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| FINAL report  Commercial and Industrial Lighting Net-to-Gross 2024-2026  C2014B |
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**ABSTRACT**

This report provides the methodology, results, and recommendations for the C2014 Commercial and Industrial (C&I) Lighting Net-to-Gross (NTG) study. The study’s purpose was to examine specific product submarkets and customer segments within the larger C&I market that were in greater need of program intervention and to develop recommendations on NTG ratios for prospective application in the Energy Opportunities (EO), Small Business Energy Advantage (Small Business), and Midstream programs in Connecticut. In the face of challenges and costs associated with general population surveys, NTG exploration is also a useful tool to understand which submarkets and segments are in greater need of program support. If certain participant groups have significantly higher NTG ratios than their counterparts, that constitutes good evidence that the first group is more in need of continued program support.

This effort was the final phase of the C&I lighting research completed under the C2014 banner, of which the overall goal was to understand the saturation of C&I lighting and remaining potential to generate program savings. Phase 1 of this study was completed in June 2021 and produced an overall market characterization of the C&I lighting market. Phase 2 was completed in June 2022 and produced qualitative insights based on interviews with lighting experts to characterize potential opportunities for TLED conversions, retrofitting existing systems with controls, and commissioning advanced controls.

To develop prospective NTG results for 2024, 2025, and 2026, the study team first developed retrospective NTG estimates based on 290 completed surveys with participants from the 2021 program year. The sample frame was stratified based on program, measure group, and size (project-level savings). Respondents were also identified as being located within a distressed municipality. Surveys were completed between January and March of 2023. The NTG survey results were analyzed to estimate participant spillover and free-ridership rates.

This investigation found that customers installing lighting with controls and customers in distressed municipalities had significantly higher NTG ratios than their counterparts. Based on this outcome, the study team produced two sets of retrospective results – one at the program/measure level and one at the submarket level. Based on comparable market characterization results from Phase 1 of this study, the study team applied the same trend logic from recent Massachusetts research to develop prospective NTG ratios for program years 2024, 2025, and 2026. It is recommended that the utilities in Connecticut apply either the prospective results presented in the table below at the program/measure level or the prospective results in the next table at the submarket level.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Program/Measure | *PY2021* | | PY2024 | | PY2025 | | PY2026 |
| Energy Opportunities | *82%* | | 70% | | 66% | | 62% |
| Small Business | *92%* | | 81.5% | | 78% | | 74.5% |
| Midstream - Lighting with Controls | *91%* | | 85% | | 83% | | 81% |
| Midstream - High/Low Bay LED | 81% | | 66% | | 81% | | 66% |
| Midstream - Screw-Based | *33%* | | 18% | | 13% | | 8% |
| Midstream - Lighting | *31%* | | 16% | | 11% | | 6% |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Submarket | *PY2021* | PY2024 | PY2025 | PY2026 |
| Downstream Non-Distressed | *80%* | 68% | 64% | 60% |
| Downstream Distressed | *95%* | 83% | 79% | 75% |
| Midstream Non-Distressed Lighting | *52%* | 38% | 33% | 28% |
| Midstream Non-Distressed Lighting with Controls | *85%* | 70% | 65% | 60% |
| Midstream Distressed | *87%* | 72% | 67% | 62% |

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# Executive Summary

This report presents the results from the Connecticut Commercial and Industrial (C&I) net-to-gross (NTG) study conducted by DNV on behalf of the Connecticut Energy Efficiency Board (EEB). The executive summary presents a high-level description of the objectives, research methodology, results, and recommendations for the prospective application of lighting NTG ratios in 2024, 2025, and 2026. Detailed descriptions of the methods and results are included in the body of the report following this section.

## Objectives

The study’s purpose was to examine specific product submarkets and customer segments within the larger C&I market that were in greater need of program intervention and to develop recommendations on NTG ratios for prospective application in the Energy Opportunities (EO), Small Business Energy Advantage (Small Business), and Midstream programs in Connecticut. In the face of challenges and costs associated with general population surveys, NTG exploration is also a useful tool to understand which submarkets and segments are in greater need of program support. If certain participant groups have significantly higher NTG ratios than their counterparts, that constitutes good evidence that the first group is more in need of continued program support.

This effort was the final phase of the C&I lighting research completed under the C2014 banner, of which the overall goal was to understand the saturation of C&I lighting and remaining potential to generate program savings. Phase 1 of this study was completed in June 2021 and produced an overall market characterization of the C&I lighting market. Phase 2 was completed in June 2022 and produced qualitative insights based on interviews with lighting experts to characterize potential opportunities for TLED conversions, retrofitting existing systems with controls, and commissioning advanced controls. This final effort leveraged a NTG investigation to understand differences in potentially underserved submarkets and segments of the market.

## Research methodology

To produce prospective NTG ratios, the study team started by calculating the 2021 retrospective NTG ratio based on computer-assisted telephone interview (CATI) surveys with 290 participants across the EO, Small Business, and Midstream programs. The sample was stratified by program, measure group, and size (project savings). The survey collected information on participants’ lighting decision-making processes, program awareness and influence, and other factors that impacted their lighting decision-making. The survey approach and scoring methodology applied in this study is very similar to the approaches used in prior Connecticut studies and in recent Massachusetts research. While slightly different from past efforts, this effort did not leverage interviews with influential vendors for the downstream programs since the focus of this effort was only on lighting whereas other downstream studies have included a more comprehensive set of end uses where influential vendors are more likely to have an impact.

The results of the NTG surveys were analyzed to estimate participant spillover and free-ridership rates, which were used to produce the retrospective 2021 NTG ratios for each lighting category. The free-ridership rate is the percentage of program participant savings that would have occurred in the absence of the program. The free-ridership rate is based on the impact the program has had on the timing, quantity, and efficiency of a participant’s lighting purchases. Spillover is the percentage of out-of-program LED savings from program participants that can be attributed to program influences even though the participants did not receive technical or financial support for this equipment. The final free-ridership and spillover estimates were weighted by site-level weights and site-level savings.

Since NTG ratios have decreased from previous studies in Connecticut[[1]](#footnote-2) and in comparable jurisdictions,[[2]](#footnote-3) the study team developed a set of NTG ratios that should be applicable prospectively in 2024, 2025, and 2026. This decline in NTG is based on the rapid increase in the natural adoption of LEDs, and the market dynamics causing this are expected to continue resulting in continued declines in NTG ratios over time. The prospective results are based on the same trend logic from recent Massachusetts studies, which used a consensus group process to develop trends in prospective NTG ratio for both downstream[[3]](#footnote-4) and Midstream[[4]](#footnote-5) pathways. The same trends in NTG ratios from those studies were applied to the retrospective estimates in Connecticut.

To understand possible differences in NTG across product submarkets and customer segments, the study team also analyzed the overall NTG scores of lighting compared to lighting with controls, Downstream versus Midstream programs, and in distressed municipalities versus non-distressed municipalities. Lighting with integrated controls was a focus because the technology is at an earlier stage of commercialization and could therefore require greater program intervention. For distressed municipalities, the study team used the 2021 list of distressed municipalities as defined by the Connecticut Department of Economic and Community Development.[[5]](#footnote-6) The study team developed a set of alternative retrospective results combining program, distressed municipality status, and controls integration. These values were disaggregated to an allowable level based on sample size and precision levels.

## Results

The study team developed two sets of retrospective and prospective NTG ratios – one that is program/measure specific (Table 1‑1) and one that is submarket specific (Table 1‑2). The NTG for the downstream programs – both EO and Small Business – remained relatively high, showing a modest decline from previous studies. Due to limitations in the tracking data and challenges with applying separate values for with and without controls, results and recommended values are not broken separated for with and without controls. Its likely that some screw-based lighting is included in these downstream results since tracking data does not allow for detailed understanding on exact measures installed.

For Midstream, there is a split in NTG ratios between the more common technologies (screw-based, linear, fixtures, and exterior) and other measures, including high/low bay and lighting with controls. In this table, the Midstream – Lighting with Controls includes all types of lighting installed with controls, including linear lamps with controls, linear fixture with controls, high/low bay with controls, and exterior with controls. The Midstream – Lighting category is an aggregated category that includes LED stairwell kits, LED linear lamps, LED linear fixtures, and LED exterior.

Based on research and trends in other areas, there will be a continued decline in NTG across all program/measure breakouts, as shown through the prospective NTG ratios in this table. Due to the market dynamics leading to the rapid natural adoption of LEDs, this decline in NTG is expected to continue.

Table 1‑1. Program/measure 2021 retrospective and prospective NTG ratios



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Program/Measure | *PY2021* | PY2024 | | PY2025 | | PY2026 | |
| Energy Opportunities | *82%* | 70% | | 66% | | 62% | |
| Small Business | *92%* | 81.5% | | 78% | | 74.5% | |
| Midstream - Lighting with Controls | *91%* | 85% | | 83% | | 81% | |
| Midstream - High/Low Bay LED | 81% | 66% | | 81% | | 66% | |
| Midstream - Screw-Based | *33%* | 18% | | 13% | | 8% | |
| Midstream - Lighting | *31%* | 16% | | 11% | | 6% | |

Investigations into submarket and customer segment differences indicated that the NTG ratios were higher in distressed municipalities compared to non-distressed municipalities,[[6]](#footnote-7) and across all programs, the NTG ratios were higher for lighting installed with controls compared to standard lighting. This indicates the program interventions are still needed to continue to transform the market toward advanced lighting systems and toward LEDs in distressed areas. Table 1‑2 shows the NTG ratios for the submarket breakout. In this table, EO and Small Business results were combined into an overall Downstream category and Midstream measure breakouts were combined. These categories were collapsed because of the need to maintain large enough sample sizes and small enough precisions. While this set of results allows for application across different market segments, it provides less granularity at the program/measure level.

Table 1‑2. Submarket 2021 retrospective and prospective NTG ratio

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Submarket | *PY2021* | PY2024 | PY2025 | PY2026 |
| Downstream Non-Distressed | *80%* | 68% | 64% | 60% |
| Downstream Distressed | *95%* | 83% | 79% | 75% |
| Midstream Non-Distressed Lighting | *51%* | 37% | 32% | 27% |
| Midstream Non-Distressed Lighting with Controls | *85%* | 70% | 65% | 60% |
| Midstream Distressed | *87%* | 72% | 67% | 62% |

## Recommendations

The Connecticut utilities should adopt either the program/measure prospective NTG ratios or the submarket prospective NTG ratios for 2024, 2025, and 2026. The utility tracking systems may not be able to account for the submarket NTG ratios at this time, but if that changes, the utilities can switch to the submarket NTG ratios in the future if so desired. To be consistent, both utilities should use the same approach. The prospective options should not be mixed within programs. For instance, if the utilities decided to apply the submarket NTG ratios for the Midstream program, they should use all the Midstream Non-Distressed Lighting, Midstream Non-Distressed Lighting with Controls, and Midstream Distressed values, and not a mix of the submarket and program/measure NTG values.

# Introduction

## Study objectives

This report presents the results from the Connecticut C&I NTG study conducted by DNV on behalf of the Connecticut EEB. The research for this effort was completed from August 2022 through April 2023. The study’s purpose was to examine specific product submarkets and customer segments within the larger C&I market that were in greater need of program intervention and to develop recommendations on NTG ratios for prospective application in the Energy Opportunities (EO), Small Business Energy Advantage (Small Business), and Midstream programs in Connecticut. More specifically, the objectives were to:

1. Identify possibly underserved areas of the C&I lighting market in need of continued program interventions to continue to transform the market.
2. Estimate retrospective spillover and free-ridership across customer segments and product submarkets within the EO, Small Business, and Midstream programs based on survey responses from PY2021 participants.
3. Develop recommendations for prospective NTG ratios for each program for inclusion in the Connecticut PY2024 Program Savings Document.

This effort represents the third and final phase of the C&I lighting research completed under the C2014 banner, of which the overall goal was to understand the saturation of C&I lighting and remaining potential to generate program savings. In the face of challenges and costs associated with general population surveys, NTG exploration is also a useful tool to understand which submarkets and segments are in greater need of program support. If certain participant groups have significantly higher NTG ratios than their counterparts, that constitutes good evidence that the first group is more in need of continued program support.

Phase 1 of this study was completed in June 2021 and produced an overall market characterization of the C&I lighting market.[[7]](#footnote-8) Using a stock turnover model calibrated through participant and non-participant distributor in-depth interviews, the study team forecasted the installed stock, total sales, and trend in net program savings for ambient linear technologies across Connecticut through 2030. The future baselines produced as part of that effort were incorporated into the calculations used to produce Adjusted Measure Lives (AMLs), which are used to estimate gross lifetime savings. Phase 2 of this study was completed in June 2022 and produced qualitative insights based on interviews with lighting experts to characterize potential opportunities for TLED conversions, retrofitting existing systems with controls, and commissioning advanced controls.[[8]](#footnote-9)

## Background on NTG in Connecticut

Previous estimates of NTG in Connecticut are based on research completed across several different studies. The current values being applied in the 2023 Program Savings Document are summarized below:

* Energy Opportunities: The EO NTG value was 94% for all lighting measures. This value was based on a 2019 study conducted by EMI, and results were based on interviews with 177 participants from 2017.[[9]](#footnote-10) Prior to 2019, the NTG value was 96%, based on a study completed in 2011.
* Small Business Energy Advantage: The small business value was 98.7% for lighting, which was based on a 2012 study conducted by Tetra Tech based on interviews with participants from 2011.[[10]](#footnote-11)
* Midstream: The Midstream NTG ratios are specific to the measure groups. The values were based on an adjustment factor that DNV developed[[11]](#footnote-12) to apply to the same EMI study from 2019 that also produce EO NTG ratios.[[12]](#footnote-13) In the absence of new primary data collection in Connecticut, the values were based on adjustments to Massachusetts research adapted to Connecticut. This adjustment factor was based on the known relationship between prospective estimates of NTG (MA 2018 study)[[13]](#footnote-14) and the actual evaluated, retrospective results (MA 2021 study)[[14]](#footnote-15) for the same year (PY2019) and applied that ratio to PY2022 prospective estimates from the C1644 study. The actual values range from 26% in exterior lighting to 58.7% in high/low bay lighting.
* The Energy Conscious Blueprint NTG value is currently being updated as part of the C1902c study and was not a focus for this study. The previous assumption was 85%, and was most recently updated as part of the same 2012 study conducted by Tetra Tech.[[15]](#footnote-16)

## Status of C&I lighting market

LEDs are an important source of Program savings, but their future savings potential is under continuous scrutiny as baselines evolve and the market continues its shift toward LED products. Phase 1 of this study characterized the status of the C&I lighting market and concluded that the non-residential lighting market in Connecticut has been experiencing a rapid transition from fluorescent technology to LEDs. It began with a transition to screw-based LEDs and TLEDs but is now being fueled by conversion to LED luminaires—accelerated by the influence of lighting programs within the state. The savings generated by the program have accounted for a significant portion of total energy efficiency program savings over the years, yet these bountiful savings are expected to decline due to increasing market saturation and the natural adoption of LED technologies.

Ambient linear represents approximately 56% of installed C&I lighting,[[16]](#footnote-17) so it provides a good snapshot of the entire lighting market. However, other submarkets have experienced varying rates of market transformation. According to the results of Phase 1 of this study,[[17]](#footnote-18) the 2020 saturation (% of installed stock) of LED linear fixtures across the C&I market was estimated to be approximately 40%, with about 11% LED luminaires and about 29% TLED fixtures. The saturation of LEDs in the market has been increasing, from about 1% in 2015 and 21% in 2018. It is expected to continue to increase rapidly, reaching over 72% by 2024. The market share (% of sales) continues to be dominated by LED technologies. Approximately 67% of linear products sold in 2020 were LEDs, and this number is expected to increase to 85% by 2024. Even in the absence of the program, the market share of LEDs would still reach 76% by 2024.

Figure 2‑1 shows the forecasted market share of LED technologies within the ambient linear submarket. The top lines show the forecasted market share assuming the program continued as-is against a hypothetical scenario where the program ends in 2020. The overall LED market share grows from 67% to 85% in 2024 in the program scenario, but in the program-ending scenario grows to 76% by 2024.

Figure 2‑2 shows the overall ambient linear LED market share curves for Connecticut (blue) compared to Massachusetts (green). This cross-state comparison is included because the study team leveraged comparable research methodologies and trends in results to benchmark and forecast NTG ratios in Connecticut. The prospective period (PY2024–PY2026) for ambient linear technologies in both Connecticut and Massachusetts shows very similar trends.

Figure 2‑1. Modeled LED market share: Program versus program-ending scenario in Connecticut

Figure 2‑2. Modeled Connecticut (program scenario) overall LED market share compared to other jurisdictions

2024-2026 prospective NTG period

# Methodology

This section provides a high-level summary of the study methodology and approach. Additional details on the methodology and NTG scoring are available in APPENDIX A, and the survey instrument is provided in APPENDIX B. The methods used in this study are very similar to the methods used in prior Connecticut studies[[18]](#footnote-19) and from recent studies conducted in Massachusetts – both on the Midstream[[19]](#footnote-20) and Downstream[[20]](#footnote-21) pathways.

## Survey approach

To collect information on participant spillover and free-ridership, the study team conducted CATI surveys with participants from PY2021. The survey collected information on participants’ lighting decision-making processes, program awareness and influence, and other factors that impacted their lighting decision-making.

2021 was the most recent full year of program data available at the initiation of this study, and the study team wanted to use the best available information to inform prospective estimates. We decided not to include participants from 2020 due to more severe impacts of COVID-19, and 2019 data was deemed too outdated for inclusion. While COVID-19 may have had lingering impacts on the market, nearly half of lighting distributors interviewed from the first phase of the study indicated that as of January 2022, business operations were already back to normal or would return to normal soon. The other half indicated that operations would return to normality within 1-2 years.[[21]](#footnote-22)

Table 3‑1 shows the final disposition of survey responses at the program and measure level. The sample frame was also stratified by size (project savings), although this table does not include those size breakouts. The team also split the EO and Small Business strata into lighting and lighting with controls, based on the available measure descriptions in the program tracking data. In some cases, the measure descriptions indicated the presence of lighting controls, while in others the description was too vague for the team to identify if there were controls (i.e., Custom Lighting).

Table 3‑1. Survey sample design



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Program/Measure | Population (N) | Sample (n) | Population Savings (kWh) | Sample Savings (kWh) | % Population Savings |
| Energy Opportunities | 870 | 58 | 72,255,975 | 4,859,765 | 7% |
| Small Business | 679 | 25 | 5,251,694 | 94,084 | 2% |
| Midstream - Screw Based | 841 | 7 | 5,005,845 | 9,441 | 0% |
| Midstream - LED Fixtures | 1,774 | 37 | 5,151,787 | 128,407 | 2% |
| Midstream High/Low Bay | 1,430 | 43 | 23,347,341 | 821,302 | 4% |
| Midstream - Lighting with Controls | 2,353 | 36 | 30,128,118 | 635,273 | 2% |
| Midstream - Linear LEDs (TLED) | 1,504 | 27 | 6,716,402 | 75,839 | 1% |
| Midstream - Exterior LEDs | 2,110 | 57 | 14,189,869 | 759,512 | 5% |
| All | 11,561 | 290 | 162,047,032 | 7,383,623 | 5% |

The final free-ridership and spillover estimates were weighted by site-level weights and site-level savings. The study team calculated site-level weights by dividing the number of 2021 participants in each stratum by the sampled number of participants in the stratum. To estimate the savings weight, we calculated the total LED savings for each measure group for which the respondent was asked about. So, if a participant was asked about midstream linear LEDs, the total savings weight was based on the savings associated their midstream linear LED purchases.

## Retrospective NTG calculation

The results of the NTG surveys were analyzed to estimate participant spillover and free-ridership rates, which were used to produce the retrospective 2021 NTG ratios for each of the various lighting applications. The team calculated the LED NTG ratio using Equation 3‑1.

Equation 3‑1. NTG ratio formula

These component fractions — free-ridership and participant spillover — were calculated using in- and out-of-program LED savings, site-level weights, and the free-ridership and spillover rates discussed below. The team calculated free-ridership and participant spillover as ratios of the sampled savings, characterized as free-ridership or spillover savings to total sampled LED savings. The final free-ridership and spillover estimates were weighted using site-level weights and site-level LED savings. These calculations are shown in Equation 3‑2 and Equation 3‑3.

Equation 3‑2. Free-ridership formula

Equation 3‑3. Spillover formula

### Free-ridership

The free-ridership rate is the percentage of program participant savings that would have occurred in the absence of the program has had on the timing, quantity, and efficiency of a participant’s lighting purchases. The initial free-ridership rate was a product of timing, quantity, and efficiency. After calculating a respondent’s initial free-ridership rate, the team reviewed each estimate where free-ridership was 100% or 0% to ensure its consistency with the respondent’s response to the level of influence the program had on their decision to purchase these LEDs and adjusted the free-ridership score as necessary.

The team used an alternative technology efficiency approach to calculate the efficiency score. Respondents were asked about what alternative technology they would have purchased in the absence of the program. Unlike previous studies in Connecticut, where respondents were only asked if they would have purchased LED, intermediate, or baseline efficiency, respondents were asked specifically what technology they would have purchased. These alternative technologies were used to determine what would have been purchased in the absence of the program. After the respondents were asked about the specific lighting type purchases they would have made in the absence of the program, an efficiency score was calculated based on a delta watts (DW) approach. This approach consisted of creating a score based on the ratio of the stated DW to the baseline DW where the DW is equal to the stated alternative lighting technology wattage (e.g., T5) minus the lighting technology wattage the respondent was sampled on (e.g., TLED). The efficiency score is then elicited by taking the difference of the ratio and 1 to determine the efficiency free-ridership score of the stated alternative technology.

### Spillover

Spillover is the percentage of out-of-program LED savings from program participants that can be attributed to program influences even though the participants did not receive technical or financial support for this equipment. Consistent with previous research, any respondent who indicated that they purchased additional LED equipment outside of a PA program was asked whether their participation in any PA-sponsored program (any past program or a lighting program) or market actors they have interacted with through a program (program expert) influenced their decision to purchase this additional equipment. If a customer indicates that a market actor influenced their decision to purchase non-program equipment, then the initial spillover score is reduced by 50% since it was less about the program that influenced their decision to purcahse the equipment and more about the market actor.

Respondents were then asked why they did not request an incentive for the additional LEDs. If respondents indicated that the equipment did not qualify for an incentive, we reduced their previously calculated spillover score by 50%. This action results in a decrease in spillover because the likely reason the customer purchased the equipment outside the program was because the customer assumed it was a different type of equipment not covered by the program. Therefore, the program did not fully cause the customer to purchase the equipment meaning the spillover credited is less. After calculating a respondent’s initial spillover rate, the DNV team reviewed each estimate to ensure it was consistent with other survey responses, similar to free-ridership, regarding influence from recommendations, prior program participation, and prior experience with LED equipment.

Since self-reported quantity estimates are notoriously unreliable and the study team did not conduct any on-site inventories to count spillover lamps/fixtures, spillover was calculated using respondent self-reported program influence of purchasing additional equipment and an out of program adjustment factor. The out of program adjustment factor that was used to calculate spillover was developed from the Massachusetts 2019 NTG study.[[22]](#footnote-23) In Massachusetts, to calculate the spillover impact on all purchases, the team first compared all LEDs found on-site during lighting inventories to program tracking data for those sites. Any remaining LED products were considered out of program and included in the spillover calculation as the out-of-program quantity. An out-of-program adjustment factor was created that was then applied to program savings at each site to derive the out-of-program quantities for each respondent. The out-of-program adjustment factor was multiplied by the average influence factor by equipment type to determine the overall spillover factor. The on-site adjustment factors were 1.15% for exterior, 3.57% for high and low bay, 4.15% for fixtures, 0.64% for TLED, and 1.21% for screw-based.

## Prospective NTG calculation

Since NTG ratios have decreased from previous studies in Connecticut and in comparable jurisdictions, the study team developed a set of NTG ratios that should be applicable prospectively in 2024, 2025, and 2026. These results are based on the same logic from recent Massachusetts studies. In the first phase of this study, the team concluded that the market conditions in 2022–2026 in Connecticut would be very similar to the market conditions in Massachusetts (see Figure 2‑2), making it reasonable to use the same logic for the trends in Connecticut. For both downstream[[23]](#footnote-24) and Midstream[[24]](#footnote-25) pathways in Massachusetts, the prospective results were based on a consensus group process. The consensus group included representatives from the Program Administrators, Energy Efficiency Advisory Council Consultants, and evaluation subject matter experts – all of which received an equal weight in their estimates of future NTG values. The same trends in NTG ratios from those studies were applied to the retrospective estimates in Connecticut.

# 2021 Retrospective Results and 2024–2026 Prospective Results

## Survey results

The following section presents the detailed results of the individual questions that impact each component of the NTG scoring algorithm. Results are presented at finer granularity in the Midstream program than at the prospective application level to show possible differences between measure categories.

### Free-ridership results

To assess free-ridership, surveyors first asked respondents whether they would have purchased the same type and quantity of equipment at the same time absent the program. To account for the instant discounts provided as part of the Midstream program delivery, customers were first asked if they were aware that the received an incentive. If they were unaware, they were reminded about it and customers were worded to account for this lack of awareness. Respondents who indicated they would not have purchased the same equipment at the same time were then asked whether their participation in the program influenced the timing of their LED purchases and whether they would have purchased LEDs at the same time without support from the program. For those who said no, surveyors then inquired into whether they would have purchased them at an earlier time, a later time, or never.

The results, shown in Figure 4‑1, show that 42% of participants would have purchased their lamps at the same time, and 46% would have purchased at a later time or never absent the program. LED Fixtures and Linear LEDs had the highest rate of purchasing their equipment at the same time, at 59% and 56% respectively. Energy Opportunities, Small Business, and Lighting with Controls had the highest rate of purchasing their equipment later or never, at 50%, 76%, and 50% respectively.

Most participants who would have purchased their LEDs later would have done so between 1 and 5 years later, with the average response being approximately 4 years. 35% of participants who would have purchased their LEDs later would have done so within 1 year. Exterior LED had the most participants report that they would have purchased within 1 year.

Figure 4‑1. Decision on timing of LED installations in the absence of program support

After the timing questions, respondents were asked whether they would have purchased the same quantity of equipment without the support of the program. As shown in Figure 4‑2, 53% of participants would have purchased a different amount of LED bulbs without the program, while 45% would have purchased the same amount. Linear LEDs and LED Fixtures had the highest rate of purchasing the same amount of equipment without the program, at 56% and 59% respectively. Small Business participants had the lowest reported rate of purchasing the same amount of equipment without the program.

Those who would have purchased fewer lamps without the program would have purchased, on average, 35% of what they ultimately purchased. Midstream Lighting with Controls had the lowest average percentage of equipment that would have been purchased without the program, at 24%. Screw-based had the highest average percentage of equipment that would have been purchased without the program, at 50%.

Figure 4‑2. Decision to purchase the same quantity of LEDs installed in the absence of program support

To end the free-ridership series, surveyors asked respondents who had purchased equipment about the efficiency level of equipment they would have purchased in the absence of the program.[[25]](#footnote-26) Respondents reported what equipment they would have purchased if support from the program had not been available.

Table 4‑1 shows the results of the efficiency questions. Of respondents who indicated they would have purchased something without the program, 38% reported that they would have purchased LED equipment, and 62% said they would have purchased non-LED equipment or something not listed (nothing and refused removed). Respondents that purchased screw-based lighting were not asked about alternative efficiencies since there is no intermediate technology (ex: CFL) with any significant market share.

Table 4‑1. Decision on efficiency of lighting products installed in the absence of program support

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Energy Opportunities | Small Business | Linear LEDs | LED Fixtures | Exterior LED | High/Low Bay | Lighting with Controls | All |
| Exterior LEDs |  |  |  |  | 11% |  |  | 3% |
| Fluorescent Lamps | 33% | 21% | 11% | 11% | 5% | 7% | 6% | 9% |
| Moguls or HID |  |  |  |  | 2% |  |  | 0.4% |
| Downlight |  |  |  |  | 2% |  |  | 0.4% |
| High/Low Bay LEDs |  |  |  |  |  | 2% |  | 0.4% |
| Linear LED or LED Fixture |  |  |  | 11% |  | 5% |  | 3% |
| LED w/o Controls | 33% | 11% | 7% |  |  |  | 3% | 3% |
| LED w Controls |  |  |  |  |  |  | 8% | 1% |
| Something else |  | 5% |  | 11% | 9% | 5% | 8% | 6% |
| Nothing |  | 16% |  | 5% | 5% | 21% | 19% | 10% |
| Refused | 33% | 47% | 81% | 62% | 67% | 60% | 56% | 64% |

The survey asked questions to understand the participant’s general perception of the influence the program had on their decision to purchase LEDs. As mentioned in Section 3.2.1, this information was used to adjust each respondent’s calculated free-ridership score if the results were inconsistent.

Figure 4‑3 shows that 73% of respondents reported that the program was very or extremely influential in their decision. Influence was highest for Energy Opportunities and Small Business, where only 4% and 0%, respectively, reported that the program had no or slight influence. Linear LEDs had the highest percent reporting that the program had no influence.

Figure 4‑3. Influence of program discount on decision to install LEDs

The survey also investigated whether market actors influenced a respondent’s decision to participate in the program. Respondents were asked whom they considered the most responsible for recommending and specifying the LEDs that were purchased through the program. Table 4‑2 shows that 39% of respondents participated without external recommendations and cited themselves or someone from their company as the most responsible party. Another 23% felt distributors were most responsible. Contractors were most responsible for 17% of respondents.

Table 4‑2. Party most responsible for Program participation, by LED type

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Energy Opportunities | Small Business | Exterior LED | High/Low Bay | LED Fixtures | Lighting with Controls | Linear LEDs | Screw-Based | All |
| Contractor | 19% | 32% | 13% | 19% | 16% | 14% | 14% | 11% | 17% |
| Distributor | 17% | 16% |  | 22% | 16% | 30% | 26% | 36% | 23% |
| Don’t Know | 2% | 4% |  |  |  | 4% | 2% |  | 2% |
| Energy Services Company | 3% | 4% |  |  |  |  |  | 3% | 1% |
| Manufacturer’s representative | 2% | 4% |  |  | 3% |  | 2% | 6% | 2% |
| Someone else | 7% | 4% | 38% |  | 19% | 18% | 14% | 6% | 11% |
| Someone else in the company | 5% | 8% |  | 4% | 8% | 5% |  | 6% | 5% |
| Third-party design prof. | 3% |  |  |  | 3% |  | 2% |  | 1% |
| Third-party engineer | 3% |  |  |  |  | 2% |  | 3% | 1% |
| Yourself | 38% | 20% | 50% | 56% | 35% | 26% | 37% | 28% | 34% |
| {PA} account manager |  | 8% |  |  |  | 2% | 2% | 3% | 2% |

### Spillover results

To assess spillover, the study team multiplied the out-of-program savings calculated using the on-site adjustment factor (see section 3.2.23.2.2) by the spillover factor. So all customers have some level of spillover savings, but this section details the questions that inform the spillover influence score. For respondents that indicated that they purchased LED products outside of the program, we asked respondents a series of questions about whether they purchased LEDs without a rebate from the program and what influenced them to do so. The results, illustrated in Figure 4‑4, show that 16% of respondents also purchased LED equipment outside of the program. 50% of screw-based participants who were surveyed purchased additional equipment, while only 11% of those who purchased midstream lighting with controls installed additional equipment.

Figure 4‑4. Presence of out-of-program LEDS

To calculate the spillover factor respondents who purchased additional equipment outside of the program were asked how influential the program was in their decision to purchase said equipment. 38% indicated the program was very or extremely influential in their decision, and 40% indicated that the program had slight or no influence in their decision. These results, by lamp type, are shown in Table 4‑3. Using a labeled magnitude scale,[[26]](#footnote-27) respondents received an initial spillover factor.

Table 4‑3. Influence of PA assistance on decision to install out-of-program LEDs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Extremely influential | Very influential | Moderately influential | Slightly influential | Not at all influential |
| Energy Opportunities |  | 13% | 25% | 13% | 50% |
| Small Business |  |  | 20% | 40% | 40% |
| Screw-Based | 25% | 25% | 50% |  |  |
| Linear LEDs | 20% | 40% | 20% | 20% |  |
| LED Fixtures | 13% | 50% | 13% | 13% | 13% |
| Exterior LED | 13% | 25% | 25% |  | 38% |
| High/Low Bay | 40% |  |  |  | 40% |
| Lighting with Controls | 50% |  | 25% |  | 25% |
| All | 17% | 21% | 19% | 13% | 28% |

The team decreased the initial spillover factor if the respondent indicated that a recommendation from a contractor; distributor, engineer, or designer influence their decision. Figure 4‑5 shows that 34% of all customers indicated that a market actor influenced their decision to purchase out-of-program LEDs. 60% of customers that purchased Linear LEDs from the Midstream program indicated influence by market actors, while only 20% of customers that purchased high/low bay LEDs from the Midstream program were influenced by market actors.

Figure 4‑5. Influence of market actor on decision to install out-of-program LEDS

To understand why customers did not purchase these additional LEDs through the program, respondents who had indicated they purchased additional equipment were asked to discuss what prevented them from further participating. As shown in Table 4‑4, 15% of respondents indicated that they thought the equipment would not qualify.[[27]](#footnote-28) For those that indicated that the equipment did not qualify, their spillover factor was also decreased by 50%.

Table 4‑4. Reasons customers did not install additional LEDs through the program

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Energy Opportunities | Small Business | Exterior LED | High/Low Bay | LED Fixtures | Lighting with Controls | Linear LEDs | Screw-Based | All |
| Cost savings not worth the effort of applying |  |  |  |  | 13% |  | 20% |  | 4% |
| Didn’t know the equipment qualified under another program |  | 20% | 25% |  | 13% | 25% | 20% | 25% | 15% |
| Just didn’t think of it |  |  | 25% |  |  | 13% |  | 25% | 6% |
| No time, needed equipment immediately |  | 40% |  |  | 13% | 13% |  |  | 9% |
| Other | 25% | 20% | 25% | 60% | 13% | 25% | 40% | 50% | 30% |
| Takes too long for approval |  |  |  |  | 13% |  |  |  | 2% |
| The equipment would not qualify | 25% |  |  |  |  |  |  |  | 4% |
| Thought the program ended | 25% | 20% |  |  |  |  |  |  | 6% |
| Too much paperwork | 13% |  | 25% |  |  |  |  |  | 4% |
| Unable to get rebate- unsure why | 13% |  |  |  |  |  |  |  | 2% |
| Vendor does not participate in program |  |  |  | 40% |  |  |  |  | 4% |
| Don’t Know |  |  |  |  |  |  |  |  |  |

## 2021 retrospective NTG results

This section discusses the calculated free-ridership and spillover rates, as well as the final 2021 retrospective NTG ratios developed based on the survey results. Table 4‑5 displays the sampled program and measure category along with the sample size, free-ridership value, spillover value, NTG ratio, and relative and absolute precision at the 90% confidence level. To provide extra detail, the table includes additional breakouts for lighting versus lighting with controls for the EO and Small Business programs. These distinctions were based on either measure descriptions provided in the tracking data that indicated controls or customer responses when asked if they also installed controls as part of the lighting project. Note that for prospective application, these categories are collapsed into an overall EO and Small Business value. This is both because tracking systems are not set up to handle different values and the precisions were too wide. Even if the tracking systems were adjusted to allow separate values, the precision would not be sufficient for breaking out this category prospectively.

To improve prevision for prospective application Midstream – Lighting includes, linear LEDs, LED fixtures, and exterior LEDs. This table presents the results for all categories separately. NTG ratios were very similar across these subcategories. High/low bay and lighting with controls were kept separate due to tighter precisions and higher NTG ratios. Screw-based lighting has a small sample size but was kept as its own category since the Midstream program is ending incentives for this technology moving forward.

The 2021 retrospective value for the EO program overall was 82%, which is a 12-percentage point decrease from the previous value, which was based on PY2017 participation. EO customers that installed lighting with controls had a higher NTG value, but their weight was insignificant in changing the overall EO NTG value. The overall Small Business ratio maintained a high NTG ratio of 92% representing a decrease of about 7 percentage points from the previous value, which was based on PY2011 participation. In the Midstream program, the retrospective values were higher in the high/low bay (81%) and lighting with controls (91%) categories compared to other lighting measures. The aggregated linear LEDs, LED fixtures, and exterior LEDs category was a combined 31% NTG. In all cases, participant spillover was very low, and the variations in NTG are due to differences in free-ridership. IN this combined category, NTG for linear LEDs and LED fixtures were 39% and 40%, and exterior LED was 27%.

The difference between this collapsed lighting category, made up of more common lighting equipment, and the high/low bay and lighting with controls category indicates that program intervention on the other and more advanced technologies is more important for market transformation. For the more common lighting equipment, the low NTG scores driven by high free-ridership indicate that most customers would have still installed LED technologies in the absence of the program.

Table 4‑5. Program/measure 2021 retrospective NTG ratios



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Program/Measure | Sample Size | Free-ridership | Spillover | NTG | Relative Precision | Absolute Precision |
| Energy Opportunities - Lighting | 52 | 22% | 4% | **82%** | 19% | 15% |
| Energy Opportunities - Lighting with Controls | 6 | 1% | 3% | **102%** | 2% | 2% |
| Small Business - Lighting | 6 | 11% | 4% | **93%** | 19% | 17% |
| Small Business - Lighting with Controls | 19 | 16% | 3% | **87%** | 26% | 23% |
| Midstream - High/Low Bay LED | 43 | 21% | 2% | **81%** | 9% | 7% |
| Midstream - Lighting with Controls | 36 | 12% | 3% | **91%** | 7% | 6% |
| Midstream – Linear LEDs\* | 27 | 62% | 0% | **39%** | 60% | 23% |
| Midstream – LED Fixtures\* | 37 | 63% | 3% | **40%** | 41% | 16% |
| Midstream – Exterior LED\* | 57 | 74% | 1% | **27%** | 67% | 18% |
| Midstream - Screw-Based | 7 | 67% | 1% | **33%** | 114% | 38% |

\*Measures collapsed to Midstream – Lighting for prospective application.

## Submarket differences

To understand possible differences in NTG across other customer segments, the study team also analyzed the overall NTG scores across lighting compared to lighting with controls, by downstream versus Midstream programs, and in distressed municipalities against non-distressed municipalities. For distressed municipalities, the study team used the 2021 list of distressed municipalities as defined by the Connecticut Department of Economic and Community Development.[[28]](#footnote-29) Updated annually, the list identifies the state’s most fiscally and economically distressed municipalities and is used by state agencies to target funds for needs such as housing, insurance, open space, brownfield remediation, and economic development programs. The 25 municipalities are deemed distressed based on the fiscal capacity of each municipality as determined by the tax base, personal income of residents, and the residents’ need for public services.

In all cases, the NTG ratios were different across customer segments. The NTG ratio for lighting with controls was significantly higher than lighting in both the downstream and Midstream programs. In distressed municipalities, the NTG ratio was higher in both downstream and Midstream programs; however, it was only statistically significant for Midstream programs. Based on these findings, the study team developed a set of alternative retrospective results combining program, distressed municipality status, and controls integration. Table 4‑6 shows the NTG ratios for the submarket breakout including sample size, NTG, and relative and absolute precision of the submarket analysis. In this table, EO and Small Business results were combined into an overall Downstream category and Midstream measure breakouts were combined. These categories were collapsed because of the need to maintain large enough sample sizes and small enough precision levels.

Table 4‑6. Submarket 2021 retrospective NTG ratios



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Submarket | Sample Size | NTG | Relative Precision | Absolute Precision |
| Downstream Non-Distressed | 60 | 80% | 21% | 17% |
| Downstream Distressed | 23 | 95% | 9% | 9% |
| Midstream Non-Distressed Lighting | 130 | 51% | 29% | 15% |
| Midstream Non-Distressed Lighting with Controls | 24 | 85% | 11% | 9% |
| Midstream Distressed | 46 | 87% | 9% | 8% |

In addition to the lighting with controls and distressed municipality breakouts, the study team also used survey responses to examine if there were any differences in NTG across the size of businesses and the business types. The sample frame was not specifically stratified at this level. The results were also not re-weighted for this analysis and the confidence intervals in the results are large. To fully understand the impact that business size and type has on NTG vales, we would recommend conducting a multivariate analysis taking into account covariation with other factors. For business size, reflected by number of employees at location, the retrospective NTG values were largest for the smallest (less than 10 people) and the largest businesses (more than 200 people). For building type, there was not enough sample to break out many specific building types beyond manufacturing/warehouses and retail; however, both building types had higher NTG values than the rest of the identifiable sample.

## Prospective NTG results

The study team developed two sets of prospective NTG ratios based on the two sets or retrospective NTG ratios – one that is program/measure specific and one that is submarket specific. Table 4‑7 shows the prospective NTG ratios for the program/measure approach. The table includes the PY2021 retrospective value for context. For the EO program, the NTG declines 4 percentage points per year, matching the rate of decline in the Massachusetts downstream custom and prescriptive lighting retrofit initiatives. For Small Business, the NTG declines 3.5 percentage points, matching the rate of decline in the Massachusetts downstream custom and prescriptive lighting small retrofit initiatives.

In Table 4‑7, the Midstream – Lighting with Controls includes all types of lighting installed with controls, including linear lamps with controls, linear fixture with controls, high/low bay with controls, and exterior with controls. The Midstream – Lighting category is an aggregated category that includes LED stairwell kits, LED linear lamps, LED linear fixtures, and LED exterior. For the Midstream measures, the NTG declined 5 percentage points for high/low bay and 2 percentage points for lighting with controls, matching the Massachusetts rate of decline for the same measure categories. For the screw-based and lighting category, the NTG also declined 5 percentage points, matching the screw-based, fixtures, and exterior categories in Massachusetts.

Section 4.5 presents a comparison of results to Massachusetts and other areas, and it shows how Connecticut values for high/low bay and lighting with controls are substantially higher than in Massachusetts calling into question if the Massachusetts trends are appropriate for Connecticut. The study team believes that the trends from Massachusetts still represent the best available information for informing Connecticut. The lighting with controls category, which represents all lighting measure with controls, has only a 2% decline over time. And for high/low bay, the NTG value is higher in Connecticut but there is no evidence to assume that the rate of decline would be different given this higher value.

Table 4‑7. Program/measure prospective NTG ratios



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Program/Measure | *PY2021* | PY2024 | PY2025 | PY2026 |
| Energy Opportunities | *82%* | 70% | 66% | 62% |
| Small Business | *92%* | 81.5% | 78% | 74.5% |
| Midstream - Lighting with Controls | *91%* | 85% | 83% | 81% |
| Midstream - High/Low Bay LED | 81% | 66% | 81% | 66% |
| Midstream - Screw-Based | *33%* | 18% | 13% | 8% |
| Midstream - Lighting | *31%* | 16% | 11% | 6% |

Table 4‑8 presents the prospective NTG ratios for the submarket approach. The table includes the PY2021 retrospective value for context. Since there was less information available to guide the trend in NTG across the submarket breakouts, the study team assumed a 4-percentage point annual rate of decline matching the assumption used for the EO program decline in the program/measure scenario and 5 percentage point decline for the Midstream program matching the most common assumption across the Midstream categories in the program/measure scenario.

Table 4‑8. Submarket prospective NTG ratio

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Submarket | *PY2021* | PY2024 | PY2025 | PY2026 |
| Downstream Non-Distressed | *80%* | 68% | 64% | 60% |
| Downstream Distressed | *95%* | 83% | 79% | 75% |
| Midstream Non-Distressed Lighting | *51%* | 37% | 32% | 27% |
| Midstream Non-Distressed Lighting with Controls | *85%* | 70% | 65% | 60% |
| Midstream Distressed | *87%* | 72% | 67% | 62% |

## Results comparisons

To compare how Connecticut retrospective and prospective values compare to prior assumptions and to other jurisdictions, Table 4‑9 presents a comparison of the results. The table includes the results from this study alongside the previous Connecticut assumptions and results from research conducted in Massachusetts and New York. EO and Small Business results are comparable to both Massachusetts and Connecticut. Connecticut is slightly higher than the other states, but the New York value also does not include spillover, since the reported results did not include spillover at the measure level. For the Midstream measures, the lighting category in Connecticut (linear, fixtures, and exterior) are all slightly higher than Massachusetts but are similarly lower than the other Midstream categories. High/low bay and lighting with controls are also higher in Connecticut than Massachusetts but have a similar trend of higher values than other lighting measures. It is important to note that prior Midstream assumptions in Connecticut were based on adjustment factors applied to older Connecticut research. No primary data was collected to inform those previous assumptions.

Table 4‑9. NTG comparisons

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Program/Measure | Prior CT Assumption | CT 2021 Retro. | MA 2022[[29]](#footnote-30), [[30]](#footnote-31) | NGRID NY 2022[[31]](#footnote-32) | CT 2024 Prosp. | MA 2024 |
| Energy Opportunities – Lighting | 94% (2019)[[32]](#footnote-33) | 82% | 65.8% Cus. 78.5% Pres. | 77%\* | 70% | 58.3% Cus.  71.1% Pres. |
| Small Business – Lighting | 98.7 (2012)[[33]](#footnote-34) | 92% | 80% Cus.  86% Pres. | 90%\* | 81.5% | 73.3% Cus.  79.5% Pres. |
| Midstream – Screw-Based | 48.3%  (2022)[[34]](#footnote-35) | 33% | 45% |  | 21% | 35% |
| Midstream – Linear LEDs | 38.5%  (2022) | 39% | 26% |  | 21% | 14% |
| Midstream – LED Fixtures | 35.6% (2022) | 40% | 27% |  | 21% | 17% |
| Midstream – Exterior LED | 26% (2022) | 27% | 17% |  | 21% | 7% |
| Midstream – High/Low Bay | 58.7% (2022) | 81% | 49% |  | 66% | 38% |
| Midstream – Lighting with Controls | *51.1% (2022)* | 91% | 58% |  | 85% | 53% |

\*New York values are based on only free-ridership impacts. Spillover was not reported at the measure level, so it is not included in this comparison.

# Conclusions and Recommendations

## Conclusions

Similar to other jurisdictions, the NTG for the downstream programs – both EO and Small Business – remained high, showing a modest decline from previous studies. For Midstream, there is a split in NTG ratios between the more common technologies (screw-based, linear, fixtures, and exterior) and the other measures including high/low bay and lighting with controls. These measure groups represent a greater opportunity to continue to transform the lighting market and generate program savings. Based on research and trends in other areas, there will be a continued decline in NTG across all program/measure breakouts.

Investigations into submarket differences indicated that the NTG ratios were higher in distressed municipalities compared to non-distressed municipalities, and across all programs, the NTG ratios were higher for lighting installed with controls compared to standard lighting. The NTG ratio for disadvantaged communities participating in the Midstream program was significantly higher than the NTG for non-disadvantaged communities, indicating this program is an important pathway for the adoption of LEDs in these communities. Overall, these results indicate the program interventions have more influence in these submarkets and are still needed to continue to transform the market towards advanced lighting systems and toward LEDs in distressed areas.

While spillover is nearly non-existent for customers, free-ridership continues to increase as more customers have gained familiarity and comfort with LED technologies and equipment costs have declined, leading to the overall downward NTG trend. The program’s moderate impact on the timing and quantity of participants’ LED purchases continues to be primary driver of free-ridership. 44% of customers said they would have purchased their LEDs at the same time or earlier without the program, and 45% of customers said they would have purchased the same amount without the program. While some customers indicated they would have purchased non-LED equipment in the absence of the program the majority of the customers preferred to not answer the question.

## Recommendations

The Connecticut utilities should adopt either the program/measure prospective NTG ratios (Table 4‑7) or the submarket prospective NTG ratios (Table 4‑8) for 2024, 2025, and 2026. The utility tracking systems may not be able to account for the submarket NTG ratios at this time, but if that changes, the utilities can switch to the submarket NTG ratios in the future if so desired. To be consistent, both utilities should use the same approach. The prospective options should not be mixed within programs. For instance, if the utilities decided to apply the submarket NTG ratios for the Midstream program, they should use all the Midstream Non-Distressed Lighting, Midstream Non-Distressed Lighting with Controls, and Midstream Distressed values, and not a mix of the submarket and program/measure NTG values.

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###### Detailed free-ridership and Spillover Scoring Algorithm

Table 5‑1. Initial free-ridership scoring

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Type | Question | Responses | Calculation | Score | Initial Free-Ridership |
| Timing | Without would you have purchased equipment at the same time? | Yes | T = 0 | FR\_Timing =  (1 – ((T-6) \* 0.024)) | **FR =**  **FR\_Timing \* FR\_Quantity \* FR\_Efficiency** |
| Would you have purchased the equipment earlier than you did, at a later date, or never? | Same Time | T = 0 |
| Never | T = 48 |
| How much earlier/later would you have purchased the equipment? | \_\_\_\_\_\_\_ years | T = (Recorded # of Years \* 12) + Recorded # of Months |
| \_\_\_\_\_\_\_ months |
| Quantity | Without discount would your business have purchased the exact same quantity of equipment? | Yes | Q = 100 | FR\_Quantity = Q/100 |
| Compared to the amount of equipment that you purchased what percent do you think your business would have purchased? | Enter Percent (0-100) \_\_\_ | Q = Recorded Percent |
| Efficiency | Without the discount would you have purchased the exact same efficiency as the equipment that you purchased? | Yes | E = alt technology efficiency score | FR\_Efficiency = E |
| No | E = 0 |

Table 5‑2. Free-ridership consistency check

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type | Question | Responses | Calculation[[35]](#footnote-36) | Final Free-Ridership |
| Influence | Overall, how influential was the price discount you received on your company’s decision to purchase the equipment? | Extremely influential | I = 0 | **IF FR = 0 & I > 0.35 then FR = .5 If FR = 1 & I < 0.89 then FR = .5** |
| Very influential | I = 0.35 |
| Moderately influential | I = 0.5 |
| Slightly influential | I = 0.89 |
| Not at all influential | I = 1 |

Table 5‑3. Spillover influence score

|  |  |  |  |
| --- | --- | --- | --- |
| Type | Question | Responses | Calculation |
| Spillover Influence | How influential was the PA assistance on your decision to purchase the additional LED equipment without an incentive? | Extremely influential | I = 0 |
| Very influential | I = 0.35 |
| Moderately influential | I = 0.5 |
| Slightly influential | I = 0.89 |
| Not at all influential | I = 1 |
| Initial Spillover Factor | Did you purchase any other LED equipment on your own without a rebate or discount | Yes |  |
| Did a recommendation from a contractor; distributor, engineer, or designer influence your decision to purchase some or all of the additional LED equipment on your own? | Yes | Spill Factor = Spill Factor \* .5 |
| No | Spill Factor = Spill Factor |
| Why didn't you purchase these additional LEDs through a program | Equipment would not qualify | Spill Factor = Spill Factor \* .5 |
| Other | Spill Factor = Spill Factor |

Table 5‑4. Spillover consistency check

|  |  |  |
| --- | --- | --- |
| Type | Method | Calculation |
| Final Spill Factor | If Spill Factor = 1  & Spill Influence < .35 | Final Spill Factor = .25 |
| If Spill Factor = 1  & Spill Influence < .89 | Final Spill Factor = .5 |
| If Spill Factor = .5  & Spill Influence < .35 | Final Spill Factor = .25 |

Table 5‑5. Spillover on-site adjustment factor

|  |  |  |
| --- | --- | --- |
| Measure Type | On-site Adjustment Factor | Spillover |
| Lighting with Controls D | 4.15% | **Spillover =  On-Site Adjustment Factor \***  **Savings Weighted Average of Spillover Factor by Lighting Type** |
| Exterior LED | 1.15% |
| High/Low Bay LED | 3.57% |
| LED Fixtures | 4.15% |
| Lighting with Controls U | 4.15% |
| Linear LEDs | 0.64% |
| Screw-Based | 1.21% |

###### Business Type and Size NTG Results

Table B-1. Retrospective NTG - employee size

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Net-to-Gross** | **Lower CI** | **Upper CI** | **Relative Precision** | **Absolute Precision** |
| Less than 10 people (n=105) | 84% | 79% | 89% | 6% | 5% |
| Between 10 and 50 people (n=77) | 64% | 41% | 87% | 36% | 23% |
| Between 50 and 200 people (n=26) | 85% | 74% | 97% | 14% | 12% |
| More than 200 people (n=10) | 100% | 94% | 105% | 6% | 6% |
| Missing (n=69) | 54% | 25% | 84% | 54% | 29% |

Table B-2. Retrospective NTG – business type

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Net-to-Gross | Lower CI | Upper CI | Relative Precision | Absolute Precision |
| Manufacturing (n=49) | 87% | 77% | 96% | 11% | 9% |
| Other (n=179) | 70% | 57% | 83% | 19% | 13% |
| Retail (n=34) | 76% | 64% | 88% | 16% | 12% |
| Missing (n=28) | 69% | 59% | 80% | 15% | 11% |

###### Customer Survey Instrument

**Overview**

Primary Objective: to calculate customer-level net-to-gross (NTG) ratios including free-ridership and participant spillover. Individual respondents will be asked a series of question and responses on timing, quantity, and efficiency will be put into an algorithm to determine individual NTG ratios. Final results will be weighted to produce overall program and measure level NTG ratios to be applied prospectively starting in 2023.

Sample Frame: the sample will be drawn from lighting program participants from 2019-2021, excluding new construction participants. The sample will be stratified by program, measure, and size (annual savings). The final sample design will be presented prior to fielding the survey.

|  |  |
| --- | --- |
| Questions | Objective |
| INTRO1 - INTRO3 | Ensure we are speaking to the correct contact |
| SCRN\_Part0 - SCRN\_Part3 | Identify building type, buyer vs. contractor, installation location, and facility size |
| RB1 – RB10 | Clarify which lighting type was installed and what it replaced. Identify if the customer was aware that they received the rebate. |
| FR1 – FR2 | Determine if there was an influential vendor |
| FR3a – FR 6 | Timing freeridership questions |
| FR7 – FR8 | Quantity freeridership questions |
| FR9 – FR10 | Efficiency freeridership questions |
| FR11 | Freeridership consistency check |
| PA1a – PA8 | Credit for technical assessments, past participation, and dual fuel |
| SO1 – SO6 | Spillover questions |
| SO7 | Spillover consistency check |
| END1- END2 | Record email address, thank, and terminate |

Survey Variables

|  |  |
| --- | --- |
| Variable | Explanation |
| <Interviewer Name> | CATI Interviewer name |
| <Firm Name> | CATI firm name |
| <contact> | Customer contact name |
| <Address> | Customer site address |
| <PA> | Customer’s electric program administrator |
| <Participant> | Program in which customer participated (m vs. downstream) |
| <Year> | Program year |
| <Vendor1> | Customer’s Downstream implementation vendor |
| <LED Type 1> | Type of LED equipment for which the customer was sampled |
| <LED Type 2> | Type of LED equipment with most savings after <LED Type 1> from tracking data |
| <LED Type 3> | Type of LED equipment with second most savings after <LED Type 1> from tracking data |
| <LED Type 4> | Type of LED equipment with third most savings after <LED Type 1> from tracking data |
| <LED Type 5> | Type of LED equipment with fourth most savings after <LED Type 1> from tracking data |
| <LED Type 6> | Type of LED equipment with fifth most savings after <LED Type 1> from tracking data |
| <Lighting Type 1> | Lighting category associated with <LED Type 1> |
| <distributor1> | Vendor that the customer purchased lamps through |
| <distributor2> | Vendor that the customer purchased lamps through |
| <Total Quantity1> | Quantity of LED Type 1 found in tracking data |
| <Total Quantity2> | Quantity of LED Type 2 found in tracking data |
| <Total Quantity3> | Quantity of LED Type 3 found in tracking data |
| <Total Quantity4> | Quantity of LED Type 4 found in tracking data |
| <Total Quantity5> | Quantity of LED Type 5 found in tracking data |
| <Total Quantity6> | Quantity of LED Type 6 found in tracking data |
| <Total Incentive> | Total incentive provided by PA |
| <Building Type> | Customer building type recorded by program records |
|  |  |

**Introduction**

[IF SURVEY IS TAKEN ONLINE, begin at PERSON1. Alternative text will be provided where applicable with the programming instructions stating, “IF SURVEY IS TAKEN OVER THE PHONE” with alternative text after “IF SURVEY IS TAKEN ONLINE”.]

Intro1. Hello, my name is <INTERVIEWER NAME> from <FIRM NAME>, calling on behalf of the EnergizeCT program sponsored by <PA> regarding your recent lighting purchases. THIS IS NOT A SALES CALL NOR A SERVICE CALL. May I please speak with <contact>?

[IF NEEDED]  
We’re not selling anything, we are interested in your opinions and the factors that were important in your decision to purchase lighting equipment. This survey is authorized by the EnergizeCT program sponsored by <PA>.

|  |  |  |
| --- | --- | --- |
| 1 | Yes | PERSON1 |
| 2 | Make Appointment=APPT | APPT |
| 3 | No longer works here | Intro1a. |
| 88 | Refused | Thank & Terminate |

[If Intro1 = 2]

APPT.

|  |  |  |
| --- | --- | --- |
| 77 | Record day of the week, time of day and date to call back. Record phone number and contact name if needed. | Call contact and repeat intro process at designated time |
| 88 | Refused | Thank & Terminate |
| 99 | Don’t know | Thank & Terminate |

[If Intro1 = 3]

Intro1a. Could you give me the name and telephone number of someone else at your facility who is knowledgeable about your lighting equipment?

|  |  |  |
| --- | --- | --- |
| 77 | Record name and telephone number | Call contact and repeat intro process |
| 88 | Refused | Thank & Terminate |
| 99 | Don’t know | Thank & Terminate |

PERSON1 [IF SURVEY IS TAKEN ON THE PHONE]  
According to our records, you recently purchased LED lighting equipment through a program supported by the EnergizeCT program sponsored by <PA>. We would like to speak with you regarding the LEDs installed at your facility. Your responses will be kept confidential. We need to speak with someone who is knowledgeable about the purchase of LEDs at this facility. Would that be you?

|  |  |  |
| --- | --- | --- |
| 1 | Yes | INTRO3 |
| 2 | Yes, need to make an appointment | APPT |
| 3 | No, but I will give you the name | Person2 |
| 4 | No one knows about the lighting equipment | Thank and Terminate |

[IF SURVEY IS TAKEN ONLINE]  
According to our records, you recently purchased LED lighting equipment through a program supported by the EnergizeCT program sponsored by <PA>. We would like to ask you some questions regarding the LEDs installed at your facility. Your responses will be kept confidential. We need to ensure that the person responding to these questions is knowledgeable about the purchase of LEDs at this facility. Would that be you?

|  |  |  |
| --- | --- | --- |
| 1 | Yes | INTRO3 |
| 3 | No, but I will give you the name and email | Person2 |
| 4 | No one knows about the lighting equipment | Thank and Terminate |

Person2 [IF SURVEY IS TAKEN ON THE PHONE]  
Who would be the person most familiar with your organization’s lighting equipment?  
[Enter New Contact Name and move on]

|  |  |  |
| --- | --- | --- |
| 77 | Record Name, as <CONTACT> | MAY\_I |
| 88 | Refused | Thank & Terminate |
| 99 | Don’t know | Thank & Terminate |

[IF SURVEY IS TAKEN ONLINE]  
Please provide the name and email for who would be the person most familiar with your organization’s lighting equipment.

|  |  |  |
| --- | --- | --- |
| 77 | Record Name, as <CONTACT> | Thank & Terminate |
| 78 | Record Email, as <EMAIL> | Thank & Terminate |
| 88 | Refused | Thank & Terminate |
| 99 | Don’t know | Thank & Terminate |

MAY\_I May I speak with him/her?

|  |  |  |
| --- | --- | --- |
| 1 | Yes | INTRO2 |
| 2 | Yes, need to make an appointment | APPT |
| 88 | Refused | Thank & Terminate |

INTRO2. Hello, my name is <INTERVIEWER NAME> calling on behalf of the EnergizeCT program sponsored by <PA>. This is not a sales call. We are interested in speaking with the person most knowledgeable about this facility’s lighting equipment. I was told that would be you. Is this correct?

[IF NEEDED]  
We’re not selling anything, we are interested in your opinions and the factors that were important in your decision to purchase lighting equipment. This survey is authorized by the EnergizeCT program sponsored by <PA>.

|  |  |  |
| --- | --- | --- |
| 1 | Yes | INTRO3 |
| 2 | No, there is someone else | Repeat Person2 until correct person is found or call must be terminated |
| 99 | No and I don’t know who to refer you to | Thank & Terminate |

INTRO3. Today we’re conducting an important study on the energy needs and perceptions of organizations like yours. We are specifically interested in how your company thinks about and manages their energy consumption. The survey should take less than 15 minutes and at no time will we try to sell you anything. We know your time is important and would like to offer you a $25 Amazon gift card for responding to our questions today.

Finally, we would like to remind you that your responses will be kept confidential.

[IF NEEDED]  
Results will only be reported in aggregate to maintain the anonymity of your organization and responses.

Screener

SCRN\_Part0. Before we begin, we want to ensure we have the correct building type on file. Our records indicate that this business is listed as “<Building Type>”. Is this correct?  
[IF <Building Type>=Other, skip to SCRN\_Part0a]

Yes

No

Don’t Know

Refused

SCRN\_Part0a. [IF SCRN\_Part0 does NOT equal “Yes”] How would you describe your building?  
[DO NOT READ LIST; CONFIRM CATEGORIZATION WITH RESPONDENT]  
[IF <Building Type>=Other, use the following text]: Before we begin, we want to ensure we have the correct building type on file. Out records indicate that this business is listed as “Other”. How would you describe your building?

College or University

Grocery/Food Sales

Industrial/Manufacturing

K-12 School

Lodging

Office Building

Parking Garage

Restaurant/Food Service

Retail

Warehouse and Storage

Hospital

Medical Office

Nursing home or assisted living facility

Other

Don’t Know

Refused

DO NOT READ – FOR INTERVIEWER REFERENCE

|  |  |
| --- | --- |
| Building Type | Includes |
| College and University | College or university, junior or community college |
| Grocery/Food Sales | Grocery store or food market, gas station with convenience store, convenience store |
| Hospital | Hospital, inpatient rehabilitation, nursing homes |
| Industrial/Manufacturing | Plants, factories, or mills |
| K-12 School | Elementary and high schools, preschool or daycare, adult education, care or vocational training, religious education |
| Lodging | Motel or inn, hotel, dormitory, retirement home, nursing home, assisted living |
| Medical Office | Medical office, clinic or other outpatient health care, veterinarian |
| Office Building | Administrative or professional office, government buildings, federal, state, or local government office, city hall, city center, bank or other financial institution, mixed-use office, sales office, call center. |
| Parking Garage | Parking spaces, ramps, entrances and exits, ticket booth. |
| Restaurant/Food Service | Fast food, restaurant or cafeteria, bar, coffee, bagel or doughnut shop, ice cream or frozen yogurt shop |
| Retail | Retail store, beer, wine or liquor store, auto dealership or showroom, enclosed mall, strip shopping center |
| Warehouse and Storage | Refrigerated warehouse, non-refrigerated warehouse, distribution or shipping center |
| Other | A wide variety of buildings, including recreational and entertainment facilities such as health clubs, ice rinks, museums, theaters, casinos; service-oriented facilities such as auto repair shops, dry cleaners, car washes, post offices, libraries, etc.; religious facilities such as churches, mosques, synagogues; municipal buildings such as government offices, police and fire stations, etc. |

SCRN\_Part1. [If Participant=Upstream] Our records show that you purchased <LED type 1> [if applicable for LED type 2-5], <LED type 2>, <LED type 3>, <LED type 4>, <LED type 5>, and <LED type 6> lighting equipment from <distributor1> [if applicable] and <distributor2>; in <Year>. Is this correct?

Yes

No

No LEDs installed on site

Don’t Know

Refused

SCRN\_Part1b [If Participant=Downstream] Our records indicate the energy efficiency lighting project you implemented at <Address> with <PA>’s assistance included <LED type 1> [if applicable for LED type 2-5], <LED type 2>, <LED type 3>, <LED type 4>, <LED type 5>, and <LED type 6>Is this correct?

Yes

No

No LEDs installed on site

Don’t Know

Refused

SCRN\_Part1a. [If Scrn\_Part1=2, 3, 4, 5; If Scrn\_Part1b=2, 3, 4, 5]  
Is there someone at your company who would be more familiar with these purchases?

Yes (Obtain Contact Information and contact this person and repeat INTRO2 and SCRN\_Part1)

No (Thank and Terminate)

Don’t Know (Thank and Terminate)

Refused (Thank and Terminate)

SCRN\_Part2.

Did you purchase these LEDs for use at your facility, at another facility owned by your company, or for a customer at an outside organization you were supplying lighting equipment to?

[IF PHONE: “Respondent’s facility”, IF ONLINE “My facility”]

Another facility owned by [IF PHONE: “respondent’s”, IF ONLINE: “my”] company

For a customer outside of your company

Don’t Know (Thank and Terminate)

Refused (Thank and Terminate)

SCRN\_Part2a. [IF SCRN\_Part2=2 or 3]

You mentioned before that the business was a <Building Type>. Is this the same type of business that the lighting equipment was installed?

Yes

No

Don’t Know

Refused

SCRN\_Part2b. [IF SCRN\_Part2a does NOT equal “Yes”]

What kind of building was the lighting equipment installed at?

[DO NOT READ LIST; CONFIRM CATEGORIZATION WITH RESPONDENT]

College or University

Grocery/Food Sales

Industrial/Manufacturing

K-12 School

Lodging

Office Building

Parking Garage

Restaurant/Food Service

Retail

Warehouse and Storage

Hospital

Medical Office

Nursing home or assisted living facility

Other

Don’t Know

Refused

[If Scrn\_Part2=1,2 then Actor=Buyer, If scrn\_part2=3 then Actor=Contractor]

SCRN\_Part3. [If Scrn\_part2=3] Which of the following best describes how the LED equipment mentioned above was used by your organization?

Equipment was installed at a single facility

Equipment was installed at multiple facilities

Equipment was kept in storage for later use

Don’t know

Refused

[If Scrn\_Part3=2,3,4,5 then Contractor\_Type=Multi]

SCRN\_Part3a. [If Actor = Buyer] We are trying to get an understanding of your business before we get started. Our records who that you purchased lighting equipment for the business located at <Address>. Approximately how many employees are located at this location?

Enter Answer (0-10) \_\_\_

Don’t Know

Refused

SCRN\_Part3a2. [IF SCRN\_Part3a = 2] Can you provide a rough estimate?

Less than 10 people

Between 10 and 50 people

Between 50 and 200 people

Between 200 and 500 people

Between 500 and 1000 people

Over 1000 people

SCRN\_Part3b. [If SCRN\_Part3a = 1] Approximately how many employees work for your company in all its locations?

Enter Answer (0-10) \_\_\_

Don’t Know

Refused

SCRN\_Part3b2. [IF SCRN\_Part3b = 2] Can you provide a rough estimate?

Less than 10 people

Between 10 and 50 people

Between 50 and 200 people

Between 200 and 500 people

Between 500 and 1000 people

Over 1000 people

SCRN\_Part3c. [If Actor = Contractor] We are trying to get an understanding of business where the lighting was installed before we get started. Approximately how many employees are located at <Address>. Approximately how many employees are located at this location?

Enter Answer (0-10) \_\_\_

Don’t Know

Refused

SCRN\_Part3c2. [IF SCRN\_Part3c = 2] Can you provide a rough estimate?

Less than 10 people

Between 10 and 50 people

Between 50 and 200 people

Between 200 and 500 people

Between 500 and 1000 people

Over 1000 people

**Replacement Behavior**

Now we are going to be asking you questions about your <LED type 1> equipment that you purchased or installed at your facility at <Address>. The questions in this survey will refer to your “FACILITY,” which means ALL of the buildings and tenants serviced by <PA> under that address. You may have also purchased or installed other types of lighting, lighting for other locations, or other types of energy efficient equipment, but for now, we want you to only think about your <LED type 1> equipment that you purchased for the location [IF PHONE: “I”/IF ONLINE: “just”] mentioned.

By <LED type 1> equipment, what [IF PHONE: I am/IF ONLINE: we are] referring to is [IF PHONE: read only assigned <LED type 1> definition] [IF ONLINE: display assigned <LED type 1> definition]:

|  |  |
| --- | --- |
| <LED type 1> | Definition |
| LED Lighting | LED lamps or fixtures which can include screw-based, linear, high or low bay, and exterior lighting. |
| Screw-In LEDs | LED lamps or fixtures used for task lighting and found in applications such as table lamps, ceiling fans, recessed cans, or tracking lighting. |
| Stairwell Kit | LED lamps or fixtures intended to provide ambient light in stairwell settings. |
| Linear LEDs (TLED) | Linear LED lamps such as common recessed, suspended, or surface-mounted fixtures intended to provide ambient lighting in settings such as office spaces, schools, retail stores, and other commercial environments. |
| Linear LEDs (TLED) w/Controls | Linear LED lamps with integrated controls that allow for Lamps to be programmed, scheduled, dimmed, or turned on/off remotely. |
| LED Fixtures | Linear LED fixtures such as common recessed, suspended, or surface-mounted fixtures intended to provide ambient lighting in settings such as office spaces, schools, retail stores, and other commercial environments. |
| LED fixtures with Integrated Controls | LED fixtures with integrated controls that allow for fixtures to be programmed, scheduled, dimmed, or turned on/off remotely. |
| High or Low Bay LEDs | LED lamps or fixtures such as pendent, recessed, or surface mounted fixtures specific for indoor high ceiling spaces that would not be classified as ambient linear lighting. |
| High or Low Bay LEDs w/Controls | High or Low bay LED lights with integrated controls that allow for lamps or fixtures to be programmed, scheduled, dimmed, or turned on/off remotely. |
| Exterior LEDs | LED lamps or fixtures for use outdoors or in locations open to elements like building exteriors, parking garages, or wide-open spaces. |
| Exterior LEDs w/ Controls | Exterior LED lamps or fixtures with integrated controls that allow for lamps or fixtures to be programmed, scheduled, dimmed, or turned on/off remotely. |

RB1. [If contractor\_type = Multi, skip to RB2] Which of the following best describes the facility at <Address> in which the <LED Type 1> equipment was installed? [READ LIST; SELECT ONE]

A newly constructed building

New construction to expand floor space on an existing building

Renovation - of 75% or more of an existing facility

Renovation - of less than 75% of an existing facility

Existing building with simple replacement of equipment (didn’t build anything)

Existing building with the addition of equipment (didn’t build anything)

Don’t know

Refused

RB2. [If Participant=Upstream] Our records show that you purchased <total quantity1> <LED type 1> through <distributor1> [if applicable] and <distributor2>; in <Year>. Does that sound correct?

Yes [skip to RB3]

No

RB2\_a. [If RB2 = No] What is your best estimate of the total number of <LED type 1> you purchased through <distributor1> [if applicable] and <distributor2>; in <Year>?

Enter number\_\_\_\_\_\_\_\_ [include units (lamps vs. fixtures)] [range is acceptable]

Don’t know

Refused

RB2\_b. [If Participant=Downstream] Our records show that you installed <total quantity1> <LED type 1> as part of an energy efficiency project sponsored by <PA> in <Year>. Does that sound correct?

Yes [skip to RB3]

No

RB2\_c. [If RB2\_b=No] What is your best estimate of the total number of <LED type 1> you installed as part of a project sponsored by <PA> in <Year>?

Enter number\_\_\_\_\_\_\_\_ [include units (lamps vs. fixtures)] [range is acceptable]

Don’t know

Refused

RB3a. [If RB1 = 3,4,5,7,8, else skip to RB4]  
Did the <LED Type 1> equipment you received replace any existing lighting?

Yes

No [Skip to RB4]

Don’t Know [Skip to RB4]

Refused [Skip to RB4]

RB3b. What did <LED Type 1> replace?

Record\_\_\_\_\_

Don’t Know

Refused

RB4. Now thinking about ALL the <LED type 1> at this facility, what is your best estimate of the number of <LED type 1> currently installed at your facility, regardless of where and when these units were purchased?

Enter number\_\_\_\_\_\_\_

Don’t know

Refused

RB5. [If Participant=Downstream] When you installed <LED type 1>, did you install lighting controls as part of that project?

Yes

No [Skip to RB7]

Don’t Know [Skip to RB7]

Refused [Skip to RB7]

RB5a. [If RB6=1, else skip to RB7]

Please identify the types of controls installed with <LED type 1>.

Record\_\_\_\_\_

Don’t Know

Refused

[If Participant = Downstream skip to Free Ridership section ]

RB6. Going back to the <LED type 1> you purchased through <distributor1> [if applicable] and <distributor2>; in <Year>, did your [if actor=buyer] contractor or equipment supplier; [if actor=contractor] equipment supplier; mention any discounts or rebates?

Yes [If actor= buyer then specify if it was distributor or contractor]

No [Skip to RB9]

Don’t Know [Skip to RB9]

Refused [Skip to RB9]

RB7. [If RB6 = Yes] Did they say where the discount or rebate came from?

Yes

No [Skip to RB9]

Don’t Know [Skip to RB9]

Refused [Skip to RB9]

RB8. [If RB7 = Yes] What sources did they say provided the discount or rebate?  
[DO NOT READ; SELECT ALL THAT APPLY]

Themselves (contractor or equipment supplier/distributor)

Manufacturer

<PA> [Skip to FR1]

State of Connecticut

EnergizeCT Program [Skip to FR1]

Energy Opportunities [Skip to FR1]

Connecticut Upstream Lighting Program [Skip to FR1]

Small Business Energy Advantage

Someone else-Specify [If Eversource or United Illuminating recode as RB8=3]

Don’t Know

Refused

RB9. Were you aware that any of the equipment you purchased from <distributor1> and [if applicable] <distributor2> received a price discount sponsored by your electricity service provider, <PA> and/or the EnergizeCT program?

Yes

No [Skip to FR1]

Don’t Know [Skip to FR1]

Refused [Skip to FR1]

RB10. [If RB9 = Yes] Where did you learn about the price discount?  
[DO NOT READ, SELECT ALL THAT APPLY]

Contractor or Distributor

<PA>

EnergizeCT Program materials or website

Energy Opportunities material or website

Connecticut Upstream Lighting program materials or website

Small business Energy Advantage

Internet other than <PA> website

Program advertising (TV, radio, print)

Colleagues within organization

Colleagues outside of organization

Other-Specify

Don’t Know

Refused

[If participant = Downstream then Aware = yes, else if RB8= 3, 5, 6, 7 or RB9 = 1 then Aware=Yes, else Aware=No]

**Net to Gross**

**Free Ridership**

[If Participant=Upstream] Now [IF PHONE: “I’d like to ask” /IF ONLINE: “we would like to discuss with”] you about your decision to purchase <LED type 1> equipment from <distributor1> [if applicable] and <distributor2>; with <PA’s> assistance. [If Aware=No] According to our records, you received a discount of <total incentive> from <PA> through a EnergizeCT program for your <LED type 1> equipment purchases in <Year>.

[If Participant=Downstream] Now [IF PHONE: “I’d like to ask” /IF ONLINE: “we would like to discuss with”] you about your decision to install <LED type 1> equipment with <PA’s> assistance. According to our records, you received a discount of <total incentive> from <PA> through EnergizeCT for your <LED type 1> equipment installed in <Year>.

FR1. Who was most responsible for recommending or specifying the LEDs we are discussing?  
[DO NOT READ LIST; ONLY SELECT ONE]

[IF PHONE: “Respondent”, IF ONLINE: “You”]

Someone else in the company

Third-party design professional

Third-party engineer

Distributor

Contractor

Energy Services Company (record name\_\_\_\_\_\_\_)

Manufacturer’s representative

<PA> account manager

Someone else- specify \_\_\_\_\_\_\_\_\_\_\_\_\_

Don’t Know

Refused

FR2. [If FR1= 3,4,5,6,7,8,9]  
How influential was the <FR1 response> on your company’s decision to install the <LED type 1>?

Extremely influential

Very influential

Moderately influential

Slightly influential

Not at all influential

Refused

FR2a. [If FR2 =1 or 2] What is the name of the <FR1 response> that influenced your company’s decision to install <LED type 1>? [OPEN RESPONSE]

**TIMING**

FR3a. [If Aware=Yes] How likely is it that your business would have purchased the same quantity of <Lighting Type 1> at that same time if <PA> had not provided this program assistance?

Very likely to have purchased at the same time

Likely to have purchased at the same time

50/50 chance to have purchased as the same time

Unlikely to have purchased at the same time

Very unlikely to have purchased at the same time

Refused

FR3b. [If Aware=No] According to our records, you received a discount of <total incentive> from <PA> through a EnergizeCT program for your <LED type 1> purchases through <distributor1> [if applicable] and <distributor2>; in <Year>. How likely is it that your business would have purchased the same quantity of <Lighting Type 1> at that same time if they had cost <total incentive> more?

Very likely to have purchased at the same time

Likely to have purchased at the same time

50/50 chance to have purchased as the same time

Unlikely to have purchased at the same time

Very unlikely to have purchased at the same time

Refused

FR4a. [If Aware=Yes] If <PA> had not provided a price discount, would your business have purchased any type of <Lighting Type 1> equipment at the same time?

Yes

No

Don’t Know

Refused

FR4b. [If Aware=No] If <PA> had not discounted the cost of these lamps, would your business have purchased any type of <Lighting Type 1> equipment at the same time?

Yes

No

Don’t Know

Refused

FR5. [If FR4a = 2,3,4 or FR4b = 2,3,4] Would you have purchased the <Lighting Type 1> equipment earlier than you did, at a later date, or never?

Earlier

Same Time [recode FR4a or FR4b = Yes]

Later

Never

Don’t Know

Refused

FR6. [If FR5 = 1,3] How much <earlier/later> would you have purchased the <Lighting Type 1> equipment?

\_\_\_\_\_\_\_ years

\_\_\_\_\_\_\_ months

Don’t know

Refused

**Quantity**

FR7. Without the price discount provided by <PA> would your business have purchased the exact same quantity of <Lighting Type 1> equipment [if FR4a=Yes or FR4b=Yes] at that same time [If FR4a=No or FR4b=No] within <FR6 timeframe>?

Yes

No

Don’t Know

Refused

FR8. [If FR7= No] Compared to the amount of <Lighting Type 1> equipment that you purchased through the <PA> program, what percent do you think your business would have purchased [if FR4a=Yes or FR4b=Yes ] at that same time [if FR4a=No or FR4b=No ] within <FR6 timeframe>?

Enter Percent (0-100) \_\_\_

Don’t Know

Refused

**Efficiency**

FR9. Without the price discount provided by <PA>, would your business have purchased the exact same efficiency as the <LED Type 1> equipment that you purchased?

Yes [Skip to FR11a]

No

Don’t Know

Refused

FR10. [If FR9 = 2,3 AND <LED Type 1> ≠ “LED Lighting”] You [IF PHONE: “said” /IF ONLINE: “mentioned”] your business would have purchased [If FR7= Yes] all; [IF FR7= No] <FR8%>; [IF FR7= Don’t Know, Refused] some; of the lighting equipment on your own if the <PA> price discount had not been available. Thinking about the lighting you would have purchased on your own, what would you have purchased if you had not purchased the <LED Type 1> equipment?

[read options under <LED Type 1> and then, based on response, read options associated with category selection]

[FOR ONLINE VERSION ONLY: Display all options in the first column under their respective <LED Type 1>. If the respondent selects a response that has no additional options (e.g., <LED Type 1>=”High or Low Bay LEDs” and they select “High or Low Bay LEDs”, record that as the response and move to next question. If the respondent selects a response that has additional options (e.g., <LED Type 1>=”High or Low Bay LEDs” and they select “Linear LED or LED Fixtures”, then display all options available and record their selected response (e.g., “LED Fixture”). Entire question should result in a single choice.]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| <LED Type 1> | Option 1 | Option 2 | Option 3 | Option 4 | Option 5 | Option 6 |
| LED Fixtures with Integrated Controls | | | | | |  |
| LED Fixtures with Integrated Controls (DO NOT READ) |  |  |  |  |  |  |
| Linear LED or LED Fixtures without Integrated Controls | Linear LED/TLED | LED Fixture | Other | Don’t Know |  |  |
| Fluorescent Tubes or Fixtures | T5 | High Performance T8 | T8 | T12 | Other | Don’t Know |
| Something Else | Explain |  |  |  |  |  |
| Nothing (DO NOT READ) |  |  |  |  |  |  |
| Linear LEDs | | | | | |  |
| Linear LEDs or LED Fixtures (DO NOT READ) | Linear LED/TLED | LED Fixture | Other | Don’t Know |  |  |
| Fluorescent Tubes or Fixtures | T5 | High Performance T8 | T8 | T12 | Other | Don’t Know |
| Something Else | Explain |  |  |  |  |  |
| Nothing (DO NOT READ) |  |  |  |  |  |  |
| LED Fixtures | | | | | | |
| Linear LEDs or LED Fixtures (DO NOT READ) | Linear LED/TLED | LED Fixture | Other | Don’t Know |  |  |
| Fluorescent Tubes or Fixtures | T5 | High Performance T8 | T8 | T12 | Other | Don’t Know |
| Something Else | Explain |  |  |  |  |  |
| Nothing (DO NOT READ) |  |  |  |  |  |  |
| High or Low Bay LEDs | | | | | |  |
| High or Low Bay LEDs  (DO NOT READ) |  |  |  |  |  |  |
| Linear LED or LED Fixtures | Linear LED/TLED | LED Fixture | Other | Don’t Know |  |  |
| Fluorescent Tubes or Fixtures | T5 | High Performance T8 | T8 | T12 | Other | Don’t Know |
| Moguls or HID | Metal Halides | Sodium Lamps | Other | Don’t Know |  |  |
| Something Else | Explain |  |  |  |  |  |
| Nothing (DO NOT READ) |  |  |  |  |  |  |
| Exterior LEDs | | | | | |  |
| Exterior LEDs (DO NOT READ) |  |  |  |  |  |  |
| Fluorescent Lamps, Tubes or Fixtures | T5 | High Performance T8 | T8 | T12 | Other | Don’t Know |
| Moguls or HID | Metal Halides | Sodium Lamps | Other | Don’t Know |  |  |
| Spotlight, Flood light, Downlights or Wall Packs | CFLs | Halogen | Other | Don’t Know |  |  |
| Something Else | Explain |  |  |  |  |  |
| Nothing (DO NOT READ) |  |  |  |  |  |  |
| Screw-In LEDs [skip to FR11a] | | | | | |  |

FR10b. [If FR9 = 2,3 AND <LED Type 1> = “LED Lighting”] You [IF PHONE: “said” /IF ONLINE: “mentioned”] your business would have purchased [If FR7= Yes] all; [IF FR7= No] <FR8%>; [IF FR7= Don’t Know, Refused] some; of the lighting equipment on your own if the <PA> price discount had not been available. Thinking about the lighting you would have purchased on your own, what percent of this equipment would have been the same level of efficiency or better, the minimum efficiency, and something between?

FR10b1. The same type of LED equipment you purchased or something of equal efficiency

Enter Percent (0-100) \_\_\_\_

Don’t Know

Refused

FR10b2. Equipment between code and the LED equipment you purchased.

Enter Percent (0-100) \_\_\_\_

Don’t Know

Refused

FR10b3. Equipment that meets minimum code

Enter Percent (0-100) \_\_\_\_

Don’t Know

Refused

FR11a. [If Aware=Yes] Overall, how influential was the price discount you received from <PA> on your company’s decision to purchase the <LED Type 1> equipment?

Extremely influential

Very influential

Moderately influential

Slightly influential

Not at all influential

Refused

FR11b. [If Aware=No] Overall, how influential was the reduction in cost from <PA> on your company’s decision to purchase the <LED Type 1> equipment?

Extremely influential

Very influential

Moderately influential

Slightly influential

Not at all influential

Refused

**Program Awareness and Process**

PA1a. [If Participant=Upstream] Prior to purchasing LED equipment through <distributor1> [if applicable] and <distributor2>; in <Year>, had your business ever participated in <PA>'s programs or offerings for any energy-related equipment purchases?

Yes

No

Don’t Know

Refused

PA1b. [If Participant=Downstream] Prior to installing LED equipment through in <Year>, had your business ever participated in <PA>'s programs or offerings for any energy-related equipment purchases?

Yes

No

Don’t Know

Refused

PA2. [If PA1a OR PA1b= 2, 3, or 4] Before [IF PHONE: “this conversation today” /IF ONLINE: “taking this survey”], were you aware of <PA> programs or offerings that support energy efficient lighting?

Yes

No

Don’t Know

Refused

PA3. [If PA1a OR PA1b= 1]  
[IF PHONE: “I’m going to read you” /IF ONLINE: “We are going to present you with”] several statements. For each statement, please tell me whether you agree or disagree that this statement applies to your business. There are no right or wrong answers, we just want your honest opinion.

Our previous experience implementing energy efficiency projects through the <PA> offerings has…

PA3a. Made our firm more likely to consider energy efficient equipment

Agree

Disagree

PA3b. Made our firm more likely to install energy efficient equipment

Agree

Disagree

PA3c. Given us more confidence in the financial benefits of energy efficient equipment

Agree

Disagree

PA3d. Given us more confidence in the nonfinancial benefits of energy efficient equipment

[If needed: Lower maintenance costs, increased productivity, reduced heat output] [Include examples in text for web version]

Agree

Disagree

[If Participant=Upstream, Skip to SO1]

PA4. Did your firm also have some gas equipment installed through a Connecticut gas provider around that same time?

1. Yes

2. No

3. Don’t know

4. Refused

PA5. [If PA4 = 1] If <PA> had not provided funding at about that same time as you were completing your gas equipment project, how likely is it that your business would have implemented the same quantity and efficiency of <LED Type 1> equipment at that same time?

Very likely to have implemented at the same time

Likely to have implemented at the same time

50/50 chance to have implemented as the same time

Unlikely to have implemented at the same time

Very unlikely to have implemented at the same time

Refused

PA6. Did your company receive a technical assessment from <PA> as part of your participation in the program?

1. Yes

2. No

3. Don’t know

4. Refused

PA7. [IF PA6 = 1] If <PA> had not paid a portion of the cost for the technical assessment you received, would your company have paid to have a similar assessment done at that same time?

1. Yes

2. No

3. Don’t know

4. Refused

PA8. [IF PA7 = 2] How much influence did the information provided by the technical assessment have on your decision to implement lighting project?

Extremely influential

Very influential

Moderately influential

Slightly influential

Not at all influential

Refused

**Participant Spillover**

[If PA2 = 2,3, or 4 skip to LP1]

SO1. As a reminder, you [IF PHONE: “said” /IF ONLINE: “mentioned”] your business purchased [If RB2= Yes] <total quantity1> <LED Type 1>; [IF RB2= No] <RB2a> <LED Type 1> ; [IF RB2a= Don’t Know, Refused] some <LED Type 1>; with support from a <PA> program. [if applicable] It looks like you also purchased <total quantity2> <LED Type 2>, [if applicable] <total quantity3> <LED Type 3>, [if applicable] <total quantity4> <LED Type 4>, <total quantity5> <LED Type 5>, and [if applicable] <total quantity6> <LED Type 6> in <Year>. Did you purchase any other LED equipment on your own for installation at <Address>, that is, without a rebate or discount from <PA> in <Year>?

Yes

No [SKIP TO LP1]

Don’t Know [SKIP TO LP1]

Refused [SKIP TO LP1]

SO2. Did a recommendation from a [if actor = buyer] contractor; [if actor = buyer or contractor] distributor, engineer, or designer who you worked with in the <PA> Program influence your decision to purchase some or all of the additional LED equipment on your own?

Yes

No

Don’t Know

Refused

SO3. Did your participation in any <PA> offerings prior to <Year> influence you to purchase some or all this equipment on your own?

Yes

No

Don’t Know

Refused

SO4. Did your experience with the LED equipment received in <Year> with <PA>’s assistance influence your decision to purchase some or all of the additional LEDs on your own?

Yes

No

Don’t Know

Refused

SO5. [If SO2 = Yes OR SO3 = YES OR SO4 = Yes]  
For each of the following lighting categories, how many LEDs would you say you purchased on your own without support from a <PA> program?   
[FILL IN QUANTITY IN TABLE BELOW]

|  |  |  |
| --- | --- | --- |
|  | Definition [If needed] | Quantity |
| LED fixtures with Integrated Controls | LED fixtures with integrated controls that allow for fixtures to be programmed, scheduled, dimmed, or turned on/off remotely. |  |
| Linear LEDs | Linear LED lamps or fixtures such as common recessed, suspended, or surface-mounted fixtures intended to provide ambient lighting in settings such as office spaces, schools, retail stores, and other commercial environments. |  |
| LED Fixtures |  |
| High or Low Bay LEDs | LED lamps or fixtures such as pendent, recessed, or surface mounted fixtures specific for indoor high ceiling spaces that would not be classified as ambient linear lighting. |  |
| Exterior LEDs | LED lamps or fixtures for use outdoors or in locations open to elements like building exteriors, parking garages, or wide-open spaces. |  |
| Screw-In LEDs | LED lamps or fixtures used for task lighting and found in applications such as table lamps, ceiling fans, recessed cans, or tracking lighting. |  |

SO6. Why didn't you purchase these additional LEDs through a program sponsored by <PA>?  
[DO NOT READ. SELECT ALL THAT APPLY]

Too much paperwork

Cost savings not worth the effort of applying

Takes too long for approval

The equipment would not qualify

Vendor does not participate in program

Outside the <PA>’s service territory

No time, needed equipment immediately

Thought the program ended

Didn’t know the equipment qualified under another program

Just didn’t think of it

Unable to get rebate- unsure why

Other- Specify [If “Equipment would not qualify”, code as SO6 = 4]

Don’t Know

Refused

SO6a. [If SO6=4] Why didn’t the equipment qualify?

Record Answer\_\_\_\_\_\_\_\_

Don’t Know

Refused

SO6b. [IF SO6 = 1, 2,3, 5, 6, 7, 8, 9, 10, 11] What would have made you consider purchasing the equipment with PA assistance?

Record Answer\_\_\_\_\_\_\_\_

Don’t Know

Refused

SO7. Overall, how influential was the [if aware=yes] <PA> assistance; [if aware=no] reduction in purchase cost due to <PA> assistance; have on your decision to purchase the additional LED equipment without an incentive?

Extremely influential

Very influential

Moderately influential

Slightly influential

Not at all influential

Refused

**Ending**

END1. Those are all the questions [IF PHONE: “I”/IF ONLINE: “we”] have for you today. [IF PHONE: “I’d”/IF ONLINE: “We would”] like to thank you for your time and assistance with our research efforts. As a reminder, you will be sent a $25 Amazon e-gift card for your participation in this survey effort. Can you please tell me your email address so that we can send you your gift card?

|  |  |
| --- | --- |
| Record Email Address: |  |

END2. Please note that it may take a couple of days to process the gift cards. If you have any questions or concerns about this survey or your gift card, please contact Geoff Cooper at DNV. His email address is [geoffrey.cooper@dnv.com](mailto:geoffrey.cooper@dnv.com). Thank you and have a good day.

About DNV

DNV is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.

1. <https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf> [↑](#footnote-ref-2)
2. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-3)
3. <https://ma-eeac.org/wp-content/uploads/MA20X07-B-CIOMNINTG_CI-PrescrCustom-NTG-Report_Final_2021.09.13.pdf> [↑](#footnote-ref-4)
4. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-5)
5. <https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/02_Review_Publications/Distressed-Municipalities> [↑](#footnote-ref-6)
6. <https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/02_Review_Publications/Distressed-Municipalities> [↑](#footnote-ref-7)
7. <https://energizect.com/sites/default/files/2022-07/CT%20C2014_CI%20Lighting%20Saturation%20and%20Remaining%20Potential_Phase%201%20Memo_FINAL_20210628.docx> [↑](#footnote-ref-8)
8. <https://energizect.com/sites/default/files/2022-07/CT%20C2014A_CI%20Lighting%20Remaining%20Potential_Proposed%20Final%20Report.pdf> [↑](#footnote-ref-9)
9. <https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf> [↑](#footnote-ref-10)
10. [Microsoft Word - 2011 CI FR-SO Report Final (energizect.com)](https://energizect.com/sites/default/files/documents/2011%20CI%20FR-SO%20Report%20Final.pdf) [↑](#footnote-ref-11)
11. <https://dev1.energizect.com/sites/default/files/2022-02/CT%202022%20PSD%20Upstream%20Lighting%20RR%20Assumptions%20Memo%20DELIVERED.pdf> [↑](#footnote-ref-12)
12. <https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf> [↑](#footnote-ref-13)
13. <https://ma-eeac.org/wp-content/uploads/P78_MACI_Upstream_LED_NTG_Report_FINAL_2018.10.18.pdf> [↑](#footnote-ref-14)
14. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-15)
15. [Microsoft Word - 2011 CI FR-SO Report Final (energizect.com)](https://energizect.com/sites/default/files/documents/2011%20CI%20FR-SO%20Report%20Final.pdf) [↑](#footnote-ref-16)
16. <https://www.energy.gov/eere/ssl/ssl-forecast-report> [↑](#footnote-ref-17)
17. <https://energizect.com/sites/default/files/2022-07/CT%20C2014_CI%20Lighting%20Saturation%20and%20Remaining%20Potential_Phase%201%20Memo_FINAL_20210628.docx> [↑](#footnote-ref-18)
18. <https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf> [↑](#footnote-ref-19)
19. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-20)
20. <https://ma-eeac.org/wp-content/uploads/MA20X07-B-CIOMNINTG_CI-PrescrCustom-NTG-Report_Final_2021.09.13.pdf> [↑](#footnote-ref-21)
21. <https://energizect.com/sites/default/files/2022-07/CT%20C2014_CI%20Lighting%20Saturation%20and%20Remaining%20Potential_Phase%201%20Memo_FINAL_20210628.docx> [↑](#footnote-ref-22)
22. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-23)
23. <https://ma-eeac.org/wp-content/uploads/MA20X07-B-CIOMNINTG_CI-PrescrCustom-NTG-Report_Final_2021.09.13.pdf> [↑](#footnote-ref-24)
24. <https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf> [↑](#footnote-ref-25)
25. Respondents that purchased screw-based lighting did not receive the efficiency question since there are not intermediate efficiency options available in the market for screw-based lighting. [↑](#footnote-ref-26)
26. <https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2021/4-monitoring-and-evaluation-for-a-wise-just-and-inclusive-transition/likert-scales-are-too-simplistic-better-and-more-useful-alternatives-in-four-applications-in-energy-efficiency/> [↑](#footnote-ref-27)
27. Respondents that indicated other, the largest percentage of responses, but their reasoning aligned with “the equipment did not qualify” were post coded. [↑](#footnote-ref-28)
28. <https://portal.ct.gov/DECD/Content/About_DECD/Research-and-Publications/02_Review_Publications/Distressed-Municipalities> [↑](#footnote-ref-29)
29. [<https://ma-eeac.org/wp-content/uploads/MA20X07-B-CIOMNINTG_CI-PrescrCustom-NTG-Report_Final_2021.09.13.pdf>](https://ma-eeac.org/wp-content/uploads/MA20X07-B-CIOMNINTG_CI-PrescrCustom-NTG-Report_Final_2021.09.13.pdf) [↑](#footnote-ref-30)
30. [<https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf>](https://ma-eeac.org/wp-content/uploads/MA20C10-E-UPLNTG_UpstreamLightingNTG_FinalReport_01JUL2021.pdf) [↑](#footnote-ref-31)
31. [<https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B3469FDE9-8587-47AB-A27D-406DCA3C5569%7D>](https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B3469FDE9-8587-47AB-A27D-406DCA3C5569%7D) [↑](#footnote-ref-32)
32. [[https://energizect.com/sites/default/files/C1644 - EO NTG Final Report\_9.25.19.pdf](https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf)](https://energizect.com/sites/default/files/C1644%20-%20EO%20NTG%20Final%20Report_9.25.19.pdf) [↑](#footnote-ref-33)
33. [[https://energizect.com/sites/default/files/documents/2011 CI FR-SO Report Final.pdf](https://energizect.com/sites/default/files/documents/2011%20CI%20FR-SO%20Report%20Final.pdf)](https://energizect.com/sites/default/files/documents/2011%20CI%20FR-SO%20Report%20Final.pdf) [↑](#footnote-ref-34)
34. [[https://dev1.energizect.com/sites/default/files/2022-02/CT 2022 PSD Upstream Lighting RR Assumptions Memo DELIVERED.pdf](https://dev1.energizect.com/sites/default/files/2022-02/CT%202022%20PSD%20Upstream%20Lighting%20RR%20Assumptions%20Memo%20DELIVERED.pdf)](https://dev1.energizect.com/sites/default/files/2022-02/CT%202022%20PSD%20Upstream%20Lighting%20RR%20Assumptions%20Memo%20DELIVERED.pdf) [↑](#footnote-ref-35)
35. Scores based on labeled magnitude scaling: <https://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2021/4-monitoring-and-evaluation-for-a-wise-just-and-inclusive-transition/likert-scales-are-too-simplistic-better-and-more-useful-alternatives-in-four-applications-in-energy-efficiency/> [↑](#footnote-ref-36)