Santee Cooper Demand Response Market Potential Study

Submitted to Santee Cooper

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Contents

1. Executive Summary

Santee Cooper retained Resource Innovations to determine the potential demand savings that could be achieved by demand response (DR) programs within Santee Cooper retail service territory. The main objective of the study is to estimate the quantity and source of demand savings potential. Santee Cooper can use the results of this study to develop DR program offers for 2023 through 2042.

This report describes our overall scope of work, the methods we employed in the study, baseline conditions in the Santee Cooper retail service territory, and details around achievable DR potential estimates. Wherever possible, we include figures and tables to describe methods, baseline conditions, or to summarize our results.

1.1. Methodology

Resource Innovations staff developed these estimates using models, tools, and techniques developed over dozens of client engagements for DR resource planning. Our models and platforms provide the ability to examine multiple scenarios by changing inputs related to load forecasts, electricity prices, program incentives, and historic program savings, where applicable. Resource Innovations used data provided by Santee Cooper and supplementary sources to identify potential DR load reductions by customer class and end use.

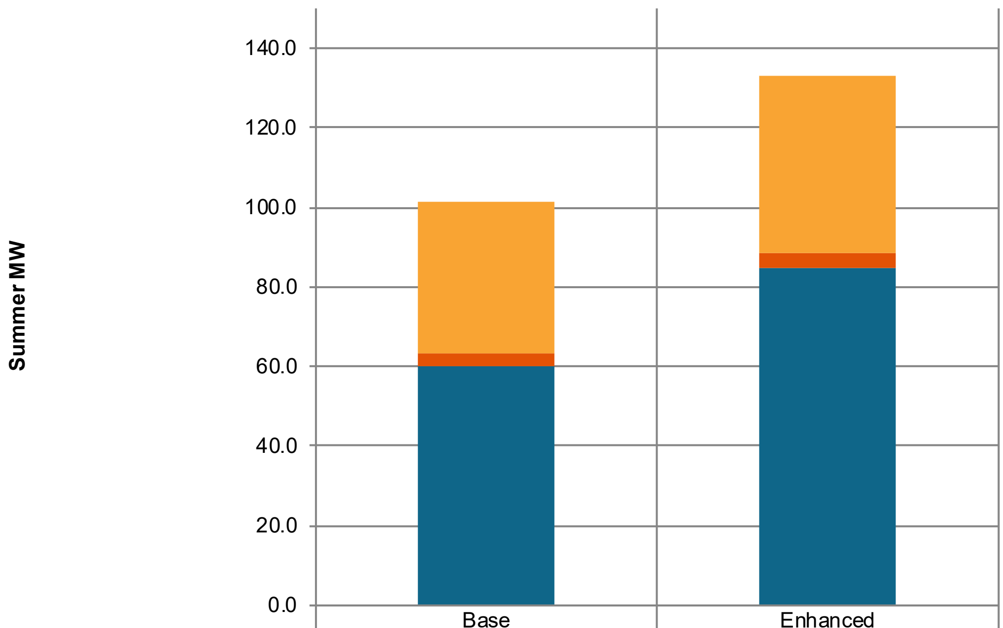
We aggregated measure impacts for the technical, economic, and achievable scenarios according to scenario criteria such as load coincidence, utility avoided costs, and hypothetical DR offers. Following regulatory and stakeholder direction, we estimated economic potential by applying the Utility Cost Test (UCT) to weigh DR costs against their estimated benefits, the latter of which were provided to us by Santee Cooper. We therefore describe our estimates of achievable potential as expected DR potential in a market featuring utility-sponsored programs and incentives; the estimates assume that adaptive program management is applied to lower market and non-market barriers to customer adoption over time. It must be stated that the magnitude and degree of influence market barriers have on customer adoption is not currently known, and future research in the service territory on this topic may identify refinements to these assumptions.

1.2. Demand Response Potential

Our analysis describes DR opportunities for the Santee Cooper retail service territory in terms of summer and winter peak capacity reductions delivered through utility-sponsored DR initiatives from a technical, economic, and achievable potential perspective. While technical and economic potential are theoretical upper limits, participation rates are calculated as a function of the incentives offered to each customer group. For a given incentive level and avoided cost, the cost-effectiveness of each customer segment and/or end use is evaluated to determine whether the aggregate DR potential from that segment should be included in the achievable potential. Two scenarios, Base and Enhanced, were constructed for the DR potential analysis. The Base Scenario assumes an increase in DR scope from current Santee Cooper offerings that focuses on specific end-uses, while the Enhanced Scenario assumes more aggressive expansion to include additional end uses, higher incentives, and more intensive marketing[1]. A detailed description of the scenarios is provided in Section 5.1.4.

Figure 1-1 and Figure 1-2 summarize the summer peak and winter peak DR potential estimated for Santee Cooper under two achievable scenarios analyzed in the study: a base case and an enhanced case.

Figure 1-1 Santee Cooper DR Summer Peak Capacity Achievable Potential



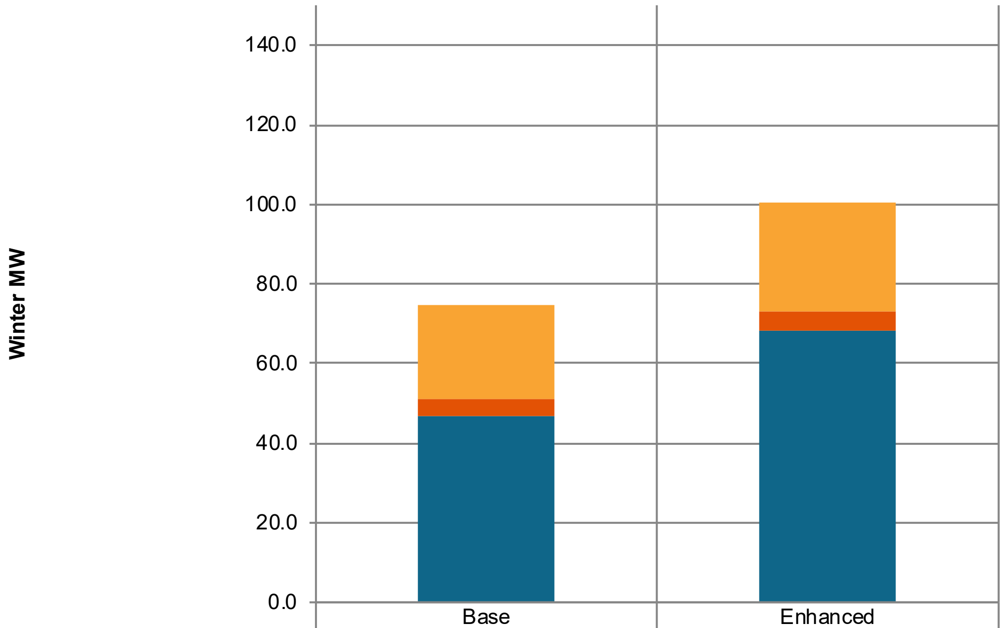
	Base	Enhanced
Large C&I	38.1	44.4
Small and Medium Business	2.9	3.4
Residential	60.3	85.0

The estimated summer peak capacity is 101.3 megawatts for the base case, and the enhanced case shows expected increases to 132.8 megawatts from increasing program incentive offers over the levels presented in the base case.

[1] Santee Cooper's IRP utilizes three DR scenarios: low, medium, and high. The IRP medium scenario corresponds with the base case in this study. The IRP high scenario corresponds with the enhanced case in this study. The IRP low scenario is aligned with Santee Cooper's current DR program goals and is therefore not included in this study.

We estimate base case winter DR capacity totals 74.4 megawatts, with increased program incentives yielding 100.3 megawatts for the enhanced case.

Figure 1-2 Santee Cooper DR Winter Peak Capacity Achievable Potential



	Base	Enhanced
Large C&I	23.5	27.4
Small and Medium Business	3.9	4.7
Residential	47.0	68.2

2. Introduction

This section describes the objectives and deliverables that RI generated to provide Santee Cooper with a Demand Response Market Potential Study. Section 2.1 describes the goals and study output, while Section 2.2 presents an overview and background of market potential studies.

2.1. Objectives and Deliverables

Santee Cooper retained Resource Innovations, Inc. to determine the potential demand savings that could be achieved by DR programs in the Santee Cooper retail service territory. The main objectives of the study include:

- Estimating the potential demand savings for Santee Cooper residential and commercial customers
- Developing scenarios that demonstrate the sensitivity of estimates to changes in hypothetical program offers, primarily through increased customer incentives for enrollment and ongoing participation

2.2. Methodology

Market potential studies involve a number of analytical steps to produce estimates of each type of demand savings potential: technical, economic, and achievable. A market potential study is an assessment of current market conditions and trends, as indicated by available primary and secondary data.

Technical Potential is the theoretical maximum coincident load that could be available for DR, regardless of cost and other barriers that may prevent the installation or adoption of an energy efficiency measure. Technical potential is only constrained by customer weather responsiveness or system coincidence. Economic Potential is the capacity of reductions that are estimated to be cost-effective for the utility to pursue through utility-sponsored programs or other enablers. The Utility Cost Test (UCT) perspective is used for cost-effectiveness screening in this study which is in keeping with jurisdictional requirements. Achievable Potential is the energy savings that can feasibly be achieved in the market with consideration given to market barriers and the influence of incentive levels on adoption rates.

The quantification of these three levels of demand savings potential is an iterative process reflecting assumptions on cost effectiveness that refine these opportunities from the theoretical maximum to realistic savings potential in a market with utility-sponsored programs.

3. Market Characterization

3.1. Customer Segmentation

Customer segmentation identifies the opportunities and addresses the business need to deliver cost-effective DR programs. Significant cost efficiency can be achieved through strategic DR program designs that recognize and address the similarities of DR potential that exists within each customer group. RI segmented Santee Cooper customers according to the following:

- By Economic Sector – how much of the Santee Cooper's summer peak, and winter peak load forecast is attributable to retail customers in the residential and commercial economic sectors?
- By Customer Segment – how much electricity does each customer type consume annually and during system peaking conditions?
- By End Use – within a home or business, what equipment is using electricity during periods of peak demand?

Table 3-1 summarizes the segmentation within each sector. Residential customer segments were further segmented by the heating fuel type ('H' or other) and by annual consumption bracket within each sub-segment (resulting in six groups) for the DR analysis. Based on data from Santee Cooper, the "H" heating type is assumed to include customers that use electric heat pumps for space heating, whereas the "other heating" category covers all other types of customer equipment. The goal of this segmentation was to understand which customer groups were most cost-effective to recruit and allow for more targeted marketing of DR programs.

Table 3-1: Customer Segments and Sub-Sectors

Residential	Commercial
"H" Heating	Santee Cooper GA rate
Other Heating	Santee Cooper GB rate
	Other

For the DR assessment, the end uses targeted were those with controllable, coincident load for residential and small commercial customers. For large commercial customers who would potentially shed larger loads for a limited time, all load during peak hours was included. For residential customers, space cooling and heating loads, pool pumps, and electric water heaters were studied. For small/medium business customers, the analysis was limited to space cooling and heating loads. The following two sections describe the segmentation analysis and results for commercial (Section 3.1.1) and residential accounts (Section 3.1.2).

3.1.1. Commercial Accounts

For the DR analysis, RI divided the non-residential customers into the two customer classes of "Small/Medium Business" (SMB) and "Large Commercial" (LC) based on monthly demand. For the purposes of this analysis, Large Commercial included customers with at least three occurrences of a monthly peak demand exceeding 300 kW. Small/Medium Business customers were made up of remaining commercial accounts not included in the Large Commercial group. We applied these filters to Santee Cooper interval meter data covering the period August 2021 to August 2022 and got the following results.

Table 3-2: Customer Segments and Sub-Sectors

Number of SMB Accounts	Number of LC Accounts
19,005	166

3.1.2. Residential Accounts

Segmentation of residential customer accounts enabled RI to align DR opportunities with utility capacity needs and avoided costs. The DR assessment required the use of interval data to estimate the loads associated with space cooling and space heating. Resource Innovations used NREL's recent RESSTOCK end use profiles for Horry County, SC.

The residential sector was segmented into three equal sized bins based on annual consumption. Within each of these customer segments, heating and cooling load reductions were estimated. The residential customer segments were further segmented according to space heat fuel source ('H' and "other") producing a total of six residential customer segments. For H heating, each bin contains 44,693 account; whereas, for other heating, each bin contains 9,154 accounts. Cooling loads for 'H' and 'other' heating customers were assumed to be identical for each of the corresponding consumption bins, as cooling loads for central air conditioners and heat pumps are comparable.

Table 3-3: Summary of Residential Segments

Customer Segment	First Tertile	Second Tertile	Third Tertile	Total
"H" Heating	44,693	44,693	44,693	134,079
Other Heating	9,154	9,154	9,154	27,462

3.2. Forecast Disaggregation

Although the primary focus of the DR potential study was the peak load forecasts, the accuracy of the demand impacts is enhanced by a detailed approach to peak load disaggregation.

Additionally, a common understanding of the assumptions and granularity in the baseline peak load forecast was developed with input from Santee Cooper. Key discussion topics reviewed with Santee Cooper included:

- How are Santee Cooper's current program offerings reflected in the demand forecast?
- What are the assumed weather conditions and hour(s) of the day when the system is projected to peak?

3.2.1. Peak Demand (kW) Forecast

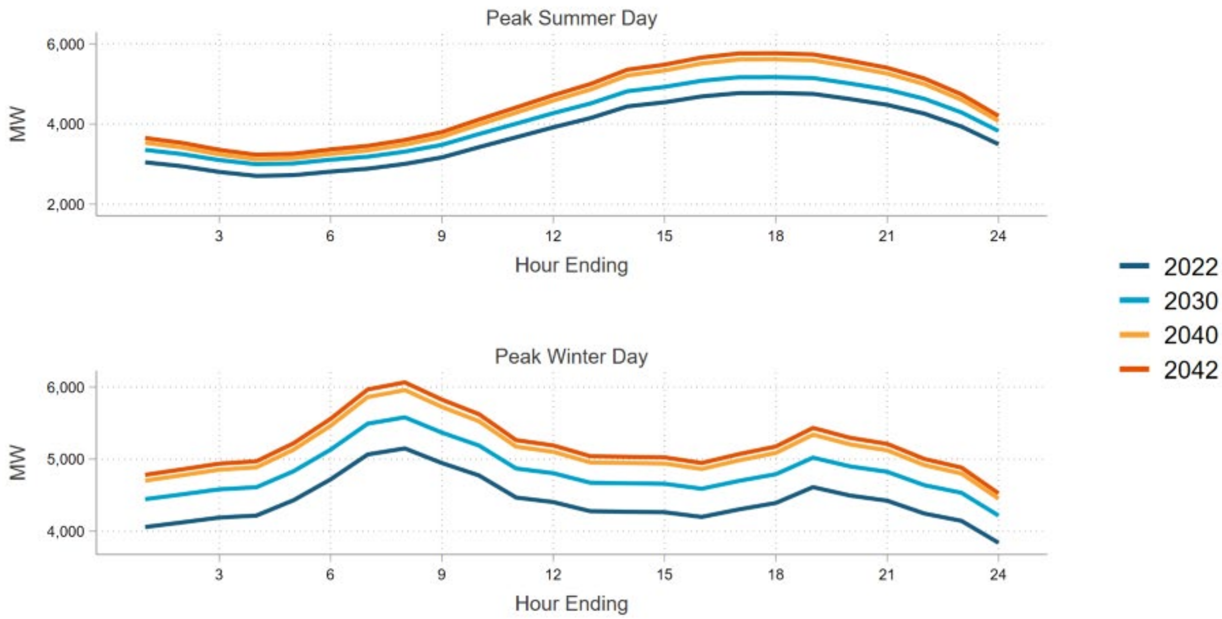
A fundamental component of DR potential was establishing a baseline forecast of what loads or operational requirements would be, absent any dispatchable DR. This baseline was necessary to assess how DR can assist in meeting specific planning and operational requirements. RI used Santee Cooper's summer and winter peak demand forecast, which was developed for system planning purposes.

3.3. Santee Cooper System Demand 2023 - 2042

Estimating technical potential for demand response resources requires knowing how much load is available to be curtailed or shifted during system peak demand conditions. Demand response benefits accrue from avoiding costly investments to meet peak loads; load reductions will not have any value unless they occur during hours of peak system usage. Market potential for demand response is based on when load reductions will most likely be needed throughout the year.

The primary data source used to determine when demand response resources will be needed was the Santee Cooper system load forecast. This forecast contains forecasted loads for all 8,760 hours of each year in the study period (2023-2042). Figure 3-1 represents an initial inspection of the data. Each figure shows the expected average load profiles for two distinct types of days: peak summer days and peak winter days. Summer was defined as June-September and winter as November-February, while the peak days refer to the day with the maximum demand during the year and season.

Figure 3-1 Santee Cooper System Load Forecast by Year (2022, 2030, 2040 and 2042)



Several patterns are apparent from examining the figure above. First and foremost, forecasted loads shapes are relatively unchanged over time as the total magnitude of projected load increases. Winter peak loads are higher than summer peak loads. The peak hour in summer is typically hour-ending 17:00 and the peak hour in winter is hour-ending. This potential study therefore focuses on the current summer peak hour, 17:00, and the current winter peak hour, 08:00.

Though useful for assessing patterns in system loads, Figure 3-1 does not provide very much information about the concentration of peak loads. A useful tool to examine peak load concentration is a load duration curve, which is presented for 2022, and 2042 in Figure 3-2 and Figure 3-3 respectively. This curve shows the top 10% of hourly loads as a percentage of the system's peak hourly usage, sorted from highest to lowest.

Figure 3-2 Santee Cooper Forecasted Load Duration Curve for 2022

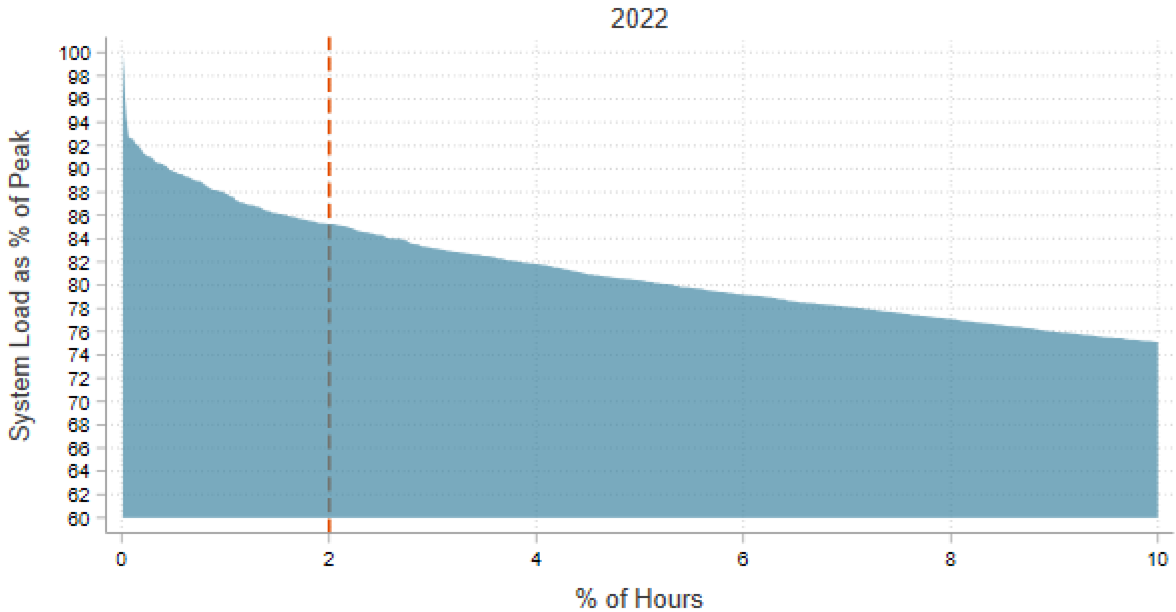
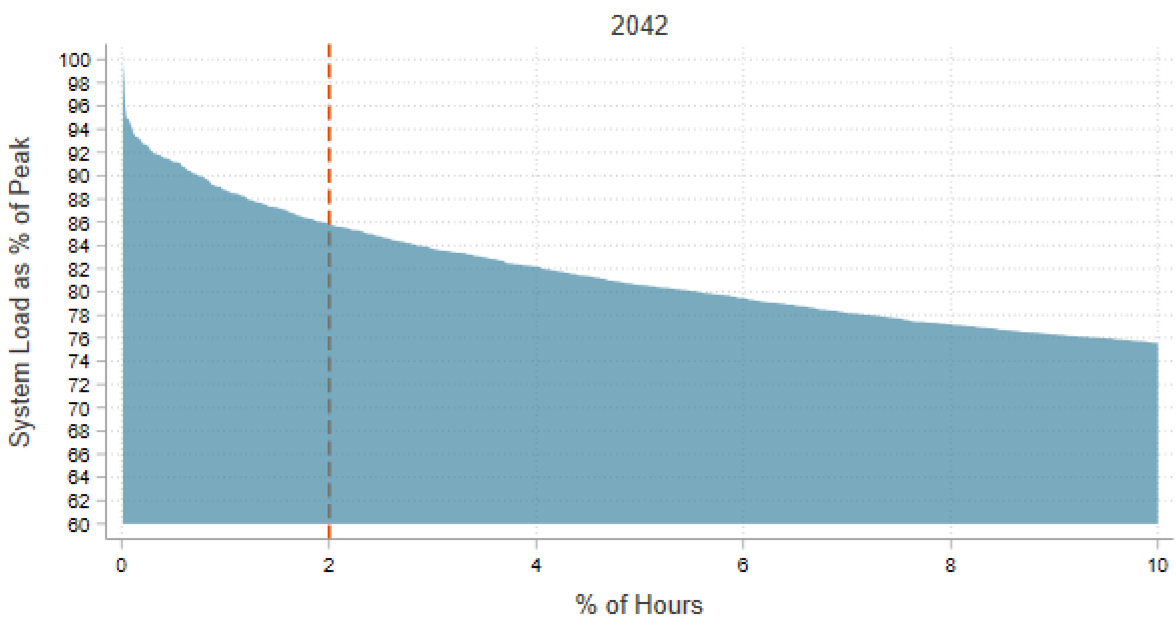


Figure 3-3 Santee Cooper Forecasted Load Duration Curve for 2042

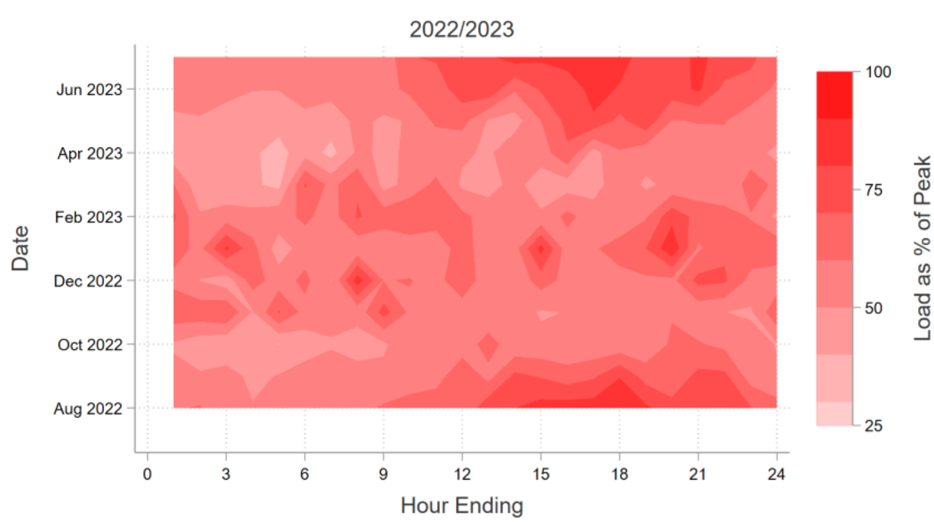


The x-axis in Figure 3-2 and Figure 3-3 is depicted as the cumulative percentage of hours. The red dotted line drawn at 2% serves as a helpful reference point for interpretation by showing the amount of peak capacity needed to serve the 2% of hours with the highest usage.[2] The Santee Cooper system currently uses 15% of peak capacity to serve only 2% of hours, and is projected to use around 16% of peak capacity to serve 2% of hours by 2042. This means that overall Santee Cooper's peak is expected to remain the same or become slightly less concentrated over time.

Another valuable tool for studying peak loads is a contour plot. Often referred to as "heat maps", these plots show frequencies or intensities of a particular variable for different combinations of two other variables. Figure 3-3 and Figure 3-4 contains the same hourly data as a percentage of peak system load that is presented in Figure 3-2; however, it shows the months and hours when each hourly load occurs for all hours instead of only the top 10% of hours.

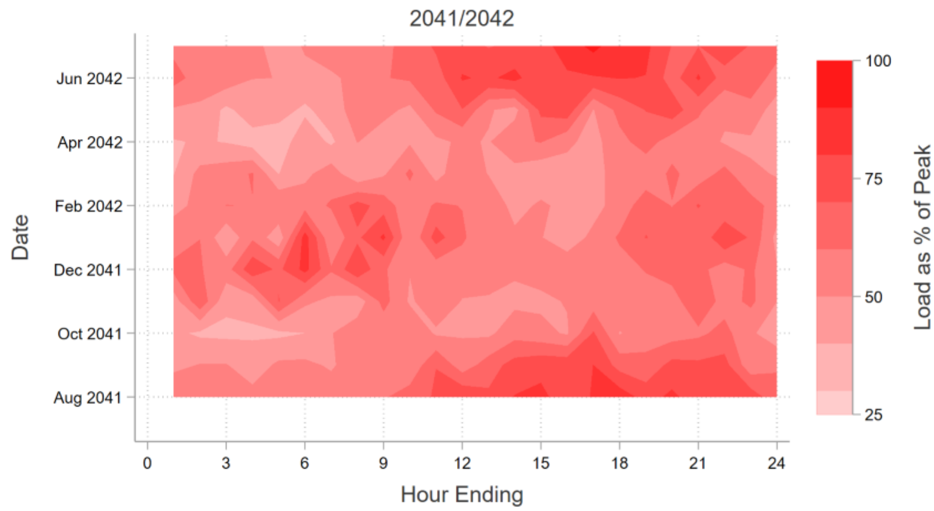
The results in Figure 3-3 and Figure 3-4 show the highest hours of usage are concentrated in winter morning hours and summer evening hours. Actual weather patterns reflect year to year variation in loads and, depending on the extreme temperatures for a year, summer peaks can still be of concern. This is especially true due to the sustained nature of summer peaking conditions, whereas the winter peaking conditions are more acute, even though they are not as widespread. Another consideration is market prices, which can be high in winter if natural gas is used both for heating and electricity generation.

Figure 3-4 Forecasted Patterns in Santee Cooper System Load for Years 2022-2023



[2] Another interpretation of the load duration curve data would be the amount that peak load capacity could be reduced by shaving demand during 2% of the hours throughout the year.

Figure 3-5 Forecasted Patterns in Santee Cooper System Load for Years 2041-2042



4. DR Services and Products

RI and Santee Cooper worked together to determine which DR products and services were included in the MPS, and addressed the following:

- **Direct load control.** Customers receive incentive payments for allowing the utility a degree of control over equipment, such as air conditioners or water heaters. This includes both switch-based programs and smart thermostat programs.
- **Emergency load response.** Customers receive payments for committing to reduce load if called upon to do so by the grid operator.
- **Base interruptible DR**. Customers receive a discounted rate for agreeing to reduce load to a firm service level upon request.
- **Automated DR**. Utility dispatched control of specific end-uses at customer facilities.

5. Achievable Market Potential

5.1. DR Achievable Potential Methodology

5.1.1. Estimation of Participation Rates for DR Programs

Achievable potential takes into account the estimated participation rate and how that affects the overall cost-effectiveness of the customer segment. The magnitude of DR resources that can be acquired is fundamentally the result of customer preferences, program or offer characteristics (including incentive levels), and how programs are marketed. How predisposed are specific customers to participate in DR? What are the details of specific offers and how do they influence enrollment rates? What is the level of marketing intensity and what marketing tactics are employed?

For program-based DR, participation rates are calculated as a function of the incentives offered to each customer group. For a given incentive level and participation rate, the cost-effectiveness of each customer segment is evaluated to determine whether the aggregate DR potential from that segment should be included in the achievable potential. The following subsections describe how marketing/incentive level, participation rates, and technology costs are handled by this study.

5.1.2. Marketing and Incentive Levels for Programs

Several underlying assumptions are used to define three different marketing levels. The number of marketing attempts and the method of outreach are varied by marketing level, as described in Table 5-1. The enhanced case assumes a high marketing level for program-based DR, while the base case assumes a medium marketing level (the low marketing level was not utilized for this study). Within each marketing level, the participation rate for each customer segment is a function of the incentive level.

The specific tactics included in the low, medium, and high marketing scenarios are not prescriptive but are instead designed to provide concrete details about the assumptions used in the study. There is a wide range of strategies and tactics that can attain the same enrollment levels and the best approach for a jurisdiction is best developed through testing and optimizing the mix of marketing tactics and incentives.

Table 5-1: Marketing Inputs for Residential Program Enrollment Model

Input	Marketing Level			
	No Marketing	Low	Medium	High
Number of marketing attempts (Direct mail)	0	5	5	8
Outreach mode	No marketing	Direct Mail	DM + Phone	DM + Phone
Installation required (%)	0%	100%	100%	100%
Attrition Rate	7.5%	7.5%	7.5%	7.5%

The incentive level and marketing inputs for each scenario determine the participation rate, assuming that the incentive is uniform across all customer segments within a given customer class.

5.1.3. Participation Rates

The participation models for the residential and non-residential customer segments use a bottom up approach to estimate participation rates. These estimates have been crosschecked with mature programs in other jurisdictions to ensure that the estimated participation rates are reasonable.

Many DR potential studies rely on top down approaches which benchmark programs against enrollment rates that have been attained by mature programs. However, aggregated program results often do not provide enough detail to calibrate achievable program potential. In many cases, programs are not marketed to all customers, either because it is not cost-effective to market to all customers or due to budget constraints. Enrollment rates are a function of specific offers; they also vary based on the degree to which DR resources are utilized and tend to be higher when payments are high but actual events are infrequent, particularly among large C&I customers.

For residential customers, the RI approach to estimate participation rates involves five steps:

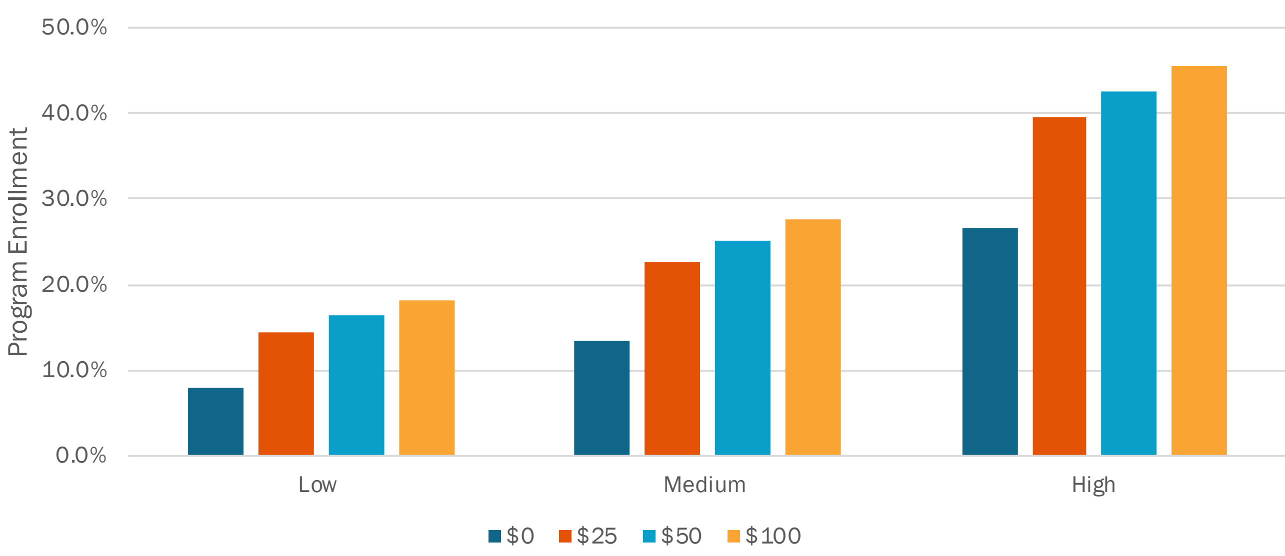
- Apply results from an econometric choice model of who has and has not enrolled in DR programs. The goal is to estimate the pre-disposition or propensity of different customers to participate in DR based on their characteristics. Because micro-level acquisition marketing data were not available, we relied on differences in participation rates by usage level and electric heating. This information is based on prior micro-level analysis of program participation by RI and supplemented by outbound acquisition marketing that RI implements for load control programs.
- Incorporate information about how different offer characteristics influence enrollment likelihood. What is the incremental effect of incentives? How do requirements for on-site installation affect enrollment rates? The two questions above have been analyzed using mature market specific data for residential customers. In each case, regression coefficients describe the incremental effect of each of the above factors on participation rates. It is important to note that while this element of the participation model was derived using non-

Santee Cooper specific data, it is only being used to determine the incremental impact of additional incentives on participation (i.e., how does increasing the sign-up incentive increase participation in DR programs). The underlying assumption is that customers' response to incremental financial incentives is similar across various geographic regions. Finally, as will be described in subsequent steps, the final participation model is calibrated to reflect the Santee Cooper territory.

- Incorporate information about how marketing tactics and intensity of marketing influence participation rates. What is the effect of incremental acquisition attempts? Is there a bump in enrollment rates when phone and/or door-to-door recruitment is added to direct mail recruitment? This relies on data from side-by-side testing designed to explicitly quantify the effect of marketing tactics on enrollment rates.
- Calibrate the models to reflect actual enrollment rates attained with mature programs. To calibrate the models, the constant is adjusted so that the model produces exactly the enrollment rates observed by mature programs used for benchmarking.
- Predict participation rates using specific tactics and incentive levels for programs with and without installation requirements. The enrollment estimates were produced for low, medium, and high marketing levels, where specific marketing tactics are specified for each scenario. All estimates reflect enrollment rates for eligible customers.

As a demonstration of how marketing level and incentive affects participation in DR programs, Figure 5-1 shows the range of participation rates for each marketing level for a given residential customer segment at several different incentive levels.

Figure 5-1: Program Enrollment for Residential Customer Segments Under Different Marketing and Incentive Levels



For SMB customers, a similar approach was used to estimate participation levels. However, these customers tend to have lower enrollments than larger commercial customers and were scaled accordingly. SMB customers tend to exhibit roughly 40% of the uptake of residential customers, based on data from other utilities, which have extensively marketed these programs.

For large commercial customers, enrollment levels were predicted as a function of load rather than the number of customers, since large customers tend to have relatively high participation rates and commit to relatively large demand reductions on a percentage basis. For these customers, publicly available data on DR programs offered by other utilities were used to model program participation rates. Participation data were combined with data from the utilities on customer size and industry to generate a breakdown of participation rates, which is summarized in Table 5-2.

Table 5-2: Large Nonresidential Participation Rates by Size and Industry

Industry	Annual Max Demand (Non-coincident)				Total
	100kW-300kW*	300-500kW	500kW-1MW	1MW or more	
Agriculture, Mining & Construction	19.8%	43.2%	57.9%	60.7%	**44.6%**
Manufacturing	24.2%	44.8%	52.3%	74.0%	**64.6%**
Wholesale, Transport & Other Utilities	27.9%	50.1%	55.7%	60.8%	**49.7%**
Retail Stores	28.1%	53.0%	53.8%	48.0%	**42.7%**
Offices, Hotels, Finance, Services	13.0%	26.9%	34.3%	40.2%	**30.0%**
Schools	15.0%	30.5%	40.3%	52.5%	**35.7%**
Institutional/Government	13.7%	34.1%	42.8%	62.3%	**40.4%**
Other or Unknown	9.4%	25.3%	29.6%	29.5%	**18.6%**
Total	**19.7%**	**40.8%**	**45.6%**	**60.8%**	**45.4%**

These programs have been marketed to every large non-residential customer in a mature market, which reflect a saturated market and a good representation of the total potential. For each large commercial customer segment, participation was estimated as a function of incentive level and number of dispatch hours, based on publicly available information on program capacity, dispatch events, and incentive budgets.

5.1.4. Scenario Analysis

Base and Enhanced scenarios were constructed for the DR potential analysis[3]. The Base Scenario assumes an increase in DR scope from current Santee Cooper offerings, which is currently comprised of a program for residential direct load control. The Enhanced Scenario assumes more aggressive expansion. Major assumptions for both scenarios are listed below:

[3] Santee Cooper's IRP utilizes three DR scenarios: low, medium, and high. The IRP medium scenario corresponds with the base case in this study. The IRP high scenario corresponds with the enhanced case in this study. The IRP low scenario is aligned with Santee Cooper's current DR program goals and is therefore not included in this study.

Program Potential - Base

- DR offerings will target Residential, SMB, and Large Commercial customers
- Assume residential load control will only target AC/heating loads and water heating
- Offer incentives for smart thermostats and incentives with installation of switches for electric water heaters
- Offer incentives to large commercial customers for temporary curtailment
- Medium marketing level for DR programs
- Target only customer segments who are cost-effective on their own

Program Potential - Enhanced

- DR offerings will target Residential, SMB, and Large Commercial customers
- 50% higher incentives for residential and commercial DR programs compared to Base scenario
- Target pool pumps in addition to AC/heating and water heating for residential customers
- Aggressively increase program marketing and outreach budgets (high marketing level)
- Target all customer segments that can be included without making the program cost-prohibitive (UCT<1.0)

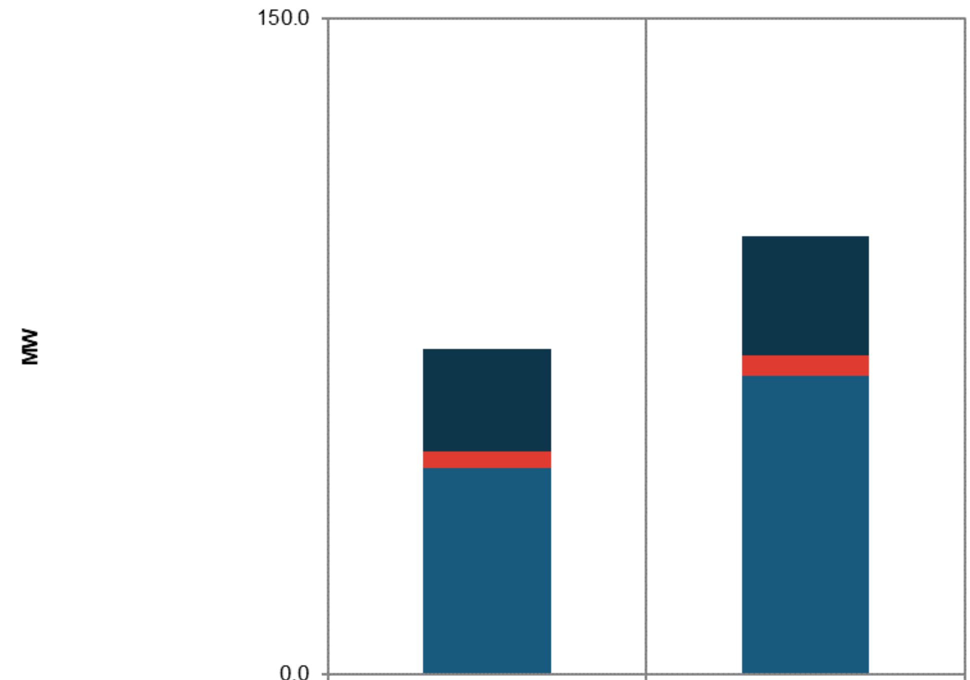
5.2. DR Achievable Potential

This section presents the estimated overall achievable market potential for the base and enhanced scenarios. The results are provided separately for summer and winter peaking capacity. The results are further broken down by customer segment and presented in the form of supply curves. All results presented reflect the projected achievable DR potential by 2042.

5.2.1. Winter Peaking Capacity

Figure 5-2 presents the overall winter peak capacity results for both scenarios, broken down by sector. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity is 74 MW in the Base Scenario and 100 MW in the Enhanced Scenario. This equates to 7.9% of Santee Cooper's winter peak distribution load in the Base Scenario and 10.7% of the winter peak distribution in the Enhanced Scenario.

Figure 5-2 Santee Cooper DR Winter Peak Capacity Achievable Potential

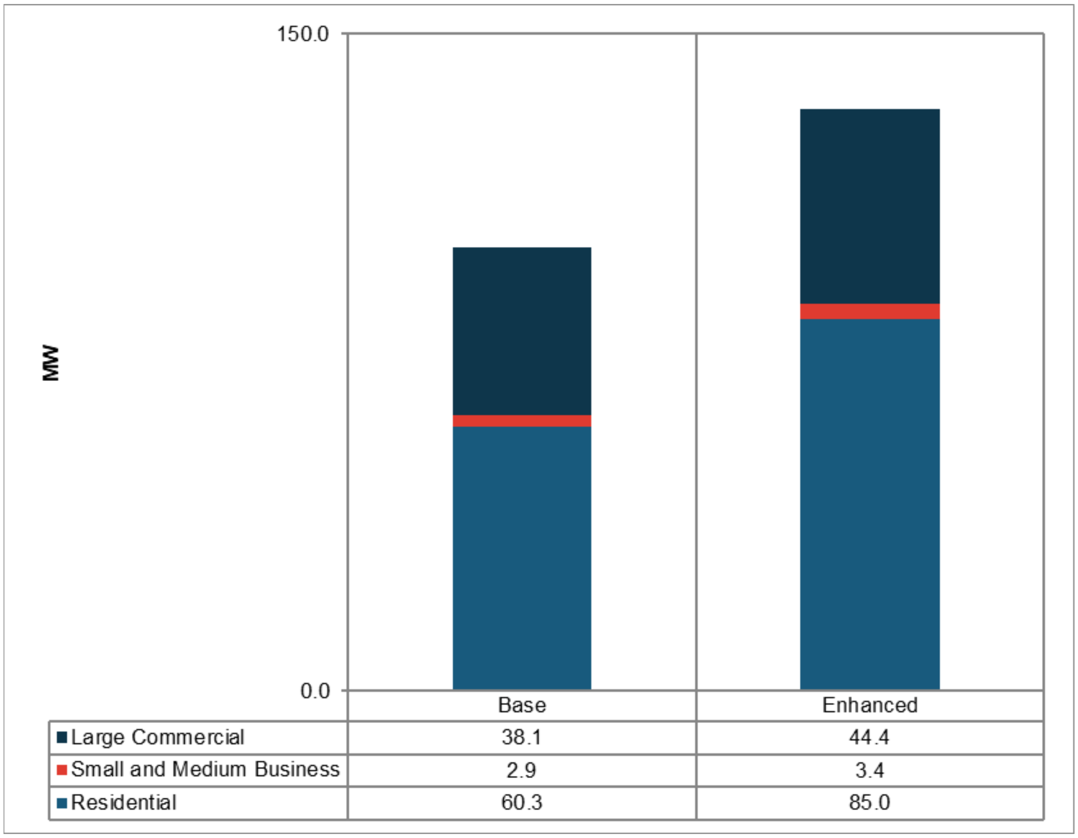


	Base	Enhanced
Large Commercial	23.5	27.4
Small and Medium Business	3.9	4.7
Residential	47.0	68.2

5.2.2. Summer Peaking Capacity

Figure 5-3 presents the overall summer peak capacity results for both scenarios, broken down by sector. The capacity is what is expected to be available during the peak hour of system demand. Overall, the estimated magnitude of peak capacity reduction comes out to 101 MW in the Base Scenario and 133 MW reduction in the Enhanced Scenario. This equates to 10.9% of Santee Cooper's distribution peak load in the Base Scenario and 14.3% in the Enhanced Scenario. Most of the peak capacity potential comes from the residential and SMB customers. Variation in the peak capacity between the two scenarios can be attributed to differences in incentive levels, the degree of marketing, and technology cost forecasts.

Figure 5-3 Santee Cooper DR Summer Peak Capacity Achievable Potential



Because the achievable potential is driven by marketing intensity, incentive levels, and technology costs, non-linear changes in participation level are possible as seen in the program participation results in Table 5-3 when comparing the Base and Enhanced cases. Note that this table shows the overall participation rate for winter DR events for each sector.

Table 5-3 Santee Cooper DR Program Participation Rates by Scenario and Customer Class

Customer Class	Base	Enhanced	Units
Residential Electric Heating	24.1%	43.0%	% of Customers
SMB	28.9%	32.2%	% of Customers
Large Commercial	57.5%	66.0%	% of Load

5.2.3. Segment specific results

A total of 12 different customer segments were individually analyzed. This includes 3 segments each for 'H' heating and 'other' heating residential customers (6), 3 rate classes for SMB customers, and 3 rate classes for Large Commercial customers. The 3 rate classes included in the commercial analysis are GA, GB, and "Other". The GA rate class is Santee Cooper's General Service Rate Class, the GB rate class is Santee Cooper's General Service Demand Rate Class, and "Other" captures all other commercial rate classes that Santee Cooper offers. "Other" customers were classified as a group because they collectively make up a small portion of Santee Cooper's commercial accounts. This section presents the segment-level results, focusing on the customer segments that are most attractive to pursue, allowing for prioritization and targeted marketing of those customer segments.

These results are fairly similar across the two scenarios that were studied, with the main difference being the magnitude of the overall resources being larger for the Enhanced Scenario due to higher participation rates across all sectors and the inclusion of additional residential end uses dramatically increasing the residential DR capacity. For the sake of simplicity, only the results for the Base Scenario are presented in this section. Table 5-4 shows the cost/benefit details for residential customer segments. All of the customer segments are cost-effective under the base case assumptions to pursue for winter DR enrollment. Residential customers who rank in the top tertile (to 33%) of consumption provide the greatest benefit/cost ratio. This is not surprising since they tend to have the greatest load available for load reduction, making it possible to enroll significant capacity per marginal dollar spent on acquisition marketing, equipment, and installation costs. Also, since the Base Scenario does not consider pool pumps, there is not much incremental DR capacity. Inclusion of pool pumps in the Enhanced Scenario provides 27.7 MW of summer capacity.

For the SMB sector, the GA rate class customers offer the most net benefit, followed by GB and other. The participation rate presented here represents the percentage of the overall peak period load from each customer segment that would be available for curtailment if DR programs are properly incentivized and marketed. They reflect a saturated market (i.e., all customers are properly informed of the program and given the opportunity to enroll). Table 5-5, Table 5-6 and Table 5-7 show the segment specific achievable potential results for each non-residential sector.

Table 5-4: Santee Cooper Residential Segment Specific Achievable Potential

Segmentation	Residential				Summer				Winter				
	Usage bin	# of accounts	Participation	Total Cost	Agg. MW	NPV of Avoided Gen Capacity Benefits ($/kW)	NPV of Avoided Dist Capacity Benefits ($/kW)	Total Benefit	Agg. MW	NPV of Avoided Gen Capacity Benefits ($/kW)	NPV of Avoided Dist Capacity Benefits ($/kW)	Total Benefit	Total Aggregate Net Benefit
"H" Heating	1	44,693	23.55%	$4,915,430	12	$37.77	$25.76	$316,914	9	$717.71	$489.43	$10,545,289	$5,946,774
	2	44,693	21.71%	$4,530,615	12	$37.77	$25.76	$314,250	13	$717.71	$489.43	$16,264,757	$12,048,392
	3	44,693	26.04%	$5,433,490	20	$37.77	$25.76	$512,662	25	$717.71	$489.43	$29,959,172	$25,038,344
"Other" Heating	1	9,154	29.21%	Usage Bin 1 Deemed Not Cost Effective									
	2	9,154	23.15%	Usage Bin 2 Deemed Not Cost Effective									
	3	9,154	31.69%	Usage Bin 3 Deemed Not Cost Effective									
Total AC/Heating Program Potential		-			**44.4**				**47.0**				
Additional Potential from Domestic Hot Water		147,002	25.89%	$20,151,728	15.9	$37.77	$25.76	$3,896,584	0.0	$ 717.71	$ 489.43	$74,035,103	$57,779,960
Total Potential		-			**60.3**				**47.0**				

Table 5-5: Santee Cooper SMB Segment Specific Achievable Potential - Summer

Small/Medium Business		Summer						
Segment	Participation	# of participating accounts	Total Cost	Agg. MW	NPV of Avoided Gen Capacity Benefits ($/kW)	NPV of Avoided Dist Capacity Benefits ($/kW)	Total Benefit	Total Aggregate Net Benefit
GA	30.36%	3195	GA Segment Deemed Not Cost Effective					
GB	12.66%	258	GB Segment Deemed Not Cost Effective					
Other	12.66%	41	Other Segment Deemed Not Cost Effective					
Total				**2.9***				

*Each individual segment of customers was not cost-effective as a summer-only program; however, the GB customer segment is cost-effective when combined with a winter program. It is assumed that GB customers who participate in a winter program would also participate in the summer program and Santee Cooper would see achievable savings from these customers in the summer.

Table 5-6: Santee Cooper SMB Segment Specific Achievable Potential - Winter

Small/Medium Business		Winter							
Segment	Participation	avg. kW for heating	# of participating accounts	Total Cost	Agg. MW	NPV of Avoided Gen Capacity Benefits ($/kW)	NPV of Avoided Dist Capacity Benefits ($/kW)	Total Benefit	Total Aggregate Net Benefit
GA	30.36%	1.1	766	$977,280	2.8	$717.71	$489.43	$3,416,997	$2,439,717
GB	12.66%	2.4	58	$155,337	1.1	$717.71	$489.43	$1,302,324	$1,146,987
Other	12.66%	0.4	11	$5,080	0.0	$717.71	$489.43	$42,588	$37,508
Total					**3.9**				

Table 5-7: Santee Cooper Large Commercial Segment Specific Achievable Potential

Large Comm - 300 kW and Up					Total Benefits				MW Potential	
Segment	Participation	# of participating accounts	MW of Tech Potential for cost calc (max of winter and summer participating)	Total Cost	NPV of Avoided Gen Capacity Benefits ($/kW)	NPV of Avoided Dist Capacity Benefits ($/kW)	Total Benefit	Total Aggregate Net Benefit	Summer Agg. MW	Winter Agg. MW
GA	80.72%	2	0.14	$133,891	$755	$515	$174,724	$40,833	0.34	0.07
GB	54.05%	73	0.40	$11,587,638	$755	$515	$15,121,568	$3,533,929	29.35	17.97
Other	54.05%	15	0.56	$3,319,630	$755	$515	$4,332,031	$1,012,401	8.41	5.42
Total									**38.10**	**23.46**

5.2.4. Key Findings

The overall DR potential is estimated to be 101 MW of peak summer capacity in the Base Scenario and 133 MW under the assumption of aggressive marketing. The overall DR potential for the peak winter capacity is estimated to be 74 MW in the Base Scenario and 100 MW in the Enhanced Scenario. These estimates are based on an in-depth, bottom-up assessment of load reduction potential of all customer segments, and includes an analysis of pricing and program-based DR.

The customer segment-level analysis of the program- and pricing-based DR potential sheds light on which customer segments can provide the greatest magnitude of capacity, as well as which customer segments are most cost-effective to pursue. Unsurprisingly, the most attractive customer segments from a benefit/cost perspective are customers who have more load available for reduction during peak hours: residential customers and large commercial customers. In general, these customers are more capable of shifting load with little inconvenience/cost, and therefore tend to have higher participation levels in DR programs as well as greater willingness to shed a higher percentage of their load.

The achievable potential estimates presented in previous sections assume a mature market for demand response, that is: the estimates do not account for the time required for a utility to develop and deploy a demand response program. Santee Cooper is currently piloting DR offers for its residential customers, providing primary market data for local customers responses to demand response offers.