don't Know)
- 99 (Refused)

[LOOP SOL8 AND SOL9 FOR EACH LIGHTING TYPE MENTIONED IN SOL7]

SOL8. How many <SOL7 RESPONSE> did you remove? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

SOL9. What is the average wattage of the <SOL7 RESPONSE> you removed? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

COOLING MODULE

EQC1. What types of energy efficient equipment did you install as part of the HVAC project?

[MULTIPLE RESPONSE, UP TO 5] (Read options)

- 1. Split air conditioning system (IF NEEDED: An A/C system that has an evaporator indoors and the compressor and condenser outdoors.)
- 2. Packaged air conditioning system (IF NEEDED: A type of central air conditioning that contains both the air handler fan, compressor and condenser in a single unit. These are typically mounted on the roof.)
- 3. Heat pump (IF NEEDED: An electric heating and cooling system)
- 4. Air cooled chiller (IF NEEDED: A system that produces cold liquid sent around to individual spaces used for cooling air usually found in larger facilities)
- 5. Water cooled chiller (IF NEEDED: A system that produces cold liquid sent around to individual spaces used for cooling air usually found in larger facilities)
- 00. Something else (specify)
- 96. (Didn't install any cooling equipment) [SKIP TO HEATING MODULE]
- 98. (Don't know)
- 99. (Refused)

[LOOP THROUGH SOC1-SOC6 FOR EACH MEASURE SELECTED IN EQC1.]

I have a few more questions about the <EQC1 RESPONSE> that you installed without receiving an incentive from <Utility>.

SOC1. What is the total capacity of the <EQC1 RESPONSE>? (IF NECESSARY: If they installed more than one, ask for the total capacity)

[NUMERIC OPEN END: 1-1000000; 9999996 = NOT APPLICABLE, 9999998 = DON'T KNOW, 9999999 = REFUSED]

[SKIP IF SOC1 = 9999996, 9999998, 9999999]

SOC1a. What unit is that measured in? (INTERVIEWER NOTE: Only read if respondent does not immediately provide answer when SOC1 is read)

1. Tons
2. Btu/hr
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SOC1=Don't know/Refused]

SOC2. Approximately, how many square feet of floor space does this equipment serve? [NUMERIC OPEN END; 1-1,000,000; 9999996=NOT APPLICABLE; 9999998=DON'T KNOW; 9999999=REFUSED]

[ASK IF EQC1=1,2,3]

SOC3. What is the efficiency level of the <EQC1 RESPONSE>? (IF NECESSARY: If they installed more than one, ask for the average efficiency level.)

[NUMERIC OPEN END: 0-30; 96 = NOT APPLICABLE, 98 = DON'T KNOW, 99 = REFUSED]
[PROGRAMMER NOTE: ALLOW DECIMALS]

[SKIP IF SOC3 = 96, 98, 99, SYSMIS]

SOC3a. What unit is that measured in? (INTERVIEWER NOTE: Only read if respondent does not immediately provide answer when SOC3 is read)

1. SEER
2. EER
3. HSPF
4. COP
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF EQC1=4,5]

SOC4. What is the approximate kW/ton efficiency value of this new equipment? (IF NECESSARY: If they installed more than one, ask for the average kW/ton.)

[NUMERIC OPEN END; 0-2, 996=NOT APPLICABLE; 998=DON'T KNOW; 999=REFUSED;
PROGRAMMER NOTE: ALLOW DECIMALS]

SOC5. Did this new equipment replace old equipment?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SOC5=1]

SOC6. How old was the replaced equipment?

1. (0-4 years)
2. (5-9 years)
3. (10-14 years)
4. (15-19 years)
5. (20 years or older)
8. (Don't know)
9. (Refused)

HEATING MODULE

EQH1. What types of energy efficient equipment did you install as part of the heating project?

[MULTIPLE RESPONSE, ACCEPT UP TO 5] [READ OPTIONS]

1. Gas furnace
2. Electric furnace
3. Gas boiler
4. Air source heat pump
5. Geothermal or ground source heat pump
6. Packaged terminal heat pump (PTHP)
7. Packaged terminal air conditioner (PTAC) (IF NECESSARY: With electric heating)
8. Infrared heater
00. (Other, specify)
96. (Didn't install any heating equipment) [SKIP TO REFRIGERATION MODULE]
98. (Don't know) [SKIP TO EMS MODULE]
99. (Refused) [SKIP TO EMS MODULE]

[LOOP THROUGH SOH1-SOH7 FOR EACH MEASURE SELECTED IN EQH1]

I have a few more questions about the <EQH1 RESPONSE> that you installed without receiving an incentive from <Utility>.

SOH1. What is the total capacity for the <EQH1 RESPONSE> you installed in Btu/hr (Btu per hour)?
[NUMERIC OPEN END: 5000-5000000; 9999996 = NOT APPLICABLE, 9999998 = DON'T KNOW, 9999999 = REFUSED]

SOH2. Did this new <EQH1 RESPONSE> replace old equipment?

1. Yes
2. No
8. (Don't know)

9. (Refused)

SOH3. What is the efficiency level of the <EQH1 RESPONSE>? (IF NECESSARY: If they installed more than one, ask for the average efficiency level.)

[NUMERIC OPEN END: 0-100; 996 = NOT APPLICABLE, 998 = DON'T KNOW, 999 = REFUSED]

[PROGRAMMER NOTE: ALLOW DECIMALS]

[SKIP IF SOH3 = 996, 998, 999]

SOH3a. What unit is that measured in? (INTERVIEWER NOTE: Only read if respondent does not immediately provide answer when SOH3 is read)

1. (AFUE)
2. (HSPF)
3. (COP)
4. (Thermal efficiency)
5. (Combustion efficiency)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF SOH2 = 1, ELSE SKIP TO END OF LOOP]

SOH4. Were the removed equipment and the installed <EQH1 RESPONSE> the same fuel type?

1. Yes
2. No
8. (Don't know)
9. (Refused)

SOH5. Was the old equipment working at the time of replacement?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SOH5 = 1, ELSE SKIP TO END OF LOOP]

SOH6. What type of old equipment was replaced?

1. Gas furnace
2. Electric furnace
3. Gas boiler
4. Air source heat pump
5. Geothermal or ground source heat pump
6. Packaged terminal heat pump (PTHP)
7. Packaged terminal air conditioner (PTAC) (IF NECESSARY: With electric heating)
8. Infrared heater
00. (Other, specify)
98. (Don't know)
99. (Refused)

SOH7. How old was the replaced equipment?

1. (0–4 years)
2. (5–9 years)
3. (10–14 years)
4. (15–19 years)
5. (20 years or older)
8. (Don't know)
9. (Refused)

SOH8. What is the efficiency level of the removed equipment? (IF NECESSARY: If they installed more than one, ask for the average efficiency level.)

[NUMERIC OPEN END: 0-100; 996 = NOT APPLICABLE, 998 = DON'T KNOW, 999 = REFUSED]

[PROGRAMMER NOTE: ALLOW DECIMALS]

[SKIP IF SOH8 = 996, 998, 999]

SOH8a. What unit is that measured in? (INTERVIEWER NOTE: Only read if respondent does not immediately provide answer when SOH3 is read)

1. (AFUE)
2. (HSPF)
3. (COP)
4. (Thermal efficiency)
5. (Combustion efficiency)
00. (Other, specify)
98. (Don't know)
99. (Refused)

EMS MODULE

I have a few more questions about the energy management system that you installed without receiving an incentive from <Utility>.

SOE1. What systems are being controlled by the energy management system? [MULTIPLE RESPONSE, UP TO 3] (Prompt, if necessary)

1. (Lighting systems)
2. (Heating systems)
3. (Cooling systems)
00. (Other, specify)
96. (Didn't install an EMS) [SKIP TO DCV MODULE]
98. (Don't know)
99. (Refused)

SOE2a. Approximately, how many square feet of the facility are controlled by the new energy management system? [NUMERIC OPEN END; 1-1,000,000; 9999996=NOT APPLICABLE; 9999998=DON'T KNOW; 9999999=REFUSED]

[ASK IF SOE2a=9999998 OR 9999999]

SOE2b. Approximately what percentage of your facility's space is being controlled by the energy management system? [NUMERIC OPEN AND 0-100%; 998=Don't know, 999=Refused]

SOE3. What type of control system did you have in place prior to installing the new energy management system? Was it a manually controlled system, a programmable system or something else?

1. Manual Control
2. Programmable
00. (Other, specify)
98. (Don't know)
99. (Refused)

DCV MODULE

I have a few more questions about the demand controlled ventilation that you installed without receiving an incentive from <Utility>.

SOD1. Does the demand controlled ventilation control a kitchen space?

- 1 Yes
- 2 No
- 8 (Don't Know)
- 9 (Refused)

SOD2a. Approximately, how many square feet of the facility are controlled by the new demand controlled ventilation? [NUMERIC OPEN END; 1-1,000,000; 9999996=NOT APPLICABLE; 9999998=DON'T KNOW; 9999999=REFUSED]

[ASK IF SOC2a=9999998 OR 9999999]

SOD2b. Approximately what percentage of your facility's space is being controlled by the demand controlled ventilation? [NUMERIC OPEN AND 0-100%; 998=Don't know, 999=Refused]

MOTORS/PUMPS MODULE

EQP1. What changes did you make to your fan or pump motors? Did you... [MULTIPLE RESPONSE, UP TO 2]

- 1 Install or replace a motor
- 00 Do something else [Specify]
- 98 (Don't know)
- 99 (Refused)

[ASK IF EQP1=1]

I have a few more questions about the motors that you installed or replaced without receiving an incentive from <Utility>.

SOP1. How many motors did you install? [NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]

SOP2. What is the approximate average horsepower of the new motors? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from <Utility>") [NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]

SOP3. What is the approximate average efficiency of the new motors? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from <Utility>") [NUMERIC OPEN END 0-100%]

SOP4. On average, how many hours per day do the motors operate? (IF NEEDED: "We are interested in the average across all of the motors you installed or replaced without receiving an incentive from <Utility>") [NUMERIC OPEN END 0-24]

SOP5. Did the motors replace existing motors?

- 1 Yes
- 2 No
- 8 Don't Know
- 9 Refused

[ASK IF SOP5=1, ELSE SKIP TO VSD MODULE]

SOP6. Approximately how old were the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the old motors you replaced without receiving an incentive from <Utility>")

- 1. (0-4 years)
- 2. (5-9 years)
- 3. (10-14 years)
- 4. (15-19 years)
- 5. (20 years or older)
- 8. (Don't know)
- 9. (Refused)

SOP7. What was the average horsepower of the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the old motors you replaced without receiving an incentive from <Utility>") [NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]

SOP8. What is the approximate average efficiency of the motors that were REPLACED? (IF NEEDED: "We are interested in the average across all of the old motors you replaced without receiving an incentive from <Utility>") [NUMERIC OPEN END 0-100%]

[ASK IF EQP1=00]

SOP9. Can you please describe the [RESPONSE FROM EQP1=00] project that did not receive an incentive from <Utility>. [OPEN END, 8=DON'T KNOW, 9=REFUSED]

VSD MODULE

EQV1. What types of equipment do the VSDs control? Do they control... [MULTIPLE RESPONSE, UP TO 5]

1. Hot water pumps
2. Chilled water pumps
3. Pumps for non-HVAC equipment
4. HVAC fans
5. Fans for non-HVAC equipment
00. Something else (specify)
96. (Didn't install any VSDs) [SKIP TO REFRIGERATION MODULE]
98. (Don't know)
99. (Refused)

I have a few more questions about the VSDs that you installed without receiving an incentive from <Utility>.

[LOOP THROUGH SOV1-SOV2 FOR EACH MEASURE SELECTED IN EQV1.]

SOV1. How many VSDs did you install on <EQV1 RESPONSE>? [NUMERIC OPEN END, 1 TO 500; 998=DON'T KNOW, 999=REFUSED]

[ASK IF SOV1=1]

SOV2a. What is the horsepower of the <EQV1 RESPONSE> that received a VSD? [NUMERIC OPEN END, 0 TO 500; 998=DON'T KNOW, 999=REFUSED]

[ASK IF SOV1>1 AND <998]

SOV2b. What is the AVERAGE horsepower of the <EQV1 RESPONSE>s that received VSDs? [NUMERIC OPEN END, 0 TO 500; 998=DON'T KNOW, 999=REFUSED]

REFRIGERATION MODULE

EQR1. What types of energy efficient refrigeration equipment did you install? [MULTIPLE RESPONSE, UP TO 5]

1. ENERGY STAR Refrigerator
2. ENERGY STAR Freezer
3. Display Case
4. LED case lights
5. Door heater controls/Anti-sweat control system
6. Electronically Commutated Motors/ECM
7. ENERGY STAR Refrigerated Beverage Vending Machine

- 8. Evaporator Fan Control
- 00. Something else (specify)
- 96. (Didn't install any equipment) [SKIP TO WATER HEATING MODULE]
- 98. (Don't know)
- 99. (Refused)

[LOOP THROUGH SOR1-SOR4 FOR EACH MEASURE SELECTED IN EQR1.]

I have a few more questions about the <EQR1 RESPONSE> that you installed without receiving an incentive from <Utility>.

SOR1. How many <EQR1 RESPONSE> did you install? [NUMERIC OPEN END: 1-5000; 9998=DON'T KNOW; 9999=REFUSED]

[ASK IF EQR1 = 3, 5, 6]

SOR1a. Was the <EQR1 Response> for a cooler or refrigerator, or was it for a freezer?

- 1. (Cooler/Refrigerator)
- 2. (Freezer)
- 3. (Some for cooler/refrigerator and some for freezer)
- 8. (Don't know)
- 9. (Refused)

[ASK IF EQR1=4]

SOR2. Do the LED case lights have motion controls?

- 1. Yes
- 2. No
- 8. (Don't know)
- 9. (Refused)

SOR3. Did this new equipment replace old equipment?

- 1. Yes
- 2. No
- 8. (Don't know)
- 9. (Refused)

[ASK IF SOR3=1]

SOR4. How old was the replaced equipment?

- 1. (0-4 years)
- 2. (5-9 years)
- 3. (10-14 years)
- 4. (15-19 years)
- 5. (20 years or older)
- 8. (Don't know)
- 9. (Refused)

WATER HEATING MODULE

EQW1. What types of energy efficient equipment did you install as part of the water heating project? [MULTIPLE RESPONSE, ACCEPT UP TO 5] (Prompt for specific type, if necessary)

1. Gas storage water heater
2. Electric storage water heater
3. Tankless gas water heater
4. Tankless electric water heater
5. Heat pump water heater
6. Solar water heater
- 00 (Other, specify)
- 96 (Didn't install any water heating equipment) [SKIP TO RETRO-COMMISSIONING MODULE]
- 98 (Don't know)
- 99 (Refused)

[LOOP THROUGH SOW1-SOW3 FOR EACH MEASURE SELECTED IN EQW1]

I have a few more questions about the <EQW1 RESPONSE> that you installed without receiving an incentive from <Utility>.

SOW1. How many <EQW1 RESPONSE> units were installed in your facility?
[NUMERIC OPEN END: 0-95; 98 = DON'T KNOW, 99 = REFUSED]

[ASK IF EQW1 = 01, 02, 05 & SOW1 <> 98, 99]

SOW2. Approximately how large is the water heater's storage tank, in gallons?
[NUMERIC OPEN END: 1 TO 997; 998 = DON'T KNOW, 999 = REFUSED]

SOW3. Is the <EQW1 RESPONSE> ENERGY STAR qualified?

1. Yes
2. No
8. (Don't know)
9. (Refused)

RETRO-COMMISSIONING MODULE

EQX1. What systems or equipment did the retro-commissioning impact? (Read list) [MULTIPLE RESPONSE, UP TO 5]

1. Chilled Water System
2. Ventilation and Air Distribution
3. Controls/Equipment Schedules
4. Compressed Air
5. Lighting
6. Motors
00. Something else (specify)
98. Don't know
99. Refused

I have a few more questions about the retro-commissioning improvements you carried out without receiving an incentive from <Utility>.

SOX1. Approximately, how many square feet of the facility was retro-commissioned? [NUMERIC OPEN END; 1-1,000,000; 9999996=NOT APPLICABLE; 9999998=DON'T KNOW; 9999999=REFUSED]

SOX2. Has the facility been commissioned or retro-commissioned previously?

1. Yes
2. No
8. (Don't know)
9. (Refused)

[ASK IF SOX2=1]

SOX3. Approximately how many years ago was the facility commissioned or retro-commissioned?

1. (0-4 years)
2. (5-9 years)
3. (10-14 years)
4. (15-19 years)
5. (20 years or more)
8. (Don't know)
9. (Refused)

OPERATIONAL CHANGES MODULE

EQM1. What types of changes did you make? Did you make changes to... [MULTIPLE RESPONSE, UP TO 5] (Read options)

1. Temperature setpoints
2. HVAC schedules
3. Airflow distribution
4. Maintenance practices
00. Something else (specify)
98. (Don't Know)
99. (Refused)

[ASK IF EQM1=1,2, ELSE SKIP TO SOM4]

Setpoint or Schedule Changes

I have a few more questions about the setpoint or schedule changes that you made.

SOM1. What systems were affected by the change? [MULTIPLE RESPONSE, UP TO 3] (Prompt, if necessary)

1. (Heating systems)
2. (Cooling systems)
00. (Other, specify)
96. (Didn't make changes to setpoints or schedules) [SKIP TO SOM4]
98. (Don't know)
99. (Refused)

SOM2a. Approximately, how many square feet of the facility were affected by the change? [NUMERIC OPEN END; 1-1,000,000; 9999996=NOT APPLICABLE; 9999998=DON'T KNOW; 9999999=REFUSED]

[ASK IF SOM2a =9999998 OR 9999999]

SOM2b. Can you give me the approximate percentage of your facility's space that was affected? [NUMERIC OPEN AND 0-100%; 998=Don't know, 999=Refused]

SOM3. Please describe the changes that were implemented. We are interested in typical temperature settings before and after the change and the days of the week and times of the day that were affected. [OPEN END, 8=Don't know, 9=Refused]

[ASK IF EQM1=3,4,00, ELSE SKIP TO OTHER MODULE]

Other Operational or Maintenance Changes

SOM4. Can you please describe the changes to [RESPONSE FROM EQM1] that were made at the facility? [OPEN END, 8=Don't know, 9=Refused]

OTHER MODULE

I have a few questions about the <OTHER_READ-IN> you mentioned. (If needed: These are the energy efficient upgrades you mentioned earlier that you implemented and that I haven't yet asked you about.)

S001. Can you describe the <OTHER_READ-IN> in more detail? We are interested in any specifics about the improvements that would allow us to get a sense what potential savings might result from the project. [OPEN END; 98=DK, 99=REF]