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Demand Response Survey Research Study

Commercial Demand Response Willingness-to-Accept and Performance Window Customer Research

Prepared for:
Consolidated Edison Company of New York

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Executive Summary

Consolidated Edison Company of New York, Inc. (Con Edison) offers two commercial demand response (DR) programs. The contingency program, known as the Distribution Load Relief Program (DLRP), supports the operation of the electric distribution system in New York City and Westchester County when real time system operational conditions require the reduction of demand within a specific network, for a specific period. The peak shaving program, known as the Commercial System Relief Program (CSRP), focuses on reducing demand on infrastructure in New York City during times of high demand as the result of extreme heat conditions.

In an effort to better understand the value of DR and identify potential options to increase enrollment and performance in Con Edison's commercial DR programs, Con Edison previously conducted research including a cost-effectiveness study testing differences in DR program design and surveys of DR aggregators. This research led to the conclusion that increased incentives and a number of programmatic changes were warranted and could lead to increased penetration of DR resources in the Con Edison service territory. As a result, Con Edison requested changes to its two commercial DR programs with the aim of increasing enrollment and performance.

On March 13, 2014, the New York State Public Service Commission (PSC) finalized its decision on these requested changes in the *Order Adopting Tariff Revisions with Modifications*.[1] Key changes included shortening the duration of DR events, increasing incentives – including offering a new bonus incentive for a three-year commitment to DR, and reducing penalties. Given that there was limited information at the time to predict the increase in enrollment that could be achieved because of programmatic changes, the *Order* required additional research:

1. Conduct a willingness-to-accept (WTA) study to determine the minimum amount a participant is willing to receive to reduce demand.
2. Produce an analysis of whether Con Edison should reduce the performance windows to better accommodate newly emerging technologies and/or to further stimulate the volume of customers that can participate.
3. Produce an analysis of the effect of the increased payment rates on enrollment.

In partnership with Con Edison, Navigant Consulting, Inc. (Navigant) conducted several research activities to meet the requirements of the *Order*, including a literature review, technology assessment, surveys with DR-program participants and non-participants, a willingness-to-accept analysis, and a historical data analysis. Table ES 1 summarizes the key findings of these research activities. This research did not study whether changes in incentives, notification periods, or performance windows have any operational value or would be cost effective, and thus there are no conclusions to such effect.

[1] Case 13-E-0573, Tariff Filing by Consolidated Edison Company of New York, Inc. to Make Revisions to its Demand Response Programs Rider S – Commercial System Relief Program and Rider U – Distribution Load Relief Program contained in P.S.C. No. 10 – Electricity, *Order Adopting Tariff Revisions with Modifications,* issued and effective March 13, 2014.

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Table ES 1. Key Findings

Research	Description	Key Findings
Willingness-to-Accept (WTA) Analysis	Conduct a WTA study to determine the minimum amount a participant is willing to receive to reduce demand.	The average WTA values for participants range from $7.24 to $15.24 per kW-month while the average WTA values for non-participants range from $9.18 to $18.35 per kW-month, higher than the $6 or $10 per kW-month that is typical of Con Edison's current DR-program offerings. The analysis reveals that performance window and notification period are the primary factors that influence the average WTA for commercial and multifamily customers, with commercial customers exhibiting a preference for longer notification periods over shorter events whereas multifamily customers exhibit a preference for shorter events over longer notification periods. Based on the data available, technology did not appear to influence the responsiveness of the average WTA to changes in the performance window and notification period.
Performance Window Analysis	Produce an analysis of whether Con Edison should reduce the performance windows to better accommodate newly emerging technologies and/or to further stimulate the volume of customers that can participate.	Economic theory suggests customers with high variable costs may exhibit a preference for DR programs with a shortened performance window (i.e., if Con Edison shortens performance windows, it may stimulate enrollment among this group, all else equal). Shortening the performance window may stimulate enrollment among customer segments that have been underrepresented in Con Edison's DR programs to date. Given that automated technologies can reduce variable costs, shortening the performance window may be more effective in stimulating enrollment among customers without automated technologies. Unlike automation-related technologies, battery technology benefits from a shortened performance window (two to three hours). As a result, batteries may play an increasing role in DR if Con Edison were to shorten performance windows.
Historical Data Analysis	Produce an analysis of the effect of the increased payment rates on enrollment.	The historical data analysis provides evidence that the increased incentives, shortened performance windows, and reduced penalties implemented by Con Edison have been effective at increasing enrollment in 2014. The largest increase in enrollment is in the CSRP program with increases in curtailments over on-site generation, and predominantly driven by aggregators. Public Administration and the Real Estate, Rental and Leasing industries experienced the largest increases in DR enrollment in 2014.

Willingness-to-Accept

The willingness-to-accept analysis identifies the average minimum incentive a customer needs to reduce demand based on a variety of program characteristics (performance window, notification period, and penalty) and customer characteristics (customer type, technology, DR awareness, building size, and prior program participation). The findings presented apply to the sample of survey respondents and may not be generally applicable due to the limited sample size.

The analysis only includes survey respondents who report being willing and able to participate in a DR program with a reasonable capacity payment ($50 per kW-month or less). Customers excluded from the analysis include: (1) respondents who were not asked the WTA questions due to their being unable or unwilling to reduce load during a DR event and (2) respondents who selected "more than $50" incentive in all scenarios. As shown in Table ES 2, 39 percent of survey respondents (n=74, or 189 minus 115) were excluded from the analysis. The majority (74 percent, or 55 of the 74 respondents) were unable or unwilling to reduce load during a DR event.[2]

All respondents excluded from the analysis were non-participants, and the majority (56 out of 74) was multifamily.[3] Among commercial customers the leading industry for respondents unwilling or unable to participate in DR is Accommodation and Food Services (22 percent, or 4 out of 18 commercial respondents). The remainder of these respondents is spread evenly across the following industry segments: Arts/Entertainment/Recreation, Construction, Educational Services, Finance and Insurance, Health Care and Social Assistance, Professional/Scientific/Technical Services, Real estate, and Retail Trade.

Table ES 2. Sample of Survey Respondents Included in WTA Analysis

	Medium Commercial	Large Commercial	Multifamily	Total
Participant	10	23	n/a	**33**
Non-Participant	21	16	45	**82**
Total	**31**	**39**	**45**	**115**

Table ES 3 presents the average WTA, providing insight into whether Con Edison's current incentive levels are sufficient to attract *new* participants and whether a change in incentives would stimulate customer enrollment. The average WTA values range from $7.24 per kW-month for medium and large commercial participants with a two-hour performance window, 21-hour notification period, and a penalty, up to $18.35 per kW-month for multifamily customers with a four-hour performance window,

[2] For example, one respondent commented "Due to our operating schedule, it would be very difficult to participate in such a program." Several noted needing more information about the program.
[3] For example, one respondent commented "The facility about which you have inquired is an affordable rental apartment building. Staff there are maintenance staff. It is not an office or commercial space, so I don't think a demand response program would work for this property."

two-hour notification, and penalty. The range of incentives is higher than the $6 or $10 per kW-month that is typical of Con Edison's current DR-program offerings. These results indicate that there is a non-linear relationship between the incentive and both notification and duration.

Table ES 3. Average Willingness-to-Accept for by Notification and Duration (with Penalty)[4]

		Duration	
		2 Hours	4 Hours
Notification	21 Hours	Non-Participant Commercial: $9.18 Participant Commercial: $7.24 Multifamily: $10.05	Non-Participant Commercial: $12.12 Participant Commercial: $10.17 Multifamily: $16.08
	2 Hours	Non-Participant Commercial: $14.25 Participant Commercial: $12.31 Multifamily: $12.31	Non-Participant Commercial: $17.19 Participant Commercial: $15.24 Multifamily: $18.35

Note: Participants include customers enrolled in CSRP, DLRP or both. As a result, the WTA values for programs scenarios that mimic existing programs cannot be directly interpreted as the WTA for a DLRP or CSRP participant in isolation.

Commercial

Based on the sample of survey respondents (n=70), the main factors influencing the average minimum incentive a medium or large commercial customer anticipates needing to reduce demand is the performance window, notification period, current program participation, and building size.

Holding all other factors constant, the average minimum incentive a commercial customer needs to reduce demand increases by $2.93 per kW-month when the performance window increases from 2 hours to 4 hours while average WTA increases by $5.07 per kW-month when the notification period decreases from 21 hours to 2 hours. This indicates that **commercial customers prefer a longer notification period to a shorter event.**[5] This is consistent with businesses that require advanced notice to adjust business plans to accommodate the occurrence of a DR event.

Aside from programmatic changes, current program participation also influences WTA suggesting that **knowledge of existing DR program incentives resulted in responses that anchored near the incentives currently being received by program participants**. Using the coefficient estimates to determine the average minimum incentive a DR participant requires to participate in a DR program similar to CSRP (four-hour performance window, twenty-one hour notification period, and penalty), yields a $10.17 per kW-month incentive. The average WTA for commercial non-participants for a DR program similar to CSRP is $12.12. The $2 difference between commercial participants and non-participants is relatively constant across all program characteristics.

[4] Based on the average building size of Commercial customers in the survey (143,000 square feet)

[5] Open-ended comments support this finding. For example, one respondent stated "Once the load shedding is in place the extra hours [i.e., event duration] does not make a difference" while another stated "we would still be able to respond, but the reduced [notification] period would be a greater challenge, but not insurmountable."

Finally, the size of a commercial building is statistically significant, reducing the average incentive needed by $0.29 per kw-month per 100,000 square feet of building area increase. The negative coefficient estimate indicates that there are economies of scale involved in a commercial customer's response to a DR event. Larger facilities are more likely to have technologies to facilitate a demand reduction, like a Building Management System, along with typically having a larger number of end-uses to leverage in providing a demand reduction. This increased use of technology and larger number of end-uses allows for those customers to spread the impact of a demand reduction around their facility and minimize acute impacts to their operations. More efficiently providing a demand reduction and minimizing the impact to business operations allows for larger facilities to accept a smaller capacity payment per kW.

Multifamily

Based on the sample of survey respondents (n=45), the main factors influencing the average minimum incentive a multifamily customer anticipates needing to reduce demand is the performance window and notification period. **The average WTA for multifamily is $8.39 per kW-month greater than the commercial model results, indicating a higher underlying cost of participation in DR for multifamily customers.**

Holding all other factors constant, the average minimum incentive a multifamily customer needs to reduce demand increases by $6.04 per kW-month when the performance window increases from 2 hours to 4 hours while average WTA increases by $2.27 per kW-month when the notification period decreases from 21 hours to 2 hours. This difference in the minimum incentive needed for demand reduction indicates that **multifamily customers prefer a shorter notification time over a longer performance period.** This is consistent with multifamily customers' comments[6] indicating that their tenants begin to complain when equipment and lighting is turned off. Similarly, survey comments[7] indicated that multifamily customers can respond to an event notification in a relatively short amount of time and are not as sensitive as commercial customers are to shorter notifications for demand reduction.

Performance Window Analysis

Con Edison and the New York State PSC are interested in whether shortening the performance window (e.g., from four hours to two hours) will better accommodate newly emerging technologies and/or further stimulate the volume of customers that can participate. To inform this discussion, Navigant presents an economic perspective of shortening performance windows, identifying the conditions under which a shortened performance window may stimulate enrollment. In addition, the technology assessment identifies the role of emerging technologies under shortened performance windows.

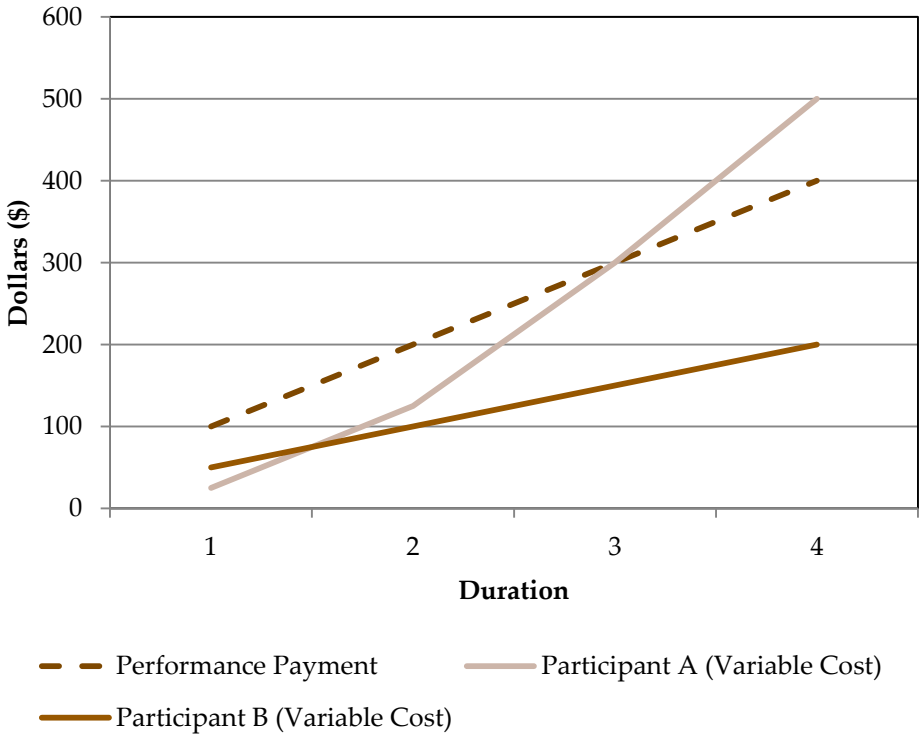
[6] For example, a multifamily response noted "I don't believe that we can shut the lights off in the building any longer without push back from the tenants."

[7] For example, a multifamily response noted "Notification time is irrelevant to me."

Enrollment

Principles of microeconomic theory suggest that a rational customer will continue to participate in an additional hour of a DR event at a given capacity payment, as long as the average performance payment (dollar per kWh) exceeds the average variable cost associated with the increased length of the DR event. In Figure ES 1, a hypothetical participant prefers a performance window of three hours above all others. For events shorter than three hours, the performance payment for one additional hour exceeds the variable cost. Assuming rational behavior, the participant will continue to participate each additional hour up to three hours. However, for events lasting longer than three hours, the variable cost exceeds the performance payment and, as a result, the customer would not participate.

Figure ES 1. Example of Performance Payments and Variable Costs



Economic theory suggests **customers with high variable costs may exhibit a preference for DR programs with a shortened performance window.** If Con Edison were to shorten the performance window, this may stimulate enrollment among customer segments, such as construction, retail, manufacturing, or food services, where variable costs are high. The WTA analysis suggests the multifamily sector may be even more responsive than the commercial sector to a DR program with a shortened performance window. Shortening the performance window may stimulate enrollment among customer segments that have been underrepresented in Con Edison's DR programs to date. It is important to note, however, that this theoretical analysis does not evaluate the appropriateness or cost effectiveness of paying the same capacity payment for a shorter performance window, nor does it consider the operational and planning implications for reducing performance windows. These are important considerations when assessing whether Con Edison should shorten the performance window.

Technology

A wide range of technologies are currently available or will be available in the next three to five years to contribute to DR programs. However, only a subset of these technologies will be viable to provide efficient load reductions in a DR program with performance windows of less than four hours. Navigant conducted a technology assessment to identify emerging technologies that can help participants enhance DR efficiency and maximum load reductions, distinguishing between technologies that may provide the greatest performance improvements under a shortened performance window. This research leveraged existing work performed as part of Con Edison's Integrated Demand Side Management (IDSM) model which provided a comprehensive set of technologies used as the basis for assessing technologies that are relevant to this study.

The technology assessment reveals that automated DR technologies and dispatchable DG improve the efficiency with which participants can reach their pledged load reductions, can provide greater curtailments, and are capable of providing the same performance improvement regardless of the performance window. Battery storage, on the other hand, can increase load reductions but are only capable of providing this performance improvement under relatively short performance windows (two to three hours). This is not to suggest that these solutions are in any way better than the other technologies and can offer more reduction, in general, than other technologies, only that battery storage technologies have the potential to increase their performance based on a shortened performance window. **If Con Edison were to shorten the performance window, battery storage may play an increasing role in DR in the near term, relative to the status quo**.[8]

Notably, automated technologies reduce the variable cost of participating in DR, making customers less sensitive to the performance window. Reduced sensitivity suggests these customers may not exhibit a preference for a shortened performance window. In other words, **shortening the performance window is more likely to stimulate enrollment among customers without automated technologies than with,**

[8] Factors that may prevent battery storage from participating in DR in the near term, even under shortened performance windows, include: insufficient incentives, batteries may be installed to minimize demand charges and not used for DR, and NYC Fire Department regulation may limit the penetration of batteries. Advances in battery storage technology will likely eliminate the benefits a shortened performance window provides.

as these customers will have higher variable costs. Based on survey data, more than half (56 percent) of all survey respondents reported having a Building or Energy Management System or other control system[9] (Table ES 4).

Table ES 4. Customer-Owned DR-Enabling Technologies

DR-Enabling Technology	Commercial	Multifamily	Total
Building or Energy Management System	61 (69%)	22 (22%)	83 (44%)
Lighting, Process or Other Control Systems	37 (42%)	7 (7%)	44 (23%)
Battery Storage	6 (7%)	1 (1%)	7 (4%)
Non-Emergency On-Site Generation	8 (9%)	0 (0%)	8 (4%)
Emergency On-Site Generation	41 (47%)	2 (2%)	43 (23%)
Solar PV	3 (3%)	2 (2%)	5 (3%)

Historical Data Analysis

Navigant analyzed historical program data from 2010 through 2014 to provide an understanding of the impact of programmatic changes on customer enrollment and pledged load reductions. **The analysis provides evidence that the increased incentives, shortened event durations, and reduced penalties implemented by Con Edison have been effective at increasing enrollment in 2014.** While this analysis cannot directly attribute changes in enrollment to programmatic changes, there is evidence of a divergence from historical trends suggesting that the programmatic changes likely contributed to the increase in enrollment. These findings are consistent with the results of the WTA analysis and Performance Window analysis which found programmatic changes may influence customer enrollment.

The analysis suggests the increase in customer and MW enrollment is largely attributed to:

- Customer enrollment in **CSRP** increased by 97% in 2014 while customer enrollments in **DLRP** increased by 12%. Large portions of the increase (45% for CSRP and 51% for DLRP) were customers that were not enrolled in either a Con Edison or NYISO DR Program in 2013.
- The increase in MW enrollment is largely attributed to **mandatory DR** (42% increase in 2014) program enrollments rather than voluntary enrollment options (3% increase in 2014).
- The majority of the MW increase is attributed to **curtailable load** (49% increase in 2014) rather than on-site generation (9% increase in 2014).
- The number of customers enrolled through **aggregators** increased by 51% in 2014 while direct enrollment in Con Edison's programs continues to decline (58% decrease in 2014).

[9] In some cases, aggregators may be providing a building management system or similar technology to facilitate the customer's participation in DR.

- Businesses in the **Real Estate, Rental and Leasing** industry dominate enrollment. This industry experienced a sharp increase in 2014 (23 megawatts, equivalent to a 41% increase), though **Public Administration** experienced the largest increase in percentage terms (2,145 kW to 21,429 kW, equivalent to an 899% increase).
- Relative to other parts of Manhattan, business located in **Midtown South** (67% increase in 2014), **Manhattan East** (63% increase in 2014) and **Manhattan West** (42% increase in 2014) exhibited the largest increase in customer enrollment in 2014.[10]

Implications for DR Program Design

The DR Survey Research Study provides valuable information on the influence of programmatic changes on enrollment, as well as the capabilities of existing and emerging technologies to enhance DR performance, and can be used to inform program and policy decisions relating to current and future DR programs.

[10] Networks included in sub-boroughs:
Midtown-West (Manhattan south of 72nd St. to 34th St. and West of Fifth Ave.): Lincoln Square, Hudson, Columbus Circle, Plaza, Rockefeller Center, Times Sq., Greeley Sq., Empire, Herald Sq., Pennsylvania.
Midtown – East (Manhattan south of 72nd St. to 34th St. and Each of Fifth Ave.): Lenox Hill, Roosevelt Island, Roosevelt, Hunter, Sutton, Turtle Bay, Beekman, Grand Central, Kips Bay.
Midtown –South (Manhattan between 34th St. and 14th St. from the East River on the east to the Hudson River on the west): Fashion, Chelsea, Madison Sq.

Table ES 5. Implications for DR Program Design

Implications for DR Program Design	Discussion
Shortening the performance window from four hours to two hours may increase enrollment at the current incentive levels.[11]	The WTA analysis reveals that customers are willing to accept a lower incentive for shorter performance windows. This finding applies to all customers in the study, but the relative influence of shortened performance windows is more pronounced among multifamily customers.
The multifamily sector is underrepresented in Con Edison's DR Programs, as currently designed.	Multifamily customers have historically had minimal participation in Con Edison's DR programs. The WTA analysis reveals that multifamily customers that are willing and able to participate in DR will be most receptive to a DR program with a two-hour rather than a four-hour performance window and an incentive that is at least $10 per kW or higher – depending upon notification time.
Despite the majority of commercial customers having energy management technologies, the WTA analysis did not identify a significant relationship between those technologies and the performance windows/ notification times.	While automated technologies, such as a building or energy management system, may allow customers to respond to DR events without manual intervention, the average WTA under different performance windows and notification periods remained the same regardless of ownership of a DR-enabling technology. Only battery storage is dependent on the performance window. However, based on survey data, the penetration of battery technology is limited. As a result, currently deployed DR-enabling technologies among Con Edison customers are unlikely to have a significant impact on participation decisions as DR program designs evolve.
The programmatic changes implemented by Con Edison in 2014 resulted in increased participation and indicates a favorable response to increased incentives.	The programmatic changes appear to have resulted in new customers joining Con Edison's DR programs through the facilitation of aggregators. With the vast majority of customers participating in DR programs through an aggregator, it is unclear whether the change in incentives was a driving factor as the financial agreement between customers and aggregators is not publicly known. The enrollment implications of the WTA analysis results may be diminished if the increase in incentives is not fully passed on to the customers – pending no additional value-added services being provided by aggregators.

[11] This research does not consider the operational, planning, and cost-effectiveness implications for reducing performance windows, important considerations when assessing whether Con Edison should shorten the performance window. For example, a two-hour performance window may be insufficient to address network peaks requiring additional demand to be pledged into the program and optimizing dispatch of the DR resource, accounting for snapback. Other considerations include administration costs and potential participation barriers associated with a more complex program.

1 Introduction

Consolidated Edison, Inc. (Con Edison) categorizes its commercial demand response (DR) programs into two segments – contingency and peak shaving. Con Edison designed the contingency program, known as the Distribution Load Relief Program (DLRP), to support operation of the electric distribution system in New York City and Westchester County when real time system operational conditions require the reduction of demand within a specific network, for a specific period. The peak shaving program, known as the Commercial System Relief Program (CSRP), focuses on reducing demand on infrastructure in New York City during times of high demand as the result of extreme heat conditions. Table 1 summarizes the two commercial DR programs.

Table 1. 2014 Commercial DR Programs

	Distribution Load Relief Program (DLRP)	Commercial Systems Relief Program (CSRP)
Program Design	Contingency program activated by Con Edison in response to system critical situations. Events last for at least four hours with notification provided to participants two hours or less prior to the event. Operates over a summer capability period of May 1 through September 30.	Peak shaving program activated when the day-ahead forecast is 96 percent or greater of the forecasted summer system peak. Events last for four hours with notification provided to participants 21 hours prior to the event. Operates over a summer capability period of May 1 through September 30.
Incentives	Participants who pre-commit load receive a $6 or $15 incentive per kW-month pledged, depending on location, and a performance incentive of $1 per kWh reduced. An additional $5 per kW-month is available for participants agreeing to pre-commit load for a three-year period. Participants who do not pre-commit load only receive a performance incentive of $3 per kWh reduced.	Participants who pre-commit load receive a $10 per kW-month incentive for months with fewer than five events and $15 per kW-month incentive if there are five or more events, and a performance incentive of $1 per kWh reduced. An additional $10 per kW-month is available for participants agreeing to pre-commit load for a three-year period. Participants who do not pre-commit load only receive a performance incentive of $3 per kWh reduced.

For more detailed information, see http://www.coned.com/energyefficiency/demand_response.asp

In an effort to better understand the value of DR and identify potential options to increase enrollment and performance in Con Edison's commercial DR programs, Con Edison previously completed a cost-effectiveness study testing differences in DR program design.[12] The study, together with other sources of information, such as surveys of DR aggregators and a literature review, led to the conclusion that increased incentives and a number of programmatic changes were warranted and could lead to increased penetration of DR resources in the Con Edison service territory. As a result, Con Edison

[12] Cost-effectiveness of CECONY Demand Response Programs, November 2013. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={BE9E7304-DA3C-4C06-B18B-ADD0D4568E3F}

requested changes to its two commercial DR programs with the aim of increasing enrollment and performance.[13]

On March 13, 2014, the New York State Public Service Commission (PSC) finalized its decision on these requested changes in the *Order Adopting Tariff Revisions with Modifications*.[14] Key changes included shortening the duration of DR events, increasing incentives – including offering a new bonus incentive for a three-year commitment to DR, and reducing penalties. Table 2 identifies key programmatic changes that were implemented in 2014.

Table 2. Changes to Con Edison's Commercial DR Programs

	2013	2014
Incentives	$3 or $6 per kW-month (DLRP) $5 or $10 per kW-month (CSRP) $0.50 or $1.50 per kWh reduced	$6 or $15 per kW-month (DLRP) $10 or $15 per kW-month (CSRP) $1.00 or $3.00 per kWh reduced
Bonus Incentive	None	$5 per kW-month for 3-years
Event Duration	5 hours or more (DLRP) 5 hours (CSRP)	4 hours or more (DLRP) 4 hours (CSRP)
Penalty	2x capacity payment times the load reduction shortfall (CSRP)	1x capacity payment times the load reduction shortfall (CSRP)

Given that there was limited information at the time to predict the increase in enrollment that could be achieved because of programmatic changes, the *Order* included the following requirements:

1. Conduct a willingness-to-accept (WTA) study to determine the minimum amount a participant is willing to receive to reduce demand.
2. Produce an analysis of whether Con Edison should reduce the performance windows to better accommodate newly emerging technologies and/or to further stimulate the volume of customers that can participate.
3. Produce an analysis of the effect of the increased payment rates on enrollment.

In this report, Navigant Consulting, Inc. (Navigant) presents results for each of these studies.

- **Chapter 3, Willingness-to-Accept** presents results of a WTA study, identifying the minimum incentive Con Edison customers require to participate in DR.

[13] Case 13-E-0573, Tariff Filing by Consolidated Edison Company of New York, Inc. to Make Revisions to its Demand Response Programs Rider S – Commercial System Relief Program and Rider U – Distribution Load Relief Program – Supplemental Filing Supporting Con Edison Commercial Demand Response Program Changes, February 7, 2014. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={A1BDA133-EB95-46BC-90F2-A5B5FD64C1C6}

[14] Case 13-E-0573, Tariff Filing by Consolidated Edison Company of New York, Inc. to Make Revisions to its Demand Response Programs Rider S – Commercial System Relief Program and Rider U – Distribution Load Relief Program contained in P.S.C. No. 10 – Electricity, *Order Adopting Tariff Revisions with Modifications,* issued and effective March 13, 2014.

- **Chapter 4, Performance Window** presents results from a technology assessment and survey research informing whether performance windows should be reduced.
- **Chapter 5, Historical Data Analysis** presents results of an analysis of historical program enrollment between 2010 and 2014 providing an understanding of the impact of programmatic changes on customer enrollment.

2 Methodology

Navigant used a variety of research methods to conduct the analyses, including a literature review, technology assessment, historical data analysis, participant and non-participant surveys, and regression analysis. The following sections describe each of these methods.

2.1 Literature Review

Navigant conducted a literature review of (1) WTA studies used in DR, (2) WTA methodology and survey approaches, and (3) DR event performance windows in relation to enhanced customer enrollment and performance. To conduct the literature review, Navigant performed the following steps to identify relevant literature:

- Reviewed literature identified in documentation from E Source;
- Searched the websites for North American Electric Reliability Corporation, Federal Energy Regulatory Commission, and utility commissions for evaluation reports and references relating to DR willingness-to-accept, DR call windows, DR incentives, and keywords relating to the design of DR programs;
- Reviewed Navigant Research reports for relevant content;
- Reviewed documents that are cited in relevant reports to determine if the cited reports contained information not already included in the literature review documents;
- Utilized internet search engines to conduct a search for sources of information relating to DR willingness-to-accept, DR call windows, DR incentives, and keywords relating to the design of DR programs; and
- Searched related academic journals and conference proceedings to identify materials that pertain to the WTA methodology.

2.2 Technology Assessment

Navigant conducted an evaluation of established and emerging technologies that can be used for DR with varying lengths of dispatch time. The effort leveraged existing work performed as part of Con Edison's Integrated Demand Side Management (IDSM) model. The IDSM model provided a comprehensive set of technologies that are used as the basis for assessing technologies that are relevant to the Demand Response Survey Research Study. In particular, Navigant identified technologies that have the potential for operations that are more efficient when used for DR during call windows of less than four hours. Additionally, Navigant assessed technologies that may enhance customer interest in DR-program participation under a shortened performance window. This assessment extended the IDSM model, which provides a wide range of technical characteristics of the various technologies by looking at considerations for leveraging these technologies in actual DR programs in the near term, as well as considering the possibility of technology combinations in some cases.

A wide range of technologies are currently available or will be available in the next three to five years to contribute to DR programs. However, only a subset of these technologies will be viable to provide

efficient load reductions in a DR program with call windows of less than four hours, or enhance customer interest in program participation. First, Navigant started with a comprehensive list of DR, distributed generation (DG), and energy storage (ES) technologies[15] that could potentially contribute to a DR program with shortened call windows. After narrowing this list to include only viable technologies, Navigant assessed the remaining technologies on both an individual basis and in combinations for their potential to do the following:

1. Provide operational efficiency[16] gains or greater DR capacity under shortened performance windows[17], and
2. Encourage customers to initiate or increase participation in DR by minimizing disruptions to business operations or providing additional value to customers.[18]

For additional information regarding the data sources used to compile the comprehensive list of technologies and the screening criteria, refer to Appendix A.

2.3 Historical Data Analysis

Using historical program data from 2010 through 2014 and customer data, Navigant analyzed historical enrollment trends to provide an understanding of the impact of programmatic changes on customer enrollment. In addition, Navigant analyzed historical program data from 2010 through 2014 for New York Independent System Operator (NYISO) as a point of comparison. Table 3 provides a summary of the different types of analysis conducted.

[15] The list of technologies is from the IDSM study.
[16] "Efficiency" of the Demand Response programs as used in this context refers to how well efforts or resources are used for providing a demand reduction. This includes the following: minimization of time required to curtail load or dispatch distributed generation, maximizing the load curtailed by customers while maintaining the same level of effort or costs, or reducing the amount of time required to attain a desired level of demand reduction after the curtailment has been initiated (or any combination of the foregoing).
[17] This includes activities that provide incrementally more DR potential when under a shorter performance window.
[18] This is determined by identifying technologies that allow customers to reduce their demand while continuing normal business operations or provide additional financial benefits through minimizing demand and energy charges on their electric bill.

Table 3. Historical Data Analysis

Analysis Type	Description
Enrollment Dynamics	Analysis of historical enrollment trends, including total kW and average kW pledged by program type (CSRP and DLRP) and program election (mandatory versus voluntary). Analysis was conducted for total population, as well as customers enrolled year-over-year.[1]
Load Curtailment Type	Analysis of historical enrollment trends of the relative contributions of on-site generation to load curtailment, including by program type.
Enrollment Type	Analysis of historical enrollment trends of the relative contributions of direct enroll to aggregator-enrolled, including by program type.
Industry	Analysis of historical enrollment trends by North American Industry Classification System (NAICS) categories, including by program type, load curtailment type, and enrollment type.
Borough	Analysis of historical enrollment trends by borough, including by program type, load curtailment type, and enrollment type.
Dual Enrollment (with NYISO)	Analysis of historical enrollment trends for customers enrolled in Con Edison's DR programs, NYISO's DR program, or both.

[1] In other words, customers enrolled in CSRP or DLRP for three consecutive years (2012-2014), customer enrolled in CSRP for four consecutive years (2011-2014), and customers enrolled in DLRP for five consecutive years (2010-2014). CSRP was not offered in 2010.

2.4 Survey

During the fall of 2014, Navigant conducted a survey with a sample of Con Edison's medium commercial, large commercial and multifamily customers. The primary objective of the survey was to elicit the minimum incentive a customer is willing to accept to participate in a commercial DR program and assess the degree to which program characteristics (such as performance window, notification period or penalties) or customer characteristics (such as the presence of a DR-enabling technology) influences incentives.

2.4.1 Survey Design

Navigant developed a survey for current Con Edison DR participants and non-participants (refer to Appendix B and Appendix C for survey instruments). The survey included the following sections, informed by the literature review, technology assessment, and historical data analysis, as previously described:

1. **Firmographics.** Characteristics of the respondent's organization, such as building size, number of employees, hours of operation, and NAICS categorization.
2. **Priming.** As identified in the literature review, a challenge with stated preference studies, including a WTA analysis, is that the scenarios being presented to the survey respondents are hypothetical scenarios. In order to avoid a "hypothetical bias," Navigant included a series of priming questions asking respondents to consider the amount of kilowatts that could potentially be reduced during a DR event at a specific facility (identified by street address) and the measures that could be used to respond to the event (e.g., changing set points on air-

conditioning systems).[19] The purpose of these questions is to prime the respondent to consider their responses to a hypothetical scenario in context of their actual facility and potential load reductions. Respondents who indicate they would be unable or unwilling to reduce load during a DR event are not asked the WTA questions.

3. **WTA.** The core set of WTA questions ask respondents to choose the minimum monthly incentive, in dollars per kilowatt per month, needed to participate in a commercial DR program.
    a. The incentive ranges provided were: $3, $5, $10, $15, $20, $25, $30, $50, and more than $50. Navigant also translated the incentive options into the range of potential savings by the end of the summer. Navigant opted to use a payment card approach, in which a set of incentive options are provided, rather than a discrete choice approach, in which only a few incentive options are provided, to allow for more variation in the range of incentives. This approach is common in the WTA literature.
    b. Three hypothetical DR programs were presented in which the performance window and notification time varied. The performance window presented was either two hours or four hours, while the event notification was either 2 hours or 21 hours. Table 4 specifies the program characteristics presented in each scenario.

Table 4. DR-Program Scenarios Included in WTA Survey

	Base Scenario	Scenario 1	Scenario 2
Participant	Performance window and notification of current program[1]	Performance window changes relative to the Base Scenario	Notification changes relative to the Base Scenario
Non-Participant	Performance window and notification randomly assigned	Performance window changes relative to the Base Scenario	Notification changes relative to the Base Scenario

[1] If the customer is participating in both CSRP and DLRP, the performance window and notification period are randomized to be consistent with either CSRP or DLRP.

Given that the CSRP program imposes a penalty for non-performance, Navigant included penalty language in the program description for CSRP participants. In addition, non-participants were randomly assigned to have penalty language included in the description. Figure 1and Figure 2 provide flow diagrams of the program descriptions included in the participant and non-participant surveys for the Base Scenario, Scenario 1, and Scenario 2.

[19] Participants were asked to consider load reductions currently pledged while non-participants were asked to consider the average or minimum (randomly assigned) kilowatts pledged by participants in their NAICS category. The pledged kilowatt data was obtained through the historical data analysis.

4. **Technology.** Navigant included a series of questions regarding the presence of DR-enabling technology and influence of technology on the decision to participate in commercial DR programs. If a respondent did not have a DR-enabling technology, the survey gauged the level of interest in various technologies. The technologies addressed in the survey were informed by the technology assessment that identified established and emerging technologies viable in the next three to five years.

Figure 1. Flow Diagram of Participant Survey

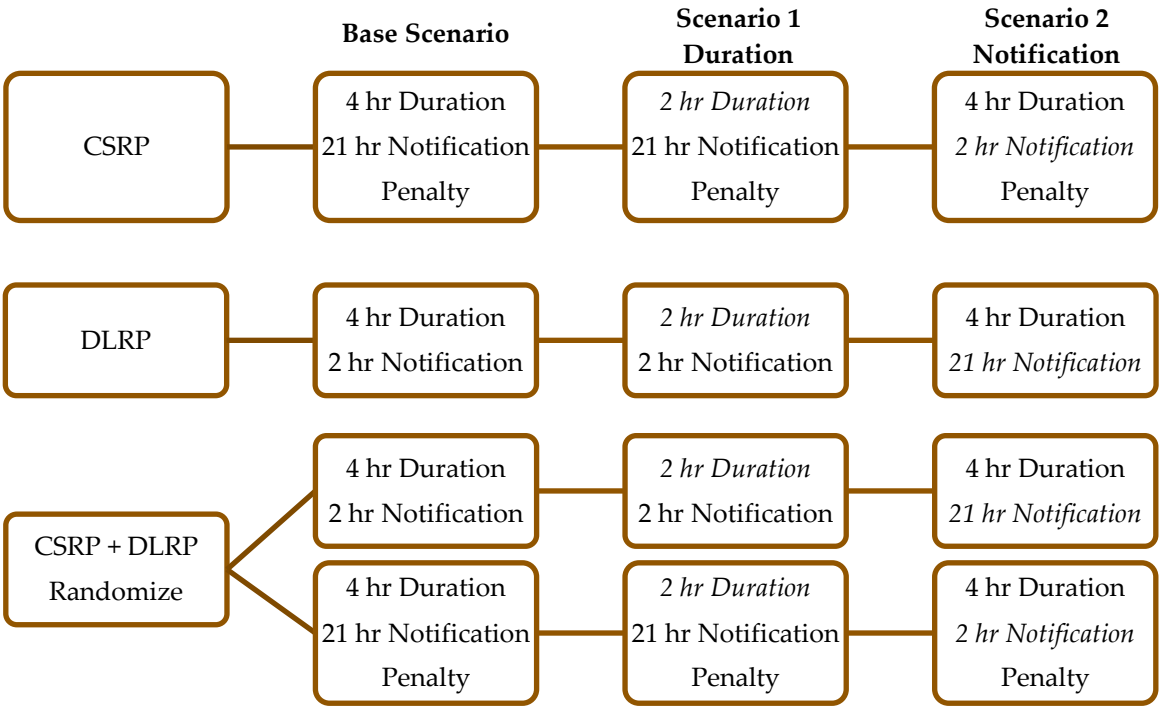
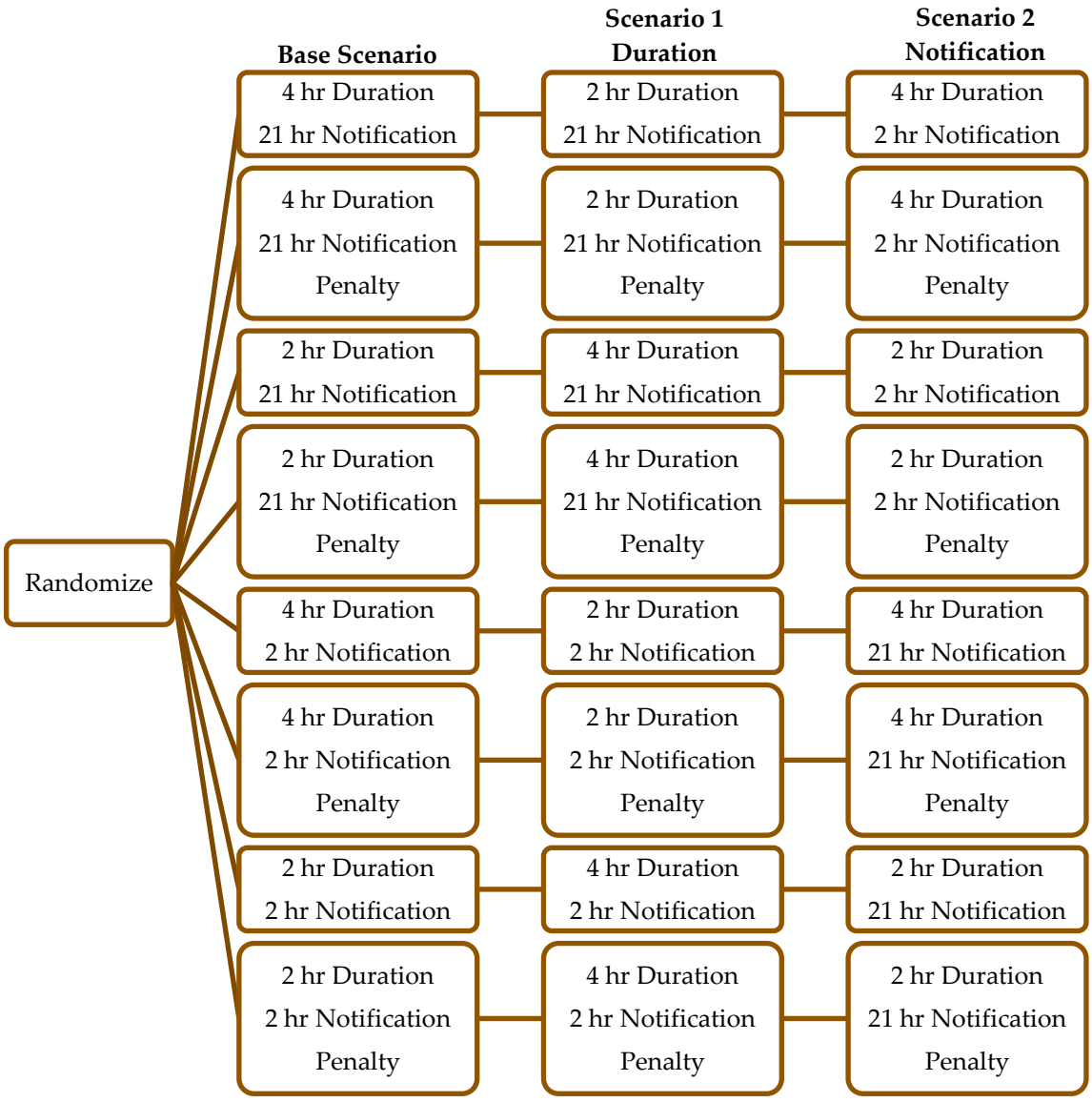


Figure 2. Flow Diagram of Non-Participant Survey



2.4.2 Survey Implementation

The survey was implemented in two stages.

1. **Screening Survey:** A telephone-based survey through which the appropriate decision-maker within the organization was identified (i.e., the person responsible for making energy management or DR-program participation decisions). The telephone mode was selected to ensure the energy decision-maker within the organization would complete the survey, ensuring the validity of the results.
2. **DR Survey:** A web-based survey completed by the decision-maker in exchange for an incentive of $100 to $150.[20] The web mode was selected to allow respondents the ability to read and understand the scenario, question, and potential responses. This approach is consistent with the WTA literature that largely relies on mail-based surveys.[21]

The survey targeted both participants and non-participants in the following three customer segments: medium commercial, large commercial, and multifamily.[22] Given there are approximately 350 unique current commercial DR participants, the participant sample is limited, reflected in the sample plan presented in Table 5.

In total, 189 customers participated in the survey, 51 percent of the targeted sample (refer to Appendix D for a Summary of Survey Findings). Navigant and Con Edison took several steps to increase response rates. These efforts included improving contact information by leveraging the customer data included in the New York's Buildings Benchmarking Database, as well as working with aggregators, prioritizing contacts identified by Con Edison as involved with energy efficiency or DR decisions, offering an incentive (and increasing incentives), and completing systematic follow up phone calls, emails, and other email reminders at specific times (e.g., prior to holiday weekends).

Table 5. Sample of Survey Respondents

	Medium Commercial	Large Commercial	Multifamily	Total
Participant	10 *(35)*	23 *(35)*	n/a *(0)*	**33** *(70)*
Non-Participant	34 *(100)*	21 *(100)*	101 *(100)*	**156** *(300)*
Total	**44** *(135)*	**44** *(135)*	**101** *(100)*	**189** *(370)*

Note: The number in parentheses represents the targeted sample for each stratum.

[20] The amount of the incentive was increased during the final weeks of surveying in an effort to increase response rates.
[21] Champ, P, Boyle, K., and T. Brown. A Primer and Nonmarket Valuation, Kluwer Academic Publishers, Norwell, MA. 2003.
[22] Medium commercial includes customers with peak demand between 250 and 750 kW; large commercial includes customers with peak demand greater than 750 kW. Historically there have been few multifamily participants in Con Edison's commercial DR programs; as a result they were not included as a stratum in the sample plan.

2.5 *Willingness-to-Accept Analysis*

The WTA analysis uses a regression modeling approach to estimate the average incentive a customer anticipates needing to participate in a DR program (i.e., average WTA).[23] In addition, this analysis examines how the average WTA varies with changes in key program characteristics, such as the performance window and notification period. It is important to note that this analysis informs the average incentive a customer anticipates needing to participate in DR, regardless of whether the customer were to enroll directly through Con Edison or through an aggregator.

Navigant estimated a separate model for commercial and multifamily customers. It is expected that, relative to multifamily, commercial customers may have a different average WTA and may respond differently to changes in program characteristics. Navigant confirmed this by estimating a pooled model, finding that the average WTA was statistically different for multifamily customers.[24] The following sections present the model specifications used for the commercial and multifamily analyses.

The WTA analysis only includes customers that reported a reasonable willingness-to-accept to participate in a commercial DR program. Customers excluded from the analysis include: (1) respondents who were not asked the WTA questions due to their being unable or unwilling to reduce load during a DR event and (2) respondents who selected "more than $50" incentive in all scenarios. As shown in Table 6, 39 percent of survey respondents (n=74) were excluded from the analysis. The majority (74 percent, or 55 of the 74 respondents) were unable or unwilling to reduce load during a DR event.[25]

All respondents excluded from the analysis were non-participants with the majority (76 percent, or 56 out of 74) multifamily customers.[26] Among commercial customers the leading industry for respondents unwilling or unable to participate in DR is Accommodation and Food Services (22 percent, or 4 out of 18 commercial respondents). The remainder of these respondents is spread evenly across the following industry segments: Arts/Entertainment/Recreation, Construction, Educational Services, Finance and Insurance, Health Care and Social Assistance, Professional/Scientific/Technical Services, Real estate, and Retail Trade.

[23] As a result of limited sample size, a meaningful estimate of the price elasticity for DR participation was not estimated.
[24] The pooled model combines the commercial and multifamily customers into a single dataset and includes an indicator variable for multifamily. The multifamily variables were determined to be jointly significant using an F-test (i.e., coefficient estimates for multifamily were statistically different from the coefficient estimates for commercial).
[25] For example, one respondent commented "Due to our operating schedule, it would be very difficult to participate in such a program." Several noted needing more information about the program.
[26] For example, one respondent commented "The facility about which you have inquired is an affordable rental apartment building. Staff there are maintenance staff. It is not an office or commercial space, so I don't think a demand response program would work for this property."

Table 6. Sample of Survey Respondents Included in WTA Analysis

	Medium Commercial	Large Commercial	Multifamily	Total
Participant	10	23	n/a	**33**
Non-Participant	21	16	45	**82**
Total	**31**	**39**	**45**	**115**

After accounting for respondents unwilling or unable to participate in DR, the commercial data set analyzed included a total of 70 customers while the multifamily data set included 45. Three observations correspond to each respondent (one for each of the three scenarios described in Figure 1 and Figure 2 above) reflecting the minimum incentive required to participate in DR under each of the three program scenarios.

2.5.1 Commercial Model Specification

The WTA model specification for commercial customers uses the following equation:[27]

Equation 1. Commercial Model Specification

$$WTA_{i,s} = \alpha_0 + \beta_1 Duration_{i,s} + \beta_2 Notification_{i,s} + \beta_3 Penalty_i + \beta_4 Awareness_i + \beta_5 Technology_i + \beta_6 SqFt_i + \beta_7 CSRP/BOTH_i + \beta_8 DLRP_i + \varepsilon_{i,s}$$

[27] Navigant tested several alternate model specifications finding the results were robust to model specification.

Table 7 describes the variables included in the model.

Table 7. Variable Description

Variable	Description
$WTA_{i,s}$	The minimum incentive selected by respondent *i* in scenario *s*. • The survey included a discrete set of incentive options; as a result, Navigant used the midpoint of the lower range for the analysis. For example, if a respondent selected $10 as the minimum incentive required, it is possible the *true* minimum incentive was less than $10 but greater than $5, the next lowest option offered in the survey. As a result, Navigant assigned the midpoint of $7.50 as the minimum incentive to more accurately reflect the average minimum WTA. • In some cases, use of the midpoint yielded incentive amounts that were internally inconsistent with the respondent's incentive selections in the following scenarios. For example, if a respondent selects $10 in Scenario 1 and in Scenario 2 indicates they would be willing to accept a *lower* incentive of $8, using the midpoint of $7.50 for Scenario 1 is inconsistent (i.e., $8 is not less than $7.50). For these cases, Navigant did not use the midpoint (i.e., the incentive in Scenario 1 is $10 not $7.50). • Navigant used $51 as the minimum incentive for respondents who selected "more than $50." While the results were somewhat sensitive when testing different incentive amounts, Navigant chose $51 given that respondents tend to over-state their WTA.[28]
$Duration_{i,s}$	Binary variable equal to one if the performance window is four hours and equal to zero if the performance window is two hours. Duration varies with respondent *i* and scenario *s*.
$Notification_{i,s}$	Binary variable equal to one if the notification period is two hours, and equal to zero if the notification period is 21 hours. Notification period varies with respondent *i* and scenario *s*.
$Penalty_i$	Binary variable equal to one if the DR-program description included a penalty, and equal to zero if penalty language was not included. Penalty varies with respondent *i*.
$Awareness_i$	Binary variable equal to one if the respondent was aware of DR, and equal to zero if unaware.
$Technology_i$	Binary variable equal to one if the respondent had at least one DR-enabling technology, such as a Building/Energy Management System, and indicated the technology had a high level of influence (3 or higher out of a six-point scale) over their decision to participate in DR.
$SqFt_i$	Square feet of the facility managed by respondent *i* (reported in 100,000's).
$CSRP/BOTH_i$	Binary variable equal to one if the respondent is currently enrolled in CSRP or both CSRP and DLRP, and equal to zero otherwise.
$DLRP_i$	Binary variable equal to one if the respondent is currently enrolled in DLRP and equal to zero otherwise.
$\varepsilon_{i,s}$	The cluster-robust error term for respondent *i* and scenario *s*. Cluster-robust errors account for heteroscedasticity and autocorrelation[29] at the respondent-level.

[28] Moore, R., Bishop, R. C., Provencher, B. and Champ, P. A. (2010), Accounting for Respondent Uncertainty to Improve Willingness-to-Pay Estimates. Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 58: 381–401.

[29] Ordinary Least Squares (OLS) regression models assume the data are homoscedastic and not autocorrelated. If either of these assumptions is broken, the resulting standard errors of the parameter estimates are likely underestimated. A random variable is heteroscedastic when the variance is not constant. A random variable is autocorrelated when the error term in this period is correlated with the error term in previous periods.

The average minimum incentive a customer needs to participate in a DR program with a two-hour duration, 21-hour notification, no penalty, and who is not a participant, not aware of DR and has no DR-enabling technology is given by the intercept term, parameter α_0. The parameter $\beta_1$indicates the incremental amount needed when the performance window increases to four hours, $\beta_2$is the incremental amount needed when the notification period is shortened to two hours, and $\beta_3$is the incremental amount needed when a penalty is introduced. For example, the average WTA a commercial non-participant needs to participate in a DR program with two-hour duration, 21-hour notification, penalty (similar to the CSRP), who is not aware of DR and has no DR-enabling technology is equal to $(\alpha_0 + \beta_1 + \beta_3)$.

Table 8 presents the interpretation of coefficient estimates for various DR programs for commercial customers who are not currently participating in a Con Edison DR program, who are not aware of DR, and do not have DR-enabling technology. To determine the average WTA for commercial participants who are aware of DR and have at least one-DR-enabling technology, simply add $(\beta_4 + \beta_5 + \beta_7 + \beta_8)$ to Table 8. These formulae can be applied to the coefficient estimates presented in Table 10 and Table 11 to determine the average WTA for various DR program designs and customer characteristics.

Table 8. Interpretation of Coefficient Estimates

Performance Window (Hours)	Notification Period (Hours)	Penalty	Average WTA
2	21	No	α_0
2	21	Yes	$\alpha_0 + \beta_3$
4	21	No	$\alpha_0 + \beta_1$
4	21	Yes	$\alpha_0 + \beta_1 + \beta_3$
2	2	No	$\alpha_0 + \beta_2$
2	2	Yes	$\alpha_0 + \beta_2 + \beta_3$
4	2	No	$\alpha_0 + \beta_1 + \beta_2$
4	2	Yes	$\alpha_0 + \beta_1 + \beta_2 + \beta_3$

2.5.2 Multifamily Model Specification

The WTA model specification for multifamily customers uses the following equation:[30]

Equation 2. Multifamily Model Specification

$$WTA_{i,s} = \alpha_0 + \beta_1 Duration_{i,s} + \beta_2 Notification_{i,s} + \beta_3 Penalty_i + \beta_4 Awareness_i + \beta_5 Technology_i + \varepsilon_{i,s}$$

This model is the same as Equation 1, excluding square feet and the indicator variables for CSRP and DLRP as explanatory variables. Since there are no participants in the multifamily sector that were sampled, CSRP and DLRP are not included.[31] In addition, Navigant excluded square feet as an explanatory variable as it was not statistically significant and the results did not vary with inclusion or exclusion.

[30] Navigant tested several alternate model specifications finding the results were robust to model specification.
[31] Historically there have been few multifamily participants in Con Edison's commercial DR programs; as a result they were not included as a stratum in the sample plan.

3 Willingness-to-Accept

In this section, Navigant presents results of a WTA analysis, identifying the average minimum incentive a customer willing and able to participate in DR needs to reduce demand based on a variety of program characteristics (performance window, notification period, and penalty) and customer characteristics (customer type, technology, DR awareness, building size, and prior program participation). The findings presented in this section apply to the sample of survey respondents and may not be generally applicable due to the limited sample size.

Table 9 presents the average WTA. The average WTA values range from $7.24 per kW-month for medium and large commercial participants with a two-hour performance window, 21-hour notification period, and a penalty, up to $18.35 per kW-month for multifamily customers with a four-hour performance window, two-hour notification, and penalty. The range of incentives is higher than the $6 or $10 per kW-month that is typical of Con Edison's current DR-program offerings. These results indicate that there is a non-linear relationship between the incentive and both notification and duration.

Table 9. Average Willingness-to-Accept by Notification and Duration (with Penalty)[32]

		Duration	
		2 Hours	4 Hours
Notification	21 Hours	Non-Participant Commercial: $9.18 Participant Commercial: $7.24 Multifamily: $10.05	Non-Participant Commercial: $12.12 Participant Commercial: $10.17 Multifamily: $16.08
	2 Hours	Non-Participant Commercial: $14.25 Participant Commercial: $12.31 Multifamily: $12.31	Non-Participant Commercial: $17.19 Participant Commercial: $15.24 Multifamily: $18.35

Note: Participants include customers enrolled in CSRP, DLRP or both. As a result, the WTA values for programs scenarios that mimic existing programs cannot be directly interpreted as the WTA for a DLRP or CSRP participant in isolation.

Key findings from the WTA analysis include the following:

- The primary factors influencing the minimum amount for commercial customers are the performance window, notification period, and current participation in a DR program. For multifamily customers, the primary factors influencing the minimum incentive are the performance window and notification period.
- Commercial customers prefer longer notification periods over shorter events, whereas multifamily customers prefer shorter events over longer notification periods.
- Based on the WTA analysis, Navigant found that DR awareness and the presence of DR-enabling technology did not have a statistically significant influence on the minimum incentive

[32] Based on the average building size of DR Participant Commercial customers (771,922 square feet) and Non-Participant Commercial customers in the survey (370,965 square feet)

customers require to participate in DR, even when presented with varying performance windows and notification periods.

3.1 Commercial

Based on the sample of survey respondents, the main factors influencing the average minimum incentive a medium or large commercial customer anticipates needing to reduce demand is the performance window, notification period, and current program participation (Table 10). The intercept term of the regression model is $10.52, with all other coefficients applied as adjustments to that value (as described in Section 2.5).

Aside from the intercept term, participation in DLRP (-7.55) and/or CSRP (9.66) have estimates with the largest magnitude. This indicates that knowledge of existing DR program incentives resulted in responses that anchored near the incentives currently being received by program participants. Using the coefficient estimates to determine the average minimum incentive a DR participant[33] requires to participate in a program similar to CSRP (four-hour performance window, twenty-one hour notification period, and penalty), yields a $10.17 per kW-month incentive. The average WTA for commercial non-participants for a DR program similar to CSRP is $12.12. The $2 difference between commercial participants and non-participants is relatively constant across all program characteristics.

The estimate for duration indicates that, holding all other factors constant, the average minimum incentive a commercial customer needs to reduce demand increases by $2.93 per kW-month when the performance window increases from 2 hours to 4 hours. Holding all other factors constant, the average minimum incentive a commercial customer needs increases by $5.07 per kW-month when the notification period decreases from 21 hours to 2 hours. This indicates that commercial customers prefer a longer notification period to a shorter event.[34] This is consistent with businesses that require advanced notice to adjust business plans to accommodate the occurrence of a DR event.

Finally, the size of a commercial building is statistically significant, reducing the average incentive needed by $0.29 per 100,000 square feet. The negative coefficient estimate indicates that there are economies of scale involved in a commercial customer's response to a DR event. Larger facilities are more likely to have the ability to spread the impact of a demand reduction around their facility and minimize acute impacts to their operations, allowing them to accept a lower incentive.

[33] This includes customers participating in CSRP, DLRP or both.

[34] For example, one respondent stated "Once the load shedding is in place the extra hours [i.e., event duration] does not make a difference" while another stated "we would still be able to respond, but the reduced [notification] period would be a greater challenge, but not insurmountable."

Table 10. Commercial WTA Results

Coefficient		Estimate ($)	t Value	Pr(>|t|)	Significance
Intercept	α_0	10.52	2.51	0.01	***
Duration	β_1	2.93	3.09	0.00	***
Notification	β_2	5.07	4.39	0.00	***
Penalty	β_3	-0.25	-0.06	0.95	
Awareness	β_4	2.46	0.49	0.62	
Technology	β_5	3.74	1.01	0.31	
SqFt[35]	β_6	-0.29	-3.05	0.00	***
CSRP/BOTH	β_7	9.66	1.63	0.10	*
DLRP	β_8	-7.55	-2.48	0.01	***

This table presents the results of estimating the model specified in Equation 1.
Significance level of *** 1%, ** 5%, and * 10%.

Whether a customer is facing a penalty for non-performance, the presence of DR-related technologies, and awareness of DR were all factors included in the model, but none yielded an estimate that is statistically significant from zero. This does not mean that these factors do not influence the average WTA; rather, it is an indication that the influence of these factors is not consistent enough in the survey data to provide a statistically significant result.

In addition to the variables included in the model specified in Table 10, Navigant conducted additional diagnostic analysis to determine if there were any interactions among other survey variables that would indicate a more complex relationship between incentive amounts and program characteristics. In particular, Navigant analyzed the interactions between DR awareness and the presence of at least one DR-enabling technology, and the performance window, notification period, and penalty. Navigant did not identify any meaningful or statistically significant results using the survey data.[36]

3.2 Multifamily

Based on the sample of survey respondents, the main factors influencing the average minimum incentive a multifamily customer anticipates needing to reduce demand is the performance window and notification period (Table 11). The intercept term of the regression model is $18.91, with all other coefficients applied as adjustments to that value. The intercept for multifamily is $8.39 per kW-month greater than the commercial model results, indicating a higher underlying cost of participation in DR for multifamily customers.[37]

[35] Per 100,000 Square Feet.
[36] The coefficient estimates presented were robust to the inclusion of interaction terms.
[37] Costs include accounting costs (lost revenue, decreased productivity, etc.) as well as noneconomic costs such as inconvenience, discomfort, etc.

Table 11. Multifamily WTA Results

Coefficient		Estimate ($)	t Value	Pr(>|t|)	Significance
Intercept	α_0	18.91	4.92	0.00	***
Duration	β_1	6.04	4.34	0.00	***
Notification	β_2	2.27	1.50	0.14	
Awareness	β_4	-4.78	-1.22	0.22	
Technology	β_5	0.54	0.14	0.89	
Penalty	β_3	-8.87	-2.35	0.02	**

This table presents the results of estimating the model specified in Equation 2.
Significance level of *** 1%, ** 5%, and * 10%.

The estimates for duration, notification, and penalty[38] are statistically different from zero with a 90 percent confidence interval. The estimate for duration indicates that, holding all other factors constant, the average minimum incentive a multifamily customer needs to reduce demand increases by $6.04 per kW-month when the performance window increases from 2 hours to 4 hours. Holding all other factors constant, the average minimum incentive a multifamily customer needs increases by $2.27 per kW-month when the notification period decreases from 21 hours to 2 hours. This indicates that multifamily customers prefer a shorter notification time over a longer performance period. This is consistent with the multifamily customers' comments indicating that their tenants begin to complain when equipment and lighting is turned off.[39] Similarly, survey comments indicated that multifamily customers can respond to an event notification in a relatively short amount of time and are not as sensitive as commercial customers are to shorter notifications for demand reduction.

In addition to the variables included in the model specified in Table 11, Navigant conducted additional diagnostic analysis to determine if there were any interactions among other survey variables that would indicate a more complex relationship between average minimum WTA and program characteristics. As with the commercial customers, Navigant interacted DR awareness and the presence of at least one DR-enabling technology with the performance window, notification period, and penalty. Navigant did not identify any meaningful or statistically significant results using the survey data.[40]

[38] The estimate for the penalty variable is a negative value. This indicates that a customer would accept a lower incentive when faced with a penalty. This is not an intuitive response, but is robust to model specification and confirmed with additional analysis of the survey data. It is possible that the multifamily customer misunderstood the implications of a penalty and responded erroneously. As a result, the estimate for penalty is being treated as an error correction for customer responses rather than the impact of facing a penalty.

[39] For example, one respondent commented "I don't believe that we can shut the lights off in the building any longer without push back from the tenants." Another stated "I would only implement something that would not adversely impact my tenants."

[40] The coefficient estimates presented were robust to the inclusion of interaction terms.

4 Performance Window

Con Edison and the New York State PSC are interested in whether shortening the performance window (e.g., from four hours to two hours) will better accommodate newly emerging technologies and/or further stimulate the volume of customers that can participate.[41] To inform this discussion, Navigant presents a theoretical economic perspective of shortening performance windows, identifying the conditions under which a shortened performance window may stimulate enrollment. In addition, the technology assessment identifies the role of emerging technologies under shortened performance windows. Key findings include:

- Economic theory suggests customers with high variable costs may exhibit a preference for shortened performance windows, i.e., if Con Edison were to shorten the performance window, this may stimulate enrollment among customer segments with high variable costs (all else being equal).
- The WTA analysis the multifamily sector may be more responsive than the commercial sector to shortening performance windows.
- Automated DR technologies and dispatchable DG improves DR operational efficiency and can provide greater curtailments. Both are capable of providing the same performance improvement regardless of the performance window.
- Unlike Automated DR technologies, battery technologies can increase load reductions but are only capable of providing this performance improvement under relatively short performance windows (two to three hours). If Con Edison were to shorten performance windows, batteries may[42] play an increasing role in DR relative to the status quo.
- Among the seven respondents that currently have battery technologies, five indicated that batteries are highly influential in their decision whether to participate in DR or not. All five of those respondents are not currently participating in DR. Therefore, battery technologies do not appear to be influencing customers to participate in DR based on current incentives and program design.
- Based on the survey data, DR technologies did not appear to influence the responsiveness of the average WTA to changes in the performance window and notification period, but they do appear to be influential in the overall decision to participate in DR – regardless of program design.

4.1 An Economic Perspective of Shortening Performance Windows

Ex ante, one might expect that customers would require a higher incentive for a DR event with a longer performance window, all else equal. In turn, this suggests that shortening the performance window, while holding incentives constant, should stimulate enrollment. However, 43 percent of survey

[41] Refer to footnote 11.

[42] Factors that may prevent battery storage from participating in DR, even under shortened performance windows, include: insufficient incentives, batteries may be installed to minimize demand changes and not used for DR, NYC Fire Department regulation may limit the penetration of batteries.

respondents selected the same incentive level for a DR program with two-hour performance window as a four-hour performance windows, i.e., the performance window had no influence on the decision to participate. The remaining 57 percent required a higher incentive for a DR program with a four-hour performance window or were willing to accept a lower incentive for a DR program with a two-hour performance window. This section presents a theoretical analysis identifying the conditions under which a shortened performance window may or may not stimulate participation in DR and accommodate newly emerging technologies.

Consider a customer making the decision to participate in a commercial DR program where both programs are identical in every way except for the performance window. One DR program has a two-hour performance window while the second has a four-hour performance window. In exchange for participation, the customer would receive a capacity payment ($ per kilowatt-month) and an performance payment ($ per kilowatt-hour reduced). All else being equal, the capacity payment does not vary across the two programs, as it does not depend on the performance window, while the performance payment doubles. For simplicity, consider the following example (Table 12) in which the participant pledges 100 kW in both programs, and indicates that the minimum capacity payment necessary for participation is $10 per kW-month.

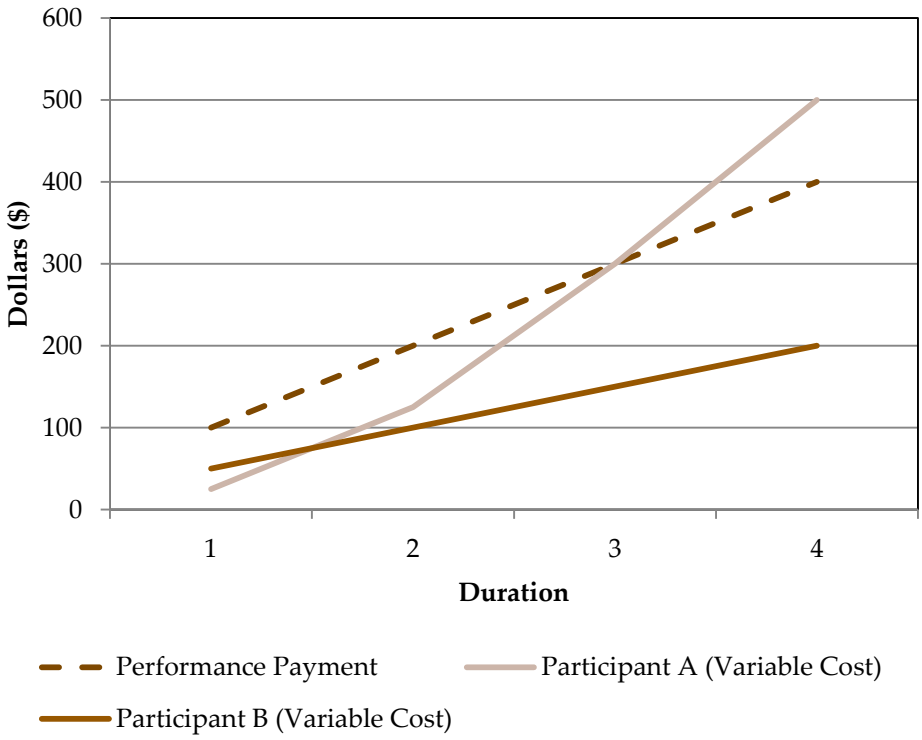
Table 12. Example

Incentive Payment	2 hour Performance Window	4 hour Performance Window
Capacity Payment ($10 per kW-month)	$10 x 100 = $1,000 per month	$10 x 100 = $1,000 per month
Performance Payment ($1 per kWh reduced)	$1 x 100 x 2 hour = $200 per event	$1 x 100 x 4 hour = $400 per event

Assuming the capacity payment covers fixed costs associated with participating in the program, principles of microeconomic theory suggest that a rational customer will continue to participate in an additional hour of a DR event at the stated minimum capacity payment of $10 per kW-month, as long as the average performance payment (which is also the marginal performance payment, $1.00 per kWh) exceeds the average variable cost associated with the increased length of the DR event. Variable costs are costs that vary with the duration of a DR event and may include lost output, reduced productivity, discomfort, or other similar factors.

Figure 3 illustrates this condition. In this example, Participant A prefers a performance window of three hours above all others. For events shorter than three hours, the performance payment for one additional hour exceeds the variable cost. Assuming rational behavior, the customer will continue to participate each additional hour up to three hours. However, for events lasting longer than three hours, the variable cost exceeds the performance payment and, as a result, the customer would require a higher incentive to participate. Participant B, on the other hand, does not require a higher incentive to continue participating in each additional hour as the performance payment exceeds variable costs.

Figure 3. Performance Payment and Variable Costs



The WTA survey asked customers to select a capacity payment for a given performance window and performance payment – and then are asked whether they require a larger capacity incentive for a longer performance window or whether they would be willing to accept a lower incentive for a shorter performance window, depending on the performance window presented in the initial scenario. In this case, if Participant A selected a $10 per kW-month capacity incentive for a three-hour event, Participant A would report needing a higher capacity payment for a four-hour performance window. However, if Participant B selected a $10 per kW-month capacity incentive for a three-hour event, they would report needing the same incentive for the four-hour performance window.

Only customers with high variable costs will require a larger incentive for a longer performance window or, holding incentives constant, would prefer a shortened performance window. If Con Edison were to shorten the performance window of DR events, this may stimulate enrollment among customers with high variable costs. It is important to note, however, that this theoretical analysis does not evaluate the appropriateness or cost effectiveness of paying the same capacity payment for a shorter performance window, nor does it consider the operational and planning implications for reducing performance windows. These are important considerations when assessing whether Con Edison should shorten the performance window.

As discussed in Section 3, on average commercial customers require an additional $2.93 per kW-month for events lasting four hours rather than two hours, while multifamily customers require an additional $6.04 per kW-month. This suggests that the sample of survey respondents have average variable costs that exceed the average performance payment for a four-hour event. Furthermore, if Con Edison were to shorten the performance window and the capacity payment remained the same, the multifamily sector with the highest variable cost would be the most likely to respond.

4.2 Technology Assessment

From a participant's perspective, the two most important aspects of responding to a DR event are the operational efficiency with which they can reach their pledged demand reduction after an event has been initiated, and the maximum level of demand reduction that can be consistently reduced. The participant's ability to achieve efficient and consistent load reductions maximizes its opportunity for compensation while avoiding performance-related penalties. In the following sections, Navigant identifies emerging technologies that can help customers enhance DR operational efficiency and maximize load reductions, distinguishing between technologies that may provide the greatest performance improvements under a shortened performance window.

4.2.1 Technologies to Improve Demand Response Operational Efficiency

One important aspect of improving DR efficiency for customers (and by extension, for the utility or RTO/ISO[43] calling the event) is ramp rate of the technologies used to achieve the pledged load reduction at the beginning of an event. A slow ramp rate can result in a participant failing to meet its targeted demand reduction, which is especially crucial during shorter performance windows. However, slow ramp rates can be sufficiently mitigated through advanced notification. Taking steps to improve the efficiency of achieving demand reductions is an important part of ensuring that pledges are met and penalties are avoided.

To improve DR operational efficiency by reducing the effort required to meet curtailment obligations and achieve an enhanced level of certainty regarding the ability to meet program requirements, the implementation of automation-related DR technologies[44] and dispatchable DG is highly recommended. See Figure 4 for a list of these technologies. These technologies are capable of providing similar performance improvements for events longer than 4 hours, so the benefits are not exclusive to performance windows shorter than 4 hours. It is important to keep in mind that automated DR technologies do not enable additional resources to be curtailed from the standpoint of the characteristics of end uses that integrate with automated DR. The Auto DR technologies are mainly an enhancement to existing capabilities for responding to a DR event. Energy storage and non-dispatchable DG technologies do not directly impact the efficiency of responding to a DR event; therefore, those technologies are not included in the list.

[43] RTO/ISO- Regional Transmission Organization/Independent System Operator

[44] Automated DR technologies allow for load reductions to occur in an automated manner without the direct interaction of an operator. All automated DR resources are assumed to be capable of responding within 15 minutes of receiving the event signal. Some technologies can likely respond as quickly as within 5 seconds, but 15 minutes is conservatively assumed for the purpose of this study. Customers were not directly asked about their willingness to have technologies that automatically manage their load reductions as part of the study.

Figure 4. DR Technologies to Improve Response Efficiency

Demand Response
• Auto DR + Energy Management System (EMS) • Auto DR + Lighting Control System • Auto DR + Process Controls • Decentralized Auto DR + Local Wireless Communication • Dispatchable DG Engine - Diesel • Dispatchable DG Engine - Natural Gas • Dispatchable DG Turbine - Natural Gas • Programmable Communicating Thermostat (PCT) • Smart Plug • Window AC with Integrated Controls

Automated DR Technologies[45] may not be a suitable option for all customers. Some customers--including Commercial & Industrial and residential--may not want to give up direct control of their energy usage. There may also be security concerns and side-effect concerns, such as production concerns in the case of an industrial facility or comfort concerns for commercial buildings or households. The tradeoff between efficient demand reduction capabilities and assorted customer-specific concerns should be addressed on a case-by-case basis.

4.2.2 Technologies to Provide Greater Curtailments to Demand Response Events

Shorter performance windows, e.g., less than four hours, allow participants to utilize a wider array of technologies in their demand reduction strategy. Technologies that automate the demand reduction process allow for participants to reach their pledged reductions in a more *efficient* manner. In addition, automation technologies allow participants to coordinate the curtailment of additional end uses along with dispatching on-site generation. With the exception of battery storage technologies, these additional resources are not dependent on a shorter performance window to participate in DR, but the automation technologies allow for the inclusion of additional resources that may not be feasible to manually curtail.

As shown in Table 13, with the exception of Advanced Lead Acid batteries, most battery technologies can only discharge their maximum demand for up to four or five hours under ideal conditions. Performance windows ranging from two to three hours align with these capabilities and allow for a wider array of battery technologies to be used for demand reduction purposes.[46] From a cost-effectiveness perspective, customers are more likely to adopt Lithium Ion and Advanced Lead Acid

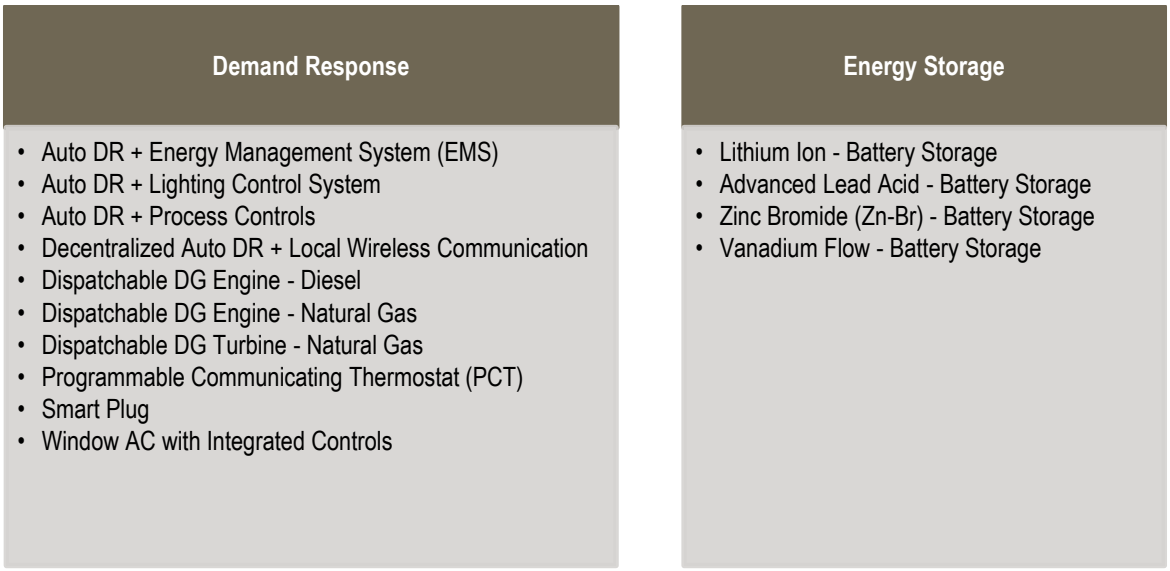
[45] Automated demand response (ADR) describes a system that automates the DR dispatch process, from the grid operator to the DR aggregator (if involved) to the end-use customer – all without any manual intervention.
[46] More information on the capabilities of battery storage technologies can be found in the DOE Electric Storage Handbook. http://energy.gov/sites/prod/files/2013/08/f2/ElecStorageHndbk2013.pdf

batteries due to the superior round trip efficiency[47] in relation to other battery technologies[48]. Figure 5 provides a list of these battery technologies along with viable automation technologies that enable participants to increase their demand reduction. These technology combinations enable batteries to be used in a more efficient manner to participate in DR.

Table 13. Energy Storage Technologies

Energy Storage Technology	Hours of Storage	Round Trip Efficiency
Lithium Ion - Battery Storage	1 to 5	86.5% to 92%
Advanced Lead Acid - Battery Storage	2 to 10	82.5% to 90%
Zinc Bromide - Battery Storage	1 to 5	62.5% to 65%
Vanadium Flow - Battery Storage	3 to 5	68% to 71.5%

Figure 5. Curtailment Enhancing Technologies



Businesses with complex operational procedures or products and services that are sensitive to environmental conditions are the most likely to benefit from advanced technologies. In particular, industrial customers, hotels, and grocery stores are the most likely to benefit from the implementation of automation technologies. Demand reduction procedures for many industrial customers involve the curtailment of a wide array of machines in a specific order relating to manufacturing processes. Manually curtailing multiple machines can be inefficient and result in a limited curtailment potential.

[47] Round trip efficiency is defined as the ratio of electrical energy produced after charging and discharging the storage system to the electrical energy required from the charging source.
[48] Refer to footnote 8.

Similarly, hotels require a highly coordinated curtailment response to avoid impacting the comfort of guests. For grocery stores, refrigeration is an end use that is more viable for performance windows less than four hours.[49] Automation technologies are an important part of curtailing refrigeration equipment to achieve a demand reduction without damaging merchandise.

There are also opportunities for the use of automation technologies at businesses that have large facilities like office buildings, warehouses, retail stores, or schools. Increased curtailments can be achieved by cycling multiple heating, ventilating, and air-conditioning (HVAC) or lighting systems throughout the facilities. This increases the cumulative curtailment potential with minimal impacts to operations. The increased curtailments offered through the implementation of automation technologies are not exclusive to shorter performance windows and are applicable to longer performance windows as well.

Energy storage and dispatchable DG technologies are the primary viable options to achieve demand reductions for businesses that are unable to curtail their end uses in a meaningful and consistent manner. Hospitals, nursing homes, and restaurants are often businesses that meet this condition. Natural Gas and Diesel generators are the most common types of on-site dispatchable generation. Additionally, viable battery storage technologies include the following: Lithium Ion, Advanced Lead Acid, Zinc Bromide (Zn-Br) and Vanadium Flow.[50] With the exception of Zinc Bromide and Vanadium Flow batteries, these battery technologies can be deployed in sizes ranging from 1 kW to 500 kW and greater. Zinc Bromide and Vanadium Flow batteries typically require high maintenance, so they are better suited for facilities above 50kW and utility-scale deployments.

4.2.3 Combinations of Technologies that Improve Demand Response Operational Efficiency and Curtailment Amounts

Although there are several technologies that can contribute to improved DR operational efficiency and curtailment amounts on an individual basis, some technologies are better suited to be deployed in combination with another technology. Combinations of DR, DG, and ES technologies can provide benefits to DR-program participants that are not attainable through individual technologies.

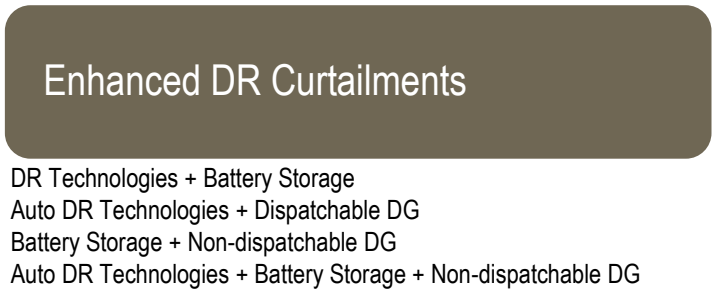
As shown in Figure 6, automated DR technologies allow other technologies to contribute to more efficient demand reductions. This is primarily due to the automated DR technologies incorporating dispatchable DG, Battery Storage, Programmable Communicating Thermostats, Smart Appliances, and Smart Plugs into the array of available resources for providing a demand reduction. Automated DR systems are capable of identifying the optimal set of resources to meet curtailment targets within the performance window. Pre-programmed procedures can be attributed to each of the available resources and an automated DR system can initiate those programs at the beginning of a performance window without operator interaction. The automated processes in these technologies can be adjusted to accommodate a wide range of performance windows and is not exclusive to shorter performance windows. This level of automation increases the operational efficiency of a wide range of resources that are typically lacking the automation needed to provide an efficient demand reduction.

[49] The 2008 Process Evaluation of California Statewide Aggregator Demand Response Programs notes that refrigeration equipment is typically insulated enough to maintain temperatures in an acceptable range for less than four hours during curtailment.
[50] Refer to footnote 8.

Figure 6. Combinations of Technologies for Improved DR Operational Efficiency

As shown in Figure 7, there are several combinations of technologies that are capable of providing additional demand reductions during performance windows. Primarily, the addition of automated DR capabilities to battery storage and dispatchable DG allow for those resources to provide additional curtailments. An automated DR system or a monitoring system is capable of monitoring the status of battery storage and dispatchable DG to ensure that they are available to be used in response to a DR event. In the case of battery storage, an automated DR or monitoring system can identify if the batteries need additional charging in advance of an event or if other resources need to be used in place of batteries that are insufficiently charged. Additionally, battery storage and non-dispatchable DG resources can provide additional curtailment resources for DR when they are deployed in combination. Battery storage can be used to firm the supply of energy from non-dispatchable DG (e.g., Photovoltaics) and allow the energy generated to be dispatched during a performance window.

Figure 7. Combinations of Technologies for Enhanced DR Curtailments



4.2.4 Penetration of DR-Enabling Technology

Navigant analyzed survey data to assess the penetration of DR-enabling technologies. A total of 56 percent (n=106) of survey respondents reported having at least one DR-enabling technology. As shown in Table 14, the vast majority had an automation-related DR technology such as a Building/Energy Management System or other control system. The majority (approximately 70 percent) reported these technologies had a high level of influence over the decision to participate in DR.[51] Only seven respondents reported having battery storage[52] (1 participant and 6 non-participants) and five of the seven (all non-participants) indicated the battery had a high level of influence over the decision to participate in DR.[53] This indicates that the occurrence of battery technologies may be influencing customers to not participate in DR based on the current program design or that the existing batteries are configured to provide emergency backup and it is not feasible or economic to enroll that technology in DR.

Table 14. Customer-Owned DR-Enabling Technologies

DR-Enabling Technology	Commercial	Multifamily	Total
Building or Energy Management System	61 (69%)	22 (22%)	83 (44%)
Lighting, Process or Other Control Systems	37 (42%)	7 (7%)	44 (23%)
Battery Storage	6 (7%)	1 (1%)	7 (4%)
Non-Emergency On-Site Generation	8 (9%)	0 (0%)	8 (4%)
Emergency On-Site Generation	41 (47%)	2 (2%)	43 (23%)
Solar PV	3 (3%)	2 (2%)	5 (3%)

Of those respondents without a DR-enabling technology, 28 percent (n=23) were interested in purchasing a DR-enabling technology. The majority were multifamily customers. A Building/Energy Management System or other control system was the primary technology identified (Table 15) with only one respondent citing battery storage.

[51] A high level of influence is a defined as a three or higher on a six-point scale.
[52] 4 customers with Lithium-Ion batteries, 1 with Lead-Acid batteries, and 2 with unknown emergency backup batteries.
[53] Industries that reported battery storage include Accommodation and Food Services, Retail Trade, Real Estate/Rental/Leasing, and Finance/Insurance.

Table 15. Customer Interest in DR-Enabling Technologies

DR-Enabling Technology	Commercial	Multifamily	Count
Building or Energy Management System	3	8	11
Lighting, Process or Other Control Systems	3	10	13
Battery Storage	0	1	1
Non-Emergency On-Site Generation	3	4	7
Solar PV	0	6	6

5 Historical Data Analysis

Navigant analyzed historical program data from 2010 through 2014 to provide an understanding of the impact of programmatic changes on customer enrollment and pledged load reductions. The analysis provides evidence that the increased incentives, shortened event durations, and reduced penalties implemented by Con Edison were effective at increasing enrollment in 2014.

This analysis suggests the increase in customer and MW enrollment is largely attributed to:

- Customer enrollment in CSRP increased by 97% in 2014 while customer enrollments in DLRP increased by 12%. Large portions of the increase (45% for CSRP and 51% for DLRP) were customers that were not enrolled in either a Con Edison or NYISO DR Program in 2013.
- The increase in MW enrollment is largely attributed to mandatory DR (42% increase in 2014) program enrollments rather than voluntary enrollment options (3% increase in 2014).
- The majority of the MW increase is attributed to curtailable load (49% increase in 2014) rather than on-site generation (9% increase in 2014).
- The number of customers enrolled through aggregators increased by 51% in 2014 while direct enrollment in Con Edison's programs continues to decline (58% decrease in 2014).
- Businesses in the Real Estate, Rental and Leasing industry dominate enrollment. This industry experienced a sharp increase in 2014 (23 megawatts equivalent to a 41% increase), though Public Administration experienced the largest increase in percentage terms (2,145 kW to 21,429 kW, equivalent to an 899% increase).
- Relative to other parts of Manhattan, business located in Midtown South (67% increase in 2014), Manhattan East (63% increase in 2014) and Manhattan West (42% increase in 2014) exhibited the largest increase in customer enrollment in 2014.[54]

While this analysis cannot directly attribute changes in enrollment to programmatic changes, there is evidence of a divergence from historical trends suggesting that the programmatic changes likely contributed to the increase in enrollment. Nevertheless, these findings are consistent with those presented in Sections 3 and 4 which found programmatic changes may influence customer enrollment. Furthermore, survey respondents provided comments regarding discontinued participation, highlighting the importance of program design, incentives in particular.[55]

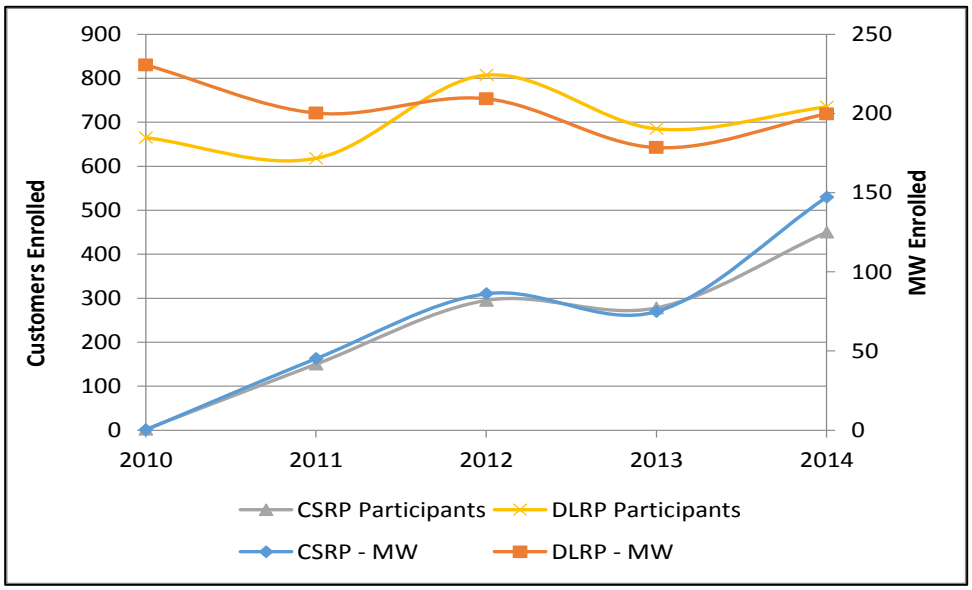
[54] Refer to footnote 10.

[55] For example, one respondent stated "The Money that we made was too little for the efforts required."

5.1 Enrollment

Figure 8 depicts customer enrollment and pledged load reductions between 2010 and 2014. Both programs experienced declines in enrollment between 2012 and 2013, with these trends reversing in 2014 after programmatic changes were implemented. Enrollment in CSRP between 2013 and 2014 increased sharply, diverging from historical trends and achieving the highest levels of enrollment to date. Growth in enrollment in DLRP between 2013 and 2014 was more modest. This is largely a result of new enrollments in 2014 that were not participating in any DR program in 2013 (113 new customers in CSRP and 123 new customers in DLRP).

Figure 8. Historical Enrollment[56]



[56] The source for all figures and tables in this memorandum is Navigant analysis of historical enrollment data provided by Con Edison.

Figure 9 depicts the average kW pledged by customers enrolled in DLRP and CSRP for three consecutive years (2012 through 2014). This includes 141 customers in CSRP and 417 customers in DLRP. The trend suggests that customers that participate year-over-year increased the average kW pledged in 2014. However, when considering the population of customers enrolled in DLRP from 2010 through 2014 (n=246) and those enrolled in CSRP from 2011 through 2014 (n=72) the trend suggests the programmatic changes for this population of customers were ineffective at inducing increases in the average kW pledged (Figure 10). This is an indication that customers that have been enrolled in the programs for more than three years are not responsive to the programmatic changes. The more recent enrollments appear to have responded favorably to the increased incentives, shortened event durations, and reduced penalties.

Figure 9. Average kW Enrolled (2012-2014 Consecutive Participants)

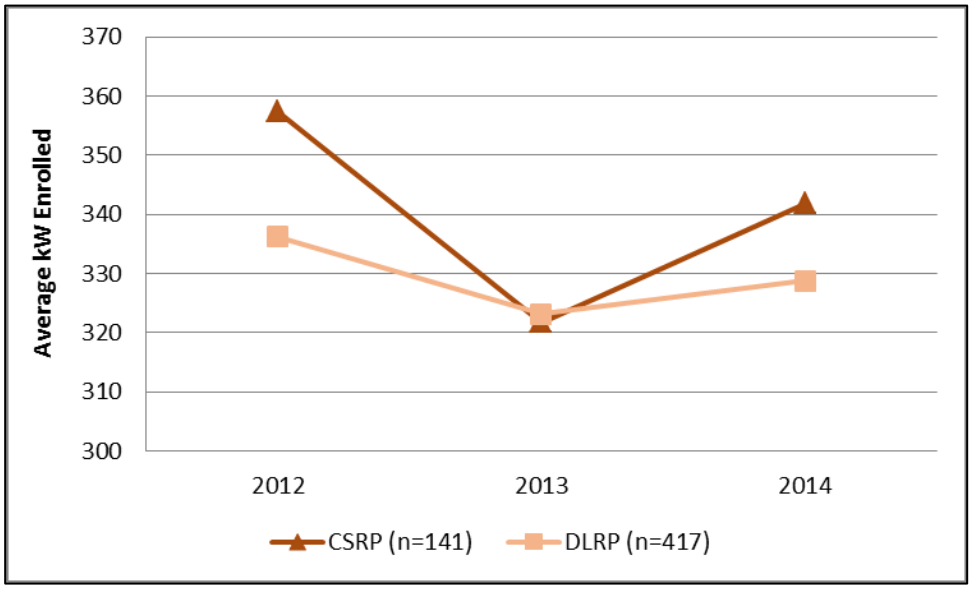
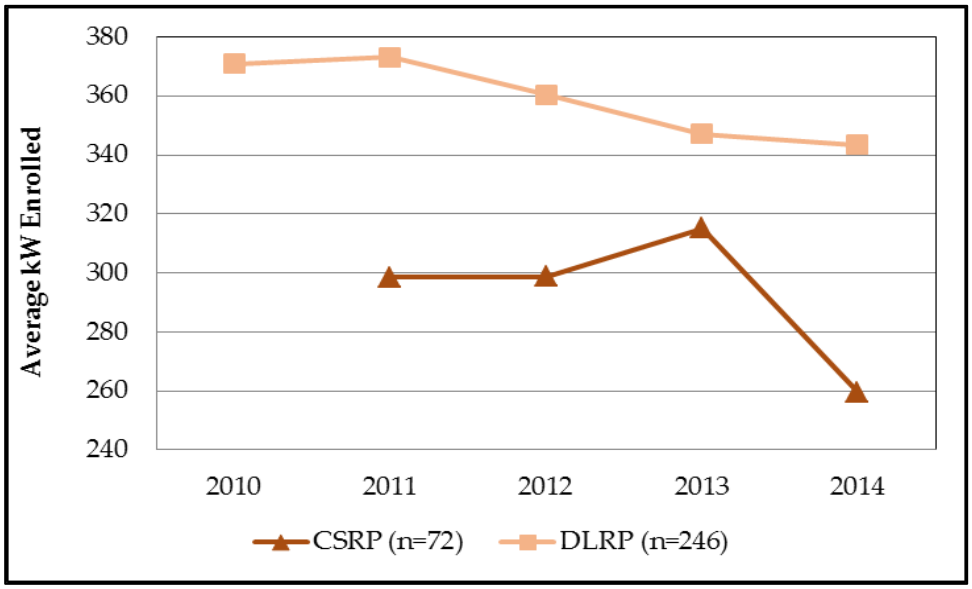


Figure 10. Average kW Enrolled (2010-2014 Consecutive Participants)



5.2 *Mandatory versus Voluntary*

Both DLRP and CSRP include a mandatory (Reservation Payment Option) and voluntary (Voluntary Enrollment Option) enrollment option with different obligations and incentives, as noted in Table 1. Participants enrolled in the mandatory option receive a monthly reservation payment and a performance incentive, while participants enrolled in the voluntary option only receive a performance incentive. Navigant conducted an analysis of the dynamics of enrollment in the mandatory and voluntary options, as described below.

Figure 11. Historical Enrollment CSRP

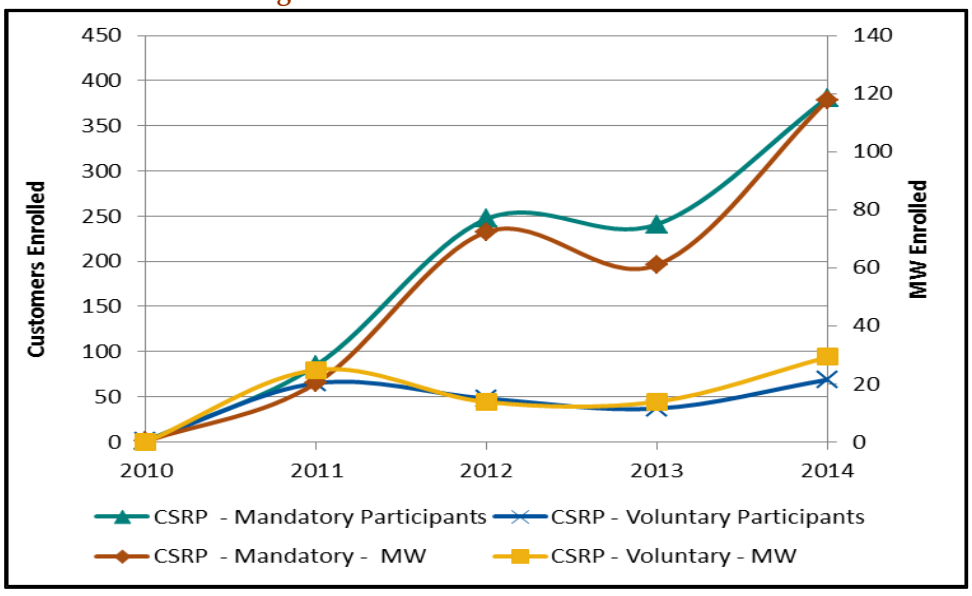


Figure 12. Historical Enrollment DLRP

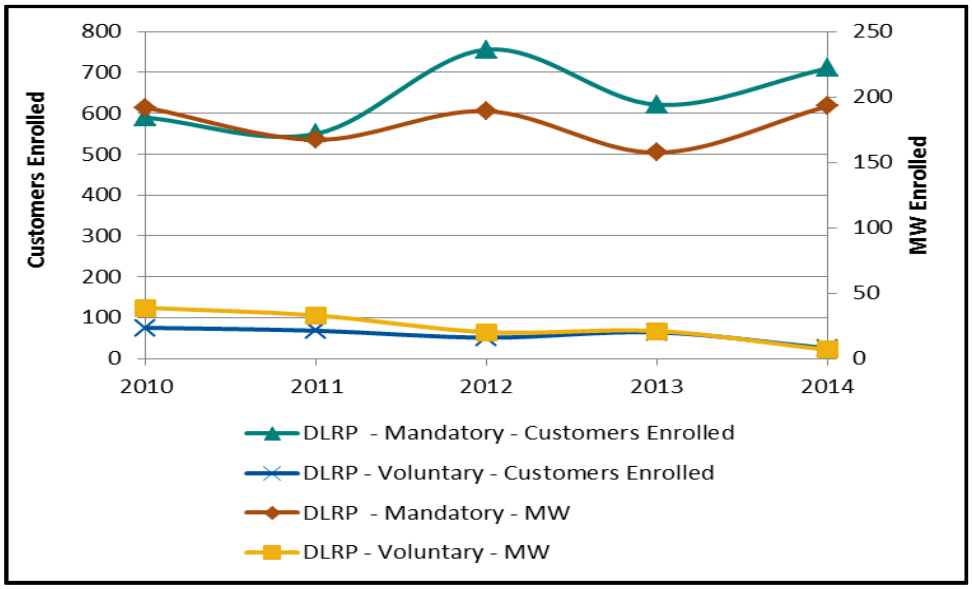
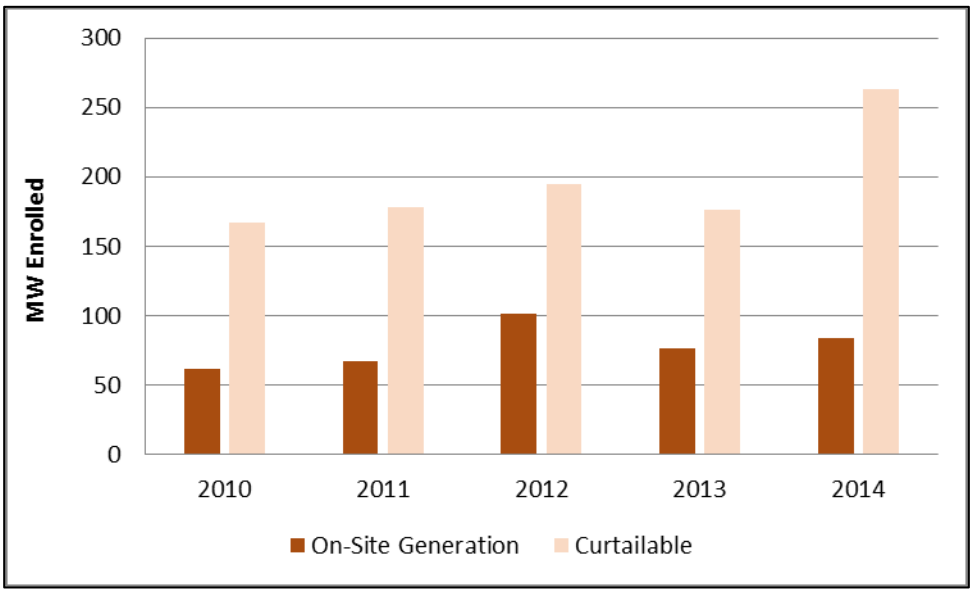


Figure 11 and Figure 12 show the annual customer enrollments and pledged MWs for the mandatory and voluntary enrollment options for CSRP and DLRP. Customer enrollment and pledged MW in the mandatory option for CSRP dramatically increased from 2013 to 2014 while the corresponding values for the CSRP voluntary enrollment option only slightly increased. The same is not the case with the DLRP program where mandatory option moderately increased from 2013 to 2014 and the voluntary option slightly declined. Across both programs it is clear that from 2013 to 2014 there was shift towards participating in the mandatory enrollment option rather than the voluntary enrollment option. This is likely the result of decreased penalties associated with the mandatory CSRP program and the significant increase in capacity payments in the mandatory options of CSRP and DLRP.

5.3 *Curtailable versus On-Site Generation*

Participating customers may use on-site generation in addition to curtailment to reduce load during DR events. Navigant analyzed the contributions of on-site generation[57] relative to curtailment to identify whether the increase in enrollment in 2014 can be attributed to an increased reliance on on-site generation or simply an increase in curtailment. The majority of the increase in pledged load reductions is attributed to curtailment rather than on-site generation. Figure 13 depicts the total MW enrolled through on-site generation and load curtailment. Notably, on-site generation peaked in 2012 as a share of total MW enrolled and has been on the decline.

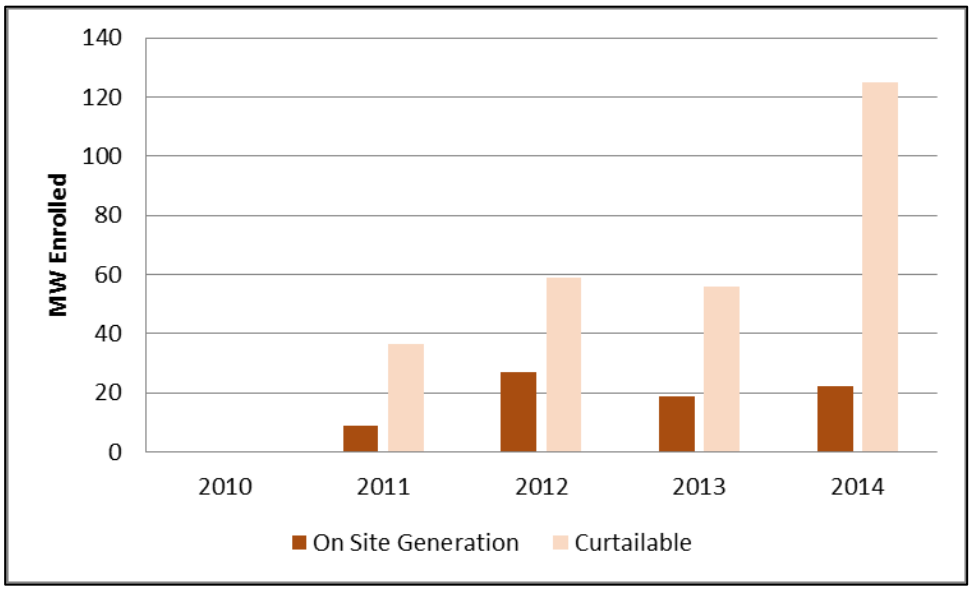
Figure 13. Pledged MW: On-Site Generation versus Curtailable Load



[57] On-site generation data is self-reported by customers and may underrepresent the actual amount of on-site generation.

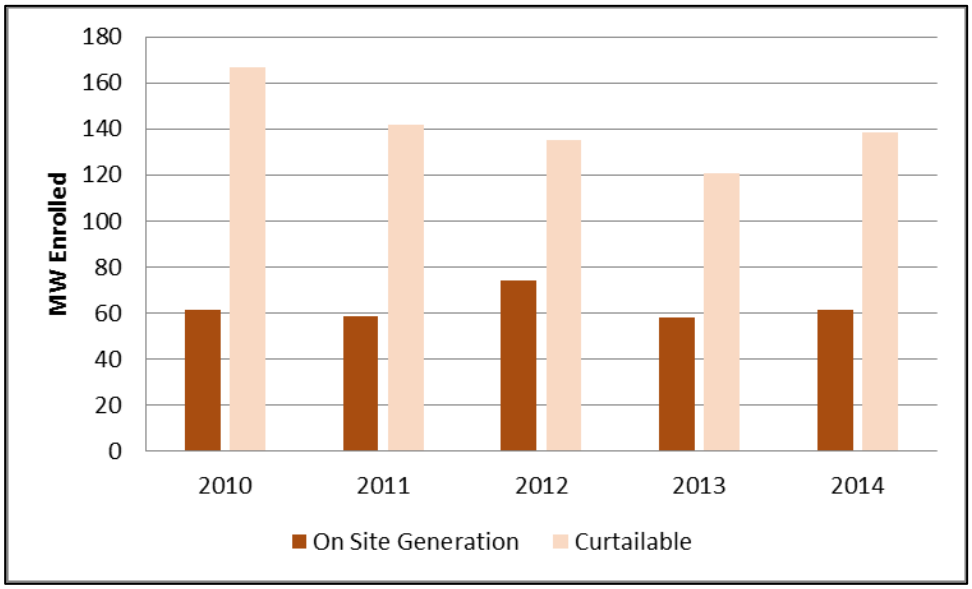
As shown in Figure 14 and Figure 15, among CSRP and DLRP participants, DLRP participants commit a larger share of load reduction using on-site generation (31% in 2014). This is in line with average historical levels of on-site generation for DLRP (31% from 2010-2014). In contrast, the share of on-site generation for CSRP participants continued to decrease between 2013 and 2014 (25% to 15%). This is a result of additional CSRP enrollments primarily coming from curtailable loads while on-site generation has maintained similar levels of enrollment.[58]

Figure 14. Pledged MW: On-Site Generation versus Curtailable Load – CSRP



[58] The lack of growth in on-site generation may be a result of environmental regulations on the emissions and hours of operations for reciprocating internal combustion engines (RICE) that are commonly used as on-site generation.

Figure 15. Pledged MW: On-Site Generation versus Curtailable Load – DLRP



5.4 Aggregator versus Direct Enrollment

Customers may participate in Con Edison's program through third-party aggregators or enroll directly in the program. Navigant analyzed whether the increase in enrollment in 2014 can be attributed to an increase in enrollment through aggregators or through the direct enrollment option. The majority of the increase in enrollment in 2014 is attributed to aggregators (Figure 16), largely within CSRP (Figure 17). Direct enrollment in Con Edison's programs continues on a downward trend.[59]

[59] Aggregators have indicated that their sales resources in NYC have increased due to the programmatic changes. Correspondingly, they expect a continued increase in DR enrollments due to their marketing efforts.

Figure 16. MW Enrolled in Commercial DR: Aggregator versus Direct Enroll

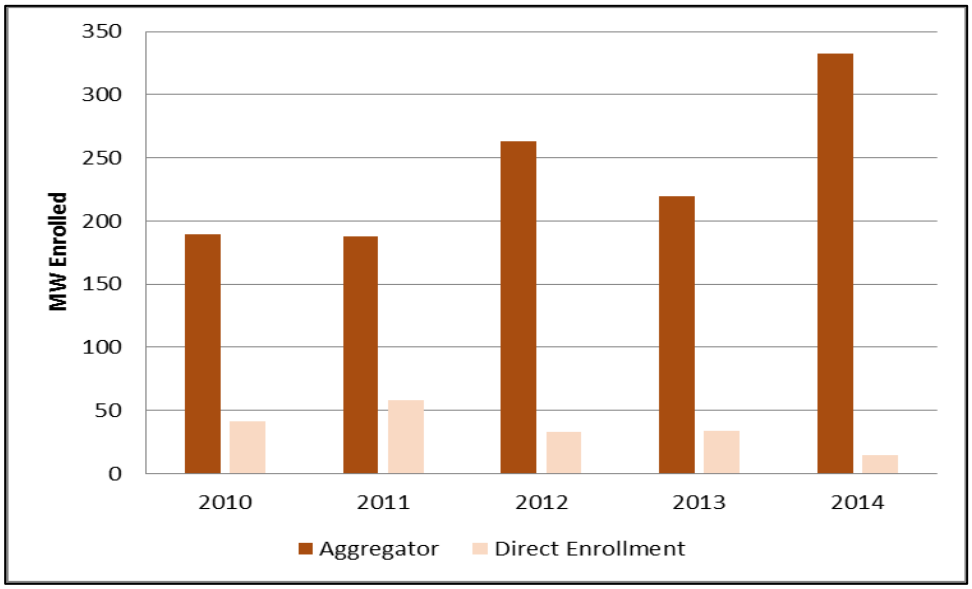
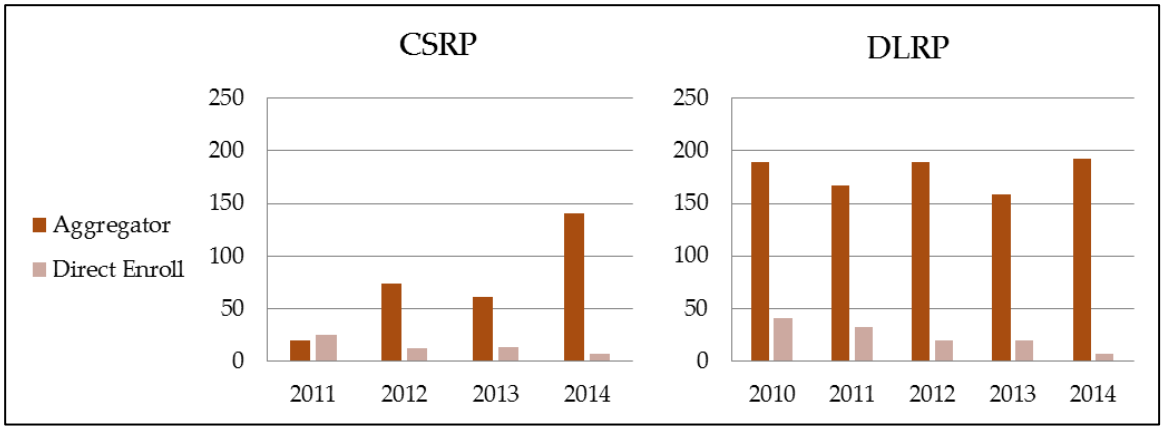


Figure 17. MW Enrolled: Aggregator versus Direct Enrollment – CSRP and DRLP



As shown in Figure 18 and Figure 19, among CSRP and DLRP customers enrolled year-over-year the average kW pledged through aggregators changes little despite the total increase in 2014, particularly for CSRP participants. This indicates that aggregators are enrolling new customers that have similar enrolled kW amounts to the customers they have previously enrolled. In contrast, both the average and total kW pledged through direct enrollment drops sharply in 2014 for both programs.

Figure 18. Pledged Load Reduction for Customers Enrolled in CSRP Year-over-Year (2011-2014)

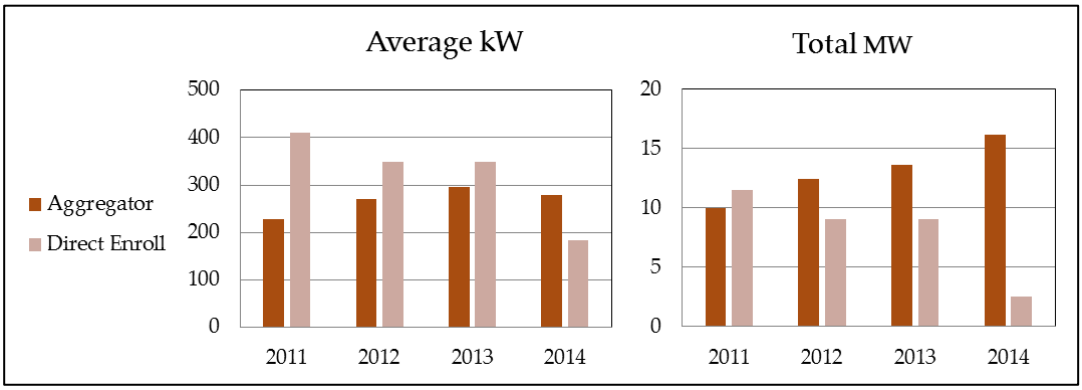
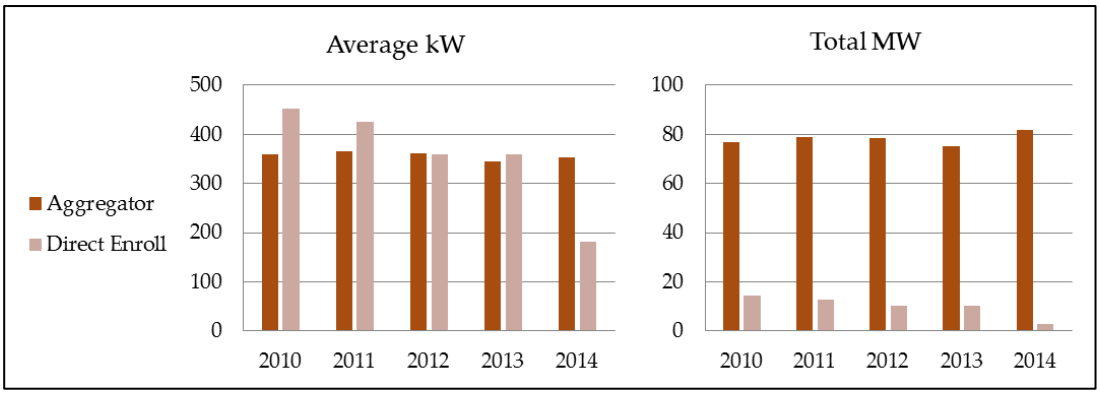


Figure 19. Pledged Load Reduction for Customers Enrolled in DLRP Year-over-Year (2010-2014)



5.5 Industry Segment

Navigant combined customer information with historical enrollment data to identify the industry segments (as identified by the North American Industry Classification System, or NAICS, code) that participate in Con Edison's commercial DR programs, and whether any notable trends were evident. The analysis was limited to NAICS categories with 50 or more participating accounts by 2014.

As shown in Figure 20 and Figure 21, the leading industry enrolled in Con Edison's DR programs is Real Estate, Rental, and Leasing with total pledge load reductions increasing from 20 MW in 2010 to 80 MW in 2014. Notably, the total enrolled load reduction fell in 2013 and rose sharply in 2014 for CSRP and DLRP reaching an all-time high. Other industry segments with substantial DR enrollment in 2014 include Construction, Finance and Insurance, Information, Professional/Technical Services, Public

Administration, and Retail Trade. Most sectors exhibited an increase in enrollment in 2014 with the largest increase in Public Administration. The increase in enrollment for Public Administration in 2014 resulted in that industry segment having the highest share of peak demand (24.7 percent) participating in DR (Table 16). Other industries with substantial DR participation as a share of peak demand include Management of Companies and Enterprises, Information, and Professional/Technical Services.

The breakdown of enrollment in CSRP and DLRP is relatively stable between 2010 and 2014 for most industry segments with a few notable exceptions. Information, Professional/Technical Services, Public Administration, and Real Estate, Rental, and Leasing all had noticeable increases in enrollment in 2014 that were primarily attributed to increases in CSRP enrollment.

Table 16. Demand Response Participation Rate by Industry Segment[60]

Industry Segment	2014 Share of Peak Demand (kW) Participating in Demand Response
Public Administration	24.7%
Management of Companies and Enterprises	13.3%
Information	10.9%
Prof., Sci. , and Tech., Services	9.4%
Utilities	8.6%
Finance and Insurance	7.0%
Construction	6.9%
Educational Services	6.1%
Real Estate and Rental and Leasing	5.7%
Administrative Support, Waste Management	4.4%
Transportation and Warehousing	3.6%
Arts, Entertainment, and Recreation	3.6%
Health Care and Social Assistance	3.4%
Wholesale Trade	3.4%
Retail Trade	3.2%
Common Facilities	2.8%
Manufacturing	2.1%
Other Services (exc. Pub. Admin)	1.9%
Accommodation and Food Services	0.3%

[60] Peak demand by industry segment includes the demand of customers that do not qualify for demand response programs.

Figure 20. KW Enrolled by Program and Industry[61]

[61]Corresponding two digit NAICS codes for the industry categories: 22 – Utilities; 23 – Construction; 31, 32, 33 – Manufacturing; 42 - Wholesale Trade; 44, 45 - Retail Trade; 48, 49 - Transportation and Warehousing; 51 – Information; 52 - Finance and Insurance; 53 - Real Estate and Rental and Leasing; 54 – Prof., Sci., and Tech Services; 55 - Management of Companies and Enterprises; 56 – Administrative, Support and Waste Management; 61 - Educational Services; 62 - Health Care and Social Assistance; 71 - Arts, Entertainment, and Recreation; 72 - Accommodation and Food Services; 81 - Other Services (except Public Administration)

Figure 21. KW Enrolled by Program and Industry (continued)[62]

[62]Corresponding two digit NAICS codes for the industry categories: 22 – Utilities; 23 – Construction; 31, 32, 33 – Manufacturing; 42 - Wholesale Trade; 44, 45 - Retail Trade; 48, 49 - Transportation and Warehousing; 51 – Information; 52 - Finance and Insurance; 53 - Real Estate and Rental and Leasing;

Navigant also analyzed whether there were any notable trends across industries in enrollment through aggregators versus direct enrollment, as well as the use of on-site generation versus curtailment (Figure 22 through Figure 25). Across all industry segments the majority of customers and load are enrolled through aggregators, with the exception of Utilities. Historically, direct enrollment has remained relatively constant in absolute terms and declining relative to enrollment through aggregators. The largest decline in direct enrollment between 2013 and 2014 is in the Professional, Scientific, and Technical Services (99 percent decrease) industry as well as Construction (88 percent decrease).

The level of on-site generation for each industry segment remained relatively constant with the majority of increased enrollments in 2014 coming from curtailable loads. Information, Professional/Technical Services, Public Administration, and Real Estate, Rental, and Leasing all had noticeable increases in curtailable load enrollment in 2014. These are the same industry segments that had noticeable increases in CSRP enrollment and enrollment through aggregators. It appears that the combination of increased incentives, shorter event durations, and reduced penalties has resulted in customers enrolling curtailable loads through aggregators in the CSRP program.

54 – Prof., Sci., and Tech Services; 55 - Management of Companies and Enterprises; 56 – Administrative, Support and Waste Management; 61 - Educational Services; 62 - Health Care and Social Assistance; 71 - Arts, Entertainment, and Recreation; 72 - Accommodation and Food Services; 81 - Other Services (except Public Administration)

Figure 22. KW Enrolled by Industry - Aggregator versus Direct Enrollment

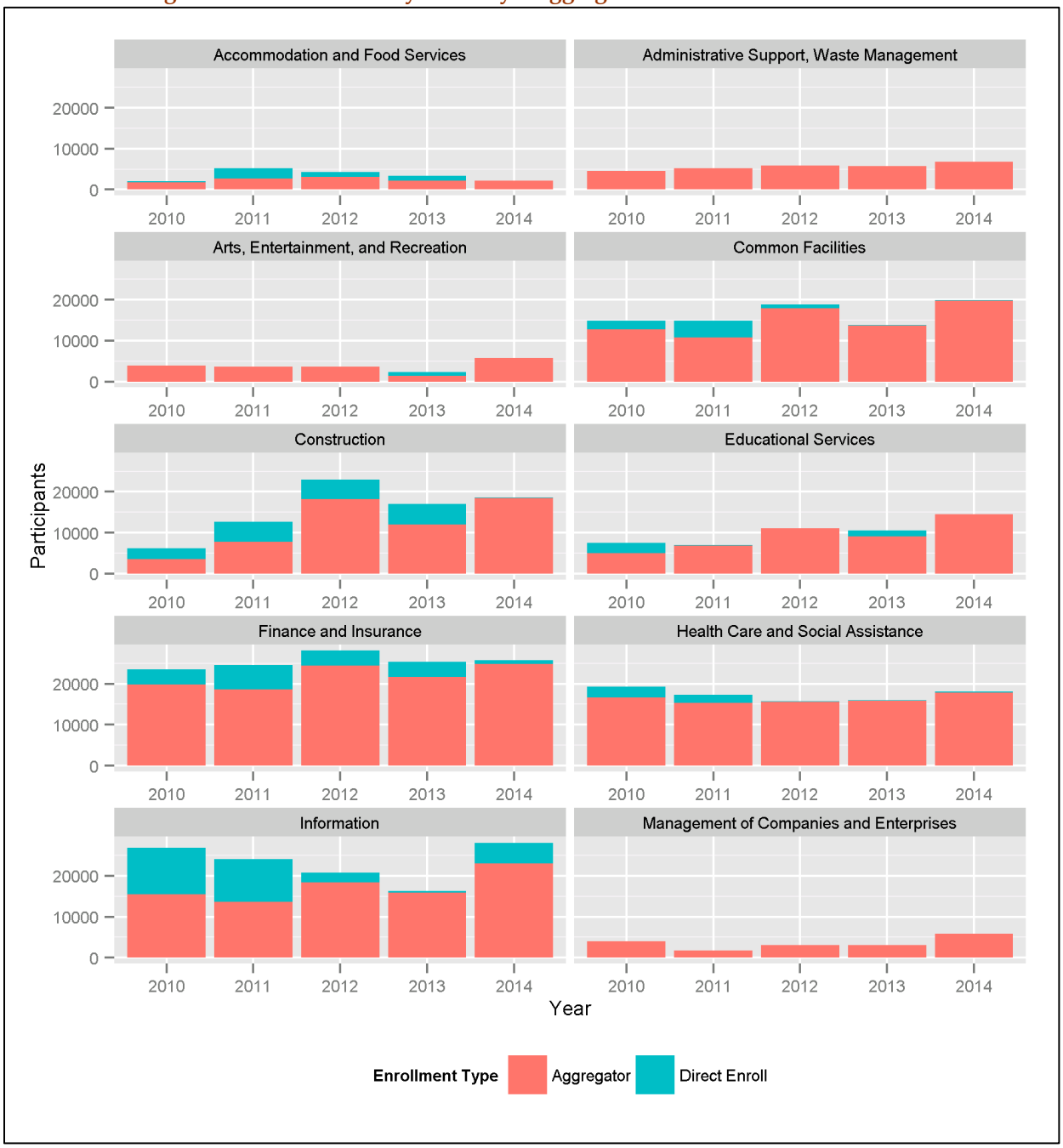


Figure 23. KW Enrolled by Industry - Aggregator versus Direct Enrollment (continued)

Figure 24. KW Enrolled by Industry - On-Site Generation versus Curtailable Load

Figure 25. KW Enrolled by Industry - On-Site Generation versus Curtailable Load (continued)

5.6 Borough

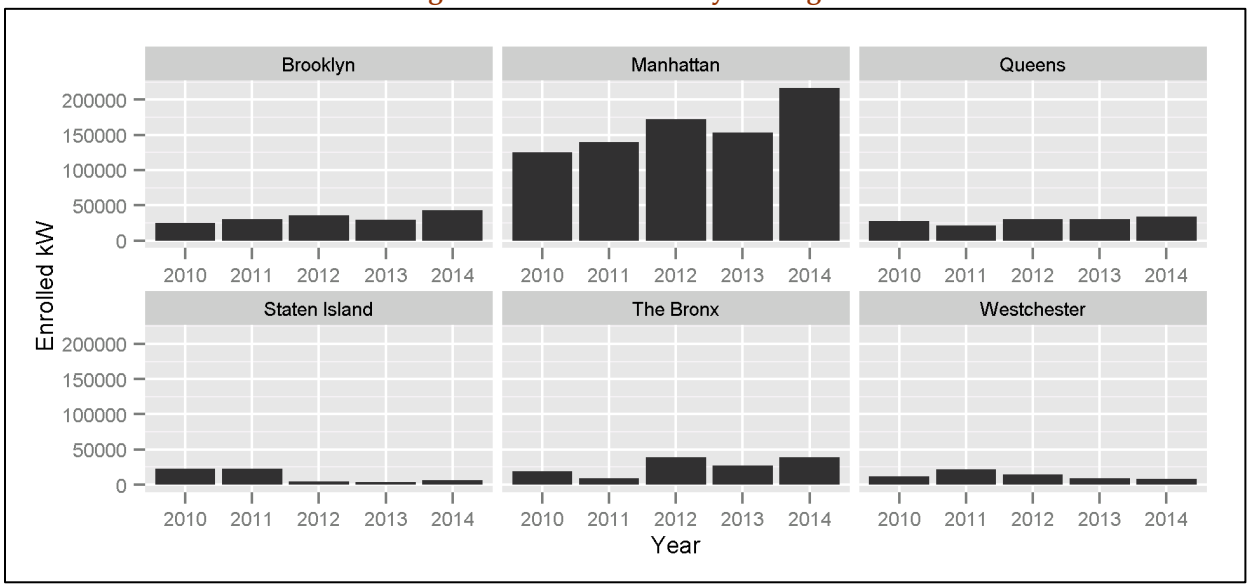
Navigant also analyzed customer information with historical enrollment data to identify where participants are located, by borough. The vast majority of enrollment is in Manhattan (62%), followed by Brooklyn (12%), the Bronx (11%), Queens (10%), Staten Island (2%), and Westchester (2%) (Figure 26). In 2013, the Bronx, Brooklyn and Manhattan experienced a drop in enrollment, following by an increase in 2014, with the largest increase in Manhattan (41% increase).

Table 17 identifies the leading industry segments among DR participants and notable changes in enrollment within each borough.

Table 17. Changes in Enrollment by Borough and Industry

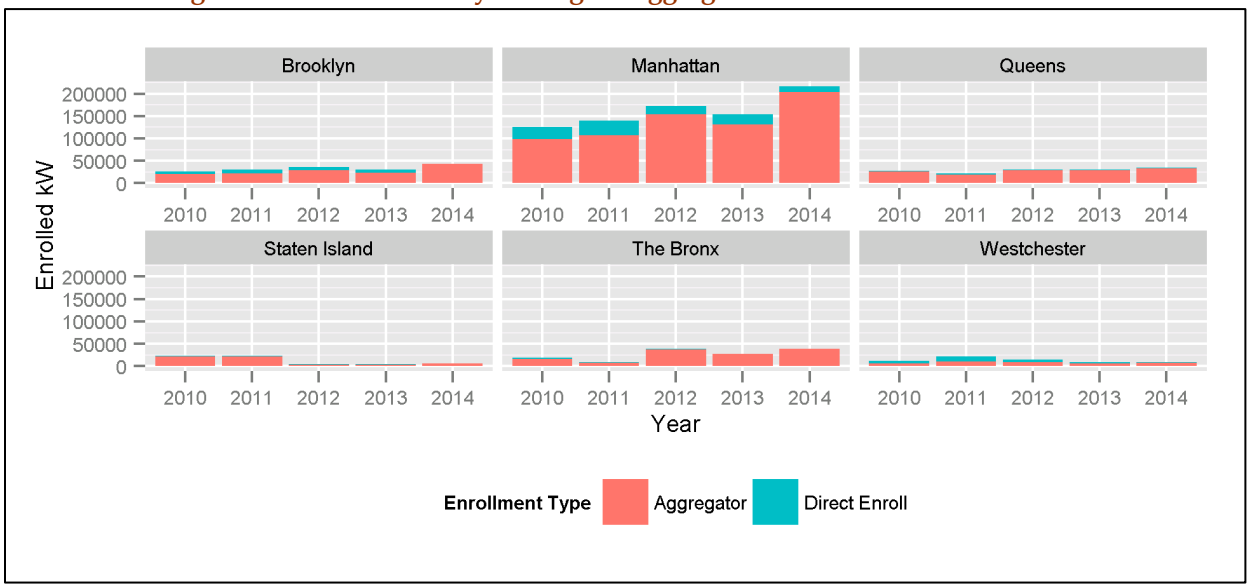
Borough	Leading Industry Segments	Notable Changes
Brooklyn	Public Administration, Information, Retail Trade	The Public Administration industry segment accounts for 32% of enrolled kW in 2014 after no enrollments in 2013. The Information industry segment doubled their enrolled kW from 2013 to 2014
Manhattan	Real Estate and Rental and Leasing, Finance and Insurance, Information	The Real Estate and Rental and Leasing industry segment increased their enrolled kW by 43% from 2013 to 2014. The Information industry segment increased their enrolled kW by 68% from 2013 to 2014
Queens	Retail Trade, Prof., Sci. , and Tech., Services, Public Administration	The Prof., Sci., and Tech., Services industry segment doubled their enrolled kW from 2013 to 2014. The Public Administration industry segment accounts for 12% of enrolled kW in 2014 after minimal enrollments in 2013.
Staten Island	Prof., Sci. , and Tech., Services, Real Estate and Rental and Leasing, Retail Trade	The Real Estate and Rental and Leasing industry segment accounts for 15% of enrolled kW in 2014 after no enrollments in 2013.
The Bronx	Real Estate and Rental and Leasing, Prof., Sci. , and Tech., Services, Management of Companies and Enterprises	Real Estate and Rental and Leasing industry segment increased their enrolled kW by 51% from 2013 to 2014.
Westchester	Information, Retail Trade, Health Care and Social Assistance	Retail Trade industry segment increased their enrolled kW by 32% from 2013 to 2014.

Figure 26. Enrolled KW by Borough



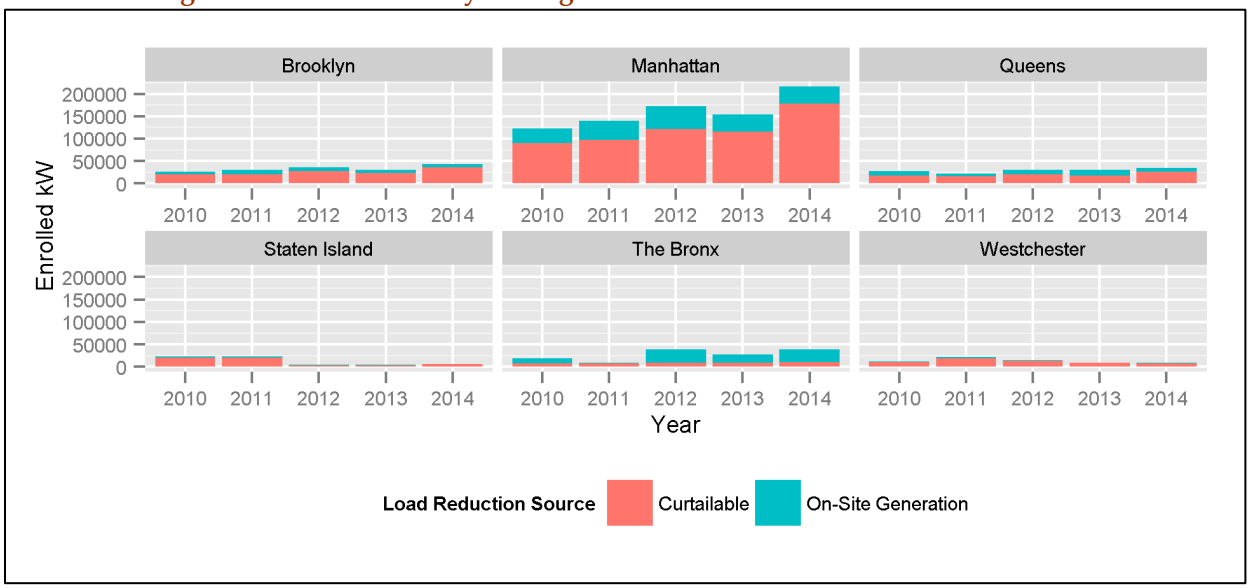
As shown in Figure 27, the ratio of enrollment through an aggregator versus direct enrollment has remained relatively stable across each borough with Manhattan having the largest amount of direct enrollment. Outside of Manhattan the vast majority of enrollment has been through an aggregator.

Figure 27. Enrolled KW by Borough – Aggregator versus Direct Enrollment



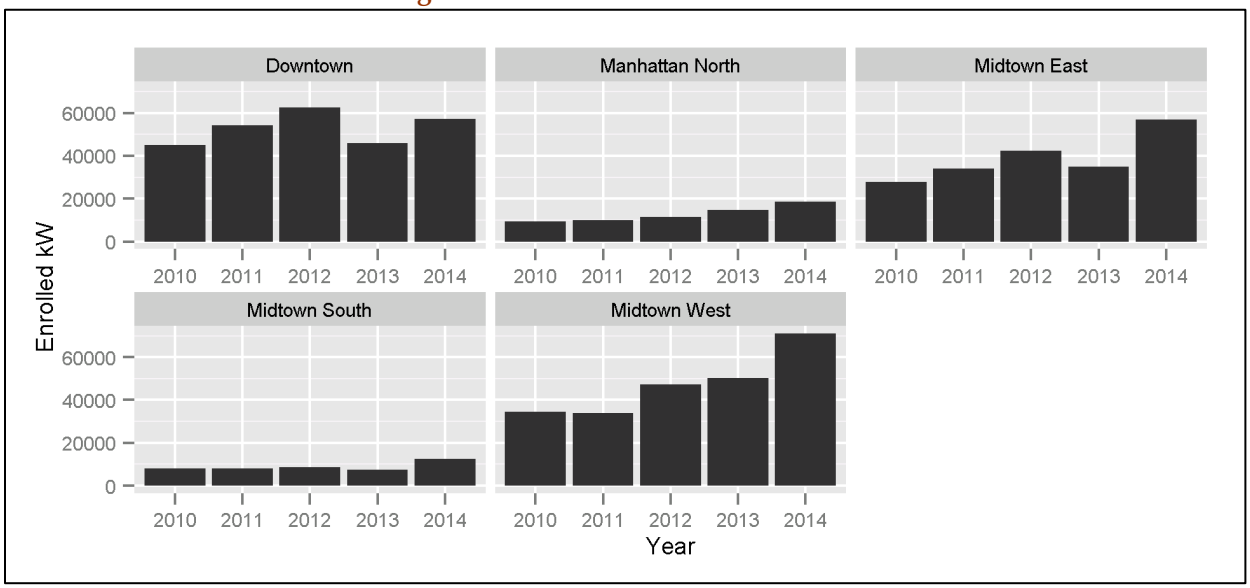
The amount of on-site generation in each borough has remained relatively constant since 2012 with the majority of annual changes in enrollment coming from curtailable loads (Figure 28). In particular, Manhattan and Brooklyn saw increases in 2014 enrollment that are almost entirely from curtailable loads.

Figure 28. Enrolled KW by Borough – On-Site Generation versus Curtailable



As shown in Figure 29, Manhattan[63] enrollment is primarily attributed to Midtown East (240 customers) and Midtown West (232 customers), followed by Downtown (188 customers). Each of these areas experienced a sharp increase in enrollment in 2014 reaching all-time highs.

Figure 29. KW Enrolled in Manhattan



[63] Refer to footnote 10.

As shown in Figure 30 and Figure 31, the majority of the increase from 2013 to 2014 can be attributed to enrollments through aggregators and the enrollment of curtailable loads in the DR programs. The largest increases in aggregator enrollments from 2013 to 2014 are in Downtown, Midtown East, and Midtown West. Similarly, increases in curtailable load enrollment are seen in the same areas of Manhattan. The enrollment of on-site generation has remained steady (Midtown West) or slightly declined across most of Manhattan.

Figure 30. Enrolled KW in Manhattan – Aggregator versus Direct Enroll

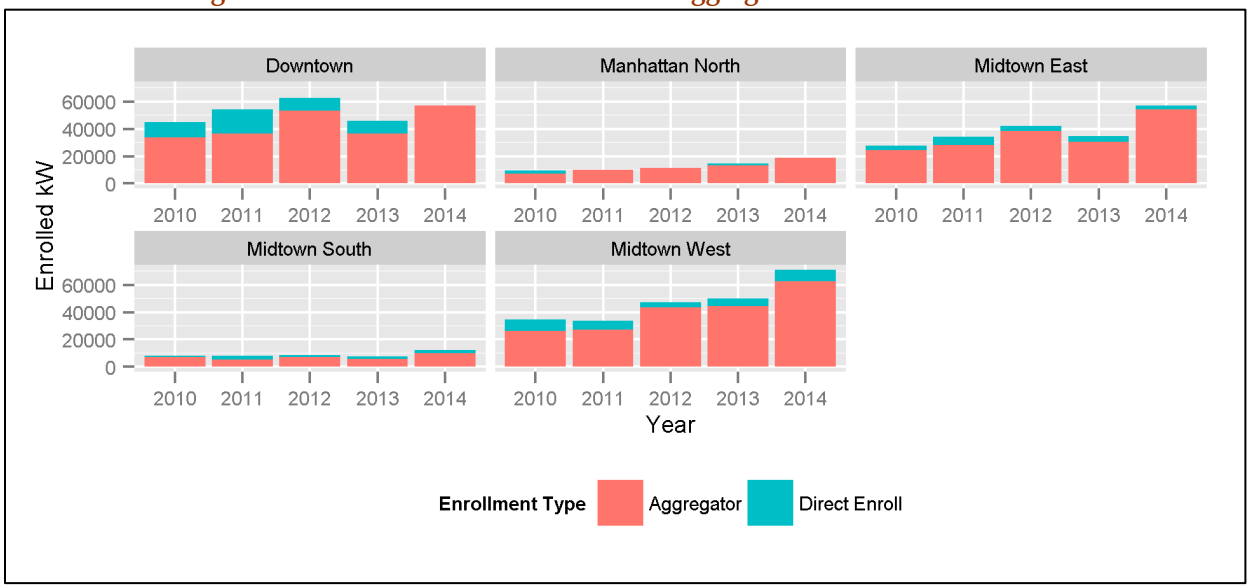
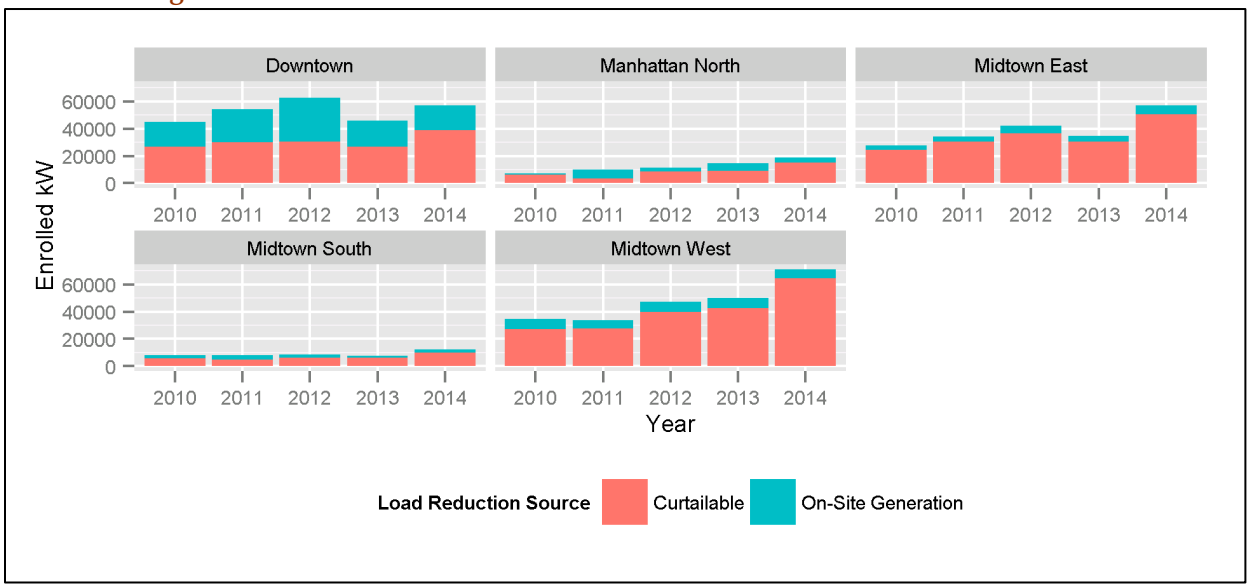


Figure 31. Enrolled KW in Manhattan – On-Site Generation versus Curtailable

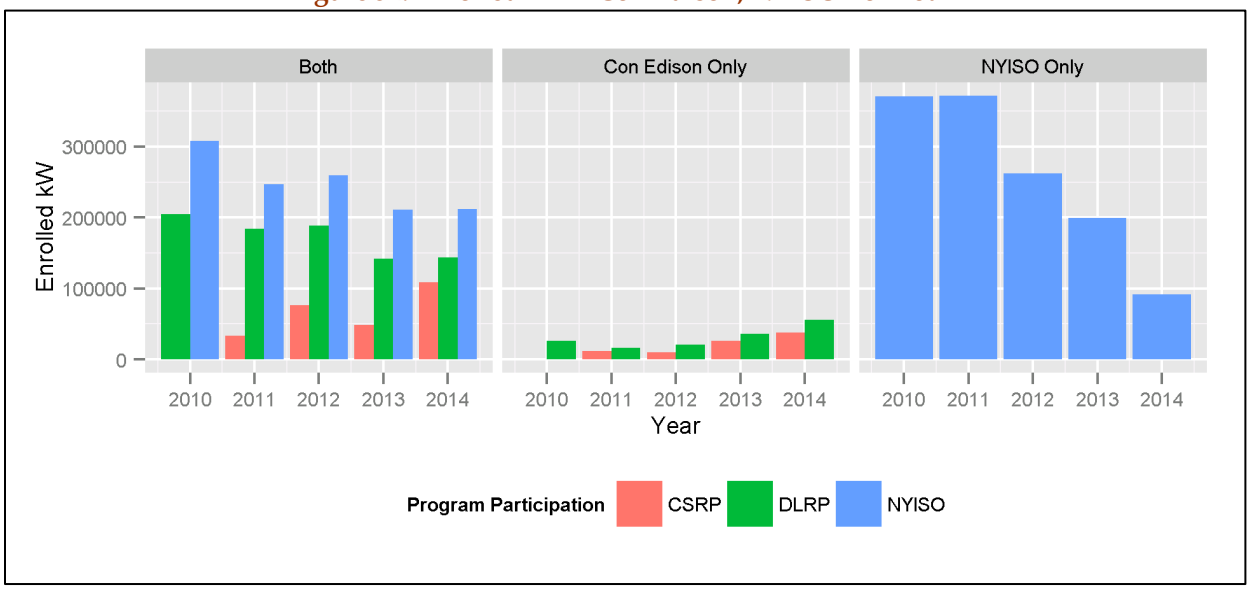


5.7 *Dual Enrollment in Con Edison and NYISO DR Programs*

The NYISO also offers DR programs to businesses within Con Edison's service territory. Using historical enrollment data for participants in both NYISO and Con Edison's DR programs, Navigant analyzed whether enrollment trends differed for customers participating in Con Edison's programs, NYISO's programs, or both. Given that NYISO did not implement as many programmatic changes, this comparison across programs may provide further insight into whether the changes implemented by Con Edison were effective at increasing enrollment levels.

As shown in Figure 32, pledged load reductions for customers that are dually enrolled in Con Edison and NYISO's DR programs exhibit a similar pattern increasing between 2010 and 2012, decreasing in 2013, and increasing again in 2014.[64] However, pledged load reductions for customers enrolled in only Con Edison's DR programs exhibit an upward trend, in sharp contrast to customers enrolled in only NYISO's DR programs, which exhibit a significant downward trend. In particular, the enrolled kW for CSRP for customers participating in both increased significantly in 2014. A large portion of the additional customer enrollments in CSRP (45 percent) and DLRP (51 percent) were not enrolled in a DR program through either Con Edison or NYISO in 2013 and chose to begin participating in a Con Edison DR program in 2014. This suggests that enrollment patterns may be driven in large part by Con Edison's programmatic changes.

Figure 32. Enrolled KW - Con Edison, NYISO[65] or Both



[64] The Emergency Demand Response Program (EDRP) and the ICAP Special Case Resources (SCR) program

[65] NYISO data is for zones I and J only.

6 Implications for DR Program Design

The DR Survey Research Study provides valuable information on the influence of programmatic changes on enrollment, as well as the capabilities of existing and emerging technologies to enhance DR performance, and can be used to inform program and policy decisions relating to current and future DR programs. This study has provided several important insights regarding the influence of programmatic changes on enrollment that should inform future DR program planning:

- **The average WTA values for participants range from $7.24 to $15.24 per kW-month while the average WTA values for non-participants range from $9.18 to $18.35 per kW-month, higher than the $6 or $10 per kW-month that is typical of Con Edison's current DR-program offerings.** The average WTA provides insight into whether Con Edison's current incentive levels are sufficient to attract *new* participants and whether a change in incentives would stimulate customer enrollment. Results suggest an increase in incentives may stimulate enrollment.
- **The analysis reveals that performance window and notification period are the primary factors that influence the average WTA for commercial and multifamily customers, with commercial customers exhibiting a preference for longer notification periods over shorter events whereas multifamily customers exhibit a preference for shorter events over longer notification periods.** The average WTA for commercial customers was also influenced by current participation in a DR program.
- **Based on the data available, technology did not appear to influence the responsiveness of the average WTA to changes in the performance window and notification period**. Unlike automation-related technologies used for DR, battery technology benefits from a shortened performance window (two to three hours). If Con Edison were to shorten performance windows, batteries may play an increasing role in DR in the near term, relative to the status quo.
- **Economic theory suggests customers with high variable costs may exhibit a preference for DR programs with shortened performance windows.** If Con Edison were to shorten the performance window, this may stimulate enrollment among customer segments with high variable costs (all else being equal), such as retail, manufacturing, food services, or multifamily. Furthermore, shortening the performance window may stimulate enrollment among customer segments that have been underrepresented in Con Edison's DR programs to date.
- **The historical data analysis provides evidence that the increased incentives, shortened event durations, and reduced penalties implemented by Con Edison have been effective at increasing enrollment in 2014.** While the analysis cannot directly attribute changes in enrollment to programmatic changes, there is evidence of a divergence from historical trends suggesting that the programmatic changes likely contributed to the increase in enrollment.

Collectively, these key findings have several implications with respect to program and policy decisions relating to current and future DR programs as described in Table 18.

Table 18. Implications for DR Program Design

Implications for DR Program Design	Discussion
Shortening the performance window from four hours to two hours may increase enrollment at the current incentive levels.[66]	The WTA analysis reveals that customers are willing to accept a lower incentive for shorter performance windows. This finding applies to all customers in the study, but the relative influence of shortened performance windows is more pronounced among multifamily customers.
The multifamily sector is underrepresented in Con Edison's DR Programs as currently designed.	Multifamily customers have historically had minimal participation in Con Edison's DR programs. The WTA analysis reveals that multifamily customers that are willing and able to participate in DR will be most receptive to a DR program with a two-hour rather than a four-hour performance window and an incentive that is at least $10 per kW or higher – depending upon notification time.
Despite the majority of commercial customers having energy management technologies, the WTA analysis did not identify a significant relationship between those technologies and the performance windows/ notification times.	While automated technologies, such as a building or energy management system, allows customers to respond to DR events without manual intervention, the average WTA under different performance windows and notification periods remained the same regardless of ownership of a DR-enabling technology. Only battery storage is dependent on the performance window. However, based on survey data, the penetration of battery technology is limited. As a result, currently deployed DR technologies among Con Edison customers are unlikely to have a significant impact on participation decisions as DR program designs evolve.
The programmatic changes implemented by Con Edison in 2014 resulted in increased participation and indicates a favorable response to increased incentives.	The programmatic changes resulted in new customers joining Con Edison's DR programs through the facilitation of aggregators. With the vast majority of customers participating in DR programs through an aggregator, it is unclear whether the change in incentives was a driving factor as the financial agreement between customers and aggregators is not publicly known. The enrollment implications of the WTA analysis results may be diminished if the increase in incentives is not fully passed on to the customers – pending no additional value-added services being provided by aggregators

[66] Refer to footnote 11.

Appendix A Technology Assessment

This appendix provides additional information regarding the technology assessment.

Phase 1. Develop a Comprehensive list of DR, DG and ES Technologies

The first phase of the technology assessment was to compile a comprehensive list of Demand Response, Distributed Generation[67] and Energy Storage technologies that are potentially available to be deployed in the Con Edison service territory. The comprehensive technology list was developed from a variety of information sources as part of the Con Edison Localized Integrated Resource Planning (LIRP) project, including:

- Con Edison 2009 Energy Efficiency Potential Study (conducted by Global Energy Partners)
- Con Edison 2009 Callable Potential Study (conducted by Summit Blue Consulting)
- Other Con Edison primary data sources
- New York State Technical Reference Manual[68]
- Secondary sources from TRMs in other states in the region (e.g., Mid-Atlantic, Pennsylvania, etc.)

[67] For the purposes of this analysis, only DG technologies that are dispatchable are considered a DR technology. This is to avoid duplicating technologies and to identify DG technologies that can provide a firm resource to be used for DR. Only non-dispatchable DG technologies will be included in the DG technology category.

[68] https://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/766a83dce56eca35852576da006d79a7/$FILE/TechManualNYRevised10-15-10.pdf

Error! Reference source not found. summarizes the total number of technologies examined in each technology area (DR, DG, and ES). In total, there were 92 technologies included in the universal measure list.

Table A-1. Universal Technology List Summary

Technology Area	Total Number of Technologies
Demand Response (DR)[69]	43
Distributed Generation (DG)[70]	31
Energy Storage (ES)[71]	18
Total	**92**

Phase 2: Screening Criteria

In the second phase, technologies were screened to identify a final list of technologies that would be viable for Con Edison commercial customers in the next three to five years.

Screening Criteria Applicable for all Technology Areas: The following screening criteria were applied to all technologies discussed above. If a negative answer is found for any of these criteria, the technology fails the screen and is excluded from further measure-level analyses.

- ***Technical Viability.*** Is the technology proven and will it be commercially available within the next 3-5 years? Is the technology commercially available and supported by the necessary market infrastructure? Or, will the technology and any required support industry be commercially available within 3-5 years?
- ***Applicability.*** Is the technology applicable to building stock, geography, end use loads, and climate of Con Edison service territory?
- ***Best Available Technology.*** Is this the best available technology or is there another technology that addresses a specific inefficiency in equipment, operation, or building envelope that is clearly superior in performance, acceptability to consumers, commercial availability, and cost-effectiveness?
- ***Quality Data.*** Is the cost, performance, and savings data associated with the technology quantified and documented from reliable sources? Can the impacts and costs of the technology be quantified such that an economic evaluation is both possible and reasonable? Are the

[69] See the Navigant Research DR Report outline for a list of companies providing DR technologies. http://www.navigantresearch.com/research/demand-response

[70] See the Navigant Research report outline for "Combined Heat and Power for Commercial Buildings" for a list of companies providing DG technologies related to cogeneration: http://www.navigantresearch.com/research/combined-heat-and-power-for-commercial-buildings

See the Navigant Research report outline for "Solar Photovoltaic Consumer Products" for a list of companies providing PV technologies: http://www.navigantresearch.com/research/solar-photovoltaic-consumer-products

[71] See the Navigant Research report outline for "Residential Energy Innovations" for a list of companies that are providing the ES technologies identified: http://www.navigantresearch.com/research/residential-energy-innovations

potential savings reasonably significant to justify their own program or to be included as part of another program?

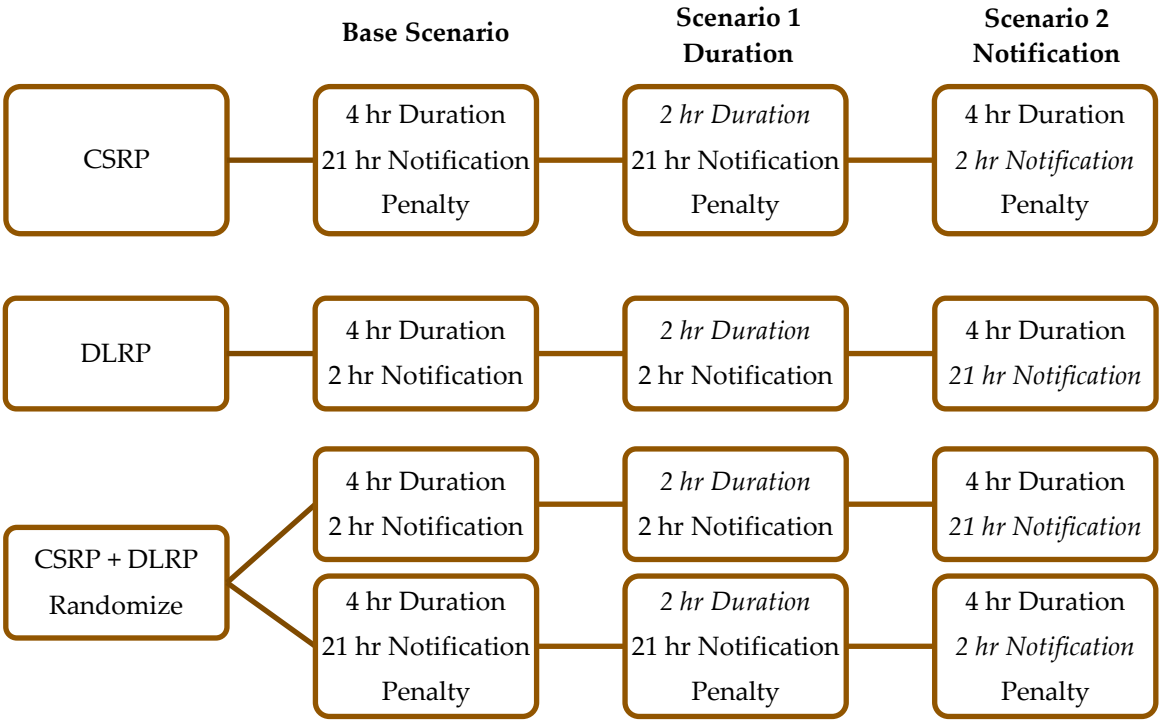
- ***Acceptability.*** Is the technology acceptable to customers? Does the technology have significant barriers to customer acceptance such as reduction in the quality of energy-service, space requirements, specialized operations and management (O&M) requirements, or environmental issues to the point that energy consumers are unwilling to install it in important markets?
- ***Duplication.*** Is the technology only captured in one category to avoid double counting? This screening criterion ensures that a specific technology that may reasonably fall into multiple categories is only counted in one of them. This is primarily to maintain internal consistency in categorization.

Additional Screening Criteria Applicable for Specific Technology Areas: The following additional screening criteria were applied to specific technology areas. If a technology met any of these criteria, it would fail the screen and be excluded from further measure-level analyses.

- ***DR-specific screening criteria:***
    - Does the DR technology directly provide a load reduction? Does the technology itself control the response after receiving a signal from the customer or utility? For example, a water heater controller and smart appliance would qualify, since they receive notification of an event and directly initiate a response. In contrast, an AMI meter and web portal would not qualify, since they communicate with the technology actually controlling the response.
    - Is the technology owned by the customer, rather than the utility? Utility-owned technologies, such as dispatchable capacitor banks, metering infrastructure, and communications technologies, would not qualify under this criteria.
- ***DG-specific screening criteria:***
    - Is the DG technology applicable to customer-sited installations? Does the technology come in a size relevant to customer-sited installations or is it designed for large utility-scale applications?
    - Is the fuel type required by the DG technology available in Con Edison service territory?
- ***ES-specific screening criteria:***
    - Is the ES technology applicable to customer-sited installations? Is the ES technology suited for customer-sited installations or large scale utility installations?

Appendix B Participant Survey

To assess WTA, three hypothetical DR programs were presented in which the performance window and notification time varied. For participants, the performance window and notification period of their current program was presented in the base scenario. For customers enrolled in both CSRP and DLRP, customers were randomly assigned to see a program description of either CSRP or DLRP.



Section 0. Introduction

INTRO. Con Edison thanks you for taking the time to complete this important survey. Please enter the pin included in your email message below. [PIN]

Con Edison is considering re-designing their demand response programs and would like input from their customers. In exchange for completing the survey, you will receive a $100 electronic gift card. The electronic gift card can be shared with anyone should you choose to give the gift card to another (e.g., a charitable organization), or if your firm prohibits acceptance of an incentive for completing a survey. If you have any questions regarding the survey, please call The Blackstone Group at 1-800-468-0419. If you would like to contact Con Edison directly, please call 1-800-752-6633.

This survey is estimated to take less than 20 minutes. If you accidentally close the survey window or have no activity for 45 minutes or longer, the survey will time-out. If that happens, please re-enter your

PIN, which will take you back to this page, then will skip you directly to the last question you completed.

Please select the type of gift card or incentive you would like. Limit of one incentive per person.

1. Amazon
2. Target
3. Starbucks
4. No, thanks. I don't need an incentive.

INCENT2. **[SHOW IF INTRO=1-3]** After completing the survey, you will receive an email within the week with the electronic gift card of your choosing.

Section 1. Firmographics

During this survey we will ask questions about your business and participation in Demand Response Programs. For the purpose of the survey, please consider the facility located at [ADDRESS].

F1. Which of the following best describes your business. **[ALPHABETIZE ANSWER LIST. ANCHOR OTHER (SPECIFY) AT THE BOTTOM]**

1)	Agriculture, Forestry, Fishing and Hunting
2)	Mining, Quarrying, and Oil and Gas Extraction
3)	Utilities
4)	Construction
5)	Manufacturing
6)	Wholesale Trade
7)	Retail Trade
8)	Transportation and Warehousing
9)	Information
10)	Finance and Insurance
11)	Real Estate and Rental and Leasing
12)	Professional, Scientific, and Technical Services
13)	Management of Companies and Enterprises
14)	Administrative and Support and Waste Management and Remediation Services
15)	Educational Services
16)	Health Care and Social Assistance
17)	Arts, Entertainment, and Recreation
18)	Accommodation and Food Services
19)	Other Services (except Public Administration)
20)	Public Administration

97) Other (Specify)

F2. Approximately what size, in square feet, is the building you occupy or the floors that your business operates on?

[Numeric Response, range 100-9,000,000] square feet

F3. Approximately how many full-time and part-time employees work in this location?

[Numeric Response, range 1-20,000] employees

F4. Which of the following most closely corresponds to your organization's normal hours of operation at this location? This would be the period when most employees are present.

1. 8 hours per day, 5 days per week
2. 12 hours per day, 5 days per week
3. 8 hours per day, 7 days per week
4. 12 hours per day 7 days per week
5. 24 hours per day 7 days a week

Section 2. Priming Questions

The next questions ask about your experience with demand response programs.

PRIME. Through demand response programs, participating customers commit to reduce their electricity usage when requested by Con Edison. The programs help reduce emissions from electricity generation, reduce the purchase of expensive energy, and delay the installation of costly utility equipment.

Typically, participating customers are asked to reduce their electricity usage for two to four hours, up to five times during the summer months (May through September). In exchange, participating customers receive financial incentives – a monthly incentive, paid per kilowatt pledge to the program, and an energy incentive, paid per kilowatt-hour reduced during an event.

P1. According to Con Edison's records, the building located at [ADDRESS] recently participated in a Demand Response program. Is this accurate?

1. Yes
2. No [ASK P2]

P2. [IF P1=2 AND *AGGREGATOR* IS NOT NULL] The records indicate that you were participating in the program through [*AGGREGATOR]*. Did you participate in a Demand Response program with [*AGGREGATOR]*?

1. Yes
2. No [SKIP TO P5]

P3. [IF P1=1 or P2=1] The records also indicate that you were able to pledge approximately *[PLEDGEDKW]* kilowatts to the program? Is this accurate?

1. Yes

2. No
98. Don't Know [SKIP TO P5]

P3a. [P3=2] Approximately how many kilowatts did you pledge? [Range 0-90,000,000]

[RECORD NUMBER] kilowatts (NOTE: This response replaces *PLEDGEDKW* for the remainder of the survey.)

P4. [IF P1=1 or P2=1] Please identify the measures you typically use to respond to an event. [SELECT ALL THAT APPLY]

1. Change set points on central air-conditioning systems
2. Change cycling strategy on central air-conditioning systems
3. Freezing elevator banks
4. Turn off Lighting, Appliances or other Equipment
5. Use batteries
6. Use on-site generation

97. Other [Please Specify]

P5. [IF P2=2 or P3=98] Con Edison's records indicate that your facility did participate in a Demand Response program and that you were able to pledge *[PLEDGEDKW]* kilowatts into the program. Please call the Blackstone Group at 1-800-468-0419 if you feel another person in your organization is better suited to answer this survey regarding your participation in Con Edison's Demand Response programs. Otherwise, please click below to continue with the survey.

Section 3. Program Description

PROG. As noted previously, Con Edison is considering re-designing their demand response programs and would like input from their customers.

Con Edison customers can participate in demand response programs offered both by the New York Independent System Operator (NYISO) and Con Edison. This survey will focus *only* on the programs offered by Con Edison.

In particular, Con Edison is interested in understanding what amount of financial incentives is required for participation, and which program features present the greatest barrier to participation.

The next page contains a description of the demand response program(s) you are currently enrolled in and asks about the financial incentives you would require to participate in the program. Con Edison will aggregate the survey results for hundreds of customers to help it determine whether it is possible to offer a program that is both cost effective and acceptable to most program participants. Your individual responses will be strictly confidential.

Con Edison understands that its customers will not enroll in a program where the incentive payments are not high enough to adequately compensate them for participating in the program. On the other hand, if it finds that the level of incentive payment required for the targeted level of program participation is too high relative to the energy savings generated (i.e., that the programs are too costly), it may limit the program offering in the future. In answering the next series of questions please think carefully about the incentive amount you would truly need to participate in the program.

Here is the first scenario.

Scenario 0: Consider that the demand response program will involve a maximum of 5 events per summer, with each event lasting up to **4 hours** per event. Customers will be given *[BASE SCENARIO - NOTIFICATION]* hours of notification in advance of an event. The program incentive structure will continue as currently designed with $1.00 per kilowatt-hour of energy reduced during a demand response event. [IF *PROGRAM=CSRP* or *PROGRAM=BOTH* – "There is a penalty for not reducing energy during events which may reduce your incentive payment. However, historically, the incidence of participants incurring a penalty has been limited."]

1. Assuming you continue to pledge [*PLEDGEDKW]* kilowatts, please select the **minimum** monthly incentive ($ per kilowatt per month) that you anticipate you would need to participate in the program?

$3	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$5	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$10	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$15	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$20	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$25	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$30	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$50	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
More than $50	This would mean that by the end of summer your monthly incentives would be at least $X.

Minimum Incentive ($X)	Maximum Incentive ($Y)
$Response x PLEDGEDKW x 5 months	($Response x PLEDGEDKW x 5 months) + ($Response x PLEDGEDKW x Duration x 5 events)

2. You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting 4 hours with [*NOTIFICATION* – base scenario] hours of notification. If the event duration changed to **2 hours**, would you be willing to accept a lower incentive to participate in the program?

   1.Yes

   2.No

   2a. What is the minimum incentive that you would need? $ [NUMERIC RESPONSE] per kilowatt per month

   2b. [ASK IF Q2=NO] Please provide a brief explanation of why your incentive would not change.

3. You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting 4 hours with [*NOTIFICATION* – base scenario] hours of notification. If the notification time changed to ***[NOTIFICATION* –scenario 2] hours,** would you
   [IF NOTIFICATION-BASE < NOTIFICATION-SCENARIO 2 "be willing to accept a lower incentive" OR
   IF NOTIFICATION-BASE > NOTIFICATION- SCENARIO 2 "need a larger incentive"]
   to participate in the program?
   1. Yes
   2. No

   3a. [ASK IF Q3=YES] What is the incentive that you would need?
   $[NUMERIC RESPONSE] per kilowatt per month

   3b. [ASK IF Q3=NO] You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting 4 hours with [*NOTIFICATION* – base scenario] hours of notification. If the notification time changed to ***[NOTIFICATION* –scenario 2]** hours, please provide a brief explanation of why your incentive would not change?

4. If you are managing multiple buildings, is the minimum monthly incentive ($ per kW per month) you would need to participate for most of the other buildings similar to the building identified in this survey?
   1. Yes
   2. No (Please provide a brief explanation) [Open End]
   3. I do not manage buildings

[IF *PROGRAM=CSRP* or *PROGRAM=BOTH*]

5. How influential is the risk of incurring a penalty on your decision to participate in Con Edison's Demand Response program on a scale of 1 to 5, where 1 means no influence at all and 5 means extremely influential? [RECORD NUMBER 1-5]

Section 4. Technology

Con Edison is interested in understanding whether your facility has technologies that enable demand response, such as an Energy or Building Management System (EMS/BMS) or other control system, battery storage, or on-site generation. Other customers participating in Con Edison's Demand Response programs have found these technologies useful for meeting their pledged reductions. For example,

- An EMS/BMS or other control system can help to identify which equipment or systems can be turned off or adjusted to participate in a demand response program.
- Battery storage allows participants to store energy when it is most convenient and rely on the storage to respond to demand response events.
- Participants can rely on non-emergency on-site generation to respond to demand response events.

T1. Which of the following technologies, if any, do you have at your facility located at [ADDRESS]? Please select all that apply.
1. Energy or Building Management System
2. Lighting, Process or Other Control System
3. Battery Storage capabilities
4. Non-Emergency On-Site generation
5. Solar Photovoltaics
96. Other. Please Specify.
97. Other. Please Specify.
98. Other. Please Specify.
99. None of the above.

[IF T1=1 or 2, ASK T2-T3] STOR. You indicated that your facility has [PIPE IN T1/T2 response]

T2. Is the [PIPE IN RESPONSE OF T1] currently configured to participate in a demand response program by automatically reducing power use upon receiving a signal?
1. Yes
2. No
98. Don't Know

T3. [ASK IF T1=1 or 2] Approximately how much of your overall energy usage is controlled by the [PIPE IN T1 response]?

[Numeric Response, range 0-100] **percent**

Answers should not add up to more than 100%:

Error message should be:
Total percent of overall energy usage controlled by EMS/BMS and Lighting, Process or Other Control Systems cannot be greater than 100. If these systems overlap, enter the percent of energy usage where the system is the primary form of control.

[IF T1=3, ASK T4- T6] STOR. You indicated that your facility has battery storage capabilities.

T4. What type of battery storage do you have? Please select all that apply.

1. Lithium Ion
2. Lead Acid

97Other, Please specify [OPEN END]

T5. Approximately what size is the battery?

[Numeric response] **kilowatts**

[Numeric response] **kilowatt-hours**

NO T6

[ASK IF T1=4] You indicated that you have non-emergency on-site generation at your facility.

T7. What type of generator do you have? Please select all that apply.

a. Diesel, engine
b. Natural gas, engine

97 Other, Please specify [OPEN END]

T8. Approximately what size is your unit(s)?

[Numeric Response] **kilowatts**

[ASK IF T1= 5] SOL. You indicated that you have Solar Photovoltaics at your facility.

T9. Approximately what size is your system?

[Numeric Response, 1-30,000,000] kilowatts

NO T10

[ASK IF T1= 1, 2, 3, 4, 5, 6]

T11. How influential were the following technologies on your decision to participate in Con Edison's Demand Response program on a scale of 0 to 5, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS THAT WERE SELECTED IN T1. STARTING IN T11, ADD "N/A – THIS TECHNOLOGY DOES NOT APPLY TO DEMAND RESPONSE" ANSWER]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]
6	OTHER	[RECORD NUMBER, 0-5]

T12. Now consider a demand response program with short event durations (e.g., 2 hours). Does having this technology influence your decision to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS THAT WERE SELECTED IN T1]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]
6	OTHER	[RECORD NUMBER, 0-5]

T13. Now consider the amount of kilowatts you pledge into the demand response program. Does having this technology influence the kilowatts you pledge? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS SELECTED IN T1]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]

4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]
6	OTHER	[RECORD NUMBER, 0-5]

T14. Now consider the minimum monthly incentive you need to participate in the demand response program. Does having this technology influence the minimum monthly incentive you need to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS SELECTED IN T1]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]
6	OTHER	[RECORD NUMBER, 0-5]

[IF T1=99]

T15. Are you currently shopping for or considering one of these technologies? Please select all that apply.

a. Energy or Building Management System
b. Lighting, Process or Other Control System
c. Battery Storage capabilities
d. Non-Emergency On-Site generation
e. Solar Photovoltaics

9. None of the above.

[ASK T16 FOR EACH RESPONSE TO T15, EXCEPT T15= 9]

T16. When do you plan on making your purchase decision? [SELECT ONE]

a. In the next 6 months
b. Six months to one year
c. More than 1 year from now

[ASK IF T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

T17. Please rate how influential having this technology would be on your decision to participate in a demand response program on a scale of 0 to 5, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2. THE OPTION SHOULD ONLY BE SHOWN IF IT WAS ANSWERED IN T15 AND IF THAT ANSWER OPTION WAS GIVEN A '1' OR '2' IN T16]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

T18. Now consider a demand response program with short event durations (e.g., 2 hours). Would having this technology influence your decision to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

T19. Now consider the amount of kilowatts you pledge into the demand response program. Would having this technology influence the kilowatts you pledge? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

T20. Now consider the minimum monthly incentive you need to participate in the demand response program. Would having this technology influence the minimum monthly incentive you need to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

[IF T15=9]

T21. Which of these Demand Response-enabling technologies are you most interested in purchasing for your firm? Please select all that apply.

a. Energy or Building Management System
b. Lighting, Process or Other Control System
c. Battery Storage capabilities
d. Non-Emergency On-Site generation

9. None of the above.

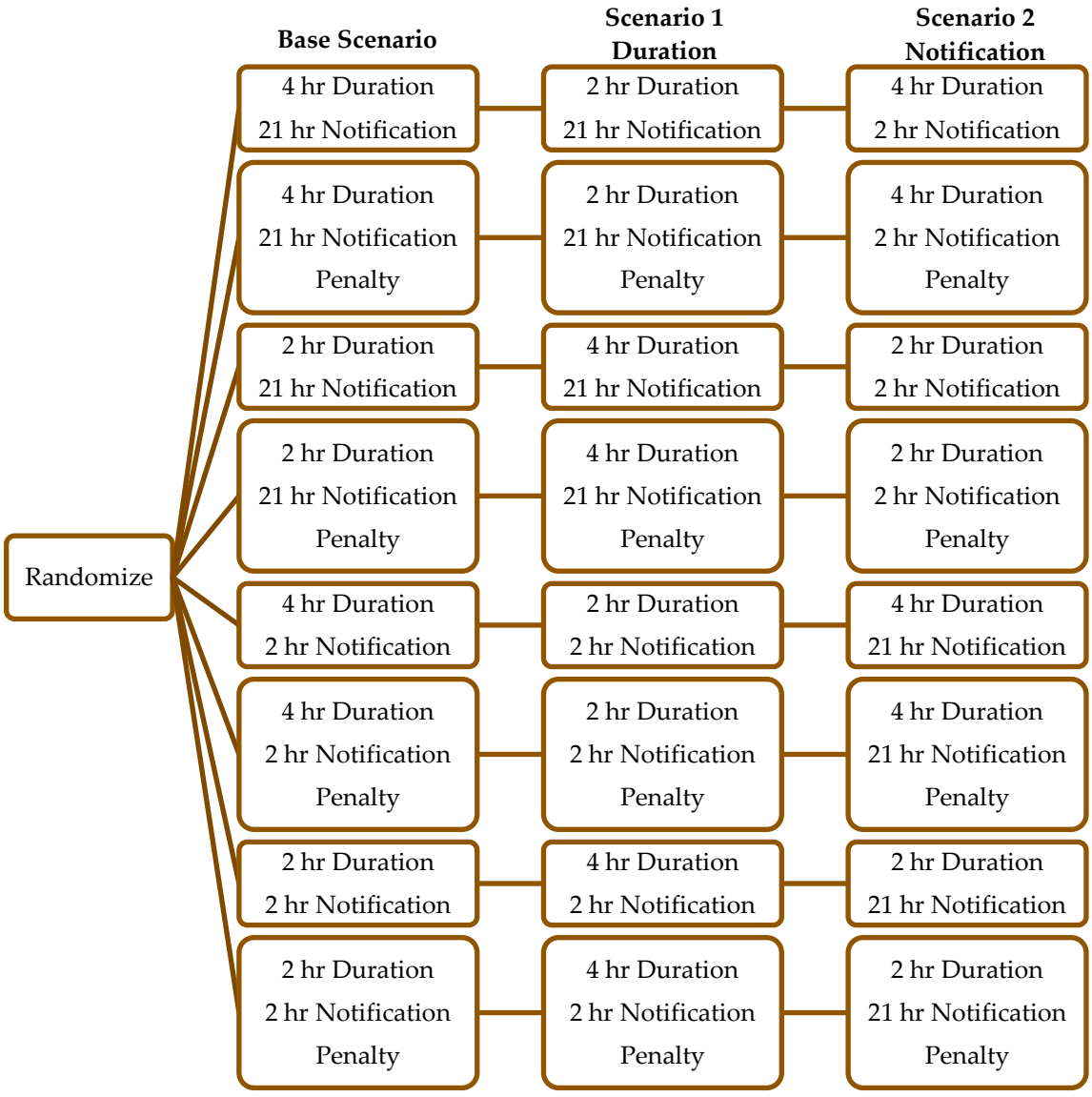
T22. Lastly, what other comments, if any, do you have regarding the demand response program? (Open-End) [PROGRAMMING NOTE: Should allow for no response]

CLOSE

You have now completed the demand response Please click "Next" to submit your answers. We deeply appreciate the time and thoughtful opinions you've shared with us. Thank you very much for participating! [Programming Note: Have customers be directed to the following webpage? http://www.coned.com/energyefficiency/demand_response.asp]

Appendix C Non-Participant Survey

To assess WTA, three hypothetical DR programs were presented in which the performance window and notification time varied. For non-participants, the performance window, notification period, and presence of a penalty were randomized.



Section 0. Introduction

INTRO. Con Edison thanks you for taking the time to complete this important survey. Please enter the pin included in your email message below. [PIN]

Con Edison is considering re-designing their demand response programs and would like input from their customers. Con Edison customers can participate in demand response programs offered both by the New York Independent System Operator (NYISO) and Con Edison. This survey will focus *only* on the programs offered by Con Edison. In exchange for completing the survey, you will receive a $100 electronic gift card. The electronic gift card can be shared with anyone should you choose to give the gift card to another (e.g., a charitable organization), or if your firm prohibits acceptance of an incentive for completing a survey. If you have any questions regarding the survey, please call The Blackstone Group at 1-800-468-0419. If you would like to contact Con Edison directly, please call 1-800-752-6633.

This survey is estimated to take less than 20 minutes. If you accidentally close the survey window or have no activity for 45 minutes or longer, the survey will time-out. If that happens, please re-enter your PIN, which will take you back to this page, then will skip you directly to the last question you completed.

Please select the type of gift card or incentive you would like. Limit of one incentive per person.

1. Amazon
2. Target
3. Starbucks
4. No, thanks. I don't need an incentive.

INCENT2. **[SHOW IF INTRO=1-3]**After completing the survey, you will receive an email within one week with the electronic gift card of your choosing.

Section 1. Firmographics

This survey asks about your business and demand response programs. For the purpose of this survey, please consider the facility located at [ADDRESS] when responding to the survey questions.

The next questions ask about your business and the characteristics of the facility located at [ADDRESS].

F5. Which of the following best describes your business. **[ALPHABETIZE ANSWER LIST. ANCHOR OTHER (SPECIFY) AT THE BOTTOM]**

1)	Agriculture, Forestry, Fishing and Hunting
2)	Mining, Quarrying, and Oil and Gas Extraction
3)	Utilities
4)	Construction
5)	Manufacturing
6)	Wholesale Trade

7) Retail Trade
8) Transportation and Warehousing
9) Information
10) Finance and Insurance
11) Real Estate and Rental and Leasing
12) Professional, Scientific, and Technical Services
13) Management of Companies and Enterprises
14) Administrative and Support and Waste Management and Remediation Services
15) Educational Services
16) Health Care and Social Assistance
17) Arts, Entertainment, and Recreation
18) Accommodation and Food Services
19) Other Services (except Public Administration)
20) Public Administration
21) Common Living Facilities

97 Other (Specify) [PROGRAMMING NOTE: Replace with min, max mean if NAICS if different from database.]

F6. Approximately what size, in square feet, is the building you occupy or the floors that your business operates on?

[Numeric Response, range 100-9,000,000] square feet

F7. Approximately how many full-time and part-time employees work in this location?

[Numeric Response, range 1-20,000] employees

F8. Which of the following most closely corresponds to your organization's normal hours of operation at this location? This would be the period when most employees are present.

1. 8 hours per day, 5 days per week
2. 12 hours per day, 5 days per week
3. 8 hours per day, 7 days per week
4. 12 hours per day 7 days per week
5. 24 hours per day 7 days a week

Section 2. Priming Questions

PRIME. The next questions ask about your knowledge of, and experience with, demand response programs. Through demand response programs, participating customers commit to reduce their electricity usage when requested by Con Edison. The programs help reduce emissions from electricity generation, reduce the purchase of expensive energy, and delay the installation of costly utility equipment.

Typically, participating customers are asked to reduce their electricity usage for two to four hours, up to five times during the summer months (May through September). In exchange, participating customers receive financial incentives – a monthly incentive, paid per kilowatt pledged to the program, and an energy incentive, paid per kilowatt-hour reduced during an event.

P1. Prior to participating in this survey, had you heard of a demand response program before?
1. Yes
2. No

P2. [ASK IF P1=2] There are independent third parties, known as aggregators or curtailment service providers, authorized to work with Con Edison to reduce energy usage during periods of peak demand. The aggregator works with customers and offers to pay them per kilowatt to reduce power use when the state or Con Edison requests it. To participate customers must have a 15-minute interval meter. Are you aware of load reduction or demand response programs?
1. Yes
2. No

P3. [ASK IF P2=1] Have you been contacted by an aggregator to participate in a demand response program in the last six months?
1. Yes
2. No

P4. [ASK IF P1=1 or P2=1] Have you participated in a demand response program in your current facility located at [ADDRESS]?
1 Yes
2 No

P4a. [IF P4=1] Why did your organization stop participating in the demand response program? [OPEN END]

P4b. [IF P4=1] Approximately how many kilowatts were you able to pledge to the program? Please enter the actual value without comma.

[RECORD NUMBER, Range 0-30,000,000] kilowatts [ASSIGN AS *KWRANDOM* IF KWRANDOM>= MINNAICS] [PROGRAMMING NOTE: Note, this should only happen if the number reported is greater than MINNAIC, otherwise question P4C is asked]

98 Don't Know

[IF NUMBER LESS THAN *MINNAICS* or Don't Know ASK (P4C), OTHERWISE SKIP TO SECTION 3]

P4c. [IF P4b response is less than MINNAICS or P4b is Don't Know] Participants in your industry typically pledge between *[MINNAICS]* and *[MAXNAICS]* kilowatts in Con Edison's demand response

programs. Given your knowledge of your facility, do you feel you would be able to pledge at least *[KWRANDOM]* [PROGRAMMING NOTE: KWRANDOM should be from the database if response to P4B is less than MINNAICS or response to P4B is don't know] E.g., respondent says 10kW but minimum is 15kW. We want this question to use the database KWRANDOM.] kilowatts if Con Edison offered a demand response program and the financial incentives were sufficient?

1. Yes [ASSIGN AS *KWRANDOM*] [SKIP to Section 3 & MINNAICS should replace KWRANDOM]
2. No [skip to section 4 if kwrandom=minnaics OR to P4d if kwrandom=mean naics.]
3.

P4d. [IF *KWRANDOM = MEANNAICS* ASK] Would be able to pledge at least *[MINNAICS]* kilowatts?

1. Yes [ASSIGN AS *KWRANDOM*]
2. No [SKIP TO SECTION 4]

[IF P4=2]

P4e. If Con Edison offered a demand response program and the financial incentives were sufficient, do you feel, given your knowledge of your facility, that you would be able to pledge at least] kilowatts? Participants in your industry typically pledge between *[MINNAICS]* and *[MAXNAICS]* kilowatts in Con Edison's demand response programs and achieve reductions by adjusting set points or cycling strategies on air-conditioning systems, pre-cool the building, freeze elevator banks, turn off unnecessary lighting, appliances and equipment, or use on-site generation or batteries to pledge reductions.

1. Yes [ASSIGN AS *KWRANDOM*]

No [Programming should direct P4e=1 to section 3 and P4E=2] [SKIP TO SECTION 4 IF KWRANDOM=MINNAICS, SKIP TO P4f if KWRANDOM=MEANNAICS] [

P4f. [ASK IF P4e=2 AND IF *KWRANDOM = MEANNAICS*] Would be able to pledge at least *[MINNAICS]* kilowatts?

i. Yes [ASSIGN AS *KWRANDOM*] [SKIP to Section 3 & MINNAICS should replace KWRANDOM]
ii. No [SKIP TO SECTION 4]

P5. [ASK IF P1=2 or P2=2] If Con Edison offered a demand response program and the financial incentives were sufficient, are there areas where you could envision reducing your electricity consumption? Participating customers typically adjust set points or cycling strategies on air-conditioning systems, pre-cool the building, freeze elevator banks, turn off unnecessary lighting, appliances and equipment, or use on-site generation or batteries to pledge reductions in energy use for demand response programs.

1. Yes
2. No [SKIP TO SECTION 4]

P5a. [IF P5=1] Participants in your industry typically pledge between *[MINNAICS]* and *[MAXNAICS]* kilowatts in Con Edison's demand response programs. Given your knowledge of your facility, do you feel you would be able to pledge at least *[KWRANDOM]* kilowatts if Con Edison offered a demand response program and the financial incentives were sufficient?

1. Yes [ASSIGN AS *KWRANDOM*] [SKIP to Section 3 & MINNAICS should replace KWRANDOM]
2. No [SKIP TO SECTION 4 IF KWRANDOM=MINNAICS, SKIP TO P5b if KWRANDOM=MEANNAICS]

P5b [IF P5a=2 AND IF *KWRANDOM = MEANNAICS* ASK] Would be able to pledge at least *[MINNAICS]* kilowatts?

i. Yes [ASSIGN AS *KWRANDOM*] [SKIP to Section 3 & MINNAICS should replace KWRANDOM]
ii. No [SKIP TO SECTION 4]

Section 3. Program Description

PROG. Con Edison is considering re-designing their demand response programs and would like your input. Con Edison customers can participate in demand response programs offered both by the New York Independent System Operator (NYISO) and Con Edison. This survey will focus *only* on the programs offered by Con Edison. In particular, Con Edison is interested in understanding what amount of financial incentives is required for participation, and which program features present the greatest barrier to participation.

The next page contains a description of a demand response program and asks about the financial incentives you would require to participate in the program. Con Edison will aggregate the survey results for hundreds of customers to help determine whether it is possible to offer a program that is both cost effective and acceptable to most program participants. Your individual responses will be strictly confidential.

Con Edison understands that its customers will not enroll in a program where the incentive payments are not high enough to adequately compensate them for participating in the program. On the other hand, if it finds that the level of incentive payment required for the targeted level of program participation is too high relative to the energy savings generated (i.e., that the programs are too costly), it may limit the program offering in the future. For this reason, in answering the next series of questions please think carefully about the incentive amount you would truly need to participate in the program.

Here is the first scenario.

Scenario 0: Consider that the demand response program will involve a maximum of 5 events per summer, with each event lasting *[DURATIONRANDOM* – base scenario] hours. Customers will be given *[NOTIFICATIONRANDOM* – base scenario*]* hours of notification in advance of an event. Program incentives include a $1.00 per kilowatt-hour of energy reduced during a demand response event. [IF *PENALTY=1* – "There is a penalty for not reducing energy during events which may reduce your incentive payment. However, historically, the incidence of participants incurring a penalty has been limited."]

1. Assuming you are willing to pledge *[KWRANDOM]* kilowatts, please select the **minimum** monthly incentive ($ per kilowatt per month) that you anticipate you would need to participate in the program.

$3	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$5	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$10	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$15	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$20	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$25	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$30	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
$50	This would mean that by the end of summer your monthly incentives would total between $X and $Y depending on the number of events called.
More than $50	This would mean that by the end of summer your monthly incentives would be at least $X.

Minimum Incentive ($X)	Maximum Incentive ($Y)
$Response x PLEDGEDKW x 5 months	($Response x PLEDGEDKW x 5 months) + ($Response x PLEDGEDKW x Duration x 5 events)

2. You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting [*DURATIONRANDOM* – base scenario] hours with [*NOTIFICATIONRANDOM* – base scenario] hours of notification. If the event duration changed to **[*DURATIONRANDOM* – alternate scenario] hours**, would you
[IF DURATIONRANDOM-BASE > DURATIONRANDOM-ALTERNATE "be willing to accept a lower incentive" OR
IF DURATIONRANDOM-BASE < DURATIONRANDOM-ALTERNATE "need a larger incentive"]
to participate in the program?

    1. Yes
    2. No

    2a. [ASK IF Q2=YES] What is the minimum incentive that you would need?
    $[NUMERIC RESPONSE] per kilowatt per month

    2b. [ASK IF Q2=NO] Please provide a brief explanation of why your incentive would not change. [OPEN END]

3. You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting [*DURATIONRANDOM* – base scenario] hours with [*NOTIFICATIONRANDOM* – base scenario] hours of notification. If the notification time changed to ***[NOTIFICATIONRANDOM* – alternate scenario] hours,** would you
[IF NOTIFICATIONRANDOM-BASE < NOTIFICATIONRANDOM-ALTERNATE "be willing to accept a lower incentive" OR
IF NOTIFICATIONRANDOM-BASE > NOTIFICATIONRANDOM-ALTERNATE "need a larger incentive"] to participate in the program?
    1. Yes
    2. NO

        3a. [ASK IF Q3=YES] What is the incentive that you would need?
        $[NUMERIC RESPONSE] per kilowatt per month

        3b. [ASK IF Q3=NO] You selected a [RESPONSE TO Q1] incentive for the demand response program with events lasting [*DURATIONRANDOM* – base scenario] hours with [*NOTIFICATIONRANDOM* – base scenario] hours of notification. If the notification time changed to ***[NOTIFICATIONRANDOM* – alternate scenario] hours,** please provide a brief explanation of why your incentive would not change. [OPEN END]

4. If you are managing multiple buildings, is the minimum monthly incentive ($ per kW per month) you would need to participate for most of the other buildings similar to the building identified in this survey?
    a. Yes
    b. No
        i. [IF NO] Please provide a brief explanation. [OPEN END]
    c. I do not manage multiple buildings.

[IF *PENALTY=1*]

5. How influential would the risk of incurring a penalty be on your decision to participate in Con Edison's demand response program on a scale of 1 to 5, where 1 means no influence at all and 5 means extremely influential. [RECORD NUMBER 1-5]

Section 4. Technology

TECH. The next questions ask whether your facility, located at [ADDRESS], has technologies that enable demand response, such as an Energy or Building Management System (EMS/BMS) or other control system, battery storage, or on-site generation. Other customers participating in Con Edison's demand response programs have found these technologies useful for meeting their pledged reductions. For example,

- An EMS/BMS or other control system can help to identify which equipment or systems can be turned off or adjusted to participate in a demand response program.
- Battery storage allows participants to store energy when it is most convenient and rely on the storage to respond to demand response events.
- Participants can rely on non-emergency on-site generation to respond to demand response events.

T1. Which of the following technologies, if any, do you have at your facility? Please select all that apply. [PROGRAMMING NOTE: Appear on same page as intro text]

1 Energy or Building Management System
2 Lighting, Process or Other Control System
3 Battery Storage capabilities
4 Non-Emergency On-Site generation
5 Solar Photovoltaics
6 Emergency generation
7 Other. Please Specify. [PROGRAMMING NOTE: Survey should allow multiple entries. Perhaps allow three boxes for "other"]
8 None of the above.

[ASK IF T1=1 or 2] STOR. You indicated that your facility has [PIPE IN T1=1 or 2]

T2. Is the [PIPE IN RESPONSE TO T1 = 1 or 2] currently configured to participate in a demand response program by automatically reducing power use upon receiving a signal?

1. Yes
2. No

98 Don't Know

T3. [ASK IF T1=1 or 2] Approximately how much of your overall energy usage is controlled by the [Q1 response]?

[Numeric Response, range 0-100] **percent**

Answers should not add up to more than 100%:

Error message should be:
Total percent of overall energy usage controlled by EMS/BMS and Lighting, Process or Other Control Systems cannot be greater than 100. If these systems overlap, enter the percent of energy usage where the system is the primary form of control.

[ASK T4-T6] STOR. You indicated that your facility has battery storage capabilities.

T4. What type of battery storage do you have? Please select all that apply.

1. Lithium Ion
2. Lead Acid

97 Other. Please specify [OPEN END]

T5. Approximately [PROGRAMMING NOTE: Programming should show table with technologies identified in Q4] what size is the battery?

[Numeric response] kilowatts [0.1 – 99999999]
[Numeric response] kilowatt-hours

[ASK IF T1=4] T6a. You indicated that you have non-emergency on-site generation at your facility.

T7. What type of generator do you have? Please select all that apply.

a. Diesel, engine
b. Natural gas, engine
c. Other. Please specify [OPEN END]

Approximately what size is your unit(s)? [PROGRAMMING NOTE: Programming should show table with technologies identified in Q7.]
T8.

[Numeric Response] kilowatts [0.1 – 99999999]

[ASK IF T1= 5] You indicated that you have Solar Photovoltaics at your facility.

T9. Approximately what size is your system?

[Numeric Response] kilowatts [0.1 – 99999999]

NO T10

[ASK IF T1= 1, 2, 3, 4, 5, 6]

T11. How influential is having these technologies on your decision to participate in a demand response program on a scale of 0 to 5, where 0 means no influence at all and 5 means extremely influential. [PROGRAMMING NOTE: program so it is singular/plural depending on how many selected. STARTING WITH T11, SHOW "N/A, THIS TECHNOLOGY DOES NOT APPLY TO DEMAND RESPONSE" ALL THE WAY TO THE RIGHT]

[ONLY SHOW APPLICABLE OPTIONS ANSWERED IN T1]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]

5 Solar Photovoltaics	[RECORD NUMBER, 0-5]
6 OTHER	[RECORD NUMBER, 0-5]

T12. Now consider a demand response program with short event durations (e.g., 2 hours). Does having this technology influence your decision to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS ANSWERED IN T1]

1 Energy or Building Management System	[RECORD NUMBER, 0-5]
2 Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3 Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4 Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5 Solar Photovoltaics	[RECORD NUMBER, 0-5]
6 OTHER	[RECORD NUMBER, 0-5]

T13. Now consider the amount of kilowatts you would pledge into the demand response program. Does having this technology influence the kilowatts you would pledge? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

ONLY SHOW APPLICABLE OPTIONS ANSWERED IN T1]

1 Energy or Building Management System	[RECORD NUMBER, 0-5]
2 Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3 Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4 Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5 Solar Photovoltaics	[RECORD NUMBER, 0-5]
6 OTHER	[RECORD NUMBER, 0-5]

T14. Now consider the minimum monthly incentive you would need to participate in the demand response program. Does having this technology influence the minimum monthly incentive you would need to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

ONLY SHOW APPLICABLE OPTIONS ANSWERED IN T1]

Energy or Building Management System	[RECORD NUMBER, 0-5]

Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
Battery Storage Capabilities	[RECORD NUMBER, 0-5]
Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
Solar Photovoltaics	[RECORD NUMBER, 0-5]
OTHER	[RECORD NUMBER, 0-5]

[IF T1=99]

T15. Are you currently shopping for or considering one of these technologies? Please select all that apply.

a. Energy or Building Management System
b. Lighting, Process or Other Control System
c. Battery Storage capabilities
d. Non-Emergency On-Site generation
e. Solar Photovoltaics

99 None of the above.

[LOOP THROUGH T16 FOR EACH RESPONSE TO T15, EXCEPT "7"]

T16. When do you plan on making your purchase decision? [SELECT ONE]

a. In the next 6 months
b. Six months to one year
c. More than 1 year from now

[ASK IF T15 = 1, 2, 3, 4, 5, 6 AND T16 = 1 or 2]

T17. Please rate how influential having this technology would be on your decision to participate in a demand response program on a scale of 0 to 5, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW OPTIONS T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2. THE OPTION SHOULD ONLY BE SHOWN IF IT WAS ANSWERED IN T15 AND IF THAT ANSWER OPTION WAS GIVEN A '1' OR '2' IN T16]

1 Energy or Building Management System	[RECORD NUMBER, 0-5]
2 Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3 Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4 Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5 Solar Photovoltaics	[RECORD NUMBER, 0-5]

T18. Now consider a demand response program with short event durations (e.g., 2 hours). Would having this technology influence your decision to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

T19. Now consider the amount of kilowatts you pledge into the demand response program. Would having this technology influence the kilowatts you pledge? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]
5	Solar Photovoltaics	[RECORD NUMBER, 0-5]

T20. Now consider the minimum monthly incentive you need to participate in the demand response program. Would having this technology influence the minimum monthly incentive you need to participate? Please use the same 0 to 5 scale, where 0 means no influence at all and 5 means extremely influential.

[ONLY SHOW APPLICABLE OPTIONS – T15 = 1, 2, 3, 4, 5 AND T16 = 1 or 2]

1	Energy or Building Management System	[RECORD NUMBER, 0-5]
2	Lighting, Process or Other Control System	[RECORD NUMBER, 0-5]
3	Battery Storage Capabilities	[RECORD NUMBER, 0-5]
4	Non-Emergency On-Site Generation	[RECORD NUMBER, 0-5]

5 Solar Photovoltaics	[RECORD NUMBER, 0-5]

[IF T15=9]

T21. Which of these demand response-enabling technologies are you most interested in purchasing for your firm? Please select all that apply.

a. Energy or Building Management System
b. Lighting, Process or Other Control System
c. Battery Storage capabilities
d. Non-Emergency On-Site generation
e. None of the above.

T22. Lastly, what other comments, if any, do you have regarding the demand response program? (Open-End)

CLOSE

You have now completed the demand response Please click "Next" to submit your answers. We deeply appreciate the time and thoughtful opinions you've shared with us. Thank you very much for participating! [Programming Note: Have customers be directed to the following webpage? http://www.coned.com/energyefficiency/demand_response.asp]

Appendix D Summary of Survey Findings

This Appendix provides a summary of survey responses.

Table D-1. Survey Respondent Characteristics

	Non-Participants	Participants
Approximately what size, in square feet, is the building you occupy or the floors that your business operates on?		
Minimum	100	800
Maximum	2,000,000	8,000,000
Average	156,745	771,923
Approximately how many full-time and part-time employees work in this location?		
Minimum	1	10
Maximum	6,000	4,000
Average	287	1,843
Which of the following most closely corresponds to your organization's normal hours of operation at this location? This would be the period when most employees are present.		
8 hours per day, 5 days per week	68	7
12 hours per day, 5 days per week	20	13
8 hours per day, 7 days per week	18	3
12 hours per day 7 days per week	13	4
24 hours per day 7 days a week	37	6
Have you participated in a demand response program in your current facility located at <address>?		
Yes	74	33
No	82	0

Table D-2. DR-Enabling Technology

	Non-Participants	Participants
The next questions ask whether your facility, located at <address>, has technologies that enable demand response, such as an Energy or Building Management System (EMS/BMS) or other control system, battery storage, or on-site generation.		
BMS/EMS	54	29
Lighting, process or Other Control Systems	28	16
Battery Storage	6	1
Non-Emergency On-Site Generation	4	4
Solar PV	4	1
Emergency On-Site Generation	21	22
Other	4	5
No DR-Enabling Technology	82	1

Table D-3. Is the Control Technology Configured to Participate in DR?

	Non-Participants	Participants
Is the Energy or Building Management System currently configured to participate in a demand response program by automatically reducing power use upon receiving a signal?		
Yes	7	5
No	30	20
Don't Know	17	4
Is the Lighting, Process or other Control System currently configured to participate in a demand response program by automatically reducing power use upon receiving a signal?		
Yes	0	1
No	17	14
Don't Know	11	1

Table D-4. Share of Energy Use Controlled by EMS/BMS or Control System

	Non-Participants	Participants
Approximately how much of your overall energy usage is controlled by the Energy or Building Management System?		
Minimum	5%	10%
Maximum	100%	100%
Average	44%	50%
Approximately how much of your overall energy usage is controlled by the Lighting, Process or other Control System?		
Minimum	<1%	<1%
Maximum	100%	50%
Average	32%	15%

Table D-5. Battery Storage

What type of battery storage do you have?	Non-Participants	Participants
Lithium Ion	4	
Lead Acid	1	
Other	1	1

Table D-6. Size of Battery Storage

	What size is your Lithium Ion battery? (kW)	What size is your Lithium Ion battery? (kWh)	What size is your Lead Acid battery? (kW)	What size is your Lead Acid battery? (kWh)	What size is your battery? (kW)		What size is your battery? (kWh)	
	Non-Participant	Non-Participant	Non-Participant	Non-Participant	Non-Participant	Participants	Non-Participant	Participants
Minimum	1	1	20	24	10	6	10	2
Maximum	15	10	20	24	10	6	10	2
Average	9	4.25	20	42	10	6	10	2

Note: Battery sizes appeared to be reported in watts instead of kilowatts in several cases. The statistics reported in this table are adjusted to reflect sizes in kilowatts.

Table D-7. On-Site Generation

	Non-Participants	Participants
What type of non-emergency on-site generation do you have?		
Diesel	2	2
Natural Gas	3	1
other		1
What type of emergency on-site generation do you have?		
Diesel	16	1
Natural Gas	4	0
other	1	0

Table D-8. Size of On-Site Generation and Solar PV

	Size of Diesel Generator		Size of Natural Gas Generator		Size of "Other" Generator		Size of PV System	
	Non-Participant	Participants	Non-Participant	Participants	Non-Participant	Participants	Non-Participant	Participants
Minimum	25	30	35	1,400	1,000	650	25	54
Maximum	25,000	10,000	22,000	1,400	1,000	650	13,427	54
Average	2,773	2,135	4,000	1,400	1,000	650	3,400	54

Note: While several values are high relative to the typical size of a single generator, customers may have modular units with multiple generators. The statistics presented in this table are presented as reported by respondents.

Table D-9. Influence of Technology, Technology Owners

	How influential is having the technology on your decision to participate in a demand response program?		Now consider a demand response program with short event durations (e.g., 2 hours). Does having the technology influence your decision to participate?		Now consider the amount of kilowatts you would pledge into the demand response program. Does having the technology influence the kilowatts you would pledge?		Now consider the minimum monthly incentive you would need to participate in the demand response program. Does having the technology influence the minimum monthly incentive required?	
Influence Score (0-5) 5 is highest	Non-Participants	Participants	Non-Participants	Participants	Non-Participants	Participants	Non-Participants	Participants
BMS/EMS								
0	4	2	3	1	4	1	4	
1	5	3	5	3	5	3	5	4
2	5	5	7	4	3	6	7	6
3	22	6	19	7	22	4	19	6
4	6	6	10	7	8	6	9	4
5	12	7	10	7	12	9	10	9
Lighting, process or Other Control Systems								
0	3	1	3	1	2		3	
1		4		4		5		6
2	5	1	7	2	3	2	5	2
3	11	3	11	1	13	1	10	2
4	6	4	6	4	5	3	7	2
5	3	3	1	4	5	5	3	4
Battery Storage								
0	1					1	1	1
1					1			
2	1	1	1	1	1		1	
3	2		3				2	

	How influential is having the technology on your decision to participate in a demand response program?		Now consider a demand response program with short event durations (e.g., 2 hours). Does having the technology influence your decision to participate?		Now consider the amount of kilowatts you would pledge into the demand response program. Does having the technology influence the kilowatts you would pledge?		Now consider the minimum monthly incentive you would need to participate in the demand response program. Does having the technology influence the minimum monthly incentive required?	
Influence Score (0-5) 5 is highest	Non-Participants	Participants	Non-Participants	Participants	Non-Participants	Participants	Non-Participants	Participants
4	1		1		3		1	
5	1		1		1		1	
Non-Emergency On-Site Generation								
0								
1								
2	1	1	1	1	1		1	
3		2	1	2		2		2
4	1		1		1		1	
5	2	1	1	1	2	2	2	2
Solar PV								
0		1	1	1	1	1		1
1	1							
2	1		1		1		1	
3	2		2		2		2	
4								
5							1	

Table D-10. Interest in DR-Enabling Technology

	Are you currently shopping for or considering one of these technologies?		Which of these demand response-enabling technologies are you most interested in purchasing for your firm?	
	Non-Participant	Participant	Non-Participant	Participant
BMS/EMS	11		10	1
Lighting, process or Other Control Systems	13		14	1
Battery Storage	1		4	
Non-Emergency On-Site Generation	13		3	
Solar PV	6			

Table D-11. Timing of Purchase Decision

	When do you plan on making your BMS/EMS purchase decision?	When do you plan on making your Lighting, Process or Other Control System purchase decision?	When do you plan on making your Battery Storage purchase decision?	When do you plan on making your Non-Emergency On-Site Generation purchase decision?	When do you plan on making your Solar PV purchase decision?
In the next 6 months	3	4	1	1	2
Six months to one year	4	5		3	2
More than 1 year from now	4	4		3	2

Table D-12. Influence of Technology, Do not Own Technology

	How influential would having the technology be on your decision to participate in a demand response program?	Now consider a demand response program with short event durations (e.g., 2 hours). Would having the technology influence your decision to participate?	Now consider the amount of kilowatts you would pledge into the demand response program. Would having the technology influence the kilowatts you would pledge?	Now consider the minimum monthly incentive you would need to participate in the demand response program. Would having the technology influence the minimum monthly incentive required?
Influence Score (0-5) 5 is highest	Non-Participants	Non-Participants	Non-Participants	Non-Participants
BMS/EMS				
0				
1	3	2		
2	1	1	4	4
3		2		
4	1	1		1
5	2	1	3	2
Lighting, process or Other Control Systems				
0				
1	3	3	3	4
2		2	1	1
3	2			
4	2	2	1	3
5	2	2	4	1
Battery Storage				
0				
1				
2				
3				

	How influential would having the technology be on your decision to participate in a demand response program?	Now consider a demand response program with short event durations (e.g., 2 hours). Would having the technology influence your decision to participate?	Now consider the amount of kilowatts you would pledge into the demand response program. Would having the technology influence the kilowatts you would pledge?	Now consider the minimum monthly incentive you would need to participate in the demand response program. Would having the technology influence the minimum monthly incentive required?
4				
5	1	1	1	1
Non-Emergency On-Site Generation				
0				
1	2	1	1	1
2		1		1
3				
4				
5	2	2	3	2
Solar PV				
0				
1	1	1	1	1
2				1
3				
4	1	1	1	1
5	2	2	2	1