

# Commercial Energy Management Evaluation

*Final Report*

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# Acronyms and Abbreviations

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(This list uses A&A style)

BMS	Building Management System
CEM	Commercial Energy Management
CATI	Computer-Assisted Telephone Interviewing
CAWI	Computer-Assisted Web Interviewing
DPS	Department of Public Service
EM	Energy Management
EMS	Energy Management System
kW	Kilowatts
kWh	Kilowatt Hours
MW	Megawatts
MWh	Megawatt Hours
NYS	New York State
NYSERDA	New York State Energy Research and Development Authority
REM	Remote Energy Management
RTEM	Real-Time Energy Management

## Executive Summary

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NYSERDA's Commercial Energy Management (CEM) intervention strategy was designed to increase the market uptake of energy management (EM) among commercial customers in New York State (NYS). EM is the common name for the management of building energy consumption based on a combination of building data collection systems (e.g., meters, sensors, equipment feeds), analytics, and building data information services. While not a direct source of energy reductions, EM is an enabling technology and service that can allow for identification of opportunities to save energy, including both capital and operational improvements.

As part of this strategy, NYSERDA began offering a Real-Time Energy Management (RTEM) initiative in mid-2016. RTEM technology captures discrete data—such as set points, power loads, flow rates, temperature, and humidity—and feeds the information back to building operators with key insights about operations and systems that they then use to fine-tune the building energy system operations and identify capital projects with energy-saving opportunities.

Following the introduction of the RTEM initiative, NYSERDA broadened the overall CEM intervention strategy to also include Remote Energy Management (REM). REM is a virtual building assessment tool that can provide a baseline of whole building performance quickly and cost-effectively, detecting energy savings potential and identifying energy efficiency projects.

To monitor the progress of the initiative toward its goals, NYSERDA developed a range of metrics. NYSERDA contracted with Opinion Dynamics to evaluate the CEM initiative by conducting research on these metrics, planned to be conducted over the five-year period 2017-2021. The initial step, completed in 2017, involved research to develop a baseline of market conditions. This report provides an update on the performance of the initiative in 2018.

Table E-1, below, presents the key metrics addressed in this evaluation and their overall results. The remainder of the report presents these metrics at the segment level, where possible, and provides additional context around the metrics. Additional metrics will be in future updates of this research.

**Table E-1. Summary of Key Metrics from 2017 Evaluation**

Metrics	Outputs /Outcomes	Indicators	Addressed Via	2017 Result (A)	2018 Result (B)
<b>RTEM Metrics</b>					
Awareness & knowledge of RTEM	Increased awareness of RTEM among building owners/managers	Percent of building owners/managers aware/knowledgeable of RTEM*	Building owner & manager survey	24% (aware) 12% (knowledgeable)	27% (aware) 16% (knowledgeable)
	Customer confidence in RTEM results	Percent of knowledgeable building owners/managers confident in RTEM results*	Building owner & manager survey	72%	56%
Customer use of RTEM	Increased use of RTEM	Percent of building owners/managers using RTEM*	Building owner & manager survey	9%	9%
	Percent of decision-makers using RTEM data to assess operational risk	Percent of decision-makers using RTEM data to assess operational risk*	Building owner & manager survey	5%	6%
	Utilization of RTEM data sets to advance efforts at demand reduction & peak load shaving (not addressed in first year)	Percent of RTEM participants utilizing RTEM data sets to advance efforts at demand reduction & peak load shaving	Participant survey	Not assessed	69%
	Percent of RTEM projects that institute an energy efficiency goal	Percent of RTEM projects that institute an energy efficiency goal	Participant survey	Not assessed	69%
	Percent of RTEM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses)	Percent of RTEM projects that use services for non-energy benefits	Participant survey	Not assessed	80%
	Demonstrated energy savings/O&M benefits from RTEM activities	Ratio of ECMs identified to ECMs implemented	Participant survey	Not assessed	5:1
	Improved capital investment planning and asset management	Percent of RTEM projects that are a part of a larger building management portfolio	Participant survey	Not assessed	87%
RTEM market conditions	Persistence of RTEM service contracts (i.e., how many customers extend their subscription with an RTEM provider beyond 5 years)	RTEM service contracts that are longer than 5 years in duration	Participant survey	Not assessed	11% (more than 5 years) 89% (5 years or more)
		Percent of revenue increase for providers	Provider survey	Not assessed	Not reported



Executive Summary

Metrics	Outputs /Outcomes	Indicators	Addressed Via	2017 Result (A)	2018 Result (B)
	Extent of use of qualified provider list by the market	on Qualified Provider List			
		Percent of providers who attribute increase to qualified provider list	Provider survey	Not assessed	37%
	In-house data sets are large enough that RTEM service providers no longer need to partner with NYSERDA & QPL is rendered obsolete	Percent of providers who cease to apply to get listed on the Qualified Provider List	Provider survey	Not assessed	30% (find NYSERDA's qualified provider list helpful in generating new business)
		Participating providers no longer feel the need for NYSERDA assistance	Provider survey	Not assessed	49% (find technical assistance helpful in implementation) 58% (find assistance helpful in communicating to customers) 64% (have enough in-house data on RTEM to support business model)
	RTEM providers identify & act on energy efficiency opportunities	Number/type of energy efficiency opportunities identified by RTEM providers	Provider survey	Not assessed	8.6
		Number/type of energy efficiency opportunities acted on by RTEM providers	Provider survey	Not assessed	2.9
<b>REM Metrics</b>					
Awareness & knowledge of REM	Increased awareness of REM among building owners/managers	Percent of building owners/managers aware/knowledgeable of REM*	Building owner & manager survey	22% (aware) 10% (knowledgeable)	28% <sup>A</sup> (aware) 12% (knowledgeable)
	Customer confidence in REM results	Percent of knowledgeable building owners/managers confident in REM results*	Building owner & manager survey	68%	51%
Customer use of REM	Increased use of REM	Percent of building owners/managers using REM*	Building owner & manager survey	5%	7%
	Percent of decision-makers using REM data to assess operational risk	Percent of decision-makers using REM data to assess operational risk*	Building owner & manager survey	4%	8% <sup>A</sup>

Uppercase superscripts indicate statistically significant differences across the two years at 90% confidence. Metrics denoted with an asterisk were selected as priority baseline metrics by NYSERDA for purposes of reporting to the NYS Department of Public Service (DPS). 2017 estimates of these metrics at the population level were reported to the NYS DPS in November 2017; these estimates are refined in this evaluation report.

# 1 Introduction

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## 1.1 Background

NYSERDA has contracted with Opinion Dynamics to conduct market research over a 5-year period (2017 to 2021) to (1) set appropriate baselines for a pre-determined set of performance indicators for its Commercial Energy Management (CEM) intervention strategy and (2) track market changes across those indicators over time. In 2017, the market evaluation team completed research to set the baselines. This report provides an update on the performance of the initiative against the baselines.

## 1.2 CEM Initiative

As part of its overall commercial sector investment strategy, NYSERDA has designed and developed a Commercial Energy Management (CEM) intervention to increase the market uptake of energy management (EM) among commercial customers in New York State (NYS). EM is the common name for the management of building energy consumption based on a combination of building data collection systems (e.g., meters, sensors, equipment feeds), analytics, and building data information services. While not a direct source of energy reductions, EM is an enabling technology and service that can allow for identification of opportunities to save energy, including both capital and operational improvements.

The overall CEM intervention strategy has four elements:

- Assisting building owners in identifying EM systems and services that meet threshold qualifications;
- Providing independent technical advising to building owners that invest in EM;
- Investing in EM systems and services to stimulate the current market and leverage the expected natural growth; and
- Gathering, analyzing, and sharing lessons learned and successes to further stimulate investor confidence and growth.

As part of this strategy, NYSERDA began offering a Real-Time Energy Management (RTEM) initiative in mid-2016. RTEM technology captures discrete data—such as set points, power loads, flow rates, temperature, and humidity—and feeds the information back to building operators with key insights about operations and systems that they then use to fine-tune the building energy system operations and identify capital projects with energy-saving opportunities.

Following the introduction of the RTEM initiative, NYSERDA broadened the overall CEM intervention strategy to also include Remote Energy Management (REM). REM is a virtual building assessment tool that can provide a baseline of whole building performance quickly and cost-effectively, detecting energy savings potential and identifying energy efficiency projects.

NYSERDA has a broad range of objectives for the CEM interventions, including objectives focusing on EM costs, energy savings, and market adoption of EM. These objectives are:

- Increase awareness of EM and data analytics capabilities in the market;
- Reduce customer acquisition costs and project development costs for EM;
- Reduce soft costs for a broad segment of building owners interested in obtaining information about their building energy performance;
- Leverage natural market growth by addressing upfront risk and downstream returns through an open enrollment offering and technical support in order to double the year over year growth rate for EM from 16% to 32% over the next five years;
- Improve the predictability of returns from RTEM investments by engaging in studies/pilots which provide replicable approaches and assessment tools; and
- Assist in the development of the capabilities and business models of the RTEM service vendor community through sharing of data, case studies, best practices, and identification of qualifications.

### **1.3 Purpose of this Research**

The overall objective of this market research study is to develop a baseline of market conditions and track progress towards the goals of the CEM initiative. As such, research is planned over a five-year period.

The data collection and analyses of these metrics contribute to testing the following hypotheses:

- If NYSERDA provides incentives for EM systems and information services, it will accelerate the growth of the EM market in NYS, helping it to mature faster than currently forecasted. The current NY market for RTEM is estimated at \$10 million and forecast to grow to \$20 million in five years. As noted above, NYSERDA is attempting to double year over year growth from 16% to 32% during this five-year period;
- If there is easy access to qualified vendors, a simplified implementation process, proof of energy savings, and demonstrated O&M benefits of EM, then commercial customers will incorporate EM into their building operations without need for further NYSERDA incentives; and
- If NYSERDA provides education and focused vendor support for operators, the depth and persistence of energy savings will improve and EM will better inform future capital investments.

To test these hypotheses, NYSERDA has developed a wide range of metrics to be evaluated over time.

This report presents the methodology and results of the 2018 market study. The results of this study will be utilized to provide an update on the progress of the initiative across the baselines established through the 2017 study, as well as set a baseline for the metrics that could not be set as part of the 2017 study.

## 1.4 Evaluation Scope

To address NYSERDA's research objectives, the evaluation scope includes four types of research activities over the study period (2017-2021):

- **Building owner and manager research.** The market evaluation team is conducting quantitative phone surveys with building owners and managers and other decision makers to assess their knowledge of and participation in EM and to better understand their ability for improved capital investment planning and asset management because of EM.
- **Program participant research.** The market evaluation team is conducting web surveys with customers participating in NYSERDA's EM initiatives, including both RTEM and REM components. These surveys explore a variety of participant-specific metrics, including the persistence of RTEM service contracts and the percentage of EM projects that institute an energy efficiency goals, as well as characterize other effects of the program. This survey will allow for the characterization of EM initiative participants and will be replicable in future years with a minimum of effort.
- **Qualified provider research.** The market evaluation team is conducting web surveys with qualified RTEM Service and System providers and qualified REM providers. These interviews include a discussion of awareness of EM and energy efficiency opportunities identified by EM providers, market growth, and other items to characterize the effect of the program on the market for EM equipment and services.
- **Non-program EM provider research.** The market evaluation team is conducting in-depth interviews with EM providers who are not program qualified providers. These interviews assess awareness of EM, the existence and use of methods for calculating costs and savings from EM, use of programmatic criteria by providers, EM sales, and other topics.

## 1.5 Schedule of Research Activities

Table 1-1 outlines the primary research activities completed to-date and planned for future years of this study. If approved by the NYSERDA Project Manager, the market evaluation team will conduct follow-up research in 2019, 2020, and 2021. More specifically, the market evaluation team plans to conduct a full performance update in 2019 and 2021, including all four research activities. Additionally, the market evaluation team plans to conduct a limited building owner and manager survey refresh in 2020, consisting of a number of completed interviews sufficient to provide a population-level estimate of the metrics being tracked, while not providing segment-level results.

Notably, due to the delay launching the REM initiative, research into the initiative’s performance has been limited to building owner and manager awareness of the REM initiative. As program activity ramps up, the market evaluation team will integrate REM-specific research as part of the study with close coordination with the NYSERDA Project Manager.

**Table 1-1. Primary Research Activities by Year**

<b>Data Collection Activity</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Building Owner and Manager Survey	X	X	✓	✓	✓
RTEM Participant Survey		X	✓	✓	✓
REM Participant Survey			✓	✓	✓
Participating RTEM Provider Survey		X	✓		✓
Participating REM Provider Survey			✓		✓
Non-Participating EM Provider Interviews	X		✓		✓

“X” indicates completed research, “✓” indicates planned research.

## 1.6 2018 Study Challenges and Scope Adjustments

The 2018 CEM evaluation faced several challenges requiring mid-stream adjustments to project scope. This section summarizes these challenges and the resulting scope adjustments and indicates places where the study work plan differs from the materials presented in this report.

- **Challenge:** At the launch of 2018 research activities, the REM initiative did not yet have any participants or approved providers.
  - **Resolution:** The market evaluation team revised the 2018 evaluation plan to focus participant and provider research on the RTEM initiative. Pending approval of 2019 research plans and sufficient participation, the market evaluation team will conduct initial REM participant and provider research at that time.
- **Challenge:** Reaching building owners and managers in the Healthcare/Hospital and University/College segments presented a particular challenge. The market evaluation team completed five out of a target of ten interviews with customers in the Healthcare/Hospital segment, and 27 out of a target of 70 interviews with customers in the University/College segment. The market evaluation team contacted all customers in the sample frame multiple times during different times of the day and different days of the week and over an extended period of time and made all reasonable attempts to maximize the response rate, including close coordination of the fieldwork efforts with the New York Statewide Baseline Study. Coordination efforts included augmenting the baseline study telephone survey to include a section encouraging customers to participate in this study. The market evaluation team’s investigation into possible reasons for limited fieldwork success showed the following:

- In the case of the Healthcare/Hospital segment, much of the contact information available to us<sup>1</sup> was of C-level executives, and the most frequent survey call disposition was “no answer.” Combined, these findings suggest that, in order to improve future chances of reaching customers within this segment, alternative contact information is needed.
- In the case of the University/College segment, the most frequent disposition was “wrong number.” Additionally, survey timing overlapped partially with Thanksgiving and the winter holidays. University and college staff are frequently on break during that period, which likely negatively impacted the response to the survey. These findings suggest that, in order to improve future chances of reaching customers within this segment, alternative contact information is needed, and survey timing should avoid overlapping with holiday periods.

The challenges associated with reaching these two segments, and particularly the Healthcare/Hospital segment, are not unique to this study and have been an ongoing issue in the industry.

- **Resolution:** For the purposes of the 2018 report, the market evaluation team reported findings for both segments but noted small sample sizes for the Healthcare/Hospital segment. Instead of reporting survey results by customer size within the University/College segment, the market evaluation team reported them at the overall segment level. Looking forward, continued challenges with reaching the Healthcare/Hospital segment limits insight into the segment’s experiences and interactions with EM solutions. Furthermore, continued outreach is labor-intensive and results in considerable expenditure of research resources. With this in mind, in advance of launching 2019 data collection efforts, the market evaluation team will explore alternative sources of sample for both segments, including panel data, along with alternative sources of outreach. The market evaluation team will discuss possible alternatives with the NYSERDA Project Manager and devise the most optimal course of action. In addition, for the University/College segment in particular, the market evaluation team will time data collection activities earlier in the year to maximize response rates within this segment.

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<sup>1</sup> The survey sample was developed from InfoGroup.

## 2 Results

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This section presents 2018 research results, organized by topic area.

### 2.1 Awareness and Knowledge of Energy Management

NYSERDA aims to increase the market uptake of energy management (EM) among commercial customers in New York State (NYS) as part of its overall commercial sector investment strategy. Awareness/knowledge of and confidence in EM technology among the initiative’s target population – building owners and managers – is a necessary condition for accelerating the growth of the EM market in NYS. Since its inception, the CEM Initiative has provided incentives for EM systems and information services, as well as easy access to qualified vendors and a simplified implementation process to encourage commercial customers to incorporate EM into their building operations.

Because the concepts of RTEM and REM may not be fully understood by all respondents, the building owner and manager survey included a detailed description of both strategies, developed in concert with NYSERDA staff.

#### 2.1.1 Awareness

Overall, about a third of owners and managers are aware of EM (34%), and over a quarter are aware of RTEM and REM (27% and 28% respectively). These levels of awareness are slightly higher compared to 2017, but only the increase in REM awareness is statistically significant (at 90% confidence).

Customers in the University/College segment have the highest levels of awareness of EM, RTEM, and REM (ranging from 74% to 82%). Awareness of EM, RTEM, and REM tends to be higher among large customers as compared to small customers. Directionally, awareness of EM, RTEM, and REM increased across virtually all segments, but statistically significant increases are only observed in the small Commercial Office and University/College segments. Notably, awareness levels in the small Commercial Office segment more than doubled over the course of a year, while awareness in the University/College segment increased by over 30 percentage points for all three metrics.

Table 2-1 presents change in building owner & manager awareness levels of EM, RTEM, and REM between 2017 and 2018 at the segment and population level.

Table 2-1. Awareness of EM, RTEM, and REM in NYS by Segment

Category		Metric	2017 (Baseline) (A)		2018 (B)	
Sector	Size	Awareness of...	n	Percentage	n	Percentage
Overall	N/A	EM	360	29%	311	34%
		RTEM	360	24%	309	27%
		REM	358	22%	311	28% <sup>A</sup>
Commercial Office	Small	EM	35	17%	44	36% <sup>A</sup>
		RTEM	35	11%	43	30% <sup>A</sup>
		REM	35	11%	44	30% <sup>A</sup>
	Large	EM	35	34%	25	40%
		RTEM	35	29%	25	24%
		REM	35	29%	25	40%
Retail	Small	EM	35	14%	35	23%
		RTEM	35	11%	35	14%
		REM	35	11%	35	17%
	Large	EM	35	20%	35	31%
		RTEM	35	11%	35	23%
		REM	35	17%	35	31%
University/ College***	Small	EM	30	47%	N/A	N/A
		RTEM	30	43%		
		REM	30	40%		
	Large	EM	34	56%	N/A	N/A
		RTEM	34	41%		
		REM	34	50%		
	All	EM	64	50%	27	82% <sup>A</sup>
		RTEM	64	43%	27	74% <sup>A</sup>
		REM	64	44%	27	82% <sup>A</sup>
Healthcare/ Hospital***	All	EM	5	60%	5	60%
		RTEM	5	60%	5	60%
		REM	4	50%	5	60%
Hotel	Small	EM	41	22%	37	24%
		RTEM	41	17%	37	22%
		REM	41	17%	37	24%
	Large	EM	39	33%	32	38%
		RTEM	39	31%	32	38%
		REM	39	18%	32	31%
Other	Small	EM	36	17%	30	30%
		RTEM	36	11%	30	23%
		REM	35	14%	30	20%
	Large	EM	35	29%	41	43%
		RTEM	35	20%	40	43% <sup>A</sup>
		REM	35	26%	41	39%

\*\*\* Note that sample sizes for this metric are small; therefore, caution should be used when drawing inferences.

Superscripts indicate statistically significant differences at 90% confidence.

## 2.1.2 Knowledge

Knowledge of EM, RTEM, and REM increased modestly from 2017 to 2018, but the increases were not statistically significant at 90% confidence. Knowledge of EM increased from 15% in 2017 to 17% in 2018, knowledge of RTEM increased from 12% in 2017 to 16% in 2018, and knowledge of REM



increased from 10% in 2017 to 12% in 2018. Changes in knowledge across segments varied, with some showing growth and others remaining unchanged on the metric. Across segments, however, knowledge of EM, RTEM, and REM is higher among large customers as compared to small customers.

Table 2-2 presents change in knowledge of EM, RTEM, and REM between 2017 and 2018 by segment and overall.

**Table 2-2. Knowledge about EM, RTEM, and REM in NYS by Segment**

Category		Metric	2017 (Baseline) (A)		2018 (B)	
Sector	Size	Knowledgeable about...	n	Percentage	n	Percentage
Overall	N/A	EM	360	15%	311	17%
		RTEM	359	12%	308	16%
		REM	357	10%	311	12%
Commercial Office	Small	EM	35	9%	44	16%
		RTEM	35	6%	42	7%
		REM	35	6%	44	16%
	Large	EM	35	14%	25	12%
		RTEM	35	11%	25	12%
		REM	35	11%	25	4%
Retail	Small	EM	35	9%	35	9%
		RTEM	35	6%	35	9%
		REM	35	6%	35	0%
	Large	EM	35	6%	35	11%
		RTEM	35	6%	35	9%
		REM	35	0%	35	11% <sup>A</sup>
University/ College***	Small	EM	30	30%	N/A	N/A
		RTEM	30	27%		
		REM	30	27%		
	Large	EM	34	32%	N/A	N/A
		RTEM	34	27%		
		REM	34	24%		
	All	EM	64	31%	27	59% <sup>A</sup>
		RTEM	64	27%	27	56% <sup>A</sup>
		REM	64	25%	27	56% <sup>A</sup>
Healthcare/ Hospital***	All	EM	5	60%	5	60%
		RTEM	5	60%	5	60%
		REM	4	0%	5	60% <sup>A</sup>

Category		Metric	2017 (Baseline) (A)		2018 (B)	
Hotel	Small	EM	41	10%	37	14%
		RTEM	40	5%	37	11%
		REM	41	5%	37	11%
	Large	EM	39	15%	32	22%
		RTEM	39	15%	32	16%
		REM	39	8%	32	19%
Other	Small	EM	36	6%	30	17%
		RTEM	36	6%	30	17 %
		REM	35	0%	30	10% <sup>A</sup>
	Large	EM	35	14%	41	27%
		RTEM	35	11%	40	28% <sup>A</sup>
		REM	34	15%	41	24%

\*\*\* While the market evaluation team presents this data for completeness, note that the sample size for this metric is small due to survey non-response and urge caution in drawing inferences from a small sample size.

Superscripts indicate statistically significant differences at 90% confidence.

### 2.1.3 Confidence

More than half of knowledgeable customers are confident<sup>2</sup> in EM, RTEM, and EM (57%, 56%, and 51%, respectively). Confidence in EM, RTEM, and REM decreased by more than 14 percentage points each between 2017 and 2018. Reasons for this decline are unclear. Table 2-3 presents change in customer confidence in EM, RTEM, and REM between 2017 and 2018 at the population level for customers already knowledgeable of EM, RTEM, and REM, respectively.

Because only customers already aware of EM were asked this question, sample sizes for these responses are quite low, and results for this metric are not presented at the segment level.

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<sup>2</sup> This was measured on a one to seven scale (where one is “not at all confident” and seven is “extremely confident”). Respondents were considered confident if they gave a response of five or higher.

**Table 2-3. Overall Confidence in EM, RTEM, and REM in NYS**

Metric	2017 (Baseline) (A)		2018 (B)	
	n	Percentage	n	Percentage
Confidence in...				
EM	34	71%	61	57%
RTEM	36	72%	56	56%
REM	19	68%	37	51%

Superscripts indicate statistically significant differences at 90% confidence.

## 2.2 Customer Use of Energy Management

### 2.2.3.1 Building Owner & Manager Use of Energy Management

In 2018, 12% of building owners and managers in NYS were implementing EM, with 9% using RTEM and 7% using REM.<sup>3</sup> Use of EM, RTEM, and REM amongst building owners and managers was consistent from 2017 to 2018. Universities and colleges implemented EM, RTEM, and REM at higher rates than the other business segments in 2018. Changes in use of EM, RTEM, and REM across segments were mixed.

**Error! Reference source not found.** presents changes in the use of EM, RTEM, and REM in NYS between 2017 and 2018 at the segment and population level.

**Table 2-4. Use of EM, RTEM, and REM by Segment**

Category		Metric	2017 (Baseline) (A)		2018 (B)	
Sector	Size	Use of...	n	Percentage	n	Percentage
Overall	N/A	EM	360	12%	309	12%
		RTEM	358	9%	304	9%
		REM	356	5%	306	7%
Commercial Office	Small	EM	35	6%	44	14%
		RTEM	35	3%	43	12%
		REM	35	3%	44	9%
	Large	EM	35	11%	25	8%
		RTEM	34	6%	25	0%
		REM	35	6%	25	8%
Retail	Small	EM	35	0%	35	6%
		RTEM	35	0%	35	6%
		REM	35	0%	35	0%
	Large	EM	35	3%	35	17% <sup>A</sup>
		RTEM	35	3%	34	12%
		REM	35	0%	35	14% <sup>A</sup>

<sup>3</sup> Note that some respondents reported using both.

Category		Metric	2017 (Baseline) (A)		2018 (B)			
University/ College***	Small	EM	30	27%	N/A	N/A		
		RTEM	30	23%				
		REM	30	17%				
	Large	EM	34	35%				
		RTEM	33	30%				
		REM	33	18%				
	All	EM	64	30%			26	58% <sup>A</sup>
		RTEM	63	26%			26	42% <sup>A</sup>
		REM	63	17%			23	52% <sup>A</sup>
Healthcare/ Hospital***	All	EM	5	40%	5	40%		
		RTEM	5	40%	5	20%		
		REM	4	0%	5	40%		
Hotel	Small	EM	41	10%	37	16%		
		RTEM	41	2%	37	14% <sup>A</sup>		
		REM	40	8%	37	5%		
	Large	EM	39	13%	31	13%		
		RTEM	39	13%	30	7%		
		REM	39	0%	31	10% <sup>A</sup>		
Other	Small	EM	36	3%	30	7%		
		RTEM	36	3%	30	3%		
		REM	35	3%	30	3%		
	Large	EM	35	9%	41	22%		
		RTEM	35	9%	39	23% <sup>A</sup>		
		REM	35	0%	41	12% <sup>A</sup>		

\*\*\* While the market evaluation team presents this data for completeness, note that the sample sizes for this metric are small due to survey non-response and urge caution in drawing inferences from a small sample size.

Superscripts indicate statistically significant differences at 90% confidence.

**Error! Reference source not found.** presents changes in levels of EM, RTEM, and REM use to assess operational risk between 2017 and 2018 at the segment and population level. In 2018, 8% of building owners and managers in NYS are using EM to assess operational risk, including 6% who use RTEM and 8% who use REM for this purpose. Such use represents an increase from 2017, when 7% used EM for operational risk assessment, including 5% who used RTEM and 4% who used REM. However, only the increase in REM use for assessing operational risk is statistically significant. Changes over time across segments vary with some segments experiencing no change, and some, namely large customers in the Retail segment, University/College, and Other segment, showing positive significant shift, while other segments showing no change over the course of the year.

**Table 2-5. Use of EM, RTEM, and REM for Assessing Operational Risk by Segment**

Category		Metric	2017 (Baseline) (A)		2018 (B)	
Sector	Size	Assessing Operational Risk with the Use of...	n	Percentage	N	Percentage
Overall	N/A	EM	324	7%	269	8%
		RTEM	299	5%	245	6%
		REM	293	4%	239	8% <sup>A</sup>
Commercial Office	Small	EM	34	3%	38	8%
		RTEM	31	0%	34	6%
		REM	32	3%	35	9%
	Large	EM	29	7%	19	5%
		RTEM	26	0%	19	0%
		REM	27	7%	17	6%
Retail	Small	EM	32	0%	33	0%
		RTEM	31	0%	32	0%
		REM	31	0%	29	0%
	Large	EM	33	0%	31	13% <sup>A</sup>
		RTEM	32	0%	31	13% <sup>A</sup>
		REM	29	0%	28	11% <sup>A</sup>
University/ College***	Small	EM	26	27%	N/A	N/A
		RTEM	22	23%		
		REM	22	18%		
	Large	EM	29	24%	N/A	N/A
		RTEM	25	24%		
		REM	25	12%		
	All	EM	55	26%	20	55% <sup>A</sup>
		RTEM	47	23%	14	43% <sup>A</sup>
		REM	47	16%	16	56% <sup>A</sup>
Healthcare/ Hospital***	All	EM	4	25%	4	50%
		RTEM	4	25%	3	67%
		REM	4	0%	4	50%
Hotel	Small	EM	37	3%	35	11%
		RTEM	34	0%	34	12% <sup>A</sup>
		REM	36	3%	30	3%
	Large	EM	35	9%	26	15%
		RTEM	31	10%	22	9%
		REM	32	0%	25	12% <sup>A</sup>
Other	Small	EM	34	3%	28	4%
		RTEM	33	0%	24	0%
		REM	31	3%	25	4%
	Large	EM	31	0%	35	20% <sup>A</sup>
		RTEM	30	0%	32	19% <sup>A</sup>
		REM	26	0%	30	17% <sup>A</sup>

\*\*\* While the market evaluation team presents this data for completeness, note that the sample sizes for this metric are small due to survey non-response and urge caution in drawing inferences from a small sample size.

Superscripts indicate statistically significant differences at 90% confidence.

### 2.2.3.2 Participant Use of RTEM

The participant survey explored the scope and breadth of RTEM applications. Note that the market evaluation team attempted to interview all participants but was only able to complete 16 interviews. While participant survey results are presented as percentages, those percentages should be used with caution due to small sample sizes.

#### (a) Use of RTEM Data

**Error! Reference source not found.** summarizes participant use of the RTEM data. As can be seen in the table, participants most commonly use RTEM data to reduce overall energy usage (88%), followed by seeking load reduction opportunities (69%). Only a quarter of participants use RTEM data for energy equipment risk assessment or compliance with energy code reporting requirements.

**Table 2-6. Participant Use of RTEM**

Metric	2018 Result	
	n	Percentage
Percent of participants who use RTEM data to...		
Reduce overall energy usage	16	88%
Identify opportunities to reduce energy loads during times of peak demand	16	69%
Assess risks associated with operating energy equipment	16	25%
Fulfil building energy code reporting requirements	16	25%

#### (b) Presence of Building Energy Management Strategy

Twelve of 16 RTEM initiative participants reported managing multiple buildings in NYS. Virtually all of these participants (92%) have an overall energy management strategy for the buildings they oversee, and for most (82%) participation in the RTEM initiative was part of the overall building management strategy. Of all RTEM projects completed in NYS in 2018, 87% were a part of the overall energy management strategy. Table 2-7 summarizes survey results related to the building energy management strategy.

**Table 2-7. Presence of Building Energy Management Strategy**

Metric	2018 Result	
	n	Percentage
Percent of participants managing multiple buildings in NYS who...		
Have an overall energy management strategy	12	92%
Participated in the RTEM as part of the building management strategy	11	82%
Percent of projects completed by participants managing multiple buildings in NYS that...	n	Percentage
Were a part of the overall energy management strategy	11	87%

**(c) RTEM Project Energy Savings Goal Development**

RTEM projects generally have savings goals attached to them. More specifically, over eight in nine participants (83%) developed energy savings goals for RTEM project(s). Of all RTEM projects completed in NYS in 2018, 69% had energy savings goals associated with them. Table 2-8 summarizes survey results.

**Table 2-8. RTEM Project Energy Savings Goal Development**

Metric	2018 Result	
	n	Percentage
<b>Percent of participants who...</b>		
Developed energy savings goals for RTEM project(s)	12	83%
<b>Percent of projects for which...</b>	n	Percentage
Energy savings goals were developed	12	69%

**(d) Realization of Additional Benefits Associated with RTEM Initiative Participation**

Three quarters of participants (75%), representing 80% of projects, report realizing additional benefits from their participation in the RTEM initiative beyond energy savings, while the remaining 25% are not sure whether or not they realized any additional benefits. Improved building comfort and better analysis of risks associated with operating equipment are among the most commonly realized benefits, with more than half of participants (56%) reporting having realized each of those benefits. Long-term equipment management and ability to make better informed decisions about capital management were commonplace benefits as well, with 50% and 38% of customers citing them respectively. Increased knowledge about energy use for tenants was a less pronounced benefit with a quarter of participants (25%) mentioning it. Table 2-9 summarizes survey responses regarding additional benefits associated with RTEM initiative participation.

**Table 2-9. Additional Benefits Associated with RTEM Initiative Participation**

Metric	2018 Result*		
	n	Percentage of Participants	Percentage of Projects
<b>Additional benefits realized</b>			
Improved building occupant comfort	16	56%	65%
Better analysis of risks associated with operating equipment	16	56%	65%
Improved long-term equipment management	16	50%	40%
Ability to make better informed decisions about capital investments	16	38%	30%
Increased knowledge about energy use for tenants	16	25%	20%
Other	16	6%	20%
<b>Any of the above</b>	<b>16</b>	<b>100%</b>	<b>100%</b>

\* Four participants did not know whether they realized additional benefits.

**(e) Identification and Implementation of Energy Savings Opportunities Following Participation in RTEM Initiative**

Over eight in ten participants (82%) identified energy saving opportunities as a result of their participation in the RTEM initiative.<sup>4</sup> Scheduling optimization opportunities were the ones most frequently identified (identified by 64% of participants), followed by equipment replacement opportunities (55%), and opportunities for better informed capital investments (36%). While commonly identified, opportunities for scheduling optimization and equipment replacement were not frequently implemented. Conversely, half of the opportunities for better informed capital investments were implemented. On average, only one out of five identified opportunities is implemented. Table 2-10 summarizes survey responses on the topic.

**Table 2-10. Energy Saving Opportunities Identified and Implemented through RTEM Initiative Participation**

Metric	2018 Result*					
	n	Identified Opportunities		Implemented Opportunities		Ratio of Opportunities Identified : Implemented
		% of Customers	Average Number of Opportunities	% of Customers	Average Number of Opportunities	
<b>Types of opportunities</b>						
Scheduling optimization opportunities	11	64%	1.6	27%	0.5	13:2
Equipment replacement	11	55%	1.2	18%	0.2	18:5

<sup>4</sup> This percent does not match “Any of the above” response in Table 2-10, as it is based on a different question in the survey and likely includes other types of opportunities.



Metric	2018 Result*					Ratio of Opportunities Identified : Implemented
	n	Identified Opportunities		Implemented Opportunities		
		% of Customers	Average Number of Opportunities	% of Customers	Average Number of Opportunities	
<b>Types of opportunities</b>						
Opportunities for better informed capital investments	11	36%	0.4	18%	0.2	2:1
<b>Any of the above</b>	<b>11</b>	<b>81%</b>	<b>3.2</b>	<b>27%</b>	<b>0.6</b>	<b>5:1</b>

\* Four participants did not know whether they realized additional benefits.

## 2.3 EM Market Conditions

The assessment of EM market conditions builds on the results of the participant and provider surveys and covers areas such as the persistence of service contracts and the extent of provider activity in the market. This assessment is limited to RTEM due to lacking participation in the REM initiative. Note that the market evaluation team attempted to interview all participants but was only able to complete 16 surveys. While the market evaluation team reports on the participant survey results in percentage terms, those percentages should be used with caution due to small sample sizes. In contrast, the number of completed provider interviews (33) is more robust.

### 2.3.4 Persistence of RTEM Contracts

The length of RTEM service contracts varied from one to five years with the average length of 4.1 years. Of the nine respondents that reported their original contract length, two (22%) also reported that they had extended their original contract. One contract was extended by four years, the other by five years. Overall, after the extension, all but one contracts (89%) were five years or longer in duration, yet only 11% were over five years in duration. Table 2-11 **Error! Reference source not found.** summarizes average and extended contract length. As can be seen in the table, the average contract length increased by one year, when including the extension.

**Table 2-11. Contract Length**

Metric	2018 Result	
	Original Contract Length	Extended Contract Length
n	9	9
Average original contract length (years)	4.1	5.1
Percentage of contracts 5 years+ in duration	67%	89%
Percentage of contracts more than 5 years in duration	0%	11%

### 2.3.5 Use of Qualified Provider List by the Market

Over half (58%) of RTEM providers reported that their company's revenue in New York State has increased since they started participating in NYSERDA's RTEM initiative. The provider survey attempted to explore percent increase in revenue, but due to data quality could not develop a reliable estimate. Changes in revenues may be hard for providers to estimate. Additionally, due to the sensitive nature of revenue information, some providers chose not to disclose it, further impacting the quality of the data.

The survey asked participating providers who reported an increase in revenues since the start of their program participation for the reasons behind the increase, as well as to rate each reason in terms of its influence on the revenue increase. Table 2-12 details provider responses. As can be seen in the table, provider ability to offer price reductions on the RTEM systems is the most commonly cited reason for revenue increase, as well as the most influential. Over one-third of participating providers (37%) attributed revenue increase to NYSERDA's qualified provider list. However, only one provider listed NYSERDA's qualified provider list as the sole reason for revenue increase. All other providers attributed revenue increase to multiple influencers, along with NYSERDA.

**Table 2-12. Reasons for Revenue Increase**

Reasons for Revenue Increase	2018 Result		
	n	Percentage Mention	Average Influence Rating*
Company was able to offer RTEM systems to customers at a reduced price	19	68%	4.2
Market for RTEM services expanded in New York	19	42%	2.9
Company was added to the qualified provider list through NYSERDA	19	37%	2.6
Company gained experience with marketing RTEM systems to customers	19	37%	2.7
Other	19	11%	Not assessed

Multiple response question.

\* On a scale from 1 to 7, where 1 is not at all influential and 7 is very influential.

### 2.3.6 Continued Need for NYSERDA Assistance

As part of the survey, the market evaluation team asked participating providers to rate various types of assistance they received from NYSERDA. Table 2-13 **Error! Reference source not found.** summarizes provider responses. As can be seen in the table, 64% providers agree that they have sufficient in-house data on RTEM projects to support their business model. Over half (58%) agree that assistance from NYSERDA has been helpful in communicating the benefits of RTEM to customers, while close to half

agreed that NYSERDA's technical support was helpful. Just under a third of providers (30%) agreed that NYSERDA's provider list was helpful in generating new business.

**Table 2-13. NYSERDA Assistance Rating Summary**

Statement	2018 Result		
	n	Percent Agree*	Average Agreement Rating**
I have enough in-house data on RTEM projects to support my business model	33	64%	4.8
I find assistance from NYSERDA helpful in communicating the benefits of RTEM to customers	33	58%	4.8
I find technical assistance from NYSERDA helpful in implementing RTEM projects	33	49%	4.7
I find NYSERDA's qualified provider list to be helpful in generating new business	33	30%	3.8

\* A rating of 5, 6 and 7 on a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree.

\*\* On a scale of 1 to 7, where 1 is completely disagree and 7 is completely agree.

### 2.3.7 Opportunity Assessment

Participating providers report having helped their customers identify a range of opportunities since they began participating in the RTEM initiative, and they did so with varying levels of frequency. Table 2-14 **Error! Reference source not found.** summarizes the types of opportunities that providers helped customers identify and the frequency with which they did so. As can be seen in the table, scheduling optimization opportunities are the most frequently identified with nearly three-quarters of providers (73%) reporting having helped identify those opportunities and just under half (46%) reporting always doing so on their projects.

**Table 2-14. Opportunities Identified and Their Frequency**

Energy Saving Opportunity Type	2018 Result		
	n	Percent Help Identify At Least Once	Percent Always Help Identify
Scheduling optimization opportunities	33	73%	46%
Opportunities for better informed capital investments	33	55%	30%
Equipment Replacement Opportunities	33	51%	30%
Other	33	15%	9%

On average, participating providers identify 8.6 energy-saving opportunities for their NYSERDA customers. Of those, customers typically act on 2.9 opportunities on average, which means that around two-thirds of opportunities are not acted on.

**Table 2-15. Average Number of Opportunities Identified and Acted On**

<b>Average Number of Opportunities...</b>	<b>2018 Result</b>	
	<b>n</b>	<b>Average</b>
Identified by participating providers	19	8.6
Acted on by customers	18	2.9

### 3 Methodology

This section summarizes the metrics selected for the CEM initiative and describes the data collection methods that the market evaluation team used to develop the findings presented in this report.

#### 3.1 Evaluation Metrics

In support of the CEM initiative, NYSERDA developed several key performance metrics and indicators to establish a baseline of market conditions and track progress toward (1) market adoption of EM technology and (2) transformation of the EM market with respect to the costs and benefits of EM projects. In the study planning phase, NYSERDA and the market evaluation team worked together to determine how each metric should be addressed. **Error! Reference source not found.** presents all metrics planned to be assessed over the five-year study period and notes which metrics were assessed in 2017 and/or 2018.

The market evaluation team designed all research around addressing the metrics below. Additionally, the market evaluation team added additional questions to research instruments, where appropriate and feasible, to collect other information for NYSERDA.

**Table 3-1. Metrics for Assessment**

Metrics	Outputs /Outcomes	Indicators	Addressed Via	Assessed in 2017	Assessed in 2018
<b>RTEM Metrics</b>					
Awareness & knowledge of RTEM	Increased awareness of RTEM among building owners/managers	Percent of building owners/managers aware/knowledge able of RTEM*	Building owner & manager survey	✓	✓
	Customer confidence in RTEM results	Percent of knowledgeable building owners/managers confident in RTEM results*	Building owner & manager survey	✓	✓
Customer use of RTEM	Increased use of RTEM	Percent of building owners/managers using RTEM*	Building owner & manager survey	✓	✓
	Percent of decision-makers using RTEM data to assess operational risk	Percent of decision-makers using RTEM data to assess operational risk*	Building owner & manager survey <sup>a</sup>	✓	✓
	Utilization of RTEM data sets to advance efforts at demand reduction & peak	Percent of RTEM participants utilizing RTEM data sets to	Participant survey		✓

<b>Metrics</b>	<b>Outputs /Outcomes</b>	<b>Indicators</b>	<b>Addressed Via</b>	<b>Assessed in 2017</b>	<b>Assessed in 2018</b>
	load shaving (not addressed in first year)	advance efforts at demand reduction & peak load shaving			
	Percentage of RTEM projects that institute an energy efficiency goal	Percent of RTEM projects that institute an energy efficiency goal	Participant survey		✓
	Percent of RTEM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses)	Percent of RTEM projects that use services for non-energy benefits	Participant survey		✓
	Demonstrated energy savings/O&M benefits from RTEM activities	Ratio of ECMs identified: ECMs implemented	Participant survey		✓
	Improved capital investment planning and asset management	Percent of RTEM projects that are a part of a larger building management portfolio	Participant survey		✓

Metrics	Outputs /Outcomes	Indicators	Addressed Via	Assessed in 2017	Assessed in 2018
	Persistence of RTEM service contracts (i.e., how many customers extend their subscription with an RTEM provider beyond 5 years)	RTEM service contracts that are longer than 5 years in duration	Participant survey		✓
	Extent of use of qualified provider list by the market (% increase in NY RTEM revenue by listed vendors)	Percent of revenue increase for providers on Qualified Provider List	Provider survey		✓
		Percent of providers who attribute increase to qualified provider list	Provider survey		✓
	In-house data sets are large enough that RTEM service providers no longer need to partner with NYSERDA & QPL is rendered obsolete (not addressed in first year)	Percent of providers who cease to apply to get listed on the Qualified Provider List	Provider survey		✓
		Participating providers no longer feel the need for NYSERDA assistance	Provider survey		✓
	RTEM providers identify & act on energy efficiency opportunities	Number/type of energy efficiency opportunities <b>identified</b> by RTEM providers	Provider survey		✓
	RTEM providers identify & act on energy efficiency opportunities	Number/type of energy efficiency opportunities <b>acted on</b> by RTEM providers	Provider survey		✓
<b>REM Metrics</b>					
Awareness & knowledge of REM	Increased awareness of REM among building owners/managers	Percent of building owners/managers aware/knowledgeable of REM*	Building owner & manager survey	✓	✓
	Customer confidence in REM results	Percent of knowledgeable building owners/managers confident in REM results*	Building owner & manager survey	✓	✓

<b>Metrics</b>	<b>Outputs /Outcomes</b>	<b>Indicators</b>	<b>Addressed Via</b>	<b>Assessed in 2017</b>	<b>Assessed in 2018</b>
Customer use of REM	Increased use of REM	Percent of building owners/managers using REM*	Building owner & manager survey	✓	✓
	Percent of decision-makers using REM data to assess operational risk	Percent of decision-makers using REM data to assess operational risk*	Building owner & manager survey <sup>a</sup>	✓	✓

\* Metrics denoted with an asterisk were selected as priority baseline metrics by NYSERDA for purposes of reporting to the NYS Department of Public Service (DPS). Initial estimates of these metrics at the population level were reported to the NYS DPS in November 2017; these estimates are refined in this evaluation report.

<sup>a</sup> The initial research plan for this study was to use the building owner & manager survey to determine the number of those using RTEM/REM, and the participant survey to determine the share of RTEM/REM users utilizing the technology to assess operational risk. Due to low levels of participation in the RTEM initiative and no participation to date in the REM initiative at the time of sample development, the market evaluation team adjusted its evaluation strategy for these metrics to use the building owner and manager survey to answer both items. Due to the low incidence of RTEM and REM usage among the general population, these metrics are based on small sample sizes and should be treated with caution in terms of drawing conclusions. As uptake of RTEM and REM increases, the market evaluation team expects to be able to provide estimates of these metrics with increased rigor.

## 3.2 2018 Research Activities

Research activities for 2018 consisted of the following three primary data collection efforts:

- Building Owner & Manager Survey
- RTEM participant survey
- RTEM participating provider survey

The following subsections detail each data collection effort.

### 3.2.1 Building Owner and Manager Survey

#### 3.2.1.1 Background

The market evaluation team conducted a quantitative phone survey with building owners and managers and other decision makers (subsequently referred to as building owner & manager survey) to assess their knowledge of EM and participation in EM initiatives, and to gauge their ability to improve capital investment planning and asset management because of EM. The survey was conducted using computer-aided telephone interviewing (CATI) technology.

The initial target for the CEM initiative was commercial sector verticals with significant existing penetration of Building Management Systems – Commercial Office, Retail, University/College, Healthcare/Hospital, and Hotels. These segments also have large buildings or portfolios being centrally managed and, therefore, are more likely to have the human resources necessary to capitalize on the



potential of EM. Therefore, the research focused on these segments. In addition, the research included some interviews with commercial customers in other market segments.

### **3.2.1.2 Sampling Plan**

The market evaluation team drew the sample of commercial building owners/managers in New York from the InfoGroup database provided by NYSERDA. Per NYSERDA's request, the market evaluation team stratified the sample by segment, focusing on segments NYSERDA expects to be crucial to the early success of the program, as well as by facility size to provide more detail around EM relative to customer size.

The sample sizes were designed to provide 10% relative precision at 90% confidence (90/10) around the baseline estimates by segment. This precision will allow NYSERDA to accurately assess whether it has reached its targets for each specified outcome metric by 2019, by segment.

The market evaluation team planned to conduct 360 interviews as part of this survey, summarized by segment in **Error! Reference source not found.** below. The market evaluation team came slightly short of this goal, achieving 313 completes. Challenges in completing the desired number of interviews in the University/College and Healthcare/Hospitals segments was the reason for the lower than expected number of completed interviews.

**Table 3-2. Building Owner & Manager Survey by Stratum**

Segment	Size	Planned Completes	Completes Achieved
Commercial Office	Small	35	44
	Large	35	26
Retail	Small	35	35
	Large	35	35
University/College <sup>a</sup>	Small	35	10
	Large	35	17
Healthcare/Hospitals <sup>a</sup>	All	10	5
Hotels <sup>a</sup>	Small	35	37
	Large	35	33
Other	Small	35	30
	Large	35	41
<b>Total</b>		<b>360</b>	<b>313</b>

<sup>a</sup> The market evaluation team attempted a census of all customers in these segments.

Because of the low number of completed interviews for the Healthcare/Hospital and University/College segments, **Error! Reference source not found.** deso not present results for these segments by size. Furthermore, results for these segments should be interpreted with caution due to the small sample sizes.

### 3.2.1.3 Survey Outcomes & Dispositions

The market evaluation team contacted 34,850 businesses and completed 313 interviews as part of the building owner & manager survey. **Error! Reference source not found.** presents the disposition summary for this survey.

**Table 3-3. Disposition Summary for Building Owner & Manager Survey**

Disposition	Total
Complete interview	313
Eligible incomplete interview	23
Survey-ineligible Business	621
Not an eligible business	9,680
Business with undetermined survey eligibility	15,761
Undetermined if eligible business	8,452
<b>Total</b>	<b>34,850</b>

**Error! Reference source not found.** presents response and cooperation rates for the building owner & manager survey. The formulas for these rates are presented in Appendix B.

**Table 3-4. Building Owner & Manager Survey Response and Cooperation Rates**

AAPOR Rate	Percentage
RR3	4.0%
CR3	7.2%

### 3.2.1.4 Weighting

When aggregating the results of the Building Owner & Manager survey to the segment and population levels, the market evaluation team weighted the results for each stratum (defined by segment and size<sup>5</sup>) by the share of building owners/managers in the population in relation to the share of building owners/managers in the completed interviews. **Error! Reference source not found.** presents the population sizes, completes, and the weights applied for each stratum.

**Table 3-5. Building Owner & Manager Survey Weights**

Segment	Population Size (N)	Sample Completes (n)	Weight
Commercial Office - Small	63,220	44	0.7290
Commercial Office - Large	54,097	26	1.0557
Retail - Small	72,513	35	1.0512
Retail - Large	55,057	35	0.7982
University/College	1,338	27	0.0251
Healthcare/Hospital	344	5	0.0349
Hotel - Small	1,177	37	0.0161
Hotel - Large	1,130	33	0.0174
Other - Small	229,249	30	3.8773
Other - Large	138,749	41	1.7171

## 3.2.2 RTEM Participant Survey

### 3.2.2.1 Background

The market evaluation team conducted a web survey with customers who participated in NYSERDA's RTEM initiative in 2018. The survey explored a variety of participant-specific metrics, including the persistence of RTEM service contracts (i.e., how many customers extend their subscription with an RTEM provider beyond 5 years), percentage of EM projects that institute an energy efficiency goal, and

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<sup>5</sup> Except for Healthcare/Hospital and University/College, where the small number of completes does not allow for reporting by size.

the percentage of EM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses).

### 3.2.2.2 Sampling Plan

The market evaluation team contacted all customers who participated in the RTEM initiative in 2018 (census attempt). The list included 61 unique RTEM participants.

### 3.2.2.3 Survey Outcomes & Dispositions

Of 61 participants, 16 completed the survey. The market evaluation team made extensive efforts to complete interviews with as many participants as possible, including looking up alternative contact information for non-responsive participants and conducting telephone outreach, as well as leveraging help from NYSERDA’s program team to reach non-respondents.

**Error! Reference source not found.** below presents the disposition summary for this survey. Appendix C presents firmographics of survey respondents.

**Table 3-6. Disposition Summary for Participant Survey**

Disposition	Total
Complete interview	16
Eligible incomplete interview	6
Survey-ineligible business	0
Not an eligible business	1
Business with undetermined survey eligibility	38
Undetermined if eligible business	0
<b>Total</b>	<b>61</b>

**Error! Reference source not found.** presents response and cooperation rates for the participant survey. The formulas for these rates are included in Appendix B.

**Table 3-7. Participant Survey Response and Cooperation Rates**

AAPOR Rate	Percentage
RR3	26.7%
CR3	69.6%

### 3.2.3 Participating RTEM Provider Survey

#### 3.2.3.1 Background

The market evaluation team conducted a web survey with qualified RTEM service and system providers to assess the level of awareness of EM amongst building owners and managers, the number and type of energy efficiency opportunities identified by EM providers, estimates of sales that indicate market growth, and other items to characterize the effect of the program on the market for EM equipment and services.

#### 3.2.3.2 Sampling Plan

The market evaluation team contacted all 73 RTEM providers who were included on NYSERDA's Qualified Provider List (census attempt).

#### 3.2.3.3 Survey Outcomes & Dispositions

Of 73 RTEM providers, 33 completed the survey. The market evaluation team made extensive efforts to complete interviews with as many providers as possible, including looking up alternative contact information for non-responsive providers and conducting telephone outreach, as well as leveraging help from NYSERDA's program team to reach non-respondents.

**Error! Reference source not found.** below presents the disposition summary for this survey. Appendix C presents firmographics of survey respondents.

**Table 3-8. Disposition Summary for Participating Provider Survey**

<b>Disposition</b>	<b>Total</b>
Complete interview	33
Eligible incomplete interview	5
Survey-ineligible business	0
Not an eligible household	0
Business with undetermined survey eligibility	40
Undetermined if eligible business	0
<b>Total</b>	<b>73</b>

**Error! Reference source not found.** presents response and cooperation rates for the participating provider survey. The formulas for these rates are included in Appendix B.

**Table 3-9. Participating Provider Survey Response and Cooperation Rates**

<b>AAPOR Rate</b>	<b>Percentage</b>
RR3	45.2%
CR	84.6%

## Appendix A. Table of All Metric Results

### Table of All Metric Results

Theme	Outputs/Outcomes	Indicators	Addressed Via	2017 Result (A)	2018 Result (B)
<b>Overall EM Initiative Metrics</b>					
Market transformation	EM market matures more quickly than currently forecasted	Number of EM providers	Non-participating provider interviews	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
EM methods	Methods for calculating/analyzing costs & savings are standardized	Existence of standardized methods for calculating/analyzing costs & savings	Non-participating provider interviews	Non-participating providers were unable to provide this information	Not assessed
		Use of standardized methods for calculating/analyzing costs & savings	Non-participating provider interviews	Non-participating providers were unable to provide this information	Not assessed
	Programmatic criteria become industry standard (not addressed in first year)	Use of programmatic criteria by providers	Non-participating provider interviews	Not assessed <sup>a</sup>	Not assessed
<b>RTEM Metrics</b>					
Awareness & knowledge of RTEM	Increased awareness of RTEM among building owners/managers	Percent of building owners/managers aware/knowledgeable of RTEM*	Building owner & manager survey	24% (aware) 12% (knowledgeable)	27% (aware) 16% (knowledgeable)
	Increased awareness of RTEM among providers	Percent of EMS providers aware/knowledgeable of RTEM	Non-participating provider interviews	92%	Not assessed
	Customer confidence in RTEM results	Percent of knowledgeable building owners/managers confident in RTEM results*	Building owner & manager survey	72%	56%
Customer use of RTEM	Increased use of RTEM	Percent of building owners/managers using RTEM*	Building owner & manager survey	9%	9%
	Percent of decision-makers using RTEM data to assess operational risk	Percent of decision-makers using RTEM data to assess operational risk*	Building owner & manager survey <sup>a</sup>	5%	6%
	Utilization of RTEM data sets to advance efforts at demand reduction & peak load shaving (not addressed in first year)	Utilization of RTEM data sets to advance efforts at demand reduction & peak load shaving	Participant survey	Not assessed <sup>a</sup>	69%

Appendix A. Table of All Metric Results

	Percentage of RTEM projects that institute an energy efficiency goal	Percentage of RTEM projects that institute an energy efficiency goal	Participant survey	Not assessed <sup>a</sup>	69%
	Percent of RTEM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses)	Percent of RTEM projects that use services for non-energy benefits	Participant survey	Not assessed <sup>a</sup>	80%
	Demonstrated energy savings/O&M benefits from RTEM activities	Ratio of ECMS identified: ECMS implemented	Participant survey	Not assessed <sup>a</sup>	5:1
	Improved capital investment planning and asset management	Percent of RTEM projects that are a part of a larger building management portfolio	Participant survey	Not assessed <sup>a</sup>	87%
RTEM market conditions	Percent of BMS offerings with integrated RTEM capabilities	Percent of BMS offerings with integrated RTEM capabilities*	Non-participating provider interviews	Qualitatively assessed	Not assessed
	Persistence of RTEM service contracts (i.e., how many customers extend their subscription with an RTEM provider beyond 5 years)	RTEM service contracts that are longer than 5 years in duration	Participant survey	Not assessed <sup>a</sup>	11% (more than 5 years) <sup>c</sup> 89% (5 years or more) <sup>c</sup>
	In-house data sets are large enough that RTEM service providers no longer need to partner with NYSERDA & QPL is rendered obsolete (not addressed in first year)	Non-participating providers use/refer to published NYSERDA data/standards	Non-participating provider interviews	Not assessed <sup>a</sup>	Not assessed
	Extent of use of qualified provider list by the market (% increase in NY RTEM revenue by listed vendors)	Percent of revenue increase for providers on Qualified Provider List	Provider survey	Not assessed <sup>a</sup>	Not reported <sup>b</sup>
		Attribution of increase to qualified provider list	Provider survey	Not assessed <sup>a</sup>	37% <sup>d</sup>
	In-house data sets are large enough that RTEM service providers no longer need to partner with NYSERDA & QPL is rendered obsolete (not addressed in first year)	Providers cease to apply to get listed on the Qualified Provider List	Provider survey	Not assessed <sup>a</sup>	30% (find NYSERDA's qualified provider list helpful in generating new business) <sup>e</sup>
Participating providers no longer feel the need for NYSERDA assistance		Provider survey	Not assessed <sup>a</sup>	49% (find technical assistance helpful in implementation) <sup>f</sup> 58% (find assistance)	



Appendix A. Table of All Metric Results

					helpful in communicating to customers) <sup>f</sup> 64% (have enough in-house data on RTEM to support business model) <sup>f</sup>
	RTEM providers identify & act on energy efficiency opportunities	Number/type of energy efficiency opportunities identified by RTEM providers	Provider survey	Not assessed <sup>a</sup>	8.6
	RTEM providers identify & act on energy efficiency opportunities	Number/type of energy efficiency opportunities acted on by RTEM providers	Provider survey	Not assessed <sup>a</sup>	2.9
<b>REEM Metrics</b>					
Awareness & knowledge of REEM	Increased awareness of REEM among building owners/managers	Percent of building owners/managers aware/knowledgeable of REEM*	Building owner & manager survey	22% (aware) 10% (knowledgeable)	28% <sup>A</sup> (aware) 12% (knowledgeable)
	Increased awareness of REEM among providers	Percent of EMS providers aware/knowledgeable of REEM	Non-participating provider interviews	80% (familiar)	Not assessed
	Customer confidence in REEM results	Percent of knowledgeable building owners/managers confident in REEM results*	Building owner & manager survey	68%	51%
Customer use of REEM	Increased use of REEM	Percent of building owners/managers using REEM*	Building owner & manager survey	5%	7%
	Percent of decision-makers using REEM data to assess operational risk	Percent of decision-makers using REEM data to assess operational risk*	Building owner & manager survey <sup>a</sup>	4%	8% <sup>A</sup>
	Percentage of REEM projects that institute an energy efficiency goal	Percentage of REEM projects that institute an energy efficiency goal	Participant survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
	Percent of REEM projects that use services for non-energy benefits (e.g., long-term asset management, capital investment strategies, risk mitigation analyses)	Number of REEM projects that use services for non-energy benefits	Participant survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
	Demonstrated energy savings/O&M benefits from REEM activities	Ratio of ECMs identified: ECMs implemented	Participant survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
	Improved capital investment planning	Percent of REEM projects that are a	Participant survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>

Appendix A. Table of All Metric Results

	and asset management	part of a larger building management portfolio			
REM market conditions	Extent of use of qualified provider list by the market (% increase in NY REM revenue by listed vendors)	Percent of revenue increase for providers on Qualified Provider List	Provider survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
	Extent of use of qualified provider list by the market (% increase in NY REM revenue by listed vendors)	Attribution of increase to qualified provider list	Provider survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
	REM providers identify & customers act on energy efficiency opportunities	Number/type of energy efficiency opportunities identified by REM providers	Provider survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>
		Number/type of energy efficiency opportunities acted on by REM providers	Provider survey	Not assessed <sup>a</sup>	Not assessed <sup>a</sup>

<sup>a</sup> These metrics were not assessed in the evaluation, either due to the need to allow the market to develop before assessment or due to the research activity not being completed as discussed earlier in this report.

<sup>b</sup> The market evaluation team chose not to report on this metric due to data validity and reliability concerns. Provider responses were inconsistent, frequently missing, and in some cases outside of the expected reasonable bounds.

<sup>c</sup> These values account for contract length upon contract extension.

<sup>d</sup> Includes those who mention other reasons, along with the provider list, among reasons for revenue increase.

<sup>e</sup> Is based on question asking providers about their level of agreement with NYSERDA provider list being helpful in generating new business. Percent reflects provider ratings of 5, 6, and 7 on a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree.

<sup>f</sup> A rating of 5, 6, and 7 on a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree.

\* Metrics denoted with an asterisk were selected as priority baseline metrics by NYSERDA for purposes of reporting to the NYS Department of Public Service (DPS). Initial estimates of these metrics at the population level were reported to the NYS DPS in November 2017; these estimates are refined in this evaluation report.

## Appendix B. Survey Response Rate Methodology

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This appendix presents the equations used to calculate the response rate (RR) and the cooperation rate (CR) for the three survey efforts completed in 2018.

The survey RR is the number of completed interviews divided by the total number of potentially eligible respondents. The market evaluation team calculated Response Rate 3 (RR3) using the standards and formulas set forth by the Association for Public Opinion Research (AAPOR):<sup>6</sup>

### Equation B-1. AAPOR Response Rate 3

$$RR3 = \frac{I}{(I + N + e1(U1 + e2 * U2))}$$

Where:

$$e1 = \frac{(I + N)}{(I + N + X1)}$$

$$e2 = \frac{(I + N + X1 + U1)}{(I + N + X1 + U1 + X2)}$$

The survey CR is the number of completed interviews divided by the total number of eligible sample units. The market evaluation team used AAPOR Cooperation Rate 3 (COOP3), which is calculated as:

### Equation B-2. AAPOR Cooperation Rate 3

$$COOP3 = \frac{I}{((I + P) + R)}$$

The tables below provide the definitions of the letters used in the formulas above along with the distribution of the sample, for each survey effort, across the disposition categories.

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<sup>6</sup> *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*, AAPOR, 2011.  
[http://www.aapor.org/AM/Template.cfm?Section=Standard\\_Definitions2&Template=/CM/ContentDisplay.cfm&ContentID=3156](http://www.aapor.org/AM/Template.cfm?Section=Standard_Definitions2&Template=/CM/ContentDisplay.cfm&ContentID=3156).

**Table B-1. Dispositions for Building Owner & Manager Survey**

<b>Disposition Code</b>	<b>Disposition Category</b>	<b>Total</b>
Complete	I	313
Partial complete - survey eligibility confirmed	N	23
Partial complete - survey eligibility unknown	U1	14
Answering machine	U1	4,457
Respondent not available	U1	4,583
Spanish language barrier	U1	84
Non-Spanish language barrier	U1	170
Respondent scheduled appointment	U1	2,426
Cell Phone callback	U1	-
Initial refusal	U1	1,520
Hard refusal	U1	52
Cell Phone refusal	U1	-
Gatekeeper Refusal	U1	1,833
Added to DNC list	U1	622
No answer	U2	7,979
Busy	U2	473
Quota filled	X1	-
Out of business	X1	183
Ineligible to participate	X1	438
Disconnected phone	X2	2,900
Residential phone	X2	205
Computer tone	X2	717
Customer indicated called already	X2	-
Customer said wrong number	X2	4,205
Deceased	X2	47
Bad number	X2	1,606
<b>Total</b>	<b>N/A</b>	<b>34,850</b>

**Table B-2. Dispositions Summary for Participant Survey**

<b>Disposition</b>	<b>Input</b>	<b>Total</b>
Complete	I	16
Partial complete - survey eligibility confirmed	N	6
Partial complete - survey eligibility unknown	U1	1
Refused	U1	-
No response	U1	37
Ineligible to participate	X1	0
Bounced email	X2	1
<b>Total</b>	<b>N/A</b>	<b>61</b>

**Table B-3. Dispositions Summary for Participating Provider Survey**

<b>Disposition</b>	<b>Input</b>	<b>Total</b>
Complete	I	33
Partial complete - survey eligibility confirmed	N	5
Partial complete - survey eligibility unknown	U1	1
Refused	U1	0
No response	U1	34
Ineligible to participate	X1	0
Bounced email	X2	0
<b>Total</b>	<b>N/A</b>	<b>73</b>

## Appendix C. Participant and Provider Firmographics

This appendix describes RTEM participating customers and providers in terms of their interactions with the program and their key firmographic characteristics.

### RTEM Participant Survey

During 2018, 61 unique customers completed a total of 76 projects through NYSERDA's RTEM initiative across 193 unique business premises.<sup>7</sup> Projects varied in their scope and planned savings. The average total project square footage covered by an RTEM project in 2018 was close to 1.5 million square feet and the average incentive per project was \$54,380.

As part of the participant survey, the market evaluation team explored key firmographic information. Overall, most respondents either own and operate their facility or own but rent the facility to someone else (73%). Over half of respondents (56%) are in the office or healthcare/hospital segment. Respondents' facilities tend to be older, with 69% being over 30 years old. A summary of firmographics for responding RTEM initiative participants is included in Table C-1.

**Table C-1. RTEM Participant Firmographics**

<b>Response</b>	<b>n</b>	<b>Percent</b>
<b>Building Type</b>		
A stand-alone building	16	81%
A campus of buildings (multiple buildings)	16	19%
<b>Facility Type</b>		
Office space	16	31%
Retail space	16	6%
Healthcare or hospital	16	25%
Community center	16	6%
School (non-university)	16	13%
Performing space (theater)	16	13%
Synagogue	16	6%
<b>Building Ownership</b>		
My company owns and operates this facility	15	53%
My company owns this facility but it is rented to someone else	15	20%
My company rents this facility	15	27%
<b>Building Age</b>		
0 to 29 years	16	31%
30 years or more	16	69%
<b>Size of Company (compared to others in the same industry)</b>		
Small	16	25%
Medium	16	44%
Large	16	31%
<b>Employees</b>		

<sup>7</sup> One project was large and spread across 65 unique sites.

Response	n	Percent
10 to 49	16	31%
50 to 99	16	13%
100 to 249	16	13%
250 to 499	16	13%
500 or more	16	31%

### Participating RTEM Provider Survey

In 2018, a total of 73 providers were enrolled in the RTEM initiative. Of those, 36 (49%) are listed as active RTEM providers. Of the 36 active providers, half had completed RTEM projects in 2018, while the other half completed no projects. Project activity also varied among providers, with the top 10% of providers completing 78% of all 2018 projects and accounting for 77% of project incentives.

As part of the participating provider survey, the market evaluation team explored key firmographic characteristics of participating providers. Provider coverage of NYS is focused currently on New York City. Nearly all providers (97%) report that operating in New York City, and 71% report operating in Hudson valley. Nearly all providers (97%) also report operating outside of NYS. Additionally, a third (33%) of providers operate statewide (reporting operation in all ten regions), and 39% of providers operate in at least seven of the ten regions. More than half (56%) of providers describe their companies as vendors of RTEM equipment, and 78.1% describe their companies as service providers analyzing RTEM data. Slightly more than a quarter (27%) describe their companies as operating across all three domains – vendors of RTEM equipment, service providers helping customers install RTEM equipment, and service providers analyzing RTEM data. A summary of firmographics for responding RTEM providers is included in Table C-2.

**Table C-2. Participating RTEM Provider Firmographics**

Response	n	Percent
<b>Company Description (Multiple Response)</b>		
A vendor of RTEM equipment	32	56%
A service provider helping customers install RTEM equipment	32	44%
A service provider analyzing RTEM data	32	78%
<b>Region in which Company Operates (Multiple Response)</b>		
Western New York	31	42%
Finger Lakes	31	42%
Southern Tier	31	42%
Central New York	31	45%
North Country	31	42%
Mohawk Valley	31	48%
Capital District	31	52%
Hudson Valley	31	71%
New York City	31	97%
Long Island	31	65%

Appendix C. Participant and Provider Firmographics

<b>Response</b>	<b>n</b>	<b>Percent</b>
<b>Companies Operating outside NYS</b>		
Yes	33	97%
No	33	3%
<b>Employees</b>		
10 to 49	29	72%
50 to 99	29	3%
100 to 249	29	14%
250 to 499	29	7%
500 or more	29	3%



## Appendix D. Descriptive Statistics for 2018 Metrics

This appendix contains additional statistics for key metrics assessed as part of our 2018 research efforts. Table D-1 lists each metric and provides associated point estimates, population and sample size, as well as standard deviation, variance, median, minimum, and maximum, where relevant and applicable.

**Table D-1. Descriptive Statistics for 2018 Metrics**

Metrics	Value	Standard Deviation	Variance	Sample Size	Population Size	Median	Minimum	Maximum
Percent of building owners/managers aware of RTEM	27%	N/A	N/A	309	655,380	N/A	N/A	N/A
Percent of building owners/managers knowledgeable of RTEM	16%	N/A	N/A	308	655,380	N/A	N/A	N/A
Percent of knowledgeable building owners/managers confident in RTEM results	56%	N/A	N/A	56	655,380	N/A	N/A	N/A
Percent of building owners/managers using RTEM	9%	N/A	N/A	304	655,380	N/A	N/A	N/A
Percent of decision-makers using RTEM data to assess operational risk	6%	N/A	N/A	245	655,380	N/A	N/A	N/A
Utilization of RTEM data sets to advance efforts at demand reduction & peak load shaving	69%	N/A	N/A	16	61	N/A	N/A	N/A
Percentage of RTEM projects that institute an energy efficiency goal	69%	0.4841	0.2344	12	61	100%	0%	100%
Percentage of RTEM projects that use services for non-energy benefits	80%	0.4131	0.1707	16	61	100%	0%	100%
<b>Ratio of ECMs identified: ECMs implemented</b>	5:1	N/A	N/A	11	61	N/A	N/A	N/A
Average number of ECMs identified	3.2	2.7502	7.5636	11	61	3	0	10
Average number of ECMs implemented	0.64	1.2060	1.4544	11	61	0	0	3
Percent of RTEM projects that are a part of a larger building management portfolio	87%	0.3565	0.1271	11	61	100%	0%	100%
RTEM service contracts that are longer than 5 years in duration	11% <sup>a</sup>	N/A	N/A	9	73	N/A	N/A	N/A
RTEM service contracts that are 5 years or longer in duration	89% <sup>a</sup>	N/A	N/A	9	73	N/A	N/A	N/A
Attribution of increase to qualified provider list	37% <sup>b</sup>	N/A	N/A	19	73	N/A	N/A	N/A
Providers cease to apply to get listed on the Qualified Provider List	30% <sup>c</sup>	N/A	N/A	33	73	N/A	N/A	N/A
<b>Participating providers no longer feel the need for NYSERDA assistance</b>								
Find technical assistance from NYSERDA helpful in implementing RTEM Projects	49% <sup>d</sup>	N/A	N/A	33	73	N/A	N/A	N/A

Appendix D. Descriptive Statistics for 2018 Metrics

<b>Metrics</b>	<b>Value</b>	<b>Standard Deviation</b>	<b>Variance</b>	<b>Sample Size</b>	<b>Population Size</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
Find assistance from NYSERDA helpful in communicating the benefits of RTEM to customers	58% <sup>d</sup>	N/A	N/A	33	73	N/A	N/A	N/A
Have enough in-house data on RTEM projects to support business model	64% <sup>d</sup>	N/A	N/A	33	73	N/A	N/A	N/A
Number/type of energy efficiency opportunities identified by RTEM providers	8.6	6.8339	46.7018	19	73	7	0	25
Number/type of energy efficiency opportunities acted on by RTEM providers	2.9	1.4604	2.1328	18	73	3	0	6
Percent of building owners/managers aware of REM	28%	N/A	N/A	311	655,380	N/A	N/A	N/A
Percent of building owners/managers knowledgeable of REM	12%	N/A	N/A	311	655,380	N/A	N/A	N/A
Percent of knowledgeable building owners/managers confident in REM results	51%	N/A	N/A	37	655,380	N/A	N/A	N/A
Percent of building owners/managers using REM	7%	N/A	N/A	306	655,380	N/A	N/A	N/A
Percent of decision-makers using REM data to assess operational risk	8%	N/A	N/A	239	655,380	N/A	N/A	N/A

<sup>a</sup> These values account for contract length upon contract extension.

<sup>b</sup> Includes those who mention other reasons, along with the provider list, among reasons for revenue increase.

<sup>c</sup> Is based on question asking providers about their level of agreement with NYSERDA provider list being helpful in generating new business. Percent reflects provider ratings of 5, 6, and 7 on a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree.

<sup>d</sup> A rating of 5, 6, and 7 on a scale from 1 to 7, where 1 is completely disagree and 7 is completely agree.