TEXAS SCHOOL AND LOCAL GOVERNMENT ENERGY EFFICIENCY MARKET ASSESSMENT AND BASELINE STUDY

Final Report

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1. Executive Summary

This report documents the results of Opinion Dynamics Corporation's Market Assessment and Baseline Study of the School and Local Government Markets. This research was conducted for CLEAResult Consulting, Inc., and eight utilities—Oncor Electric Delivery, American Electric Power (AEP) Texas Central, AEP Texas North, AEP Southwestern Electric Power Company (SWEPCO), El Paso Electric Company, CenterPoint Energy, Texas New Mexico Power (TNMP), and Entergy Texas — to assist with the implementation and evaluation of the Educational Facilities Market Transformation Program and Government Facilities Market Transformation Program in Oncor territory and the SCORE^{SM} and CitySmart^{SM} Market Transformation Programs in the remaining utility territories. The primary objective of this study was to document the current status of school and local government energy density, key equipment, practices, and management within the aforementioned utility service territories (i.e., document baseline levels). Notably, baseline energy density data complements this study by providing actual energy usage numbers in addition to energy management characteristics. The energy density for the market can be calculated again in future studies and compared with the baseline as an indicator of program effectiveness.

This study incorporated a combination of:

1. Review and analysis of existing information for schools and cities (i.e., existing info on building characteristics, energy usage, and energy density) and
2. Original market research with schools and local governments.

Specifically, Opinion Dynamics conducted telephone interviews with a statistically significant sample 253 K-12 school districts, colleges, and local governments out of a population of 2,051. These included representatives of 107 K-12 schools (primarily public school districts), 15 representatives of colleges and universities, and 131 representatives from local governments, (i.e. counties or cities). In total, the results of this study represent 12% of the total market.

<u>Market Assessment Findings</u>

Over 80% of the market is at least somewhat interested in finding ways to save energy. However, the market faces many barriers to energy efficiency adoption, including its own processes and infrastructure for energy decision making. As such, there are many opportunities to help local governments and schools overcome obstacles to adopting energy efficient improvements through techniques such as market education, goal-setting, staffing, bill monitoring strategies, project guidelines and specifications, and monetary incentives.

For both schools and local governments (81% and 80% respectively), the most commonly stated obstacle to energy improvements is the cost of upgrading to energy efficient technology. However, over 90% of respondents indicated at least one additional non-cost barrier, with the top two being "the budget and procurement process for planning energy improvements" and "finding the time to identify, plan and execute energy improvements." Specific findings regarding barriers include:

- Only 39% of schools and 27% of local governments note that they completely understand long-term energy efficiency benefits.
- Only one-third (33%) of local governments have staff with skills to identify energy improvements. Schools are better prepared, as nearly two-thirds (65%) have such staff.
- Awareness and familiarity with energy efficient technology options are often barriers in this marketplace. Less than half of schools are very familiar with T-5s, LED indoor, and LED outdoor lighting. Furthermore, less than 30% of the local governments are very familiar with T-8s, T-5s, and LED lighting.
- Setting financial metrics for energy measures is also critical for decision making, yet 72% of schools and 75% of local governments do not have payback requirements to reference for decision-making.
- While it may appear that most schools and local governments are monitoring their energy bills, the method and rigor under which they do so shows opportunity for vast improvement. Overall, most local governments (61%) and schools (48%) informally monitor their bills by simply looking at the bill each month without any sophisticated analytical software that looks for trends over time or signals them when an irregularity occurs.

The market welcomes resources and information to overcome its obstacles to improving energy efficiency:

- More than 80% of the market stated that "add-alternates", contractor recommendations, and a written set of guidelines and specifications would help them to make energy decisions.[1]
- 83% of non-partner schools and 73% of non-partner local governments are interested in some type of program to help with energy improvements.
- Nearly two-thirds of respondents for schools and half of local governments noted that obstacles related to financing and budgeting could be overcome through support in finding financial resources such as grants, incentives, rebate programs, money, lowered costs, or cheaper prices. Respondents were also interested in finding out where they can access funding.

[1] An "add-alternate" in a request for proposals or bid document can obtain cost information an alternative that provides better energy performance.

- Many respondents cited a need for cost analyses of energy efficient projects and products, which include opportunity cost, payback period, return on investment, and pricing information. One respondent noted the need for "some kind of tool whereby we could compare what we do now with other options, especially a tool that could compare return on investment." Another noted that, "the biggest obstacle is making the calculations correct, being able to show the savings, [and] the payback that would be involved."

<u>Local Government Energy Baseline Findings</u>

Local governments own and operate a wide variety of building types, and building characteristics within each local government vary greatly. As such, it is clear that energy management plans and baseline data need to be specific to the buildings that participate in any future program. This variability is demonstrated in some of the key characteristics of buildings, such as:

- The number of occupants per city or county building ranges from an average of 8 in warehouses up to an average of 984 in airports (overall average: 86 occupants).
- The weekly operating hours per city or county building range from an average of 44 hours in courthouses up to an average of 138 hours in water treatment plants and 147 in airports (overall average: 93 hours).
- The number of computers ranges from 3 on average in warehouses up to 114 in city halls (overall average: 28 per city or county building).

There is also a great variation in energy usage and cost:

- The average annual electricity consumption per local government building ranges from 58,384 kWh per year at maintenance shops to 3,079,796 at airports (overall average: 539,612 kWh per year).

There are also clear opportunities for efficiency upgrades in key areas such as lighting, HVAC systems, and operation and management. Our findings show that:

- Only half of local government respondents have adopted any type of efficient indoor lighting. The most common type is the use of CFLs (44%). In terms of fluorescent lighting, only 12% have T5s, and 22% have T8s. Although local governments say they have this type of lighting, they only have them in a few fixtures and there are many fixtures that can still be upgraded. The standard T8 lamp will represent baseline technology with the manufacturing ban on T12 magnetic ballasts going into effect this summer.
- Overall, 34% of local government cooling units are more than ten years old.
- Only half of local governments have regular operations and maintenance procedures for energy using equipment in all of their buildings. In fact, 27% of respondents have no regular maintenance procedures at all. The most common procedures are regular and preventative maintenance for HVAC systems.

Other baseline data and opportunities for increasing efficiency are described in the report.

School Energy Baseline Findings

K-12 school districts and colleges also differ greatly in terms of building use types. School districts typically include classrooms, gyms, libraries, cafeterias, and offices. Colleges contain a wider variety of building types, with the most common being classrooms (100%), offices (87%), and gyms (87%), but also include social meeting spaces and dormitories.

Energy usage data show that high schools and combined schools (any school with a combination of grades such as all K-12 or K-8) use the most electricity and natural gas in comparison to middle schools and elementary schools. These school types are also the largest in terms of square footage and the number of students.

Energy usage data also show that dormitories, gyms, and social meeting spaces on college campuses use the most electricity and natural gas in comparison to other building types. These building types also tend to have greater operating hours, square footage, and occupants.

Specific findings for schools include:

- Three-quarters of the school market has adopted some type of efficient indoor lighting. The most common type is the use of T8s (78%) followed by CFLs (70%). Only 48% have T5s. Although many schools say they have T8s and T5s, most only have them in a few fixtures and there are many fixtures that can still be upgraded. Again, the standard T8 lamp will represent baseline technology with the manufacturing ban on T12 magnetic ballasts going into effect this summer.
  - The penetration rate of LED indoor lighting is 22% for K-12 schools and 27% for colleges[2]; the penetration rate of LED exit signs is 67% for K-12 schools and 87% for colleges; and the penetration rate of LED outdoor lighting is 19% for K-12 schools and 27% for colleges.
- Overall, one-third of K-12 and college cooling units are more than ten years old.
- More than eight in ten schools have regular operations and maintenance procedures for energy using equipment in all of their buildings. The most common procedures are regular and preventative maintenance for HVAC systems.

Other baseline data and opportunities for increasing efficiency in schools are described in the report.

[2] Note that while CLEAResult has identified some school districts or local governments that have tested indoor LED, non-exit sign lighting applications, CLEAResult has not seen interior LED lighting installations in any school or city facility. School and city program partners have cited the technology as being too cost-prohibitive. The survey question for respondents was, “Do you have any of the following types of lighting in your buildings…LED indoor lighting?” This question was asked of all respondents who said they were very or somewhat familiar with LED indoor lighting, and this followed the same question regarding LED exit sign lighting.

2. STUDY OVERVIEW

The CitySmart℠, Government Facilities, SCORE℠, and Educational Facilities programs are market transformation programs designed to help participants identify energy efficiency opportunities in existing and newly planned facilities and to provide monetary incentives to implement energy efficiency projects. The programs are funded by eight utilities – Oncor Electric Delivery, AEP Texas Central, AEP Texas North, AEP SWEPCO, El Paso Electric, CenterPoint Energy, Texas New Mexico Power, and Entergy Texas – and are being offered at no cost to participants. They are voluntary programs that offer objective, third-party consulting on best practices in the areas of energy usage and energy efficiency. The programs are implemented by CLEAResult Consulting Inc.

The programs help schools and local governments meet HB 3693, a law put in place in 2007 that requires them to establish goals to reduce electricity use by an average of 5% annually for 6 years. Requirements include establishing an electricity baseline, establishing an electricity reduction goal, recording energy improvements and electricity savings, and reporting reductions in electricity consumption. Based on partner needs, the programs provide customized energy efficiency solutions for each partner, including:

- Energy Performance Benchmarking for existing buildings;
- Energy Master Planning Workshops that allow financial and facilities personnel to learn about industry best practices and determine where best to focus short- and long-term resources;
- Technical Assistance to help identify and evaluate energy efficiency opportunities;
- Cash Incentives for new construction and renovation projects the partner elects to implement that reduce peak demand; and
- Communications support to help publicize the local government's leadership and accomplishments in energy efficiency.

CLEAResult, together with the eight utilities, hired Opinion Dynamics Corporation to conduct a market assessment and baseline of the school and local government market in Texas. This study is mandated by the Public Utility Commission of Texas.[3] In accordance with the PUCT rule, this study provides an analysis of the market's characteristics. The ultimate goal of the baseline study is to equip both CLEAResult and the utilities with an understanding of the market's current energy use, management and practices. This baseline analysis should allow for future studies to assess how well the program objectives have been achieved but it will also allow CLEAResult to streamline its program implementation strategy to focus on the key market barriers and energy practices that are impeding market transformation.

This baseline study provides both baseline market assessment characteristics and energy usage. Energy management infrastructure is a key area that the programs intend to impact

[3] Texas Administrative Code, Title 16, Part II, Chapter 25: §25.181(l)(3)(E). Notably the parameters of the baseline study are not clearly defined in the code. Therefore, Opinion Dynamics met with the Commission over the telephone in July of 2009 to clarify study goals.

as it is needed in order to make decisions that directly reduce energy consumption. The program helps local governments and schools mature to a point where they have the energy management infrastructure in place that will enable them to make decisions and take action. Therefore, much of this baseline study focuses on the market's characteristics that are expected to change as a result of these programs, such as energy management, decision-making practices, and market barriers. Furthermore, the program also helps partners implement energy efficient projects by providing technical assistance and cash incentives. A wide variety of projects are eligible for cash incentives. Therefore, this study also covers baseline penetration rates of energy efficiency technologies in the areas of HVAC, lighting, building envelope measures, and controls as these are the technologies that the program recommends most often to participants.

3. Study Methodology

This study was grounded in secondary research, upon which we designed our survey instrument and developed our primary research method and sampling approach. Primary research included a baseline telephone survey, as well as a mail survey to determine distribution of energy usage for a sample of facilities. The telephone survey was based on a sampling method designed to obtain a representative sample from across all utility territories.

3.1 Secondary Research

Opinion Dynamics examined available secondary information, databases and literature. We reviewed existing assumptions for the program, current partner information collected by CLEAResult, relevant papers, and data available on similar facilities. This step also included a review of other baseline studies from other areas of the country, energy benchmarking programs and resources, white papers, journal articles, and program evaluations. Details regarding the secondary sources that were examined during this stage are provided in Appendix C.

Opinion Dynamics examined these materials for the following information:

- Key parameters that affect peak demand and annual energy usage at existing facilities;
- Practices that directly influence demand and usage, which can be used to influence operating and purchasing decisions for new and existing schools and local government buildings; and
- Best practices for calculating energy usage in schools and local governments.

The purpose of this review was to determine key parameters and practices that affect demand and operating and purchasing decisions at facilities. This step also helped develop an appropriate methodology and data collection instrument that aligned with best practices for similar baseline studies. The information gleaned from this research allowed us to more appropriately target our primary research, including the baseline telephone survey and our approach for calculating energy usage. The energy usage data provided in the Energy Density section of this report mostly relies upon the data collected by CLEAResult as part of its Energy Benchmarking program activity.

3.2 Baseline Telephone Survey

Opinion Dynamics fielded a telephone survey in October and November 2009. In collaboration with CLEAResult and the eight utilities, we designed a data collection instrument to focus on the areas that the programs intend to affect. The program attempts to affect energy management practices. The table below shows the energy management practice key performance indicators and metrics that are expected to change, as needed, for a given partner.

Table 1: Energy Management Practice Key Performance Indicators and Metrics

Key Performance Indicator	Metric
Funding and Procurement	Develop criteria and review process approving improvement projects from operating budgets and city council-approved capital budgets
	Allocate funds for energy improvement projects
	Consider and evaluate outside financing for improvement projects
Planning and Decision Making	Set goals and objectives for energy performance
Communication and Coordination	Provide energy improvement bids to city council or school board
Evaluation and Assessment/ Information and Monitoring	Upgrade energy management software to monitor energy usage and cost on a monthly basis
	Monitor energy use for extreme variations from the norm
	Monitor and review utility bills
Energy Management Processes	Follow a budget process for planning energy improvement expenditures in new construction
	Audit utility bills to verify accuracy and allocate accountability to appropriate people/departments
	Retro-commission existing energy using equipment to test and verify that it is operating at peak performance
	Conduct regular operations and maintenance procedures
	Monitor and control systems operations when occupancy, demands, and/or loads are reduced
Personnel and Skills	Ensure that employees have the skills to identify energy improvement opportunities
Incentives and Timing	Track available incentives and financial/technical assistance for energy projects

The program also helps partners implement energy efficient projects by providing technical assistance and cash incentives. A wide variety of projects are eligible for cash incentives. Table 2 shows examples of the energy efficiency technologies that will likely be adopted through this program.

Table 2: Energy Efficiency Technology Encouraged by Programs

Category	Example
HVAC	Replace old or inefficient HVAC units (specific to buildings or schools)
	Purchase higher efficiency (15 or 16+ SEER) A/C equipment when replacing existing units
	Upgrade to premium efficiency motors
Lighting	Upgrade inefficient lighting systems in certain buildings (classrooms, gyms, exit signs)
	Work with engineering/architects to determine efficient lighting options
	Replace standard exit signs with LED exit signs
	Replace standard traffic signals with LED traffic signals
Envelope	Install solar film on windows
	Install cool roofs
	Increase insulation
	Replace leaky door and window seals
Controls	Install occupancy sensors
	Install new/more effective control systems
	Use HVAC set points to “lock out” thermostats city wide or district wide
	Install software to turn off computers when not in use
Renewable Energy	Install solar water heating systems for large domestic hot water loads
	Install solar panels

Based on the key management practices and energy efficient technologies upon which the programs focus, we developed a data collection instrument to measure the current characteristics in each of these areas. The data collection instrument is provided in Appendix D. This data collection instrument was fielded via telephone interviews with facility directors and decision-makers at school districts, colleges, and local government facilities. Although telephone surveys cannot achieve the level of detail of in-person audits, they offer the highest response rates of any survey collection method. They also have an advantage over mail surveys in that the interviewer has the opportunity to probe the respondent for the desired information and help provide explanation where necessary. Telephone interviews also provide an easier format to gain open-ended responses from the participant, which is particularly useful when trying to determine current practices and processes in place.

This study analyzes data from partners and non-partners combined. As a baseline study, we faced the challenge that some partners may have already made changes based on their interaction with the program. Therefore, we asked questions in our survey to better understand a partner's characteristics prior to program participation so that all data in this report reflects the market's baseline characteristics prior to program participation.

3.3 Energy Density and the Baseline Mail Survey

We analyzed information from 1,814 K-12 schools, 366 local government buildings, and 39 college buildings, including program partners and non-partners. Energy usage is typically described as energy density, which generally refers to energy use per square foot and can serve as an important market indicator. The energy density for the market can be calculated again in future studies and compared with the baseline as an indicator of program effectiveness. Energy density complements our baseline study by providing actual energy usage numbers in addition to energy management characteristics.

Energy density in this study is calculated in numerous ways: energy cost per square foot, energy use per square foot and an indexed EPA Benchmark Score. Our review of program information found that the EPA Benchmark Score is difficult to calculate for government and college buildings. As a result, we chose to focus our energy density primary research only on K-12 school districts. CLEAResult has benchmarking data for 1801 schools. We set out to collect information from as many non-partner schools as possible to supplement the current data. This analysis was intended to provide enough data to compare partners to non-partners.

Energy density requires specific building characteristics such as the square footage and year it was built, as well as 12 months of billing data. Because of the customer confidentiality clauses, we were unable to gain billing data directly from the utilities. In order to calculate energy density, we had to collect billing data from the customer or gain permission from the customer to be provided with their billing data by the utility. Therefore, this task required both phone and mail survey approaches. We offered telephone survey participants an incentive of $50 for their participation in a follow-up mail survey. The mail survey included questions necessary to compare the non-partner data with the data in the CLEAResult partner benchmarking database. We offered mail survey participants four options to provide us with billing information – filling out tables, submitting spreadsheets, including copies of 12 months of bills, or submitting a letter of authorization for their utility to release their information. The mail survey can be found in Appendix E.

This approach did not prove successful, as we were only able to calculate the energy density for 6 non-partner schools. Of the 82 non-partner K-12 school telephone survey respondents, 29 agreed to participate in the mail survey. Of the 29 that agreed, only 6 were able to provide us with enough information to supplement CLEAResult's energy density data.[4] Therefore, the majority of the energy density numbers provided in this report are based on partner data already collected as part of the SCORE and CitySmart program implementation. However, we believe there is enough market data for this information to serve as a reliable baseline.

Table 3: Mail Survey Response

	Number
Total Non-Partner Schools that were asked to complete the mail survey for energy density	82
Agreed to mail survey	29
Returned mail survey	13
with complete billing information	6
with adequately complete Letter of Authorization	4
with inadequate Letter of Authorization	3

[4] However, we did supplement the building characteristics information with data from all 13 mail surveys.

4. TOTAL POPULATION AND SAMPLING METHOD

As part of this study, we determined the population size for this market in the eight utility territories. The utilities were unable to provide us with customer data for confidentiality reasons; therefore we built the population using a number of methods. First, we obtained contact information for most partners from CLEAResult, as well as lists of potential partners along with contact information from some of the utilities. Next, we obtained lists of zip codes and cities in each of the utilities' territories.

To complete the school population, we used the Texas Education Association database of schools and districts to match districts to utility territories based on their zip codes. The TEA database also included contact information for the district superintendent. We also used the TEA database to find contact information for some partner schools that was not available from CLEAResult. For local governments, we performed internet searches to find contact information for cities within the utility territories. Finally, for colleges we obtained a list of colleges throughout Texas and again used their zip codes to match them to utility territories. We also used internet searches to find contact information for colleges.

When obtaining contact information online, we attempted to find contact information for the facility manager or other entity that seemed likely to be involved in energy–related decisions. However, in some cases we were only able to locate a main phone number. We also were unable to obtain contact information for all cities and colleges within the territories. An additional difficulty was that in some cases utility territories overlapped in zip codes, so we subjectively assigned those entities to a utility. If we reached them for an interview, we obtained the utility from the entity. Given these difficulties, the population sizes shown in this report are estimates.

Table 4 shows the population of school districts, governments, and colleges within the eight utility territories. Oncor's population was by far the largest.

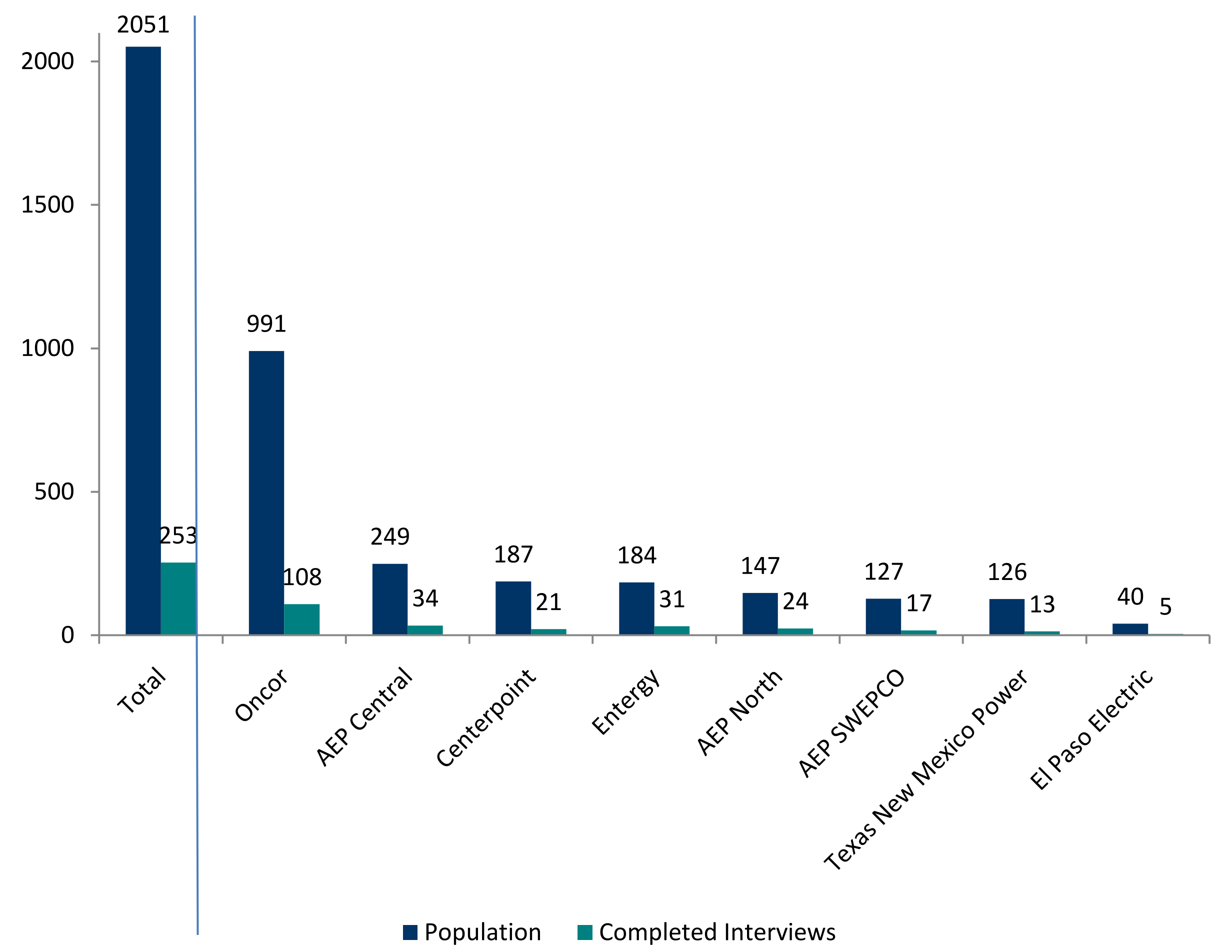
Table 4: Population by Utility and Type

Utility	School Districts	Local Government	Colleges	Total
Oncor	486	452	53	991
AEP Central	130	113	6	249
CenterPoint Energy	86	84	17	187
Entergy Texas	85	90	9	184
AEP SWEPCO	63	56	8	127
Texas New Mexico Power	60	64	2	126
AEP North	60	84	3	147

Utility	School Districts	Local Government	Colleges	Total
El Paso Electric	28	5	7	40
Total	**998**	**948**	**105**	**2051**

The total population for this study included both existing participants in the SCORE and CitySmart programs, or "partners," and potential participants, or "non-partners." Table 17 in Appendix A shows the complete population and study participant breakdown of partner and non-partner school districts, governments, and colleges by utility territory. Given the limited number of partners at the time of this study, most of the telephone interviews were conducted with non-partners to provide a baseline that is representative of the total market. For statistical significance, we aimed to complete interviews with 10% of the population in each sample category (market type and utility). This required us to contact every entity in our sample pool up to three times. Ultimately, we completed telephone interviews with 253 school districts, colleges, and local governments out of a pool of 2,051 possible contacts; therefore the results of this study represent 12% of the total market - a statistically significant sample.

Figure 1: Population and Completed Interviews by Utility Territory



The table below shows the total telephone interviews conducted in each market segment by utility territory.

Table 5: Telephone Interviews by Utility and Market Type

Utility	K-12 School Districts	Local Governments	Colleges & Universities	Total
Oncor	47	53	8	108
AEP Central	14	19	1	34
CenterPoint Energy	11	9	1	21
Entergy Texas	11	18	2	31
AEP SWEPCO	7	8	2	17
Texas New Mexico Power	7	6	0	13
AEP North	6	17	1	24
El Paso Electric	4	1	0	5
Total	**107**	**131**	**15**	**253**

We designed our sampling approach to obtain a statistically significant number of schools and local governments statewide in proportion to the population distribution amongst the utility territories. As Figure 2 and Figure 3 show, our sample distribution matches the utility population distribution quite well.

Figure 2: School Population and Interview Distribution by Utility

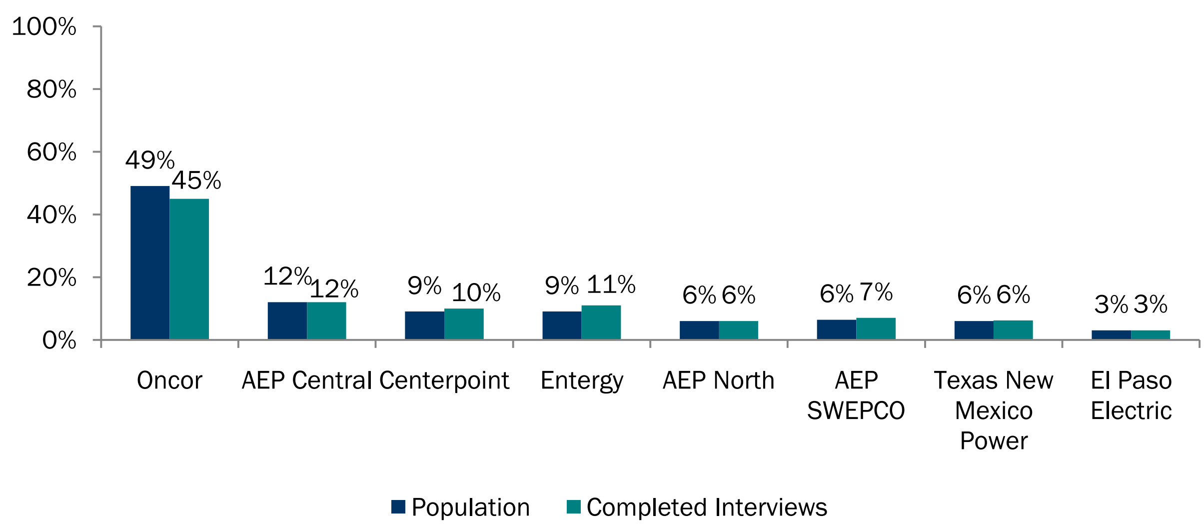
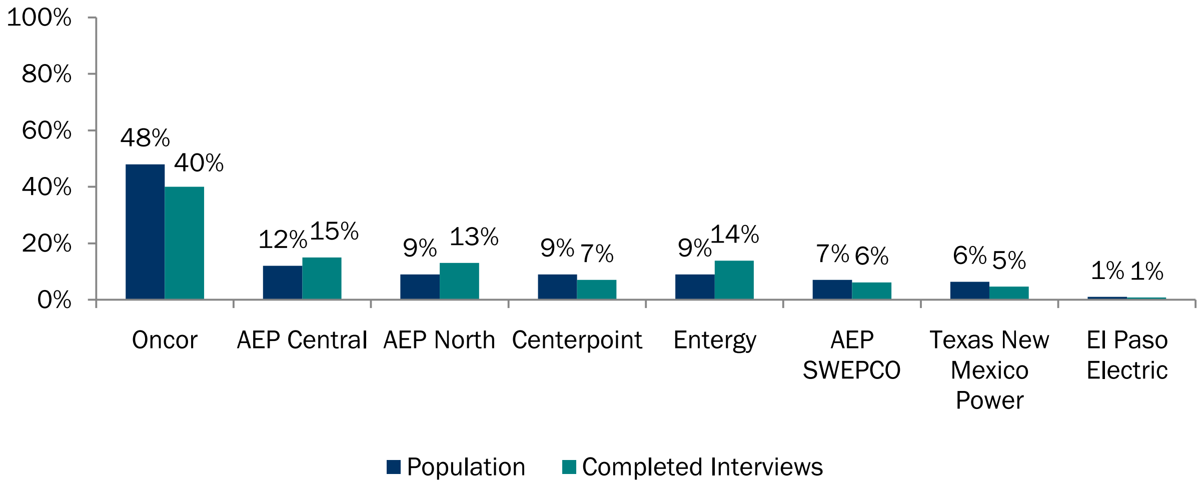


Figure 3: Local Government Population and Interview Distribution by Utility



5. Study Results

5.1 Market Assessment

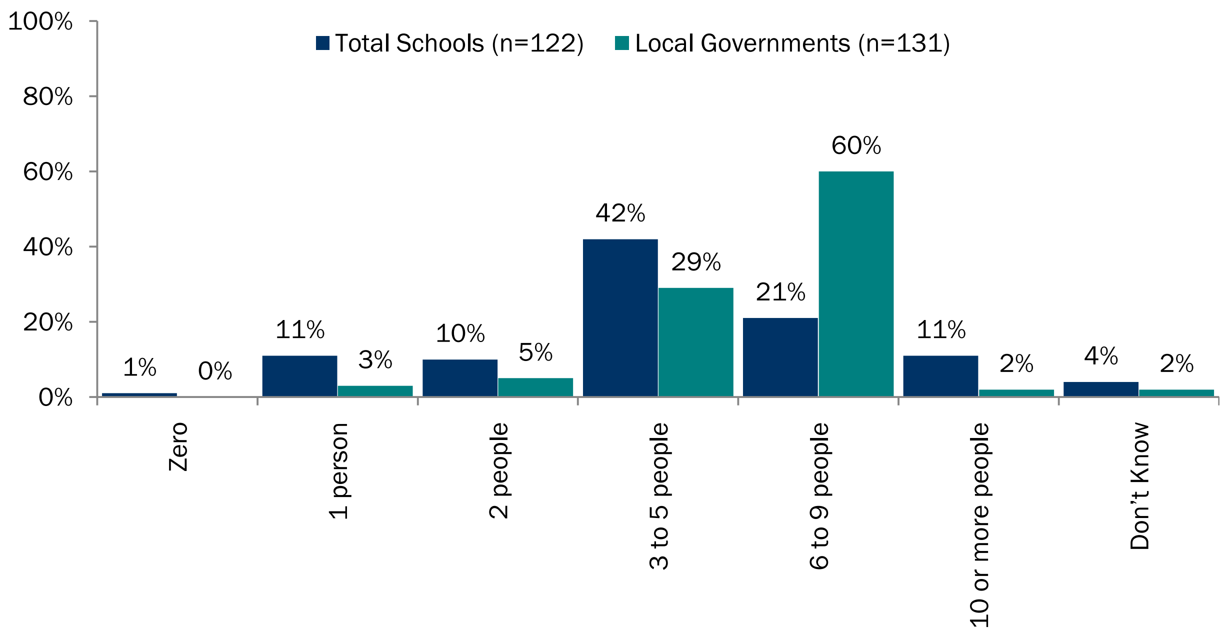
5.1.1 Energy Management & Decision-Making

The baseline market contains ample barriers to, and complex processes for, energy decision making. As such, there are many opportunities to help local governments and schools reduce barriers to energy efficient improvements, as well as to streamline energy decision making processes.

Staff

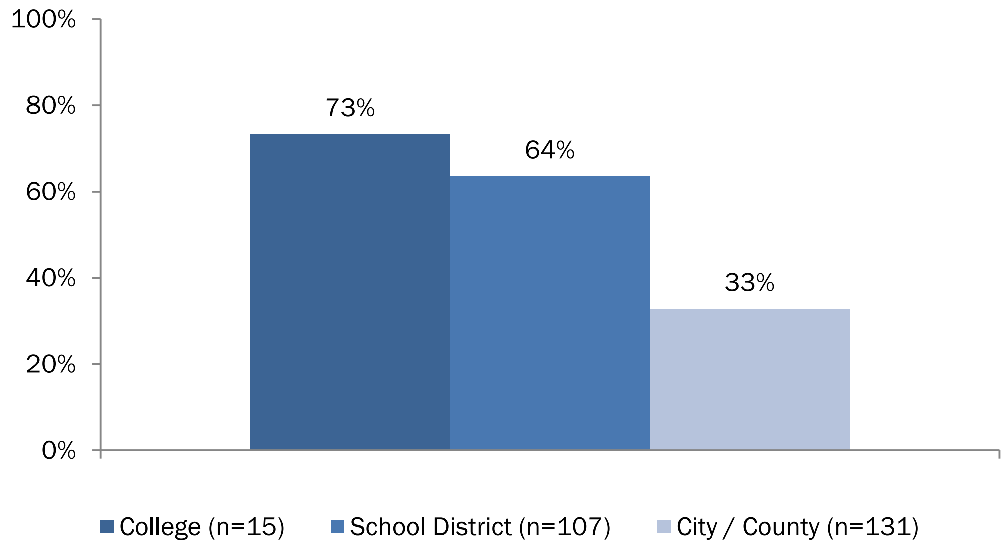
One metric used in the survey to calculate the complexity of decision-making was the number of people who are typically involved in any energy related decisions (Figure 4). In all local governments surveyed, the majority of respondents (60%) stated that six to nine people are involved in the energy decision-making process. For schools, typically three to five people are involved in making energy related decisions (42%).

Figure 4: Number of People Involved in Energy Decision-Making Process



The large number of respondents involved in energy decision-making may complicate the process. In addition, those involved may not have adequate skills to make the best energy related decisions. According to Figure 5, only one third (33%) of local governments have staff with skills to identify energy improvements. Schools are better prepared, as approximately two-thirds (65%) have staff with the skills to identify energy improvements. Staff hiring or training and development are likely an important way for local governments, as well as some schools, to optimize energy-related decisions.

Figure 5: Existence of Staff with Skills to Identify Energy Improvements



Energy Bill Monitoring

One important step to improving energy-related decision-making is monitoring energy use. According to the baseline survey results, 71% of local governments, 70% of colleges, and 90% of K-12 school districts monitor their energy bills. While it may appear that most schools and local governments are monitoring their energy bills, the method and rigor under which they do so shows opportunity for vast improvement. For our analysis we classified formal monitoring as any system that utilized software to analyze their energy bill. Informal monitoring was classified as reviewing bills or reading meters, but having no formal analytical system. Overall, most local governments (61%) and schools (48%) informally monitor their bills. Only 10% of local governments and 34% of schools formally monitor their bills. This presents an opportunity for providing these entities with systems to formally monitor their bills. There was a large disparity within schools as to how comprehensively they monitor their energy bill. According to our survey, 50% of colleges formally monitor their bills, while only 35% of school districts formally monitor their bills. This means that there is an opportunity for both local governments and colleges to implement bill monitoring strategies—particularly among the percentage of the market that only informally monitors cost and usage.

When monitoring bills, the vast majority of respondents simply review the bills for cost or usage. Few respondents said they examined energy trends over time and by comparing against historical averages.

Figure 6: Energy Bill Monitoring in Local Government (n=107)

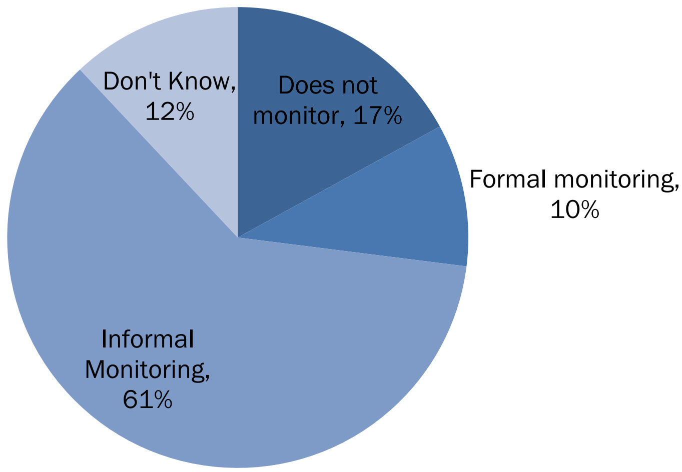


Figure 7: Energy Bill Monitoring School District (n=98)

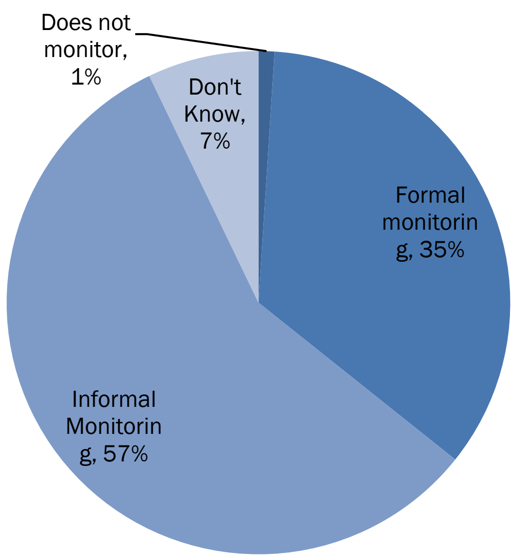
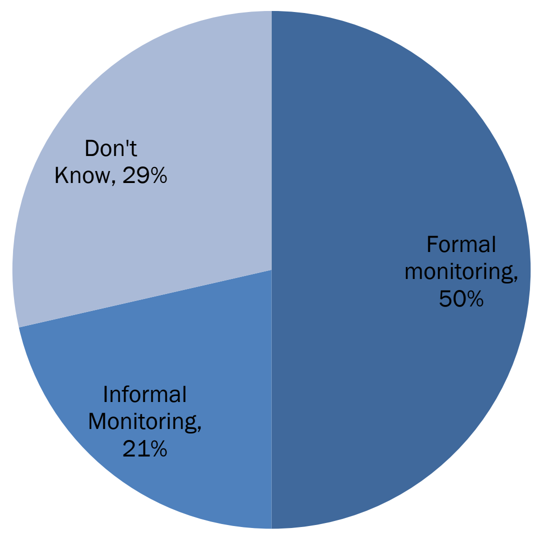


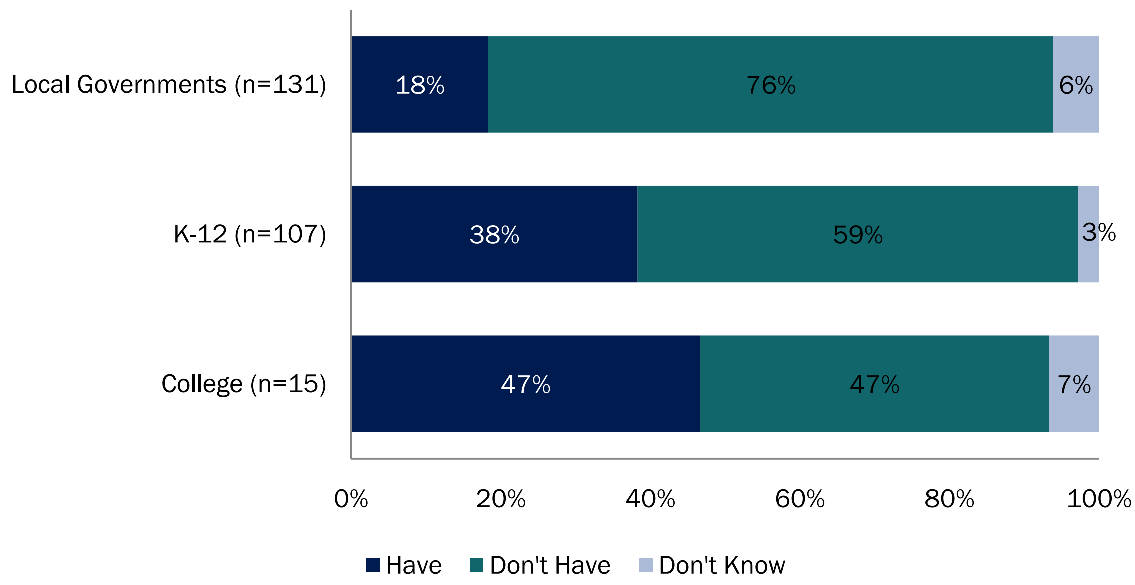
Figure 8: Energy Bill Monitoring in Colleges (n=14)



Guidelines and Specifications

Guidelines and specifications provide important information regarding energy efficient products and maintenance. According to the survey, only 38% of K-12 schools and even fewer (18%) local governments have energy performance guidelines or specifications in place. Colleges are more likely (47%) to have guidelines (Figure 9). This analysis demonstrates that specific market segments, such as K-12 schools and local governments, could stand to benefit most from the provision of guidelines and specifications for energy performance.

Figure 9: Existence of Energy Performance Guidelines or Specifications



Payback Requirement

An important element to energy decision-making is how best to decide which energy efficient measures to invest in. The survey assessed whether the payback period was an important factor in respondents energy efficient project decision making. Figure 10 and Figure 11 show that 72% of school respondents and 75% of local governments have no payback requirement at all. This may suggest that respondents focus on other investment criteria rather than downstream financial benefits. Therefore opportunities exist to assist local governments and schools with methods to identify the desired return on investment for energy efficient measures, such as a payback requirement.

Figure 10: School Equipment Price Consideration and Payback (n=122)

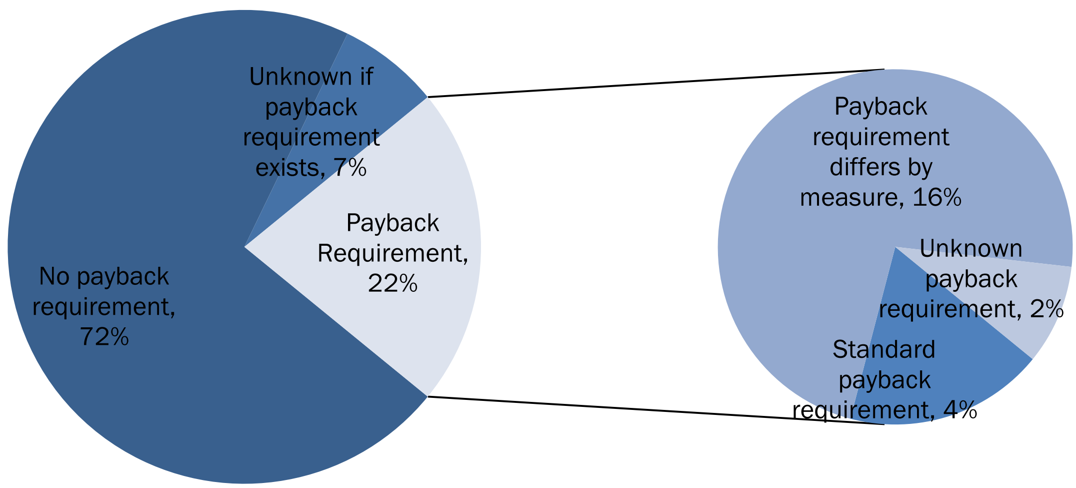
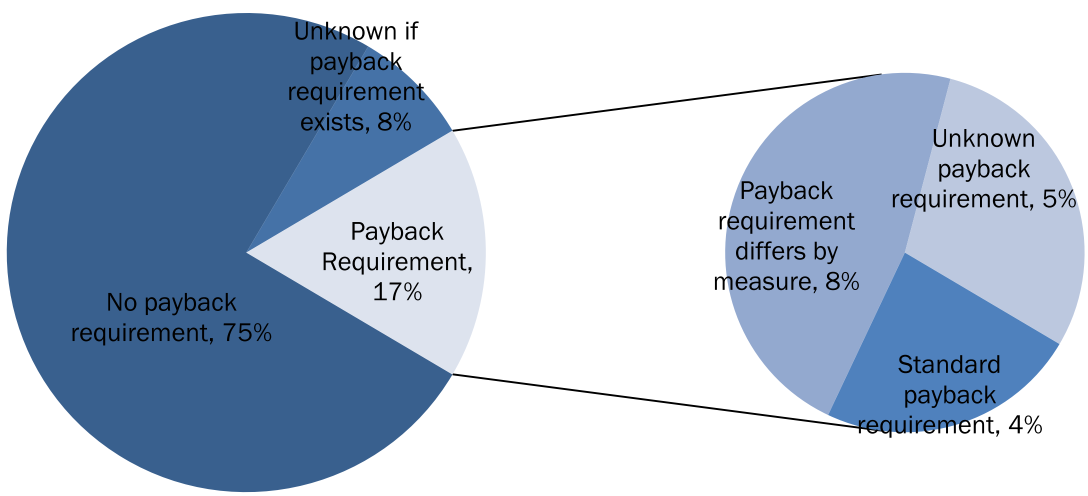


Figure 11: Local Government Equipment Price Consideration and Payback (n=131)



The figures above also demonstrate that many respondents are not familiar with their payback requirements, if any. In addition, respondents typically could not provide the specifics regarding a standard payback requirement or payback requirements that differ by measure. We obtained standard payback requirements from only 12 respondents and obtained measure-specific requirements for very few measures.[5] Payback periods range from 27 months for power factor correction to 15 years for standard payback. Notably, this payback period is significantly longer than the commercial market segment, which usually requires a 1-3 year payback. A handful of respondents noted payback periods were too long

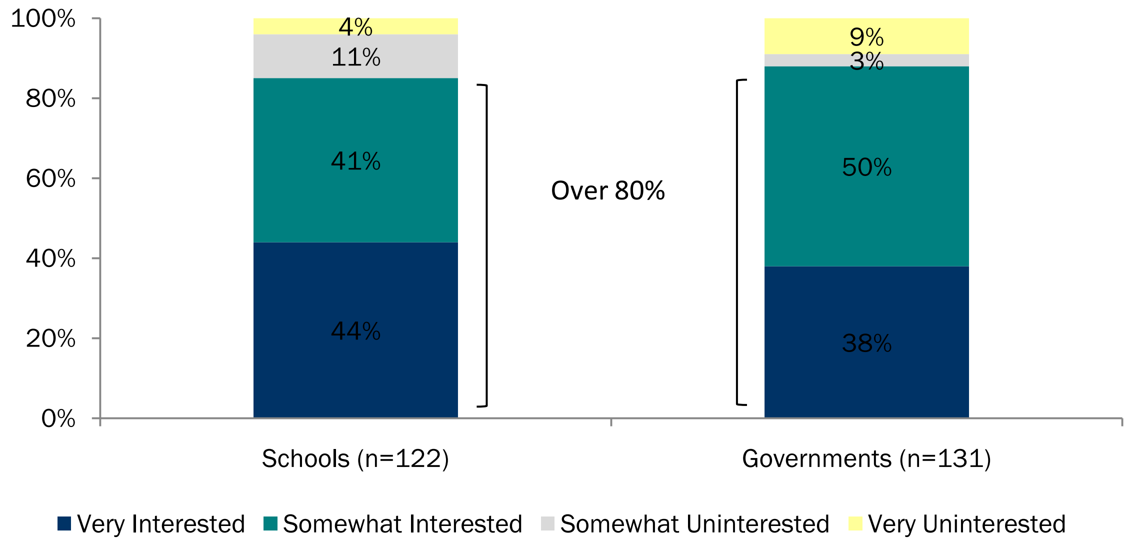
[5] For general measures, the payback period required averaged 7.7 years (n=7) for schools and 6.2 years (n=5) for cities/counties. For specific measures, lighting averaged 5.25 years (n=4 schools only), and HVAC averaged 4.8 years (n=6 schools only). Other paybacks reported include 6 years for a window unit (n=1) and 27 months for power factor correction (n=1).

to justify energy efficient projects and therefore presented a significant obstacle to energy efficient measures. These results suggest that there are opportunities to improve respondents' budgeting criteria when they assess adoption of energy efficient measures.

5.1.2 Energy Efficiency Barriers

General interest in energy efficiency is a basic need for schools and local governments to make energy decisions and take action. The survey sought to determine the market's level of interest in finding ways to save energy and, where possible, what mechanisms drive that interest. Over 80% of respondents are at least somewhat interested in finding ways to save energy, reflecting a large interest in energy savings (Figure 12).

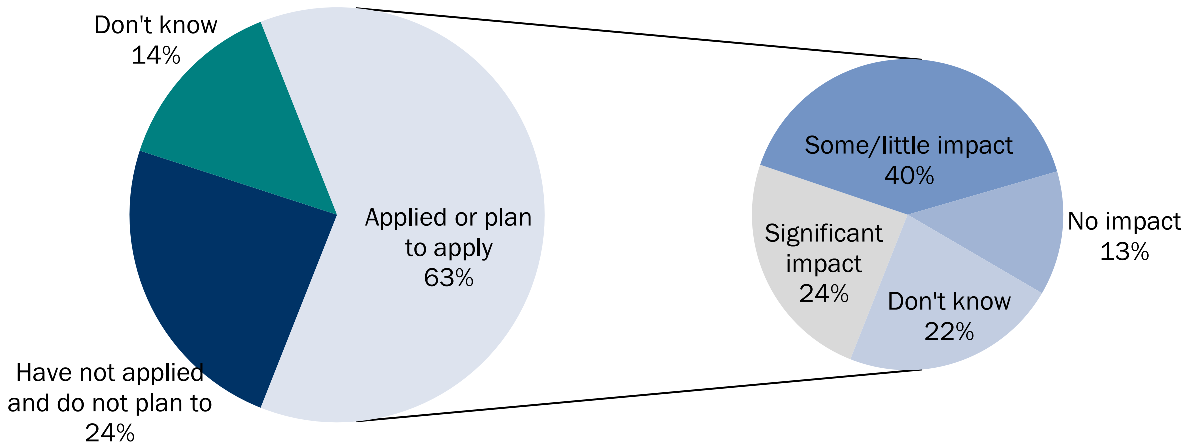
Figure 12: Interest in Finding Ways to Save Energy



It should be noted that this baseline study was conducted at a point in time when local governments' interest in energy efficiency may have been higher than usual given the recent availability of block grants for energy improvements.[6] Therefore, the survey also assessed whether block grants had a significant impact on local governments' level of interest in pursuing energy efficiency improvements (Figure 13). Over 60% of respondents stated that they had applied or planned to apply for a block grant. Of those, 64% stated that these grants had an impact on their decision to pursue energy efficiency improvements. These results show that the local governments' interest in energy efficiency may have been a larger barrier in the market prior to the block grants.

[6] Over $2.7 billion in formula grants became available to U.S. local governments under the Energy Efficiency and Conservation Block Grant (EECBG) Program, funded for the first time under the American Recovery and Reinvestment Act of 2009. This Program, authorized in Title V, Subtitle E of the Energy Independence and Security Act of 2007 (EISA) and signed into Public Law (PL 110-140) on December 19, 2007, provides funds to units of local and state government to develop and implement projects to improve energy efficiency and reduce energy use and fossil fuel emissions in their communities. The Program is administered by the Office of Weatherization and Intergovernmental Programs (WIP) in the Office of Energy Efficiency and Renewable Energy (EERE) of the U.S. Department of Energy (DOE).

Figure 13: Local Government Block Grant Penetration and Impact on Energy Efficiency Interest (n=131)

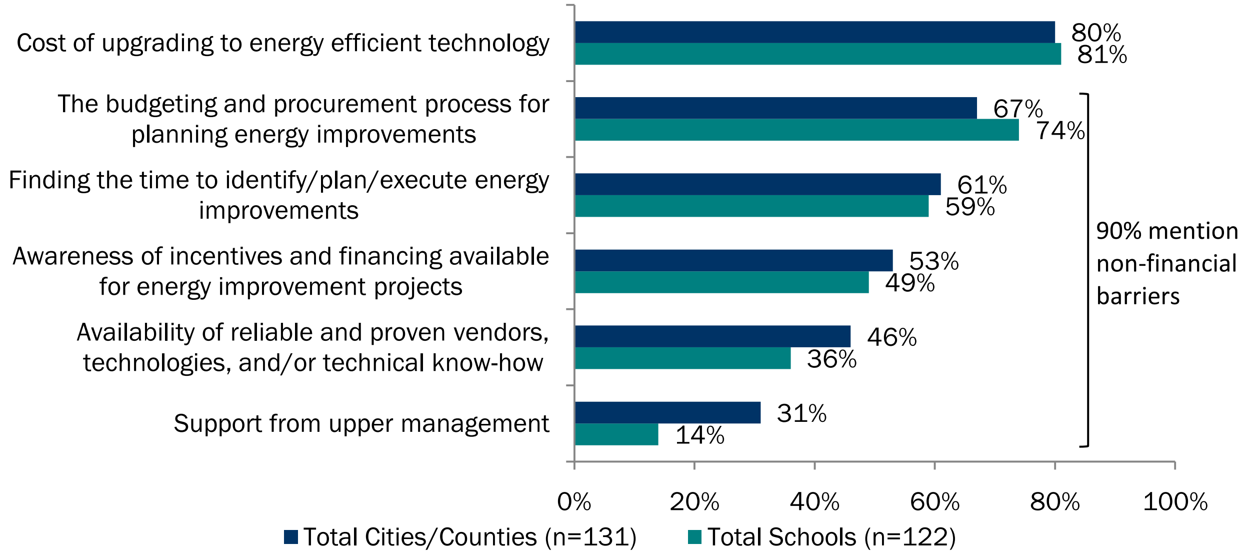


While energy efficiency interest may not be a significant market barrier, this study found that financing, internal management, and lack of energy efficiency education are all significant barriers. An array of market barriers precludes schools and local governments from taking on energy efficient measures. These barriers include perceptions regarding the benefits and drawbacks of energy efficiency improvements, financing, organization and information. This section addresses some of these commonly cited barriers and provides respondent suggested methods to overcome these barriers.

Figure 14 provides a review of common barriers to saving energy. For both schools and local governments, the most common reported obstacle is the cost of upgrading to energy efficient technology (81% and 80% respectively). However, over 90% of respondents indicated at least one non-cost barrier, with an average of 2.7 non-cost barriers noted per respondent. The most common non-cost barrier was the budgeting and procurement process for planning energy improvements (67% and 74% for local governments and schools respectively). This highlights substantial non-financial barriers that local governments and schools encounter and from which they could benefit from assistance with energy efficient product adoption.

Support from upper management was not reported to be a significant barrier to saving energy, indicating that schools' and local governments' management would likely be receptive to measures that save energy. However, one respondent stated that "I think the people at the top, like the people on the Commissioner's Court, don't understand the issues at all. When you get lower down, like people on my level, that you find people are very interested [in finding additional ways to save energy]."

Figure 14: Obstacles to Saving Energy (Prompted)



Many respondents qualitatively discussed the nature of their cost obstacles. These obstacles are summarized in the bulleted list below.

- Respondents most frequently cited financing as a chief obstacle to adopting energy efficient projects and measures. According to one respondent, "My school board really wants to make the district as energy efficient as possible, but the problem is getting the money to do it."
- Additionally, budgeting criteria and payback periods were a chief concern for one respondent: "It's not the cost so much as the time it takes to pay it back. That is the driving factor. No matter what the cost, if it's going to take 7 to 10 years to pay it back no one has any interest in it."
- Nearly two-thirds (65%) of respondents for schools and half of local governments noted that these obstacles could be overcome through financial resources (such as grants, incentives, money, lowered costs, or cheaper prices). One respondent suggested having "more incentive and rebate programs. Programs that maybe would help us to explore alternative energy sources." Additionally, respondents were interested in finding out where they can access funding.

Many respondents also qualitatively discussed the nature of their internal management and communication obstacles. These obstacles are summarized in the bulleted list below.

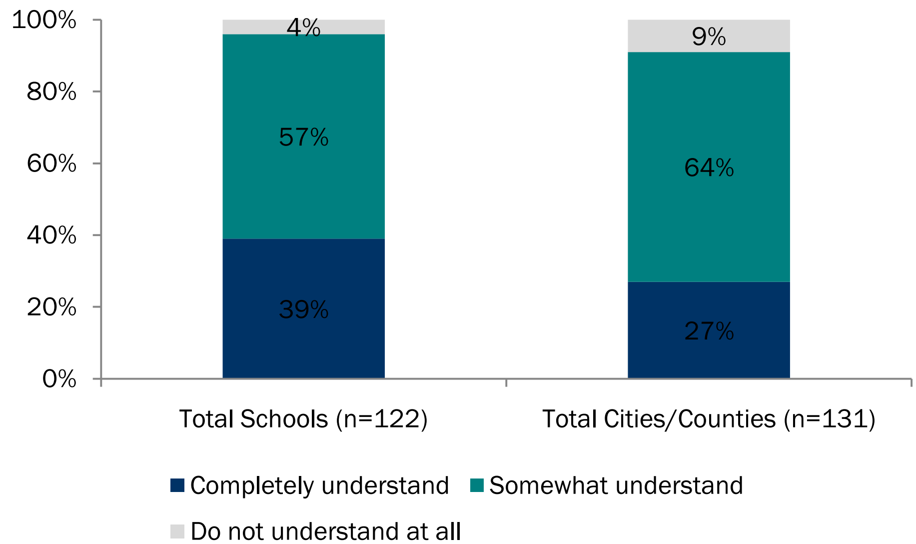
- Many respondents noted that there were barriers to energy efficient measure adoption due to lack of communication and difficulties in getting decision-makers to agree. One respondent noted that "The biggest obstacle is communication to the various departments within the university."
- Another issue was how energy related projects were prioritized. One respondent noted that "[The biggest obstacle] is the priorities of the administration." Another respondent suggested that entities should find "a way to convince the city manager and the city council that this is a good thing, that it will make us more green, that it

will save us money in the long run. Budgets are tight right now and there's not a lot of discretionary funds for other than basic things."

- Other respondents noted that adequate staffing was lacking, stating that "[The biggest obstacle] is the staff needed to carry out the project." Many respondents noted that these obstacles could be overcome by augmenting staffing and increasing training.

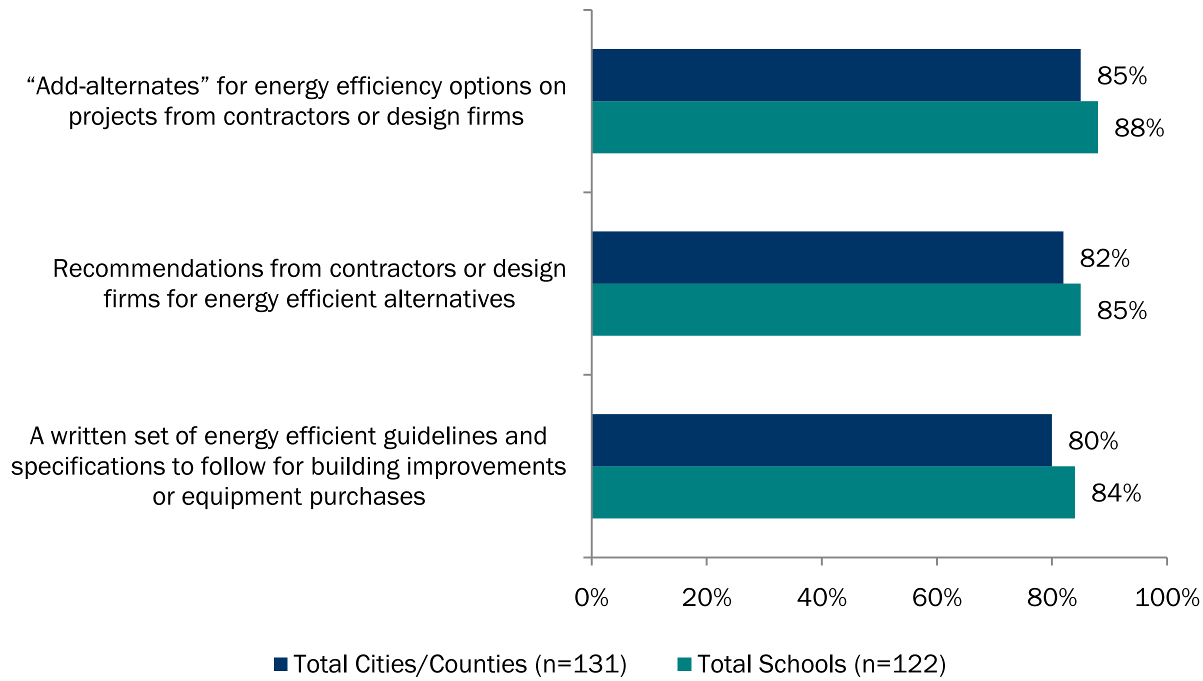
The survey also sought to determine respondent understanding of energy efficiency benefits and satisfaction with energy efficiency measures. Nearly all respondents (96% of schools and 91% of local governments) stated that they at least somewhat understand long-term energy efficiency benefits. However, only 39% of schools and 27% of local governments noted that they completely understood long-term energy efficiency benefits (Figure 15). This result demonstrates that there are opportunities to provide additional energy efficiency education to 60% or more of the respondents, especially in terms of programs that offer training and technical assistance.

Figure 15: Understanding of Long Term Energy Efficiency Benefits



Because of the respondents' desire for information to overcome barriers to energy efficient projects, we asked respondents what type of information they desired when making energy related decisions. At least 80% percent of respondents desired having a contractor or design firm include "add-alternates" for energy efficient options on projects and recommendations for energy efficient alternatives (Figure 16). In addition, 80% of local governments and 84% of schools desire a written set of energy efficient guidelines and specifications to follow for building improvements or equipment purchases. This may suggest that the respondents who stated that they already have energy efficient guidelines or specifications (in a previous section) either feel that theirs are generally lacking or are not comprehensive enough to cover their needs. One respondent noted that "we have a district standards manual that's given to architects and engineers when they design something for us; it has our standards in there. It doesn't get updated enough so we are kind of behind the wheel."

Figure 16: Information Desired to Help with Energy Decisions (prompted)



Many respondents qualitatively discussed their need for specific information to help them with energy decisions. These needs are summarized in the bulleted list below.

- Many respondents cited a need for cost analyses of energy efficient projects and products, which include opportunity cost, payback period, return on investment, and pricing information. One respondent noted the need for "some kind of tool whereby we could compare what we do now with other options, especially a tool that could compare return on investment." Another noted that, "the biggest obstacle is making the calculations correct, being able to show the savings, [and] the payback that would be involved."
- For local governments, training city council members and reducing red tape was seen as an important way to overcome barriers to energy efficient projects. One respondent noted that having "some policy in place for the requirements for different types of equipment that we needed to purchase [would help]."
- Respondents also cited an interest in specific technical knowledge, such as energy equipment specifications, information regarding proven technology, engineering studies, and information regarding the long-term reliability and life expectancy of the equipment. One respondent noted that "I always want information that helps me to evaluate new technologies so I can really see if there are negative factors that work against the positive in those technologies."
- Respondents also wanted information about vendors and where they can get help to with projects. One respondent suggested having a list of qualified market actors to retrofit or install energy efficient equipment: "I think it would be good to have someone we could call and talk to, maybe an engineer who is in the business of

saving energy and who could advise us what to do in particular cases." Further, many respondents noted that having energy audits, smart meters, and auditing software would be helpful. "We are really interested in the new smart meters. It would help us with some sites that we don't have metered right now."

- Real world experiences from neighboring towns, school districts, and other facilities were welcomed as important information for planning and implementing energy efficient projects. One respondent said, "What we would like to have is some real world experiences of what other folks have done. We would like contacts in other cities where they've gone through retrofitting and see how they've handled it."

Barriers to energy efficient project adoption can also stem from perceptions about the benefits and drawbacks of energy efficient technologies. Our survey asked those respondents who had adopted energy efficient measures what benefits or drawbacks they had found. According to our survey, less than one-third of those who adopted energy efficient measures reported a drawback and very few drawbacks were mentioned. These drawbacks included the cost of energy efficient equipment, worse lighting, equipment performance and availability, and comfort. One respondent noted that "There have been no complaints about the lighting except that sometimes it's too bright. On the control side, we get complaints because someone wants to work late and the AC gets turned off at 4. The bottom line is it's saving money." Over 80% of respondents cited a benefit to energy efficiency, which was most commonly better lighting. Over 50% of schools and 47% percent of local governments stated that a benefit from energy efficiency improvements was better lighting. Other respondents said the new energy efficient technology was working well, and some noticed a real reduction in the maintenance problems with their HVAC units. Most respondents reported being satisfied and were unable to identify a drawback with energy efficiency improvements. This finding suggests that the energy efficient technologies themselves are not a barrier.

Awareness and familiarity with energy efficient technology options are often barriers in this marketplace. In our survey, we asked respondents to rate their familiarity with energy efficient lighting technology. As shown in Figure 17 and Figure 18, less than half of schools are familiar with the T-5s, LED indoor, and LED outdoor lighting. Furthermore, less than 30% of the local governments are familiar with T-8s, T-5s, and LED lighting. There is a large opportunity for educating the market on energy efficiency lighting technology and options.

Figure 17: Market Familiarity with Energy Efficient Fluorescent Lighting

(% self-reported "very familiar")

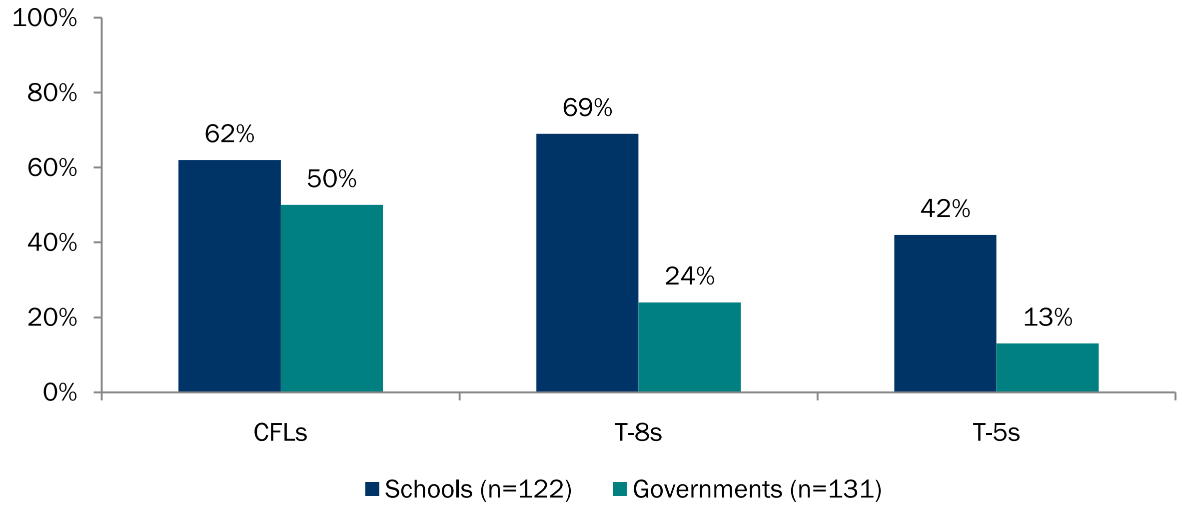
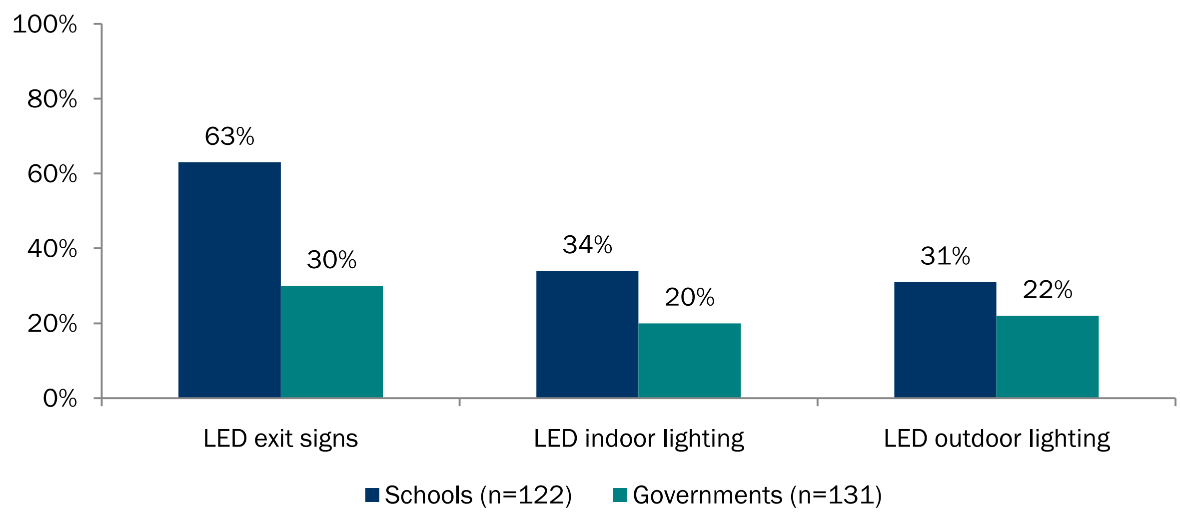


Figure 18: Market Familiarity with LED Lighting[7]

(% self-reported "very familiar")

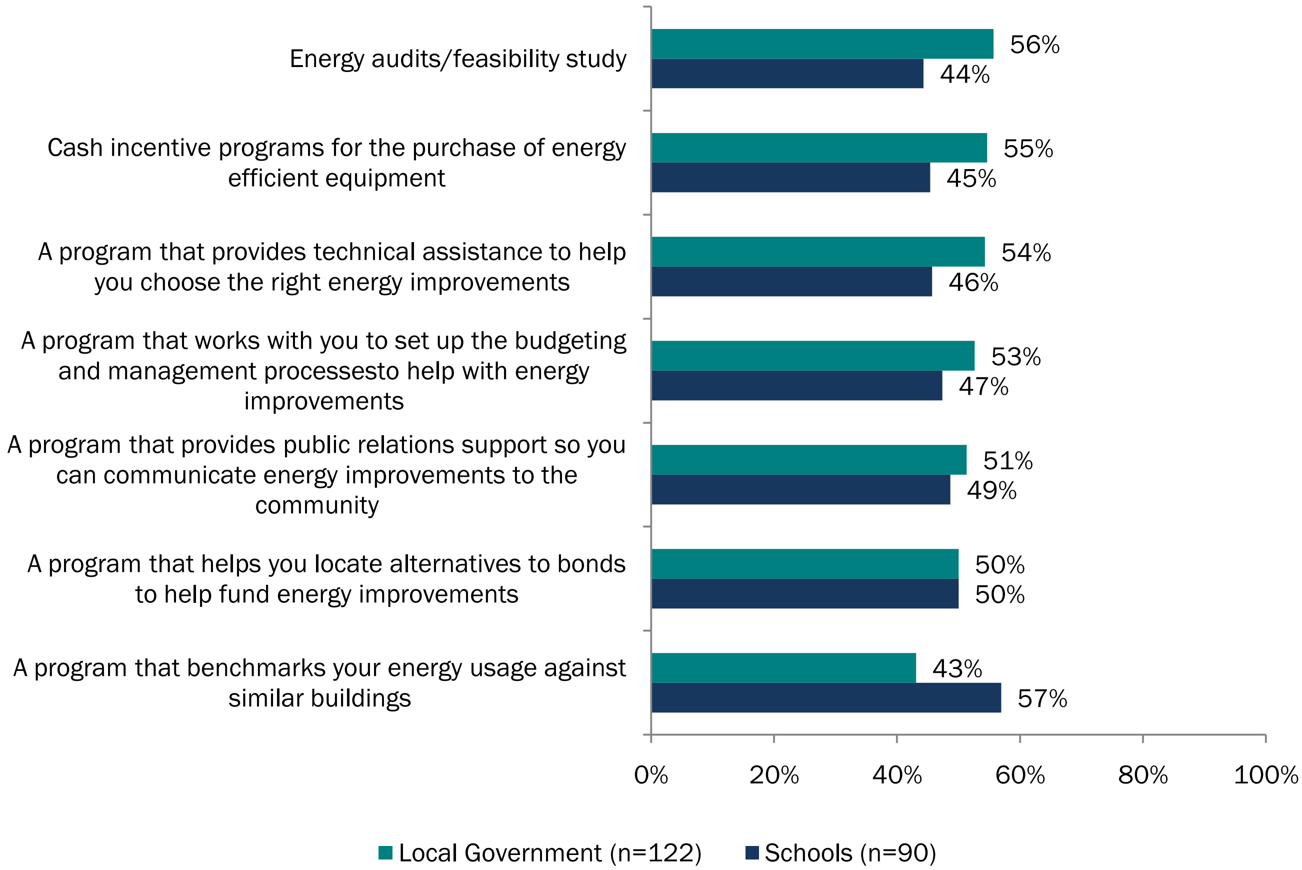


Given the significant monetary and non-monetary barriers present in the marketplace, both resource acquisition and market transformation programs are needed. The survey sought to understand non-partners' interest in specific energy efficient programs. Participants seemed to be equally interested in both monetary and non-monetary programs (Figure 19). Further,

[7] All respondents who said they were very or somewhat familiar with LED indoor lighting and/or LED exit signs were asked whether they had any LED indoor lighting or LED exit signs in their buildings.

83% of non-partner schools and 73% of non-partner local governments are interested in at least one of the types of programs listed in the figure to help with energy improvements.

Figure 19: Non-Partner Energy Efficiency Program Interest



5.2 Local Government Energy Baseline Characteristics

The following section outlines local government energy baseline characteristics, including number and type of buildings, equipment types, and operation and maintenance routines. The local government section is presented before schools because the data show that local governments have a greater need for services to improve their energy efficiency. Local governments currently generally lack energy efficient equipment as well as operations and maintenance procedures that would help existing equipment operate optimally. Throughout this section, we present a summary of the key baseline characteristics and refer to additional information in the appendices.

5.2.1 Building Characteristics

Local governments feature a diversity of buildings in number and type, making it difficult to compare energy usage between cities/counties or even buildings. The 131 cities and counties we interviewed own an average of 17 buildings each. While the vast majority of governments (81%) own ten or fewer buildings, the number ranges from 1 to 850 per local government entity, with Fort Worth being by far the largest local government interviewed in this study. Ninety-four percent of buildings were classified as existing, or more than two years old, with the average year of construction being 1983. The buildings consist of a wide variety of types. Based our interviews, the most frequently owned building types are city halls (83%), fire and police stations (62%), and maintenance shops (46%).

Drawing from building characteristic and energy usage data collected by CLEAResult as part of program implementation efforts, below we provide basic building characteristic data (mean and median) including average year built, square footage, percent of floor space cooled, number of occupants, weekly operating hours, and number of computers in total and by building type. We also present the baseline average energy usage for local governments including electric (kWh) and gas (therms) annual usage and costs. Notably, we do not currently include other fuel types beyond electric and natural gas in these tables as only 1% of the local government buildings use a different fuel type for heating.

Analyzing the building characteristics of local governments in total is challenging given the wide variability of building use types in the local government market (charts graphically showing this variation can be found in Appendix C). The average number of occupants per city or county building is 86, but this number ranges from 8 on average in warehouses up to 984 in airports. The average weekly operating hours per city or county building collectively is 93 hours; this ranges from 44 average hours in courthouses up to 138 in water treatment plants and 147 in airports. Furthermore, the average number of computers is 28 per city or county building; this ranges from 3 on average in warehouses up to 114 in city halls. There is so much variability in the types of buildings that it is important to look at each building specifically or each building type specifically. Ultimately, the best baseline for local government buildings will likely be the pre-program data for a specific building.

Table 6: Local Government Building & Energy Usage Characteristics Means (n=366)

	Overall (n=366)	Fire/Police Station (n=101)	Office (n=50)	Library (n=31)	Rec Center/Gym (n=30)	Social/Meeting (n=26)	City Hall (n=20)	Entertainment (n=14)	Maintenance Shop (n=11)	Water Treatment Plant (n=11)	Courthouse (n=8)	Airport (n=6)	Warehouse (n=3)	Medical Office (n=3)	Health Clinic (n=2)	Assisted Living (n=1)	Other (n=49)
Building Characteristics																	
Year Built	1983	1983	1979	1984	1984	1977	1978	1980	1989	1990	1968	1985	1970	1971	1985	2001	1989
Floor Area (sf)	21,682	13,223	16,730	26,162	18,443	28,433	40,503	67,500	7,701	6,139	54,215	72,972	8,445	19,464	14,886	26,500	15,123
Floor Space Cooled (%)	88	75	93	98	100	100	98	96	68	84	100	91	53	100	100	100	87
Occupants	86	29	54	148	58	94	110	287	26	19	96	984	8	58	59	400	63
Weekly Operating Hours	93	158	46	63	71	58	59	68	46	138	44	147	47	50	43	50	89
Number of PCs	28	18	37	52	7	7	114	15	5	12	85	54	3	13	34	19	18
Energy Usage and Cost																	
Electricity Usage (kWh)	539,612	275,511	322.878	578,639	433,432	529,808	995,537	835,371	58,384	2,062,149	1,167,214	3,079,796	537,353	638,000	342,899	522,473	435,287
Natural Gas Usage (therms)	8,048	3,542	4,879	6,421	5,976	12,929	16,412	19,694	6,333	3,331	19,203	12,716	2,045	16,143	3,104	9,741	14,567
Electricity Cost ($)	55,987	27,848	33,352	58,612	44,756	59,168	130,587	87,275	6,645	204,730	112,566	292,207	45.895	59,170	38,721	61,300	41,769
Natural Gas Cost ($)	7,994	3,631	4,774	6,608	6,027	11,973	15,326	19,597	6,812	3,716	18,013	13,151	1,955	16,169	3,133	8,640	15,027
Total Cost ($)	62,272	31,191	36,503	64,543	48,975	70,294	139,783	98,473	10,371	205,743	128,328	303,167	47,849	69,950	40,287	69,940	50,662
Energy Cost ($/occupant)	3,919	1,827	1,226	2,171	6,158	2,881	1,496	4,147	1,185	46,559	1,495	1,741	15,151	822	751	175	3,302

Table 7: Local Government Building & Energy Usage Characteristics Medians (n=366)

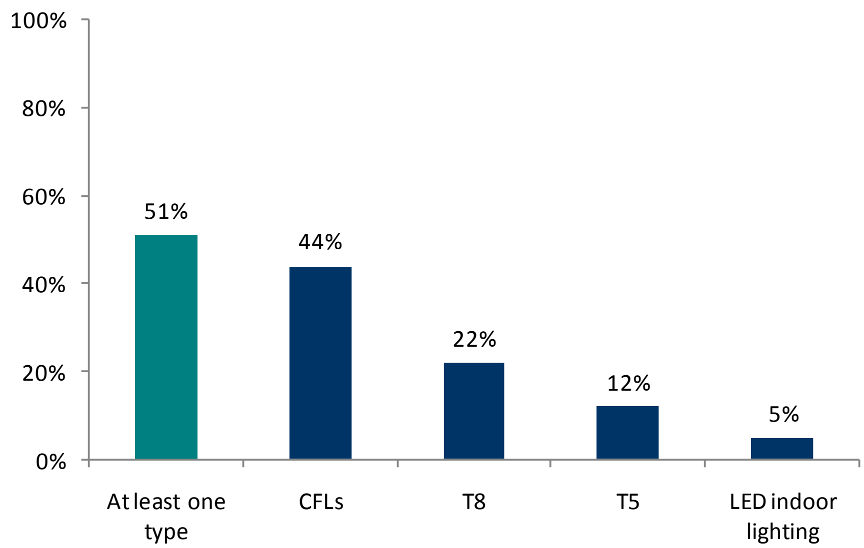
	Overall (n=366)	Fire/Police Station (n=101)	Office (n=50)	Library (n=31)	Rec Center/Gym (n=30)	Social/Meeting (n=26)	City Hall (n=20)	Entertainment (n=14)	Maintenance Shop (n=11)	Water Treatment Plant (n=11)	Courthouse (n=8)	Airport (n=6)	Warehouse (n=3)	Medical Office (n=3)	Health Clinic (n=2)	Assisted Living (n=1)	Other (n=49)
Building Characteristics																	
Year Built	1986	1986	1985	1986	1990	1977	1985	1990	1989	1991	1975	1987	1985	1972	1985	2001	1994
Floor Area (sf)	10,344	7,600	7,805	16,015	15,980	12,858	31,200	35,000	3,600	1,780	29,882	64,695	9,909	8,700	14,886	26,500	6,500
Floor Space Cooled (%)	100	72	100	100	100	100	100	100	100	100	100	95	40	100	100	100	100
Occupants	15	10	15	40	8	25	81	34	6	6	61	238	7	45	59	400	15
Weekly Operating Hours	65	168	40	64	72	47	45	71	45	168	40	140	50	51	43	50	56
Number of PCs	9	3	11	35	7	7	57	6	2	3	65	18	3	15	34	19	6
Energy Use and Cost																	
Electricity Usage (kWh)	204,792	117,672	107,641	298,170	386,884	233,074	478,671	585,984	42,972	1,833,666	557,557	2,837,478	28,980	118,971	342.899	522,473	247,320
Natural Gas Usage (therms)	3,107	2,847	1,964	1,748	3,638	3,406	3,521	10,893	1,522	3,821	4,119	15,674	1,233	16,143	3.104	9,741	4,937
Electricity Cost ($)	20,249	12,110	10,374	31,874	40,276	21,159	55,606	50,656	5,834	181,782	61,701	299,200	5,115	10,767	38.721	61,300	21,697
Natural Gas Cost ($)	3,241	3,014	2,329	2,162	3,434	3,930	3,243	13,477	2,800	3,632	4,177	17,333	1,336	16,169	3.133	8,640	5,570
Total Cost ($)	25,013	15,191	14,077	34,063	41,215	31,860	58,850	56,788	6,183	181,782	67,100	312,875	6,450	11,773	40,287	69,940	28,237

5.2.2 Equipment

Lighting

Our analysis found a large opportunity for adoption of energy efficient lighting technologies in local governments. Only half of local government respondents have adopted any type of efficient indoor lighting (Figure 20), with the most common type being CFLs (44%). In terms of fluorescent lighting, only 22% of respondents have T8s, and only 12% have the more efficient T5s. This means that most lighting consists of inefficient T12s or incandescent, with 37% of respondents saying that half or more of their fluorescent lighting is T12 and 41% of respondents stating that half or more of all lighting is incandescent. Proportions of individual lighting types including incandescent, T8, T5, and T12 can be found in Appendix A.

Figure 20: Local Government Adoption of Efficient Indoor Lighting (n=131)



Although some local governments say they have T8s and T5s, they only have them in a few fixtures and there are many fixtures that can still be upgraded (see Table 20 in Appendix A). The standard T8 lamp will represent baseline technology with the manufacturing ban on T12 magnetic ballasts going into effect this summer.

According to the survey, the LED penetration rate for local governments is only 5% for indoor lighting, 15% for outdoor lighting, and 20% for exit signs.[8] However, LED lighting is just one option for energy efficient lighting. LEDs are not always more efficient than fluorescents, but they are at least as efficient and last longer. They can also provide more directed (rather than diffuse) lighting for specific purposes. For applications such as exit signs that can

[8] Note that while CLEAResult has identified some local governments that have tested indoor LED, non-exit sign lighting applications, CLEAResult has not seen interior LED lighting installations in any city facility. City program partners have cited the technology as being too cost-prohibitive. The survey question for respondents was, "Do you have any of the following types of lighting in your buildings…LED indoor lighting?" This question was asked of all respondents who said they were very or somewhat familiar with LED indoor lighting, and this followed the same question regarding LED exit sign lighting.

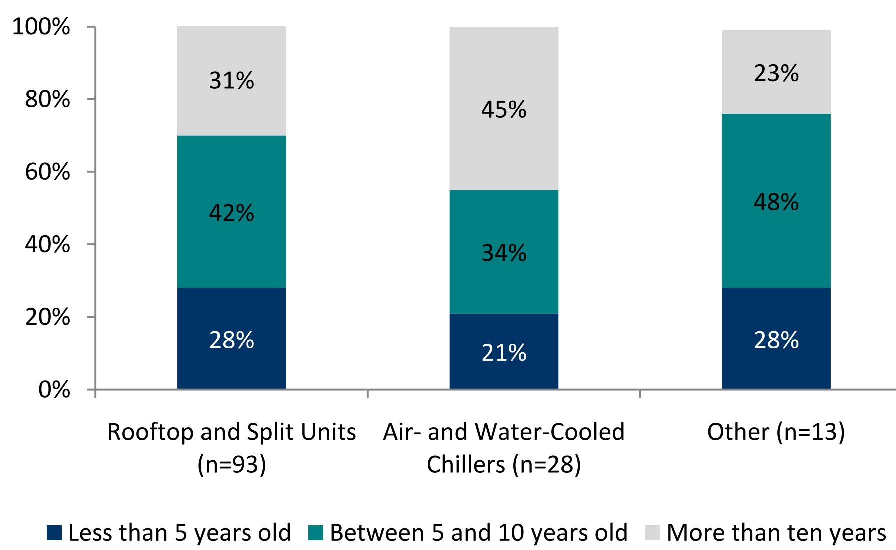
utilize a single diode, LEDs provide the most efficient lighting source. As such, all exit signs should generally be replaced with LEDs. The efficacy of installing LED outdoor or indoor lighting depends on the other types already installed, such as efficient fluorescents. Therefore there is an opportunity to move local governments toward LED exit signs, and there may also be a market for other LED lighting, which should be determined on a case by case basis.

Air Conditioning

Within the local government market there is a large opportunity to increase the efficiency of cooling equipment through replacement of older units and purchase of efficient new units. There does seem to be a trend toward the purchase of efficient units in the existing market; however, there also appears to be an opportunity to educate local governments about how to identify and select an efficient unit rather than relying on others to make decisions for them.

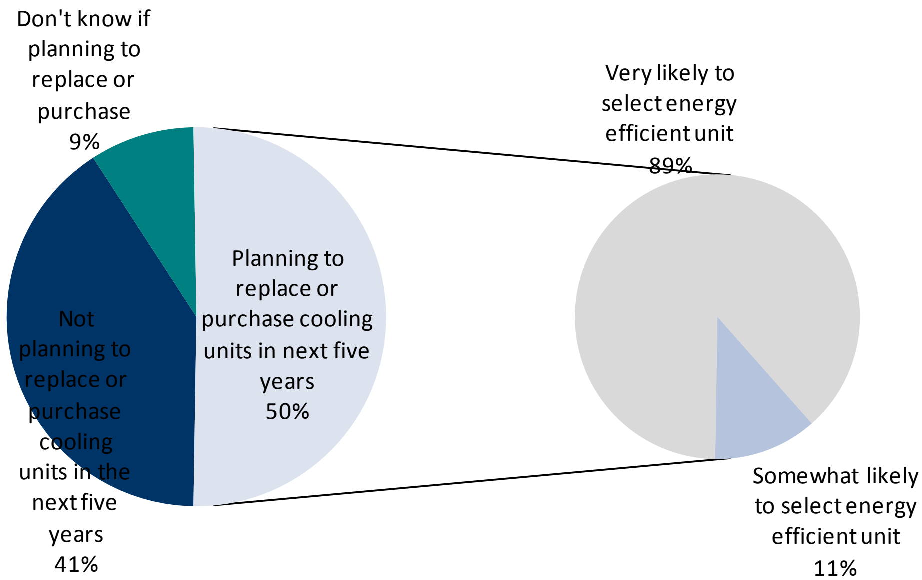
Overall, 34% of local government cooling units are more than ten years old (Figure 21). These older units are generally less efficient and provide an opportunity for replacement with high efficiency equipment. In general, chillers are older than rooftop and split units, but local governments have fewer of them (see the complete breakdown of cooling unit types in Table 22 in Appendix A).

Figure 21: Local Government Cooling System Age



In addition, half of survey respondents stated that they are planning to replace or purchase cooling equipment in the next five years (Figure 22).

Figure 22: Local Government Future Cooling Equipment Purchase (n=131)

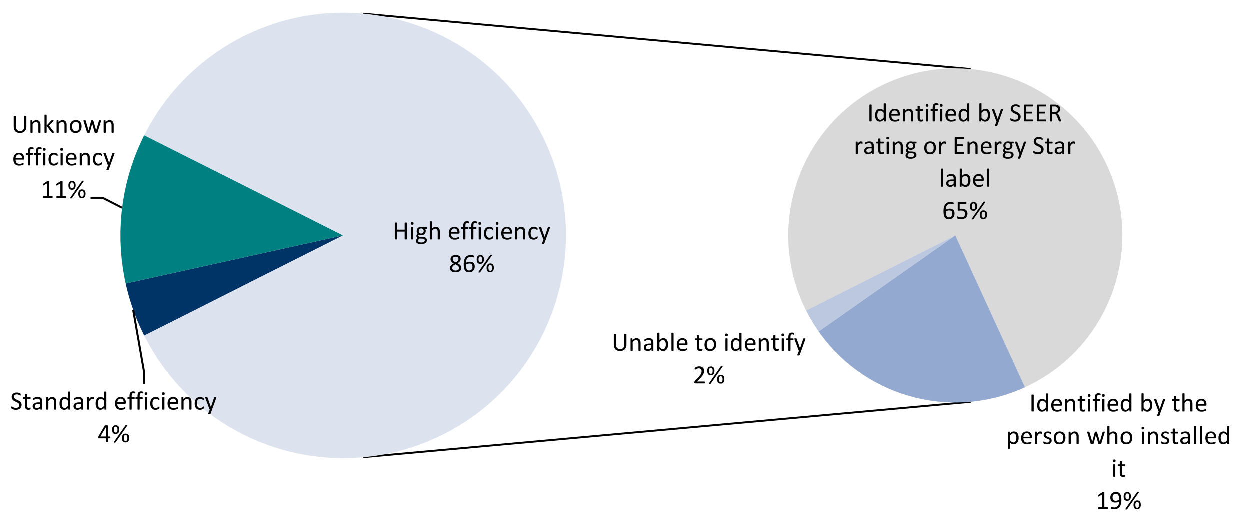


While all of those considering purchasing indicated that they are likely to select an efficient unit, there is often a gap between stated intentions and actual behavior. In the past two years, 86% of respondents who purchased cooling equipment said it was high-efficiency (Figure 23).[9] However, only 65% identified this by the SEER rating or Energy Star label. This leaves 35% of respondents who either did not purchase high efficiency units or only think they did based on what the person who installed the unit told them. This presents an opportunity to increase awareness of, and education about, energy efficient units for local government staff.

[9] Note that this data is self-reported. Additional onsite research could be completed with respondents with systems that are less than 2 years old to examine efficiency.

Figure 23: Local Government Past Two-Year Cooling Equipment Purchase Efficiency

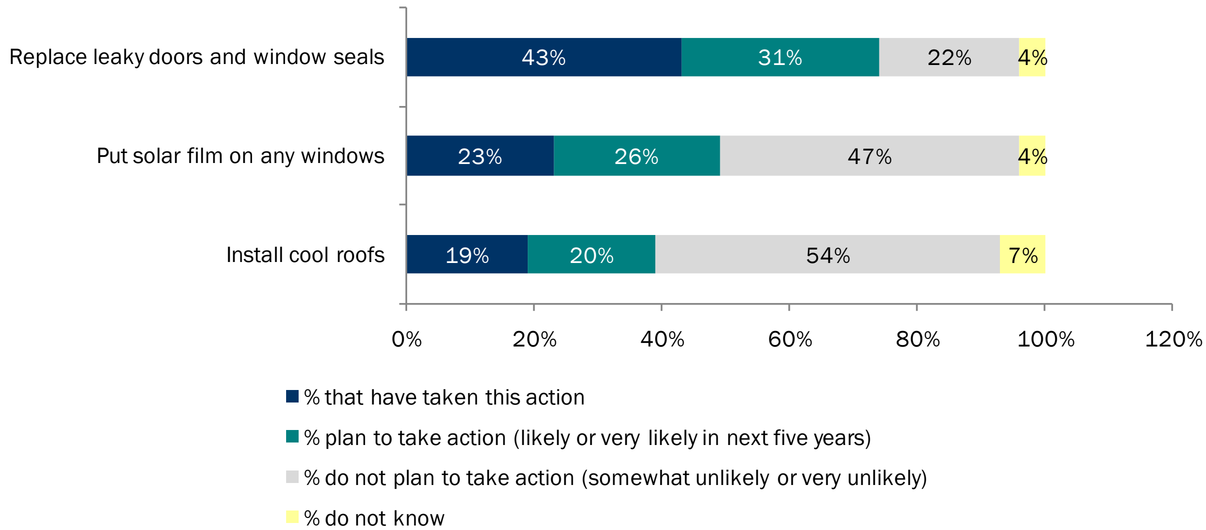
Among those who purchased equipment (n=57)



Envelope Measures

In addition to lighting and air conditioning, opportunities exists to help move local governments toward undertaking envelope measures that improve the energy efficiency of the building, either through information and awareness (for those with no plans to take action) or assistance in adopting these measures (for those with plans to take action). Replacing leaky doors and window seals is the most commonly undertaken measure, but is done by just 43% of local governments (Figure 24). In addition, very few respondents have installed solar film (23%) and cool roofs (19%).

Figure 24: Size of Building Envelope Measures Market (n=131 local governments)

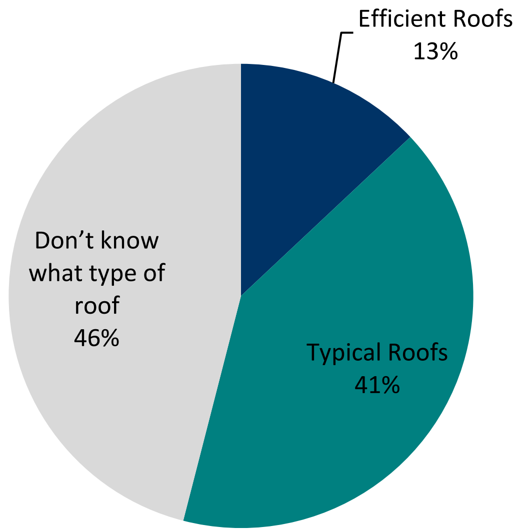


In a separate question, just 13% of those who have recently or are currently undergoing construction provided us with enough information to classify their installed roof as efficient – a cool roof or other type of roof having a solar reflectance index above 75 (Figure 25).[10] Many referred to their roofs simply as metal or tile. This may indicate that roofing is not thought about as an energy efficient measure, and is further evidence that the new roofing market is open for transformation through education or assistance.

[10] Listing of roof types available in Appendix B.

Figure 25: Types of new Roofing Installed in the Local Government Market

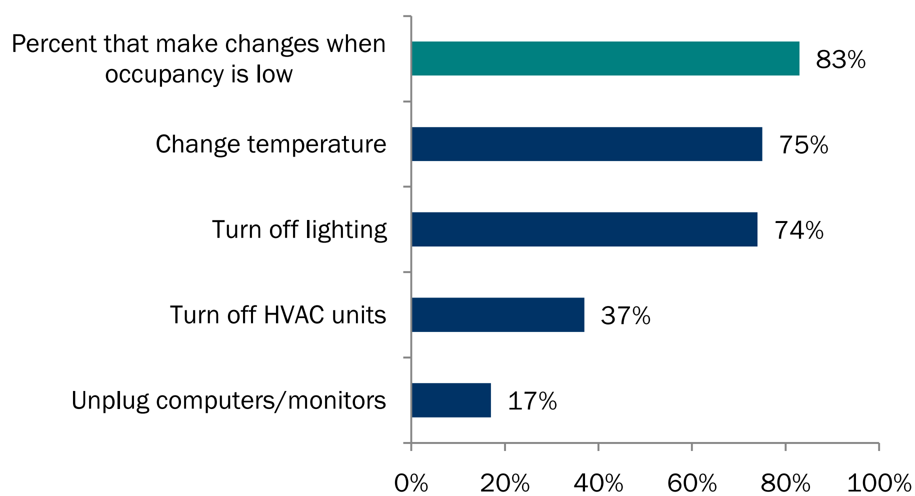
Among respondents that have recently undergone, are undergoing, or planning new construction (n=46)



Energy Management Systems

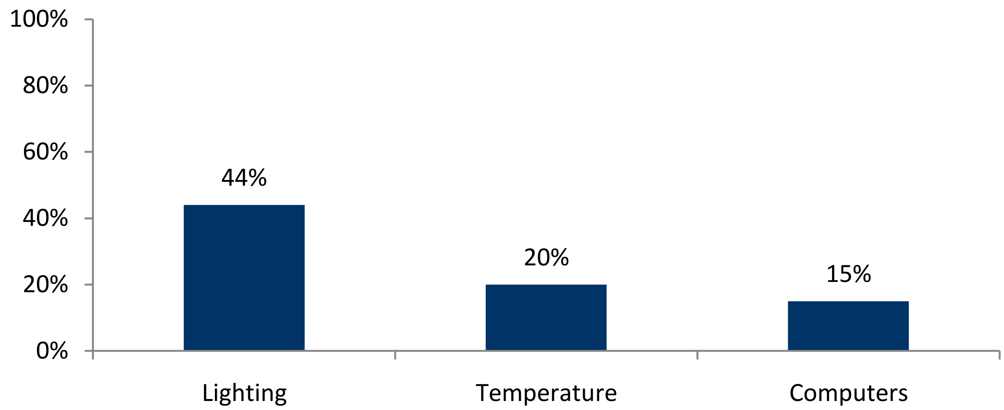
Most local governments make changes to temperature or lighting during low occupancy times (Figure 26), but these changes seem to be behavioral rather than automatic. This finding suggests that there is potential for greater energy savings through adoption of EMS.

Figure 26: Local Government Response to Low Occupancy Times (n=131)



When we inquired about energy management systems to automatically control temperature, lighting[11], and computers, we found that few systems are in place (Figure 27). Lighting has the highest adoption rate, but is still less than 50%. In addition, existing management systems often control only one or a few buildings; and are generally not comprehensive of all government owned buildings (see Table 25 in Appendix A).

Figure 27: Local Government Energy Management System or Controls Market Penetration (n=131)



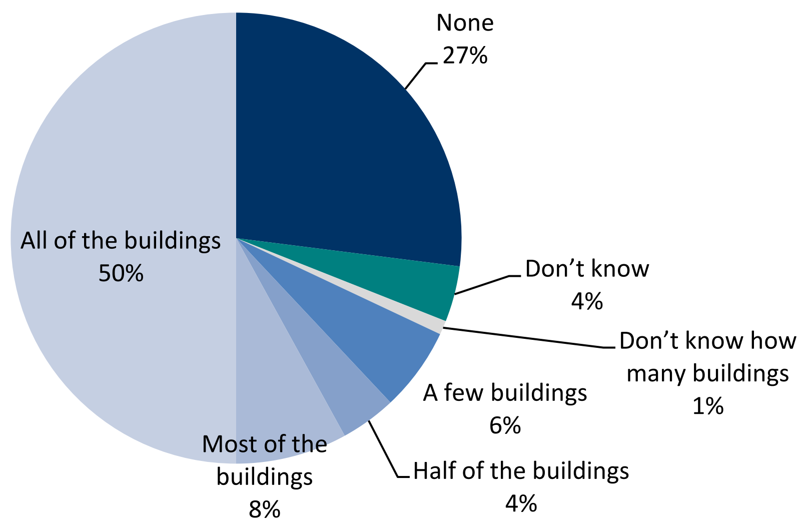
5.2.3 Operations and Maintenance

According to respondents, local governments do not undertake sufficient operations and maintenance practices to ensure that their energy using equipment is operating at peak efficiency. This represents an opportunity to increase the efficiency of existing equipment that is not yet ready for replacement.

Only half of local governments have regular operations and maintenance procedures for energy using equipment in all of their buildings (Figure 28). In fact, 27% of respondents have no regular maintenance procedures at all. The most common procedures are regular and preventative maintenance for HVAC systems.

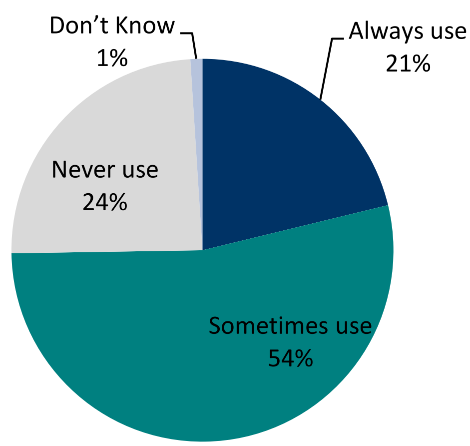
[11] Lighting controls may be part of an HVAC EMS or consist of occupancy sensors or timers. Breakdowns available in Appendix B.

Figure 28: Local Government Regular Operations and Maintenance Procedures (n=131)



In addition, one-quarter of local government respondents never make use of maintenance contracts when purchasing new equipment, and half only make use of them sometimes (Figure 29). Approximately three-quarters of respondents can increase their maintenance contract use. Maintenance contracts ensure that equipment is maintained and serviced by the original equipment manufacturer or its authorized service organization; they also include preventative maintenance and therefore increase the likelihood that the equipment will be maintained regularly.

Figure 29: Local Government Maintenance Contract Use Frequency (n=131)



Finally, only 33% of local governments have had a technician test energy equipment to see if it is operating optimally. These results suggest that there are significant gains to energy efficiency that can be made in terms of regular maintenance and operations for existing energy efficient equipment.

5.3 School Energy Baseline Characteristics

The following section outlines school (K-12 and college) energy baseline characteristics, including number and type of buildings, equipment types, and operation and maintenance routines. In general, schools are in better shape than local governments regarding energy efficiency; however, many opportunities still exist to move schools farther along the energy efficiency spectrum. As with local governments, throughout this section, we present a summary of key baseline characteristics and refer to additional information in the appendices.

5.3.1 Building Characteristics

We interviewed 107 K-12 schools or school districts and 15 colleges. The average school district has 19 buildings, and the average college owns 41 buildings. While the majority of school districts (78%) own twenty or fewer buildings, the number ranges from one to 300, with the largest school district in this study being Dallas ISD. The number of college buildings ranges from six to 230, with the largest in this study being Sam Houston State University. Ninety-three percent of buildings were classified as existing, or more than two years old, with the average K-12 school dating back to 1978 and the average college building dating back to 1982. School districts typically include classrooms, gyms, libraries, cafeterias, and offices (see Table 27 in Appendix A). Colleges contain a wider variety of building types, with the most common being classrooms (100%), offices (87%), and gyms (87%) (see Table 28 in Appendix A).

Drawing from building characteristic and energy usage data collected by CLEAResult as part of program implementation efforts, below we provide basic building characteristic data (mean and median) including average year built, square footage, percent of floor space cooled, number of students, weekly operating hours, number of months used in a calendar year, and number of computers in total and by school type (for K-12 schools) and building type (for colleges). We also present the baseline average energy usage for schools including electric (kWh) and gas (therms) annual usage and costs. Notably, we do not currently include other fuel types beyond electric and natural gas in these tables as only 1% of K-12 schools and 3% of colleges use a different fuel type for heating.

It is important to separately analyze college building characteristics from K-12 schools given that they vastly differ in terms of building use and operating hours. Furthermore, it is important look at some K-12 school building characteristics by school type as there is much variation based on school type, such as that fact that high schools are substantially larger in square footage than middle and elementary schools. Charts graphically showing this variation can be found in Appendix C.

Table 8: K-12 School and Energy Usage Characteristics Means

	Overall (n=1814)	Elementary School (n=1114)	Middle School (n=368)	High School (n=230)	Other (n=67)	Combined (n=35)
Building Characteristics						
Year Built	1978	1978	1979	1978	1971	1978
Floor Area (sf)	113,184	74,533	130,871	273,296	65,146	197,211
Floor Space Cooled (%)	97	97	98	98	97	95
Students	798	642	814	1,609	390	1065
Weekly Operating Hours	54	53	55	58	54	52
Months Used	10	10	10	11	10	10
Number of PCs	309	228	338	676	193	426
Energy Usage and Cost[12]						
Electricity Usage (kWh)	1,362,702	868,239	1,518,404	3,427,230	811,150	3,184,589
Natural Gas Usage (therms)	15,121	8,840	17,947	39,342	6,886	31,530
Electricity Cost ($)	130,393	85,578	144,917	321,932	79,390	258,826
Natural Gas Cost ($)	15,349	9,091	17,785	40,043	7,629	31,161
Total Cost ($)	144,506	93,794	161,561	360,405	86,353	289,632

[12] Energy usage and cost data are based on a subset of the total population depending on the school's fuel type usage.

Table 9: K-12 School and Energy Usage Characteristics Medians

	Overall (n=1814)	Elementary School (n=1114)	Middle School (n=368)	High School (n=230)	Other (n=67)	Combined (n=35)
Building Characteristics						
Year Built	1981	1982	1984	1979	1969	1983
Floor Area (sf)	81,794	72,800	127,553	283,716	35,921	131,482
Floor Space Cooled (%)	100	100	100	100	100	100
Students	664	621	801	1,721	260	794
Weekly Operating Hours	50	50	50	58	50	50
Months Used	10	10	10	10	10	10
Number of PCs	240	211	299	631	104	306
Energy Usage and Cost						
Electricity Usage (kWh)	948,940	801,823	1,371,621	3,327,822	393,312	1,452,820
Natural Gas Usage (therms)	9,025	6,909	13,488	30,630	4,142	14,804
Electricity Cost ($)	93,734	80,176	135,667	327,410	43,509	146,539
Natural Gas Cost ($)	9,294	7,293	13,667	31,046	4,568	15,521
Total Cost ($)	103,045	85,513	148,214	359,827	47,522	155,016

Table 10: College Building and Energy Usage Characteristics Means

	Overall (n=39)	Classroom (n=11)	Dorm (n=3)	Office (n=3)	Maintenance Shop (n=2)	Rec Center/Gym (n=1)	Social/Meeting (n=1)	Other (n=17)
Building Characteristics								
Year Built	1982	1983	2001	2005	1986	1976	1948	1979
Floor Area (sf)	169,283	11,000	80,000	5,385	1,768	41,158	225,506	44,901
Floor Space Cooled (%)	74	70	100	100	0	100	100	95
Occupants	617	150	225	30	4	76	8,625	57
Weekly Operating Hours	72	75	168	45	45	53	40	67
Number of PCs	161	24	25	7	1	46	633	10
Energy Usage and Cost								
Electricity Usage (kWh)	1,521,808	70,998	612,766	137,232	6,415	1,262,061	6,039,949	862,956
Natural Gas Usage (therms)	88,137	2,096	9,246	2,650	911	27,250	91,307	35,989
Electricity Cost ($)	141,794	8,728	94,700	14,709	1,118	95,893	454,302	78,713
Natural Gas Cost ($)	78,105	2,129	7,941	2,586	1,524	23,599	70,283	35,051
Total Cost ($)	201,875	12,676	102,640	14,709	1,880	119,492	524,584	95,060

Table 11: College and Energy Usage Characteristics Medians

	Overall (n=39)	Classroom (n=11)	Dorm (n=3)	Office (n=3)	Maintenance Shop (n=2)	Rec Center/Gym (n=1)	Social/Meeting (n=1)	Other (n=17)
Building Characteristics								
Year Built	1983	1983	1989	2005	1986	1976	1948	1979
Floor Area (sf)	13,449	21,634	86,136	8,435	1,768	41,158	225,506	339,353
Floor Space Cooled (%)	100	69	100	90	0	100	100	74
Occupants	70	147	249	29	4	76	8,625	762
Weekly Operating Hours	67	72	125	53	45	53	40	73
Number of PCs	13	36	79	7	1	46	633	295
Energy Use and Cost								
Electricity Usage (kWh)	137,232	315,263	1,082,382	113,241	6,415	1,262,061	6,039,949	2,571,698
Natural Gas Usage (therms)	5,540	6,612	19,177	2,650	911	27,250	91,307	197,592
Electricity Cost ($)	15,146	33,919	100,174	16,570	1,118	95,893	454,302	244,605
Natural Gas Cost ($)	5,350	6,604	17,208	2,586	1,524	23,599	70,283	175,325
Total Cost ($)	17,098	39,923	117,382	17,432	1,880	119,492	524,584	368,364

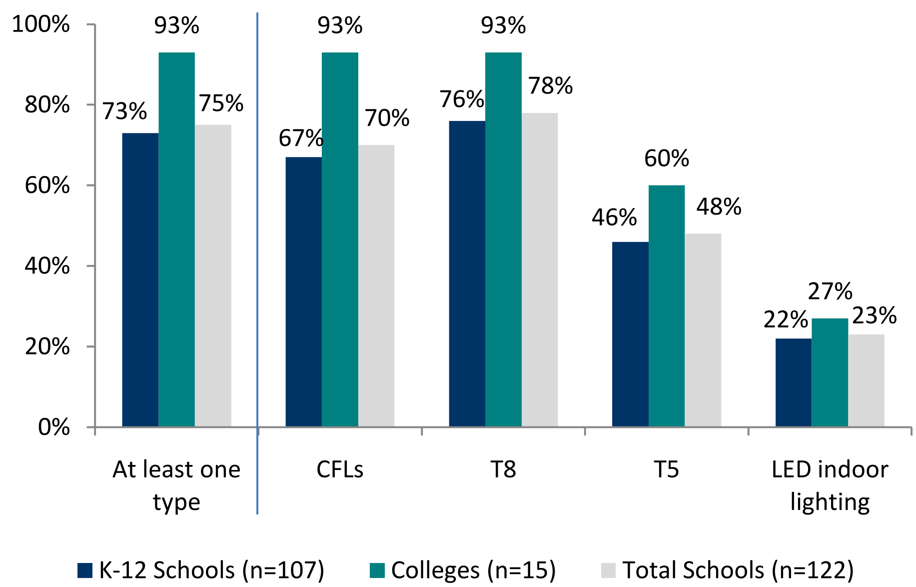
5.3.2 Equipment

Lighting

The adoption rate of energy efficient lighting is much more extensive in schools than in local governments, but there is still an opportunity to move schools toward adopting more efficient T5s and LED lighting.

Nearly three-quarters of K-12 schools and more than nine in ten colleges have adopted some type of efficient indoor lighting (Figure 30). Colleges most commonly adopted both CFLs and T8s, while K-12 schools most commonly adopted T8s. The standard T8 lamp will represent baseline technology with the manufacturing ban on T12 magnetic ballasts going into effect this summer. Less than half (48%) of schools have adopted the more efficient T5s, which indicates a significant opportunity to move schools toward a higher level of efficiency. In fact, only 12% of schools state that half or more of their non gym fluorescent lighting consists of T5s (See Table 30 in Appendix A).

Figure 30: School Adoption of Efficient Indoor Lighting[13]



Schools have adopted LED lighting in higher proportions than have local governments. The penetration rate of LED exit signs is 67% for K-12 schools and 87% for colleges; the

[13] Note that while CLEAResult has identified some school districts that have tested indoor LED, non-exit sign lighting applications, CLEAResult has not seen interior LED lighting installations in any school facility. School program partners have cited the technology as being too cost-prohibitive. The survey question for respondents was, "Do you have any of the following types of lighting in your buildings…LED indoor lighting?" This question was asked of all respondents who said they were very or somewhat familiar with LED indoor lighting, and this followed the same question regarding LED exit sign lighting.

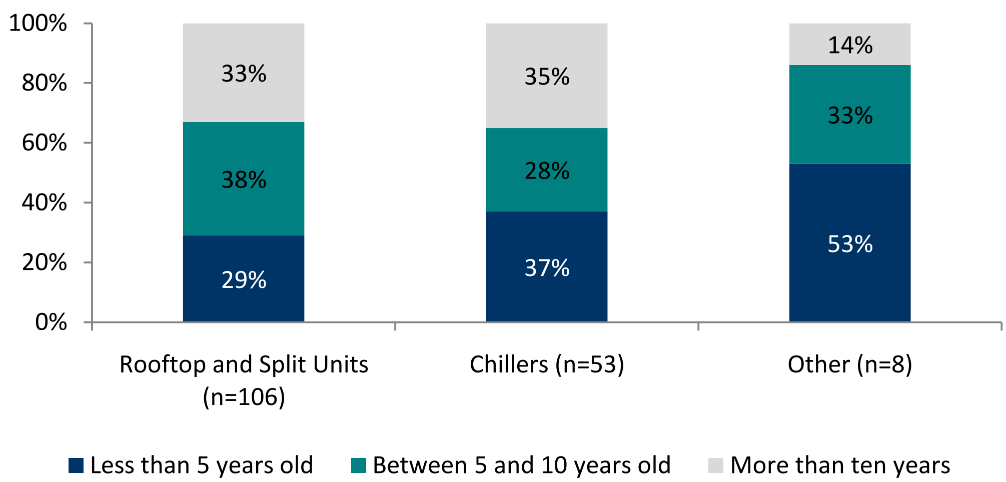
penetration rate of LED outdoor lighting is 19% for K-12 schools and 27% for colleges. Again, LED lighting should be pursued for all exit signs, and there may also be a market for LED outdoor lighting in locations where appropriate.

Air Conditioning

The age of cooling units in schools is similar to those in local governments, but a larger percentage of schools are planning to replace or purchase units in the next five years. This represents an excellent opportunity to ensure that these units are as efficient as possible by educating schools about how to identify and select efficient units.

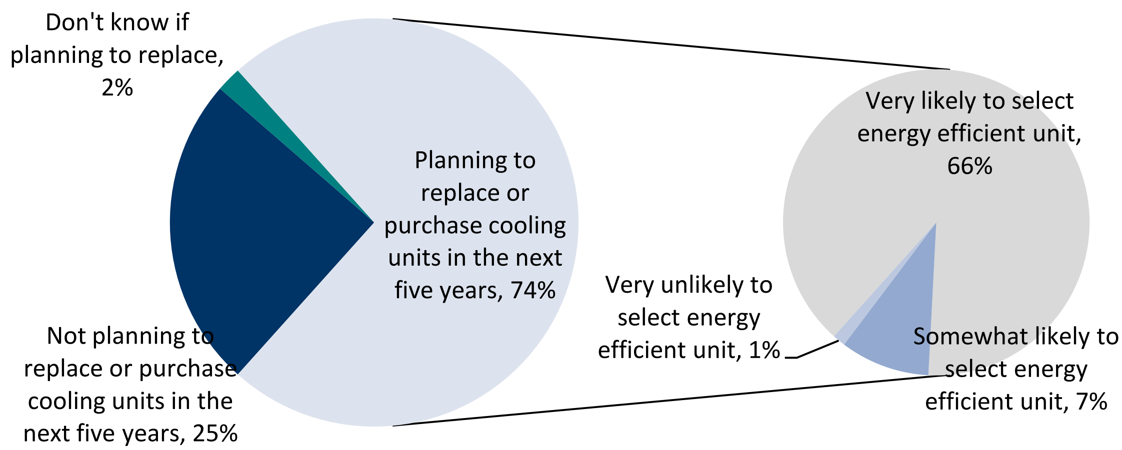
Overall, one-third of K-12 and college cooling units are more than ten years old (Figure 31). These older units are generally less efficient and provide an opportunity for replacement with high efficiency equipment. In general, more chillers are new than are rooftop and split units, but schools have fewer of them (see the complete breakdown of cooling unit types split by K-12 schools and colleges in Table 31 in Appendix A).

Figure 31: School Cooling System Age



Nearly three-quarters of survey respondents stated that they are planning to replace or purchase cooling equipment in the next five years (Figure 32). This means that there is a large opportunity to influence schools to choose efficient cooling equipment.

Figure 32: School Future Cooling Equipment Purchase (n=122)



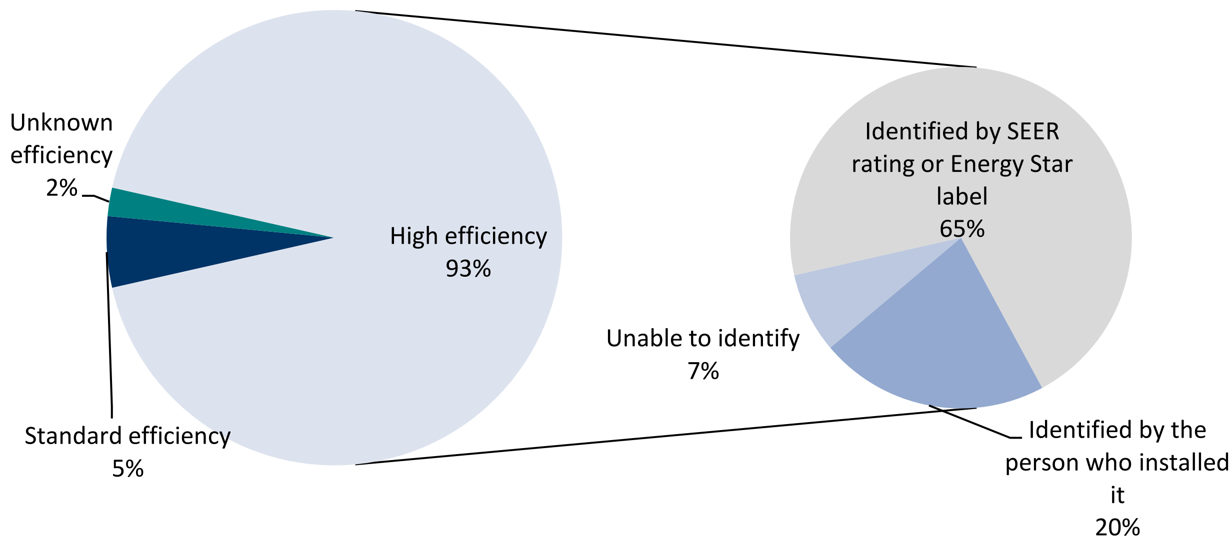
Nearly all of those considering purchasing new equipment indicated that they are likely to select an efficient unit. However, as we mentioned for local governments, there is often a disconnect between stated intentions and actual behavior, so an opportunity still exists to educate those in the market for cooling equipment on how to identify and select high efficiency equipment.

In the past two years, 93% of respondents who purchased cooling equipment said it was high-efficiency (Figure 33).[14] However, only 65% identified this by the SEER rating or Energy Star label. This leaves 35% of respondents who either did not purchase high efficiency units or only think they did based on what someone told them. This may be further indication of the opportunity to educate at least a portion of the market.

[14] Note that CLEAResult observes 13 SEER small A/C on many new construction projects, which may indicate that respondents are overstating their purchase of high efficiency equipment. We asked respondents who had purchased equipment in the past two years if they purchased high efficiency units (higher than 13 SEER) and if so, how they knew the units were energy efficient.

Figure 33: School Past Two-Year Cooling Equipment Purchase Efficiency

Among those who purchased equipment (n=86)

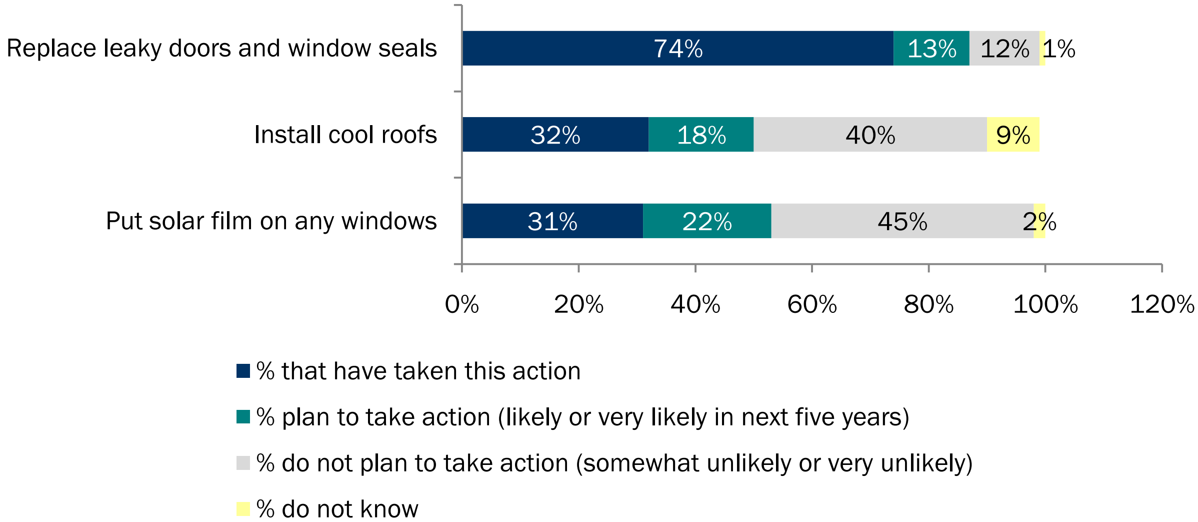


Envelope Measures

While nearly three-quarters of schools have taken the simplest envelope measure of weather-stripping, the market for other envelope measures is open for transformation. According to the survey results, an opportunity exists to help move schools toward undertaking envelope measures that improve energy efficiency of the building.

Replacing leaky doors and window seals has been undertaken by nearly three-quarters of schools (Figure 34); however, less than one-third of schools have installed cool roofs or solar film. As the figure shows, some are planning to do so in the future and might benefit from assistance, while others are not planning to and could therefore benefit from education about these measures.

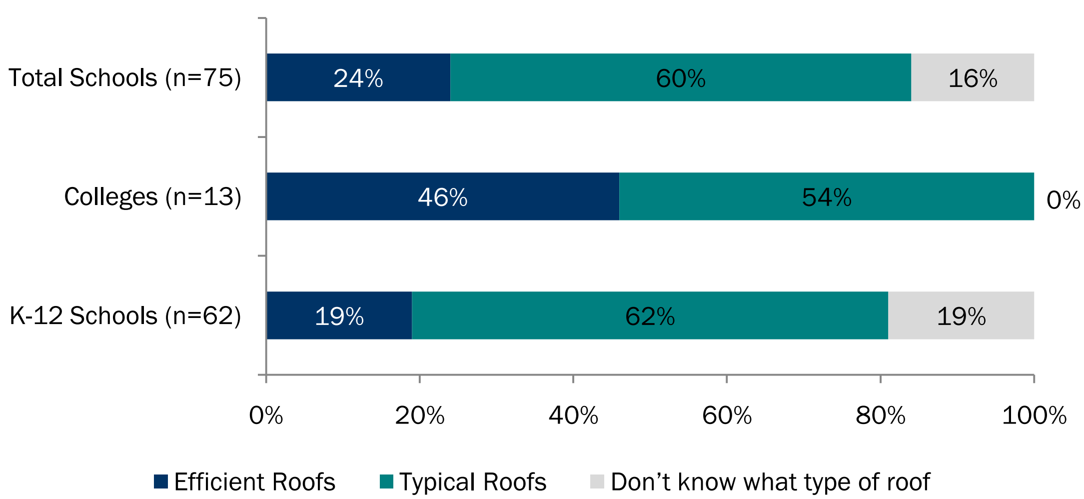
Figure 34: Size of Building Envelope Measures Market (n=122 schools)



Although 32% of school respondents stated that they have installed cool roofs, in a separate question, only 24% provided enough information to classify at least one of their installed roofs as efficient – a cool roof or other type of roof having a solar reflectance index above 75 (Figure 35).[15] Many referred to their roofs simply as metal, vinyl, or another material. Colleges seem to be more knowledgeable about their roofing types than are K-12 schools. However, colleges still install a number of non-energy efficient roofs.

Figure 35: Types of New Roofing Installed in the School Market

Among respondents that have recently undergone, are undergoing, or planning new construction



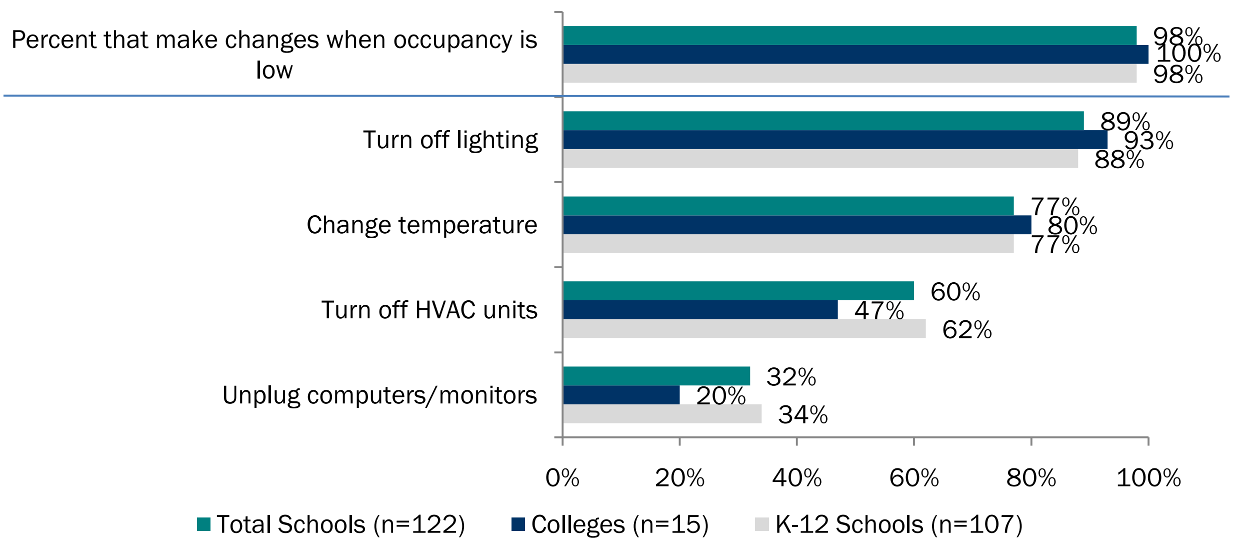
Energy Management Systems

[15] Listing of roof types available in Table 32 in Appendix B.

Our results show that the EMS market is smaller for schools than for local governments, but opportunities for energy savings still exist, particularly for computer systems and extending systems to all buildings or districts.

Nearly all schools make changes to temperature or lighting during low occupancy times (Figure 36). However, few schools unplug computers and monitors. Because schools are likely to have many of these, this could represent a large opportunity for energy savings.

Figure 36: School Response to Low Occupancy Times

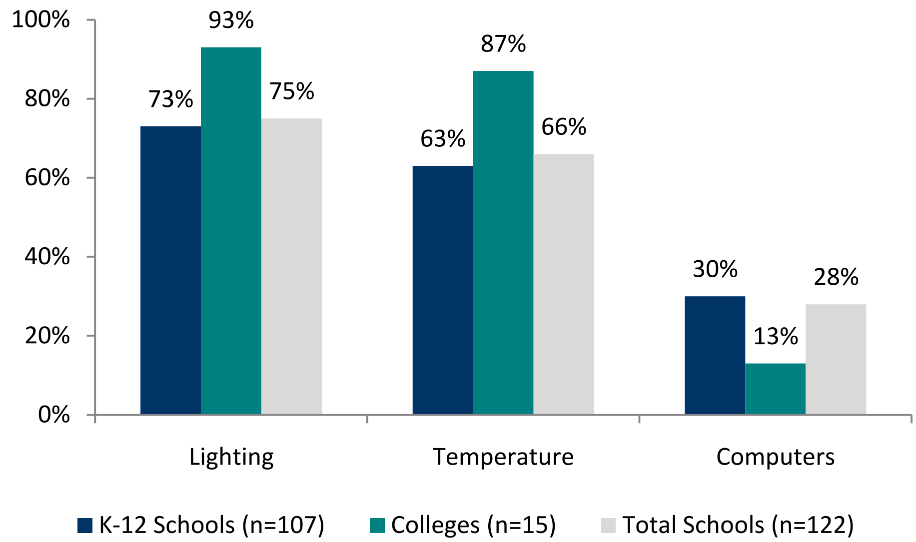


Many schools have energy management systems or other controls in place to automatically control temperature, lighting[16], and computers (Figure 37). Nearly half of the energy management systems cover all buildings or are district-wide.[17] However, a quarter or more of K-12 schools could use lighting or temperature management systems, and a large number of schools could use systems that automatically turn off computers. Some of the systems in place could also be expanded to more buildings or schools.

[16] Lighting controls may be part of an HVAC EMS or consist of occupancy sensors or timers. Breakdowns are available in Table 33 in Appendix B.

[17] Breakdowns of EMS locations are available in Table 34 in Appendix B.

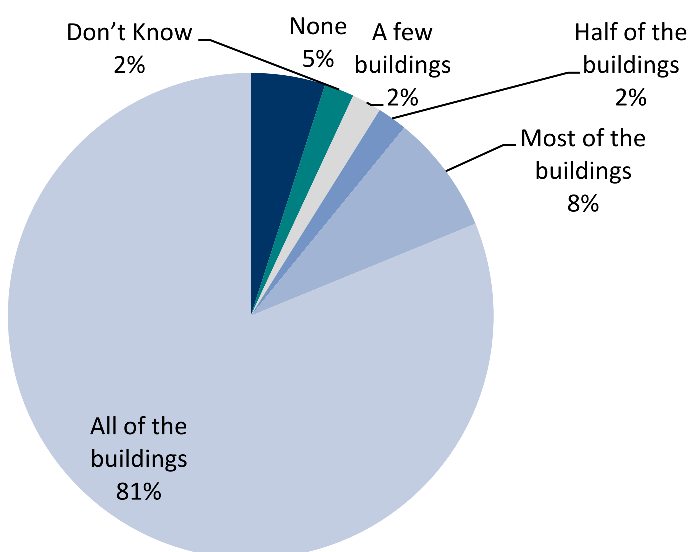
Figure 37: School Energy Management System Market Penetration



5.3.3 Operations and Maintenance

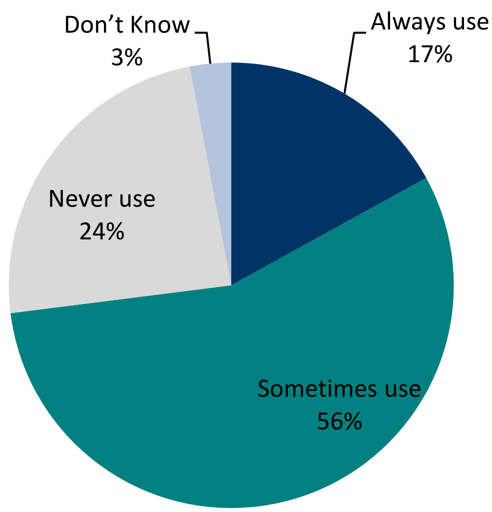
More than eight in ten schools have regular operations and maintenance procedures for energy using equipment in all of their buildings (Figure 38). This far exceeds the practices in local government. The most common procedures are regular and preventative maintenance for HVAC systems. This may be an area where little improvement or assistance is needed for schools.

Figure 38: School Regular Operations and Maintenance Procedures (n=122)



However, one quarter of school respondents never make use of maintenance contracts when purchasing new equipment and half only make use of them sometimes (Figure 39). This means that approximately three quarters of respondents can increase their maintenance contract use. As we mentioned for local governments, these may help ensure that the equipment is operating as energy efficient as possible.

Figure 39: School Maintenance Contract Use Frequency (n=122)



And finally, only about half (49%) of schools have had a technician test energy equipment to see if it is operating optimally. Although this is more frequent than for local government, it still represents an opportunity for schools to ensure existing equipment operates as efficiently as possible.

5.4 Energy Density Analysis

Energy density is a common market indicator that is calculated in baseline studies. While there are multiple methods to calculate energy density, we determined that the EPA Benchmark would be the most useful energy density calculation available for our baseline study. The information required to calculate it is typically simple to obtain, it is recommended as a best practice by the Department of Energy, and it is successfully used for schools by CLEAResult and by The New York State Energy Research and Development Authority (NYSERDA) in a similar situation. In addition, CLEAResult also has an extensive amount of data already collected for the market. CLEAResult helps program partners gather the information they need to benchmark the energy use of their districts or buildings against others. It calculates an EPA Benchmark Score, site energy use (kBtu/sf), total cost per square foot ($/sf), and total cost per student ($/student). At least one of these metrics was available for current program partners including 1801 schools, 366 government buildings, and 39 college buildings. These represent just a portion of CLEAResult's partners (Table 12).

Table 12: Energy Density Partner Data Overview

	Number of Buildings	Number of Partners	Total Partners	Percent
Local Government	366	28	69	41%
K-12 School District	1,801	98	159	62%
College Partners	39	5	26	19%

As stated in the methodology, we attempted to collect similar data from non-partners to provide energy density figures for the entire market, partners and non-partners, in this baseline study. Energy density is relatively easy to calculate when customer billing information is readily available to third parties. Given the customer confidentiality clauses that the utilities must adhere to, gaining billing information for energy customers in the state of Texas is much more difficult than in other areas of the country where this information is often analyzed for energy efficiency program effectiveness and impact. Working with the existing method to gain access to customer billing information, i.e. obtaining a complete and signed letter of authorization from the customer to release billing information, was extremely difficult. Most respondents did not complete the letter of authorization accurately as respondents often provided their utility retailer's name rather than the distributors involved in this study. Respondents also had difficulty identifying the proper account numbers.

Future research studies will likely encounter similar challenges if they attempt a mail survey approach. Instead, it is likely that customers will need someone to visit them in-person to help collect actual billing information on-site by accessing their billing files directly. If billing information is not available on-site, then the person would need to shepherd the customer through the process of completing the letter of authorization accurately and thoroughly, including helping them to find their ESID number on their bills. Obtaining customer billing information will continue to be a lengthy and costly endeavor because customer consent is required to allow third-party access to customer information for research and evaluation purposes. This information is readily shared for these purposes in other states and the utilities may consider looking into the possibility of lifting this clause for future research needs.

The EPA Energy Benchmark Tool provides an indexed energy use or density score that takes into account building characteristics like gross floor area, year of construction, use of walk-in coolers, and percent of floor area heated and cooled. The EPA Benchmarking tool results in an energy consumption score from 0 to 100. This score can then be compared to similar building use types or schools in the US (where 50 is average). Calculating an EPA Benchmark Score has been successful for school districts but has proven difficult for local governments and colleges. While CLEAResult has been able to calculate energy density figures of site energy (kBtu/sf), energy cost per square foot ($/sf), and energy cost per occupant ($/occupant), they have only been able to calculate an EPA Score for 17% of local government partners and 5% of college partners. This is because the EPA Score does not cover all types of buildings that a city or college might own and is difficult to address when many different types of buildings are on the same meter.

In addition, our review of the energy density figures that were calculated demonstrates wide variation. These numbers do not provide a very good picture of energy usage across cities, but instead tend to demonstrate the difficulty of benchmarking such disparate building use types. In addition, the value of trying to benchmark buildings with disparate uses against each other seems to be limited.

This report includes four key energy density metrics: EPA Benchmark Scores, Site Energy (energy use per square foot), Energy Cost per square foot, and Energy Cost per student/occupant (Table 13 through Table 16).[18] The mean energy density metrics have substantial variation among market segments and across building types (in the case of colleges and local governments). This variation is typically the result of aggregating building types with differing uses (such as a dorm and science lab or a waste treatment plant and a city hall) that are not comparable with the market segment. On the other hand, K-12 schools include many different types of space uses; however most districts include similar types of uses which facilitate good comparisons of energy density across schools.

The vast majority of local government buildings (83%) have a separate electric meter for each building or have only one building with one meter. Other set-ups include a variety of configurations including buildings with shared meters, separate meters, and no meters. In theory, the energy usage of these buildings could be compared against other buildings with the same usage types. It should be noted that CLEAResult was only able to calculate an EPA score for a small portion of city buildings. The results suggest that with such a variety of building types and uses, it is difficult to accurately compare these buildings.

Many of the college buildings do not fall into a type category that is easily benchmarked, as shown in data where 44% of buildings are “other.” Note that nearly all college building types have very small sample sizes, and thus limit the value of comparisons. In addition, an EPA score was only calculated for two buildings.

[18] Note that in the tables displaying these metrics, “mean” refers to the average value among that market segment; “std. dev.” refers to standard deviation, or a measure of the variability of the mean (higher standard deviation shows higher variability); and “N” refers to the number of buildings in that segment for which we had that particular energy density metric.

Table 13: Market Baseline Energy Density Metrics

	EPA Benchmark			Site Energy (kBtu/sqft)			Energy Cost per Sq Ft			Energy Cost per Occupant		
Market Segment	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Local Government Buildings	40	29	63	232	693	360	6.07	18.61	360	3,919	12,161	358
K-12 School Buildings	56	27	1801	52	18	1806	1.27	0.45	1807	189	147	1807
College Buildings	54	18	2	132	394	39	3.84	13.67	39	738	858	36

Table 14: Local Government Baseline Energy Density Metrics

	EPA Benchmark			Site Energy (kBtu/sqft)			Energy Cost per Sq Ft			Energy Cost per Occupant		
Building Type	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Fire/Police Station	4	-	1	93	42	98	2.26	1.01	98	1,827	1,049	97
Office	47	31	30	106	138	50	2.41	1.86	50	1,226	999	50
Library	-	-	-	83	29	30	2.29	0.65	30	2,171	2,046	30
Rec Center/Gym	-	-	-	107	54	30	2.96	1.94	30	6,158	5,444	30
Social/Meeting	22	-	1	95	112	25	2.26	1.15	25	2,881	4,055	25
City Hall	38	25	20	84	46	20	3.18	3.50	20	1,496	1,632	20
Entertainment	-	-	-	80	51	14	1.95	1.24	14	4,147	6,373	14
Maintenance Shop	-	-	-	56	58	10	1.30	0.93	10	1,185	1,313	10
Water Treatment Plant	1	-	1	3,033	2,199	11	79	59	11	46,559	51,212	11
Courthouse	30	21	8	94	43	8	2.33	0.68	8	1,495	1,159	8
Airport	-	-	-	179	67	6	4.82	1.81	6	1,740	1,459	6
Warehouse	46	64	2	209	323	3	4.94	7.40	3	15,151	25,432	3
Medical Office	-	-	-	118	67	3	2.79	1.36	3	822	732	3
Health Clinic	-	-	-	79	38	2	2.39	1.21	2	751	123	2
Assisted Living	-	-	-	104	-	1	2.64	-	1	175	-	1
Other	-	-	-	433	767	49	11.86	22.71	49	3,302	5,362	48

Table 15: K-12 School Baseline Energy Density Metrics[19]

	EPA Benchmark			Site Energy (kBtu/sqft)			Energy Cost per Sq Ft			Energy Cost per Occupant		
Building Type	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Elementary School	58	27	1,110	50	17	1,112	1.26	0.42	1,112	153	84	1,112
Middle School	56	26	368	52	19	368	1.24	0.47	368	208	95	368
High School	51	25	228	56	19	230	1.35	0.48	230	271	237	230
Other	51	32	65	53	23	66	1.37	0.61	67	354	353	67
Combined Grade School	48	31	30	57	22	30	1.22	0.49	30	290	222	30

Table 16: College Baseline Energy Density Metrics

	EPA Benchmark			Site Energy (kBtu/sqft)			Energy Cost per Sq Ft			Energy Cost per Occupant		
Building Type	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N
Other	-	-	-	216	593	17	6.80	20.64	17	851	767	14
Classroom	-	-	-	57	36	11	1.24	0.70	11	348	412	11
Dorm	41	-	1	61	21	3	1.32	0.08	3	379	190	3
Office	67	-	1	72	35	3	2.70	2.31	3	991	972	3
Maintenance Shop	-	-	-	35	29	2	1.03	0.40	2	547	32	2
Rec Center/Gym	-	-	-	119	110	2	2.10	1.69	2	2,785	1,771	2
Social/Meeting	-	-	-	132	-	1	2.33	-	1	61	-	1

[19] For K-12 schools, we separated data by school type. The most common type of school is elementary. The combined grade school category represents K-12 grade schools, while the "other" category represents some other combination of grades such as K-8.

Appendix A: Additional Data

Table 17: Completed Surveys and Sample by Utility, Market and Partner Type

Utility		K-12 Schools		Local Government		Colleges	
		Non Partner	Partner	Non Partner	Partner	Non Partner	Partner
Oncor	Completed	41	6	47	6	4	4
	Population	437	49	421	31	39	14
AEP Central	Completed	12	2	19	0	1	0
	Population	115	15	105	8	6	0
AEP North	Completed	5	1	17	0	1	0
	Population	55	5	82	2	3	0
AEP SWEPCO	Completed	4	3	8	0	1	1
	Population	43	20	56	0	4	4
El Paso Electric	Completed	1	3	1	0	0	0
	Population	13	15	2	3	4	3
Entergy	Completed	7	4	18	0	1	1
	Population	61	24	79	11	7	2
Centerpoint	Completed	6	5	6	3	1	0
	Population	66	20	75	9	15	2
Texas New Mexico Power	Completed	5	2	6	0	0	0
	Population	49	11	56	8	1	1

Table 18: Market Familiarity with Energy Efficient Lighting Technology

	Schools (n=122)	Local Government (n=131)
CFLs		
Very familiar	62%	50%
Somewhat familiar	26%	32%
Unfamiliar	10%	16%
Don't know	2%	2%
T-8s		
Very familiar	69%	24%
Somewhat familiar	16%	21%
Unfamiliar	13%	53%
Don't know	2%	2%
T-5s		
Very familiar	42%	13%
Somewhat familiar	34%	18%
Unfamiliar	22%	67%
Don't know	3%	2%
LED exit signs		
Very familiar	63%	30%
Somewhat familiar	23%	31%
Unfamiliar	12%	37%
Don't know	3%	2%
LED indoor lighting		
Very familiar	34%	20%
Somewhat familiar	36%	38%
Unfamiliar	26%	40%
Don't know	3%	2%
LED outdoor lighting		
Very familiar	31%	22%
Somewhat familiar	34%	37%
Unfamiliar	30%	38%
Don't know	4%	2%

Table 19: Local Government Building Types (n=131)

Building Type	Local Government
City hall	83%
Fire/police station	62%
Maintenance shop	46%
Office	35%
Library	30%
Water treatment plant	27%
Courthouse	26%
Recreation center/gym	22%
Social/meeting	21%
Entertainment	15%
Storage	14%
Airport	11%
Warehouse	11%
Health clinic	5%
Medical office	5%
Education	4%
Hospital	2%
Assisted living	1%
Outpatient health	1%
Others	18%

Table 20: Local Government Proportion of Incandescent Lighting (n=131)

	Local Government
None	15%
Very little	39%
Half	5%
Most	25%
All	11%
Don't know	5%

Table 21: Local Government Proportion of Fluorescent Tube Lighting (n=131)

	Local Government
Proportion of fluorescent tube lighting lit by T-8	
None	78%
Very little	7%
Half	5%
Most	6%
All	2%
Don't Know	2%
Proportion of fluorescent tube lighting lit by T-5	
None	88%
Very little	6%
Half	2%
Most	3%
All	0%
Don't Know	1%
Proportion of fluorescent tube lighting lit by T-12	
None	16%
Very little	18%
Half	11%
Most	18%
All	8%
Don't Know	30%

Table 22: Percent of Local Government with Cooling System Types (n=131)

Cooling System Type	Local Government
Rooftop AC units	39%
Split Systems	53%
Air cooled chillers	19%
Water cooled chillers	11%
Other Types[20]	7%

[20] Other types of AC equipment in local government include: window AC, heat pump, ground source, and stand alone compressors.

Table 23: Type and Proportion of New Roofing Installed in Local Government (n=46)

Among buildings that have recently undergone new construction

Roofing Type	Local Government
EDPM	**9%**
White granular	75%
Black	25%
Bitumen	**4%**
White Granular	100%
BUR with gravel	**7%**
Dark color	33%
Light color	67%
Other[21]	**37%**
Don't Know	**46%**

Table 24: Local Government Energy Management System Market Penetration (n=131)

Percent with:	Local Government
An EMS system to manage indoor temperature	**20%**
Lighting Occupancy Sensors	**23%**
Many sensors	20%
A few sensors	3%
Lighting Timers	**30%**
Software that turns off computers when not in use	**15%**

Table 25: Local Government Distribution of Energy Management Systems (n=10)

Note multiple responses and small sample size

Percent in:	Local Government
Certain buildings	60%
All buildings	20%
One building	10%
With separate system for each building	20%

[21] Other roofing types listed include: combination shingle roof, composite and metal, Durolast, flat gravel and tar, gabled, metal resistant, metal, metal with four inches of insulation, solar and shingle or metal, standing seam, tile, and white evaporative.

Table 26: Local Government HVAC Tune-Ups Frequency

	Local Government
Performs regular tune-ups (n=131)	65%
Time of tune-ups (n=85)	
Twice a year	33%
Once a year	48%
Once every two years	4%
Once every three to five years	2%
Other	9%
Don't know	4%
Number of units (n=85)	
A few	6%
Half	5%
Most	26%
All	61%
Don't Know	2%

Table 27: K-12 Schools Space Types (n=101)

Space Type	K-12 Schools
Classroom	99%
Gym	98%
Library	95%
Cafeteria	95%
Office	90%
Storage	70%
Warehouse	53%
Health clinic	37%
Others	10%

Table 28: College Building Types (n=15)

Building Type	Colleges
Classroom	100%
Office	87%
Rec Center/gym	87%
Restaurant/cafeteria	80%
Library	80%
Maintenance shop	73%
Dorm	67%
Social/meeting	67%
Storage	67%
Warehouse	67%
Entertainment	47%
Health clinic	47%
Medical office	27%
Others	20%
Hospital	7%

Table 29: School Proportion of Incandescent Lighting

	K-12 Schools (n=107)	Colleges (n=15)	Total Schools (n=122)
None	15%	7%	14%
Very little	64%	73%	65%
Half	7%	7%	7%
Most	7%	7%	7%
All	2%	-	-
Don't know	6%	7%	6%

Table 30: School Proportion of Fluorescent Tube Lighting

	K-12 Schools (n=107)	Colleges (n=15)	Total Schools (n=122)
Proportion of fluorescent tube lighting lit by T-8			
None	24%	7%	22%
Very little	10%	20%	11%
Half	13%	27%	15%
Most	32%	47%	34%
All	18%	-	16%
Don't Know	3%	-	2%
Proportion of non-gym fluorescent tube lighting lit by T-5			
None	54%	40%	52%
Very little	30%	40%	31%
Half	3%	20%	5%
Most	5%	-	4%
All	-	-	-
Don't Know	4%	-	3%
Proportion of fluorescent tube lighting lit by T-12			
None	15%	7%	14%
Very little	39%	47%	40%
Half	11%	27%	13%
Most	17%	13%	16%
All	2%	-	2%
Don't Know	16%	7%	15%
Proportion of fluorescent tube lighting in gyms lit by T-5			
None	54%	40%	52%
Very little	17%	40%	20%
Half	8%	7%	8%
Most	8%	7%	8%
All	7%	7%	7%
Don't Know	4%	-	3%

Table 31: Percent of Schools with Cooling System Types

Type	K-12 Schools (n=107)	Colleges (n=15)	Total Schools (n=122)
Rooftop AC units	78%	80%	78%
Split Systems	66%	87%	69%
Air cooled chillers	31%	67%	35%
Water cooled chillers	22%	73%	29%
Other Types[22]	8%	0%	7%

Table 32: Type and Proportion of New Roofing Installed in Schools

Among respondents that have recently undergone new construction

Type	K-12 Schools (n=62)	Colleges (n=13)	Total Schools (n=75)
EDPM	**6%**	**23%**	**9%**
White granular	75%	33%	57%
Black	-	67%	29%
Don't Know	25%	-	14%
Hypalon	**-**	**8%**	**1%**
T-EPDM	**2%**	**-**	**1%**
Bitumen	**8%**	**15%**	**9%**
Firestone SBS on White	40%	-	29%
White Granular	60%	50%	57%
Don't Know	-	50%	14%
Carlisle Syntec System	**3%**	**-**	**3%**
Ecology Roof	**2%**	**8%**	**3%**
Sarnafil	**2%**	**-**	**1%**
Don't Know	100%	-	100%
Stevens Hi-Tuff EP	**2%**	**-**	**1%**
BUR with gravel	**24%**	**23%**	**24%**
Dark color	27%	33%	28%
Light color	53%	33%	50%
White-coated	13%	-	11%
Don't Know	7%	33%	11%
Other (will specify)	**47%**	**46%**	**47%**
Don't Know	**19%**	**-**	**16%**

[22] Other types of AC equipment in schools include: heat pumps, water source heat pumps, window units, geothermal, and ground units.

Table 33: School Energy Management System Market Penetration

Percent with:	K-12 Schools (n=107)	Colleges (n=15)	Total Schools (n=122)
An EMS system to manage indoor temperature	**63%**	**87%**	**66%**
Lighting Occupancy Sensors			
Many sensors	25%	33%	26%
A few sensors	33%	33%	33%
Lighting Timers	**61%**	**67%**	**62%**
Software that turns off computers when not in use	**30%**	**13%**	**28%**

Table 34: School Energy Management System Location

Note that there are multiple responses.

Percent in:	K-12 Schools (n=38)	Colleges (n=7)	Total Schools (n=45)
Certain buildings	24%	29%	24%
All buildings	68%	71%	69%
District-wide	29%	NA	NA

Table 35: School HVAC Tune-Up Frequency

	K-12 Schools (n=107)	Colleges (n=15)	Total Schools (n=122)
Performs regular tune-ups	82%	87%	83%
Time of tune-ups	(n=88)	(n=13)	(n=101)
Twice a year	27%	8%	25%
Once a year	50%	39%	49%
Once every two years	5%	8%	5%
Once every three to five years	3%	-	3%
Once every six years or more	-	8%	1%
Other	8%	23%	10%
Don't know	7%	15%	8%
Number of units	(n=88)	(n=13)	(n=101)
A few	3%	-	3%
Half	8%	-	7%
Most	19%	62%	25%
All	67%	39%	63%
Don't Know	2%	-	2%

APPENDIX B: BUILDING CHARACTERISTIC VARIABILITY

The charts below graphically represent the wide variation in building characteristics among the school and local government markets.

Figure 40: School Market Square Footage

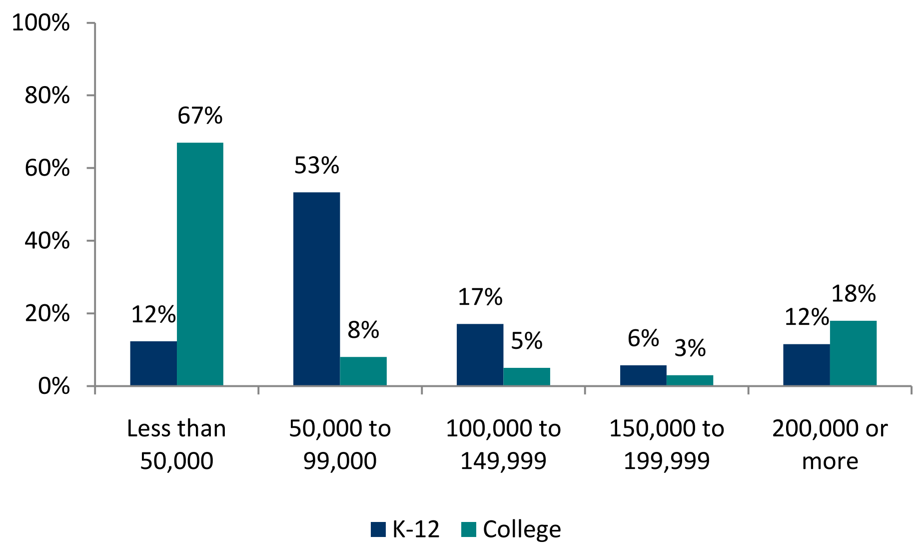


Figure 41: K-12 School Square Footage

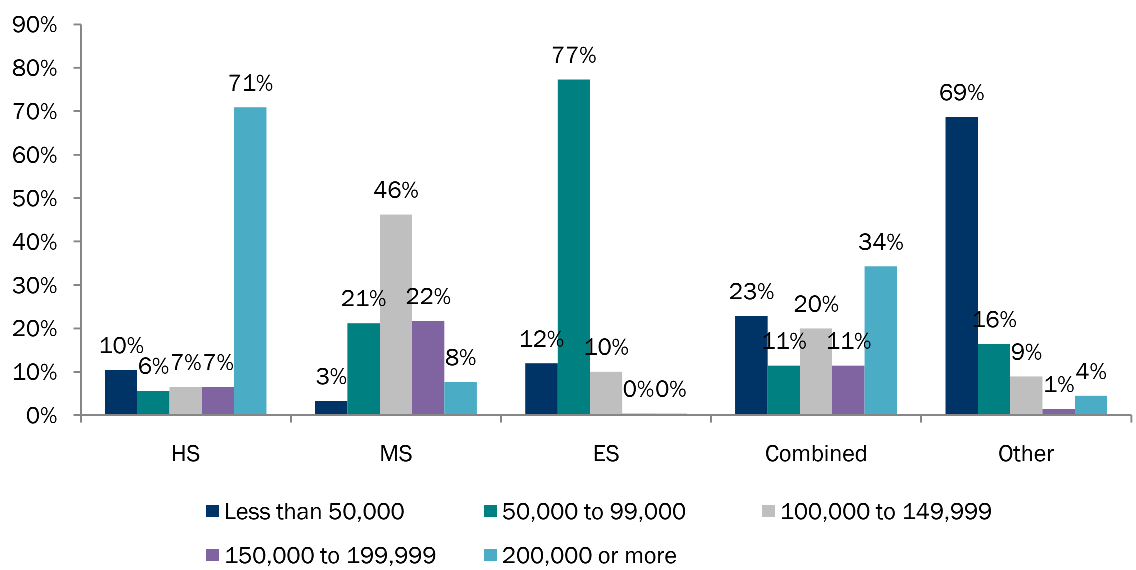


Figure 42: School Market Operating Hours

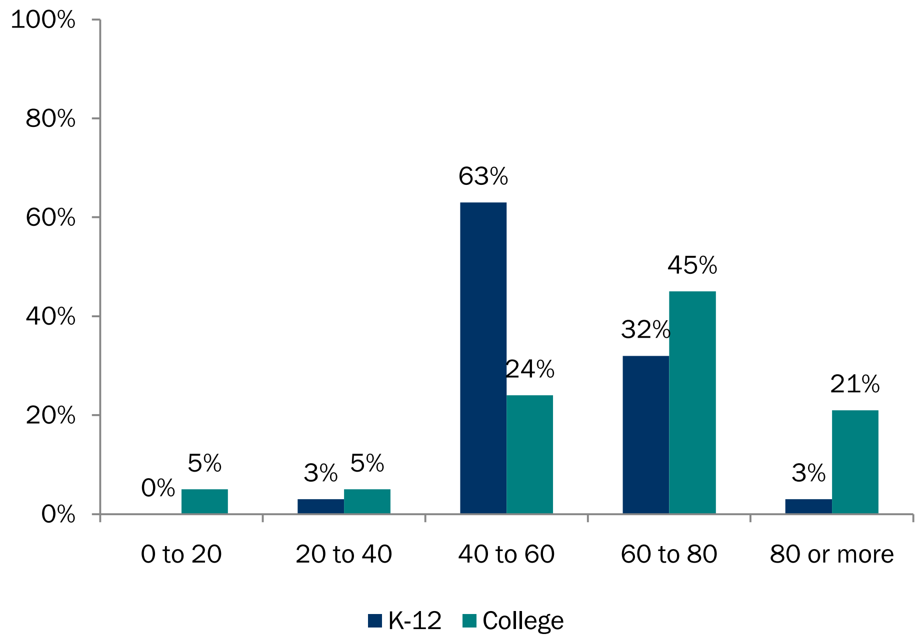


Figure 43: K-12 School Number of Months Open

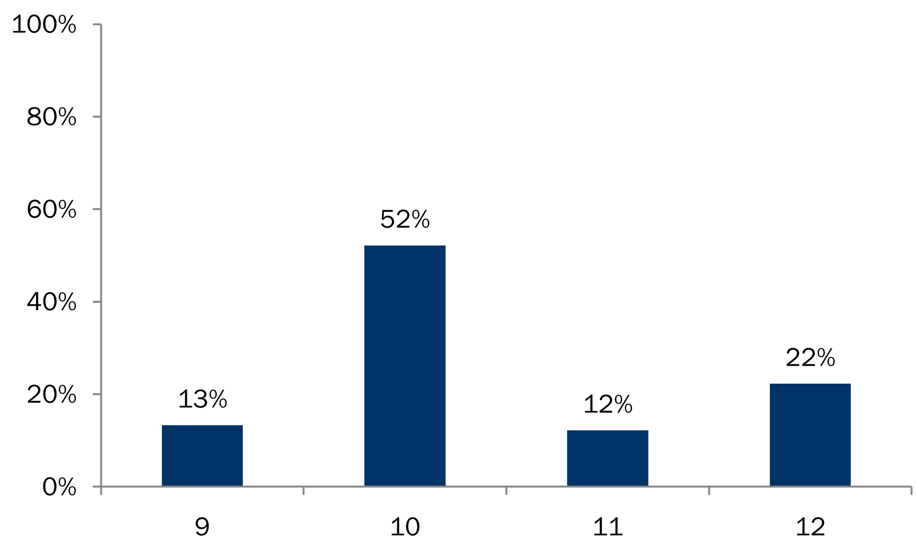


Figure 44: School Market Number of Students

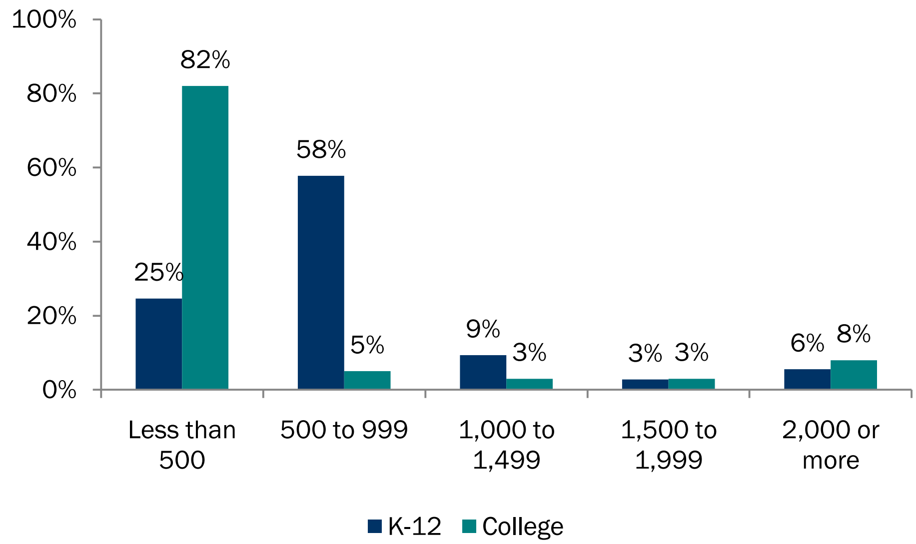


Figure 45: K-12 School Number of Students

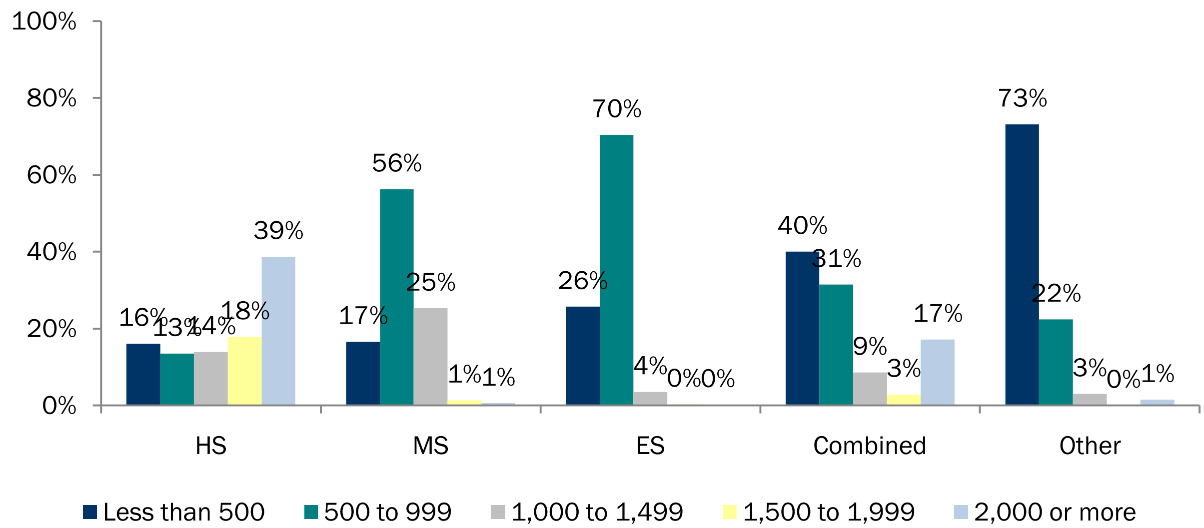


Figure 46: School Market Number of PCs

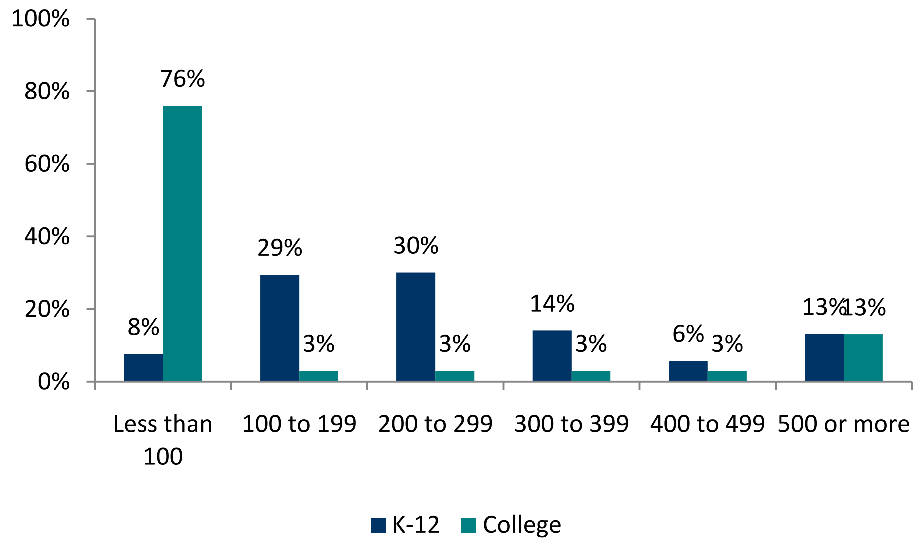


Figure 47: K-12 School Number of PCs

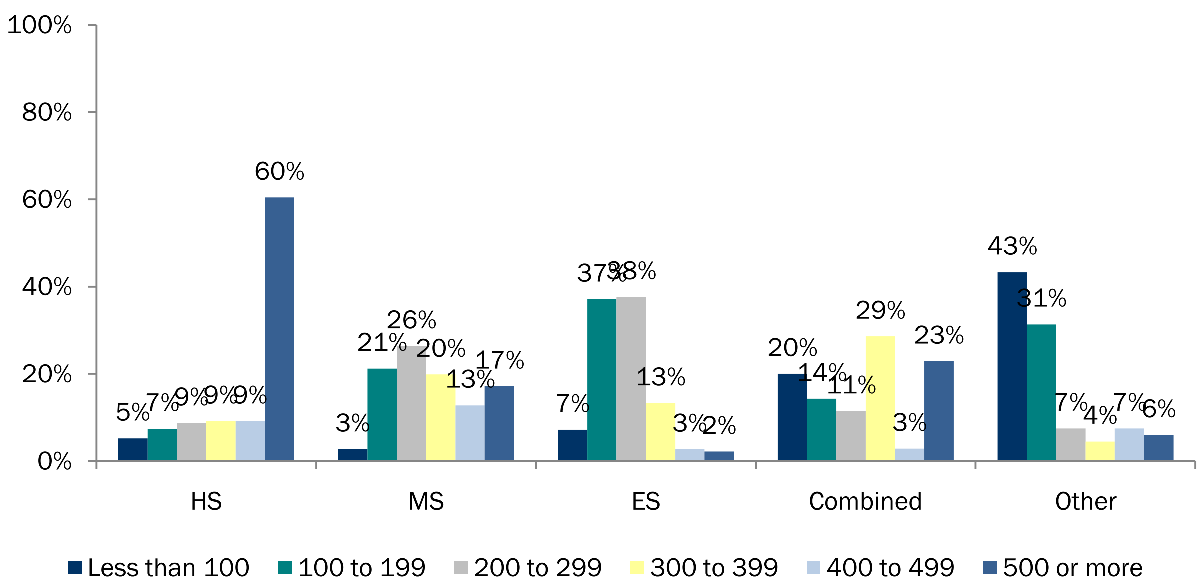


Figure 48: Local Government Building Square Footage

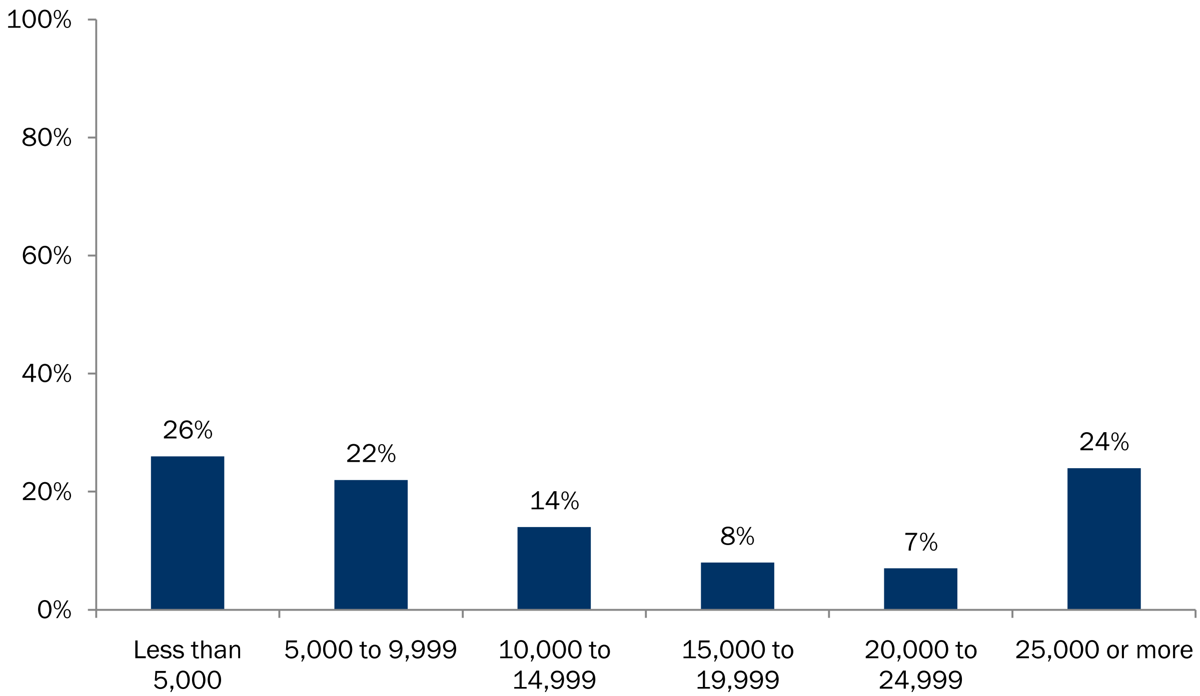


Figure 49: Local Government Weekly Operating Hours

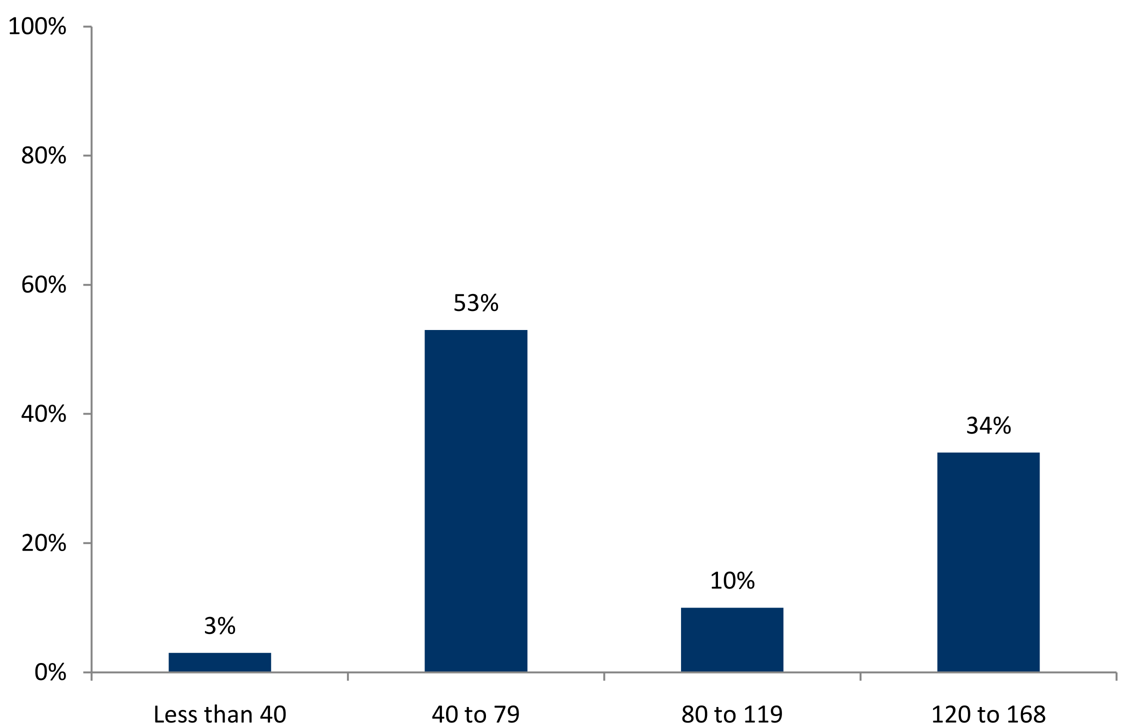


Figure 50: Local Government Building Number of Occupants

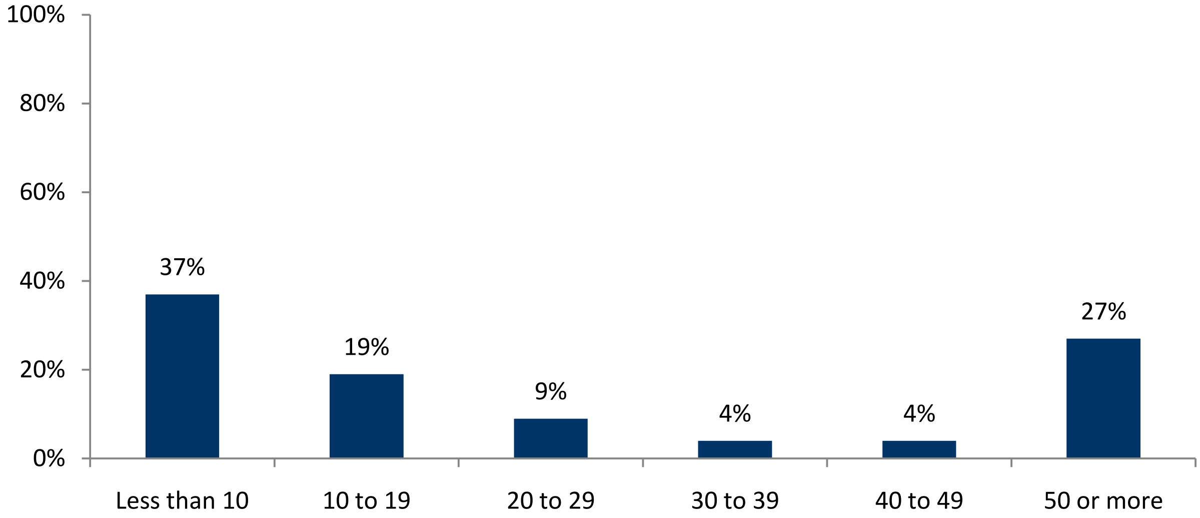
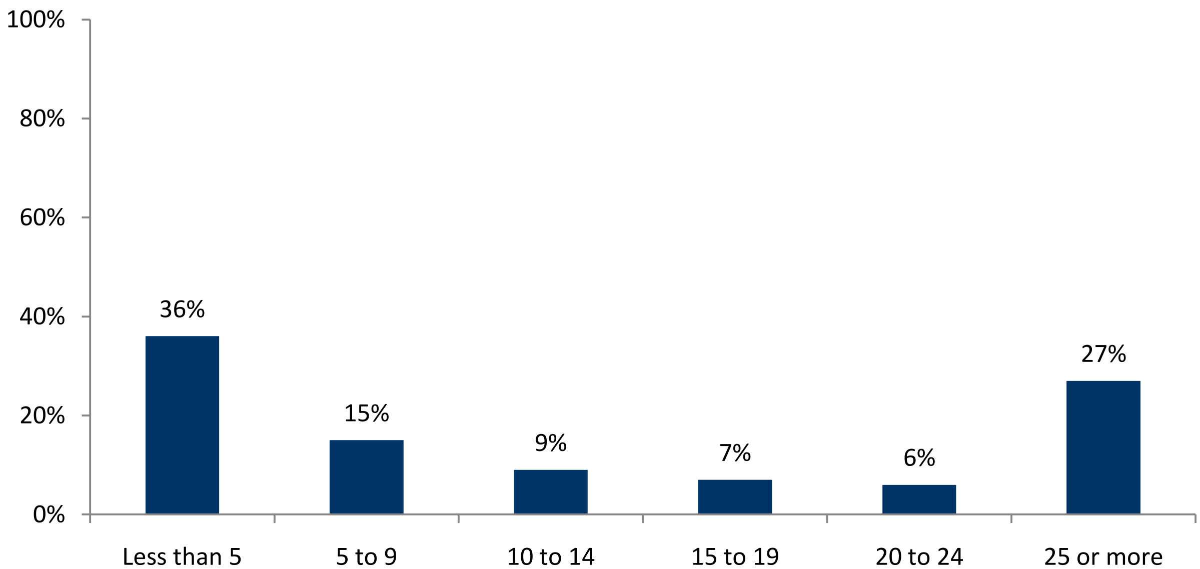


Figure 51: Local Government Building Number of PCs



APPENDIX C: SECONDARY RESEARCH FINDINGS

Common Energy Usage Metrics and Methods

Basic Energy Use Index

The most common calculation of energy consumption in the studies we reviewed was an energy use index (EUI), or the energy use per square foot. (EUI = Btu/sq.ft.) This is sometimes known as Energy Intensity. The EUI can be used to compare buildings of different make and size, and can be calculated simply from self-reporting by facilities and by obtaining units of energy used from utility bills. EUIs can also be separated into electricity and gas and expressed as kwh or therms per square foot. EUIs are often accompanied by an energy cost index (ECI), or cost of energy used divided by total square feet.

The studies we reviewed noted two important caveats. First, it is important to make sure the building area corresponds to the energy bills for that area and to consistently treat areas such as parking garages. Second, small sample sizes may prevent statistically significant comparisons. Extrapolation may be inappropriate, but the EUI may be used to benchmark buildings and can be compared to EUIs from other studies.

EPA Energy Benchmark Tool (www.energystar.gov/benchmark)

The EPA Energy Benchmark Tool provides an indexed energy use or density score that takes into account things like gross floor area, year of construction, use of walk-in coolers, and percent of floor area heated and cooled. The EPA Benchmarking tool results in an energy consumption score from 0 to 100 that shows how energy use compares to similar schools or buildings in the US (where 50 is average). The Department of Energy's Guidebook for "Best Practices for Controlling Energy Costs" suggests using the EPA Benchmark to gauge energy use and cost in comparison to others. The New York State Energy Research and Development Authority (NYSERDA) uses the EPA Benchmark based on national data in an ongoing energy benchmarking service for schools.

Additional Information

Notably, most studies normalized energy use by square footage, although NYSERDA noted that they may use student enrollment. Often student enrollment can be more easily obtained than an accurate square footage, so using it for normalization is appealing. However, in a study on lighting in schools, RLW Analytics found that in expanding sample results to the school population, total student enrollment "was not as good a predictor of school energy usage as had been anticipated. No better explanatory variable was found, however." Caution should be taken when using total enrollment for comparison purposes

.

Table 36: Summary of Energy Density Benchmarking Secondary Research Findings

	Segment	Study	Data Collection Method	Key Metrics and Analytical Methods
Energy Use Index/Energy Cost Index	Schools	SECO School Energy Efficiency Reports	Billing data, cost data, on-site walk-through energy analysis	Annual Energy Cost Index (ECI) = BTUs per year / facility square footage Energy use Index (EUI) = [Electricity Cost + Gas Cost] / [Total square feet]
	NY State Entities (State University, Department of Correctional Services, City University, the Office of General Services, etc.)	*Executive Order No. 111 "Green and Clean" State Buildings and Vehicles; Statewide Annual Energy Report For State Fiscal Year 2006/07*; January 2009; New York State Energy Research and Development Authority (NYSERDA)	Billing data, building info (size, year built, type, heating and cooling method), occupants, hours of operation—all collected by facilities' self reporting on common form .	Energy Use Index (EUI) = BTUs per facility square footage per year; For overall, or average, state EUI: [sum of all facilities' EUIs] / [number of participating entities]. (Other methods introduced but not used include: 1) weighted EUI average based on each facility's square footage as a percent of the overall square footage; and 2) using outside [e.g. LEED or ENERGY STAR] ratings.) Facility Energy Use includes two metrics: 1) MMbtus used by fuel type (e.g. electric, natural gas, oil, and other); and 2) Cost per MMBtu. Renewable Energy = Percent of energy used in buildings that was renewable (e.g. sustainably managed biomass, fuel cells, solar thermal, methane waste, etc.) Alternative-Fuel Vehicles: Percent of targeted fleet that uses alternative fuel (e.g. flex fuel, electric, compressed natural gas, etc.)
	Commercial and Residential Building in the Southwest	*Increasing Energy Efficiency in New Buildings in the Southwest: Energy Codes and Best Practices*; August 2003; Southwest Energy Efficiency Project (SWEEP)	Secondary data: Review of conventional building methods, International Energy Conservation Code (IECC 2000), and Energy Star +; Population and housing start projections for AZ, CO, NV, NM, UT, WY; New building efficiency programs	Annual Site Energy Use of Three (base, IECC, and Energy Star+) Homes per State = MMBtu/year Energy Intensity = kBtu/sq.ft/yr

	Segment	Study	Data Collection Method	Key Metrics and Analytical Methods
EZ Sim model	Nonresidential Sector	*Baseline Energy Use Index for the 2002-2004 Nonresidential Sector: Idaho, Montana, Oregon & Washington*; December 2008; Ecotope Consulting for Northwest Energy Efficiency Alliance	Billing data using EZ Sim (weather normalization and breakdown of end uses), building characteristics	Energy Use Index: total energy use (drawn from energy bills assigned to a particular building)/building square footage
	Schools	*Final Evaluation Report for The Alliance to Save Energy Green Schools Green Communities 2002-2003 School Programs*; Vanward Consulting	EZ Sim model based on billing data, nearby weather data, building characteristics and operating conditions	estimated energy and dollar savings
Utility Manager	Schools	*2004-2005 Green Schools Programs Evaluation*; August 2006; prepared for CPUC by Quantec	Utility Manager: billing data, weather (heating and cooling degree days), changes to physical structure and activity	Potential kwh Savings = Predicted Energy Use +/- Adjustments - Actual Energy Use (1) Cost/kwh = monthly energy use/monthly cost on bill (2) Cost savings = sum (potential savings * cost/kwh) (3)
EPA Benchmark	Schools	*School Operations and Maintenance: Best Practices for Controlling Energy Costs, A Guidebook for K-12 School System Business Officers and Facilities managers*; August 2004; prepared for US DOE	Follow US EPA/DOE benchmarking tool (www.energystar.gov/benchmark): zip code, gross floor area, school open on weekends (yes/no), % of gross floor area cooled, % of gross floor area heated, # personal computers, presence of cooking facilities, high school (yes/no)	Benchmarking = annual energy costs/sq ft Efficiency = Btu/sq ft/day
	Schools	*Updated Energy Benchmarking Report for Sample Central School Sample Town, NY*; prepared for NYSERDA by TRC	Utility bills, school size, type of school, number of students, types of heating and cooling, cooking facilities, number of PCs, time and hours of use, pool (based on Energy Benchmarking Building Data Form)	EPA Score Heating Fuel Usage (kBtu/sq ft) Site Energy (kBtu/sq ft) Electric Usage (kWh/sq ft) Weather Adjusted Heating Usage (Btu/sq ft/HDD) Source Energy (kBtu/sq ft) EPA Target Score Site Energy Reduction Needed (kBtu/sq ft) Total Energy Cost ($/sq ft) Total Energy Cost ($/student) Carbon footprint (emissions in tons)

	Segment	Study	Data Collection Method	Key Metrics and Analytical Methods
Other	Schools	*CT & MA Utilities 2004-2005 Lighting Hours of Use for School Buildings Baseline Study Final Report*; September 2006; RLW Analytics	Lighting only	"The indicator total student enrollment was not as good a predictor of school energy usage as had been anticipated. No better explanatory variable was found, however."
	Schools	*California Schools Market Characterization; September 2005;* submitted to PG&E by Ridge & Associates	Unknown	Annual GWh and Therm by Building Type (college, school, hotel, hospital, etc.)

Additional Energy Density Calculation Methods

EZ Sim Energy Use Index (www.ezsim.com)

The EZ Sim Excel model calculates an EUI that adjusts for building characteristics, operating conditions, and weather. EZ Sim uses billing data, nearby weather data (actual daily average temperature), building characteristics, and operating conditions. Building characteristics and operating conditions can be obtained by talking with a facility manager or from an on-site visit. The simulation files can be calibrated to actual energy use, allowing you to calculate baseline energy use, estimate conservation savings, and calculate conservation savings. EZ Sim can also estimate energy end use from components such as heat, cooling, and lighting. (Cost = $199 plus $25 per weather file.) EZ Sim was used in two studies – in one to calculate an EUI and end use EUI, and in another to calculate estimated energy and dollar savings.

This model is likely not appropriate for this baseline study given our data collection method and the reliability issues discovered through past studies. Vanward Consulting, a consulting firm that conducted an evaluation *for The Alliance to Save Energy Green Schools Green Communities 2002-2003 School Programs*, found that obtaining information through telephone surveys and using default model parameters can affect the calibration of the model and that the model may not be very robust. They recommended on-site audits performed by a technical analyst or an engineer familiar with the EZ Sim model, but they added that the calculated potential energy savings should not be used as a basis for funding. Furthermore, Ecotope Consulting found that the end-use splits were not always reliable.

Utility Manager Energy Use Index (http://www.utilityaccounting.com/index.php)

Some programs use Utility Manager, a software program, to calculate the EUI. One program switched from EZ Sim to Utility Manager software by Utility Management Services. This software can be used to create a database of monthly energy use and costs for each building and calculates savings by subtracting billing costs of the test period from the baseline period. Weather normalization is added if a single linear regression using heating and cooling degree days from the closest weather station shows that utility bills are a function of weather. Other adjustments can include energy conservation measures, floor area changes, and operating hour changes. (Cost is $7500+.)

The California Energy Commission Handbook, *Energy Accounting: A Key Tool in Managing Energy Costs*, points out that variations in energy use can be caused by four main items: weather, building area changes, operations and schedule changes, and changes in equipment. We have discussed normalizing for weather in the previous sections, but it is also important to collect enough information in the baseline about the other three items so that in future program impact studies there will be a better likelihood of demonstrating causality.

Other Related Texas Research Studies

We found few prior Texas studies related to energy usage in schools and government buildings. None of these prior Texas studies provide the level of detail and particular focus required for a comprehensive baseline study. They are not extensive enough in the school and government sector and do not have enough respondents to be representative of the eight utilities we are addressing. They were also designed to address different or fewer aspects of energy usage than necessary in this study. For this reason, these studies provided us with background knowledge in the design of our study but did not provide usable data.

Firstly, the State Energy Conservation Office (SECO) is also collecting and analyzing energy usage data from school districts across the state, with the first report issued in November 2003. So far, reports for only 43 school districts have been completed. These reports focus mainly on energy density. We have not found any existing government building energy consumption data available for public view. SECO is currently in the process of collecting usage data (gas, electric and water) for all (roughly 11,000) government facilities in Texas. SECO is collecting this data from all Texas utilities in an effort to capture energy usage trends. They will analyze the usage data from 2006 through 2010. SECO is currently in the process of requesting and collecting this from the TX utilities and the information is not ready for public consumption.

The SECO reports provide mainly energy density information and not sufficient other relevant baseline information on equipment or management practices. In addition, SECO research has had a slow roll-out and does not currently cover enough schools to make the data representative.

Secondly, Itron published an *Assessment of the Feasible and Achievable Levels of Electricity Savings from Investor Owned Utilities in Texas: 2009-2018*.[23] As part of developing a baseline to project potential energy savings, this study included end-user surveys that collected information on heating, cooling, and water heating systems, lighting systems, and other energy using systems, as well as awareness of energy efficiency opportunities and retrofits conducted. Although this information is similar to some of what we required, this study attempted to sample only 30 colleges and 30 K-12 schools as part of the larger nonresidential sector. These numbers are too small to provide an overall baseline for these segments. In addition, local government was not included in this study. Furthermore, this study also did not address the overarching management practices and institutional parameters that CLEAResult attempts to effect.

Thirdly, Summit Blue conducted an independent verification of statewide savings from energy efficiency in Texas.[24] This evaluation used interviews and reviews of databases and paper records to verify savings reported by utilities. The focus was to validate data and deemed savings and their application, as well as to assess the adequacy of inspections. As such, this was considered a desk audit and did not include primary research or any data collection.

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[23] Published by Itron on December 10, 2008 for the Texas Public Utilities Commission.

[24] *Independent Audit of Texas Energy Efficiency Programs in 2003 and 2004*, published by Summit Blue on September 6, 2006: http://www.summitblue.com/attachments/0000/0495/r19_-_Independent_Audit_of_Texas_Energy_Efficiency_Programs_in_2003_and_2004.pdf

APPENDIX D: PHONE SURVEY DATA COLLECTION INSTRUMENT

Introduction

[IF PARTNER]

Hello, my name is _____________ and I'm calling on behalf of Opinion Dynamics Corporation. We are conducting a study about the energy-related needs of [PL SEGMENT TYPE] for the State of Texas. We understand that you are currently working with [PROGRAM NAME] to improve the energy efficiency of your [SING SEGMENT TYPE] and we are conducting a study on behalf of your electric utility to better understand your energy-related needs. May I please speak with <NAME FROM SAMPLE>? (Repeat introduction if necessary). This survey will take about 30 minutes. Would you be willing to take a survey to be a part of this study?

[IF RESPONDENT IS IN ONCOR TERRITORY AND DOES NOT RECOGNIZE THE EDUCATIONAL FACILITIES PROGRAM OR GOVERNMENT FACILITIES PROGRAM BY THAT NAME SAY: This program used to be called the SCORE/CitySmart Program in 2008 and recently changed names.]

[IF NON-PARTNER]

Hello, my name is _____________ and I'm calling on behalf of Opinion Dynamics Corporation. We are conducting a study about the energy-related needs of [PL SEGMENT TYPE] for the State of Texas. This is not a sales call. (Repeat introduction if necessary). [IF NEEDED THIS STUDY IS BEING CONDUCTED ON BEHALF OF EIGHT MAJOR INVESTOR-OWNED UTILITIES IN THE STATE OF TEXAS INCLUDING ONCOR, AEP NORTH, AEP SWEPCO, AEP CENTRAL, ENTERGY, CENTERPOINT, TNMP AND EL PASO ELECTRIC]

> [IF SING SEGMENT TYPE = CITY/COUNTY]
>
> May I please speak with the [GOVT TYPE] Manager, Director of Facilities, or other person primarily responsible for maintenance of [GOVT TYPE] Government buildings or for making energy-related decisions? (IF NEEDED: I would like to speak to the person responsible for the [PL SEGMENT TYPE] lighting, roofing, and air conditioning.)
>
> [IF SING SEGMENT TYPE = DISTRICT or SCHOOL]
>
> May I please speak with the person in the [IF DISTRICT SAY DISTRICT, IF SCHOOL SAY SCHOOL] who is responsible for overall building maintenance or for making energy-related decisions? (IF NEEDED: I would like to speak to the person responsible for lighting, roofing, and air conditioning.)
>
> [IF SING SEGMENT TYPE = COLLEGE]
>
> May I please speak with the facilities manager or other person primarily responsible for maintenance of campus buildings? (IF NEEDED: I would like to speak to the person responsible for the campus' lighting, roofing, and air conditioning.)

S1, (Once person has been identified) This study is geared toward understanding your energy usage so that your utility or others can identify areas where you can save energy and money in the future.

The survey will take about 20 minutes. Would you be willing to take a survey to be a part of this study?

[PARTNERS AND NONPARTNERS]

[IF NO] Thank you so much for your time. Have a nice day.

[IF YES] Continue

The interview should take about 20 minutes. What would be a good time for you?

Time:______________________________

Date:______________________________

(Name:______________________________)

(ODC ID Number: ____________________)

Thank you so much. I look forward to speaking with you on <>. Have a nice day.

SURVEY START

Thank you so much for agreeing to participate in this study.

S2.. Just to begin, can you tell me the name of the utility company that owns your electric meter? [IF RESPONDENT INDICATES THEY HAVE MULTIPLE METERS ALLOW FOR MULTIPLE RESPONSE, IF RESPONDENT SAYS AEP, PROBE FOR SWEPCO, NORTH OR CENTRAL]

1. AEP SWEPCO
2. AEP North
3. AEP Central
4. Oncor
5. Texas New Mexico Power
6. Centerpoint
7. Entergy
8. El Paso Electric
9. Don't Know
10. Other, Please specify ___________

S3. Could you please tell me your title?

1. City manager
2. Energy manager/supervisor/coordinator
3. Facility manager
4. District superintendant
5. School superintendant
6. Facilities maintenance manager
7. Director of operations
8. Chief financial officer
9. Other, specify_________________

Building Characteristics

[ASK IF SING SEGMENT TYPE = DISTRICT]
BC1. How many schools are in your district? ___________Schools

[ASK IF SING SEGMENT TYPE = DISTRICT]
BC1a. How many total buildings are in your district? __________ Buildings

[ASK IF SING SEGMENT TYPE = COLLEGE]
BC2. How many buildings make up the campus? ________Buildings

[ASK IF SING SEGMENT TYPE = SCHOOL]
BC2a. How many buildings does your school have? ________ Buildings

[ASK IF SING SEGMENT TYPE = CITY OR COUNTY]
BC3. How many buildings does your [SING SEGMENT TYPE] own? _________Buildings

[ASK ALL]
BC3a. How many [UNIT] are more than 2 years old?_______

BC3b. How many [UNIT] are less than 2 years old?___________

[ASK IF SING SEGMENT TYPE = CITY OR COUNTY]
BC4. Which of the following types of buildings does your [SING SEGMENT TYPE] own or operate? [Check all that apply]

TYPE	NUMBER
a. Airport	
b. Assisted Living	
c. City Hall	
d. Courthouse	
e. Education	
f. Entertainment	
g. Fire/Police Station	
h. Health Clinic	
i. Hospital	
j. Library	
k. Maintenance shop	
l. Medical office	
m. Office	
n. Outpatient Health	
o. Recreation center/gym	
p. Social/Meeting	
q. Storage	
r. Warehouse	
s. Water treatment plant	

t. Other, Specify ____________________	
u. (Don't know)	

[ASK IF SING SEGMENT TYPE = CITY OR COUNTY]
BC4a. Can you describe how your electric metering is set up for all of the buildings in your [SING SEGMENT TYPE]? [For example: are all of the buildings on one meter/bill? Are several types of buildings on one meter, for example a fire station, police station, and city hall?]

[ASK IF SING SEGMENT TYPE = COLLEGE]
BC5. What types of buildings are on the college campus? [CHECK ALL THAT APPLY, READ LIST IF NECESSARY]

1. Classroom
2. Dorm
3. Entertainment
4. Health Clinic
5. Hospital
6. Library
7. Maintenance Shop
8. Medical Office
9. Office
10. Rec Center/Gym
11. Restaurant/Cafeteria
12. Social/Meeting
13. Storage
14. Warehouse
15. Other, specify____________________
16. (Don't know)

[ASK IF SING SEGMENT TYPE = DISTRICT]
BC6. What types of buildings are in the school district? [CHECK ALL THAT APPLY, READ LIST IF NECESSARY]

1. Classroom
2. Health Clinic
3. Library
4. Office
5. Gym
6. Cafeteria
7. Storage
8. Warehouse
9. Other, specify____________________

10. (Don't know)

[ASK IF SING SEGMENT TYPE = SCHOOL]
BC7. What types of buildings are at the school? [CHECK ALL THAT APPLY, READ LIST IF NECESSARY]

1. Classroom
2. Health Clinic
3. Library
4. Office
5. Gym
6. Cafeteria
7. Storage
8. Warehouse
9. Other, specify___________________
10. (Don't know)

Building Blocks for Market Transformation

Q1b. How many people are involved in the decision-making process for energy improvements?

Q2. Overall, how interested is your [SING SEGMENT TYPE] in finding additional ways to save energy? Would you say it is:

1. Very interested
2. Somewhat interested
3. Somewhat uninterested, or
4. Very uninterested
5. (Don't know)

[ASK Q2a IF PARTNER, ELSE SKIP TO Q3]
Q2a. How would you describe your interest before your interaction with the [PROGRAM NAME] program? [OPEN END]

Q3. I'm going to read a list of potential obstacles that you might be experiencing when it comes to saving energy. Please tell me whether each one is an obstacle that you face by responding yes or no. Is [READ ITEM FROM LIST] an obstacle?

	Yes	No	(Don't Know)
a. The cost of upgrading to energy efficient technology	1	2	3
b. The budgeting and procurement process for planning energy improvements	1	2	3
c. Support from [SUPPORT TYPE]	1	2	3

d.	Awareness of incentives and financing available for energy improvement projects	1	2	3
e.	Finding the time to identify/plan/execute energy improvements	1	2	3
f.	Availability of reliable and proven vendors, technologies, and/or technical know-how	1	2	3

Q4a. What is the biggest obstacle that you experience when you propose a project that incorporates energy efficiency?

[SKIP IF Q4a=98]
Q4b. What would help you to overcome that obstacle?

Q6. Do you have staff with the skills to identify energy improvement opportunities?

1. Yes
2. No
3. (Don't Know)

[ASK Q6b IF PARTNER AND STAFF (Q6=1), ELSE SKIP TO Q7]
Q6b. Did you have this staff before your interaction with the [PROGRAM NAME] program?

1. Yes
2. No
3. (Don't Know)

Q7. Does your [SING SEGMENT TYPE] monitor and review energy bills?

1. Yes
2. No
3. (Don't Know)

[ASK Q8 IF MONITOR (Q7=1), ELSE SKIP TO Q10]
Q8. Can you describe how you monitor the bills and what you look for? (For example, do you use any specific software to monitor them, what do you look for when you review the billing information)

[ASK Q9 IF PARTNER AND MONITOR (Q7=1), ELSE SKIP TO Q10]
Q9. Can you describe how you monitored bills before your interaction with the [PROGRAM NAME] program? [OPEN END]

Q10. How would you describe your organization's overall understanding of the long-term cost savings and other benefits associated with installing energy efficient equipment? Would you say they completely understand, somewhat understand or do not understand at all?

1. (Completely understand)
2. (Somewhat understand)
3. (Do not understand at all)
4. (Don't know)

Q11a. When evaluating the cost of a new piece of equipment, do you consider the initial price of the equipment or the cost to run the equipment over time or both?

1. (Initial cost)
2. (Cost to run over time)
3. (Both)
4. (Don't Know)

[ASK Q11b IF Q11a = 2 OR 3, ELSE SKIP TO Q12]
Q11b. Do you have a payback requirement or other financial criterion for equipment purchases (For example: the initial cost of the equipment must be covered in 10 years or less)?

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

[ASK Q11c IF YES (Q11b=1), ELSE SKIP TO Q12]
Q11c. Does the payback requirement differ by measure or equipment?

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

[ASK Q11d if Q11c = 2 or 3, ELSE SKIP TO Q11e]
Q11d. What is your payback requirement?

[ASK Q11e if Q11c=1, ELSE SKIP TO Q12]
Q11E. How many types of equipment or measures do you have a payback requirement for?

Q11EF-Q11EE
What is the [first…fifth] measure/equipment type?
What is the payback in years?
What is the payback in months?

Q12b. Do you have any energy performance guidelines or specifications for the building or equipment improvements you make?

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

Q12c. Would the following help you make decisions on what the most energy efficient option might be for a given project? Please respond Yes or No for each.

	Yes	No	(Don't Know)
a. If contractors or design firms recommended energy efficient alternatives	1	2	3

b. If contractors or design firms included "add-alternates" for energy efficiency options on projects (if necessary: for example a contractor might give you a base price to upgrade to energy efficiency lighting in one building but also give you the cost to upgrade the lighting in other buildings for your consideration)	1	2	3
c. A written set of energy efficient guidelines and specifications to follow for building improvements or equipment purchases	1	2	3

Q12d. What other tools or resources might help you to make decisions on the most efficient options for building improvements or equipment purchases? [OPEN END]

Q14. How often do you make use of service maintenance contracts when you purchase new equipment?

1. Never
2. Sometimes
3. Always
4. (Don't Know)

Q15. Hypothetically, if you had to provide the complete specifications for all of your air conditioning units, how would that likely be accomplished? By complete I mean the exact model number, age, and SEER rating that is likely stated on the a/c unit.

1. I would do it or someone else in my [SING SEGMENT TYPE] would do it
2. We would likely hire someone to do it
3. Other (please specify) ______________________________
4. (Don't know)

Energy Practices

EP1. Does your [SING SEGMENT TYPE] conduct regular maintenance procedures for keeping the energy-using pieces of equipment in good order?

1. Yes
2. No
3. (Don't Know)

[ASK EP2 IF YES (EP1=1), ELSE SKIP TO EP4]
EP2. Can you describe the operations and maintenance procedures that you perform on a regular basis? [OPEN END]

EP3. Would you say you perform these on…

1. A few buildings
2. Half of the buildings
3. Most of the buildings

4. All of the buildings
5. (Don't know)

[ASK IF SING SEGMENT TYPE=CITY OR COUNTY]
EP4A. Does your [SING SEGMENT TYPE] make any changes to reduce energy usage when occupancy is low, such as when the building is closed for example, on weekends or at night,

1. Yes
2. No
3. (Don't Know)

[IF SING SEGMENT TYPE = DISTRICT, SCHOOL, OR COLLEGE]
EP4B Does your [SING SEGMENT TYPE] make any changes to reduce energy usage when occupancy is low, such as when the building is closed for example, when students are on a break or on the weekends?

1. Yes
2. No
3. (Don't Know)

[ASK EP5 IF YES (EP4=1), ELSE SKIP TO EP6]
EP5. What changes do you make? [check all that apply]

1. Turn off lighting
2. Change temperature settings on HVAC units
3. Turn off HVAC units
4. Unplug computers and monitors
5. Other (please specify ___________)
6. (Don't know)

EP6. Does your [SING SEGMENT TYPE] conduct regular tune-ups to the heating and/or air conditioning systems of any of your buildings?

1. Yes
2. No
3. (Don't Know)

[ASK EP7 IF YES (EP6=1), ELSE SKIP TO EP9]
EP7. Would you say you perform these tune-ups…

1. Once a year
2. Twice a year
3. Once every two years
4. Once every three to five years
5. Once every six years or more
6. Other, specify ______________________
7. (Don't know)

EP8. Would you say you perform these tune-ups on…

1. A few HVAC units
2. Half of the HVAC units
3. Most of the HVAC units
4. All of the HVAC units
5. (Don't know)

EP9. Has your [SING SEGMENT TYPE] had anyone come out to test energy equipment and see if it is operating optimally?

1. Yes
2. No
3. (Don't Know)

Energy-Efficient Lighting

L1. How familiar are you with each of the following lighting products? Are you very familiar, somewhat familiar or unfamiliar with: (DO NOT ROTATE)

	Very Familiar	Somewhat Familiar	Unfamiliar	(Don't Know)
a. Compact fluorescent light bulbs	1	2	3	4
b. T-8 fluorescent lighting	1	2	3	4
c.T-5 fluorescent lighting	1	2	3	4
d. LED exit sign lighting	1	2	3	4
e. LED indoor lighting	1	2	3	4
f. LED outdoor lighting	1	2	3	4

[ASK L2a-f FOR EACH L1a-f=1 or 2, ELSE SKIP TO L6]
L2. Do you have any of the following types of lighting in your buildings?

	Yes	No	Don't Know
a. (IF L1a=1 or 2) Compact fluorescent light bulbs	1	2	3
b. (IF L1b=1 or 2) T-8 fluorescent lighting	1	2	3
c.(IF L1c=1 or 2) T-5 fluorescent lighting	1	2	3
d. (IF L1d=1 or 2) LED exit sign lighting	1	2	3
e. (If L1e=1 or 2)	1	2	3

LED indoor lighting f. (If L1f=1 or 2) LED outdoor lighting	1	2	3

[ASK L3 IF L2b=1 (YES), ELSE SKIP TO L4]
L3. Thinking about all fluorescent tube lighting in your buildings, overall, what proportion would you say is lit by T8 lighting? [IF SING SEGMENT TYPE = DISTRICT OR SCHOOL SAY Please focus just on classroom lighting] Would you say…

1. Very little of the lighting
2. Half of the lighting
3. Most of the lighting, or
4. All of the lighting
5. (Don't know)

[ASK L4 IF L2c =1 (YES), ELSE SKIP TO L5]
L4. Again, thinking about all fluorescent tube lighting in your buildings, overall, what proportion would you say is lit by T5 lighting? [IF SING SEGMENT TYPE = DISTRICT OR SCHOOL SAY Please focus just on classroom lighting] Would you say…

1. Very little of the lighting
2. Half of the lighting
3. Most of the lighting, or
4. All of the lighting
5. (Don't know)
6. (None)

[ASK L5 IF k-12 SCHOOL or COLLEGE AND L2c =1 (YES), ELSE SKIP TO L6]
L5. Thinking about all of your gymnasiums, what proportion of the area would you say is lit by T5 fixtures?

1. Very little of the area
2. Half of the area
3. Most of the area, or
4. All of the area
5. Don't have any gymnasiums
6. (Don't know)
7. (None)

L6. Thinking about all of your lighting, overall what proportion would you say is lit by standard incandescent lighting?

1. Very little of the lighting
2. Half of the lighting
3. Most of the lighting, or
4. All of the lighting
5. None

6. (Don't know)

L7. And, thinking about all of your fluorescent tube lighting, overall, what proportion would you say is lit by T-12 lighting?

1. Very little of the lighting
2. Half of the lighting
3. Most of the lighting, or
4. All of the lighting
5. None
6. (Don't know)

Energy-Efficient Air Conditioning/Cooling

H1. What type of cooling system(s) do you have? [CHECK ALL THAT APPLY]

1. Rooftop AC units
2. Split systems (residential type AC units)
3. Air cooled chillers
4. Water cooled chillers
5. Other, describe _______________
6. (Don't Know)

[ASK H2 FOR EACH H1=1-5, ELSE SKIP TO H3]
H2. For each of your types of cooling units, please estimate what percentage falls into the following age categories. What percentage of your [READ TYPE FROM a-c] would you say are [READ AGE CATEGORY] old?

	PERCENT OF UNITS IN EACH AGE CATEGORY			
	Less than 5 years	Between 5 and 10 years	More than ten years	Don't know
a. (IF H1=1 or 2) Rooftop AC units &/or Split Systems				
b. (IF H1=3 or 4) Chillers				
c. (IF H1=5) Other [READ IN TYPE OF EQUIPMENT FROM H1]				

H3. Have you purchased any cooling units in the last two years?

1. Yes
2. No
3. (Don't Know)

[ASK H4 IF YES (H3=1), ELSE SKIP TO H5]
H4. Did you purchase high efficiency units? [If needed: for example a high efficiency unit typically is ENERGY STAR rated or has a SEER rating higher than 13]

1. Yes
2. No
3. (Don't Know)

[ASK H4a IF YES (H4=1), ELSE SKIP TO H5]
H4a. How do you know that the unit(s) are high efficiency? [check all that apply]

1. Unit has ENERGY STAR label
2. SEER rating is greater than 13
3. The person that installed it said it was energy efficient
4. Other (please specify) ______________________
5. (Don't know)

H5. Are you planning to replace or purchase any cooling units within the next five years?

1. Yes
2. No
3. (Don't Know)

[ASK H6 IF YES (H5=1), ELSE SKIP TO EE1]
H6. How likely are you to select high energy efficient cooling units? Would you say you are…

1. Very likely
2. Somewhat likely
3. Somewhat unlikely, or
4. Very unlikely
5. (Don't know)

Energy-Efficient Envelope Measures

EE1. Please tell me if you have done any of the following to save energy in your buildings. Have you…

	Yes	No	(Don't Know)
a. Added any insulation to existing buildings?	1	2	3
b. Replaced leaky doors and window seals?	1	2	3
c. Put solar film on any windows?	1	2	3
d. Installed cool roofs?	1	2	3

[ASK EE2 FOR EACH EE1a-d=2 or 3 (NO), ELSE SKIP TO EE3]
EE2. How likely are you to [READ IN A/B/C/D as appropriate] within the next five years? Would you say you …

	Very Likely	Somewhat Likely	Somewhat Unlikely	Very Unlikely	(Don't Know)
a. Add insulation to existing buildings	1	2	3	4	5
b. Replace leaky doors and window seals	1	2	3	4	5
c. Put solar film on windows	1	2	3	4	5
d. Install cool roofs	1	2	3	4	5

EE3. Are you currently undergoing new construction, planning new construction, or have you recently completed new construction where a new roof would be or was installed?

1. Yes
2. No
3. (Don't Know)

[ASK EE4 IF YES (EE3=1), ELSE SKIP TO C1]
EE4. What type of roofs do you typically install on newly constructed buildings? [MULTIPLE RESPONSE]

1. EDPM (ethylene propylene diene terpolymer)
2. Hypalon
3. T-EPDM
4. Bitumen
5. Carlisle Syntec System
6. Ecology Roof
7. Hypsam Roofing System
8. Sarnafil
9. Stevens Hi-Tuff EP
10. Tropical Roofing Systems
11. BUR (built-up roof) with gravel
12. (Don't know)
13. Other please specify _____________

[ASK EE4a IF EE4=1, ELSE SKIP TO EE4b]
EE4a. Are the EDPM roofs generally…

1. White granular
2. Black
3. (Don't know)

[ASK EE4b IF EE4=4, ELSE SKIP TO EE4c]
EE4b. Are the Bitumen roofs generally…

1. Firestone SBS on White
2. Smooth
3. White Granular
4. (Don't know)

[ASK EE4c IF EE4=8, ELSE SKIP TO EE4d]
EE4c. Are the Sarnafil roofs generally…

1. Beige
2. Blue
3. White
4. (Don't know)

[ASK EE4d IF EE4=11, ELSE SKIP TO C1]]
EE4d. Are the BUR roofs generally…

1. Dark color
2. Light color
3. White-coated
4. (Don't know)

Energy-Efficient Controls

C1. Do you have an energy management system (EMS) or other means to automatically change indoor temperatures?

1. Yes
2. No
3. (Don't Know)

[ASK C2 IF YES (C1=1), ELSE SKIP TO C3]
C2. Can you please describe the EMS system? For example, what does it control - just temperature or lighting as well only control certain buildings or multiple buildings. [OPEN END]

C3. How many LIGHTING OCCUPANCY SENSORS would you say you have?

1. None
2. A few
3. Many
4. (Don't Know)

C4. Do you have lighting TIMERS?

1. Yes
2. No
3. (Don't Know)

C5. Do you have any software in place that turns off personal desktop computers when not in use?

1. Yes
2. No
3. (Don't Know)

Energy Efficiency Benefits and Drawbacks

[ASK SECTION IF H4=1 OR ANY IN L2a-f = 1, ELSE SKIP TO P1]

B1. Besides energy-related benefits, what have you or others liked about the energy efficiency improvements that you have made? [CHECK ALL THAT APPLY]

1. Lighting is better
2. People are more comfortable
3. Equipment is more reliable
4. Other, please specify ____________________
5. (Don't Know)

B2. And what have you or others not liked about the energy efficiency improvements you have made?

1. Lighting is worse
2. People are less comfortable
3. Equipment is less reliable
4. Other, please specify __________________
5. (Don't know)

Energy Efficiency Programs

P4. Do you have an interest in using any of the following services and products? Please tell me Yes, No, Already or Currently Using, or Not sure/need more information. Do you have an interest in…

	YES	NO	ALREADY USED/ CURRENTLY USING	NOT SURE/ NEED MORE INFO
a. Cash incentive programs for purchase of energy efficient equipment	1	2	3	4
b. Energy audits/feasibility study	1	2	3	4
c. [NON PARTNERS] A program that benchmarks your energy usage	1	2	3	4

against similar buildings				
d. [NON PARTNERS] A program that works with you to set up the budgeting and management processes to help with energy improvements	1	2	3	4
e. [NON PARTNERS] A program that provides public relations support so you can communicate energy improvements to the community	1	2	3	4
f. [NON PARTNERS] A program that provides technical assistance to help you choose the right energy improvements such as the type of lighting or air conditioning equipment that is most valuable	1	2	3	4
g. [NON PARTNERS] A program that helps you locate alternatives to bonds to help fund energy improvements	1	2	3	4

Block Grants

[ASK SECTION IF SING SEGMENT TYPE = CITY OR COUNTY, ELSE SKIP TO CLOSING]

BG1. Grants are currently available to city and county governments for energy efficiency projects as part of the Energy Efficiency and Conservation Block Grant program. Has your [SING SEGMENT TYPE] applied for a block grant as part of this program or does your [SING SEGMENT TYPE] plan to apply for one?

1. Yes
2. No
3. (Don't Know)

[ASK B2 IF HAVE APPLIED OR PLAN TO APPLY (B1=1), ELSE SKIP TO CLOSING]
BG2. What impact have these funds had on your [SING SEGMENT TYPE]'S <u>interest</u> in pursuing energy efficiency improvements?

1. No impact
2. Little impact
3. Some impact
4. Significant impact
5. (Don't Know)

Closing

[USE CLOSING 1 IF PARTNER OR IF NON-PARTNER SING SEGMENT TYPE = COLLEGE, CITY OR COUNTY]

Closing 1

Those are all the questions I have. Thank you so much for your time.

Closing 2

[IF NON-PARTNER AND SING SEGMENT TYPE = DISTRICT OR SCHOOL]

Thank you so much for your time. We would also like to find out if you would be willing to complete an additional survey in the mail regarding energy usage at [if district say = one of the schools in your district, if school say = your school]. This survey requires square footage, specific building information and access to your utility billing information. We are offering a $50 incentive if you would be willing to fill out this short mail survey for at least one of the schools in your district. The survey is short, only 20 questions long. Would you be willing to participate in this additional survey with a $50 incentive?

1. Yes
2. No

[IF NO]
Thank you so much for your time. Have a nice day.

[IF YES]

Great, we will need to send you a fed ex package with the materials. May I please have your complete name and address for this additional study?

Name:

Address:

City:

State:

Zip:

After you return the survey to us, we will mail you the $50 check. Thank you for your time.

APPENDIX E: MAIL SURVEY DATA COLLECTION INSTRUMENT

Dear [Participant Name]:

Thank you for your participation thus far in the 2009 Texas School Baseline Study. This study is sponsored by eight Texas utilities: Oncor, AEP North, AEP Central, AEP SWEPCO, Entergy, CenterPoint, Texas-New Mexico Power and El Paso Electric. The study sponsors have hired our company, Opinion Dynamics Corporation, a professional research firm, to help conduct this study. The information collected will help the utilities identify opportunities for energy efficiency and plan for the future energy needs of schools across Texas.

You recently completed the telephone survey portion of this study and agreed to take a short mail survey in return for a $50 incentive. Thank you for agreeing to fill out this mail survey! This survey asks questions regarding the characteristics of your school. If you represent a School District, please choose one school in the district and complete this survey for that one school. Again, we greatly appreciate your cooperation.

The survey questions allow us to gain the school characteristics needed to compare your school to similar schools. The survey also asks for energy use information by fuel type (e.g. gas, electric) in the last 12 months. You may refer to your monthly bills for this information. Alternatively, you can fill out the attached Letter of Authorization which allows us to directly access your billing information from the utility. Ultimately, we will use the school characteristics and billing information to calculate the energy consumption per square foot at your school. This information will allow the utilities to assess your school's energy consumption in comparison to other schools in the area and identify the schools in most need of energy efficiency improvements.

Please fill out each question according to the instructions provided. When you are finished, please place the survey and Letter of Authorization (if you did not provide your billing data in another format) in the return addressed and stamped envelope. After we receive your completed survey and completed letter of authorization (if needed), we will mail you a $50 check in appreciation for your time.

If you have questions, please contact me at (510) 444-5050 x 110.

Sincerely,

Alison Williams
Opinion Dynamics Corporation
1999 Harrison Street, 6th Floor, Suite 650, Oakland, CA 94612

BUILDING CHARACTERISTICS SURVEY

Your Name: ____

If you represent a School District, please only choose one school in the district: e.g. the school you are most familiar with.

District: ____________________________ **Name of School**: _____________________________

1. What is the address for the school? *Insert address in fields below*
   Street: _______________________
   City:________________________ State: _____________ Zip: _______________
   County: ______________________

2. What grade levels does the school teach? *Circle all that apply*
   1) Elementary school (K-5)
   2) Middle school (6-8)
   3) High school (9-12)
   4) Other: ___________

3. What year was the school built or more than 50% renovated? *Write in year*

   __________ (year)

4. What is the gross square footage of the school? Please include the floor area for all supporting functions including lobbies, stairways, elevator shafts, restrooms, etc. Do not include outdoor areas. *Write in square footage, please insert your best estimate*

   __________ square feet

5. Is the school open on weekends? Please respond "yes" if the space is used for any reason, in any season, or on one or both weekend days. *Circle yes or no*
   1) Yes
   2) No

6. How many hours per week is your school in operation? *Write in your best estimate*

   __________ hours

7. How many months per year is your school open? *Write in your best estimate*

   __________ months

8. How many personal computers are in the school? *Write in your best estimate*

____________ personal computers

9. How many WALK-IN refrigerator/freezer units are in the school? *Write in your best estimate*

___________ walk-in refrigerator/freezers

10. Does the school have on-site cooking facilities? *Answer "yes" only if the school has dedicated facilities used to prepare and serve food to students. Do not answer "yes" if the food is only being kept warm or if the kitchen is only for teachers.*

1) Yes
2) No

11. What percentage of the gross floor area is cooled? *Circle the percentage that represents your best estimate*

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

12. What percentage of the gross floor area is heated? *Circle the percentage that represents your best estimate*

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

13. What type of fuel does the school use for heating? *Circle one*

1) Electricity
2) Gas
3) Both
4) Other: ____________________
5) School does not have heating

14. How many students attend the school? *Write in your best estimate*

__________ students

Please answer Questions 15-16 if your school has a pool; otherwise skip to the Energy Use section.

15. What size is the pool? *Circle one*

1) Olympic 1 (50 meters by 25 meters)
2) Short Course (25 yards by 20 yards)
3) Recreational (20 yards by 15 yards)

16. Is the pool … *Circle one*

1) Indoor
2) Outdoor

ENERGY USE

In order to analyze the energy use at your school, we need billing information for the last 12 months for each type of energy used in your school. This information will be used for analytical purposes only for this study and will be kept strictly confidential. You can provide this information to us in multiple ways (*you only need to do one of the following*):

_______Fill out and Sign the Letter of Authorization included in this package so we can access your billing information directly from your utility company.

_______Provide a spreadsheet or output from billing software used at your school that includes your billing information from the last 12 months, and send back in the provided envelope.

_______Include copies of your energy bills (for each fuel type) for the last 12 months in the return envelope.

_______Input the information we need in the tables below for each type of energy used in your school. For example, if you use electricity, fill out Table 1 by referring to your electricity bills for the last 12 months.

Please make sure that the billing data you provide corresponds with the school you listed on Page 2 of this mail survey.

Table 1. Electricity Use and Billing [*Fill in each cell in the table*]

Month	Bill Start Date	Bill End Date	Energy Use (kWh)	Total Energy Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Table 2. Natural Gas Use and Billing [*Fill in each cell in the table*]

Month	Bill Start Date	Bill End Date	Energy Use (Therms)	Total Energy Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Table 3. Fuel Oil Billing and Usage [*Fill in each cell in the table*]

Month	Bill Start Date	Bill End Date	Energy Use (gal)	Total Energy Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Table 4. Propane Billing and Usage [*Fill in each cell in the table*]

Month	Bill Start Date	Bill End Date	Energy Use (gal)	Total Energy Cost
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				