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Energy Efficiency in Schools Program 2021-2022 Evaluation Report

Duke Energy Carolinas and Duke Energy Progress

Submitted to Duke Energy

Date: September 1, 2023

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1. Executive Summary

1.1. Program Summary

The Energy Efficiency in Schools (K12 Education) Program is a Duke Energy Carolinas and Duke Energy Progress program offering, implemented by the National Theatre for Children (NTC). The program provides school performances, tailored to a student's grade-level, by NTC's professional actors. These performances teach students about energy and energy conservation using a humorous, engaging, and entertaining format. Due to COVID-19, NTC delivered performances virtually, either as recordings or live performances, during the evaluation period. NTC also provides participating schools with a classroom curriculum to coincide with the performance; these include energy-efficiency kit request forms that student families can use to request a free kit of energy-efficiency measures that they can install in their homes.

1.2. Objectives and Results

This report presents the results and findings of evaluation activities for the DEC/DEP Energy Efficiency in Schools Program, conducted by the Resource Innovations (RI) evaluation team for the program year, from August 1, 2021, through July 31, 2022.

1.2.1. Impact Evaluation

RI divided the impact evaluation into two tasks: first to determine gross savings (or impacts); and second to determine net savings.

Gross impacts are energy and demand savings estimated at a participant's home that either directly result from the homeowner's installation of a measure included in the Duke Energy home kit or from adoption of energy-saving behaviors inspired by NTC's performance and Duke Energy's informational materials. Net impacts reflect the degree to which gross savings result from the program's efforts and funds.

Table 1-1 and Table 1-2 present summarized findings of the DEC impact evaluation.

Table 1-1: DEC Energy and Demand Savings per Kit

Measurement	Reported Savings	Realization Rate	Gross Verified Savings
Energy (kWh)	475.210	129.09%	613.469
Summer Demand (kW)	-0.0808	N/A*	0.0676
Winter Demand (kW)	0.00269	N/A*	0.1605

*The table indicates realization rates of N/A as program-reported savings were near-zero. Mathematical realization rates were -83.7% and 5,978.2% for summer demand (kW) and winter demand (kW), respectively.

Table 1-2: DEC Program Savings

Measurement	Population	Reported Savings	Realization Rate	Gross Verified Savings	NTG	Net Savings
Energy (kWh)	10,354	4,920,238	129.09%	6,351,749	97.51%	6,193,631
Summer Demand (kW)		-836	N/A*	700		682
Winter Demand (kW)		28	N/A*	1,662		1,621

*The table shows realization rates of N/A, as program-reported savings were near-zero. Mathematical realization rates were -83.7% and 5,978.2% for summer demand (kW) and winter demand (kW), respectively.

Figure 1-1 presents the portion of gross verified savings by measure type. Table 1-3 presents per-unit energy and demand savings alongside program-level free ridership, spillover, and the corresponding net-to-gross (NTG) ratio.

Figure 1-1: DEC Portion of Program Verified Savings by Measure

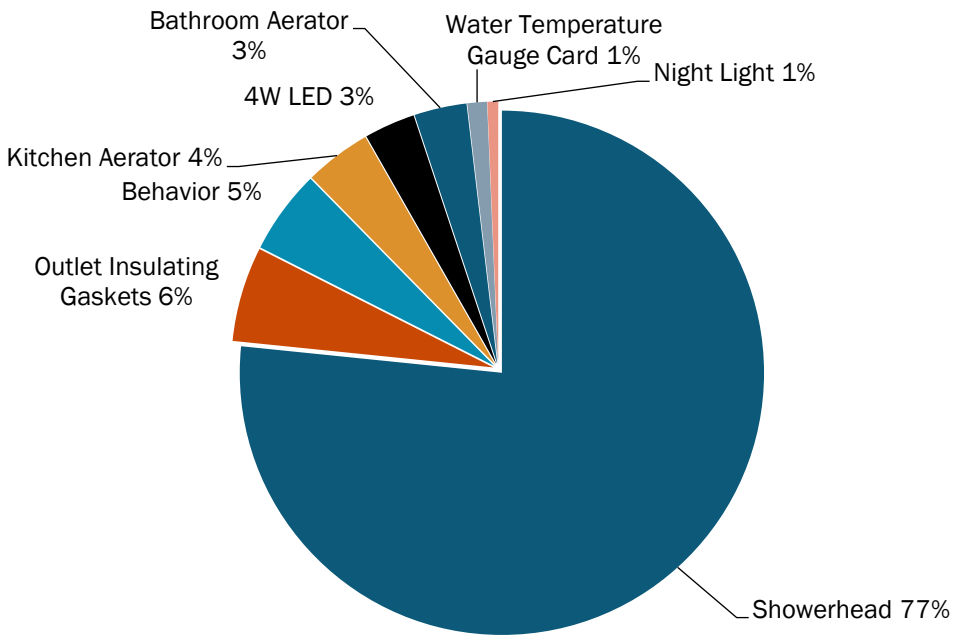


Table 1-3: DEC Verified Impacts by Measure

Measure	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)	Free Ridership	Spillover	NTG Ratio
Showerhead	470.012	0.0362	0.1298	14.55%	11.93%	97.37%
Kitchen Aerator	25.180	0.0033	0.0038			
Outlet Insulating Gaskets	35.841	0.0002	0.0002			
4W LED	19.276	0.0033	0.0015			
Bathroom Aerator	19.833	0.0027	0.0031			
Water Temperature Gauge Card	7.410	0.0008	0.0008			
Night Light	4.082	0.0000	0.0000			
Behavior*	31.835	0.0210	0.0213	0%	0%	100%
Kit	613.469	0.0676	0.1605	13.80%	11.31%	97.51%

*For behavioral measures, adjustment factors were applied to gross verified savings. Therefore, NTG adjustments were not required for behavioral measures.

Table 1-4 and Table 1-5 present summarized findings of the DEP impact evaluation.

Table 1-4: DEP Energy and Demand Savings per Kit

Measurement	Reported Savings	Realization Rate	Gross Verified Savings
Energy (kWh)	475.210	143.55%	682.186
Summer Demand (kW)	-0.0808	N/A*	0.105
Winter Demand (kW)	0.0027	N/A*	0.223

*Realization rates of N/A are listed here, as program reported savings are near-zero. Mathematical realization rates are -129.5% and 8,299.3% for summer demand (kW) and winter demand (kW) respectively.

Table 1-5: DEP Program Savings

Measurement	Population	Reported Savings	Realization Rate	Gross Verified Savings	NTG	Net Savings
Energy (kWh)	2,530	1,202,090	143.55%	1,725,657	108.50%	1,860,058
Summer Demand (kW)		-204	N/A*	265		285
Winter Demand (kW)		7	N/A*	564		608

*The table lists realization rates of N/A as program-reported savings were near-zero. Mathematical realization rates were -129.5% and 8,299.3% for summer demand (kW) and winter demand (kW), respectively.

Figure 1-2 presents gross verified savings by measure type. Table 1-6 presents per-unit energy and demand savings alongside program-level free ridership, spillover, and the corresponding NTG ratio.

Figure 1-2: DEP Portion of Program Verified Savings by Measure

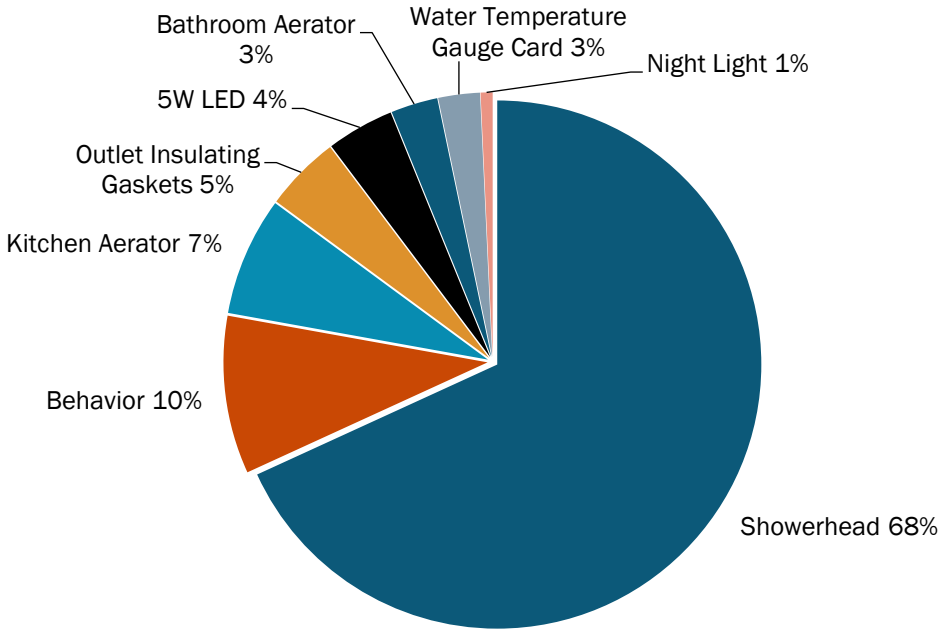


Table 1-6: DEP Verified Impacts by Measure

Measure	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)	Free Ridership	Spillover	NTG Ratio
Showerhead	471.454	0.0380	0.1363	10.35%	18.85%	108.50%
Kitchen Aerator	31.777	0.0043	0.0049			
Outlet Insulating Gaskets	44.708	0.0002	0.0002			
4W LED	22.379	0.0037	0.0016			
Bathroom Aerator	33.775	0.0042	0.0048			
Water Temperature Gauge Card	17.677	0.0020	0.0020			
Night Light	3.568	0.0000	0.0000			
Behavior*	56.849	0.0522	0.0729	0%	0%	100%
Kit	682.2	0.1046	0.2228	9.49%	17%	107.79%

* Adjustment factors were applied to gross verified savings for behavioral measures. Therefore, no NTG adjustments were needed for behavioral measures.

1.2.2. Process Evaluation

The process evaluation informed and assessed opportunities for improving the program's design and delivery in DEC/DEP's service territory. The evaluation reviewed teacher, student, and parent experiences by investigating the following:

- Teachers' assessments of the program materials, curriculum, and kits in terms of ease of use, content quality, and the ability to engage and motivate students.
- Teachers' and student families' responses to the energy-efficiency kits and the kits' effectiveness in engaging families in energy conservation.

The evaluation team reviewed program documents and web surveys with student families receiving a kit (n=213) and teachers attending the performance (n=73). Additionally, the team conducted in-depth interviews with Duke Energy program staff, NTC staff, R1 staff, and seven teachers who completed the web survey.

The process evaluation produced the following key findings:

- Parents most often requested energy-saving kits from the program website.
- Parents were highly satisfied with kit measures.
- Parents and teachers reported low student use of the Kilowatt Krush app.
- Teachers reported that NTC's elementary and middle school performances were engaging, entertaining, and informative.
- Teachers reported that NTC provided age-appropriate instructional materials that aligned with curriculum standards.
- Teachers enjoyed the option of classroom-specific performances as they could schedule performances at times convenient for them.
- Due to COVID-19, performances were held virtually during the evaluation period. Teachers reported that students were less engaged in the program this year in comparison to in-person performances held previously. The majority of teachers suggested doing only in-person performances in the future.

1.3. Conclusions and Recommendations

Based on the findings, the evaluation team offers the following conclusions along with several recommendations for program improvements:

Conclusion: Teachers generally expressed satisfaction with the material provided and with the quality of the NTC performances. The high school performances were less well regarded; however, the program has previously indicated that high school performances will be discontinued as of fall 2023. Further, teachers strongly prefer in-person, live performances.

Recommendation: Maintain NTC performances at the same quality level but change the storylines and characters on a more frequent basis. The program will be undergoing a rebranding in Fall 2023, which may help make the program feel newer.

Recommendation: Although teachers generally reported that the provided material was age-appropriate for their students and aligned with curriculum standards, all those interviewed cited time as a barrier for using all instructional materials in the kit. The program implementers may consider 1) highlighting the most important information, given teachers' time constraints. This will allow teachers to present all the material if they have the time, while guiding teachers who face greater time constraints; or 2) providing the instructional materials earlier on in the school year so that teachers have sufficient time to incorporate the concepts into their curriculums before lesson plans are set.

Conclusion: Though teachers appreciated the incentives, they suggested some additions. The program will be making some changes to incentives for the next program year in response to previous recommendations suggesting scaling the incentive to the size of the school.

Recommendation: Consider adding a small "gift" for the students or classroom, such as a keychain, poster, or other item to raise students' excitement about the program.

Conclusion: Around 11%-12% of survey respondents claimed they did not receive a kit.

Recommendation: Due to the high number of participants claiming they did not receive kits, it may prove beneficial to investigate methods to increase the reliability of kit delivery, such as providing tracking information for participants to follow.

Conclusion: Many participants did not install measures from the kit because their current measure was still working, or they already had the item.

Recommendation: Include a checkbox on the kit request form that would allow participants to check off that they do not need the measures.

2. Introduction and Program Description

2.1. Program Description

2.1.1. Overview

The Energy Efficiency in Schools (K12 Education) Program is an energy-efficiency program sponsored by Duke Energy Carolinas/Progress (DEC/DEP). The program provides free performances by the National Theatre for Children (NTC) that teach elementary, middle, and high school students about energy and conservation concepts using a humorous and engaging format. Historically, performances were delivered in-person at participating schools in schoolwide assemblies. During this evaluation period, however, NTC delivered all performances virtually due to COVID-19 concerns. During the same period, teachers could choose whether to hold the performance in their classrooms or as a school-wide performance.

In addition to performances, NTC provided teachers with the following:

- Student workbooks that reinforce topics taught through the NTC performance, including a take-home form that students and parents can complete to request an energy-efficiency starter kit (kit) from Duke Energy.[1]
- Instructional materials designed for teachers' use and associated with the student workbook content.

All workbooks, assignments, and activities used meet state curriculum requirements. NTC performers encourage students to have their parents request the kits.

The program can achieve energy savings in two ways:

1. Through installations of specific energy-efficiency measures provided in the kit.
2. By increasing students' and their families' awareness about energy conservation and engaging with them to change their behaviors to reduce energy consumption.

2.1.2. Energy Efficiency Kit Measures

Table 2-1 lists kit contents included in the program. All program-provided kits contained identical materials.

[1] All families can request kits, regardless of whether they are Duke Energy customers to contribute to classroom numbers of kit requests. Only Duke Energy customers, however, will be eligible to receive a kit.

Table 2-1: Kit Measures

Measure	Details
4 Watt LEDs	2 LED clear candelabra bulbs, 4 Watts each
Nightlight	1 LED Nightlight, 0.3 Watts
Showerhead	1 Low-flow showerhead, 1.5 GPM
Bathroom Faucet Aerator	1 Low-flow bathroom aerator, 1.0 GPM
Kitchen Faucet Aerator	1 Low-flow kitchen aerator, 1.5 GPM
Water Temperature Gauge Card	1 Temperature gauge card indicating water temperature
Outlet Insulating Gaskets	12 Switch and outlet sealing gaskets
Energy Saving Behaviors	Performances by NTC, teacher instructional materials, Department of Energy booklets, a guide on how to install the measures, and the Kilowatt Krush app encouraging changes in behavior to reduce energy consumption

2.2. Program Implementation

2.2.1. Program Marketing and School Recruitment

Duke Energy sends NTC a list of approved schools within each utility territory, enabling NTC's communications staff to contact schools for scheduling NTC performances. These communications include phone calls, emails, and postcards describing the program. During this program year, teachers reported that the majority of communication occurred via email. Once a school agrees to participate, NTC ships curriculum materials to participating schools approximately two weeks prior to the performance date.

2.2.2. NTC Performance

NTC has four shows tailored to different grade levels: two for elementary age students (kindergarten through second grade and another for grades three through five); one for middle school age students (six through eighth grade); and one for high school students (ninth through twelfth grade). Two actors perform each show, using an entertaining, humorous, and interactive format to educate students regarding four general areas:

- Energy sources
- How energy is used
- How energy is wasted
- Energy efficiency and conservation

Performers also discuss the following: how their utility offers students and their families free energy-efficiency starter kits; how kit items can save energy in their homes; ways to sign up for kits, and hand-out collateral materials designed to remind students of these tips.

2.2.3. Kit Form Promotion

During the performance, the actors explain that students must fill out the kit request form to receive their kit. Following the performance, teachers provide their students with NTC workbooks that – in addition to including educational activities to reinforce concepts drawn from the NTC performance – include a detachable, postage-prepaid postcard kit request form. Students take the form home to their parents or guardians, who complete and mail the form. Parents or guardians may also request a kit via a toll-free telephone number or by signing up at MyEnergyKit.org, the program website administered by NTC. The latter sign-up mode was the most popular from 2021-2022. To encourage program participation, their children's school receives $250 for every 100 parents that sign up.

2.2.4. Kit Distribution

Duke Energy uses two vendors to fulfill kit requests: R1 and AM Conservation. R1, which manages and processes kit requests (paper and online), confirms participants' eligibility, removes non-Duke customers from the eligibility list, and sends the results to Duke Energy, which then cleans the data and verifies participants' eligibility and contact information.

Upon completion, Duke sends the cleaned participation list back to R1 and to AM Conservation. Duke then sends a fulfillment request to AM Conservation, which has nine business days to ship the kits. Customers are told to expect energy kit delivery in four to six weeks, though delivery generally happens much more quickly.

2.2.5. Energy Kit Eligibility

Students' families can receive a kit only once every 36 months and must be Duke Energy customers. For DEP, the school must be a Duke Energy customer, however for DEC, the school does not need to be in the Duke Energy territory. These eligibility requirements present challenges in finding and motivating the participation of new schools and new student families.

2.2.6. Participation

For the defined evaluation period (August 1, 2021, through July 31, 2022), the program recorded a total of 11,789 kit recipients in DEC's territory and 2,843 kit recipients in DEP's territory.

2.2.7. Program Changes

The program faced two major changes for PY 2021-2022.

Due to the COVID-19 pandemic, NTC changed its programming from in-person to virtual performances. NTC offered livestream and pre-recorded performance options. For the livestream performance, classrooms opened the performance link at a designated time, and the performers presented the material virtually as students watched from their classroom. This option allowed for more personalization and engagement as performers could give specific shout-outs to schools watching. Performance options included a chat function that allowed students to send questions and comments to the performers. The pre-recorded performance option provided a video that teachers could play at any time to their classrooms.

Due to the aforementioned restrictions, the program found soliciting school performances more effective by changing outreach from a school-focus to a teacher-focus. Before the pandemic, NTC held performances in person through schoolwide assemblies. Due to COVID-19 regulations (e.g., social distancing), the program began offering a classroom performance option where teachers could play a virtual performance (livestream or prerecorded) to their classroom groups. This may have influenced kit request numbers as performances, previously reaching hundreds of students simultaneously, now only reached one classroom at a time.

NTC performances returned to an in-person format for the 2022-2023 school year. Other changes expected for future program years include a discontinuation of high school performances as well as a discontinuation of the Kilowatt Krush app, given these program aspects experienced lower-than-expected participation and engagement.

2.3. Research Objectives

Overarching project goals follow the impact evaluation definition established in the "Model Energy-Efficiency Program Impact Evaluation Guide – A Resource of the National Action Plan for Energy Efficiency," November 2007:

> "Evaluation is the process of determining and documenting the results, benefits, and lessons learned from an energy-efficiency program. Evaluation results can be used in planning future programs and determining the value and potential of a portfolio of energy-efficiency programs in an integrated resource planning process. It can also be used in retrospectively determining the performance (and resulting payments, incentives, or penalties) of contractors and administrators responsible for implementing efficiency programs."

Evaluation seeks to achieve two key objectives:

1. To document and measure a program's effects and to determine whether it met its goals in regard to serving as a reliable energy resource.
2. To help understand why such effects occurred and identify program improvement methods.

2.3.1. Impact

In planning the evaluation, the evaluation team outlined the following activities to assess impacts from the DEC-DEP Energy Efficiency in Schools Program:

- Quantify accurate and supportable energy (kWh) and peak demand (kW) savings for energy-efficient measures implemented in participants' homes.
- Assess the free ridership rate from the participants' perspective and determine spillover effects.
- Benchmark verified, measure-level energy impacts to applicable technical reference manual(s) and to other, similar Duke programs in other jurisdictions.

2.3.2. Process

The process evaluation assessed opportunities for improving the program's design and delivery within DEC/DEP's service territory. Specifically, the evaluation documented teacher, student, and parent experiences by investigating the following:

1. Teachers' assessments of NTC's performance, program materials, and curriculum in terms of content quality and ability to engage and motivate students to save energy.
2. Student families' responses to the energy efficiency kits and the extent that kits effectively motivated families to save energy.

The evaluation team assessed the following program delivery and customer experience elements:

- Awareness:
  - How aware were teachers and student families of DEC/DEP's program sponsorship?
  - How did they become aware of the program?

- Program experience and satisfaction:
  - How satisfied were teachers with NTC's performance and program curriculum in terms of ease of use, ability to engage, and motivation of students to conserve energy at home?
  - How satisfied were student families with measures in the kit and to what extent did the kits motivate families to save energy?
  - How did teachers and families receive the Kilowatt Krush phone app?

- Challenges and improvement opportunities:
  - Program staff reported that the program achieved only 40%-50% of its pre-COVID-19 participation. What drivers led to this significant reduction in participation?
    - Were fewer schools and/or fewer students able to participate due to COVID-19 restrictions?
  - Were systemic (i.e., non-COVID-19 related) inefficiencies or challenges associated with program delivery?
  - How engaged were teachers in implementing the curriculum and motivating student families to request program kits?

  - Did school changes due to COVID-19 affect how teachers interacted with the program (e.g., teachers are too busy, they require different resources to better adapt to remote learning, school policy, not a priority for teachers)?
  - How did teachers assess NTC performances, program information, and curriculum?

- Student family characteristics:
  - What were kit recipients' demographic characteristics?

2.4. Evaluation Overview

The evaluation team divided its approach into the following key tasks to achieve the outlined goals:

Task 1 – Develop and manage the evaluation work plan to describe processes followed to complete the evaluation tasks outlined in this project.

Task 2 – Conduct a process review to determine how successfully the programs were delivered to participants and to identify opportunities for improvements.

Task 3 – Verify gross and net energy and peak demand savings resulting from the Energy Efficiency in Schools Program using verification activities for samples of 2021-2022 program participants.

2.4.1. Impact Evaluation

The impact evaluation employed the following key steps (further described in Section 3):

Advanced Metering Infrastructure (AMI) data analysis: Home-level AMI consumption data were analyzed to determine if savings resulting from the program could be determined. The evaluation team's false experiments indicated that savings were not discernable using an AMI data approach. Therefore, the team adopted a savings analysis approach based on engineering algorithms.

Family surveys: As part of a joint data collection effort with the process portion of the evaluation, the impact evaluation conducted a web-based survey of the participants. These surveys included questions that pertained to key savings parameters, such as in-service rates and water heater fuel saturation. Table 2-2 summarizes the number of surveys completed.

Estimate gross savings: Data collected via participant surveys were used as inputs to engineering algorithms for calculating each measure's gross verified energy and demand savings. The sample's ratio of verified (*ex-post*) savings to reported (*ex-ante*) savings produced the realization rate, which the evaluation team then applied to the program population's reported savings to yield program-level, gross, verified savings estimates.

Estimate net savings: Net impacts are a reflection of the degree to which the gross savings are a result of the program efforts and incentives. The evaluation team estimated free ridership and

spillover based on self-report methods included in program participant surveys. The ratio of net verified savings to gross verified savings is the net-to-gross (NTG) ratio, which the team applied as an adjustment factor to evaluated gross savings.

2.4.2. Process Evaluation

The process evaluation examined and documented the following elements:

- Program operations
- Stakeholder satisfaction
- Opportunities to improve the efficiency and effectiveness of program delivery

To satisfy the research effort's evaluation, method, and verification objectives, the evaluation team reviewed program documents and conducted web surveys with participating student families and teachers who attended the performance. (These surveys served both the process and impact evaluation work.)

The team also held in-depth interviews (IDI's) with utility staff, implementation staff, and teachers. Table 2-2 provides a summary of the evaluation team activities.

Table 2-2: Summary of Process Evaluation Activities

Target Group	Method	Sample Size
Duke Energy program staff, NTC, R1 Staff	Phone Interview	3
Teachers	Web Survey	73
Teachers volunteering for additional interview	Phone Interview	7
Student Families (kit recipients and Duke Energy customers)	Web Survey	213*

*The process analysis included those families that reported not receiving a kit as they were established to still have valuable insights into the NTC program more generally.

3. Impact Evaluation

3.1. Methodology

The evaluation team's impact analysis focused on the energy and demand savings attributable to the Energy Efficiency in Schools Program for the period of August 2021 through July 2022. The evaluation was divided into two research areas: to determine gross savings and net savings (or impacts). Gross impacts are energy and demand savings estimated at a participant's home that are the direct result of the homeowner's installation of a measure included in the program-provided energy saving kit. Net impacts are a reflection of the degree to which the gross savings are a result of

the program efforts and funds. The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- Review of the DEC and DEP participant databases.
- Completion of web-based surveys to verify key inputs into savings calculations.
- Estimation of verified savings using primary data collected from participants.
- Comparison of the gross verified savings to program reported savings to determine a kit-level realization rate.
- Application of attribution survey data to estimate a NTG ratio and net-verified savings at the program level.

3.2. Sampling Plan and Achievement

To provide representative results and meet program evaluation goals, a sampling plan was created to guide all evaluation activities. After reviewing the program database, the evaluation team identified a population of 11,789 DEC participants and 2,843 DEP participants within the defined evaluation period. Customers who were flagged as "do not contact" in the participation database were excluded from the sample frame. As illustrated in Table 3-1Table 3-1 below, the evaluation completed 101 surveys among DEC program participants and 113 surveys among DEP participants between March 7th and May 7th, 2023. This sample size resulted in a precision of ±8.1% and ±7.6% at a 90% confidence interval for DEC and DEP, respectively.

Table 3-1: Impact Sampling

Jurisdiction	Population	Sample Size	Precision at 90% Confidence
DEC	11,789	101*	±8.1%
DEP	2,843	113*	±7.6%

*The impact evaluation includes only those families that reported receiving a kit

3.3. Description of Analysis

3.3.1. Family Web Surveys

The evaluation team administered web-based surveys to gather key pieces of information used in savings calculations. Results of the completed surveys were used to inform our program-wide assumptions as detailed in Table 3-2.

Table 3-2: Family Data Collected and Used for Analysis

Measure	Data Collected	Assumption
4W LEDs	Units Installed	In-Service Rate

Measure	Data Collected	Assumption
Night Light	Units Later Removed	
	Location Installed	Annual Hours of Use
	Base Lamp Type	Base Lamp Wattage
Showerhead	Units Installed	In-Service Rate
	Units Later Removed	
	Hot Water Fuel Type	% Electric DHW
	Frequency of Showers	Hot Water Consumption
	Duration of Showers	
Bathroom Faucet Aerator Kitchen Faucet Aerator	Units Installed	In-Service Rate
	Units Later Removed	
	Hot Water Fuel Type	% Electric DHW
	Residents per Home	Hot Water Consumption
Outlet Insulating Gaskets	Units Installed	In-Service Rate
	Units Later Removed	
Water Temperature Gauge Card	Hot Water Setback Performed	In-Service Rate
	Hot Water Setback Later Undone	
	Hot Water Fuel Type	% Electric DHW
Energy Savings Behaviors	New Behaviors	Adoption Rate
	Existing Behaviors	
	Influence of Energy Savers Booklet	Adjustment Factors
	Influence of Kit and Materials	

3.3.2. In-Service Rate

The in-service rate (ISR) represents the ratio of equipment installed and operable to the total pieces of equipment distributed and eligible for installation. For example, if 15 telephone surveys were completed for customers receiving 1 night light each, and five customers reported to still have the night light installed and operable, the ISR for this measure would be 5 out of 15, or 33%. In some instances, equipment was installed but may have been removed later due to homeowner preferences. In these cases, the equipment is no longer operable and therefore contributes negatively to the ISR. In-service rates for each measure from all eligible survey respondents are detailed in Table 3-3Table 3-3 and Table 3-4, which are used to adjust measure level savings to accurately reflect equipment in use.

Table 3-3: DEC Sample In-Service Rates

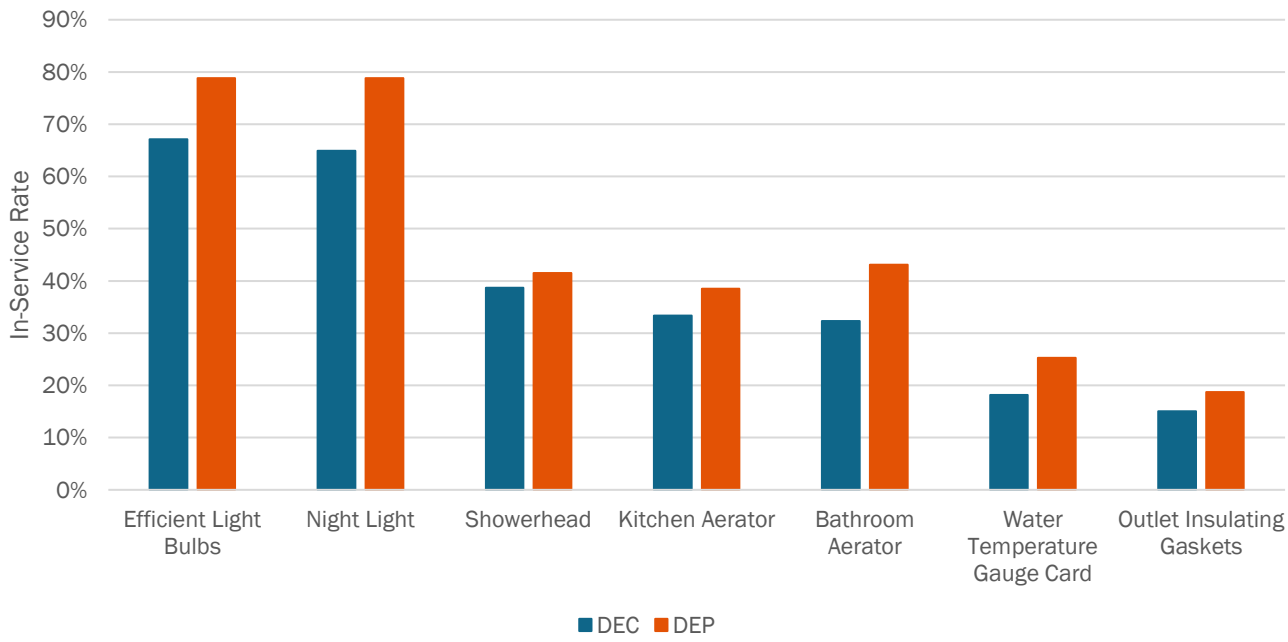
Measure	Distributed	Installed	Removed	ISR
4W LEDs	140	97	3	67%
Night Light	94	63	2	65%
Showerhead	93	40	4	39%
Kitchen Aerator	99	37	4	33%
Bathroom Aerator	99	36	4	32%
Water Temperature Gauge Card	77	18	4	18%
Outlet Insulating Gaskets	1,212	185	3	15%

Table 3-4: DEP Sample In-Service Rates

Measure	Distributed	Installed	Removed	ISR
4W LEDs	170	139	5	79%
Night Light	99	80	2	79%
Showerhead	106	52	8	42%
Kitchen Aerator	109	49	7	39%
Bathroom Aerator	109	48	1	43%
Water Temperature Gauge Card	83	23	2	25%
Outlet Insulating Gaskets	1,356	269	15	19%

Figure 3-1 shows in-service rates for physical measures distributed through the program. LEDs and night lights were found to have the highest in-service rates relative to other measures in the program. Showerheads, kitchen aerators and bathroom aerators showed in-services rates around 40%, while the water temperature gauge card and outlet insulating gaskets showed lower in-service rates. It was also observed that in-service rates were higher in DEP relative to DEC for all physical kit measures.

Figure 3-1: In-Service Rates by Measure and Jurisdiction



3.3.3. Kit Measure Savings

The following section of this report provides a summary of the algorithms used to estimate energy and demand savings for each of the kit items. As much as possible, input parameters referenced program participant responses from the family surveys. For inputs more technical in nature and which could not reliably be collected in participant surveys, the evaluation applied deemed values provided by Mid-Atlantic TRM v10. The outlet insulating gaskets measure references Pennsylvania TRM February 2021 update, as this measure is not available in Mid-Atlantic TRM v10.

Verified savings were calculated individually for each measure and participant, then those savings were averaged to derive the measure level savings presented in the remainder of this section and in Section 3.4.

3.3.3.1. Showerheads

The Energy Education in Schools Kit contained one low-flow showerhead. The algorithm provided by Mid-Atlantic TRM v10 determines average showerhead savings by calculating the total shower use in the home across all showerheads and dividing by the number of showerheads per home. The survey instrument developed for this evaluation collected data that is relevant to only the showerheads replaced through the program. This was done by asking survey respondents to indicate the average minutes per shower and average showers per day specifically for each showerhead that was retrofitted using fixtures provided by the program. Energy and demand savings algorithms provided

by Mid-Atlantic TRM v10 were therefore modified to make use of the data collected in order to present a more accurate estimation of savings from this measure.

Demand savings coincident factors (CF) for the summer and winter seasons were estimated to align with peak demand periods[2] using the study on residential domestic hot water use referenced by the Indiana TRM.[3] This method considers the average hot water use by fixture type (showerhead, faucet aerator) during the peak period along with the probability of the evaluated daily hours of use occurring within that time frame.

Equation 3-1 and Equation 3-2Equation 3-2 below outline the algorithms utilized to estimate savings accrued by the showerhead measure. Algorithm input parameters for the 2022 evaluation are shown in Table 3-5.

Equation 3-1: Showerhead Energy Savings Algorithm

$$\Delta kWh = ISR \times ELEC \times \frac{(GPM_{base} - GPM_{low}) \times \left(\frac{Avg.\,Time}{Shower}\right) \times \left(\frac{Avg.\,Total\,Showers\,Taken}{Day}\right) \times 365 \times 8.3 \times (T_{out} - T_{in})}{3412 \times RE}$$

Equation 3-2: Showerhead Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{Hours} \times CF$$

$$Hours = \frac{\left(\frac{Avg.\,Time}{Shower}\right) \times \left(\frac{Avg.\,Total\,Showers\,Taken}{Day}\right)}{60} \times 365$$

[2] The Duke Energy Carolinas and Duke Energy Progress jurisdictions define their demand peaks as 4pm to 5pm during July (Summer) and 7am to 8am during January (Winter)

[3] Aquacraft, DeOreo and Mayer, The End Uses of Hot Water in Single Family Homes from Flow Trace Analysis

Table 3-5: Inputs for Showerhead Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	39%	42%
ELEC	Family Survey	64%	80%
GPM_{base}	Federal code maximum	2.5	
GPM_{low}	Program provided equipment	1.5	
Time/Shower	Family Survey	13.43	11.73
Total Showers/Day	Family Survey	2.84	3.07
365	Days per year	365	
60	Minutes per hour	60	
3,412	Btu / kWh	3,412	
8.3	Btu / (gallon x degree Fahrenheit)	8.3	
T_{out}	Mid-Atlantic TRM v10	105	
T_{in}	Mid-Atlantic TRM v10	60.9	
RE	Mid-Atlantic TRM v10	0.98	
CF_{Summer}	Mid-Atlantic TRM v10, adjusted	0.0197	0.0186
CF_{Winter}	Mid-Atlantic TRM v10, adjusted	0.0707	0.0667

As Table 3-5 shows, the TRM deemed input parameters are consistent between the two jurisdictions. The survey data showed a higher in-service rate and higher electric water heater saturation in the DEP territory, while average shower time is higher in DEC. Average kit savings attributable to the showerhead measure are presented in Table 3-6.

Table 3-6: Showerhead Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	470.012	0.0362	0.1298
Duke Energy Progress	471.454	0.0380	0.1363

3.3.3.2. Faucet Aerators

The Energy Efficiency in Schools Kit contained one kitchen faucet aerator and one bathroom faucet aerator. Equation 3-3 and Equation 3-4 below outline the algorithms utilized to estimate savings accrued by the faucet aerator measures.

Equation 3-3: Faucet Aerator Energy Savings Algorithm

$$\Delta kWh = ISR \times ELEC \times \frac{(GPM_{base} \times Throttle_{base} - GPM_{low} \times Throttle_{low}) \times Time \times PH \times 365 \times DR \times 8.3 \times (T_{out} - T_{in})}{FH \times 3412 \times RE}$$

Equation 3-4: Faucet Aerator Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{Hours} \times CF$$

$$Hours = \frac{PH \times Time}{60} \times 365$$

The algorithm input parameters provided for kitchen and bathroom faucet aerators are shown in Table 3-7 and Table 3-9, respectively. Table 3-8 and Table 3-10 present the gross verified savings per kit for kitchen aerators and bathroom aerators, respectively.

Table 3-7: Inputs for Kitchen Aerator Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	33%	39%
ELEC	Family Survey	64%	80%
GPM_{base}	Federal code maximum	2.2	
GPM_{low}	Program provided equipment	1.5	
$Throttle_{base}$	Mid-Atlantic TRM v10	0.83	
$Throttle_{low}$	Mid-Atlantic TRM v10	0.95	
Time (min/day/person)	Mid-Atlantic TRM v10	4.5	

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
PH	Family Survey	3.60	3.81
365	Days per year	365	
60	Minutes per hour	60	
3,412	Btu per kWh	3,412	
8.3	Btu / (gallon x degree Fahrenheit)	8.3	
DR	Mid-Atlantic TRM v10	50%	
T_{out}	Mid-Atlantic TRM v10	93	
T_{in}	Mid-Atlantic TRM v10	60.9	
RE	Mid-Atlantic TRM v10	0.98	
CF_{Summer}	Mid-Atlantic TRM v10, adjusted	0.0137	0.0145
CF_{Winter}	Mid-Atlantic TRM v10, adjusted	0.0156	0.0165

All TRM inputs for the kitchen aerator measure were applied consistently to both jurisdictions, with the exception of people per home (PH). Family survey data indicated that the number of occupants in the home is higher than the TRM provided value. This is expected of this program, as kits are offered through participating schools. This limits participation to families with school age children, such that the average number of occupants in the home would be higher than the average amongst the general population.

The survey data showed a higher in-service rate and higher electric water heater saturation in the DEP territory, leading to higher verified savings relative to DEC. Average kit savings attributable to the kitchen aerator measure are presented in Table 3-8.

Table 3-8: Kitchen Aerator Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	25.180	0.0033	0.0038
Duke Energy Progress	31.777	0.0043	0.0049

Table 3-9: Inputs for Bathroom Aerator Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	32%	43%
ELEC	Family Survey	64%	80%
GPM_{base}	Federal code maximum	2.2	
GPM_{low}	Program provided equipment	1.0	
$Throttle_{base}$	Mid-Atlantic TRM v10	0.83	
$Throttle_{low}$	Mid-Atlantic TRM v10	0.95	
Time	Mid-Atlantic TRM v10	1.6	
PH	Family Survey	3.60	3.81
365	Days per year	365	
60	Minutes per hour	60	
3,412	Btu per kWh	3,412	
8.3	Btu / (gallon x degree Fahrenheit)	8.3	
DR	Mid-Atlantic TRM v10	70%	
T_{Mix}	Mid-Atlantic TRM v10	86	
T_{in}	Mid-Atlantic TRM v10	60.9	
RE	Mid-Atlantic TRM v10	0.98	
CF_{Summer}	Mid-Atlantic TRM v10, adjusted	0.0049	0.0052
CF_{Winter}	Mid-Atlantic TRM v10, adjusted	0.0055	0.0059

In line with kitchen faucet aerators, all TRM based inputs in Table 3-9 for bathroom aerators are maintained across jurisdictions, with the exception of people per home (PH) which is sourced from family survey data. Savings in DEP are higher than DEC due to differences in electric water heater saturation and in-service rate. Table 3-10 shows kit savings attributable to the bathroom aerator measure.

Table 3-10: Bathroom Aerator Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	19.833	0.0027	0.0031
Duke Energy Progress	33.835	0.0042	0.0048

3.3.3.3. Water Temperature Gauge Card

The kit also encourages participants to reduce the temperature setting of their water heater through the use of a Water Temperature Gauge Card. A temperature scale is embedded in the card to inform the user if their hot water is above 120 F. Excessively high water heater temperatures lead to greater stand-by losses from the heater's water tank. This information can then be used to determine if water heater temperature should be reduced, resulting in energy savings for the home. Energy and demand savings algorithms associated with reduced water heater temperature are outlined below in Equation 3-5 and Equation 3-6.

Equation 3-5: Water Temperature Gauge Card Energy Savings Algorithm

$$\Delta kWh = ISR \times ELEC \times \frac{U \times A \times (T_{base} - T_{new}) \times Hours}{RE \times 3{,}412 \frac{Btu}{kWh}}$$

Equation 3-6: Water Temperature Gauge Card Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{Hours}$$

In the same format as showerheads and faucet aerators above, algorithm input parameters for DEC and DEP are shown in Table 3-11.

Table 3-11: Inputs for Water Temperature Gauge Card Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	18%	25%
ELEC	Family Survey	64%	80%
U	Mid-Atlantic TRM v10.0	0.083	
A	Mid-Atlantic TRM v10.0	24.99	
T_{base}	Mid-Atlantic TRM v10.0	135	
T_{new}	Mid-Atlantic TRM v10.0	120	

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
Hours	Mid-Atlantic TRM v10.0	8,760	
RE	Mid-Atlantic TRM v10.0	0.98	

Table 3-11 shows consistent deemed TRM input parameters between the applied to both DEC and DEP, with the only variations being in-service rate and electric water heater saturation. These variations led to higher savings in DEP relative to DEC, as was the case for other hot water related kit measures. Kit savings attributable to this measure are presented below in Table 3-12.

Table 3-12: Water Temperature Gauge Card Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	7.410	0.0008	0.0008
Duke Energy Progress	17.677	0.0020	0.0020

3.3.3.4. Lighting

The lighting measures in the kit include two 4 Watt LEDs and an LED nightlight. Equation 3-7 and Equation 3-8 outline the algorithms utilized to estimate savings accrued by lighting measures. Key parameters for the 4W LED measures are defined in Table 3-13, while night light key parameters are given in Table 3-15.

Equation 3-7: Lighting Energy Savings Algorithm

$$\Delta kWh = ISR \times \frac{Watts_{Base} - Watts_{EE}}{1000 \frac{W}{kW}} \times HOU \times WHF_E \times 365 \frac{Days}{Year}$$

Equation 3-8: Lighting Demand Savings Algorithm

$$\Delta kW = ISR \times \frac{Watts_{Base} - Watts_{EE}}{1000 \frac{W}{kW}} \times WHF_D \times CF$$

Table 3-13: Inputs for 4 Watt LED Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR (ALL)	Family Survey	67%	79%
ISR (LED1)	Family Survey	71%	85%
ISR (LED2)	Family Survey	63%	73%
$Watts_{Base}$ (ALL)	Family Survey	19.2	18.3
$Watts_{Base}$ (LED1)	Family Survey	18.7	19.1
$Watts_{Base}$ (LED2)	Family Survey	19.8	17.4
$Watts_{EE}$	Program Provided Equipment	4	
Daily HOU (ALL)	Family Survey	2.71	2.71
Daily HOU (LED1)	Family Survey	3.01	2.90
Daily HOU (LED2)	Family Survey	2.38	2.49
WHF_E	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.94	
$WHF_{D\ Summer}$	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	1.27	
$WHF_{D\ Winter}$	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.50	
CF_{Summer}	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.1283	
CF_{Winter}	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.1451	

Baseline lamp wattage was estimated based on survey responses that asked families about the type of bulb removed when they installed their new 5W LEDs. The survey offered participants the choice of incandescent (32.5W), halogen (23W), compact fluorescent (7.5W), or LED (5W) lamps as baseline options. The appropriate baseline wattage was applied to each participating family, based

[4] Opinion Dynamics, Energy Efficient Lighting & Retail LED Programs Evaluation Report for Duke Energy Progress and Carolinas, April 2018

on their survey responses. A similar process was followed to determine daily hours of use (HOU) for LED lighting, as participants were asked which room type best describes the location where kit provided LEDs were installed. An estimated daily HOU was applied to each room type based on a study completed for Duke Energy in 2018. As Table 3-13 shows, baseline wattages are higher in DEC relative to DEP, while daily HOU is relatively consistent. In the DEC territory, it was found that the average baseline wattage of LED1 was lower than the baseline wattage of LED2. This is due to several survey respondents indicating that they replaced only one light in their home, and that the base lamp was either a CFL or existing LED.

In-service rates for this measure are the highest observed of any kit measure in the program. DEP in-service rates are higher than DEC's, which results in higher DEP savings relative to DEC, despite the evaluation team's observation that DEC respondents generally replaced a less-efficient lamp.

It is important to show savings associated with each individual LED provided in the kit, as there is some variation between in-service rates for the first LED and the second LED. Gross energy and demand savings for each LED, as well as the total savings of all LEDs in the kit, are summarized in Table 3-14.

Table 3-14: 4 Watt LED Gross Verified Savings per Kit

Jurisdiction	Item	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	LED 1	11.007	0.0017	0.0008
	LED 2	8.269	0.0016	0.0007
	All LEDs	19.276	0.0033	0.0015
Duke Energy Progress	LED 1	13.494	0.0021	0.0009
	LED 2	8.884	0.0016	0.0007
	All LEDs	22.379	0.0037	0.0016

Table 3-15 shows input parameters in DEC and DEP jurisdictions. Waste heat factors (WHF) were sourced from Mid-Atlantic TRM v10.0. Daily hours of use (HOU) were sourced from Tennessee Valley Authority (TVA) TRM v6.0. The night light provided in the kit was designed to automatically turn on when there is insufficient light in the room, and automatically turn off when ambient light is available. The TVA jurisdiction is at roughly the same latitude as DEC and DEP territories, and therefore provides a reasonable approximation for the amount of daylight hours for night lights.

Baseline lamp wattage was estimated based on survey responses that asked participants the type of night light removed when they installed their new LED night light. The survey offered participants the choice of incandescent (5W) or LED (0.3W) night lights as baseline options. The appropriate baseline wattage was applied to each participating family, based on their survey responses.

Table 3-15: Inputs for Night Light Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	65%	79%
$Watts_{Base}$	Family Survey	1.8	1.4
$Watts_{EE}$	Program Provided Equipment	0.3	
Daily HOU	Tennessee Valley Authority TRM v6.0	12	
WHF_{E}	Mid-Atlantic TRM v10	0.94	
$WHF_{D\ Summer}$	Mid-Atlantic TRM v10	1.27	
$WHF_{D\ Winter}$	Mid-Atlantic TRM v10	0.50	
CF_{Summer}	Engineering Judgement*	0	
CF_{Winter}	Engineering Judgement*	0	

*No night light use expected during summer peak hours (July, 4 PM – 5 PM). Sunrise expected around 7AM in January, no expected night light use during winter peak hours (January, 7 AM – 8 AM)

Table 3-15 shows that summer peak demand coincidence factor and winter peak demand coincidence factor are both zero. DEC and DEP summer peak demand period is defined as 4 PM – 5 PM on weekdays in July, while winter peak demand period is defined as 7 AM – 8 AM on weekdays in January. There is no expected night light use during the summer peak demand period. Secondary research showed that the apparent sunrise times are after 7 AM in January in North Carolina.[5] As such, a conservative assumption was applied such that there are no winter peak demand savings for this measure. Gross verified savings for the night light measure are shown in Table 3-16.

[5] National Oceanic and Atmospheric Administration, Earth System Research Laboratory, Sunrise/Sunset Calculator, Raleigh, NC (NOAA Improved Sunrise/Sunset Calculation)

Table 3-16: Night Light Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	4.082	0.000	0.000
Duke Energy Progress	3.568	0.000	0.000

3.3.3.5. Outlet Insulating Gaskets

A set of twelve outlet insulating gaskets were provided in the kit. Gaskets provide sealing to reduce air infiltration through electrical outlets, thereby saving energy through reductions in heating and cooling loads. Equation 3-9 and Equation 3-10 outline the algorithms to determine energy and demand savings. Input parameters for these equations are shown in Table 3-17.

Equation 3-9: Outlet Insulating Gaskets Energy Savings Algorithm

$$\Delta kWh = ISR \times N_{Gaskets} \times \frac{kWh}{gasket}$$

Equation 3-10: Outlet Insulating Gaskets Demand Savings Algorithm

$$\Delta kW = ISR \times N_{Gaskets} \times \frac{kW}{gasket}$$

Table 3-17: Inputs for Outlet Insulating Gaskets Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ISR	Family Survey	15%	19%
$N_{gaskets}$	Quantity Provided by Program	12	12
kWh/gasket	Pennsylvania TRM February 2021 Update, Ref Philadelphia	19.89	
kW/gasket	Pennsylvania TRM February 2021 Update, Ref Philadelphia	0.0000954	

As Table 3-17 shows, gasket in-service rate increased are higher in DEP relative to DEC, leading to higher verified savings in the DEP territory. Energy and demand savings per gasket were sourced from Pennsylvania TRM February 2021. Philadelphia was selected as a reference city based on typical annual cooling degree days (CDD) and heating degree days (HDD), as Philadelphia is the closest available approximation to Charlotte, NC.

Table 3-18 shows kit-level gross verified energy and demand savings for outlet insulating gaskets.

Table 3-18: Outlet Insulating Gaskets Gross Verified Savings per Kit

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	35.841	0.0002	0.0002
Duke Energy Progress	44.708	0.0002	0.0002

3.3.3.6. Behavioral Measures

Delivery of the Energy Efficiency in Schools program includes performances by NTC, the Energy Savers booklet, instruction materials for teachers, and the Kilowatt Krush app. These program features help to promote energy conservation behaviors in the homes of participating families.

Savings were estimated for each behavioral change as the product of several factors. An engineering analysis was performed to determine unadjusted savings (kWh, Summer Peak kW, and Winter Peak kW) of each behavior. Adoption rates were then applied for each behavior based on family survey responses. Adjustment factors were also applied to account for the influence of the program kit, the influence of kit information materials, and estimated persistence of behavioral changes. Equation 3-11 and Equation 3-12 show the algorithms used to determine savings from behavioral changes.

Equation 3-11: Behavioral Changes Energy Savings Algorithm

$$\Delta kWh = \sum Unadjusted\ kWh \times Adoption\ Rate \times Kit\ Influence \times Kit\ Information\ Materials \times Persistence$$

Equation 3-12: Behavioral Changes Demand Savings Algorithm

$$\Delta kW = \sum Unadjusted\ kW \times Adoption\ Rate \times Kit\ Influence \times Kit\ Information\ Materials \times Persistence$$

The following subsections outline and summarize the analysis methods used to determine unadjusted savings, adoption rates, and adjustment factors.

3.3.3.6.1. Unadjusted Behavioral Savings

Engineering analyses were performed to determine unadjusted kWh savings, unadjusted Summer kW savings, and unadjusted Winter kW savings for each behavioral change measure. Unadjusted savings refers to the expected savings of the new behavior, before adjusting for adoption rate, program influence factors, and persistence. The analyses relied on data and methods from TRMs, family survey data, and applicable secondary sources. A summary of unadjusted behavioral savings is given in Table 3-19 and Table 3-20.

Table 3-19: DEC Energy Efficiency Behavior Unadjusted Gross Verified Savings

Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Turn Off Lights	3.815	0.0031	0.0035
Turn Off Electronics	73.960	0.0019	0.0019
Take Shorter Showers	235.850	0.1763	0.6328
Change Thermostat Settings	376.709	0.0933	0.000
Use Fans Instead of Air Conditioning	227.376	0.0933	0.000
Turn Off Air Conditioning When Not Home	227.376	0.0933	0.000
Turn Off Heating When Not Home	149.333	0.000	0.0494
Turn Down Water Heater	51.869	0.0059	0.0059

Table 3-20: DEP Energy Efficiency Behavior Unadjusted Gross Verified Savings

Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Turn Off Lights	3.640	0.0030	0.0034
Turn Off Electronics	73.960	0.0019	0.0019
Take Shorter Showers	241.408	0.2081	0.7471

Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Change Thermostat Settings	376.709	0.0933	0.000
Use Fans Instead of Air Conditioning	227.376	0.0933	0.000
Turn Off Air Conditioning When Not Home	227.376	0.0933	0.000
Turn Off Heating When Not Home	149.333	0.000	0.0494
Turn Down Water Heater	65.354	0.0075	0.0075

3.3.3.6.2. Turn Off Lights

Turning off lights reduces energy consumption by reducing the hours of use (HOU) for a lighting system. The algorithms to determine energy and demand savings for this behavior are similar to those used to calculate savings for the 4W LED measure included in the kit, as outlined in Equation 3-13 and Equation 3-14.

Equation 3-13: Turn Off Lights Energy Savings Algorithm

$$\Delta kWh = \frac{Watts}{1000\frac{W}{kW}} \times \Delta HOU_{Daily} \times WHF_E \times 365\frac{Days}{Year}$$

Equation 3-14: Turn Off Lights Demand Savings Algorithm

$$\Delta kW = \frac{Watts}{1000\frac{W}{kW}} \times WHF_D \times CF$$

An estimated daily reduction in HOU was determined based on a study completed for DEP and DEC in 2018.[6] A likely reduction in operating hours was determined as the average difference in lighting hours between different room types in a typical single family home. Daily operating hours by room type, as well as the differences between room types, are shown in Table 3-21.

[6] Opinion Dynamics, *Energy Efficient Lighting & Retail LED Programs Evaluation Report for Duke Energy Progress and Carolinas*, April 2018

Table 3-21: Difference in Daily Lighting HOU by Room Type

Room Type & Daily HOU		Dining Room	Kitchen	Base-ment	Living Room	Other	Hallway	Bedroom	Bathroom
		4.27	4.26	3.75	2.23	1.97	1.97	1.83	1.51
Dining Room	4.27	0	0	0	0	0	0	0	0
Kitchen	4.26	0.01	0	0	0	0	0	0	0
Basement	3.75	0.52	0.51	0	0	0	0	0	0
Living Room	2.23	2.04	2.03	1.52	0	0	0	0	0
Other	1.97	2.30	2.29	1.78	0.26	0	0	0	0
Hallway	1.97	2.30	2.29	1.78	0.26	0.00	0	0	0
Bedroom	1.83	2.44	2.43	1.92	0.40	0.14	0.14	0	0
Bathroom	1.51	2.76	2.75	2.24	0.72	0.46	0.46	0.32	0

Each entry in Table 3-21 is calculated as the daily HOU from the top row, less the daily HOU from the leftmost column. In cases where this resulted in a daily HOU reduction of less than zero, the calculation defaults to a value of zero. An average of the differences shown in Table 3-21 produces a likely reduction in HOU of 0.58 hours/day.

Wattage was determined as the average of base wattages by baseline lamp type indicated as by the family survey responses for the 4W LED measure. Input parameters for this unadjusted savings calculation are shown in Table 3-22.

Table 3-22: Inputs for Turn Off Lights Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
$Watts_{Base}$	Family Survey	19.2	18.3
ΔHOU_{Daily}	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.58	

WHF_E	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.94
$WHF_{D\ Summer}$	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	1.27
$WHF_{D\ Winter}$	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.50
CF_{Summer}	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.1283
CF_{Winter}	DEC/DEP EEL and Retail LED Evaluation Report (2018)[4]	0.1451

Table 3-23 provides unadjusted savings for Turn Off Lights behavior.

Table 3-23: Turn Off Lights Unadjusted Gross Verified Savings

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	3.815	0.0031	0.0035
Duke Energy Progress	3.640	0.0030	0.0034

3.3.3.6.3. Turn Off Electronics

Unadjusted savings for turning off electronics behavioral changes were determined by examining Smart Strip or Advanced Power Strip measures of regional TRMs, as well as planning estimates developed for the Smart Strip Entertainment measure for Duke Energy's 2019-2020 Market Potential Study (MPS). Data collected from these sources is listed in Table 3-24, and algorithms to determine savings are given in Equation 3-15 and Equation 3-16.

Equation 3-15: Turn Off Electronics Energy Savings Algorithm

$$\Delta kWh = Average\ Deemed\ kWh\ Savings = \frac{\sum_1^n Annual\ kWh\ Savings}{n}$$

Equation 3-16: Turn Off Electronics Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{Daily\ Idle\ Time\ (Hours) \times 365} \times CF$$

Table 3-24: Inputs for Turn Off Electronics Savings Calculations

Variable	Source	2022 Evaluation
Annual kWh Savings	Duke Energy Market Potential Study	65.7
Annual kWh Savings	Illinois TRM v10.0	80.0
Annual kWh Savings	Indiana TRM v2.2	23.0
Annual kWh Savings	Mid-Atlantic TRM v10	112.3
Annual kWh Savings	Pennsylvania TRM, February 2021	88.8
Daily Idle Time (Hours)	Duke Energy Market Potential Study	20
CF_{Summer}	Mid-Atlantic TRM v10, unspecified end use	0.19
CF_{Winter}	Assumed	0.19

The winter coincidence factor was assumed to be the same as the summer coincidence factor based on the results of Duke Energy's Market Potential Study. Table 3-25 provides unadjusted savings for the Turn Off Electronics behavior.

Table 3-25: Turn Off Electronics Unadjusted Gross Verified Savings

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	73.960	0.0019	0.0019
Duke Energy Progress	73.960	0.0019	0.0019

3.3.3.6.4. Take Shorter Showers

Taking shorter showers reduces energy consumption of residential water heaters by reducing the average minutes per shower, and therefore hot water consumed during each shower. The algorithms to determine energy and demand savings for this behavior are similar to those used to calculate savings for the showerheads measure included in the kit, as outlined in Equation 3-17 and Equation 3-18.

Equation 3-17: Take Short Showers Energy Savings Algorithm

$$\Delta kWh = ISR \times ELEC \times \frac{GPM \times \Delta Time \times \left(\frac{Avg.\,Total\,Showers\,Taken}{Day}\right) \times 365 \times 8.3 \frac{Btu}{gal \cdot °\mathrm{F}} \times (T_{out} - T_{in})}{3412 \frac{Btu}{kWh} \times RE}$$

Equation 3-18: Take Short Showers Demand Savings Algorithm

$$\Delta kW = ISR \times ELEC \times \frac{GPM \times 60 \times 8.3 \frac{Btu}{gal \cdot °\mathrm{F}} \times (T_{out} - T_{in})}{3412 \frac{Btu}{kWh} \times RE} \times CF$$

An estimated reduction in shower minutes was determined by comparing family survey responses to the assumed minutes per shower given in Mid-Atlantic TRM v10. Survey responses were grouped into bins of two minutes, with the mean of the bin taken as the estimated shower time. A reduction goal for each bin was then estimated, under the assumption that the goal was to reach the average shower time of 7.8 minutes as given by Mid-Atlantic TRM v10. A reduction goal of zero minutes was assumed for survey respondents who indicated that their average shower time was less than eight minutes. Reduction goals and survey responses are shown in Table 3-26.

Table 3-26: Reduction in Minutes per Shower Based on Family Survey Responses

Minutes Per Shower				Duke Energy Carolinas		Duke Energy Progress	
Bin Start	Bin End	Bin Mean	Reduction Goal	Count	Fraction	Count	Fraction
0	2	1	0	1	2.8%	1	2.3%
2	4	3	0	0	0.0%	2	4.5%
4	6	5	0	4	11.1%	9	20.5%
6	8	7	0	0	0.0%	4	9.1%
8	10	9	1.2	9	25.0%	15	34.1%
10	12	11	3.2	1	2.8%	1	2.3%
12	14	13	5.2	0	0.0%	0	0.0%
14	16	15	7.2	14	38.9%	7	15.9%
16	18	17	9.2	0	0.0%	0	0.0%
18	20	19	11.2	6	16.7%	1	2.3%
20	22	21	13.2	0	0.0%	0	0.0%
22	24	23	15.2	0	0.0%	0	0.0%
24	23	25	17.2	0	0.0%	1	2.3%
26	28	27	19.2	0	0.0%	0	0.0%
28	30	29	21.2	1	2.8%	2	4.5%

Minutes Per Shower				Duke Energy Carolinas		Duke Energy Progress	
Bin Start	Bin End	Bin Mean	Reduction Goal	Count	Fraction	Count	Fraction
30	32	31	23.2	0	0.0%	0	0.0%
32	34	33	25.2	0	0.0%	0	0.0%
34	36	35	27.2	0	0.0%	0	0.0%
36	38	37	29.2	0	0.0%	0	0.0%
38	40	39	31.2	0	0.0%	0	0.0%
40	42	41	33.2	0	0.0%	0	0.0%
42	44	43	35.2	0	0.0%	0	0.0%
44	46	45	37.2	0	0.0%	0	0.0%
46	48	47	39.2	0	0.0%	0	0.0%
48	50	49	41.2	0	0.0%	0	0.0%
50	52	51	43.2	0	0.0%	0	0.0%
52	54	53	45.2	0	0.0%	0	0.0%
54	56	55	47.2	0	0.0%	0	0.0%
56	58	57	49.2	0	0.0%	0	0.0%
58	60	59	51.2	0	0.0%	1	2.3%

A weighted average of reduction goal by the fraction of survey responses gives a likely reduction of 5.64 minutes per shower in DEC and 4.40 minutes per shower in DEP. A summary of input parameters for these savings calculations are presented in Table 3-27.

Table 3-27: Inputs for Take Shorter Showers Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ELEC	Participant Survey	64%	80%
GPM	Family Survey	2.14	2.13
ΔTime	Participant Survey	5.6	4.4
SPD_{Person}	Family Survey	0.77	0.80
T_{Mix}	Mid-Atlantic TRM v10	105	
T_{in}	Mid-Atlantic TRM v10	60.9	
365	Days per year	365	
RE	Mid-Atlantic TRM v10	0.98	
CF_{Summer}	Mid-Atlantic TRM v10, adjusted	0.0197	0.0186
CF_{Winter}	Mid-Atlantic TRM v10, adjusted	0.0707	0.0667

Showerhead GPM was applied as either federal code maximum (2.5 GPM) or program provided equipment (1.5 GPM) based on family survey responses indicating if a showerhead from the kit was in-service at the home. Unadjusted savings attributable to taking shorter showers are shown in Table 3-28.

Table 3-28: Take Shorter Showers Unadjusted Gross Verified Savings

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	235.850	0.1763	0.6328
Duke Energy Progress	241.408	0.2081	0.7471

3.3.3.6.5. Change HVAC Use

Several behavioral changes regarding residential heating, ventilation, and air conditioning (HVAC) can result in significant energy savings if adopted by parents. These include adjusting thermostat settings, using fans instead of air conditioning, turning off air conditioning when not home, and turning off heating when not home. Unadjusted savings for these behaviors were calculated by applying an estimated savings fraction to typical household energy use for heating and cooling systems. The algorithms for determining unadjusted savings of HVAC changes are shown in Equation 3-19 and Equation 3-20.

Equation 3-19: Change HVAC Use Energy Savings Algorithm

$$\Delta kWh = \%\, Savings_{Heat} \times kWh_{Heat} + \%\, Savings_{Cool} \times kWh_{Cool}$$

Equation 3-20: Change HVAC Use Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{EFLH} \times CF$$

Estimated savings fractions were determined by investigating the deemed savings of smart thermostat measures in several TRMs. Estimated savings fractions are shown in Table 3-29.

Table 3-29: Annual Smart Thermostat Savings Estimates

Source	% Annual Heating Savings	% Annual Cooling Savings
Illinois TRM v10.0	8.5%	8.4%
Mid-Atlantic TRM v10	6.0%	7.0%
Pennsylvania TRM, February 2021	7.9%	7.5%
Average	7.5%	7.6%

The average annual savings fractions presented in Table 3-29 were then applied to average annual household heating and cooling energy. Annual household heating and cooling energy was estimated as total space heating and air-conditioning electricity use in the South Atlantic census division of the South region of the United States, as given by the U.S. Energy Information Administration Residential Energy Consumption Survey.[7] A summary is given in Table 3-30.

Table 3-30: Annual Household Heating and Cooling Energy Use

Parameter	Heating Systems	Cooling Systems
Housing Units (Millions)	23.5	
Electricity Use (Billion kWh/year)	47	70
Average Household Electricity Use (kWh/year)	2,000	2,979

A summary of these factors, as well as other calculation inputs, is presented in Table 3-31.

Table 3-31: Inputs for Change HVAC Use Savings Calculations

Variable	Source	Duke Energy Carolinas / Duke Energy Progress
% $Savings_{Heat}$	TRM Estimates	7.5%
% $Savings_{Cool}$	TRM Estimates	7.6%
kWh_{Heat}	US EIA RECS 2015	2,000

[7] U.S. Energy Information Administration, Residential Energy Consumption Survey 2015, Table CE4.3, Released May 2018

kWh_{Cool}	US EIA RECS 2015	2,979
$EFLH_{Heat}$	DEC-DEP Smart $aver Evaluation 2020-2022[8]	1,089
$EFLH_{Cool}$	DEC-DEP Smart $aver Evaluation 2020-2022[9]	877
CF_{Summer}	DEC-DEP Smart $aver Evaluation 2020-2022[10]	0.3599
CF_{Winter}	DEC-DEP Smart $aver Evaluation 2020-2022[11]	0.3604

Calculation inputs were used to determine energy, summer peak demand, and winter peak demand savings for each of the four behavioral changes related to HVAC use. Changing thermostat settings is expected to provide energy savings in both heating and cooling seasons, as well as summer peak demand savings. Reductions in air conditioning use, either by using fans when home or by turning off the system when not home, provide cooling season energy savings and summer peak demand savings. Turning off heating when not home provides heating season energy savings and winter peak demand savings. Unadjusted savings attributable to changes in HVAC use are given in Table 3-32.

Table 3-32: Change HVAC Use Unadjusted Gross Verified Savings

Jurisdiction	Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas/Duke Energy Progress	Change Thermostat Settings	376.709	0.259	0
	Use Fans Instead of Air Conditioning	227.376	0.259	0
	Turn Off Air Conditioning When Not Home	227.376	0.259	0
	Turn Off Heating When Not Home	149.333	0	0.137

[8] Smart $aver 2020-2022 Evaluation Report, Duke Energy Carolinas and Progress, August 2023

[9] Smart $aver 2020-2022 Evaluation Report, Suke Energy Carolinas and Progress, August 2023

[10] Ibid

[11] Ibid

3.3.3.6.6. Turn Down Water Heater

Excessively high water heater temperatures contribute to greater stand-by losses from the heater's water tank. Participating families are encouraged to reduce the temperature setting of their domestic water heaters through a variety of educational methods. However, the kit also includes a Water Temperature Gauge Card measure as described in Section 3.3.3.3. Families that indicated they used the Water Temperature Gauge Card were not allotted savings for the Turn Down Water Heater behavior. This was done to avoid accounting for the same savings twice. The algorithms for estimating unadjusted savings are similar to those for the Water Temperature Gauge Card measure, as shown in Equation 3-21 and Equation 3-22.

Equation 3-21: Turn Down Water Heater Energy Savings Algorithm

$$\Delta kWh = ELEC \times \frac{U \times A \times (T_{base} - T_{new}) \times Hours}{RE \times 3{,}412 \frac{Btu}{kWh}}$$

Equation 3-22: Turn Down Water Heater Demand Savings Algorithm

$$\Delta kW = \frac{\Delta kWh}{Hours} \times CF$$

Algorithm input parameters are given in Table 3-33. These match the input parameters of the Water Heater Gauge Card measure, with the exclusion of in-service rate, which is taken into account with the adoption rate discussed in the following section.

Table 3-33: Inputs for Turn Down Water Heater Savings Calculations

Variable	Source	Duke Energy Carolinas	Duke Energy Progress
ELEC	Family Survey	64%	80%
U	Mid-Atlantic TRM v10.0	0.083	
A	Mid-Atlantic TRM v10.0	24.99	
T_{base}	Mid-Atlantic TRM v10.0	135	
T_{new}	Kit Information Materials	120	
Hours	Mid-Atlantic TRM v10.0	8,760	
RE	Mid-Atlantic TRM v10.0	0.98	
CF_{Summer}	Mid-Atlantic TRM v10.0	1.0	
CF_{Winter}	Mid-Atlantic TRM v10.0	1.0	

Unadjusted savings associated with the Turn Down Water Heater behavior are presented in Table 3-34.

Table 3-34: Turn Down Water Heater Unadjusted Gross Verified Savings

Jurisdiction	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Duke Energy Carolinas	51.869	0.0059	0.0059
Duke Energy Progress	65.354	0.0075	0.0075

3.3.3.6.7. Behavior Adoption Rates

Adoption rates were applied to the unadjusted savings of each behavioral change based on family survey responses. Adoption rates estimate the portion of family survey respondents that indicated new energy saving behaviors in their homes following participation in the Energy Efficiency in Schools program. This is similar to an in-service rate, except that it is a representation of people's habits instead of the installation of a physical measure.

Adoption rates were determined using responses to the parent survey discussed in Section 3.3.1. The family survey included the following questions to determine if new behaviors were adopted in the home:

- Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, has **your child** adopted or increased any **new behaviors** to help save energy in your home? This would only include new energy saving **behaviors** that your child adopted since receiving the kit.
- Since receiving your energy kit from Duke Energy, have **you or other adults in the home** adopted or increased any of the following behaviors to help save energy in your home?

A comparison of child and parent behavior adoption rates between the DEC and DEP jurisdictions are shown in Figure 3-2 and Figure 3-3, respectively.

Figure 3-2: Child Energy Efficiency Behavior Adoption Rates

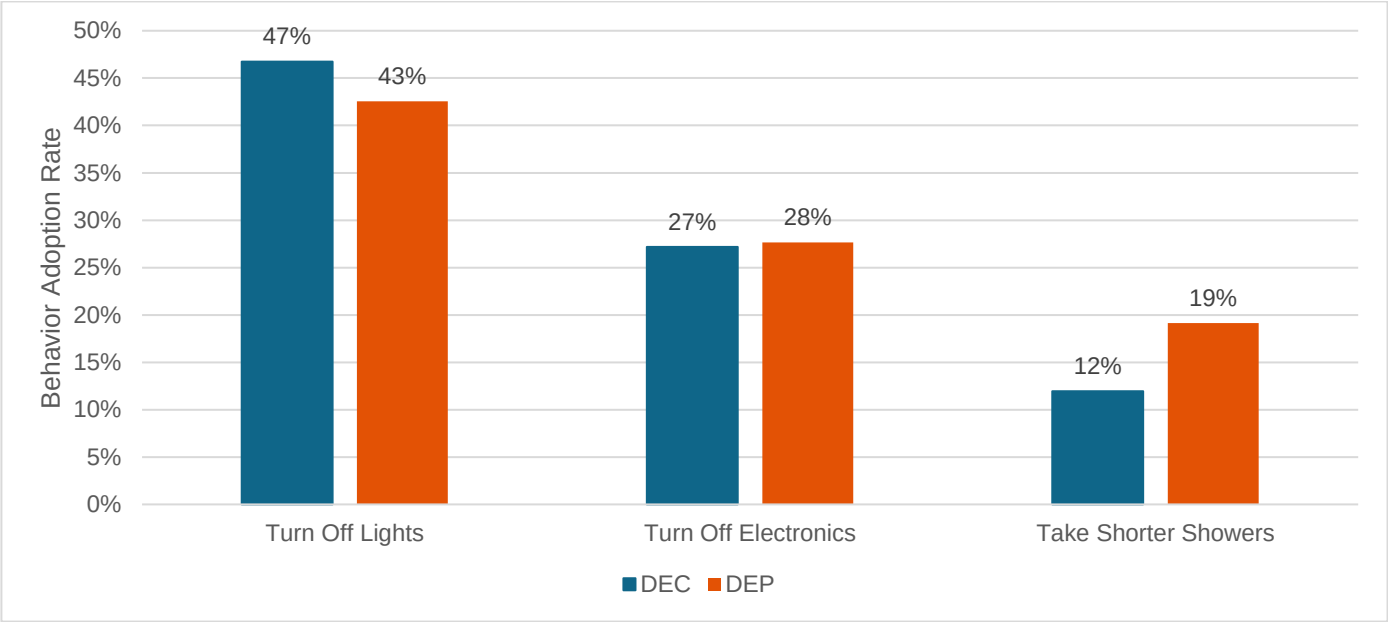
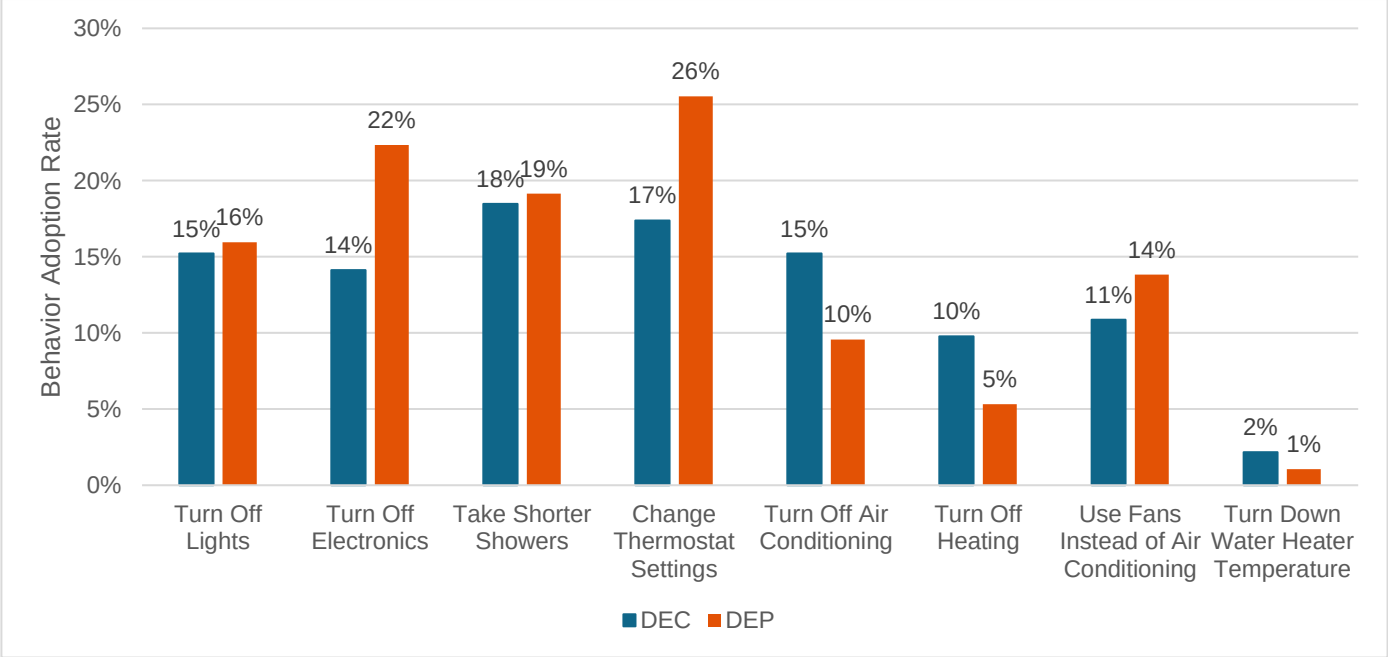


Figure 3-3: Parent Energy Efficiency Behavior Adoption Rates



An adjustment was made to the adoption rate of the Turn Down Water Heater Temperature behavior. This behavior includes performing the same energy saving action as the Water Temperature Gauge Card kit measure. Parents who indicated that they used the Water Temperature Gauge Card were not

considered to have adopted the Turn Down Water Heater Temperature behavior. This prevented the evaluation team from accounting for the same verified savings twice.

3.3.3.6.8. Behavioral Adjustment Factors

Adjustment factors were applied to behavioral savings to account for the influence of the program kit, the influence of kit information materials, and estimated persistence of behavioral changes. A comparison of adjustment factors applied in the DEC and DEP jurisdictions are shown in Table 3-35.

Table 3-35: Historical Behavioral Savings Adjustment Factors

Variable	Duke Energy Carolinas	Duke Energy Progress
Kit Influence	39.9%	42.4%
Kit Information Materials	58.5%	71.9%
Persistence	27.8%	27.8%
Total Adjustment	7.5%*	9.5%*

*The three individual adjustment factors presented in this table multiplied together do not produce the exact Total Adjustment shown, as they are individually calculated for this table only. The Total Adjustment is a direct average inclusive of all three contributing adjustment factors (i.e., not a simple average of the three individual adjustment factor averages) and was therefore used for the evaluation's savings calculations.

3.3.3.6.9. Kit Influence

A kit influence adjustment was applied to account for the impact of the Energy Efficiency in Schools kit on the adoption of new energy saving behaviors. The family survey included the following question to assess kit influence:

- On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how much influence did Duke Energy's kit and materials on saving energy have on this change of energy using behaviors?

A kit influence adjustment factor was applied to the behavioral savings of each participating family according to the values listed in Table 3-36. The average kit influence among responding parents was 40% in DEC and 42% in DEP.

Table 3-36: Kit Influence Behavior Adjustment Factors

Parent Survey Response	Kit Influence Adjustment	Number of Responses	
		Duke Energy Carolinas	Duke Energy Progress
0	0%	48	46
1	10%	0	0
2	20%	0	0
3	30%	0	1
4	40%	0	0
5	50%	2	3
6	60%	3	3
7	70%	11	10
8	80%	6	7
9	90%	6	3
10	100%	16	21

3.3.3.6.10. Kit Informational Materials

The Energy Efficiency in Schools kit included an Energy Savers booklet describing ways that participating families could save energy in their homes. The family survey included the following questions to assess the influence of informational materials provided in the kit:

- Did you read any of the Energy Savers booklet that came in the kit? This is the 44-page booklet with information about how to save energy in the home.
- On a scale from 0 to 10 where 0 is not at all helpful and 10 is very helpful, how helpful was the Energy Savers booklet in identifying ways your household could save energy at home?

A kit informational materials adjustment factor was applied to the behavioral savings of each participating family according to the values listed in Table 3-37. The average influence of kit informational materials among responding parents was 59% in DEC and 72% in DEP.

Table 3-37: Kit Informational Materials Behavior Adjustment Factors

Parent Survey Response	Kit Informational Materials Adjustment	Number of Responses	
		Duke Energy Carolinas	Duke Energy Progress
Did Not Read	0%	24	15
0	0%	0	0
1	10%	0	0
2	20%	0	0
3	30%	2	0
4	40%	2	0
5	50%	6	1
6	60%	4	6
7	70%	12	17
8	80%	16	15
9	90%	2	8
10	100%	24	33

3.3.3.6.11. Persistence

While behavioral changes designed to increase energy efficiency result in immediate impacts, the initial activity is expected to wane in the absence of consistent intervention. This decay of energy savings resulting from a change in behavior has been carefully documented through random control trials of home energy report (HER) programs such as Duke Energy's MyHER program or programs implemented in other jurisdictions by Oracle (formally Opower). The rate at which energy savings persists after a customer receives a report depends on the frequency and longevity of follow-up reports.

The Energy Efficiency in Schools kit provides a single educational intervention to inspire energy efficient behaviors. The decay of savings from a single intervention was determined in order to provide an estimate of the persistence of energy saving behaviors attributable to program participation. A 2014 study of the Opower program provides estimates of savings resulting from quarterly behavioral interventions, as well as observed decay when reports are no longer provided.[12]

[12] Allcott, H, Rogers, T. The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation. American Economic Review 2014, 104(10): 3003-3037. Tables 2 and 3.

Estimated persistence of behavioral changes resulting from the Energy Efficiency in Schools program is shown in Table 3-38.

Table 3-38: Energy Saving Behavior Persistence

Item	kWh / Day
Quarterly Report, Immediate Impact	0.197
Quarterly Report, Decay Between Reports	0.708
Savings / Decay (Persistence)	27.8%

3.3.3.6.12. Summary of Behavioral Impacts

After applying the total adjustment factor and applicable child or parent adoption rates to the unadjusted savings, kit-level gross verified savings for each behavior, as well as the behavioral total, for DEC are presented in Table 3-39. The same parameters are presented for DEP in Table 3-40.

Table 3-39: DEC Gross Verified Behavioral Savings per Kit

Children/Parents	Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Children	Turn Off Lights	0.164	0.0001	0.0001
	Turn Off Electronics	2.027	0.0001	0.0001
	Take Shorter Showers	2.432	0.0018	0.0065
Parents	Turn Off Lights	0.088	0.0001	0.0000
	Turn Off Electronics	1.810	0.0000	0.0000
	Take Shorter Showers	4.889	0.0131	0.0140
	Change Thermostat Settings	11.029	0.027	0.0000
	Turn Off Air Conditioning	5.433	0.0022	0.0000
	Turn Off Heating	1.915	0.0000	0.0006
	Use Fans Instead of Air Conditioning	2.049	0.0008	0.0000
	Turn Down Water Heater Temperature	0.000	0.0000	0.0000
Kit Total Behavioral Savings		31.835	0.0210	0.0213

Table 3-40: DEP Gross Verified Behavioral Savings per Kit

Children/Parents	Behavior	Energy (kWh)	Summer Demand (kW)	Winter Demand (kW)
Children	Turn Off Lights	0.227	0.0002	0.0001
	Turn Off Electronics	3.065	0.0001	0.0001
	Take Shorter Showers	6.421	0.0055	0.0199
Parents	Turn Off Lights	0.116	0.0001	0.000
	Turn Off Electronics	3.102	0.0001	0.0001
	Take Shorter Showers	11.896	0.0368	0.0523
	Change Thermostat Settings	19.403	0.0048	0.0000
	Turn Off Air Conditioning	4.886	0.0020	0.0000
	Turn Off Heating	1.370	0.0000	0.0005
	Use Fans Instead of Air Conditioning	6.145	0.0025	0.0000
	Turn Down Water Heater Temperature	0.217	0.0000	0.0000
Kit Total Behavioral Savings		56.849	0.0522	0.0729

3.4. Results

Measure, kit, and program savings are summarized in the following tables. Table 3-41 and

Table 3-42 show measure-level gross verified savings that contribute to total kit savings, for each of DEC and DEP respectively. Measure specific calculations are discussed above in Section 3.3.3.

Table 3-41: DEC Gross Verified Measure Savings per Kit

Measure	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Showerhead	470.012	0.0362	0.1298
Kitchen Aerator	35.841	0.0033	0.0038
Outlet Insulating Gaskets	19.276	0.0002	0.0002

Measure	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
4W LEDs	19.833	0.0033	0.0015
Bathroom Aerator	7.410	0.0027	0.0031
Water Temperature Gauge Card	4.082	0.0008	0.0008
Night Light	31.835	0.0000	0.0000
Behavior	613.469	0.0210	0.0213
Kit Total	470.012	0.0676	0.1605

Table 3-42: DEP Gross Verified Measure Savings per Kit

Measure	Energy Savings (kWh)	Summer Demand Savings (kW)	Winter Demand Savings (kW)
Showerhead	471.454	0.0380	0.1363
Kitchen Aerator	44.708	0.0043	0.0049
Outlet Insulating Gaskets	22.379	0.0002	0.0002
4W LEDs	33.775	0.0037	0.0016
Bathroom Aerator	17.677	0.0042	0.0048
Water Temperature Gauge Card	3.568	0.0020	0.0020
Night Light	56.849	0.0000	0.0000
Behavior	682.186	0.0522	0.0729
Kit Total	471.454	0.1046	0.2228

Program changes and family survey responses led to energy savings adjustments which contributed to program energy realization rate of 129% in DEC and 144% in DEP. Kit savings and program savings are presented in Table 3-43 and Table 3-44, respectively.

Table 3-43: Energy and Demand Savings per Kit

Jurisdiction	Measurement	Reported Savings	Realization Rate	Gross Verified Savings
Duke Energy Carolinas	Energy (kWh)	475.210	129.1%	613.469
	Summer Demand (kW)	-0.0808	N/A*	0.0676
	Winter Demand (kW)	0.0027	N/A*	0.1605
Duke Energy Progress	Energy (kWh)	475.210	143.6%	682.186
	Summer Demand (kW)	-0.0808	N/A*	0.1046
	Winter Demand (kW)	0.0027	N/A*	0.2228

*Realization rates of N/A are listed here, as program reported savings are near-zero. Mathematical realization rates in DEC are -83.7% and 5,978.2% for summer demand (kW) and winter demand (kW) respectively, and in DEP are-129.5% and 8,299.3% for summer demand (kW) and winter demand (kW) respectively.

Table 3-44: Program Savings

Jurisdiction	Measurement	Population	Reported Savings	Realization Rate	Gross Verified Savings
Duke Energy Carolinas	Energy (kWh)	10,354	4,920,238	129.1%	6,351,749
	Summer Demand (kW)		-836.1	N/A*	699.7
	Winter Demand (kW)		27.8	N/A*	1,661.9
Duke Energy Progress	Energy (kWh)	2,530	1,202,090	143.6%	1,725,657
	Summer Demand (kW)		-204.3	N/A*	264.6
	Winter Demand (kW)		6.8	N/A*	563.7

*Realization rates of N/A are listed here, as program reported savings are near-zero. Mathematical realization rates in DEC are -83.7% and 5,978.2% for summer demand (kW) and winter demand (kW) respectively, and in DEP are -129.5% and 8,299.3% for summer demand (kW) and winter demand (kW) respectively.

4. Net-To-Gross Evaluation

The evaluation team used student family survey data to calculate a NTG ratio for the Energy Education in Schools Program. NTG reflects the effects of free ridership (FR) and spillover (SO) on gross savings. Free ridership refers to the portion of energy savings that participants would have achieved in the absence of the program through their own initiatives and expenditures (U.S. DOE, 2014). [13] Spillover refers to the program-induced adoption of additional energy-saving measures by participants who did not receive financial incentives or technical assistance for the additional measures installed. The evaluation team used the following formula to calculate the NTG ratio:

$$NTG = 100\% - FR\% + SO\%$$

The evaluation team calculated the FR and the SO separately for each measure and aggregated those values to the program level.

4.1. Free Ridership

Free ridership estimates how much the program influenced participants to install the energy-saving items included in the energy efficiency kit. Free ridership ranges from 0% to 100%, with 0% being no free ridership and 100% being total free ridership, with values in between representing varying degrees of partial free ridership.

The evaluation team used participant survey data to estimate free ridership. The survey used several questions to identify items that a given participant installed and remain in use:

- For items that came one to a kit (showerhead, kitchen and bathroom faucet aerators, and night light), the survey asked whether the participant installed the item and, if so, whether the participant later removed the item.
- For insulator gaskets, which came 12 to a kit, the survey asked how many the participant installed and if the participant later removed them.
- For the LEDs, the survey first asked whether the participant installed one, both, or neither. The survey then asked whether the participant removed the bulbs.

This line of questioning was important for the NTG calculation, as the NTG questions were asked only for those measures that remained installed.

[13] The U.S. Department of Energy (DOE) (2014). The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures. Chapter 23: Estimating Net Savings: Common Practices. Retrieved August 29, 2016 from http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf.

The evaluation team's methodology for calculating free ridership consists of two components, free ridership change (FRC) and free ridership influence (FRI), both of which range from 0% to 100% in value and are equally averaged.

$$FR=50\%*FRC+50\%*FRI$$

4.1.1. Free Ridership Change

FRC reflects what participants reported they would have done if the program had not provided the items in the kit. For each respondent, the survey assessed FRC for each measure that the respondent installed and did not later remove.

Specifically, the survey asked respondents which, if any, of the currently installed items they would have purchased and installed on their own within the next year if Duke Energy had not provided them. For each measure, the evaluation team assigned one of the FRC values shown in Table 4-1, based on the response.

Table 4-1: Free Ridership Change Values

What Respondent Would Have Done Absent the Program	FRC Value
Would not have installed measure on their own	No free ridership
Would have installed measure on their own	Full free ridership
Don't know if they would have installed measure on own	Partial free ridership

4.1.2. Free Ridership Influence

FRI assesses how much influence the program had on a participant's decision to install (and keep installed) the items in the kit. The survey asked respondents to rate how much influence six program-related factors had on their respective decisions to install the measures, using a scale from 0 ("not at all influential") to 10 ("extremely influential"). The program-related factors included:

- The fact that the items were free
- The fact that the items were sent to their home
- The chance to win cash prizes for their household and school
- Information in the kit about how the items would save energy
- Information that their child brought home from school
- Other information or advertisements from Duke Energy, including its website

Asking respondents to separately rate the influence of each of the six above items had on the decision to install each measure would have been overly burdensome. Therefore, while the survey

assessed FRC for each measure, it assessed influence at the end-use level once for all water-saving measures and once for the light bulbs.

For each end-use (water-saving and light bulbs), the highest-rated item for each respondent represents the overall program influence. The evaluation team assigned the following FRI scores, based on that rating (Table 4-2). The evaluation team calculated up to two FRI scores for each respondent: one FRI score for water-saving measures and one FRI score for light bulbs.

Table 4-2: Free Ridership Influence Values

Influence Value	Score Assigned
0	100%
1	90%
2	80%
3	70%
4	60%
5	50%
6	40%
7	30%
8	20%
9	10%
10	0%

4.1.3. End Use Specific Total Free Ridership

The evaluation team calculated total free ridership by measure by:

- Calculating measure-specific FR scores for each respondent by summing each measure-specific FRC score with the corresponding end-use-specific FRI score.
- Calculating the mean FR score for each measure across all respondents from the individual measure-specific FR scores.
- Calculating a savings-weighted mean of the measure-specific FR means for water-saving measures and a separate savings-weighted mean of the measure-specific FR means for light bulbs.

Table 4-3 presents the end-use FR estimates for DEC and Table 4-4 presents the end-use FR estimates for DEP.

Table 4-3: DEC Measure Level Free Ridership Scores

Kit Measures	FRC	FRI	Total FR
Showerhead	29.79%	4.04%	16.91%
Kitchen Aerator	15.79%	6.58%	11.18%

Bathroom Aerator	5.41%	6.49%	5.95%
Night Light	15.71%	3.86%	9.79%
Light Bulb	23.18%	2.58%	12.88%
Gaskets	16.76%	0.65%	8.70%
Overall Kit Measures	25.70%	3.41%	14.55%

Table 4-4: DEP Measure Level Free Ridership Scores

Kit Measures	FRC	FRI	Total FR
Showerhead	19.64%	2.14%	10.89%
Kitchen Aerator	14.29%	3.47%	8.88%
Bathroom Aerator	12.50%	2.71%	7.60%
Night Light	29.79%	3.40%	16.60%
Light Bulb	30.59%	2.07%	16.33%
Gaskets	16.36%	0.67%	8.51%
Overall Kit Measures	18.89%	1.81%	10.35%

4.1.4. Program Level Free Ridership

The evaluation team estimated program-levels free ridership by calculating a savings-weighted mean of the measure specific FR scores presented Table 4-3 and Table 4-4.

The behavior FR is already taken into account in the gross savings analysis and is therefore assigned a FR value of 0%. For DEC, combining the 14.55% FR found for kit measures with the 0% FR for behavioral measures on a savings weighting basis yields an overall free ridership for the NTC kits of 13.80%. For DEP, combining the 10.35% FR found for kit measures with the 0% FR for behavioral measures on a savings weighting basis yields an overall free ridership for the NTC kits of 9.49%.

Table 4-5: DEC Measure Level Free Ridership Scores

Component	FR
Kit Measures	14.55%
Behavior	0%
Savings Weighted Program Total	13.80%

Table 4-6: DEP Measure Level Free Ridership Scores

Component	FR
Kit Measures	10.35%
Behavior	0%
Savings Weighted Program Total	9.49%

4.2. Spillover

Spillover estimates energy savings from additional energy improvements made by participants who are influenced by the program to do so and is used to adjust gross savings. Since behavioral actions are considered gross impacts, spillover calculations only include additional installations of energy saving technologies. The evaluation team used participant survey data to estimate spillover. The survey asked respondents to indicate what energy-saving measures they had implemented since participating in the program. The evaluation team then asked participants to rate the influence the Energy Education Program had on their decision to purchase these additional energy-saving measures on a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential."

The evaluation team converted the ratings to a percentage representing the program-attributable percentage of the measure savings, from 0% to 100%. The team then applied the program-attributable percentage to the savings associated with each reported spillover measure to calculate the participant measure spillover (PMSO) for that measure. We defined the per unit energy savings for the reported spillover measures based on ENERGY STAR® calculators as well as algorithms and parameter assumptions listed in the in the Illinois TRM v10.0., outputs from this impact evaluation, as well as previous evaluations conducted by our team for Duke Energy Indiana.

Participant measure spillover (PMSO) is calculated as follows:

PMSO=Deemed Measure Savings*Program Attributable Percentage

Table 4-7 exhibits the PMSO by measure category for DEC. Table 4-8 exhibits the PMSO by measure category for DEP.

Table 4-7: DEC Participant Measure Spillover, by Measure Category

Measure	Count	Weight	Attributable Savings (kWh)
ENERGY STAR Refrigerator	4	100%	148
ENERGY STAR Clothes Washer	5	80%	504
ENERGY STAR Clothes Dryer	5	92%	736
ENERGY STAR Freezer	1	60%	21
Dishwasher	3	83%	93
Central Air Conditioner	2	100%	348
Insulation	6	67%	225
Seal Leaks	6	75%	279
Seal Ducts	2	50%	451
LEDs	129	80%	1,031
Total	163		3,835

The evaluation team summed all PMSO values and divided them by the sample's gross savings to calculate an estimated spillover percentage for the Energy Education Program:

$$Program\ SO = \frac{\sum Program\ PMSO}{\sum Sample\ Gross\ Program\ Savings} = \frac{3{,}835}{32{,}153} = 11.93\%$$

These calculations produced a spillover estimate of 11.93% for kit items. Spillover for behavioral actions was 0%.

Table 4-8: DEP Participant Measure Spillover, by Measure Category

Measure	Count	Weight	Attributable Savings (kWh)
ENERGY STAR Refrigerator	4	70%	103
ENERGY STAR Clothes Washer	5	74%	466
ENERGY STAR Clothes Dryer	3	73%	352
ENERGY STAR Freezer	1	100%	35
Central Air Conditioner	3	60%	313
Insulation	12	67%	1,910
Seal Leaks	14	76%	664
Seal Ducts	5	68%	1,533
LEDs	310	79%	2,892
Total	357		8,303

The evaluation team summed all PMSO values and divided them by the sample's gross savings to calculate an estimated spillover percentage for the Energy Education Program:

$$Program\ SO = \frac{\sum Program\ PMSO}{\sum Sample\ Gross\ Program\ Savings} = \frac{8{,}303}{44{,}045} = 18.85\%$$

These calculations produced a spillover estimate of 18.85% for kit items. Spillover for behavioral actions was 0%.

4.3. Net-To-Gross

Inserting the FR and SO estimates into the NTG formula (NTG = 100% – FR% + SO%) produces an NTG value of 97.37% for the kit measures for DEC (Table 4-9). Incorporating the behavior NTG of 100% produces a savings weighted NTG of 97.51% for the DEC program overall.

Table 4-9: DEC Program NTG Results

Component	Verified Savings (kWh)	FR	SO	NTG	Net Savings (kWh)
Kit Measures	6,022,132	14.55%	11.93%	97.37%	5,864,014
Behavior	329,617	0%	0%	100%	329,617
Program Total	6,351,749	13.80%	11.31%	97.51%	6,193,631

Inserting the FR and SO estimates into the NTG formula (NTG = 100% – FR% + SO%) produces an NTG value of 108.50% for the kit measures for DEP (Table 4-10). Incorporating the behavior NTG of 100% produces a savings weighted NTG of 107.79% for the DEP program overall.

Table 4-10: DEP Program NTG Results

Component	Verified Savings (kWh)	FR	SO	NTG	Net Savings (kWh)
Kit Measures	1,581,852	10.35%	18.85%	108.50%	1,716,254
Behavior	143,804	0%	0%	100%	143,804
Program Total	1,725,657	9.49%	17.28%	107.79%	1,860,058

5. Process Evaluation

5.1. Key Findings

The process evaluation produced the following key findings:

- Parents most often requested energy-saving kits from the program website.
- Parents were highly satisfied with the kit measures.
- Teachers reported that NTC performances were engaging, entertaining, and informative for elementary and middle school students.
- Teachers reported that NTC provided age-appropriate instructional materials aligned with curriculum standards.
- Due to COVID-19, performances were held virtually during this evaluation period. Teachers reported students were less engaged in the program this year in comparison to the in-person performances held previously.

5.2. Summary of Data Collection Activities

The process evaluation is based on phone interviews with Duke Energy program staff, implementer staff from NTC and R1, and teachers who had attended an NTC performance. The process evaluation is also based on web surveys with teachers who had attended an NTC performance and student families who received a kit during the program evaluation year (Table 5-1).

Table 5-1: Summary of Process Evaluation Data Collection Activities

Target Group	Method	Sample Size
Duke Energy program staff, NTC, R1 Staff	Phone Interview	3
Teachers	Web Survey	73
Teachers volunteering for additional interview	Phone Interview	7
Student Families (kit recipients and Duke Energy customers)	Web Survey	213*

*The process analysis included those families that reported not receiving a kit as they were established to still have valuable insights into the NTC program more generally.

5.2.1. Teacher Surveys and Follow-Up Interviews

The evaluation team surveyed and interviewed teachers who attended NTC performances to better understand program success and delivery and to gather an educator perspective on what could be improved.

In January and February 2023, the evaluation team contacted 4,117 teachers who attended NTC performances via email, and ultimately surveyed 73 teachers who saw performances during the 2021-2022 school year. Of the 73 teacher respondents, 73% taught elementary school, 16% taught middle school, and 10% taught high school. We report elementary and middle school findings together unless a meaningful difference emerged between school types.

In March 2023, the evaluation team contacted teachers who completed the teacher web survey conducted by RI and indicated interest in being interviewed about their experience. The evaluation team requested their participation in a follow-up IDI regarding their experiences with the performance, curriculum materials, and kit request forms. These IDIs allowed the team to achieve a deeper understanding of topics raised in the web survey and to provide additional details about teachers' program experiences. The team completed interviews with seven teachers.

5.2.2. Survey of Student Families Who Received Kits

In March 2023, the evaluation team surveyed 213 families who received energy-efficiency kits from DEC/DEP during the 2021-2022 school year. During that period, DEC claimed distribution of 11,789 kits to families who completed kit request forms their children brought home from school; DEP claimed distribution of 2,843 kits, although 11%-12% of respondents reported that they did not receive a kit. This resulted in 10,354 kits distributed in DEC and 2,530 kits distributed in DEP used in the impact analysis.

Using email survey invitations, the team attempted to contact a random sample frame of 2,071 households for which program records provided an email address. Ultimately, the data collection effort achieved a 10.3% response rate, providing the 213-family sample with 6% precision at the 90% confidence level representing the population. Comparisons with census data demonstrated the sample was largely representative of ownership status for the region, though respondents reported slightly higher income levels, greater educational attainment, and larger-sized households than those typical of the region.[14]

5.3. Process Evaluation Findings

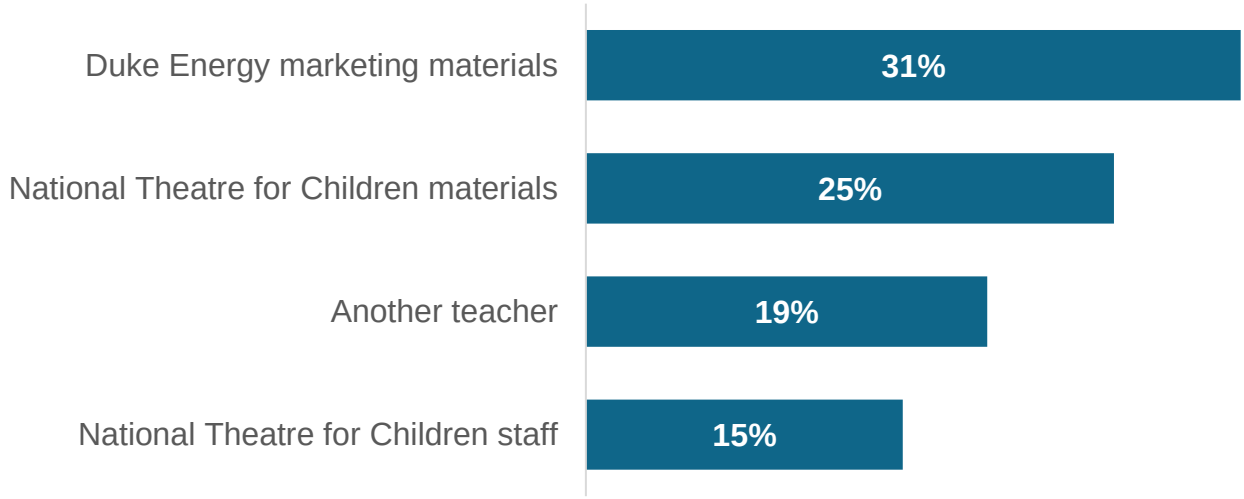
As no meaningful differences emerged between jurisdictions, this section reports DEC and DEP process findings together.

[14] Region comparisons come from 2018 American Community Survey (Census) 5-year period estimates data for Indiana.

5.3.1. Awareness of DEC/DEP Program Sponsorship

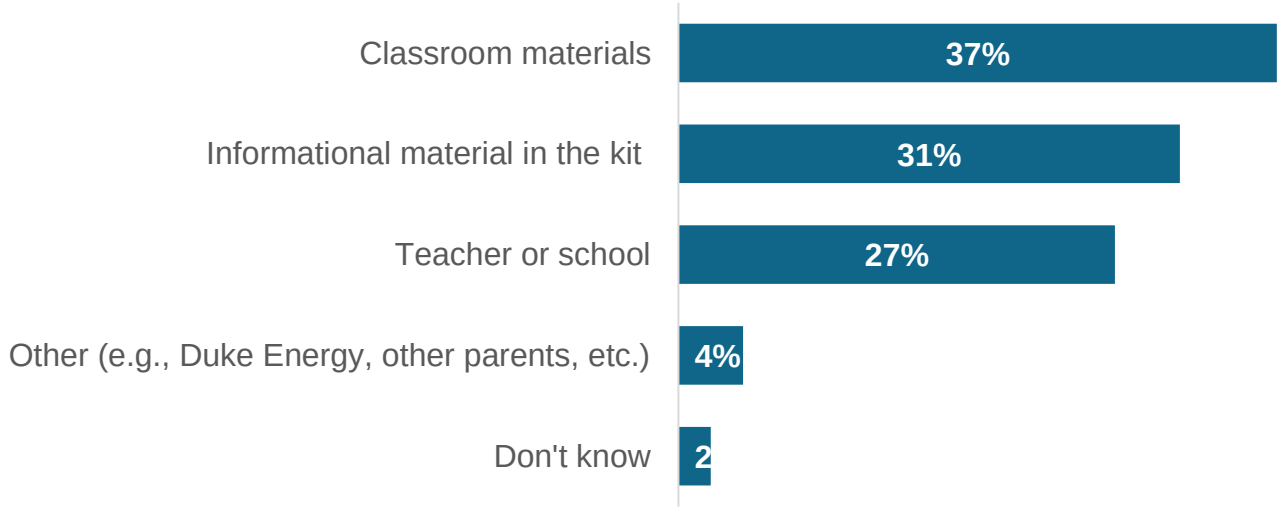
Teachers and student families largely reported awareness of DEC/DEP's program sponsorship. The majority of teachers (87%) reported this awareness prior to completing the survey. As shown in Figure 5-1, the teachers most often learned about the sponsorship through Duke Energy marketing materials (31%). Other common sources included NTC materials (25%) and from other teachers (19%).

Figure 5-1: How Teachers Learned About Duke Sponsorship



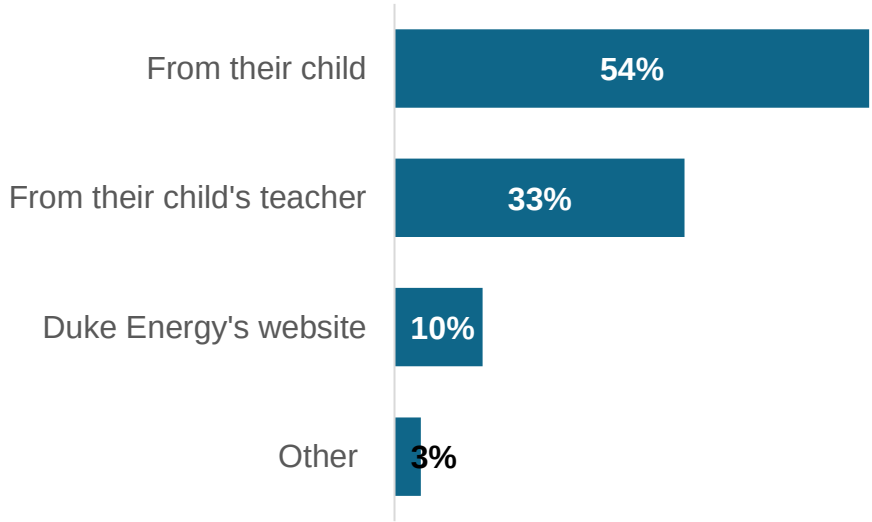
Student families also exhibited high awareness of DEC/DEP's sponsorship, with most (94%) stating they knew Duke Energy sponsored the kit. Figure 5-2 presents sources through which student families learned about Duke Energy's program sponsorship. Student families most often reported learning of Duke's sponsorship via classroom materials (37%) or informational material included in the kit (31%).

Figure 5-2: How Student Families Learned About Duke Sponsorship



Just over one-quarter (28%) of student family respondents reported knowing of energy-related classroom activities and NTC performances at their child's school. Of these, over one-half (54%) learned about NTC activities from their child. Figure 5-3 highlights the remaining responses.

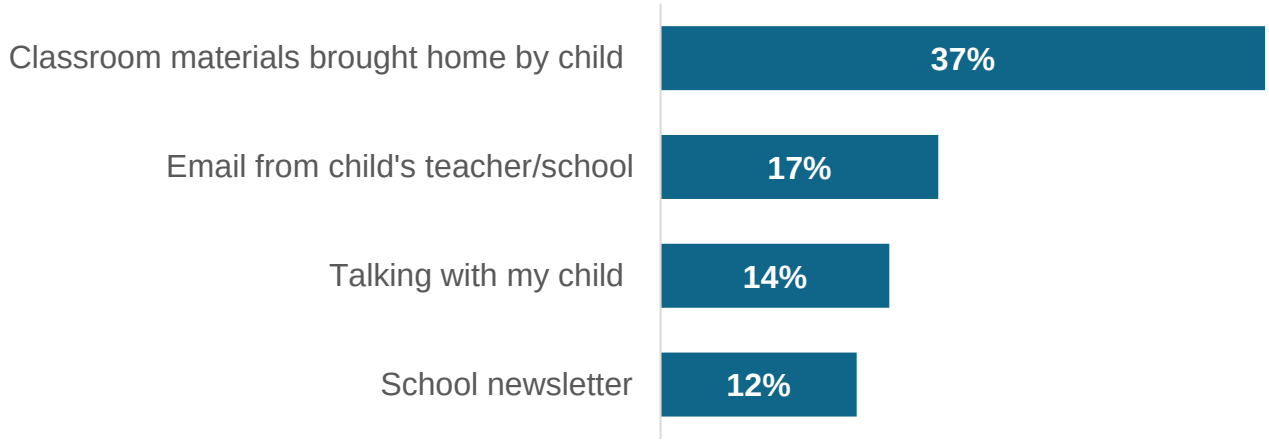
Figure 5-3: How Student Families Learned About NTC Performances



5.3.2. Parent Awareness of Kit Opportunity

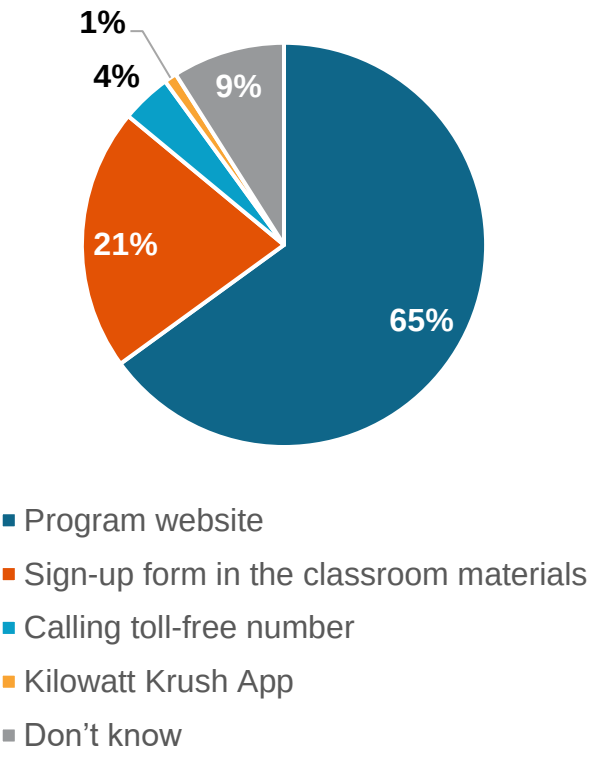
As shown in Figure 5-4, families reported classroom materials sent home with students served as their key awareness source regarding the kits, with the highest proportion of student families (37%) learning about the opportunity to receive a Duke Energy kit through this medium. Other respondents learned about the kits through talking with their child (14%), various school communications from the school (e.g., an email from the child's teacher) (17%), or school newsletters (12%).

Figure 5-4: How Student Families Became Aware of Energy Kits



As shown in Figure 5-5, the majority of student families requested energy kits through the program website (65%). Additionally, the figure shows how remaining student families requested energy kits.

Figure 5-5: How Student Families Requested the Energy Kits



5.3.3. Teacher Program Experiences

5.3.3.1. NTC Performance

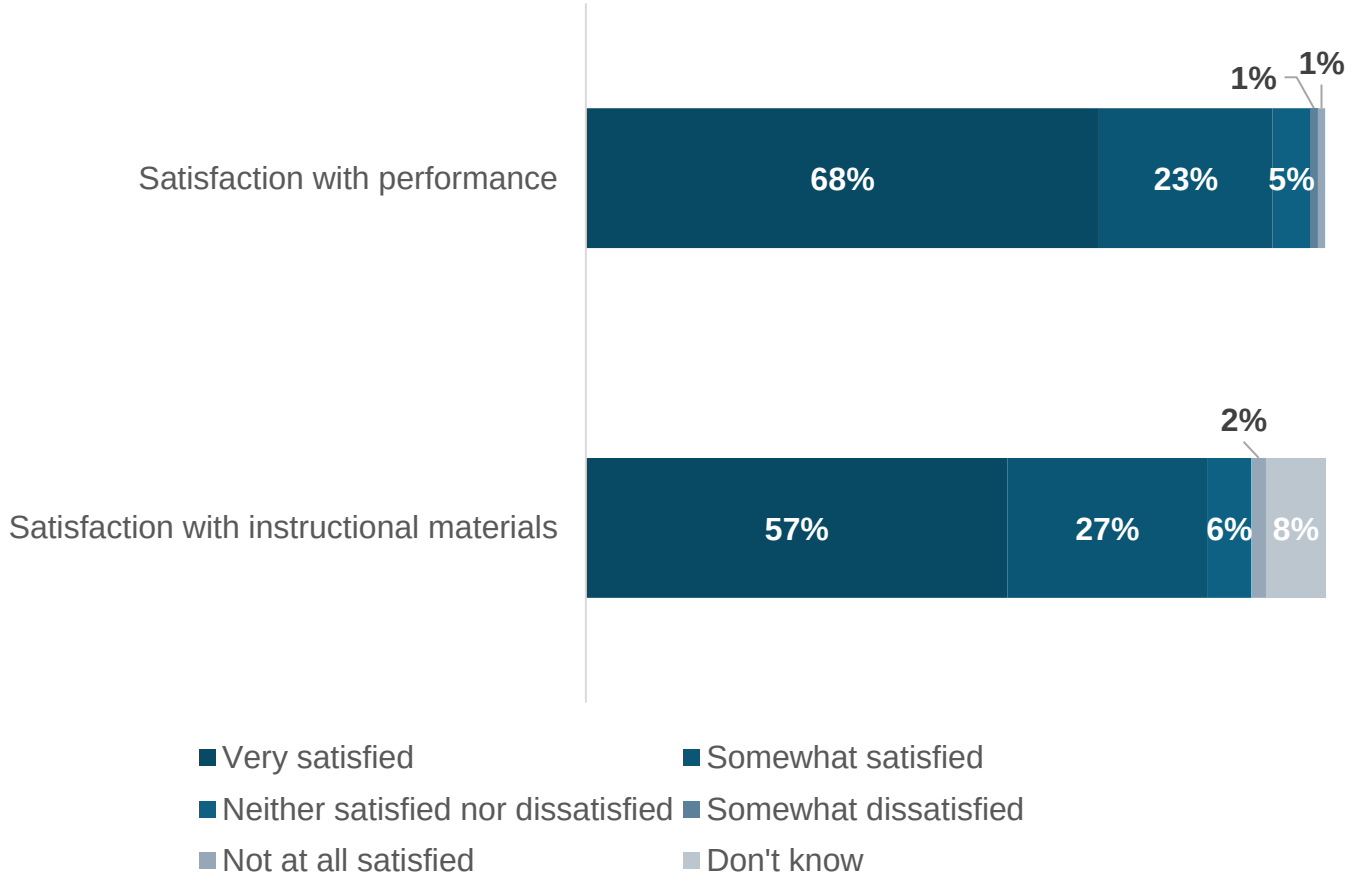
Due to the COVID-19 pandemic, NTC conducted performances virtually during the 2021-2022 school year. Of interviewed teachers, most saw a livestreamed performance (44%), though 95% of all performances were watched in-class rather than remote learning. Elementary and middle school teachers expressed high satisfaction levels with NTC's performance. They found the content age-appropriate and the performance engaging and entertaining. They did note, however, that students were less engaged with performances than in previous years when performances were held in-person. Interviewed teachers attributed this lower engagement level to challenges presented by the pandemic rather than the performance itself. Further, interviewed teachers reported the performance as visually more engaging in person rather than through the screen.

Overall, teachers were largely satisfied with the performance, with 91% of teachers reporting they were "very satisfied" or "somewhat satisfied" with the performance, as shown in Figure 5-6. When asked for reasons for their high satisfaction ratings, teachers reported that performers were engaging and funny, presented an entertaining and appropriately paced performance, performances were informative, students appreciated a different learning method from their usual classroom activities, and concepts presented were interesting and related to the curriculum being taught.

For elementary and middle school teachers expressing dissatisfaction, they reported that some vocabulary was too advanced for the younger grades, it was difficult to hear performers, or the show was repetitive from previous years. For high school teachers expressing dissatisfaction, they reported that the humor was not age appropriate for their students and that the content did not apply to the local areas or future post-secondary school/career paths.

Teachers also reported high satisfaction levels with the instructional materials, with 84% of teachers reporting they were "very satisfied" or "somewhat satisfied." Almost three-quarters (73%) of teachers reported that instructional materials were at about the right level for their students.

Figure 5-6: Teacher Satisfaction with NTC Program



In addition, most surveyed teachers (82%) said explanations of energy-related concepts were presented at about the right level for most of their students. Notably, however, surveyed and interviewed high school teachers generally reported the performance as not age appropriate for their students. They generally found the performance and humor too young for high school students.

Still, regarding age appropriateness, elementary and middle school interviews reinforced the survey findings. All five interviewed elementary and middle school teachers reported the performance as

age appropriate and held their students' attention. One teacher considered some of the vocabulary too advanced for their youngest students. Despite this, the teacher reported that the higher-level vocabulary presented a great learning opportunity to teach the students new words.

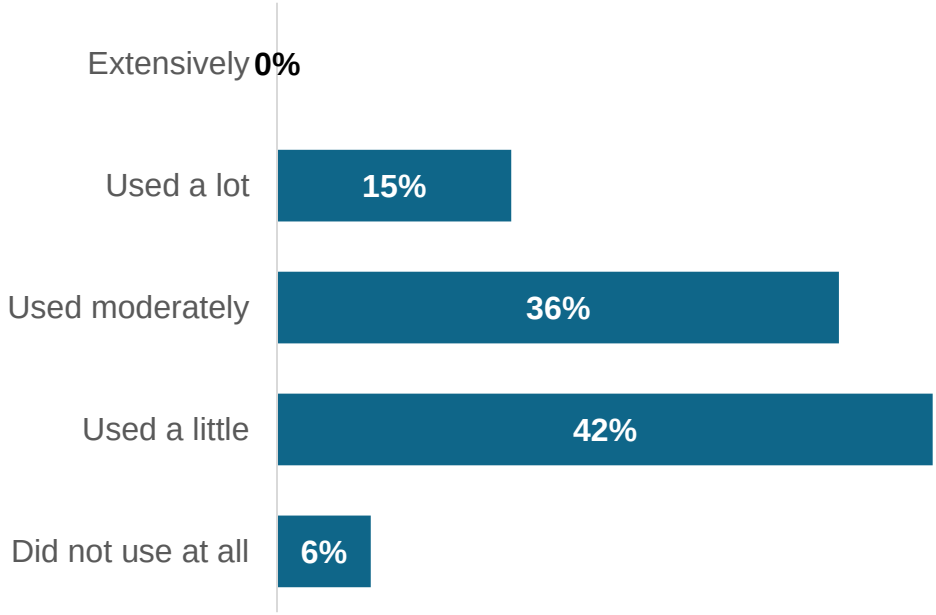
Interviewed elementary and middle school teachers commented on performance quality, specifically noting that the performance was engaging, humorous, and informative. When asked how performances might be improved, teachers reiterated their enthusiasm for the performances, but emphasized that they were more engaging in person.

5.3.3.2. Curriculum and Instructional Materials

All teachers reported distributing or making their students aware of kit request forms. The highest proportion of teachers distributed paper forms (48%), while 31% of teachers made students aware of online forms and distributed paper forms, 19% of teachers only directed students to online forms, and 2% of teachers could not recall how they made students aware of the kit form.

Almost three-quarters of teachers reported receiving instructional materials through the program (73%). Of teachers receiving the materials, Figure 5-7 presents how much teachers used the materials. Those stating that they used the educational material infrequently were asked why they did so; teachers most commonly responded that they did not have the time to incorporate the materials into already full curriculums. This highlights that educational materials were not regularly used in conjunction with the presentation, as intended. To incorporate the material into their curriculum, several teachers suggested providing instructional material earlier in the school year; so it could be considered while planning the curriculum. Respondents also suggested providing an online forum where teachers could discuss how they used the materials in their classrooms.

Figure 5-7: Teachers Use of Instructional Materials



Teachers reported use of the instructional materials as well as the materials' usefulness, age-appropriateness, alignment with state science standards, or presentation of concepts that children had trouble understanding. From their comments (and as reflected in interview findings), the following observations emerged:

- Use of materials ranged from minimal to moderate: 42% of teachers reported using the materials "a little," and 36% reported using the materials "moderately."
- Materials were useful: when asked to rate the materials' usefulness, most respondents rated them as extremely useful (39%) or somewhat useful (29%). Just over one-quarter of respondents (25%) found the materials "neither useful nor not useful," with 2% reporting that the materials were "somewhat not useful." The remaining 3% did not know.
- Materials were age-appropriate: the majority of teachers (73%) considered the instructional materials at about the right level for their students.
- Most respondents said that the materials aligned with state science standards: 11% reported that workbooks aligned "completely" with state science standards, while 42% reported they "mostly aligned." However, 35% found the workbooks "somewhat aligned," while 2% reported that they "poorly aligned." The remaining 10% did not know how the workbooks aligned with state standards.

5.3.3.3. Kit Requests Forms

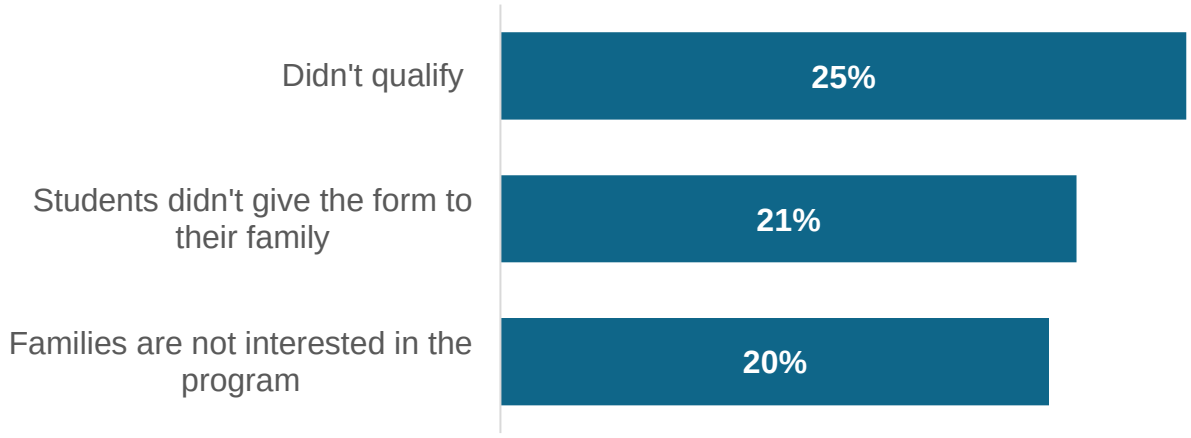
As discussed, most teachers reported sending kit request forms home with children. In both interviews and surveys, however, teachers indicated that student families requesting a kit

predominantly did so online. Teachers perceived that a low number of kit requests were submitted overall, regardless of request method.

Interviewed teachers reported no challenges related to receiving or distributing kit request forms. Though some found the teacher incentive useful in motivating them to distribute kit request forms, others noted that the student's enthusiasm for the program provided sufficient motivation to encourage kit sign-ups.

Most teachers (68%) reported following up with students to learn if their household requested a kit, with 48% of those teachers generally estimating that 0%-20% of students brought the kit form back or signed up online. The largest proportion of teachers either said that 0%-10% of families signed up online (23%) or that they did not know how many signed up (18%). Figure 5-8 highlights the reasons why teachers believed that parents did not sign up for kits.

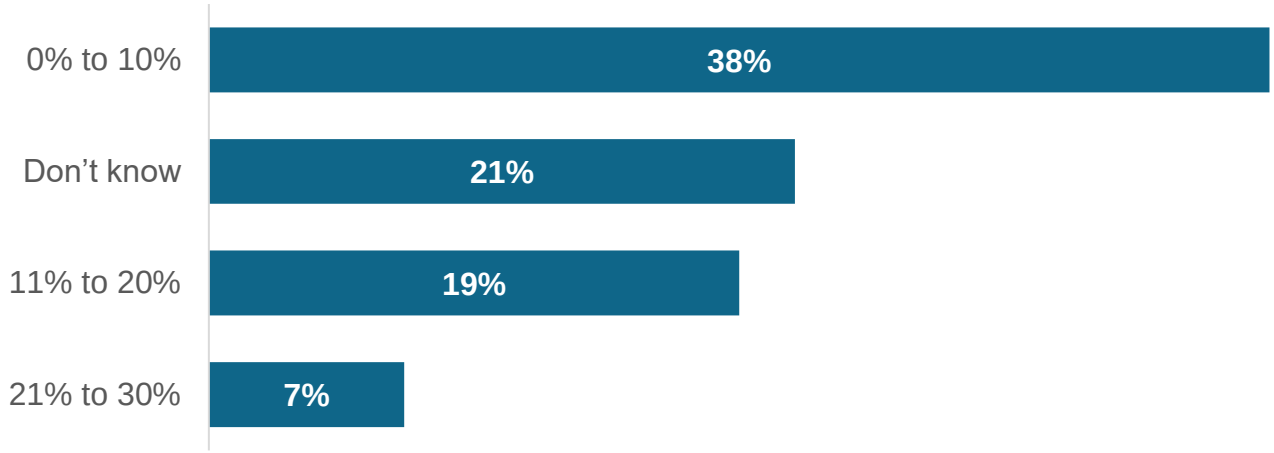
Figure 5-8: Reasons Teachers Believe Families Did Not Sign Up for Kits



5.3.3.4. Kilowatt Krush App

Teachers reported that performers and instructional materials mentioned the Kilowatt Krush app. Of surveyed teachers, 38% reported that a small proportion of students (0%-10%) downloaded the app; 21% of teachers did not know if students downloaded the app, as shown in Figure 5-9. Of 213 parents surveyed, only 8% reported their child using the app. The majority (67%) reported that their child only used it a few times. Parents reported that children primarily did not use the app because they forgot to download it (30%), were not interested (26%), or for unknown reasons (18%).

Figure 5-9: Teacher Perceptions on How Many Students Downloaded Kilowatt Krush App



5.3.4. Student Family Experience with the Program

5.3.4.1. Installation and Use Rates

Almost all participants (88%) installed at least one measure from the kit, most of which were lighting measures, including LEDs (98%) and night lights (87%). Far fewer used insulator gaskets or water-related measures (ranging from 41%-55%). Table 5-2 presents the percentage of respondents who reported installing each measure.

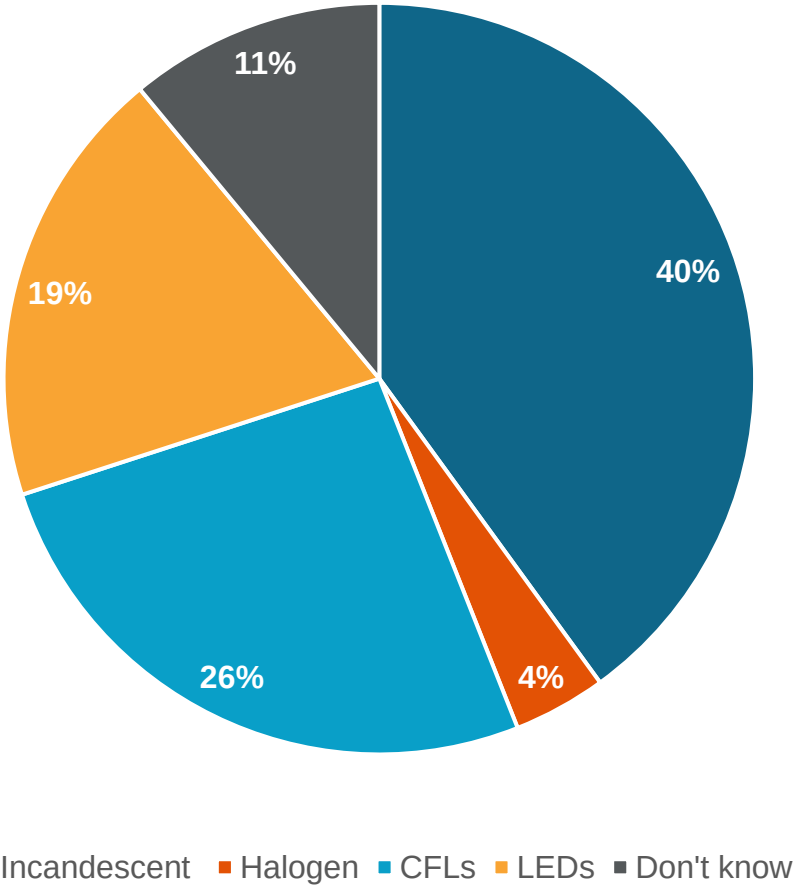
Table 5-2: Student Family Installation Rates by Measure

Measure	Percent of Respondents who Installed
LEDs	98%
Night lights	87%
Showerhead	55%
Kitchen faucet aerator	46%
Bathroom faucet aerator	45%
Insulator gaskets	41%

Respondents were least likely to install showerheads or kitchen faucet aerators. Most respondents choosing to remove kit measures reported dissatisfaction with the measure's performance or aesthetics. Participants most commonly uninstalled showerheads as they did not like how they worked (75%), did not like how they looked (8%), or for other reasons (16%). More specifically, respondents reported dissatisfaction with showerheads due to water pressure or their personal preference for detachable showerheads. Kitchen faucet aerators remained uninstalled as respondents did not like the way it worked (3 out of 7 respondents), because the unit was broken (1 out of 7 respondents) or for other unspecified reasons (3 out of 7 respondents).

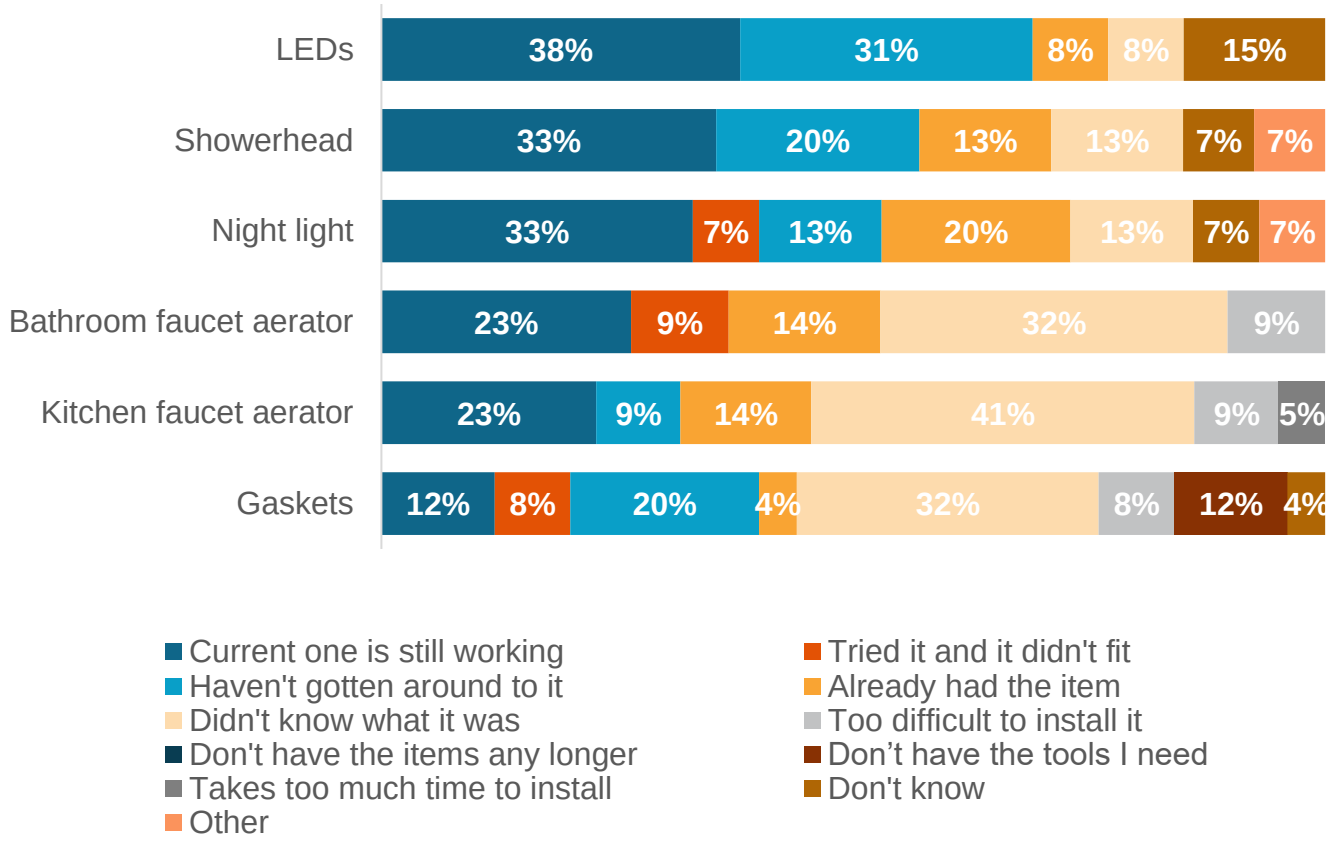
The large majority of those installing light bulbs said they typically replaced incandescent (40%) or CFL (26%) bulbs.

Figure 5-10: Student Family Lights Replaced by Type



Of those not installing all items in the kit, only 6% did not plan to install any items they had not yet installed. Figure 5-11 summarizes their reasons for not planning to install individual measures. Though these varied across measures, respondents generally would not install the remaining items as currently installed items worked, they "haven't gotten around to it," or they did not know the purpose of the measure.

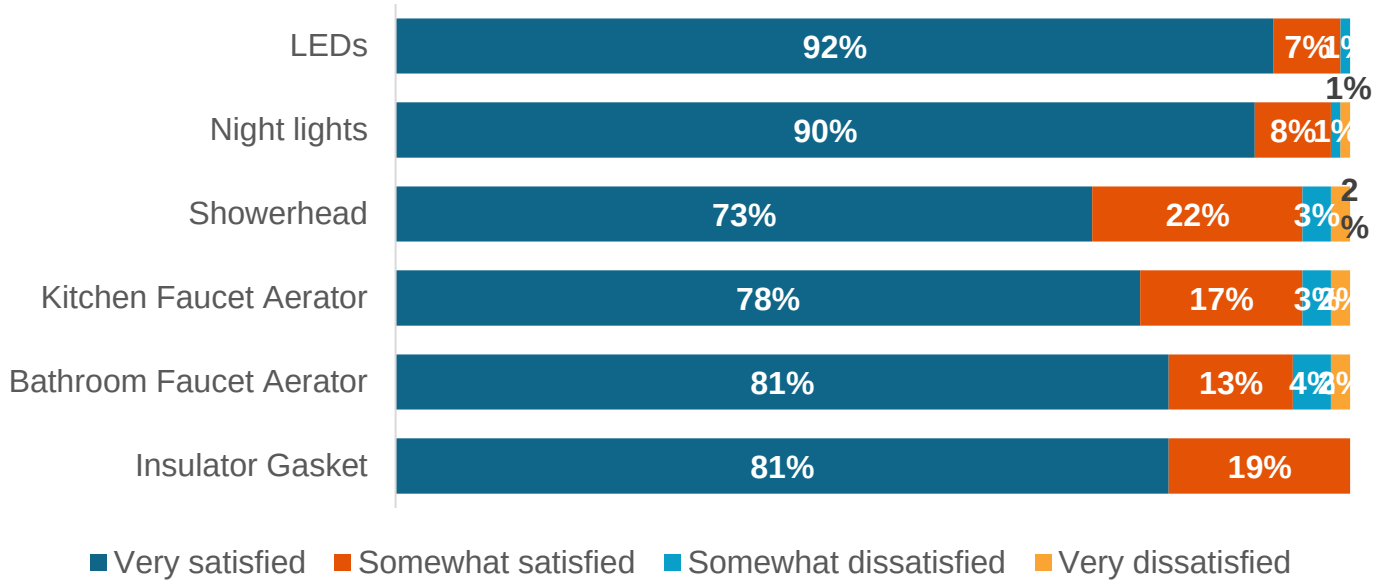
Figure 5-11: Reasons for Not Installing Measures in the Future



5.3.4.2. Measure Satisfaction

Nearly all kit recipients reported high satisfaction levels with items they installed from their kits. To best gauge their experience with the measures, the evaluation team asked respondents to rate their satisfaction with all measures they installed, including those they later removed. As shown in Figure 5-12, respondents explained that dissatisfaction with water measures resulted from low water pressure, while most respondents' dissatisfaction with lighting measures resulted from the light not being sufficiently bright.

Figure 5-12: Student Family Measure Satisfaction



5.3.4.3. Energy Saving Educational Materials in the Kit

The Energy Efficiency Kit includes a Duke Energy-labeled DOE Energy Saver Booklet that provides educational information on saving energy at home. Most respondents (80%) said they read the booklet, a majority of whom (98%) found it highly helpful. While only 2% of respondents did not find the booklet highly helpful, a variety of concerns with the booklet emerged. For example, these respondents stated the booklet was too long and the information presented was basic, vague, or described as "common sense." To improve the booklet, respondents suggested making it shorter or in point form, including information on older homes, and providing videos to supplement the written booklet.

The research team understands that the Duke Energy program team did not develop the booklet themselves and would thus be unable to adjust the information presented. Duke Energy's program team, however, may consider developing a brief video or a one-page, quick energy-saving guide as supplemental materials to the DOE Energy Saver booklet. These would address concerns that the booklet was too long and would allow Duke to provide helpful information to families living in older homes.

5.3.4.4. Energy-Saving Behaviors

Parents and children reported adopting new energy-saving behaviors since their involvement in the program. Most parents (92%) reported adopting an energy-saving behavior, and a large majority (81%) reported that their child adopted new energy-saving behaviors since receiving their kit. Parents most commonly reported now turning off lights when no longer in the room (21%) and turning off

electronics when not using them (16%). Similarly, parents most commonly said their child now turns off lights when not using a room (41%) or turn off electronic devices when not in use (25%). More than one-half of the respondents (60%) found the kit highly influential in changing their and their children's behaviors.

The kit motivated some respondents to purchase energy-efficient equipment or services, with 39% of respondents purchasing or installing additional energy-efficiency measures since receiving their kits. LEDs and/or CFLs were the most commonly reported energy-efficiency measures installed since participation (34%).

Twenty-three respondents who purchased or installed an additional measure reported receiving a Duke Energy rebate for their additional measures. Of these 23 respondents, seven received rebates for purchasing LEDs and/or CFLs, six for energy-efficient appliances, six for efficient heating or cooling equipment, two for insulation, and two for a water heater.

The highest proportion of respondents installing an additional measure said the Duke Energy schools program proved highly influential on their decisions to purchase and install additional energy-saving measures.

6. Conclusions and Recommendations

Based on findings, the evaluation team presents the following conclusions and provides several recommendations for program improvements:

Conclusion: Teachers generally expressed satisfaction with the material provided and with the quality of the NTC performances. The high school performances were less well regarded; however, the program has previously indicated that high school performances will be discontinued as of fall 2023. Further, teachers strongly prefer in-person, live performances.

> **Recommendation:** Maintain NTC performances at the same quality level but change the storylines and characters on a more frequent basis. The program will be undergoing a rebranding in Fall 2023, which may help make the program feel newer.

> **Recommendation:** Although teachers generally reported that the provided material was age-appropriate for their students and aligned with curriculum standards, all those interviewed cited time as a barrier for using all instructional materials in the kit. The program implementers may consider 1) highlighting the most important information, given teachers' time constraints. This will allow teachers to present all the material if they have the time, while guiding teachers who face greater time constraints; or 2) providing the instructional materials earlier on in the school year so that teachers have sufficient time to incorporate the concepts into their curriculums before lesson plans are set.

Conclusion: Though teachers appreciated the incentives, they suggested some additions. The program will be making some changes to incentives for the next program year in response to previous recommendations suggesting scaling the incentive to the size of the school.

> **Recommendation:** Consider adding a small "gift" for the students or classroom, such as a keychain, poster, or other item to raise students' excitement about the program.

Conclusion: Around 11%-12% of survey respondents claimed they did not receive a kit.

> **Recommendation:** Due to the high number of participants claiming they did not receive kits, it may prove beneficial to investigate methods to increase the reliability of kit delivery, such as providing tracking information for participants to follow.

Conclusion: Many participants did not install measures from the kit because their current measure was still working, or they already had the item.

> **Recommendation:** Include a checkbox on the kit request form that would allow participants to check off that they do not need the measures.

Appendix A Summary Form

DEC/DEP

Summary Form

Description of program

The Energy Education in Schools Program is an energy efficiency program that provides free in-school performances by the National Theatre for Children (NTC) that teach elementary, middle and high school students about energy and conservation concepts in a humorous and engaging format. NTC provides teachers with: 1) student workbooks that reinforce topics taught in the NTC performance, which include a take-home form that students and parents can complete to receive an energy efficiency starter kit from DEC/DEP and 2) lesson plans associated with the content in the student workbooks.

Date	August 2023
Region(s)	Carolinas and Progress
Evaluation Period	August 1, 2021 – July 31, 2022
Annual Gross kWh Savings	DEC: 6,351,749 kWh DEP: 1,725,657 kWh
Per Kit kWh Savings	DEC: 613.469 kWh DEP: 682.186 kWh
Annual Gross Summer kW Savings	DEC: 699.7 kW DEP: 264.6 kW
Annual Gross Winter kW Savings	DEC: 1,661.9 kW DEP: 563.7 kW
Net-to-Gross Ratio	DEC: 97.51% DEP: 107.79%
Process Evaluation	Yes
Previous Evaluation(s)	2017-18, 2019-20

Evaluation Methodology

Impact Evaluation Activities

- Web surveys (DEC n = 101, DEP n= 113) and analysis of 8 unique measures.

Impact Evaluation Findings

- DEC realization rates 129% (energy); N/A (summer demand); N/A (winter demand)
- DEP realization rates 144% (energy); N/A (summer demand); N/A (winter demand)
- Net-to-gross ratio 0.9751 (DEC); 1.0779 (DEP)

Process Evaluation Activities

- 213 web surveys with student families and analysis of 8 unique measures.
- 73 web surveys with teachers from participating schools; 7 in-depth follow up interviews
- 1 in-depth interview with program staff
- 1 in-depth interview with NTC implementation staff
- 1 in-depth interview with R1 implementation staff

Process Evaluation Findings

- Elementary and middle school teachers are highly satisfied with the NTC performance
- Parents largely learning about performances, kits, and materials from their children
- Student families are highly satisfied with kit items
- The NTC program is successfully influencing families to adopt energy saving behaviors

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Appendix B Measure Impact Results

Table B-1: DEC per Unit Verified Impacts by Measure – Key Measure Parameters

Measure	Gross Verified Energy Savings (kWh)	Gross Verified Summer Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio
Showerhead	470.012	0.0362	0.1298	Estimated at kit level			
Kitchen Aerator	25.180	0.0033	0.0038				
Outlet Insulating Gaskets	35.841	0.0002	0.0002				
4W LED	19.276	0.0033	0.0015				
Bathroom Aerator	19.833	0.0027	0.0031				
Water Temperature Gauge Card	7.410	0.0008	0.0008				
Night Light	4.082	0.0000	0.0000				
Behavior	31.835	0.0210	0.0213				
Kit Total	613.469	0.0676	0.1605	129.09%	13.80%	11.31%	97.51%

DEC%20EE%20Ed%20(K12)%202022%20

Table B-2: DEP per Unit Verified Impacts by Measure – Key Measure Parameters

Measure	Gross Verified Energy Savings (kWh)	Gross Verified Summer Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (Energy)	Free Ridership	Spillover	Net to Gross Ratio
Showerhead	471.454	0.0380	0.1363	Estimated at kit level			
Kitchen Aerator	31.777	0.0043	0.0049				
Outlet Insulating Gaskets	44.708	0.0002	0.0002				
4W LED	22.379	0.0037	0.0016				
Bathroom Aerator	33.775	0.0042	0.0048				
Water Temperature Gauge Card	17.677	0.0020	0.0020				
Night Light	3.568	0.0000	0.0000				
Behavior	56.849	0.0522	0.0729				
Kit Total	682.186	0.1046	0.2228	143.55%	9.49%	17.28%	107.79%

DEP%20EE%20Ed%20(K12)%202022%20D

Appendix C Consumption Analysis

The National Theatre for Children (NTC) implements the K12 Energy Efficiency Education Program, a Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) offering. The program provides age-appropriate school performances by NTC's professional actors. These performances teach students about energy and energy conservation using an engaging and entertaining format. In addition, NTC provides participating schools with classroom curriculum to coincide with the performance as well as opportunities for student families to request free kits that contain energy-efficiency measures to install in their homes.

At Duke Energy's request, the evaluation team sought to estimate energy savings attributable to the K12 Education program by analyzing energy-use patterns before and after receipt of program kit items. These analyses assessed the effectiveness of standard energy-saving detection approaches in detecting marginally sized savings that could be attributed to the program.

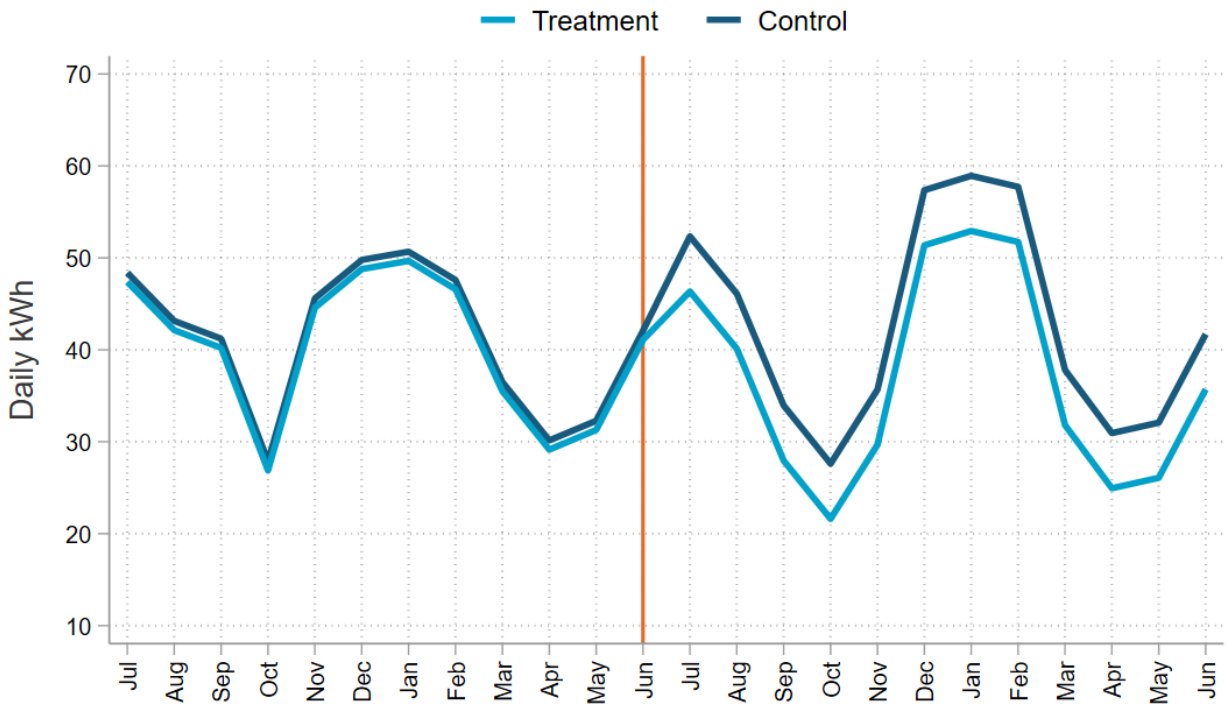
C.1 Methodology

To estimate energy savings with household consumption data, it is necessary to estimate what energy consumption would have occurred in the absence of the program – the counterfactual or baseline. To infer that the program led to energy savings, it is necessary to systematically eliminate plausible alternative explanations for differences in electricity use patterns.

Figure C-1, which illustrates the basic framework for analysis, relies on a control group and on pre- and post-enrollment consumption data. The evaluation team implemented the analysis using a difference-in-differences regression approach, which compares program participants to a matched comparison group and removes pre-existing differences between treatment and control groups. If the program's kit led to reductions in consumption, we should observe:

- A change in consumption for households that participated in the K12 Education Program.
- No similar change in consumption for the control group.
- The timing of the change should coincide with the receipt of kits.

Figure C-1: Framework for Consumption Analysis with Comparison Groups



While the K12 Education program's design did not involve a randomly assigned control group, the evaluation team developed a comparison group to use in the analysis. Challenges emerged, however, in producing reliable energy-savings estimates using billing analysis.

The program's small effect size posed the primary challenge. On a percentage basis, expected energy savings from each kit were generally a small share of annual household energy consumption. Therefore, it proved difficult to isolate program impacts from other potential explanations, including random chance.

Second, households that signed up for the kit self-selected from their peers. Despite using a comparison group, this only accounted for observable characteristics, such as pre-treatment energy-use patterns. As a result, while participant and comparison group may have experienced similar energy-use patterns during the pre-treatment period, their energy-use trajectories, absent program participation, were not necessarily the same due to differences in the household-use patterns.

A broader list of challenges posed by using consumption-based analysis follows, including the key challenges discussed above.

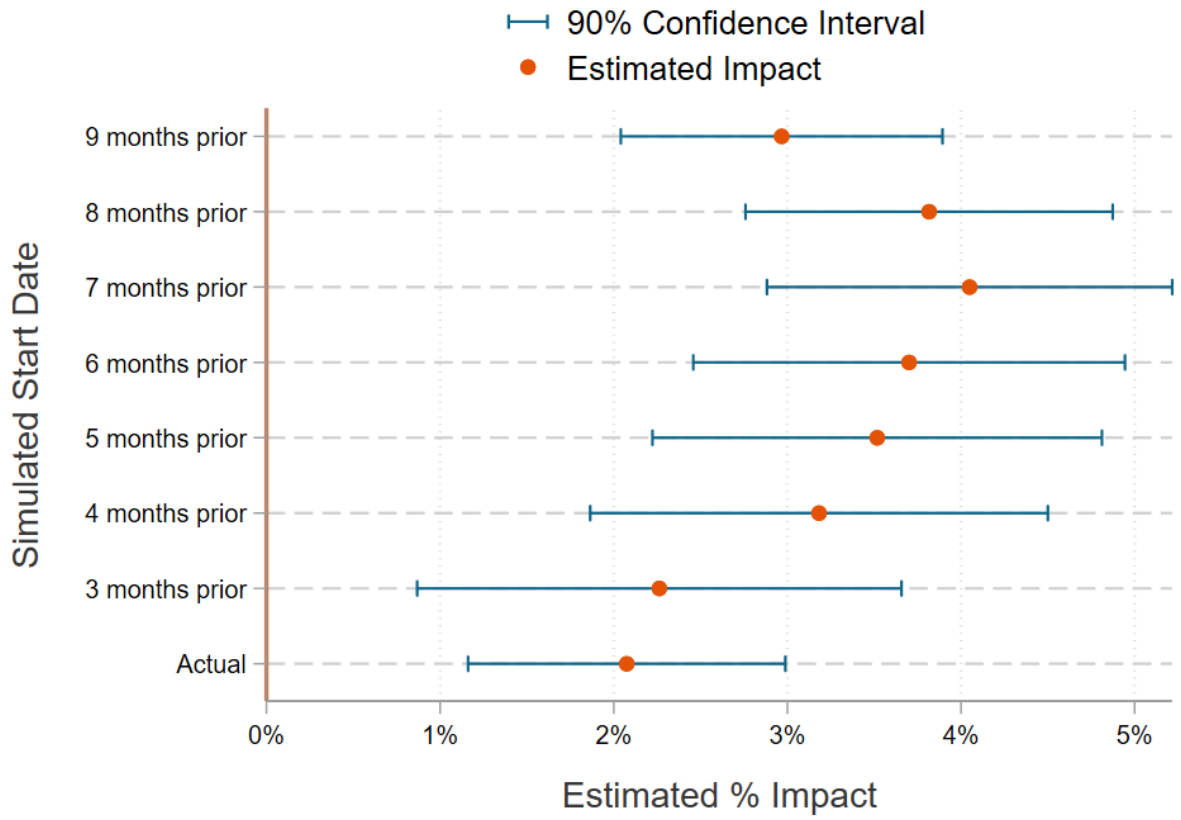
- Effect size. On a percentage basis, expected programs impacts were small and difficult to distinguish from the inherent "noise" in the consumption data.
- Timing of intervention. Changes in the participant mix and/or the timing of individual measure installations could be confused with natural changes in energy use.
- Self-selection. Customers enrolling in the K12 Education program inherently differed from customers who did not.
- Customers enrolling in the program likely had different household occupancy and/or electric consumption needs that could yield different responses to program interventions.
- To operate effectively, the kits rely on customers to correctly install the individual measures themselves.

C.2 Results

Resource Innovations implemented a series of false experiments to assess if the consumption analysis produced reliable results. This approach simulated fake enrollment dates for each customer prior to their actual program participation and assessed if the models detected an effect when using data from a false "pre" period to estimate the counterfactual for a false "post" period. As enrollment dates were fictitious and actual post periods excluded, the evaluation team knew impacts from the program would be zero and estimated impacts resulted from modeling error. The team used two years of pre-treatment data for the false experiments, and each participant's enrollment date was simulated to occur three to nine months prior to actual participation in increments of one month.

Figure C-2 shows the results from the difference-in-differences model false experiments, estimating energy increases ranging from approximately 2% to 4% without intervention taking place.

Figure C-2: Difference-in-Difference Consumption Analysis with Comparison Group Results



C.3 Conclusion

When the percent change in household energy use is small, as it is with the K12 Education program, the only reliable way to estimate energy savings using a consumption analysis is through a randomized control trial (RCT) using large treatment and control groups combined with pre- and post-enrollment consumption data. The most critical component of a well-designed RCT is to guarantee no differences appear between the treatment and control groups, other than the program's treatment.

This is a critical step to ensure that the analysis is able to accurately estimate the counterfactual – or what would have happened absent the treatment. If inherent differences exist between the treatment group and control group, any changes in the post-treatment period could be due to these differences, rather than the treatment itself. In order to verify that effects are purely the result of the treatment intervention, the two groups must be ostensibly identical in every way except for the intervention.

With an opt-in enrollment method, however, homogeneity between treatment and control groups cannot be guaranteed. That one group of customers chose to enroll in the program while the other did not implies some intrinsic differences exist between the groups. These may include the following:

- Behavioral preferences or predispositions for energy- and water-efficiency measures.
- Non-enrollees could not access information about the program.
- Enrollees had higher energy needs and therefore a greater incentive to curb their consumption.

Any of these characteristics likely contributed to consumption responses or patterns that could not be attributed to program intervention. A well-designed RCT includes randomly selected customers in the treatment and control groups, ensuring that analysis avoids adverse effects of selection bias and/or lurking confounding variables. Given these variables, RCTs can prove impracticable for opt-in programs.

After a thorough investigation, the evaluation team concluded that, absent an RCT, consumption analysis was unable to reliably detect energy savings resulting from program participation. The team did not conclude that the program failed to generate energy savings; rather, the team found this approach an incorrect tool for estimating energy-savings attributable to the program. Thus, the team recommends relying on the engineering analysis and findings as a source of verified gross and net savings for the program.

Appendix D DEC/DEP Program Performance Metrics

Figure D-1: Student Family Demographics Reach PPIs

Program experience & satisfaction PPIs	Participants %	Participants n
Usefulness of kit instructions	80%	187
Satisfaction with Showerhead	73%	128
Satisfaction with Kitchen faucet aerator	78%	107
Satisfaction with Bathroom faucet aerator	81%	105
Satisfaction with Night lights	90%	187
Satisfaction with Energy efficient light bulbs	92%	212
Satisfaction with Insulator gaskets	81%	88
Program influence on behavior PPIs		
Installed at least one kit measure	88%	220
Most common measure installed: LEDs	98%	220
Respondents reporting program attributable spillover: DEC/DEP	12%/19%	44
Challenges and opportunities for improvement PPIs		
Measure with lowest installation rate: Insulator gaskets	41%	220
Measure with highest uninstallation rate: Showerhead	26%	63
Measure with highest dissatisfaction: Bathroom faucet aerator	6%	105

Appendix E Data Collection Instruments

E.1 Program Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the Energy Efficiency Education Program in the Duke Energy **Carolinas and Progress** territories. We would like to learn about your experiences administering this program in the 2021-2022 school year.

Your comments are confidential. If I ask about areas you are not familiar with, please feel free to tell me and we will move on.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. First please describe your role at Duke Energy as well as your role in Duke Energy's Energy Efficiency Education Program. How long have you been in this role? Has your role changed since the last time this program was evaluated?

Q2. Has Duke Energy's role changed in terms of program delivery since the last time this program was evaluated?

Delivery and Operations

Next, I'd like to learn more about how this offering was delivered since your involvement. If any elements of implementation are different during the 2021-2022 school year than in the past, please let me know.

Q3. What were your targets for the 2021-2022 school year for the following metrics, and were you successful in meeting them? If not successful, what do you think may have contributed to challenges in meeting the goals?

1. Number of schools recruited
2. Number of students involved
3. Number of classes attending performances
4. Use of curricula by teachers
5. Number of kit requests
6. Savings
7. Subcontractor SLAs (NTC, R1, AMC)
8. Incentives (e.g., kit request incentives, teacher award)

Q4. Has the delivery process changed since 2020-2021, prior to any forced upon the program by COVID-19?

Q5. How did COVID-19 affect program delivery, if at all, in terms of the:

1. Recruitment, Marketing, Outreach, Website
2. Curriculum and Performance
3. App (KiloWatt Krush)
4. Kit: contents, request process, delivery schedule

Q6. In our previous evaluation period, there were some concerns mentioned about the age appropriateness of the performances. Are there any noteworthy concerns about the age appropriateness of the materials and performances, or has that largely been addressed?

1. Have there been any issues with language of the performance?

Q7. During our last evaluation period, it was mentioned that a high school program was being piloted and implemented. In what ways, does the delivery strategy for the high school program differ from the elementary and middle school strategy?

Q8. Can you talk a bit about the development of the high school delivery strategy? What were the priorities, goals, etc.?

Q9. How has the high school program been going generally in Carolinas/Progress? Have there been any significant challenges or successes specific to the high school program in 2021-2022? How have these been addressed?

Q10. Are there any changes, beyond those caused by COVID-19, that you have implemented in the 2022-2023 school year? Any planned for 2023-2024?

Q11. Has anything changed with staffing or management of the program (communications, staff, budget, program goals, data management, subcontractor performance, etc.) since the previous evaluation, both related to COVID-19 and unrelated to COVID-19? If so, how has this affected program delivery or operations?

Communication

Q12. In the previous evaluation, we were told that the operational staff (NTC, R1, and Duke Energy) gathered on bi-weekly calls. Has the communication frequency stayed the same or changed? Are there any other established communication protocols?

Program Experience and Satisfaction

Q13. From your experience, how is the new phone app Kilowatt Krush being received by teachers, students, and families?

Q14. Do you have any metrics to measure satisfaction or usage of the Kilowatt Krush app? If so, how has the app been received thus far?

Q15. During the last evaluation, no app download data was available. Is this data now available?

Q16. From our understanding, there were no live performances during this evaluation period. What did the online delivery of the program look like? How did this differ from previous years in terms of curriculum, content delivery, etc?

1. Were participants satisfied with online delivery of the program? How was this success measured?

Q17. Have there been any changes to the incentive structure where schools were previously awarded $100/250 kit requests? (PROBE IF NECESSARY: Are the incentives proportional to the size of the school?)

Marketing and Outreach

Q18. How was the program marketed during COVID-19? Was there more, less, or the same amount of marketing during this program year as compared to previous years?

Q19. How was outreach to schools conducted during COVID-19? Was there more, less, or the same amount of schools targeted and contacted this program year as compared to previous years?

1. Who do you connect with to coordinate the program offering in the schools? Does this differ by grade level? (e.g., principal, teacher, etc.)

Q20. In previous evaluations, we became aware of issues with recruiting and reaching saturation of schools. Was this an issue that was encountered this year in terms of outreach?

Q21. When outreach was conducted, did school representatives mention any concerns with the virtual delivery of the program during the 2021-2022 program year? If so, how did these concerns impact the school decision to sign up for the program?

Measures in the Kit

Q22. Have measures provided in the kit changed since the last time the evaluation was conducted? Any future plans to change them?

Kit Tracking and Reporting

Q23. How many kits were requested during this program year? How does this compare to previous years? If this is different, why do you think the number of requests has differed?

Q24. Were there any changes with kit distribution as a result of the pandemic? (e.g., supply chain issues, increased delivery windows, etc.)

Wrap Up

We are almost done. I have a few more questions.

Q25. We know that no live performances were held due to COVID-19. Did COVID-19 impact the program in any other ways during the 2021-2022 school year? If so, how? Have these effects persisted in the 2022-2023 school year?

Q26. What would you say are the greatest strengths of the program in the 2021-2022 school year? Is this specific to the DEC/DEP jurisdiction?

Q27. What would you say is the biggest challenge in administering this program in 2021-2022? Is this specific to the DEC/DEP jurisdiction?

Q28. How can this offering be improved?

Q29. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q30. What would you like to learn from this program evaluation?

Closing

Those are all of my questions. Thank you very much for your time.

E.2 NTC Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the Energy Efficiency Education Program in the Duke Energy **Carolinas/Progress** territories. We would like to learn about your experiences administering this program in the 2021-2022 school year.

Your comments are confidential. If I ask about areas you are not familiar with, please feel free to tell me and we will move on.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. First please describe your role in NTCs work with the Duke Energy Energy-Efficiency Education Program. How long have you been in this role? Has your role changed since the last time this program was evaluated?

Q2. Has NTC's role changed in terms of program delivery since the last time this program was evaluated?

Delivery and Operations

Next, I'd like to learn more about how this offering was delivered since your involvement. If any elements of implementation are different during the 2021-2022school year than in the past, please let me know.

Q3. Has the delivery process changed since the last evaluation, prior to any forced upon the program? Separately, how did COVID-19 affect program delivery, if at all, in terms of:

1. Marketing and outreach (Can you provide recruitment materials?): [PROBE: We were told that the outreach approach changed to be teacher-focused. What did that outreach look like?]
2. Recruitment:
3. Curriculum:
4. Performance:
5. Kit request process:

Q4. In the last evaluation, we were told that there were some challenges with recruiting new schools because a saturation point of eligibility had been reached. What has been done to address this challenge?

Q5. In what ways, if at all, does the delivery strategy for the high school program differ from the others?

Q6. Can you talk a bit about the development of the high school delivery strategy, including how this applies to materials, performances, etc.?

Q7. Have there been any significant challenges or successes specific to the high school program in 2021-2022? How have these been addressed?

Q8. Do you have copies of the 2021-2022 materials for all three programs that you could send me?

Q9. We were told that school level incentives have changed, and teacher incentives have been added. How has the change in incentive impacted participation?

Q10. What does teacher involvement in the program look like?

Q11. In past years, students were able to request their energy saving kits from the program website, a sign-up form in the classroom materials given to students, by calling a toll-free number, or through the Kilowatt Krush app. Did the way that students were able to request their kit change due to COVID? (i.e., did they still get a sign-up form through classroom materials?)

Q12. What energy saving behaviors do you encourage through the plays?

- Switching to LEDs, insulation for doors and windows, powerstrips, turning off the lights, shorter showers, what you can do in your community and careers, etc.

Q13. Are there any changes, beyond those caused by COVID-19, that you have implemented in the 2022-2023 school year? Any planned for 2023-2024?

Q14. Does the operational staff still gather on bi-weekly calls (NTC, R1, Duke Energy)? Are there any other established communication protocols? Any changes there?

Q15. Has anything changed with staffing/management at NTC (communications, content creation, admin, or management staff)? If so, how has this affected program delivery or operations?

Q16. How has the introduction of the Kilowatt Krush app impacted, if at all, student engagement with the performances or curriculum?

Q17. Have you heard any feedback about the Kilowatt Krush app? If yes, has the app been received positively or negatively? Why do you say that?

Wrap Up

We are almost done. I have a few more questions.

Q18. We know that no live performances were held due to COVID-19. Did COVID-19 impact the program in any other ways during the 2021-2022 school year? If so, how? Have these effects persisted in the 2022-2023 school year?

Q19. What would you say are the greatest strengths of the program in the 2021-2022 school year? Is this specific to the DEC/DEP jurisdiction?

Q20. What would you say is the biggest challenge in administering this program in 2021-2022? Is this specific to the DEC/DEP jurisdiction?

Q21. How can this offering be improved?

Q22. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q23. What would you like to learn from this program evaluation?

Closing

Those are all of my questions. If any other questions come up for us while analyzing the data, would you be willing to be contacted again over e-mail? Thank you very much for your time.

E.3 R1 Staff In-Depth Interview Guide

Introduction

Today, we'll be discussing your role in the Energy Efficiency Education Program in the Duke Energy **Carolinas/Progress** territories. We would like to learn about your experiences administering this program in the 2021-2022 school year.

Your comments are confidential. If I ask about areas you are not familiar with, please feel free to tell me and we will move on.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Roles & Responsibilities

Q1. First please describe your role at R1 as well as your role in Duke Energy's Energy Efficiency Education Program. How long have you been in this role? Has your role changed since the last time this program was evaluated?

Q2. Has R1's role changed in terms of program delivery since the last time this program was evaluated?

Delivery and Operations

Next, I'd like to learn more about how this offering was delivered since your involvement. If any elements of implementation are different during the 2021-2022 school year than in the past, please let me know.

Q3. Has anything changed in this delivery process? (Prompts: relationship with AMC, data verification and transfer with Duke Energy/Duke Energy online look-up tool, processing of paper applications, online processing)

Q4. How long does it typically take for kit requests to be fulfilled and shipped out to customers?

Q5. Does all the operational staff still gather on bi-weekly calls? Can you briefly describe communication protocols?

Q6. Have there been any changes to the process that you follow since the inclusion of high schools in the program?

Challenges and Successes

Q7. Have you experienced any specific challenges due to the introduction of the high school program? Any successes?

Q8. Have you experienced any specific challenges with data management or processing? Any successes?

Q9. In the last evaluation, we were told that Duke was redoing their internal systems and introducing Customer Connect where they merged their systems together. Has Customer Connect been introduced? Can you please describe your experience working with Customer Connect thus far?

1. What do you like best about the system?
2. What do you like least about the system?
3. How can the system be improved?

Wrap Up

We are almost done. I have a few more questions.

Q10. We know that no live performances were held due to COVID-19. Did COVID-19 impact the program in any other ways during the 2021-2022 school year? If so, how? Have these effects persisted in the 2022-2023 school year?

Q11. Do you have any insight into the Kilowatt Krush app that was introduced as part of this program during the evaluation period? If yes, please describe how the app impacted your role or the number of kit requests that you received.

Q12. What would you say are the greatest strengths of the program in the 2021-2022 school year? Is this specific to the DEC/DEP jurisdiction?

Q13. What would you say is the biggest challenge in administering this program in 2021-2022? Is this specific to the DEC/DEP jurisdiction?

Q14. How can this offering be improved?

Q15. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Q16. What would you like to learn from this program evaluation?

Closing

Those are all of my questions. Thank you very much for your time.

E.4 Teacher Interview Guide

Introduction

Today, we'll be discussing your experience in Duke Energy Carolinas/Progress's Energy Efficiency Education Program during the 2021-2022 school year.

Your comments are confidential. If I ask about areas you are not familiar with, please feel free to tell me and we will move on.

I would like to record this interview for my note-taking purposes. Do I have your permission? Do you have any questions before we start?

Awareness, Grades and Subjects Taught, Type of Performance Seen

Q1. Confirm the following from the survey responses:

1. What grade(s) and subject(s) do you teach?
2. How did you hear about the program?
3. Did you experience a school wide performance, or an individual classroom performance?
4. Did your class participate in a livestream performance or a pre-recorded performance?

Q2. How were the performances scheduled for your school? Are you involved with this? If so, in what way? [PROBE BASED ON ANSWER IF IT WAS THROUGH THE TEACHER: Did your school participate in the past? How was the program marketed to you?]

Q3. On a scale of 1 to 5, where 1 is "not satisfied at all" and 5 is "very satisfied," how satisfied were you with the process of scheduling performances for the school or for your class?

Q4. We were told that Duke Energy introduced teacher incentives for the program where for every 20 kids who put in a kit request, the teacher received $50. Please tell us what you think about that incentive model. How did the incentive model impact the way you promoted kit requests to students?

Q5. Do you have any suggestions to improve recruitment and performance scheduling?

Program Experience and Satisfaction

Q6. What did you and/or your students think about the [LIVESTREAM OR PRE-RECORDED] performance? What did you enjoy? What could be improved?

Q7. What topics were covered in the performance?

Q8. Do you think any of the topics could have been better emphasized or explained? If so, which ones and why?

Q9. Should any topics be removed from the performance? If so, which ones and why?

Q10. Was the content appropriate for all ages [elementary, middle, or high]? If not, what was not age appropriate? How could this be improved?

Q11. Did the performance keep your students' attention? If not, how could the content be improved to keep the students entertained and attentive?

Q12. What did you like most about the performance?

Q13. Is there anything that you disliked? How could this be improved?

Q14. How did your students respond to the performance? [PROBES: What did your students say about the performance? Did they like it? What specifically did they like most about it?]

Q15. One of the goals of the NTC program is for performers to get students' families to sign up for energy efficiency kits from Duke Energy. Did the performers talk about the kits and how to sign up? [IF YES: What did they say?]

Q16. Have you seen any other NTC performances?

1. [IF YES] When did you see those performances? How did the latest performance compare to the prior performance(s)?
2. Were the other performance(s) that you saw performed in person? How did the in-person performance compare to the virtual delivery of the program?

Q17. On a scale of 1 to 5, where 1 is "not at all interested" and 5 is "very interested," how interested were the students in the virtual or recorded performances?

Q18. Do you have any suggestions that might improve the National Theatre for Children performance(s)?

Q19. NTC provides student workbooks that contain educational materials and a form to get an energy saver kit for their home. Did you distribute these workbooks and forms to your students either electronically or print outs?

1. IF NO: Why not?
2. IF YES: How does the distribution work? Did you print them yourselves, view it online, or were paper copies delivered? How did you use the workbook in your classroom?

Q20. Did you get any teacher-facing instructional material from NTC? What was it? How did you receive it? To what extent did you use that material?

1. [IF MATERIAL WAS NOT USED] Why haven't you used the materials? What would make you more likely to use them?
2. [IF USED] Using a 1 to 5 scale, where 1 means "not at all useful" and 5 means "extremely useful," how useful was the instructional material? Why did you give that rating? What was the most/least useful about them?

Q21. Thinking about the educational materials that NTC provided…

1. In what ways, if any, did you incorporate the material into your lesson plans? [IF NOT MENTIONED] That is, did you extensively use it – such as weaving it into your course work over the year – or did you briefly use it in the time surrounding the performance? Please explain how extensively you used the material.
2. Was the content age appropriate, or was it too advanced or too basic? What was too basic/advanced? How effective is it in teaching kids about energy concepts?

Q22. Do you have any suggestions that might improve the classroom materials received from the National Theatre for Children?

Q23. Did anyone or any of the materials you received emphasize the value of the kits to you? If so, what did they say?

Q24. In the online survey you said you [DID/DID NOT] distribute the kit request form to your students.

1. [IF DISTRIBUTED] What challenges, if any, did you encounter when trying to distribute the kit forms? Did remote learning and/or COVID-19 restrictions make distributing the kit request form more challenging? Did you have to coordinate with other faculty or staff? If so, can you describe the process and how well the process worked? What can NTC or Duke Energy do to make this process easier for you?
2. [IF NOT DISTRIBUTED] Why did you not distribute the kit forms? Were there challenges in distributing the form due to remote learning and/or COVID-19 restrictions? What can NTC or Duke Energy do to make this process easier for you?

Q25. Do you have any suggestions that might improve the distribution of the kit forms to students, or the online sign-up process?

Q26. In what ways did the performers or the materials mention the Kilowatt Krush app, if at all? Did your students report using it? Do you have any feedback about the app or how it's communicated to participants?

Q27. Thinking about the performance and curriculum as a whole, in what ways, if any, did your students subsequently demonstrate knowledge on the topics presented? [IF NOT MENTIONED] What were some of their main takeaways? What is the evidence of their increased knowledge? (Test scores, etc.)

Wrap Up

We are almost done. I have a few more questions.

Q28. We know that no live performances were held due to COVID-19. Did COVID-19 impact student engagement with the content? If so, how? Have these effects persisted in the 2022-2023 school year?

Q29. What would you say are the greatest strengths of the program in the 2021-2022 school year? Is this specific to the DEC/DEP jurisdiction?

Q30. How can this offering be improved?

Q31. Is there anything else about the program that we have not discussed that you feel should be mentioned?

Closing

Those are all of my questions. Thank you very much for your time.

E.5 Teacher Survey

Landing Page Introduction

Thank you for agreeing to take this survey. It starts with a few questions about what grades and subjects you teach, which we need for our analysis of the survey responses. The survey then asks for your feedback on various elements of the program.

Grades and Subjects Taught

Q1. What grade(s) did you teach during the 2021-2022 school year? *Please select all that apply.*

[multiple response]

1. Kindergarten
2. Grade 1
3. Grade 2
4. Grade 3
5. Grade 4
6. Grade 5
7. Grade 6
8. Grade 7
9. Grade 8
10. Grade 9
11. Grade 10
12. Grade 11
13. Grade 12
14. Other, please specify: [Open-ended response] – Collect open end response- then TERMINATE
15. None; I did not teach last year [TERMINATE]

[IF Q1= 7-Grade 6 to 13-Grade 12]

Q2. What subject(s) did you teach during the 2021-2022 school year? *Please select all that apply.*

[MULTIPLE RESPONSE]

1. Math
2. Natural sciences
3. English/language arts
4. Social studies/social sciences/history
5. Music

6. Art
7. Physical education
8. Other – please specify: [OPEN-ENDED RESPONSE]

[IF Q2=1,2,4]

Q3. Did you teach any topics on energy (electricity, gas, coal, etc.) generation, transformation, use, or conservation (including, but not limited to, topics/materials provided by the Energy Efficiency for Schools program)?

[SINGLE RESPONSE]

1. Yes
2. No

Performance Seen

[IF Q1= 1-Kindergarten to 6-Grade 5 AND Q1<> 7-Grade 6 to 13-Grade 12]

Q4. Did you view The National Theatre for Children performance for elementary school students in [PERFORMANCE_MONTH] of [PERFORMANCE_YEAR]?
1. Yes – I attended a school-wide performance
2. Yes – I attended a classroom performance
3. No [TERMINATE]

98. Don't know/ Can't recall [TERMINATE]

[IF Q4 = 1]

Q5. Did your students see a performance even more specific to their grade level?
1. Yes, they saw the K-2 performance
2. Yes, they saw the performance for grades 3-5
3. No, they saw the K-5 performance
4. Don't know / Can't recall

[IF Q1= 7- Grade 6 to 9- Grade 8]

Q6. Did you see the National Theatre for Children performance for middle school students in [PERFORMANCE_MONTH] of [PERFORMANCE_YEAR]?
1. Yes – I attended a school-wide performance
2. Yes – I attended a classroom performance
3. No [TERMINATE]

98. Don't know/ Can't recall [TERMINATE]

[IF Q1= 10- Grade 9 to 13- Grade 12]

Q7. Did you see the National Theatre for Children performance for high school students in [PERFORMANCE_MONTH] of [PERFORMANCE_YEAR]?
1. Yes – I attended a school-wide performance
2. Yes – I attended a classroom performance
3. No [TERMINATE]

98. Don't know/ Can't recall [TERMINATE]

Q8. Was the performance you saw via scheduled livestream or pre-recorded?
1. Livestream
2. Pre-recorded

98. Don't know/ Can't recall

Q9. Was your class in-person or remote learning at the time of the performance?
1. My students were in class with me in person
2. My students were learning remotely from their homes

98. Don't know/ Can't recall

[TERMINATION SCREEN TEXT: We have determined that you do not meet the qualification criteria for this study. Thank you for your time!

Awareness of Duke Energy Sponsorship

Q10. Before today, were you aware that Duke Energy sponsored the National Theatre for Children performance(s) in your school?
1. Yes
2. No

98. Don't know

[If Q10= 1 (YES)]

Q11. How did you learn of Duke Energy's involvement with the National Theatre for Children program? *Please select all that apply.*

[MULTIPLE RESPONSE]

1. Another teacher
2. Duke Energy marketing materials
3. Duke Energy staff
4. National Theatre for Children staff
5. National Theatre for Children materials
6. Other, please describe: [OPEN-ENDED RESPONSE]

98. Don't know

Q12. Are you (one of) the decision-maker(s) regarding the National Theatre for Children performances at your school?
1. Yes – I helped organize the schoolwide session
2. Yes – I organized my specific classroom session
3. No
4. Don't know

Q13. [Q12=2] How did you learn about the option to have a classroom session?
1. I knew about the National Theatre for Children performances from previous years
2. National Theatre for Children contacted me
3. NTC contacted my school
4. A colleague at my school told me about it
5. A colleague at a different school told me about it
6. Other: [Record Response]
7. Don't know

[IF Q12 = 1 or 2 (YES)]

Q14. Do you recall how the importance of the program was communicated to you? If so, how was it communicated to you?
1. Yes: [OPEN-ENDED RESPONSE]
2. No

Program Experience and Satisfaction

The next few questions are about the **performance(s)** that National Theatre for Children presented to your school.

Q15. Thinking back to the school performance, would you say that energy related concepts presented in the performance were:

[SINGLE RESPONSE]

1. Far too advanced for most of your students
2. Somewhat too advanced for most of your students
3. About right for most of your students

4. Somewhat too basic for most of your students
5. Far too basic for most of your students
96 Other, please specify: [Open-ended response]

98. Don't know

[IF Q15= 1 or 2]

Q16. What about the performance was too advanced for most of your students?
1. [OPEN-ENDED RESPONSE]

[IF Q15= 4 or 5]

Q17. What about the performance was too basic for most of your students?
1. [OPEN-ENDED RESPONSE]

Q18. Were there any concepts that the performance(s) did not cover that *should have been* covered?
1. Yes
2. No [SKIP TO Q20]

98. Don't know [SKIP TO Q20]

[IF Q18= 1 (YES)]

Q19. What concepts were not covered that *should have been* covered?
1. [OPEN ENDED]

Q20. Please estimate **your student's** overall engagement level with the National Theatre for Children performance on the following scale WHERE 1=NOT AT ALL ENGAGED AND 5=COMPLETELY ENGAGED, with DK; LABEL ONLY THE END POINTS (1 AND 5) – DISPLAY AS HORIZONTAL GRID:

Not at all Engaged				Completely Engaged	Don't Know
1	2	3	4	5	98

Q21. Please rate **your** overall satisfaction with the National Theatre for Children performance on the following scale. [Single response; insert 1-5 scale WHERE 1=NOT AT ALL SATISFIED AND

5=COMPLETELY SATISFIED, with DK; LABEL ONLY THE END POINTS (1 AND 5) – DISPLAY AS HORIZONTAL GRID

Not at all Satisfied				Completely Satisfied	Don't Know
1	2	3	4	5	98

Q22. Please explain why you offered this satisfaction rating.
1. [OPEN ENDED]

The next few questions are about the **curriculum or instructional materials** that you may have received from the National Theatre for Children around the time of the performance.

Q23. Did you receive curriculum or instructional materials, such as student workbooks, related to energy and energy conservation from National Theatre for Children for the Fall 2021-Spring 2022 school year?
1. Yes, they were mailed to our schools
2. Yes, we were directed to these resources on the program website, myenergykit.org
3. No [SKIP TO Q37]

98. Don't know [SKIP TO Q37]

[IF Q23= 1 or 2 (YES)]

Q24. To what degree did you use the curriculum or instructional materials in teaching your students about energy?

[Single response]

1. Not at all [SKIP TO Q36]
2. A little
3. Moderately
4. A lot
5. Extensively

98. Don't know [SKIP TO Q37]

[IF Q24= 2 (A little)]

Q25. Why did you only use the curriculum or instructional materials "a little" in teaching your students about energy?

1. [OPEN-ENDED RESPONSE]

[IF Q24= 2 through 5]

Q26. Thinking about how the student workbooks explained energy-related concepts, would you say that the material was generally:

[SINGLE RESPONSE]

1. Far too advanced for most of your students
2. Somewhat too advanced for most of your students
3. About right for most of your students
4. Somewhat too basic for most of your students
5. Far too basic for most of your students

96. Other, please specify: [Open-ended response]

98. Don't know

[IF Q24= 2, 3, 4, or 5]

Q27. Please rate how useful the materials were to you in teaching your students about energy. [Single response; insert 1-5 scale WHERE 1=NOT AT ALL USEFUL AND 5=EXTREMELY USEFUL, with DK

Not at all Useful				Extremely Useful	Don't Know
1	2	3	4	5	98

[IF Q24= 2, 3, 4, or 5]

Q28. Please rate the degree to which the topics in the workbook aligned with your state's science standards for the grade(s) you teach.

1. Completely aligned
2. Mostly aligned
3. Somewhat aligned

4. Poorly aligned
5. Not aligned at all
6. N/A – no science standards for my grade(s)

98. Don't know

[IF Q28= 4 or 5]

Q29. Which topic(s) was or were poorly aligned or not aligned at all with your state's science standards? In what way(s)?
1. [OPEN-ENDED RESPONSE]

[IF Q24= 2, 3, 4, or 5]

Q30. Were there any concepts covered in the curriculum or instructional materials that your students had challenges with?
1. Yes
2. No [SKIP TO Q32]

98. Don't know [SKIP TO Q32]

[IF Q30= 1 (yes)]

Q31. What concepts did your students have challenges with?
1. [OPEN-ENDED RESPONSE]

[IF Q24= 2, 3, 4, or 5]

Q32. Were there any concepts that the materials did not cover that *should have been* covered?
1. Yes
2. No [SKIP TO Q34]

98. Don't know [SKIP TO Q34]

[IF Q32= 1 (YES)]

Q33. What concepts were not covered that *should have been* covered?
1. [OPEN-ENDED RESPONSE]

[IF Q24= 2, 3,4, or 5]

Q34. Please rate your overall satisfaction with curriculum or instructional materials you received from the National Theatre for Children program using the following scale.

[Single response; insert 1-5 scale WHERE 1=NOT AT ALL SATISFIED AND 5=COMPLETELY SATISFIED with DK; LABEL ONLY END POINTS (1 and 5)]

Not at all Satisfied				Completely Satisfied	Don't Know
1	2	3	4	5	98

[IF Q23= 1 or 2 (YES)]

Q35. Do you have any additional input regarding the **curriculum or instructional materials** received from the National Theatre for Children that you would like to provide, including other things you liked or think could be improved? This might include things like overall presentation, length, level of detail, messaging, or anything else.

1. [OPEN ENDED]

[IF Q24= 1 (NOT AT ALL)]

Q36. Why did you *not* use the curriculum or instructional materials in teaching your students about energy?

1. [OPEN ENDED]

Interactions with NTC Staff

Q37. Did you have any interactions with anyone from the National Theatre for Children regarding the curriculum or instructional materials?

1. Yes
2. No [SKIP TO Q40]

98. Don't know [SKIP TO Q40]

[IF Q37= 1 (YES)]

Q38. What did those interactions involve?

1. [OPEN-ENDED RESPONSE]

[IF Q37= 1 (YES)]

Q39. Using the scale provided, how satisfied were you with:

a. Your interactions with the National Theatre for Children staff, overall

b. The professionalism and courtesy of the National Theatre for Children staff
c. The National Theatre for Children staff's knowledge about the topics you discussed with them

[Single response; for each item, insert 1-5 scale WHERE 1=NOT AT ALL SATISFIED AND 5=COMPLETELY SATISFIED with; LABEL ONLY THE END POINTS (1 AND 5)]

Not at all Satisfied				Completely Satisfied	Don't Know
1	2	3	4	5	98

Encouragement of Students to Complete Kit Request Form; Use of App

The National Theatre for Children provided a form that parents can fill out to receive a kit from Duke Energy. The kit contains energy efficient bulbs, a low flow showerhead, and a few additional items that students and their parents can install in their home to save energy.

Q40. Did you make students aware of the kit request form (Online and/or Paper version)?
1. Yes – I distributed the paper kit request form
2. Yes – I provided information to students on where they can request a kit online.
3. Yes, I made students aware of the online form and provided the paper form.
4. No

98. Don't recall

[IF Q40= 4 (NO)]

Q40a. Why didn't you distribute the kit request forms to your students?

[OPEN-ENDED]

Q40.b Did you make parents aware of the program and the kit request form in any of your regular communications to them (e.g. weekly/monthly emails or newsletters)?

1. Yes

2. No, why not? [Open text box]

98. Don't recall

[IF Q40= 1 OR 3 (YES)]

Q41. On average, about what percentage of your students took the kit request form home? Your best estimate is fine.

1. 0% to 10%
2. 11% to 20%
3. 21% to 30%
4. 31% to 40%
5. 41% to 50%
6. 51% to 60%
7. 61% to 70%
8. 71% to 80%
9. 81% to 90%
10. 91% to 100%

98. Don't know

[IF Q40= 1, 2 OR 3 (YES)]

Q42. After students take the kit form home or are provided with the MyEnergyKit.org link, do you follow up with students later to find out if their parents completed the form or signed up online?

1. Yes
2. No

98. Don't know

[IF Q40= 1, 2 OR 3 (YES)]

Q43. About what percentage of your students either brought the kit form back to you to mail, or reported their parents completed the online form to receive their kit?

1. 0% to 10%
2. 11% to 20%
3. 21% to 30%
4. 31% to 40%
5. 41% to 50%
6. 51% to 60%
7. 61% to 70%
8. 71% to 80%
9. 81% to 90%

10. 91% to 100%

98. Don't know

[IF Q40= 1, 2, 3 OR 98 OR IF Q40a=1 OR 98]

Q44. About what percentage of student families who had signed up for kits signed up on the website? Your best estimate is fine.
1. 0% to 10%
2. 11% to 20%
3. 21% to 30%
4. 31% to 40%
5. 41% to 50%
6. 51% to 60%
7. 61% to 70%
8. 71% to 80%
9. 81% to 90%
10. 91% to 100%

98. Don't know

Q45. In cases where a family did not request a kit, why do you think they would not have requested one?
1. Didn’t need the items
2. Didn’t have time to install them
3. Not interested in energy or water efficiency
4. Other: _____

Q46. Did the National Theatre for Children performers or the instructional materials mention the “Kilowatt Krush” app?
1. Yes
2. No [SKIP TO Q49]

98. Don't know [SKIP TO Q49]

[IF Q46= 1 (YES)]

Q47. About what percentage of students would you say downloaded and used the app?
1. 0% to 10%
2. 11% to 20%
3. 21% to 30%
4. 31% to 40%
5. 41% to 50%
6. 51% to 60%
7. 61% to 70%

8. 71% to 80%
9. 81% to 90%
10. 91% to 100%

98. Don't know

Q48. Do you have any suggestions to improve the app or how it was presented to students?
1. Yes; [OPEN ENDED RESPONSE]
2. No

Challenges and Opportunities for Improvement

Q49. Did government or organizational responses to COVID-19 offer any challenges for you regarding your participation in this program (e.g., different resources needed for remote learning, school policy, changing school or learning priorities, etc.), other than those you've already discussed? If so, what were they, and how do you think they might best be addressed moving forward?
1. Yes: [OPEN-ENDED RESPONSE]
2. No

98. Don't know

Q50. Do you have any additional feedback regarding this program or Duke Energy that you would like to provide?
1. Yes; [OPEN ENDED RESPONSE]
2. No

In-Depth Interview Recruitment

Q51. Would you be willing to participate in a phone interview, so we might learn more about you and your students' experience with the program? It should take about 15 minutes to complete, and we will provide you with an additional $25 gift card for your time.
1. Yes
2. No [SKIP TO CLOSE]

98. Don't know [SKIP TO CLOSE]

[IF Q51= 1 (YES)]

Q52. Thank you for your willingness to be interviewed! If we have not yet met our goal for completed interviews, we will be in touch with you regarding scheduling.

CLOSE:

Thank you for your time completing this survey. Your responses have been recorded.

Have a great day!

E.6 Student Parent Survey

Landing Page (Web)

Thank you for agreeing to take this survey! It starts with a few questions about your experience in the program. The survey then asks for your feedback on various elements of the kit you received.

Introduction/Screening

Q32. Your student viewed an energy efficiency educational theatrical performance that Duke Energy sponsored in your child's school during the 2021-2022 school year. In addition to sponsoring classroom activities, Duke Energy sent a kit containing energy saving items to your home.

This kit included light bulbs, a showerhead, and other items that help you save energy in your home. Do you recall receiving this kit?

1. Yes
2. No [If no: Is there another adult in the home that remembers receiving the kit?]
98. Don't know

Q1-a. [IF Q1= 2 or 98] Is there another adult in the home that remembers receiving the kit?

1. Yes
2. No [Terminate]
98. Don't know [Terminate]

Q1-1. [IF Q1-a=Yes] Please have the adult who remembers receiving the kit answer the remainder of the questions in this survey. Your student viewed an energy efficiency educational theatrical performance that Duke Energy sponsored in your child's school during the 2021-2022 school year. In addition to sponsoring classroom activities, Duke Energy sent a kit containing energy saving items to your home.

This kit included light bulbs, a showerhead, and other items that help you save energy in your home. Do you recall receiving this kit?

1. Yes
2. No [Terminate]
98. Don't know [Terminate]

Termination Language: *We have determined that you do not meet the qualification criteria for this study. Thank you for your time!*

Program Experience

Q1.

Q2. Before today, did you know the kit you received was sponsored by Duke Energy?

1. Yes
2. No
98. Don't know

[IF Q2=1]

Q3. How did you learn that the kit was sponsored by Duke Energy? *[Select all that apply]*

1. Classroom materials brought home by child
2. My child's teacher/school
3. Information material included in/on the kit
4. Other (specify: _____)
98. Don't know

Q4. How did you hear about the opportunity to receive the kit from Duke Energy? *[Select all that apply]*

1. From talking with my child
2. Classroom materials brought home by child
3. School newsletter
4. Email from my child's teacher/school
5. School website or school web portal
6. In-person conversations with my child's teacher
7. Saw a poster at my child's school
8. After hours event at my child's school
9. Other (specify: _____)
98. Don't know

Q5. How did you request your kit?

1. Program's website (www.myenergykit.org)
2. Sign-up form in the classroom materials my child brought home
3. By calling the toll-free number
4. Via the "Kilowatt Krush" app on my smartphone
98. Don't know

Q6. Has your child used the "Kilowatt Krush" app on any smartphone in your household?

1. Yes
2. No
98. Don't know [SKIP TO Q7]

Q6.No. [AFTER DISPLAYING THIS QUESTION SKIP TO Q7] Why has your child not used the "Kilowatt Krush" app on any smartphone in your household?

1. Forgot to download

2. Felt it was not age-appropriate

3. Downloaded the app but child has not tried it yet

4. Not interested

5. Other, please specify:
98. Don't know

Q6a. About how often would you say that your child uses the "Kilowatt Krush" app?
1. They used it once
2. They used it a few times
3. They use it daily
4. They use it weekly
5. Other: [OPEN-ENDED RESPONSE]
98. Don't know

Q6b. Have you noticed your child engaging in energy saving behaviors you can attribute to their use of the "Kilowatt Krush" app?
1. Yes
2. No
3. Don't know

Q6c. [If Q6b = 1] What energy saving behaviors have you noticed?
1. Turning off the lights when not in a room
2. Turning off electronics when not in use
3. Taking shorter showers
4. Spending less time with the refrigerator door open
5. Student asked parents to change light bulbs to LED
6. Using a small lamp instead of overhead lights
7. Helping parents shop for energy efficient appliances
8. Opening blinds in the winter to let sun heat the room
9. Other - Please specify.
10. Don't know

Q6d. Do you have any feedback that might help improve the "Kilowatt Krush" app?

1. Yes [Q6d.1 What might improve the app? [OPEN-ENDED RESPONSE]
2. No
98. Don't know

Q5.

Q6. Did you read any of the Energy Savers booklet that came in the kit? This is the 44-page booklet with information about how to save energy in the home.

1. Yes
2. No
98. Don't know

[If Q7=1] On a scale from 0 to 10 where 0 is not at all helpful and 10 is very helpful, how helpful was the Energy Savers booklet in identifying ways your household could save energy at home?

0. Not at all helpful
1.
2.
3.
4.
5.
6.
7.
8.
9.
10. Very helpful

[ASK Q9 IF Q8<7]

Q7. What might have made the information more helpful?

[OPEN-ENDED RESPONSE]

Q8. In addition to sending the energy saving kits, Duke Energy sponsored a performance about energy and energy efficiency at your child's school, which included classroom materials and a virtual performance by the National Theatre for Children. Were you aware of this performance before today?

1. Yes
2. No
98. Don't know

[ASK IF Q10=1]

Q9. From whom or where did you hear about this program?

[MULTIPLE RESPONSE]

1. From my child/children
2. From a teacher/school administrator
3. On Duke Energy website
4 Other, please specify:

98 Don't Know

Assessing Energy Saver Kit Installation

We'd like to ask you about the energy saving items included in your kit.

The kit contained an energy-efficient showerhead, faucet aerators for the bathroom and kitchen, energy efficient light bulbs, a night light, and some insulator gaskets for light switches and electricity outlets.

Q10. Have you or anyone else installed any of those items in your home, even if they were taken out later?

1. Yes
2. No [SKIP TO Q18]

[ASK IF Q10 = 1]
Q11. Which of the items did you install, even if they were taken out later?

Item	Response
Q13a Showerhead	1. Yes 2. No
Q13b Kitchen faucet aerator	1. Yes 2. No
Q13c Bathroom faucet aerator	1. Yes 2. No
Q13d Night light	1. Yes 2. No
Q13e Energy efficient light bulb(s) (LEDs)	1. Yes 2. No
Q13f Insulator gaskets for light switches and electricity outlets	1. Yes 2. No

[ASK IF Q13E (ENERGY EFFICIENT LIGHT BULB(S)) = 1 (YES)]
Q12. In addition to the night light, there were two LED light bulbs in the kit. Did you install one or both LED light bulbs in the kit?

1. I installed only one LED light bulb
2. I installed both LEDs

[ASK IF Q13f = 1]

Q13. How many of the twelve (12) light switch and electric outlet gasket insulators from the kit di*d you, or someone else,* install in your home?

1. None
2. One
3. Two
4. Three
5. Four
6. Five
7. Six
8. Seven
9. Eight
10. Nine
11. Ten
12. Eleven
13. Twelve

[ASK IF ANY PART OF Q13= 1]

Q14. Overall, how satisfied are you with the item[s] you installed? Please use 0 to 10 scales, where 0 is very dissatisfied and 10 is very satisfied. How satisfied are you with…?

DISPLAY IF	Item	Rating
Q13a = 1	Q16a Showerhead	0-10
Q13b = 1	Q14b Kitchen faucet aerator	0-10
Q13c = 1	Q14c Bathroom faucet aerator	0-10
Q13d = 1	Q14d Night light	0-10
Q13e = 1	Q14e Energy efficient light bulbs (LEDs)	0-10
Q13f = 1	Q14f Insulator gaskets	0-10

[ASK IF ANY ITEMS IN Q14a - Q14f <7]

Q16.1. Can you please explain any dissatisfaction you had with the [DISPLAY ALL ITEMS IN Q14 THAT ARE <7]?

Q14.1a [IF Q14a < 7] Showerhead

Q14.1b [IF Q14b < 7] Kitchen Faucet aerator

Q14.1c [IF Q14c <7] Bathroom faucet aerator

Q14.1d [IF Q14d< 7] Night light

Q14.1e [IF Q14e <7] Energy efficient light bulbs (LEDs)

Q14.1f [IF Q14f < 7] Insulator gaskets

[OPEN END]

[ASK IF Q11a OR Q11b OR Q11c OR Q11d OR Q11e OR Q11f = 1]
Q15. Have you since uninstalled any of the items from the kit that you had previously installed?

[SINGLE RESPONSE]

1. Yes
2. No

[ASK IF Q15= 1]
Q16. Which of the items did you uninstall?

[MULTIPLE RESPONSE]

1. [DISPLAY IF Q11a = 1] Showerhead
2. [DISPLAY IF Q11b = 1] Kitchen faucet aerator
3. [DISPLAY IF Q11c = 1] Bathroom faucet aerator
4. [DISPLAY IF Q11d = 1] Night light
5. [DISPLAY IF Q11e = 1] Energy efficient light bulbs (LEDs) [Q18.5.a – How many did you uninstall?]
6. [DISPLAY IF Q11f = 1] Insulator gaskets [Q18.6.a – How many did you uninstall?]

[ASK IF Q16 1-6 OPTIONS WERE SELECTED]
Q17. Why were those items uninstalled?

	Item	Reason
IF Q16 = 1 IF Q16 = 2 IF Q16 = 3 IF Q16 = 4 IF Q16 = 5 IF Q16 = 6	Q17a Showerhead	Repeat reason options
	Q17b Kitchen faucet aerator	Repeat reason options
	Q17c Bathroom faucet aerator	Repeat reason options
	Q17d Night light	Repeat reason options
	Q17e Energy efficient light bulbs	Repeat reason options
	Q17f Insulator gaskets	Repeat reason options

Response options:

[MULTIPLE RESPONSE]

1. It was broken
2. I didn't like how it worked
3. I didn't like how it looked
4. Other: (specify)
98. Don't Know

[ASK IF Q10 = 2]

Q18. a-b. You said you haven't installed [INPUT ONLY THOSE ITEMS IN Q11 IF Q11a-f = 2]. Which of those items do you plan to install in the next three months?

[SELECT ALL THAT APPLY].

1. [Q11a = 2] Showerhead
2. [Q11b = 2] Kitchen faucet aerator
3. [Q11c = 2] Bathroom faucet aerator
4. [Q11d = 2] Night light
5. [Q11e = 2] Energy efficient light bulbs(LEDs)
6. [Q11f = 2] Insulator gaskets
98. None

[ASK IF Q12 = 2 and Q13 only one item has NOT been installed]

Q20c. You said you haven't installed the [INPUT THE ONE ITEM IN Q13=2]. Do you plan to install this item in the next 3 months?

1. Yes
2. No

[ASK IF Q20c = 2]

Q20c.1 What's preventing you from installing the [INPUT THE ONE ITEM IN Q13=2]?

3. Didn't know what that was
4. Tried it, didn't fit
5. Tried it, didn't work as intended (Please specify: _____)
6. Haven't gotten around to it
7. Current one is still working
8. Takes too much time to install it/No time/Too busy
9. Too difficult to install it, don't know how to do it
10. Don't have the tools I need
11. Don't have the items any longer (threw away, gave away)
12. [DISPLAY IF Q18.5 was not selected] Already have energy efficient light bulbs
13. [DISPLAY IF Q18.1 was not selected] Already have efficient showerhead
14. [DISPLAY IF Q18.2 was not selected] Already have efficient kitchen faucet aerator
15. [DISPLAY IF Q18.3 was not selected] Already have efficient bathroom faucet aerators
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF ANY 1-6 OPTIONS WERE NOT SELECTED IN Q18 OR OPTION 98 "NONE" WAS SELECTED]
Q19. What's preventing you from installing those items?

[MULTIPLE RESPONSE]

DISPLAY IF	Item	Reason
SKIP IF Q18=1 ,98	Q19a Showerhead	Use multiple response options below
SKIP IF Q18=2,98	Q19b Kitchen faucet aerator	Use multiple response options below
SKIP IF Q18=3,98	Q19c Bathroom faucet aerator	Use multiple response options below
SKIP IF Q18=4,98	Q19d Night light	Use multiple response options below
SKIP IF Q18=5, 98	Q19e Energy efficient light bulbs	Use multiple response options below
SKIP IF Q18=6,98	Q19f Insulator gaskets	Use multiple response options below

[MULTIPLE RESPONSE OPTIONS FOR Q19]

1. Didn't know what that was
2. Tried it, didn't fit
3. Tried it, didn't work as intended (Please specify: _____)
4. Haven't gotten around to it
5. Current one is still working
6. Takes too much time to install it/No time/Too busy
7. Too difficult to install it, don't know how to do it
8. Don't have the tools I need
9. Don't have the items any longer (threw away, gave away)
10. [DISPLAY IF Q18.5 was not selected] Already have energy efficient light bulbs
11. [DISPLAY IF Q18.1 was not selected] Already have efficient showerhead
12. [DISPLAY IF Q18.2 was not selected] Already have efficient kitchen faucet aerator
13. [DISPLAY IF Q18.3 was not selected] Already have efficient bathroom faucet aerators

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF ANY PART OF Q11 = 1 AND IT'S NOT THE CASE THAT ALL PARTS OF Q16=SELECTED (THAT IS, THEY INSTALLED ANYTHING AND DID NOT UNINSTALL EVERYTHING THEY INSTALLED)]

[ASK IF Q11A (SHOWERHEAD)) = 1 (YES) AND Q16 <>1 (SHOWERHEAD); THAT IS, SHOWERHEAD WAS INSTALLED AND NOT UNINSTALLED]

Q20. Thinking of the efficient showerhead currently installed in your home that you received from the program...on average, how many showers per day are taken in this shower (by all occupants)?

[INTEGER RESPONSE]

Q21. Again, thinking specifically about the showerhead installed in your home that you received from the program, what is the average shower length taken in this shower? Please provide your response in minutes.

[INTEGER RESPONSE]

[ASK IF Q11d = 1 AND Q18 <>4 NIGHT LIGHT OPTION WAS NOT SELECTED]
Q22. YOU SAID YOU INSTALLED THE NIGHT LIGHT. Did the night light replace an existing night light?

1. Yes
2. No

[ASK IF Q22 = 1]
Q23. Did the old night light use an incandescent or LED bulb? If you could take out and replace the bulb once it burned out, it was likely an incandescent bulb.

1. Incandescent
2. LED
98. Don't know

[ASK IF (Q11E = 1 AND Q16 <> 5 (ENERGY EFFICIENT LIGHTS WERE NOT SELECTED)]
Q24. You said you installed at least one of the energy efficient lights. What type of bulb(s) did you replace with the energy efficient lightbulb(s)?

1. Incandescent (O*ld-fashioned light bulb - likely purchased more than two years ago*)
2. Halogen (B*ulb that looks like an incandescent, but has a glass tube inside of the bulb*)
3. CFL (S*piral, or twisty shape bulb that fit into ordinary light fixtures)*
4. LED (N*ew bulb type that uses little electricity and lasts a long time*)
98. Don't know

[ASK IF (Q11E = 1 AND Q16 <> 5 (ENERGY EFFICIENT LIGHT BULBS NOT SELECTED)]
Q25. In what rooms did you install the energy efficient lightbulbs that were included in the kit? [MULTIPLE RESPONSE]

1. Living room
2. Dining room
3. Bedroom
4. Kitchen
5. Bathroom
6. Den
7. Garage
8. Hallway

9. Basement
10. Outdoors
11. Other area (please specify):_____

Q26. Have you adjusted the temperature of your water heater based on the Hot Water Gauge Card included in your kit?

1. Yes
2. No
3. Don't recall seeing the Hot Water Gauge Card

[ASK IF Q26 = 1]
Q27. Is the new water heater temperature setting still in place?

1. Yes
2. No
98. Don't know

[IF Q27 = 2]
Q28. Why did you change the water heater temperature a second time?

[Record response]

Net-To-Gross

[IF ANY PART OF Q11 = 1 AND IT'S NOT THE CASE THAT ALL PARTS OF Q16 =SELECTED (THAT IS, THEY INSTALLED ANYTHING AND DID NOT UNINSTALL EVERYTHING THEY INSTALLED)]

ASK Q29 IF [Q11a = 1 AND Q16<>1]OR [Q11b = 1 AND Q16 <>2] OR [Q11=c AND Q16 <> 3] OR [Q11d = 1 AND Q16 <>4] OR Q11e = 1 AND Q16 <> 5] OR [Q11f = 1 AND Q16 <>6]

Q29. If you had not received the free efficiency items in the kit, would you have purchased and installed any of these same items within the next year?

1. Yes
2. No [Skip to Q34]
98. Don't know

Q30. What items would you have purchased and installed in the next year?

1. [DISPLAY IF Q11A = 1 AND Q16 <>1] Energy-Efficient Showerhead
2. [DISPLAY IF Q11B = 1 AND Q16 <> 2] Kitchen Faucet Aerator
3. [DISPLAY IF Q11C = 1 AND Q16 <>3] Bathroom Faucet Aerator
4. [DISPLAY IF Q11D = 1 AND Q16 <>4] Energy-Efficient Light Bulbs (LEDs)
5. [DISPLAY IF Q11E = 1 AND Q16 <> 5] Energy-Efficient Night Light
6. [IF Q11F = 1 AND Q16 <>6] Switch/Outlet Gasket Insulators
7. No, I would not have purchased any of the items
98. Don't know

[ASK Q31 IF Q30.4 = YES]

Q31. If you had not received them for free in the kit, how many LED light bulbs would you have purchased?

1. One
2. Two
98. Don't know

[IF (Q11*a*=1 AND Q16 <>1) OR (Q11*b*=1 AND Q16 <>2) OR (Q11*c*=1 AND Q16 <>3)]

Q32. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how influential were the following factors on your decision to install the low flow kitchen aerator, bathroom aerator, and showerhead from the kit? How influential was…

Elements	Responses
The fact that the items were free	0-10 scale with DK
The fact that the items were mailed to your house	0-10 scale with DK
Information in the kit about how the items would save water or energy	0-10 scale with DK
Information that your child brought home from school	0-10 scale with DK
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK

[ASK Q33 IF (Q11D=1 AND Q16 <>4) OR (Q33 IF Q11E=1 AND Q16 <>5) OR (Q33 IF Q11F=1 AND Q16 <>6)] (THAT IS, ANY OF THE 3 MEASURES WERE INSTALLED AND NOT REMOVED)

Q33. Using a scale from 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential" how influential were the following factors on your decision to install the lightbulbs, night light, or outlet gaskets from the kit? *How influential was…*

Elements	Responses
The fact that the items were free	0-10 scale with DK
The fact that the items were mailed to your house	0-10 scale with DK
Information in the kit about how the items would save energy	0-10 scale with DK
Information that your child brought home from school	0-10 scale with DK
Other information or advertisements from Duke Energy, including its website	0-10 scale with DK

Q34. Since your child learned about energy conservation at school and signed up for your energy kit from Duke Energy, has **your child** adopted or increased any **new behaviors** to help save energy in your home? This would only include new energy saving **behaviors** that your child adopted since receiving the kit.

[MULTIPLE RESPONSE]

1. Not applicable - no new behaviors
2. Turning off lights when not in a room
3. Turning off electronics when not using them
4. Taking shorter showers
5. Other (specify: _____)
98. Don't know

Q36a. [IF ☐ =2 OR 3 OR 4 OR 5] Before receiving the kit, was your child already…
[DISPLAY ITEMS SELECTED IN ☐]

Q37b.2 [Display IF ☐ = 2] Turning off lights when not in a room
Q37b.3 [Display IF ☐ = 3] Turning off electronics when not using them
Q37b.4 [Display if ☐ = 4] Taking shorter showers
Q37b.5 [Display IF ☐ = 5 [Insert Q37 "other"]_____)

1. Yes
2. No
98. Don't know

Q35. Since receiving your energy kit from Duke Energy, have <u>you or other adults in the home</u> adopted or increased any of the following behaviors to help save energy in your home?

[Multiple response]

1. Not applicable - no new behaviors
2. Turning off lights when not in a room
3. Turning off furnace when not home
4. Turning off air conditioning when not home
5. Changing thermostat settings so heating or cooling system uses less energy
6. Using fans instead of air conditioning
7. Turning off electronics when not using them
8. Taking shorter showers
9. Turning water heater temperature down
10. Other (specify: _____)
11. Don't know

☐b. [IF ☐= 2-10] Before receiving the kit, were you already…

[DISPLAY ITEMS SELECTED IN ☐- [Question labels: ☐b2 – ☐b10]

1. Yes
2. No
98. Don't know

[ASK ☐ IF ☐b2 OR ☐b3 OR ☐b4 OR ☐b5 OR ☐b6 OR ☐b7 OR ☐b8 OR ☐b9 OR ☐b10 = 2]

Q36. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential," how much influence did Duke Energy's kit and materials on saving energy have on this change of energy using behaviors?

0 – Not at all influential	1	2	3	4	5	6	7	8	9	10 – Extremely influential	98 DK

Q37. Since receiving your energy kit from Duke Energy, have you purchased and installed any other **products** or made any improvements to your home to help save energy?

1. Yes
2. No
98. Don't know

[ASK IF Q37 = 1] [IF Q37 = 2 OR 98, SKIP TO Q55]

Q38. What **products** have you purchased and installed to help save energy in your home?

[MULTIPLE RESPONSE]

1. Energy efficient appliances
2. Efficient heating or cooling equipment
3. Efficient windows
4. Insulation
5. Products to seal air leaks in your home
6. Products to seal ducts
7. LEDs and/or CFLs
8. Water heater
9. None – no other actions taken
96. Other, please specify: _____
98. Don't know

[ASK IF Q38= 1-8,96]

Q39. Did you get a rebate from Duke Energy or another entity for any of those products or services? If so, which ones?

[LOGIC] Item	Response
Q39.1 [IF Q38.1 IS SELECTED] 1. Energy efficient appliances	Yes, No DK
Q39.2 [IF Q38.2 IS SELECTED] 2. Efficient heating or cooling equipment	Yes, No DK
Q39.3 [IF Q38.3 IS SELECTED] 3. Efficient windows	Yes, No DK
Q39.4 [IF Q38.4 IS SELECTED] 4. Additional insulation	Yes, No DK
Q39.5 [IF Q38.5 IS SELECTED] 5. Products to seal air leaks in your home	Yes, No DK
Q39.6 [IF Q38.6 IS SELECTED] 6. Products to seal ducts	Yes, No DK

Q39.7 [IF Q38.7 IS SELECTED] 7. LEDs and/or CFLs	Yes, No DK
Q39.8 [IF Q38.8 IS SELECTED] 8. Install an energy efficient water heater	Yes, No DK
Q39.96 [IF Q38.96 IS SELECTED] 96. [**Q38 OPEN ENDED RESPONSE]**	Yes, No DK

[ASK IF ANY ITEM IN Q38 WAS SELECTED AND Q39=NO]

Q40. On a scale of 0 to 10, where 0 means "not at all influential" and 10 means "extremely influential", how much influence did the Duke Energy schools program have on your decision to…

[MATRIX QUESTION: SCALE]

[LOGIC] Item	Response
Q40.1 [IF Q38.1 IS SELECTED] 1. Buy energy efficient appliances	0-10 scale with DK
Q40.2 [IF Q38.2 IS SELECTED] 2. Buy efficient heating or cooling equipment	0-10 scale with DK
Q40.3 [IF Q38.3 IS SELECTED] 3. Buy efficient windows	0-10 scale with DK
Q40.4 [IF Q38.4 IS SELECTED] 4. Buy additional insulation	0-10 scale with DK
Q40.5 [IF Q38.5 IS SELECTED] 5. Seal air leaks in your home	0-10 scale with DK
Q40.6 [IF Q38.6 IS SELECTED] 6. Seal ducts	0-10 scale with DK
Q40.7[IF Q38.7 IS SELECTED] 7. Buy LEDs and/or CFLs	0-10 scale with DK
Q40.8 [IF Q38.8 IS SELECTED] 8. Install an energy efficient water heater	0-10 scale with DK
Q40.96[IF Q38.96 IS SELECTED] **[Q38 open ended response]**	0-10 scale with DK

[ASK IF Q38.1 IS SELECTED AND Q40.1 <> 0, DK]

Q41. What kinds of appliance(s) did you buy?

[MULTIPLE RESPONSE]

1. Refrigerator
2. Stand-alone Freezer
3. Dishwasher
4. Clothes washer
5. Clothes dryer
6. Oven
7. Microwave
96. Other, please specify: _____

[AS*K Q42* IF Q41 = 1-96] [REPEAT Q42 FOR EACH ITEM MENTIONED IN Q41]

Q42. Was the [INSERT Q41 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1 Yes
2 No
98. Don't know

[ASK IF Q41 = 5]
Q43. Does the new clothes dryer use natural gas?

1 Yes - it uses natural gas
2 No – does not use natural gas
98. Don't know

[ASK IF Q41 = 6]
Q45A. Does the new oven use natural gas?

1 Yes - it uses natural gas
2 No – does not use natural gas
98. Don't know

[ASK IF Q38 = 2 AND Q40.2 > 0]
Q44. What type of heating or cooling equipment did you buy?

[MULTIPLE RESPONSE]

1. Central air conditioner
2. Window/room air conditioner unit
3. Wall air conditioner unit
4. Air source heat pump
5. Geothermal heat pump
6. Boiler
7. Furnace
8. WIFI-enabled thermostat
96. Other, please specify: _____
98. Don't know

[ASK IF Q44 = 6-7]
Q45. Does the new [INSERT Q44 RESPONSE] use natural gas?

1. Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know

[ASK IF Q44 = 1-7, 96] QUESTION LABELS: Q46.1, Q46.2, Q46.3, Q46.4, Q46.5, Q46.6, Q46.7, Q46.96
Q46. Was the [INSERT Q44 RESPONSE] an ENERGY STAR or high-efficiency model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[REPEAT Q46 FOR EACH ITEM MENTIONED IN Q44]

[ASK IF Q38 = 3 AND Q40.3 > 0]

Q47. HOW MANY WINDOWS DID YOU INSTALL?

1. [_____] [Numeric Response 1-30
98. Don't know

[ASK IF Q38 = 4 AND Q40.4 > 0]

Q48. Did you add insulation to your attic, walls, or below the floor?

[MULTIPLE RESPONSE]

1. Attic
2 Walls
3 Below the floor
98. Don't know

[ASK IF Q48 <> 98]
[PROGRAMMER: REPEAT Q49 FOR EACH ITEM MENTIONED IN Q48] Q49.1 = ATTIC Q49.2 = WALLS Q49.3 = BELOW THE FLOOR]

Q49. Approximately what proportion of the [ITEM MENTIONED IN Q48] SPACE DID YOU ADD INSULATION TO? Your best estimate is fine.

1 [RECORD AS %] [NUMERIC RANGE 1 – 100]
98 Don't know

[ASK IF Q38 = 7 AND Q40.7 > 0]

Q50. How many of LEDs and CFLs did you install in your property?

1. [NUMERIC RESPONSE 1- 100]
98. Don't know

[ASK IF Q50 > 50)

Q51. You said that you installed [Q53 RESPONSE] LED and CFL bulbs on your property. Is this the correct number?

1. Yes, this is number of LED and CFL bulbs I installed
2. No, the correct number is: _____
98. Don't know

[ASK IF Q38 = 8 IS SELECTED AND Q40.8 > 0]
Q52. Does the new water heater use natural gas?

1 Yes - it uses natural gas
2. No – does not use natural gas
98. Don't know

[ASK IF Q38 = 8 IS SELECTED AND Q40.8 > 0]
Q53. Which of the following water heaters did you purchase?

1. A traditional water heater with a large tank that holds the hot water
2. A tankless water heater that provides hot water on demand
3. A heat pump water heater
4. A solar water heater
5. Other, please specify: _____
98. Don't know

[ASK IF Q38 = 8 AND Q40.8 > 0]
Q54. Is the new water heater an ENERGY STAR model?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

Demographics

Q55. Which of the following types of housing units would you say best describes your home?

1 Single-family detached house
2 Single-family attached home (such as a townhouse or condo)
3 Duplex, triplex or four-plex
4 Apartment or condominium with 5 units or more
5 Manufactured or mobile home
6 Other _____
98. Don't know

Q56. How many showers are in your home? Please include both stand-up showers and bathtubs with showerheads. [SINGLE RESPONSE]

1. One
2. Two
3. Three
4. Four
5. Five
6. More than five
98. Don't know

Q57. How many bathroom sink faucets are in your home? (Keep in mind that some bathrooms may have multiple bathroom sink faucets in them.) [SINGLE RESPONSE]

1. One
2. Two
3. Three
4. Four
5. Five
6. Six
7. Seven
8. Eight or more
98. Don't know

Q58. How many kitchen faucets are in your home? [SINGLE RESPONSE]

1. One
2. Two
3. Three
4. Four or more
98. Don't know

Q59. What is the fuel type of your water heater?

1. Electricity
2. Natural Gas
3. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Q60. How many square feet of living space are there in your residence, including bathrooms, foyers and hallways (exclude garages, unfinished basements, and unheated porches)?

1. Less than 500 square feet
2. 1,000 to under 1,500 square feet
3. 1,500 to under 2,000 square feet
4. 2,000 to under 2,500 square feet
5. 2,500 to under 3,000 square feet
6. 3,000 to under 4,000 square feet

7. Greater than 4,000 square feet
98. Don't know

Q61. Do you or members of your household own your home, or do you rent it?

1. Own / buying
2. Rent / lease
3. Occupy rent-free
98. Don't know

Q62. Including yourself, how many people currently live in your home year-round?

1. I live by myself
2. Two people
3. Three people
4. Four people
5. Five people
6. Six people
7. Seven people
8. Eight or more people
98. Don't know

Q63. What was your total annual household income for 2021, before taxes?

1. Under $15,000
2. 15 to under $25,000
3. 25 to under $35,000
4. 35 to under $50,000
5. 50 to under $75,000
6. 75 to under $100,000
7. 100 to under $150,000
8. 150 to under $200,000
9. $200,000 or more
99. Prefer not to say

Q64. What is the highest level of education achieved among those living in your household?

1. Less than high school
2. Some high school
3. High school graduate or equivalent (such as GED)
4. Trade or technical school
5. Some college (including Associate degree)
6. College degree (Bachelor's degree)
7. Some graduate school

8. Graduate degree, professional degree
9. Doctorate
99. Prefer not to say

Q65. Lastly, did the COVID-19 pandemic, or government or organizational responses to it, offer any challenges to you regarding your participation in this program? If so, what were these challenges, and how do you think they might best be addressed moving forward?

1. Yes: [OPEN-ENDED RESPONSE]
2. No
98. Don't know

CLOSE:

Thank you very much for your time today! On behalf of Duke Energy, thank you for your time in completing this survey. If you were one of the first 100 to complete the survey, you will receive a $5 gift card!

Appendix F Participant Demographics

Home type	%	n
Single-family detached	78%	91
Single-family attached	8%	9
Duplex, triplex, four-plex	1%	1
Apartment or condo 5 units or more	3%	4
Manufactured or mobile home	9%	10
Other	1%	1
Don't know	1%	1
Home size	**%**	**n**
Less than 500 square feet	1%	1
500 to under 1,000 square feet	12%	13
1,000 to under 1,500 square feet	39%	43
1,500 to under 2,000 square feet	23%	25
2,000 to under 2,500 square feet	15%	17
2,500 to under 3,000 square feet	5%	5
Greater than 3,000 square feet	5%	6
Ownership Status	**%**	**n**
Own / buying	84%	97
Rent / lease	16%	18
Occupy rent-free	1%	1
Don’t know	0%	0
Prefer not to say	0%	0
Water Heater Fuel Type	**%**	**n**
Electric	68%	78
Natural Gas	27%	31

Other	4%	5
Household Size	%	n
I live by myself	22%	26
Two people	34%	39
Three people	16%	18
Four people	16%	19
Five people	5%	6
Six people	3%	4
Seven people	1%	1
Eight or more people	0%	0
Prefer not to say	3%	3
Household Income	%	n
Under $20,000	6%	6
20 to under $30,000	11%	11
30 to under $40,000	18%	17
40 to under $50,000	12%	12
50 to under $60,000	13%	13
60 to under $75,000	10%	10
75 to under $100,000	14%	14
100 to under $150,000	12%	12
150 to under $200,000	0%	0
$200,000 or more	2%	2
Education Level	%	n
Less than high school	1%	1
Some high school	2%	2
High school graduate or equivalent (such as GED)	21%	24
Trade or technical school	3%	4
Some college (including Associate degree)	23%	27

College degree (Bachelor's degree)	23%	26
Some graduate school	6%	7
Graduate degree, professional degree	13%	15
Doctorate	4%	5
Prefer not to say	3%	4

Appendix G Participant Responses

Measurement	Carolinas NC	Carolinas SC	Progress NC	Progress SC
Survey Responses	72	29	86	27
Average Occupants per Home	3.56	3.72	3.85	3.70
Electric Water Heater %	61.4%	69.0%	75.3%	96.2%
Showerheads				
Provided	67	26	83	23
Installed	27	13	40	12
Removed	2	2	5	3
Installed %	40.3%	50.0%	48.2%	52.2%
Removed %	7.4%	15.4%	12.5%	25.0%
In-Service Rate	37.3%	42.3%	42.2%	39.1%
Shower per Day (per person)	0.76	0.77	0.78	0.91
Minutes per Shower	13.5	13.4	12.2	9.8
Showerheads per Home	1.94	1.81	2.10	1.74
Kitchen Faucet Aerator				
Provided	70	29	83	26
Installed	22	15	33	16
Removed	3	1	5	2
Installed %	31.4%	51.7%	39.8%	61.5%
Removed %	13.6%	6.7%	15.2%	12.5%
In-Service Rate	27.1%	48.3%	33.7%	53.8%
Bathroom Faucet Aerator				
Provided	70	29	83	26
Installed	25	11	38	10
Removed	3	1	1	0
Installed %	35.7%	37.9%	45.8%	38.5%
Removed %	12.0%	9.1%	2.6%	0.0%
In-Service Rate	31.4%	34.5%	44.6%	38.5%
Water Temperature Gauge Card				
Provided	55	22	60	23
Installed	14	4	13	10
Removed	3	1	2	0

Measurement		Carolinas NC	Carolinas SC	Progress NC	Progress SC
Installed %		25.5%	18.2%	21.7%	43.5%
Removed %		21%	25%	15%	0%
In-Service Rate		20%	14%	18%	43%
4W LEDs					
Provided		98	42	128	42
Installed		63	34	107	32
Removed		3	0	5	0
Installed %		64.3%	81.0%	83.6%	76.2%
Removed %		4.8%	0.0%	4.7%	0.0%
In-Service Rate		61.2%	81.0%	79.7%	76.2%
Base Lamp Wattage		19.87	18.0	18.82	16.7
Daily Hours of Use		2.78	1.47	2.65	0.91
Night Light					
Provided		65	29	76	23
Installed		38	25	62	18
Removed		1	1	1	1
Installed %		58.5%	86.2%	81.6%	78.3%
Removed %		2.6%	4.0%	1.6%	5.6%
In-Service Rate		56.9%	82.8%	80.3%	73.9%
Base Lamp Wattage		2.1	1.5	1.3	1.9
Outlet Insulating Gaskets					
Provided		864	348	1032	324
Installed		141	44	171	98
Removed		0	3	7	8
Installed %		16.3%	12.6%	16.6%	30.2%
Removed %		0.0%	6.8%	4.1%	8.2%
In-Service Rate		16.3%	11.8%	15.9%	27.8%
Behavior					
Turn Off Lights Children	Opportunity	66	26	71	23
	Adoption	35	8	27	13
	Adoption Rate	53.0%	30.8%	38.0%	56.5%
Turn Off Lights Parents	Opportunity	66	26	71	23
	Adoption	10	4	10	5
	Adoption Rate	15.2%	15.4%	14.1%	21.7%

Measurement		Carolinas		Progress	
		NC	SC	NC	SC
Turn Off Electronics Children	Opportunity	66	26	71	23
	Adoption	18	7	16	10
	Adoption Rate	27.3%	26.9%	22.5%	43.5%
Turn Off Electronics Parents	Opportunity	66	26	71	23
	Adoption	10	3	10	11
	Adoption Rate	15.2%	11.5%	14.1%	47.8%
Take Shorter Showers Children	Opportunity	66	26	71	23
	Adoption	11	0	15	3
	Adoption Rate	16.7%	0.0%	21.1%	13.0%
Take Shorter Showers Parents	Opportunity	66	26	71	23
	Adoption	14	3	14	4
	Adoption Rate	21.2%	11.5%	19.7%	17.4%
Change Thermostat Settings Parents	Opportunity	66	26	71	23
	Adoption	11	5	12	12
	Adoption Rate	16.7%	19.2%	16.9%	52.2%
Turn off Air Conditioning Parents	Opportunity	66	26	71	23
	Adoption	10	4	4	5
	Adoption Rate	15.2%	15.4%	5.6%	21.7%
Turn Off Heating Parents	Opportunity	66	26	71	23
	Adoption	7	2	2	3
	Adoption Rate	10.6%	7.7%	2.8%	13.0%
Use Fans Instead of Air Conditioning Parents	Opportunity	66	26	71	23
	Adoption	9	1	7	6
	Adoption Rate	13.6%	3.8%	9.9%	26.1%
Turn Down Water Heater Parents	Opportunity	66	26	71	23
	Adoption	2	0	1	0
	Adoption Rate	3.0%	0.0%	1.4%	0.0%