

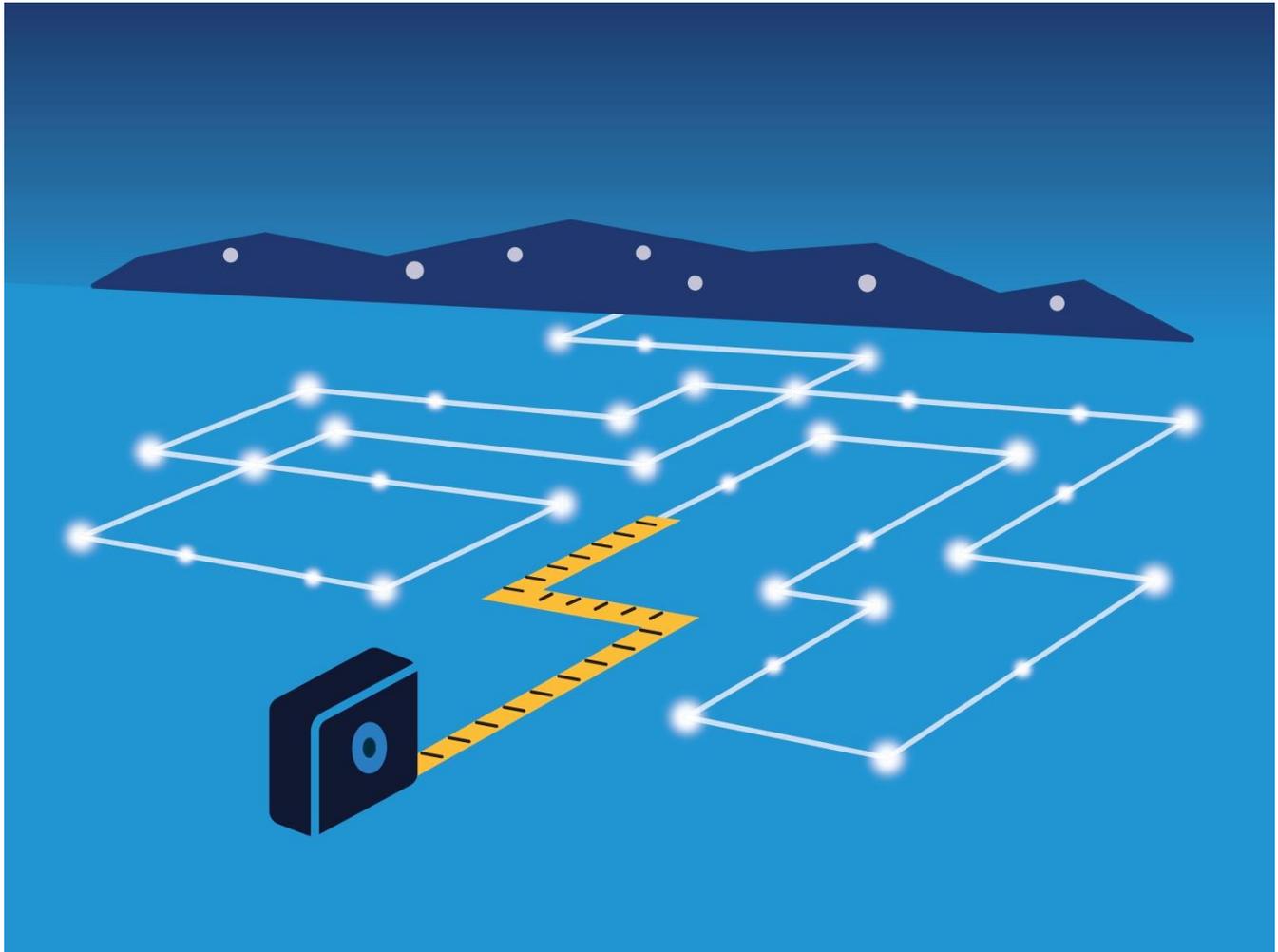


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# CLC and NGRID Education Kits Program Evaluation

Final Report

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# 1. Executive Summary

This report presents the results of Opinion Dynamics' evaluation of the Cape Light Compact (CLC) and National Grid (NGRID) Education Kit programs. The programs provide teachers with lesson plans, in-class activities, and training on energy efficiency topics to incorporate into their science curricula. The primary source of energy savings from the program are take-home kits with energy savings measures provided to students. Since the inception in 2015, CLC has distributed 2,634 kits and plans to distribute 1,100 more in 2017-2018. NGRID distributed 790 kits in the first year of the program.

The National Energy Education Development (NEED) Project is the program implementer for both program administrators (PAs) and is responsible for distributing kits and facilitating teacher training. In addition to NEED Energy Training Solutions (ETS) has been contributing to teacher training and curriculum development for CLC only.

The key objectives of the evaluation were to:

- Estimate energy savings from the energy savings measures offered in the kits;
- Assess program strengths and opportunities for improvement;
- Explore opportunities for additional kit measures and savings; and
- Identify strategies for increasing the evaluability of the program, especially as related to capturing in-service rates (ISRs) for key measures and increasing response rates.

The evaluation team sought to address these objectives by reviewing survey data and deemed savings assumptions, interviewing program and implementation staff, conducting literature review of similar programs delivered in other parts of the country, and conducting in-depth interviews with participating teachers. Notably, while the original scope of work included calculating ISRs, the evaluation team ultimately determined that additional data collection would be necessary to evaluate ISRs.

## Assessment of In-Service Rate and Response Rate

The Education Kits programs face unique limitations and biases when it comes to participant data collection and ISR estimation, social desirability bias and limited ability to solicit feedback from parents being the largest ones. NGRID and CLC currently assume an ISR of 50% for all measures. During this study, it was decided that ISRs developed through only student responses were not acceptably rigorous in Massachusetts at this time. As part of our evaluation, therefore, the evaluation team explored ways to improve methods used to estimate ISR as well as strategies and tactics to improve and increase measure installation. Based on interviews with teachers and program implementers, we found that three key barriers negatively impact the ISR: 1) lack of parent awareness of kit distribution; 2) physical barriers to measure installation, such as rental status of residents; and 3) language barriers. Our research also identified useful supplementary tactics to increase student knowledge and self-efficacy that may ultimately lead to increased measure installation.

NGRID has not claimed any savings from the education kit program to-date. CLC only claims savings from the kits for which they received a completed survey from the student. Such an approach to claiming savings is relatively rare. Of the programs we reviewed as a part of this evaluation, five provided information on how they claim savings. Of these, four claim savings for all kits using survey-based ISR research and only one links claimable savings to completed survey receipt. Given this unique paradigm, exploring survey response rates

and identifying ways to improve them was of paramount importance. As part of the investigation, we explored differences in survey response rates by meaningful breakdowns to understand any differences that exist and identify areas in particular need of improvement.<sup>1</sup> We also leveraged the results of literature review and teacher interviews to identify strategies and tactics to improve survey response rate. Based on interviews with teachers and program staff, we identified two key barriers to increasing survey responses: 1) kits being ordered too close to the end of the year to collect and submit surveys; 2) teachers are lacking time to submit survey results (specific to NGRID); and 3) language barriers.

Based on the research findings, we developed a list of actionable recommendations and considerations that the PAs can pursue to improve ISR and response rate. Because ISR and response rates are closely connected, adopting one tactic may have a positive impact in both areas. As such, we list our recommendations and considerations and specify, for each, applicability to ISR and response rate.

**Table 1. ISR and Response Rate Improvement Recommendations**

Recommendation	Potential ISR Improvements	Potential Response Rate Improvements
To ensure that ISRs pass regulatory scrutiny and are accepted in the state, PAs should incorporate collecting feedback from parents as part of the program implementation process. That can be best done through parent reply cards distributed with the kits. These reply cards could either collect the desired data or ask parent to volunteer for a follow-up phone survey with the evaluation team.	✓	
We recommend a kit distribution deadline of early May to allow time for students to install items and upload survey responses before the end of the school year.		✓

**Table 2. ISR and Response Rate Improvement Considerations**

Consideration	Potential ISR Improvements	Potential Response Rate Improvements
Providing letters or reminders to inform parents of the energy lessons their children are learning and the take-home kits they are receiving can lead to greater engagement of the whole family with the program and ultimately increased measure installation. Providing letters or reminders to parents may also encourage the parent to help the student complete the survey.	✓	✓
Partnering with organizations such as the National Theater for Children and online game vendors that provide additional engagement actions around energy efficiency topics can be a viable tactic to increasing student engagement and promoting measure installation. Notably, these resources are available for no additional cost from public and non-profit organizations.	✓	
Deploying in-language materials that encourage measure installation and inform parents of the energy savings benefits of the kit measures can help boost ISRs and increase program inclusion of unique customer segments. Notably, multiple evaluations and research studies conducted across the country consistently	✓	✓

<sup>1</sup> We should note that, because there were no completed surveys available for NGRID, our analysis of survey response rates was limited to CLC's data.

Consideration	Potential ISR Improvements	Potential Response Rate Improvements
<p>show that linguistically isolated customers are generally underserved through traditional energy efficiency programs and lag behind in their knowledge of energy efficiency and energy efficiency behaviors. Providing an in-language survey may also help students in non-English-speaking households get the assistance they need from parents to complete the survey.</p>		
<p>The PAs should consider a strategy of limiting kits to only households who request them. This would involve including a kit request card with a letter sent home to parents after the student completes the in-class lessons. Parents would request kits online or through a paper form returned to the teacher and could also be asked to give their permission to be contacted for a survey. This approach is beneficial in that it only sends kits to households that have expressed interest in the kits and are thus more likely to install the measures. Requesting parent permission for a follow-up survey also creates the opportunity to verify student survey results and to test for persistence over time (i.e., exploring whether, after initial install, households removed them for some reason). Potential drawbacks of this approach include equitability concerns (i.e., providing kits to some students and not others may create feelings of unfairness among students who do not receive kits) and that shipping kits directly may result in additional costs compared to bulk shipping kits to schools.</p>	✓	
<p>The PAs should consider providing incentives for teachers who achieve high survey response rates or introducing a competition element to classrooms. Incentive strategies are employed by other education kits programs around the country and have been shown to increase survey response rates. Several programs also ask teachers to treat the survey as a homework assignment. Notably, there are concerns around the bias of student survey results when competitions or homework assignments are introduced. However, these can be counteracted by making a signed note from parents an acceptable “completion” of the assignment. These sources of bias have also been addressed in other evaluations by collecting additional parent survey responses to verify the ISRs.</p>		✓
<p>Adopting a lead teacher model, similar to CLC, may assist with some of the time constraints cited by teachers who collected surveys but did not have time to submit them.</p>		✓

### Assessment of Participant Spillover

Opinion Dynamics explored presence of participant spillover by reviewing student/parent responses to the survey included as part of the take-home kit. Our analysis is limited to just CLC participants, since there were no survey respondents for NGRID and we could not complete our own primary data collection activities. The findings indicate opportunity for meaningful spillover savings from the current program interventions and kit configurations. Opportunity for spillover savings primarily stems from lighting and weatherization improvements, based on the student/parent feedback. However, further validation and detail is necessary to confirm that the actions truly qualify as spillover activity and accurately quantify savings from those measures. Opinion Dynamics provided specific improvements to the spillover section of the take-home kit survey. Those improvements will allow the PAs to get a much better idea of the measures qualifying for spillover and the

magnitude of spillover savings. As of the writing of this report, both CLC and NGRID have adapted the recommendations to the survey.

### Assessment of Kit Contents

Our assessment and comparison of other education kit programs across the country reveals that the contents of NGRID and CLC’s kits contain the measures most commonly found in other programs. Removing faucet aerators emerged through our research as an opportunity to improve the existing kits content in light of negative teacher feedback that this measure is difficult to install, and that many households have specialty faucets that the program faucet aerators do not fit. Removing this measure, however, will cause a reduction in the kit’s electric savings by a third for CLC and by about half for NGRID, which is a considerable number.

As part of the kit contents assessment, we also explored possible additions to the kits. Table 9 presents these measures. Also note that the measure cost information is based on data from only one source and has not been vetted through additional research and investigation. The results, therefore, should be used for general guidance purposes.

Table 3. Additional Measure Savings and Costs

Kit Item	Brief Description	Potential Savings					Cost (\$ per item)
		kWh	Gas (mmbtu)	Propane (mmbtu)	Oil (mmbtu)	Water (Gals/yr)	
Advanced smart strip	Power strips automatically turn off devices when they are not in use and reduce both standby and phantom energy consumption for energy savings.	79 – Tier 1	N/A	N/A	N/A	N/A	13.90 – 18.50
		346 – Tier 2					
Door sweeps	Plastic attachments to the underside of doors to seal air flowing into the home and reduce energy loss.	129.75	0.0425	0.0411	0.0402	N/A	1.60
Shower timers	Five-minute timers attach in the shower and help users reduce the length of their showers and conserve water.	289	0.7851	0.7851	0.7851	2471	1.35
Toilet leak detector tablets	Dye tablets which alert users if they have a toilet leak and are wasting water.	N/A	N/A	N/A	N/A	10,958	0.19
Weather-stripping	Applied to doors, windows, or other areas to seal out air leaks and reduce energy loss.	7.425 /ft	0.0468 /ft	0.0449 /ft	0.0446 /ft	N/A	1.29

Given PA interest in pursuing measures with additional savings, opportunities to enhance the kits content are limited in that regard to door sweeps and shower timers. Those two measures are relatively easy to self-install and not costly. While savings from advanced power strips, especially Tier 2, can be significant, they hinge on 1) proper connection of peripheral devices and use of the power strips and 2) presence of peripheral devices with large load (e.g., gaming consoles). Furthermore, the measure is costly and may ultimately not be a cost-effective solution for this program. Weather-stripping may be a difficult measure to include in the kit because of the unknown needs for weather-stripping in a given home. It may be difficult for the PAs to estimate how many linear feet of weather-stripping to include as part of a kit to minimize waste but also not to miss energy savings opportunities. All other measures that our research and investigation identified do not result in energy savings directly but rather contribute to enhanced savings for main measures (e.g., improved operation of the water heater) or lead to spillover-like behaviors.

### **Assessment of Program Processes**

Opinion Dynamics completed a detailed assessment of the program processes. Table 4 on the next page contains our conclusions, recommendations, and suggestions as they pertain to each step in the program delivery process.

Table 4. Conclusions, Recommendations, and Suggestions for Program Process Improvements

Program Delivery Component	Conclusions	Recommendations	Considerations
Initial contact with school	<ul style="list-style-type: none"> <li>■ Overall, initial contact with the school and teacher enrollment was smooth for both programs, despite key differences in approach.</li> <li>■ Engaging lead teachers can help ensure consistency and better coordination of program activities at the school level, but will increase program cost in the form of additional incentives to lead teachers.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ The evaluation team suggests that NGRID consider recruiting lead teachers to coordinate program efforts, such as kit distribution and survey collection.</li> </ul>
Teacher training	<ul style="list-style-type: none"> <li>■ Both PAs' teacher trainings meet national best practices and teachers were highly satisfied with the convenience and content of the training.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ To further promote teacher interest and engagement in the training, the PAs could consider applying through the Massachusetts Department of Education to offer Professional Development Points (PDPs) for training attendance to attract new teachers and add value for returning teachers.<sup>2</sup></li> <li>■ Based on teacher feedback on timing, the evaluation team recommends that CLC and NGRID continue to provide teacher trainings throughout the year to accommodate varying teacher schedules.</li> </ul>

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<sup>2</sup>More information on becoming a provider and a link to the application is available here: <http://www.doe.mass.edu/pd/providers.html>

Program Delivery Component	Conclusions	Recommendations	Considerations
Teacher surveys and stipends	<ul style="list-style-type: none"> <li>■ Both programs offer generous incentives although they differ in whether they are provided to the schools or teachers.</li> <li>■ Both programs have sufficient processes for collecting regular feedback from teachers, though NGRID's process focuses on the training rather than the program as a whole.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ If they would find it useful to have more feedback from teachers, NGRID should consider adding a wrap-up meeting with teachers at the end of each school year to discuss participation experiences.</li> </ul>
Kit order placement	<ul style="list-style-type: none"> <li>■ Both PAs have sufficient kit order processes, though they slightly differ in approach.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any further considerations for changes or improvements for this program component.</li> </ul>
Delivery of in-class curriculum	<ul style="list-style-type: none"> <li>■ The curriculum and in-class activities are well customized to be age- and classroom-appropriate in Massachusetts.</li> <li>■ Teachers were highly satisfied with the curriculum and in-class activities.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any further considerations for changes or improvements for this program component.</li> </ul>
Kit distribution to students	<ul style="list-style-type: none"> <li>■ Both PAs' processes are standard across programs nationwide, though CLC may be missing an opportunity to provide additional information on energy efficiency tips along with the kits.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ CLC should consider adding informational materials to kits on low or no-cost energy-saving behaviors and other CLC programs.</li> </ul>
Kit content installation	<ul style="list-style-type: none"> <li>■ Findings suggest presence of barriers to measure installations that span beyond simple reluctance to install measures.</li> </ul>	<ul style="list-style-type: none"> <li>■ Please refer to the recommendations and considerations on improving ISRs provided in Section 6.2.</li> </ul>	<ul style="list-style-type: none"> <li>■ Please refer to the recommendations and considerations on improving ISRs provided in Section 6.2.</li> </ul>
Survey completion	<ul style="list-style-type: none"> <li>■ NEED received no survey responses from NGRID's participating teachers in 2017-2018, which may partly be driven by time constraints among teachers preventing them from submitting the surveys to NEED.</li> </ul>	<ul style="list-style-type: none"> <li>■ Please refer to the recommendations and considerations on improving survey response rates provided in Section 6.3.</li> </ul>	<ul style="list-style-type: none"> <li>■ Please refer to the recommendations and considerations on improving survey response rates provided in Section 6.3.</li> </ul>

Program Delivery Component	Conclusions	Recommendations	Considerations
Teacher reminders	<ul style="list-style-type: none"> <li>Both programs have sufficient follow-up processes to remind teachers to submit surveys.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any further considerations for changes or improvements for this program component.</li> </ul>
Teacher incentives	<ul style="list-style-type: none"> <li>CLC provides a generous incentive to lead teachers.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have evidence stating whether this level of incentive is necessary but we do not recommend removing the incentive from the CLC program as this may have a negative effect on teacher participation. Should NGRID decide to adopt the lead teacher model per our earlier recommendation, we suggest that NGRID consider whether it is cost-effective for their program to incentivize lead teachers at this level.</li> </ul>
Wrap-up meetings with teachers	<ul style="list-style-type: none"> <li>Wrap-up meetings are a helpful process for program implementers to collect regular feedback from teachers.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We recommend that NGRID consider adding this process, if cost-effective, and that CLC continue implementing this process.</li> </ul>

## Assessment of Program Evaluability

The evaluability of the education kits program hinges on the ability to collect program specific data on the kit measure installation and operation. As such, we focused our assessment on the improvements to the data collection practices and survey design as a way to ensure collection of valid and reliable program detail on participant behaviors that will pass PA and Energy Efficiency Advisory Council consultant scrutiny. As a result of the assessment with provided detailed recommendations elated to the data collection practices and approaches as part of the ISR and response rate assessment section above. As part of this area, we worked with the PAs to make revisions to the survey instruments. Both CLC and NGRID adopted our recommendations and revisions to the survey instruments as of the writing of this report.

## 2. Introduction and Research Objectives

This report presents the results of the first evaluation of the Cape Light Compact (CLC) and National Grid (NGRID) Education Kit programs. The key objectives of the evaluation were to:

- Estimate energy savings from the energy savings measures offered in the kits;
- Assess program strengths and opportunities for improvement;
- Explore opportunities for additional kit measures and savings; and
- Identify strategies for increasing the evaluability of the program, especially as related to capturing in-service rates (ISRs) for key measures and increasing response rates.

With the key objectives in mind, the evaluation addressed the following research questions.

- Are the current deemed savings for the kit measures accurate or are updates necessary?<sup>3</sup>
- What additional savings, if any, can be claimed for the draft stoppers and temperature cards?
- What is the ISR for the relevant key measures?
- Have households taken additional energy-saving actions or participated in other programs since receiving the kits/educational collateral? Is there potential for spillover savings?
- What other non-lighting measures could provide energy savings through the program?
- What are the similarities and differences between the CLC and NGRID program designs and implementation processes? What are the strengths of each program?
- What process changes could be made to improve ISRs?
- What process changes could be made to improve participant survey response rates?
- What additional support (e.g., information, technical support, materials) would teachers like to have to teach their students about saving energy?
- What additional information (provided in the classroom or with the kits) would help households save more energy?
- What data-tracking process improvements could be implemented to help in future evaluations?
- What improvements to take-home survey design could be made to improve the data collection process and evaluability of results?

Notably, while the original scope of work included calculating ISRs, the evaluation team ultimately determined that additional data collection would be necessary to evaluate ISRs.

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<sup>3</sup> This research question was addressed in an interim memo delivered in May 2018.

### 3. Program Overview

NGRID launched its Education Kit program in 2016 and CLC launched its program in 2015. The programs provide teachers with lesson plans, in-class activities, and training on energy efficiency topics to incorporate into their science curricula. The primary source of energy savings from the program are take-home kits with energy savings measures provided to students. The National Energy Education Development (NEED) Project is the program implementer for both program administrators (PAs) and is responsible for distributing kits and facilitating teacher training. In addition to NEED Energy Training Solutions (ETS) has been contributing to teacher training and curriculum development for CLC only.

The content of the take-home kits varies by PA and includes LEDs, faucet aerators, outlet seals, refrigerator, freezer, water, and thermostat temperature cards, flow rate test bags, and showerheads. In addition to the energy saving measures, each kit contained a paper survey instructing students to complete it with help of their parents, if needed, and return to their teacher. The paper survey includes questions about measure installation, household characteristics, and energy saving behaviors.

Since the program’s inception in 2015, CLC has distributed 2,634 kits and plans to distribute 1,100 more in 2017-2018. NGRID distributed 790 kits in the first year of the program. Table 5 provides a distribution of kits across grade levels for each PA and program year. As can be seen in the table, CLC either distributed or plans to distribute nearly half of its kits to high school students (47%) and another 46% to middle school students. Conversely, NGRID distributed 62% of all kits to elementary school students, 36% to middle school students, and a small number of high school students.

Table 5. Kit Distribution by School Level

Measure	CLC			NGRID	
	2015-2016	2016-2017	2017-2018 (Planned)	2016-2017	2017-2018 (Planned)
<b>Kits</b>	<b>1,202</b>	<b>1,432</b>	<b>1,100</b>	<b>790</b>	<b>TBD</b>
Elementary	180	50	62	493	-
Middle	165	500	1,038	285	-
High	857	882	0	10	-

Note: In addition to the kits distributed to schools, NGRID gave out two kits in 2016-2017 to a non-profit organization.

## 4. Methodology Overview

To answer the study research questions, Opinion Dynamics completed the following range of research and analytical activities:

- Review of program materials;
- Deemed savings review;
- Analysis of the implementer-collected survey data;
- Literature review;
- Program staff and implementer interviews; and
- Teacher Interviews.

Below, we provide a detailed description of each task.

### Program Materials Review

The evaluation team reviewed program collateral, lesson plans, and other relevant program materials to gain a better understanding of the of the programs' implementation. We also reviewed the take-home surveys for both programs and provided recommended revisions to the PAs.

### Deemed Savings Review

We reviewed, for each kit measure, deemed savings values and provided alternative savings estimates where reasonable and feasible.

### Analysis of the Implementer-Collected Survey Data

Opinion Dynamics completed a detailed analysis of CLC take-home kit survey responses<sup>4</sup> to assess the presence of additional energy saving actions taken by the families (spillover) and collect information on CLC household characteristics for the deemed savings review.

### Literature Review

Opinion Dynamics completed a review of past evaluations and other reports of similar programs across the country to identify recommendations for new measures, identify improvements to information sent with the kits, and identify strategies for improving ISRs, survey response rates and the evaluability of the programs. Throughout this task, we closely collaborated with the PAs to ensure that the course of our investigation and exploration was of the greatest value and impact. The sources reviewed for this analysis can be found in Appendix A.

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<sup>4</sup> There were no completed surveys for NGRID.

## Program Staff and Implementer Interviews

The evaluation team conducted a total of four interviews in April 2018 with CLC and NGRID program implementation staff as well as their program partners, NEED and ETS. The purpose of the program staff interviews was to understand program processes and survey data collection strategies, collect feedback on program successes and challenges, and identify potential process improvements. Interviews with the implementation partners focused on gaining a more detailed understanding of the delivery of teacher training, classroom curriculum, and the kits.

## Teacher Interviews

The evaluation team completed a total of nine interviews with teachers who have attended the training and used the NEED curriculum in class.<sup>5</sup> Of those, six interviews were with teachers participating in CLC's program and three were with teachers participating in NGRID's program. The interviews focused on assessing teacher satisfaction with the training, curriculum, and in-class activities, as well as strategies teachers use to encourage students to install kit measures and complete the survey.

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<sup>5</sup> A total of 36 teachers participated in the CLC program and 24 participated in the NGRID program (60 total).

## 5. Research Limitations

The evaluation faced a series of limitations with data availability and potential biases in the data collection tasks.

- **Participant access:** The PAs are prohibited from contacting students' households unsolicited for evaluation purposes. As such, Opinion Dynamics was limited in the ability to verify measure installation and persistence and develop an independent estimate of the ISR.
- **Data availability:** Responses from the take-home kit survey were available for just CLC. Consequentially, the survey data leveraged by this study only represents CLC participants from the 2015-2016 and 2016-2017 program years and may not adequately reflect the behaviors of NGRID program participants.
- **Self-report bias:** Since some students receive homework credit for their survey completion, there is a potential for students to report installing measures when they did not if they believe it will contribute to their grade or if they view it as a socially desirable response.
- **Non-response bias:** Of all surveys distributed with the CLC kits, a third (34%) were returned and available for analysis. Such a response rate may signal a presence of non-response bias if students who did not return the surveys behaved differently than those who returned the surveys.

## 6. Detailed Findings

This section presents the detailed findings from the research and analytical activities that Opinion Dynamics completed.

### 6.1 Current Education Kits Savings Assessment

Opinion Dynamics developed energy savings estimates for the measures provided as part of the take-home kits and provided those in a separate memo deliverable in May 2018. To avoid duplication of information, we do not provide the results of our analysis and assessment in this report.

### 6.2 In-Service Rate Assessment

#### 6.2.1 Detailed Findings

One of the key objectives of this evaluation was to develop an independent estimate of the ISR for the relevant measures in the kit. Traditional impact evaluations rely on surveys with program participants to verify program measure installation and persistence and develop an evaluation-verified estimate of the ISR. Education kit programs are unique in that the recipients of the kit measures and educational interventions from the program are students and the evaluation team's ability to solicit feedback from students is generally limited. As such, common approaches to developing ISRs is through the feedback from students collected by program implementers. There are concerns, however, about student responses being disproportionately impacted by social desirability bias compared to self-report data collected from other groups (e.g., parents). For instance, in an effort to present themselves as more energy conscious to their teachers and fellow students and/or to earn credits toward their classes, students may be inclined to say that they installed the kit measures when in reality they did not. Thus, to increase the rigor of the ISR results, some evaluations have supplemented ISR information collected from students with the measure installation data collected from parents.

Our review of seven education kits program reports and two cross-program best practices reviews identified five programs with information on how they estimate ISRs for their program. As shown in Table 6, a student survey implemented by the program is the most common approach to developing an estimate of program ISRs.

Table 6. Sources of Program ISR

Program Name	Implementer Collected		Evaluator Collected Parent Survey
	Student Survey	Parent Survey	
Commonwealth Edison (ComEd) Kit Program	✓	✓	
Ameren Illinois School Kits Program	✓		
Ohio Energy Program	✓		
LivingWise	✓		
Energizing Indiana (six territories)	✓		✓

NGRID and CLC currently assumes an ISR of 50% for all measures. During this study, it was decided that ISRs developed through only student responses were not acceptably rigorous in Massachusetts at this time. As part of our evaluation, therefore, the evaluation team explored ways to improve methods used to estimate ISR as well as strategies and tactics to improve and increase measure installation.

As can be seen in Table 6 above, two programs relied on parent feedback in addition to the student feedback to verify student responses and develop a more rigorous estimate of the ISR. For the ComEd program, such feedback was gathered by the implementer through a reply card sent with the survey and was specifically aimed at collecting ISR information on a specific measure (smart strips), program satisfaction, and the clarity of installation instructions. The evaluation of the Energizing Indiana program conducted parent surveys to verify student ISRs, ultimately taking the average of the student and parent ISRs since both efforts had different sources of potential bias based on survey timing. We view this as an effective way to collect data on measure installation along with other aspects of program performance.

Notably the ComEd program only distributes kits to parents who request them via a paper form sent home with the students. This strategy may boost ISRs by avoiding sending kits to households that have physical barriers to installation (e.g., renters who believe they cannot install the measures) or are otherwise disinclined to install the measures. However, this approach has some drawbacks as well, such as equitability concerns (i.e., it may create feelings of unfairness among students who do not receive kits) and that there may be additional costs associated with shipping kits directly to homes rather than in-bulk to schools.

Our literature review identified several supplementary tactics to increase student knowledge and self-efficacy that may ultimately lead to increased measure installation. While there is no clear evidence linking these tactics to increased ISRs, the tactics do not detract from program cost-effectiveness since they are free resources. Some examples of these include the following.

- **Online energy education activities:** By partnering with ENERGY STAR® or a similar provider of online educational activities, other programs gained access to online games and educational resources at no cost. These additional resources supplemented the curriculum with energy lessons completed at home, reducing the separation between the lessons learned at school and the installation of the measures at home. (See Figure 3 Appendix D for an example)
- **Energy education theater:** Some school programs partner with a group called the National Theater for Children (NTC) who put on a comedy performance called "The Resource Force" at a school assembly at no cost to the school. This interactive performance reinforces the lessons learned about energy savings and is accompanied by similar energy education materials and activities. In a recent evaluation of this program<sup>6</sup>, over 400 teachers gave near-perfect ratings on average of the performances' overall education value and the ability of the performance to increase student retention of the lessons, as well as a high rating for the performance's stimulation of class discussion.

Through the teacher feedback, we found the following to be the key challenges to measure installation.

- **Lack of parent awareness of the kit distribution:** Three teachers that we interviewed said that one of the reasons for low ISRs is parents being unaware of the kits being sent home. They said this was due to parents not being home when students get home, parents not speaking English, and students not telling parents they received the kits.
- **Physical barriers to measure installation:** Two teachers mentioned several physical barriers that stand in the way of kit measure installation, including renting homes, safety concerns with students installing draft stoppers on outlets, and the inability to bring glass LEDs on to school buses (one teacher).

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<sup>6</sup> Navigant Consulting. *ComEd National Theatre for Children's Middle School Kits Program Evaluation Report*. January 2017.

- **Language barriers.** Two teachers reported that language barriers and lack of in-language materials can be detrimental to measure installation. Since program materials and installation instructions are not provided in English, non-English speaking families may not be able to understand how or why they should install the take-home measures, nor will they be able to complete the surveys with their children.

## 6.2.2 Conclusions, Recommendations, and Considerations

Education kits programs face unique limitations and biases when it comes to participant data collection and ISR estimation, with social desirability bias and the limited ability to solicit feedback being the largest ones.

Based on these conclusions, we provide the following **recommendation**.

- To ensure that ISRs pass regulatory scrutiny and are accepted in the state, PAs should incorporate collecting feedback from parents as part of the program implementation process. That can be best done through parent reply cards distributed with the kits. These reply cards could either collect the desired data or ask parents to volunteer for a follow-up phone survey with the evaluation team.

Based on the results from the literature review and teacher interviews, we also provide the following enhancements for the PAs to **consider**.

- Informing parents of the energy lessons their children are learning and the take-home kits they are receiving can lead to greater engagement of the whole family with the program and ultimately increased measure installation. This can also serve as a reminder to parents to help the student complete the survey.
- Partnering with organizations such as the NTC and online game vendors that provide additional engagement actions around energy efficiency topics can be a viable tactic to increasing student engagement and promoting measure installation. Notably, these resources are available for no additional cost from public and non-profit organizations.
- Deploying in-language materials that encourage measure installation and inform parents of the energy savings benefits of the kit measures can help boost ISR and increase program inclusion of unique customer segments. Notably, multiple evaluations and research studies conducted across the country consistently show that linguistically isolated customers are generally underserved through traditional energy efficiency programs and lag behind in their knowledge of energy efficiency and energy efficiency behaviors.
- The PAs should consider a strategy of limiting kits to households who request them. This would involve including a kit request card with a letter sent home to parents after the student completes the in-class lessons. Parents would request kits online or through a paper form returned to the teacher and could also be asked to give their permission to be contacted for a survey.

## 6.3 Response Rate Assessment

### 6.3.1 Detailed Findings

NGRID has not claimed any savings from the education kit program to-date and received no responses to their survey in 2017-2018. Further, while CLC received a 34% response rate overall (see Table 7), CLC can only claim savings from the kits for which they received a completed survey. Such an approach to claiming savings

is relatively rare. Of the programs we reviewed as a part of this evaluation, five provided information on how they claim savings. Of these, four claim savings for all kits using survey-based ISR research and only one links claimable savings to completed survey receipt. Given this unique paradigm, exploring survey response rates and identifying ways to improve them was of paramount importance. As part of the investigation, we explored differences in survey response rates by meaningful breakdowns to understand any differences that exist and identify areas in particular need of improvement.<sup>7</sup> We also leveraged the results of literature review and teacher interviews to identify strategies and tactics to improve survey response rate.

Our analysis of survey response rates shows that, overall, a third of students who received kits completed a survey. There are meaningful differences in response rates by school level (see Table 7), with elementary school level having the lowest response rate (11%), followed by high school level (24%). Analysis of response rates by teacher showed high degree of variation. This suggests that both teachers and students can be contributing to low response rates.

Table 7. Survey Response Rate by School Level

School Level	Survey Response Rate	Total Kits
Elementary (Six teachers)	11%	230
Middle (Six teachers)	41%	1,739
High (Two teachers)	24%	665
<b>Overall (14 teachers)</b>	<b>34%</b>	<b>2,634</b>

Base: 14 CLC teachers in 2015-16 or 2016-17 who distributed kits. Excludes 22 teachers who received training but did not distribute kits.

Note: According to data provided by CLC, one teacher achieved response rates over 100%. This may be due to a data entry error. The evaluation team truncated the value to 100%.

As part of the CLC program, surveys are provided in paper form and responses can be provided either at school or at home. There is no clear pattern in the response rates achieved between teachers who allowed online submissions at home versus teachers who required surveys to be returned to school and uploaded online, which suggests that offering to complete surveys at home may not be a meaningful strategy for increasing response rates.

Through our evaluation of both programs as well as a review of other program designs, the evaluation team has identified key areas to improve survey response rates.

- **Deadlines and lead teachers:** Both programs ship kits on-demand when teachers are ready to incorporate the curriculum into their lessons. As mentioned by NGRID, another challenge that both programs faced was having some kits ordered and distributed too late in the school year to allow enough time for survey collection afterward. While setting windows or a uniform date for kit distribution proved infeasible, as classrooms vary in when they implement the curriculum, it may be necessary to set a deadline to distribute the kits in order to leave enough time to facilitate survey collection. Further, discussions with NEED and a review of e-mail correspondence between NEED and teachers revealed that several teachers collected surveys from students but never provide them to NEED, in some cases

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<sup>7</sup> We should note that, because there were no completed surveys available for NGRID, our analysis of survey response rates was limited to CLC's data.

due to a lack of time. Thus, recruiting lead teachers to coordinate this effort may help improve response rates.

- **Teacher incentives and classroom competitions:** Through a review of other school kits programs, we found that education kit programs elsewhere that provided incentives for teachers who achieved a certain level of response achieved between 51% and 85% response rates.<sup>8</sup> If the cost-effectiveness of incentives is a concern, a potential alternative is to leverage competition between classrooms or schools, where classes with higher response rates can win prizes. This strategy provides a direct incentive to the students who are ultimately responsible for returning the completed survey. However, the competition strategy may require steps to counteract potential bias associated with students providing false responses to win a prize or competition. A potential solution includes asking teachers to accept a signed note from parents stating that they received the kit but did not install anything, which is a strategy that several teachers mentioned they already employ.
- **Homework assignments or extra credit:** Four out of nine interviewed teachers mentioned that they treat survey responses as a homework assignment or as an opportunity to earn “extra credit” on a future assignment. The evidence that this is a successful strategy is limited but it is notable that three teachers who achieved high to medium response rates offered extra credit for survey completion whereas two teachers who had low response rates did not offer credit. However, similar to competitions, this strategy may introduce significant potential bias in survey results and is reliant on teachers to communicate that installing measures is not a requirement of the assignment.
- **Multilingual materials:** Similar to suggestions from teachers around ISRs, two teachers (one from each program) suggested that creating non-English surveys may also improve the ability of students to complete the surveys with their parents if they have non-English-speaking households. The two explained that this is especially an issue when students cannot not receive help from non-English-speaking family members about technical questions regarding the home (e.g., water heater type).

### 6.3.2 Conclusions, Recommendations, and Considerations

Based on these conclusions, we provide the following **recommendations**.

- We recommend a kit distribution deadline of early May to allow time for students to install items and upload survey responses before the end of the school year. If teachers who participate in a spring teacher training plan to implement the program in the following school year, the PAs should require teachers to notify them to account for these kits and send reminders to improve survey collection efforts in the following school year.

Based on the results from the literature review and teacher interviews, we also provide the following enhancements for the PAs to **consider**.

- The PAs should consider providing incentives for teachers who achieve high survey response rates or introducing a competition element to classrooms. Incentive strategies are employed by other education kits programs around the country and have been shown to increase survey response rates. Several programs also ask teachers to treat the survey as a homework assignment. Notably, there are concerns around the bias of student survey results when competitions or homework assignments are

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<sup>8</sup> Opinion Dynamics. (2017). Evaluation of 2015 Ameren Illinois Company Residential Energy Efficiency School Kits Program.

introduced. However, these can be counteracted by making a signed note from parents an acceptable “completion” of the assignment. These sources of bias have also been addressed in other evaluations by collecting additional parent survey responses to verify the ISRs.

- Similar to ISRs, an in-language survey may help students in non-English-speaking households get the assistance they need from parents to complete the survey. Providing letters or reminders to parents may also encourage the parent to help the student complete the survey.
- Adopting a lead teacher model, similar to CLC, may assist with some of the time constraints cited by teachers who collected surveys but did not have time to submit them.

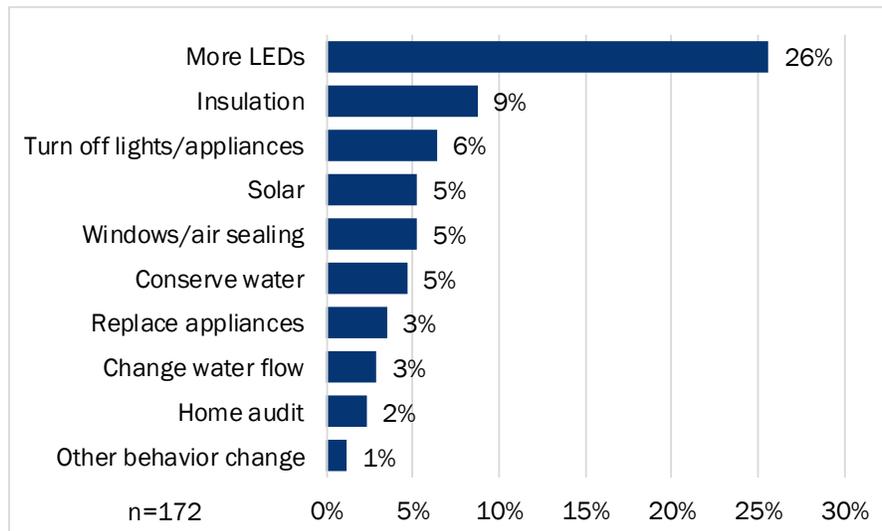
## 6.4 Assessment of Spillover Presence

### 6.4.1 Detailed Findings

Opinion Dynamics explored presence of participant spillover by reviewing responses to the survey included as part of the take-home kit. Our analysis is limited to just CLC participants since there were no survey respondents for NGRID and we could not complete our own primary data collection activities.

In the CLC survey, participants were asked if they had made other changes or have planned to make other changes in their home as a result of participating in the program. Approximately one in five participants in 2016-17 (21%, n=404) and nearly a quarter of participants in 2015-16 (24%, n=521) reported doing so. Of those who took additional actions to improve the energy efficiency of their homes and could report exact actions taken, a quarter (26%, n=172) reported installing or planning to install additional LEDs. Other common actions include insulating homes and taking behavioral actions, such as turning off lights and appliances (see Figure 1).

Figure 1. Reported Spillover Actions



Base: Respondents who reported taking or planning an action.

Additionally, 22% of the respondents who took additional actions reported non-specific actions that they planned to take (e.g. “being more energy efficient”). Six percent reported that they received (or planned to receive) a home audit from CLC.

## 6.4.2 Conclusions, Recommendations, and Considerations

The findings indicate opportunity for meaningful spillover savings from the current program interventions and kit configurations. Opportunity for spillover savings primarily stem from lighting and weatherization improvements based on the survey data. However, further validation and detail is necessary to confirm that the actions truly qualify as spillover activity and accurately quantify savings from those measures. Opinion Dynamics provided specific improvements to the spillover section of the student/parent survey (see Section 6.7 of this report). Those improvements will allow the PAs to get a much better idea of the measures qualifying for spillover and the magnitude of spillover savings. As of the writing of this report, both CLC and NGRID have adapted the recommendations to the survey.

## 6.5 Kit Design Assessment

### 6.5.1 Assessment of Existing Kit Measures

Table 8 provides a comparison of each PA's kit contents. Our assessment and comparison of other education kit programs across the country reveals that the contents of NGRID and CLC's kits contain the measures most commonly found in other programs - LEDs, faucet aerators, and showerheads (NGRID only) - as well as some measures less commonly provided but that result in energy savings, namely temperature cards.

Table 8. Kit Contents by PA

Measure	CLC	NGRID
LEDs	3	2
Faucet aerators	2	2
Outlet seals (Pack of 12)	1	1
Refrigerator temperature cards	1	1
Freezer temperature cards	1	1
Thermostat temperature cards	1	Not offered
Flow rate test bags	1	Not offered
Hot water temperature cards	1	1
Showerheads	Not offered	1

As part of the interviews with teachers, we explored their experiences with and feedback on the kit content. A few had suggestions for improving the kit contents. Three teachers said the faucet aerators were not popular since they were difficult to install or did not fit in the homes. Two teachers recommended simplifying kits so that not as much parent involvement was necessary for installing the measures. One teacher said that when students are required to do more than simply screw in a light bulb (e.g., installing draft stopper outlet seals) then they are less likely to do it at all. Another teacher's suggestion to simplify the kit was rooted in a concern for safety, particularly for students at the elementary school level being required to unscrew outlets to install the outlet seals.

### 6.5.2 Additional Measure Assessment

CLC and NGRID are interested in fostering a statewide discussion about additional kit components, with a focus on non-lighting measures and measures that fit in a kit and are easy and safe for children to install. Thus, instead of explicit measure recommendations from the evaluation team, they requested that the additional measures research be presented as a collection of items for consideration by all the Massachusetts

PAs. We relied on the literature review to develop a list of measures that are either offered as part of the kits or could be a possible fit given the criteria described above. For each measure, we performed an engineering review to provide energy savings (where applicable). In addition, we obtained measure cost information from NEED with the purpose of providing initial insight on measure costs to the PAs.

Table 9 presents these measures and Appendix A includes a full list of sources used to develop the savings estimates. Please note that measure savings are not adjusted for ISR. Also note that the measure cost information is based on data from only one source and has not been vetted through additional research and investigation. The results, therefore, should be used for general guidance purposes.

Table 9. Additional Measure Savings and Costs

Kit Item	Brief Description	Potential Savings					Cost (\$ per item)
		kWh	Gas (mmbtu)	Propane (mmbtu)	Oil (mmbtu)	Water (Gals/yr)	
Advanced smart strip	Power strips automatically turn off devices when they are not in use and reduce both standby and phantom energy consumption for energy savings.	79 – Tier 1	N/A	N/A	N/A	N/A	13.90 – 18.50
		346 – Tier 2					
Door sweeps	Plastic attachments to the underside of doors to seal air flowing into the home and reduce energy loss.	129.75	0.0425	0.0411	0.0402	N/A	1.60
Shower timers	Five-minute timers attach in the shower and help users reduce the length of their showers and conserve water.	289	0.7851	0.7851	0.7851	2471	1.35
Toilet leak detector tablets	Dye tablets which alert users if they have a toilet leak and are wasting water.	N/A	N/A	N/A	N/A	10,958	0.19
Weather-stripping	Applied to doors, windows, or other areas to seal out air leaks and reduce energy loss.	7.425 /ft	0.0468 /ft	0.0449 /ft	0.0446 /ft	N/A	1.29

Given PA interest in pursuing measures with additional savings, opportunities to enhance the kits content are limited in that regard to door sweeps and shower timers. Those two measures are relatively easy to self-install and not costly. While savings from advanced power strips, especially Tier 2, can be significant, they hinge on 1) proper connection of peripheral devices and use of the power strips and 2) presence of peripheral devices with large load (e.g., gaming consoles). Furthermore, the measure is costly and may ultimately not be a cost-effective solution for this program. Weather-stripping may be a difficult measure to include in the kit because

of the unknown needs for weather-stripping in a given home. It may be difficult for the PAs to estimate how many linear feet of weather-stripping to include as part of a kit to minimize waste but also not to miss energy savings opportunities. All other measures that our research and investigation identified do not result in energy savings directly but rather contribute to enhanced savings for main measures (e.g., improved operation of the water heater) or lead to spillover-like behaviors.

## Recommendations, and Considerations

We do not provide recommendations on the new measure additions but rather present all options and leave it to the PAs to consider them as they plan future program interventions. As a consideration for future program design, PAs can consider removing the faucet aerator measure from the kits in light of negative teacher feedback that this measure is difficult to install and that many households have specialty faucets that the program faucet aerators do not fit. We should note, however, that by removing this measure the kit deemed electric energy savings, as they currently stand, will reduce by a third for the CLC program and by about half for the NGRID program, which is a considerable number.

## 6.6 Program Implementation Assessment

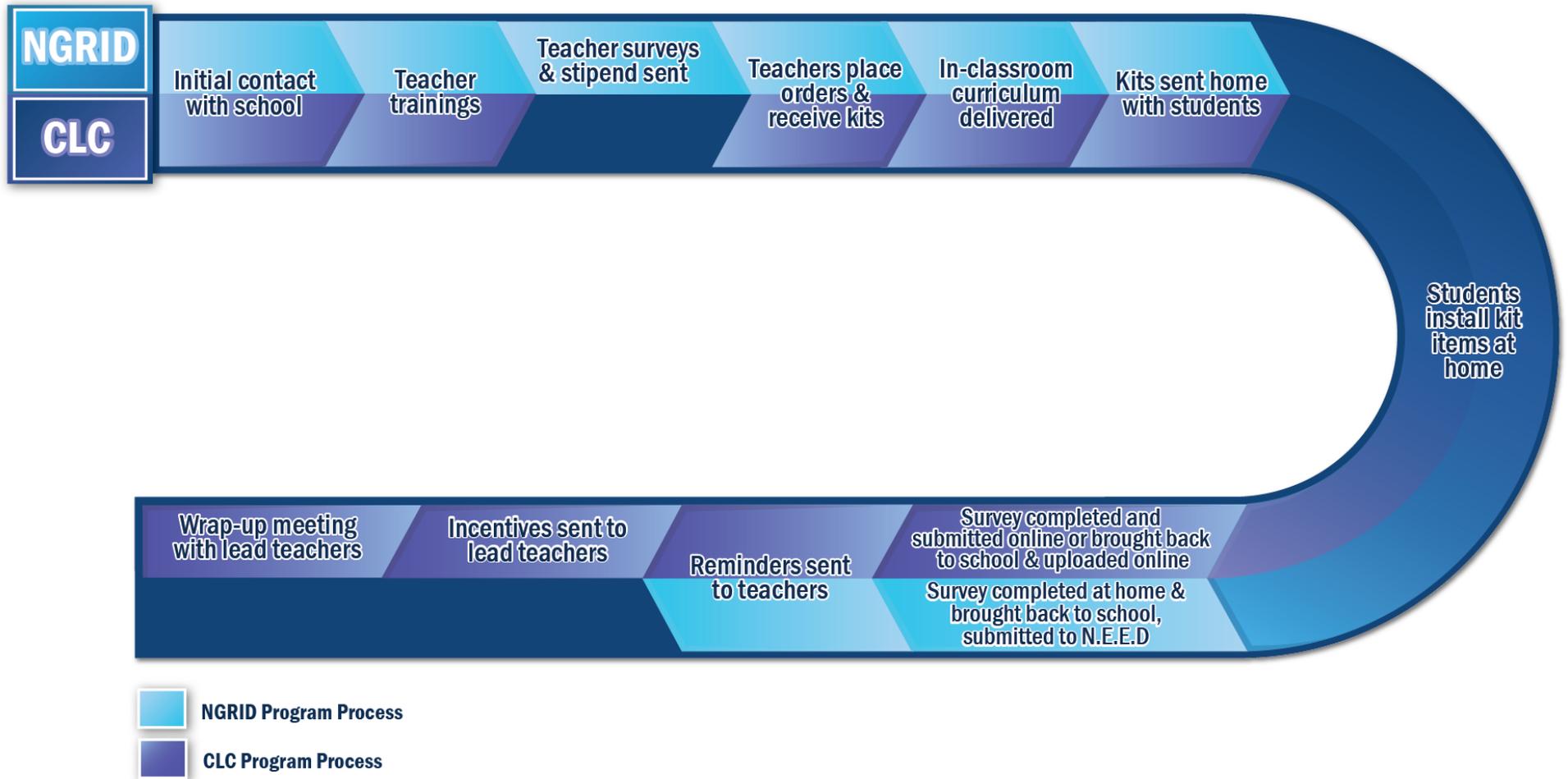
### 6.6.1 Detailed Findings

The CLC and NGRID programs follow largely the same program delivery process. Based on our review of NEED program materials and discussion with NEED staff, the delivery process is also similar to school kits programs nationwide, especially those that partner with the NEED program<sup>9</sup>. Figure 2 below provides a visual overview of the key meaningful and distinct program delivery and participation steps for each PA's program. Following the figure, we provide a brief description of the activities undertaken as part of each step, highlight and comment on the differences in program delivery between the two PAs, bring additional information from the literature review, where available and meaningful, and highlight teacher feedback where relevant.

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<sup>9</sup> This was concluded through a review of NEED program materials and discussion with NEED staff. (<http://www.need.org/curriculum>)

Figure 2. Program Process Comparison



## Initial Contact with School

During this step, PAs and NEED establish initial contact with the schools selected to participate in the program. Both programs leverage teacher networks to identify interested schools and teachers. Some of these networks are established by the program over time (e.g., CLC conducts initial outreach via their Teacher Advisory Board) and some are pre-existing industry groups (e.g., NEED conducts outreach via the Massachusetts Science Teachers Association). Ultimately, specific schools are identified based on target districts within the PAs' service territories and letters are sent directly to these teachers. These outreach strategies are used by NEED across their national programs and neither program's staff mentioned facing challenges related to recruiting schools and teachers.

CLC and NGRID use differing approaches to teacher communication and coordination. CLC selects "lead teachers" for each school who act as liaisons with the school and help coordinate program activities ranging from mobilizing the other teachers in the school, coordinating kit ordering, providing participant surveys back to the implementer, and offering overall program-related support. To incentivize the teachers for doing additional work, CLC offers a \$1,000 per teacher incentive for three years of participation. Interviews with the CLC program implementer and teachers revealed that the lead teacher allowed for coordinated and consistent program activities at the school level, notably making sure that students uploaded survey responses to the online platform. Conversely, NGRID does not establish lead teachers at participating schools and relies on individual teachers to order kits and upload survey data individually. When asked about the idea of adding lead teachers, NGRID staff reported that lead teachers may not be a helpful addition because teachers are generally not always teaching the curriculum and ordering the kits at the same time. Further, it is unclear whether adding lead teachers and/or incentivizing them would compromise the cost-effectiveness of the NGRID program.

## Teacher Trainings

Both PAs offer teacher trainings that include but are not limited to giving teachers hands-on experience with the in-class activities, educating teachers about energy topics associated with the program, and getting the teachers oriented with the take-home kits and how to facilitate kit distribution and survey data collection. NEED facilitates all NGRID training and this training is consistent with what NEED provides for programs across the country. In addition, ETS provides support to energy education programs in other states and offers the same support for the Massachusetts programs. While NEED has recently organized training for CLC teachers, CLC historically has facilitated most of their training with assistance from staff at ETS. Both CLC and NGRID trainings are rooted in a nationwide best practice of teaching energy science topics to teachers and workshopping the in-class activities with teachers to help them apply the Massachusetts state standards when they implement the curriculum.

NEED runs six to eight trainings during the calendar year across a variety of regions. CLC holds trainings two to three times a year in different locations in their territory. All interviewed teachers found the training convenient to attend in terms of location and amenities. While some teachers described the timing of the training as an obstacle, there was no clear consensus on which time of year would most convenient for all. The spring teacher training can interfere with the timing of the Massachusetts state testing schedule, while teachers can be burdened by planning activities at the beginning of the school year making late summer and fall trainings inconvenient as well. Interviewed teachers emphasize the importance of being notified about the training well in advance to plan their attendance and make the necessary arrangements.

Teachers were generally satisfied with the teacher trainings across a number of areas. All reported that the trainings were easy or had become easier to attend (n=9). Since these teachers continually attended the trainings, some reported the redundancy of learning the same activities as a shortcoming, but the training still

earned an average score of 3.9 out of 4 (n=9) for usefulness, where zero is “not at all useful” and four is “extremely useful”. The average knowledge gained from the teacher training was a 1 out of 4<sup>10</sup> across all nine teachers, reflecting that many teachers are either repeat training participants or have had some prior experience with energy science. Three teachers specifically remarked on the training’s ability to make non-science teachers comfortable with teaching energy science topics.

One teacher detailed the re-certification requirements for Massachusetts teachers and explained that they had previously received the necessary Professional Development Points (PDPs) from a NEED graduate course. Teachers typically receive PDPs from professional training similar to the ones facilitated by the program. This presents an opportunity to attract more teachers to the training with this additional value. NEED is advertised as a certified PDP provider on the Massachusetts Department of Education website, providing PDPs at more than 100 events per year at all grade levels.

Based on feedback from the program implementers and teachers, the evaluation found that the teacher trainings have been highly successful and found no evidence to suggest that changes are needed to the content or the flow of the training.

### Teacher Surveys and Stipends

As an additional step in the delivery process, the NGRID program includes NEED conducting pre- and post-training surveys of the participating teachers’ knowledge of the energy topics covered in training. While NGRID staff remarked that the teacher feedback collected by NEED may suffer from positive response bias, as described earlier the evaluation team’s interviews collected similarly positive feedback on the training. The CLC program does not collect teacher feedback after the training but, as detailed later in this section, the CLC program collects teacher feedback through a wrap-up meeting at the end of the school year.

Both programs offer schools or teachers monetary assistance. NGRID provides a \$100 incentive to schools to offset the cost of a substitute for trainings held during the school year. During the summer, NGRID provides the \$100 incentive directly to the teachers to compensate them for their time. CLC provides a \$500 to the school for the first year of participation in the program but not specifically for the training. As mentioned earlier, CLC also incentivizes lead teachers for participating in the program. The evaluation team did not see evidence of other programs providing stipends for the trainings. However, one teacher mentioned that the stipend was helpful for hiring a substitute and NEED mentioned that one school initially did not want to participate due to resource constraints, but the incentive helped overcome this barrier.

### Kit Order Placement

Teachers order kits from NEED once they are ready to deliver the program curriculum to their classrooms. For CLC, lead teachers order kits and distribute them across the school. For the NGRID program, each individual teacher places an order for the needed number of kits. We found no indications of any issues with the kit ordering process.

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<sup>10</sup> Teachers were asked to rate their knowledge of energy science topics before and after the trainings on a scale from 0 to 4, where 0 is “not at all knowledgeable” and 4 is “extremely knowledgeable”. The reported metric represents an average of the differences between these knowledge ratings before and after the training.

## Delivery of In-Classroom Curriculum

NGRID receives in-classroom activities and curriculum created by NEED with the help of ETS for their national program. CLC created their own curriculum with the help of ETS as well, so the materials are for the most part the same. These materials include an energy of science kit with several hands-on activities that teach lessons about energy production and usage and elements of energy efficiency, as well as an energy house activity which teaches about insulation. NGRID specifically offers school energy surveys which involves learning about the energy use of various school buildings and appliances. During the trainings, these activities are all covered along with general energy education and lessons on how to tie energy science into the state standards.

Three of the CLC teachers said they used the take-home kits as a demonstration in their energy science lesson plans. As an in-classroom activity, these teachers gave it a 3 out of 4 for usefulness (n=3) where zero is “not at all useful” and four is “extremely useful”. All six CLC teachers we interviewed said the curriculum was accurately tied together with the materials in the kit.

The energy of science activities seemed to be the most flexible in how they integrated with teachers’ normal lesson plans. More than half (five of nine) teachers reported that they had picked and chosen which activities to use in the classroom. Four teachers reported that time constraints were an issue for the energy science curriculum. Nevertheless, they said the program did a good job of offering a menu of activities and lesson plans that can be embellished upon. Specific suggestions with regards to these activities included removing the mercury thermometers for safety reasons, modifying the activities so they are more comprehensible at lower grade levels, and collaborating with teachers to develop guidelines that detail how the activities and lesson plans can meet the state standards.

Five of the nine teachers used the energy house activity in-class, which involves a cardboard model of a home through which students can test the efficiency of insulation by using various materials to keep ice cubes from melting inside the house and protecting against drafts entering the house. The activity was highly rated by several teachers (average of 3 out of 4 for usefulness<sup>11</sup>, n=3) though two teachers did not provide a specific energy house rating. Despite the positive ratings, it was reported that this activity was the most time-consuming and some teachers modified the activity to fit their schedule, including one teacher who used the activity as the culminating project to assess their students’ overall comprehension of the energy curriculum.

Based on this teacher feedback, the in-class curriculum appears to be a highly successful aspect of the program.

## Kit Distribution to Students

During this step, teachers distribute the ordered kits in conjunction with their energy science lesson. As part of the kit distribution process, teachers distribute letters to parents which detail the program and describe the take-home kit measures. NGRID kits are delivered in an NGRID-branded energy efficiency box and includes a handout in the take-home kit with descriptions of the residential energy efficiency programs that the PA offers. CLC chose not to include branded materials. Other programs we reviewed include branded take-home kit boxes, branded materials, and parent letters similar to the NGRID materials<sup>12</sup>. One teacher from CLC and an

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<sup>11</sup> Teachers were asked to rate the usefulness of the in-class activities on a scale from 0 to 4, where 0 is “not at all useful” and 4 is “extremely useful”. Some teachers rated the activities with a collective overall score, while others offered discrete ratings for each activity. Not all teachers provided these discrete ratings due to time limitations in the interviews.

<sup>12</sup> Examples include the Texas WaterWise Program and Black Hills Energy LivingWise Program.

implementation staff member from NEED suggested that this program would be a good opportunity to provide information to families about home energy audits and improve the impact of the program.

### **Kit Content Installation**

During this step, students with help from their parents review and install measures provided in the kits. While we were unable to conduct interviews with kit recipients to understand measure installation patterns and challenges to measure installations, we elicited insight on this topic from the participating teachers. Teachers from both programs reported that some households could not install the measures for various reasons. These included concerns of safety around outlets (specific to draft stoppers) and the inability to change out showerheads in rental units (though it is unclear how common this issue is). These findings suggest the presence of barriers to measure installations that span beyond simple reluctance to install measures.

### **Survey Completion**

Teachers participating in the CLC program send paper surveys home with the student kits, and they are submitted via two different methods, depending on the school. Some students complete the survey at home, bring it back to school, then upload their responses to the online site under the supervision of the lead teacher. For other students, their teachers provide the password to students and families to submit their answers online at home. Teachers participating in the NGRID program similarly send students home with paper surveys. However, the NGRID program does not have an online submission platform. Students are asked to return the completed surveys to their teachers, who then mail the completed surveys to NEED.

### **Teacher Reminders**

Both programs provide reminders to teachers to submit survey responses. CLC maintains regular contact with the lead teachers to stay updated on the program at their schools. NGRID sent many reminders to teachers in attempts to collect survey responses, however it was not made clear what methods were used to communicate with the teachers.

### **Teacher Incentives**

This step is unique to the CLC's program and is not a part of NGRID's program delivery. Following the end of their first year participating, CLC sent \$1,000 incentives to lead teachers to encourage them to serve this role for three years. According to the program implementer, these funds are for use in the classroom, but it is at the teacher's discretion how the stipend is spent.

### **Wrap-Up Meetings with Teachers**

This step is unique to the CLC's program and is not a part of NGRID's program delivery. At the end of the school year, CLC implementation staff holds a meeting with lead teachers to discuss successes and other program aspects. This feedback, along with a review of program tracking data, gets incorporated into a year-end report drafted for CLC by the implementer and is used by the implementer when kicking off the next program year. While we did not explore with teachers whether this feedback process was helpful but the CLC program implementer found that this step was a useful addition.

## **6.6.2 Conclusions, Recommendations, and Considerations**

Table 10 summarizes conclusions, recommendations, and considerations based on the research findings. The table organizes them by the program delivery component.

Table 10. Summary of Conclusions, Recommendations and Considerations

Program Delivery Component	Conclusions	Recommendations	Considerations
Initial contact with school	<ul style="list-style-type: none"> <li>■ Overall, initial contact with the school and teacher enrollment was smooth for both programs, despite key differences in approach.</li> <li>■ Engaging lead teachers can help ensure consistency and better coordination of program activities at the school level, but will increase program cost in the form of additional incentives to lead teachers.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ The evaluation team suggests that NGRID consider recruiting lead teachers to coordinate program efforts, such as kit distribution and survey collection.</li> </ul>
Teacher training	<ul style="list-style-type: none"> <li>■ Both PAs' teacher trainings meet national best practices and teachers were highly satisfied with the convenience and content of the training.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ To further promote teacher interest and engagement in the training, the PAs could consider applying through the Massachusetts Department of Education to offer PDPs for training attendance to attract new teachers and add value for returning teachers.<sup>13</sup></li> <li>■ Based on teacher feedback on timing, the evaluation team recommends that CLC and NGRID continue to provide teacher trainings throughout the year to accommodate varying teacher schedules.</li> </ul>
Teacher surveys and stipends	<ul style="list-style-type: none"> <li>■ Both programs offer generous incentives although they differ in whether they are provided to the schools or teachers.</li> <li>■ Both programs have sufficient processes for collecting regular feedback from teachers, though NGRID's process focuses on the training rather than the program as a whole.</li> </ul>	<ul style="list-style-type: none"> <li>■ We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>■ If they would find it useful to have more feedback from teachers, NGRID should consider adding a wrap-up meeting with teachers at the end of each school year to discuss participation experiences.</li> </ul>

<sup>13</sup>More information on becoming a provider and a link to the application is available here: <http://www.doe.mass.edu/pd/providers.html>

Program Delivery Component	Conclusions	Recommendations	Considerations
Kit order placement	<ul style="list-style-type: none"> <li>Both PAs have sufficient kit order processes, though they slightly differ in approach.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any further considerations for changes or improvements for this program component.</li> </ul>
Delivery of in-class curriculum	<ul style="list-style-type: none"> <li>The curriculum and in-class activities are well customized to be age- and classroom-appropriate in Massachusetts.</li> <li>Teachers were highly satisfied with the curriculum and in-class activities.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any further considerations for changes or improvements for this program component.</li> </ul>
Kit distribution to students	<ul style="list-style-type: none"> <li>Both PAs' processes are standard across programs nationwide, though CLC may be missing an opportunity to provide additional information on energy efficiency tips along with the kits.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>CLC should consider adding informational materials to kits on low or no-cost energy-saving behaviors and other CLC programs.</li> </ul>
Kit content installation	<ul style="list-style-type: none"> <li>Findings suggest presence of barriers to measure installations that span beyond simple reluctance to install measures.</li> </ul>	<ul style="list-style-type: none"> <li>Please refer to the recommendations and considerations on improving ISRs provided in Section 6.2.</li> </ul>	<ul style="list-style-type: none"> <li>Please refer to the recommendations and considerations on improving ISRs provided in Section 6.2.</li> </ul>
Survey completion	<ul style="list-style-type: none"> <li>NEED received no survey responses from NGRID's participating teachers in 2017-2018, which may partly be driven by time constraints among teachers preventing them from submitting the surveys to NEED.</li> </ul>	<ul style="list-style-type: none"> <li>Please refer to the recommendations and considerations on improving survey response rates provided in Section 6.3.</li> </ul>	<ul style="list-style-type: none"> <li>Please refer to the recommendations and considerations on improving survey response rates provided in Section 6.3.</li> </ul>
Teacher reminders	<ul style="list-style-type: none"> <li>Both programs have sufficient follow-up processes to remind teachers to submit surveys.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any further considerations for changes or improvements for this program component.</li> </ul>

Program Delivery Component	Conclusions	Recommendations	Considerations
Teacher incentives	<ul style="list-style-type: none"> <li>CLC provides a generous incentive to lead teachers.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have evidence stating whether this level of incentive is necessary but we do not recommend removing the incentive from the CLC program as this may have a negative effect on teacher participation. Should NGRID decide to adopt the lead teacher model per our earlier recommendation, we suggest that NGRID consider whether it is cost-effective for their program to incentivize lead teachers at this level.</li> </ul>
Wrap-up meetings with teachers	<ul style="list-style-type: none"> <li>Wrap-up meetings are a helpful process for program implementers to collect regular feedback from teachers.</li> </ul>	<ul style="list-style-type: none"> <li>We do not have any recommendations for changes or improvements for this program component.</li> </ul>	<ul style="list-style-type: none"> <li>We recommend that NGRID consider adding this process, if cost-effective, and that CLC continue implementing this process.</li> </ul>

## 6.7 Program Evaluability Assessment

### 6.7.1 Detailed Findings

The evaluability of the Education Kits programs hinges on the ability to collect program specific data on kit measure installation and operation. As such, we focused our assessment on the improvements to data collection practices and survey design as a way to ensure collection of valid and reliable program detail on participant behaviors that will pass PA and Energy Efficiency Advisory Council consultant scrutiny. We address findings and recommendations related to the data collection practices and approaches in sections 6.2 and 6.3 of this report and do not repeat them here to avoid duplication.

As of the writing of this report, we delivered revised survey instruments to NGRID and CLC and both PAs plan to use them in future implementation. The surveys are largely consistent, differing only in installation verification questions to reflect differences in the kit offerings, and thus could be used as a statewide model. The revised surveys are available in Appendix C.

We recommended the following changes to both surveys.

- **Expanding demographics section:** For enhanced engineering review, the evaluation team recommends the inclusion of a question about water heating fuel type to increase the accuracy of savings estimates for hot water savings measures. In addition, a small change to the household size question is recommended to improve the accuracy of the responses.
- **Clarify the installation verification questions:** In our review of the survey instruments, the evaluation team found that the installation verification questions for each measure were double-barreled, meaning they asked two different questions but only allowed one answer. Specifically, the surveys asked if respondents had installed or planned to install each measure. For evaluation purposes, this question would not provide an accurate ISR, so the evaluation team recommends changing the question to only ask if the measures were installed.
- **An improved spillover section:** To improve the evaluability of the program's impact on additional energy-saving behaviors, we recommend an update to the survey instrument to gather responses that include a description of the spillover action, a clarification that the action was influenced by the program, a rating of the influence that the program had on the additional action, and an explanation of how the program was influential. This additional data improves the ability of the evaluation team to determine the validity of the spillover action and enhances the program's opportunity to claim savings for these actions.

### 6.7.2 Conclusions, Recommendations, and Considerations

We identified and recommended strategies to improving data collection processes in sections in sections 6.2 and 6.3 of this report. Both CLC and NGRID adopted our recommended revisions to the survey instruments. We do not provide any additional recommendations or considerations in this area.

## Appendix A. Additional Measures Research Sources

### Literature Review References

- Black Hills Energy. (2016). *LivingWise Program Summary Report 2015-2016*. Black Hills Energy South Dakota, July 2016.
- EnergyStar. “Energy Star Kids.” Accessed February 2018. Link: [http://www.energystar.gov/index.cfm?c=kids.kids\\_index](http://www.energystar.gov/index.cfm?c=kids.kids_index).
- Evergreen Economics. (2014). *Evaluation of the Hawaii Energy Conservation and Efficiency Programs*. Evergreen Economics, June 2014.
- Illume Advising. (2015). *Overview of Energy Savings ‘Kit’ Programs: Background, Challenges, and Opportunities*. Illume Advising White Paper, January 2015.
- Indiana Statewide Core Program Evaluation Team. (2013). *2012 Energizing Indiana Programs EM&V Report*. TecMarket Works, Opinion Dynamics, Cadmus, Integral Analytics, Building Metrics and EE Homes Midwest, June 2013.
- Navigant Energy. (2017). *ComEd: National Theatre for Children’s Middle School Kits Program Evaluation Report*. Navigant Consulting, Inc., January 2017.
- Navigant Energy. (2015). *Comprehensive Review of Behavior and Education Programs*. Navigant Consulting, Inc., June 2015.
- Opinion Dynamics. (2017). *Ameren Illinois Company PY8 School Kits Report*. Opinion Dynamics Corporation, February 2017.
- Resource Action Programs. (2017). *Texas WaterWise Program Summary Report 2016-2017*. Resource Action Programs & Post Oak Savannah Groundwater Conservation District, July 2017.

### Engineering Sources for Additional Kit Measure Savings

Table 11. Source of Savings and Assumptions

Kit Item	Source of Savings & Assumptions
Advanced smart strip	Massachusetts TRM 2013: 79 kWh for Tier 1 strip Massachusetts TRM 2016-2018: 346 kWh for Tier 2 strip (NEEP (2012). Advanced Power Strips Deemed Savings Methodology)
Digital thermometers	Indiana EM&V Report No savings for this measure as the measure itself does not save energy. Energy savings come from any actions taken as a result of its use
Door sweeps	CT TRM 2017 (KEMA, Evaluation of the Weatherization Residential Assistance Partnership and Helps Programs (WRAP/Helps), September 10, 2010.)
Shower timers	IL TRM V6.0 method for thermostatic showerhead restrictor valve adjusted for time reduction due to shower timer and Massachusetts water temperature. Gas, oil and propane savings calculated from kWh value. Average baseline shower time from:

Kit Item	Source of Savings & Assumptions
	(Michigan Evaluation Working Group Showerhead and Faucet Aerator Meter Study. June 2013)
Toilet leak detector tablets	NYC.gov and WaterSense "Repair your leaking toilets: Save water and stop flushing away your water bill." A "small" leak as defined in the referenced articles wastes about 30 gallons of water per day. The yearly water estimate is calculated from this number.
Weather-stripping	CT TRM 2017 (KEMA, Evaluation of the Weatherization Residential Assistance Partnership and Helps Programs (WRAP/Helps), September 10, 2010.)

## Appendix B. Teacher Interview Guide



Education Kits\_  
Teacher Interview Gu

## Appendix C. Revised Survey Instruments

Below are the revised survey instruments for both programs, they differ only in installation verification questions to reflect the kit offerings.



NGRID Revised  
Survey Instrument.d



CLC Revised Survey  
Instrument.docx

## Appendix D. Other Program Educational Materials

Figure 3. ENERGY STAR® Education Activities Website

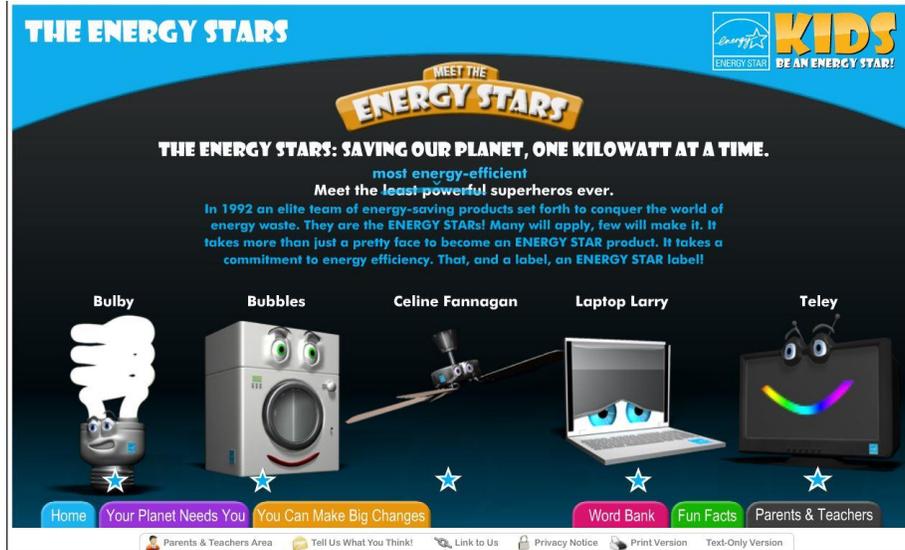


Figure 4. Parent Feedback Postcard

**ATTN. PARENT/GUARDIAN:** In order to improve the [redacted] Energy Education Kit program, we would like to know what you think. Simply fill out this postage-paid postcard and drop it in the mail. **THANK YOU!** [redacted]

SCHOOL: \_\_\_\_\_  
PARENT/GUARDIAN NAME: \_\_\_\_\_  
CITY: \_\_\_\_\_ ZIP: \_\_\_\_\_ PHONE: (\_\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

1. Were the kit products easy for you and your child to install and use?  Yes  No  
2. Will you continue to use the kit products after completion of the program?  Yes  No  
3. Would you like to see this program continued in local schools?  Yes  No  
4. Do you have comments about the program you would like to share (your favorite aspect, a new idea, etc.)? \_\_\_\_\_  
\_\_\_\_\_

5. If you would like information on additional energy-saving programs offered by your utility, please provide your email address: \_\_\_\_\_

I am willing to participate in a short follow-up interview on my experience with this program.  
 I do not wish to be contacted in the future for additional feedback on this program.

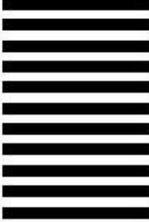
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