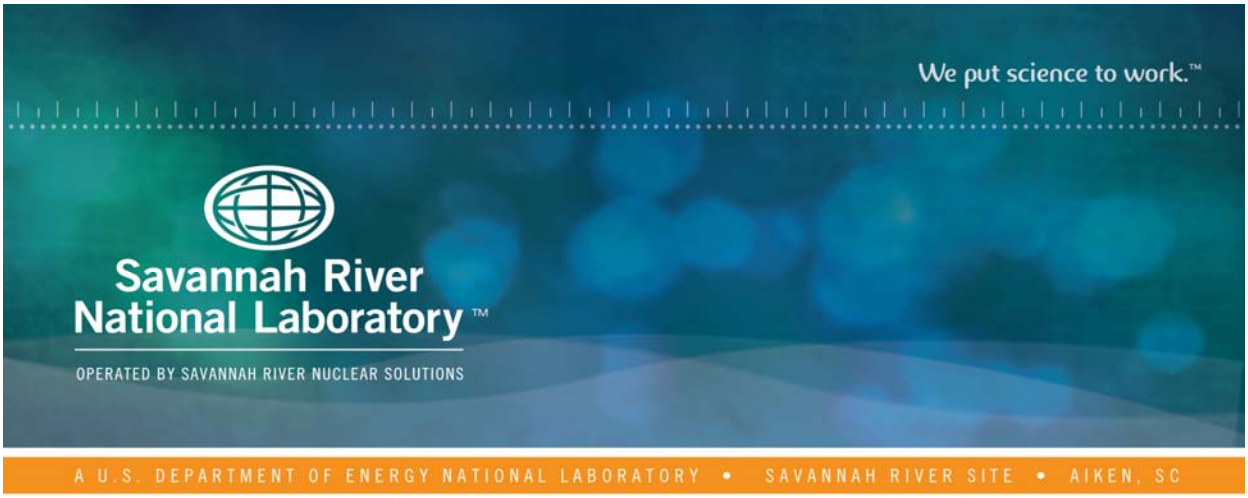

2015 South Carolina PV Soft Cost and Workforce Development

Part I: Initial Survey Results

Elise B. Fox

Thomas B. Edwards

May 2016

SRNL-STI-2016-00177, Revision 0

DISCLAIMER

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May 2016

Prepared for the U.S. Department of Energy under contract number DE-AC09-08SR22470.

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EXECUTIVE SUMMARY

The South Carolina solar industry has surged over the past two years, largely due to the implementation of Act 236, and continues to grow at a rapid pace. At the beginning of 2014, there was little more than 3MW total spread across the state, but by the end of 2021, that state solar industry will have grown to over 300MW across all sectors. Prior to this study, there has been little publically available information on the solar industry in SC and throughout the Southeastern US. This makes SC a key case study of an emerging market, enabling the development of regional best practices in order to decrease associated costs and increase deployment.

Act 236 has created a wealth of new opportunities for the solar industry in the state. Although there is excitement about its implementation, there is still general confusion from residents about costs, how to participate in IOU programs, and how to identify a reputable business. Businesses are likewise struggling with issues such as navigating the permitting system, engaging customers, and finding a qualified work force for installations. This technical report is the first in a series that is designed to better understand the solar industry in SC, how it is growing, and what its emerging issues are. This report will help to clarify the current costs of solar within the state, while identifying workforce gaps and helping shape policy recommendations.

It was previously estimated that the soft costs in SC would be up to 25% higher than the rest of the country, consequently, driving up total costs for the system. However, our results show the total cost of a residential system averages between $3.42 - $3.54/W, while commercial and utility scale systems average $2.65 - $2.70/W and $1.70 - $1.76/W, respectively, which is on par with recently reported costs nationwide. Additionally, soft costs within the state were found to be approximately 40% of the total cost for residential and commercial systems and 30% for utility scale systems. The largest portion of these costs was attributed to labor costs for installation. While permitting accounted for approximately 14% of the reported soft costs, it was the area of largest concern for respondents.

The solar workforce in SC is expected to grow rapidly in the six month period from October 2015-April 2016. Nearly 200 additional jobs, primarily in installation and sales, are expected. Growth is anticipated to slow down, but continue over the three year period of October 2015 – October 2018, where approximately 480 new jobs are expected. Workforce shortages have already been identified along with training and qualification gaps that will need to be filled in order to support the growth of the industry within the state.

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AC	Alternating current
DC	direct current
IOU	Investor Owned Utility
kW	kilowatt
MW	megawatt
PV	photovoltaic
SRNL	Savannah River National Laboratory
SC	South Carolina
SuNLaMP	SunShot National Laboratory Multiyear Partnership

1.0 Introduction

On June 2, 2014 South Carolina (SC) Governor Nikki Haley signed the SC Distributed Energy Resources Act into law. [1] This landmark legislation, which received unanimous passage in the House and Senate, was the result of cooperation between the State's Investor Owned Utilities (IOUs), electric cooperatives, environmental groups, consumers, and SanteeCooper, the state owned utility. This legislation will allow the IOUs to produce 2% of their five year peak power production from solar energy by 2021, half of which would be utility scale production and the other half distributed power generation on residential and commercial rooftops. At the time of its passage, SC had stagnated at slightly more than 3.6 MW total power production from distributed solar across the state. After Act 236 was passed, but before it was fully implemented, an additional 1.5MW capacity from distributed systems was installed by August 2015. [2] A majority of this new growth occurring in Charleston County. New distributed installations (commercial and residential) are expected to approach 100MW by 2021, a significant jump from 5.1MW. Some challenges associated with such rapid expansion can include a shortage of qualified workforce, confusion and discontinuity in permitting processes, and increasing installation and inspection times. This, coupled with unclear costs in an immature market, can rapidly lead to customer dissatisfaction and stifling of the anticipated market.

Recently reported data on the costs of photovoltaics [3, 4] have significant gaps in estimates within the Southeastern US and SC in particular, making it difficult to determine accurate and reliable price points for customers and to develop regional specific policies to aid the transition towards increasing distributed generation. Previous estimates have indicated that soft costs within SC could be nearly 25% higher than the rest of the nation and this is largely due to the market deficiencies discussed above. In order to help combat these challenges and determine what programs will have the largest effect on these costs, it is first necessary to establish clear cost metrics for the State of SC. This report is a strategic attempt to baseline the hard and soft costs for SC in 2015. This report will be repeated annually in order to track cost reductions and job growth as Act 236 is fully enacted across the state.

2.0 Experimental Procedure

2.1 Data Collection

On October 23, 2015 a survey (see Appendix A) was handed out at the South Carolina Solar Council's fall meeting. This survey included fifteen questions designed to better understand the solar industry in South Carolina. The survey was given to the 150 attendees of the meeting, representing approximately 80 different companies or individuals. Thirty-eight responses were received. Seven of the survey responses only contained contact information and were discarded from the data set. Three of the responding companies install only in North Carolina and were also discarded from the data set. Of the remaining 28 responses, two were from the same company with the exact same responses. These two surveys were consolidated into one response representative of that company. One additional company also submitted two responses, however the reported data was similar, but not the same. These surveys were filled out separately by the company's owner and a sales representative. The two responses were kept as individual data sets, resulting in 27 data sets from 26 companies that were used in this analysis. A recent survey by The Solar Foundation™,[f] reported that there are 51 solar companies operating in South Carolina (SC) [5], which is calculated from the Solar Energy Industries Association's National Solar Database. [6] The results of the 26 companies captured in this survey equate to responses from 53% of the reported companies. The analyses presented in this report were conducted using JMP Pro Version 11.2.1[7].

[f] The Solar Foundation™ is an independent 501(c)(3) nonprofit with a stated mission: "to increase understanding of solar energy through strategic research and education that transform markets."

2.2 Quality Assurance

Requirements for performing reviews of technical reports and the extent of review are established in SRNL Manual E7 2.60. SRNL documents the extent and type of review using the SRNL Technical Report Design Checklist contained in WSRC-IM-2002-00011, Rev. 2.

3.0 Results and Discussion

The fifteen-question survey was broken down into three parts focusing on: 1) establishing current costs of solar, 2) determining additional workforce needs and suggested training for those positions, and 3) determining the focus and experience of the respondents. Detailed analysis of the survey is presented and discussed below. Where possible, data are broken down by individual sectors: residential, commercial, and utility.

3.1 Solar Sector Served by Respondents

Respondents were asked to indicate which segment of the solar business sector they serve: residential, commercial, or utility. The results are presented in numerical form in Table 3-1 and in graphical form in Figure 3-1. 67% of the 27 respondents serve the residential sector, but only 19% exclusively serve the residential sector. The commercial sector was served by the largest number (74%) of respondents, followed by that utility sector at 52%. A majority of the respondents (64%) serve more than one sector within South Carolina.

Table 3-1. Solar PV Segments Served by Respondents.

	Segment Served - Residential	Segment Served - Commercial	Segment Served - Utility	Number of Respondents	% of Total (27)
			X	2	7.4%
		X		2	7.4%
		X	X	5	18.5%
	X			5	18.5%
	X	X		6	22.2%
	X	X	X	7	25.9%
Total	18	20	14		
% of All	66.7%	74.1%	51.9%		

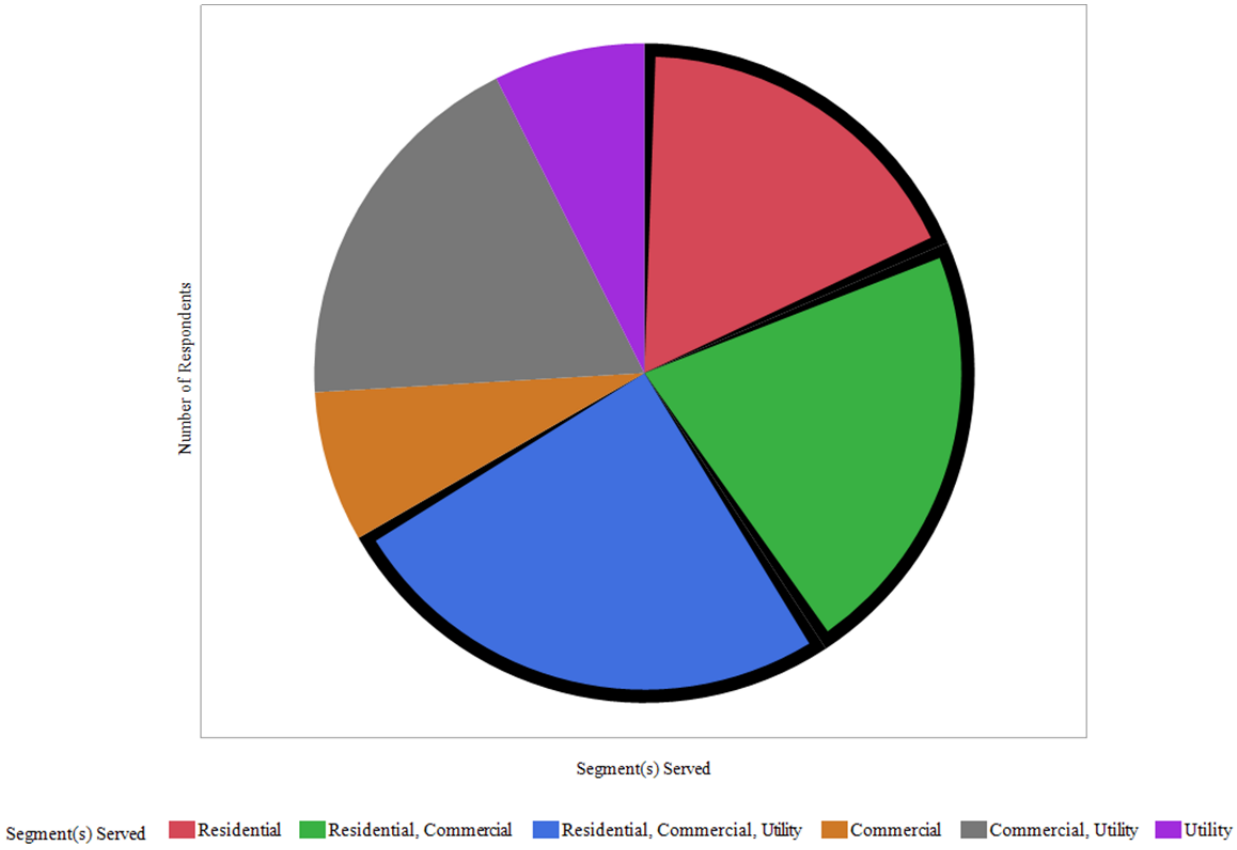


Figure 3-1. Solar PV Segments Served by Respondents.

3.2 Typical Size of Installation by Type

Respondents were asked to provide information on the typical size in kilowatts of direct current (kW-DC) of their installations by type. Some respondents reported their size data as a range, with other respondents providing a single size value for the typical installation. This was also true for other quantitative responses from the survey. In an effort to fully represent the range of values provided in some of the responses, both low-end and high-end size values were established for each respondent. The same value was used for both representations when the respondent provided a single size value. The same convention is followed for the other quantitative responses discussed within.

The values from the respondents are recorded in Figure 3-2 along with a low-end average and a high-end average for each market segment. The red circle represents the low-end of the reported range, while the green cross represents the high end of the range. If a single data point was reported, it is indicated by both the cross and circle. As expected, the average install size increases from residential to commercial to utility. As the typical size increases for some of the respondents for a segment, so does the variability in the installation size for that segment of the industry. Residential installations are typically no larger than 10kW-DC, although installations as large as 20kW-DC were reported. Commercial installations typically average between 136 – 236 kW-DC, while utility scale installations average between 5 – 15 MW-DC.

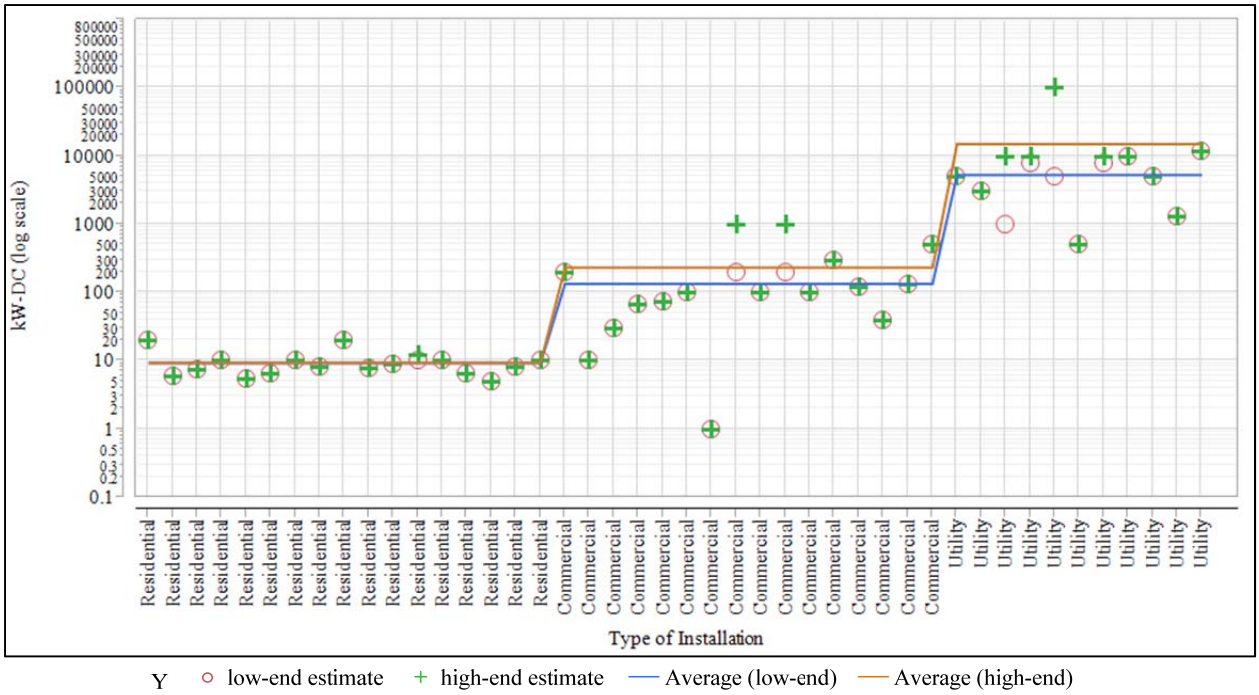


Figure 3-2. Average PV Installation Size (kW-DC), by Sector Served and Respondent.

3.3 Average Cost ($/W-DC) by Type of Installation

Respondents were asked to provide information on the total cost in dollars per watt of direct current ($/W-DC) by installation type. In an effort to fully represent the range of values provided in the responses, both low-end and high-end total cost values were established for each respondent. These low- and high-end estimates in $/W-DC as reported by respondent and industry segment along with the average value for the total cost by segment in Figure 3-3. A variability plot of the same data is found in Figure 3-4, which includes a box plot[1] of the total cost values for each industry segment. A wide range of total install cost is present in each segment. Residential installs were found to average between $3.42 – $3.54/W-DC with a range of $2.50 – $4.00/W-DC. This is lower than the reported cost of $4.30/W for residential systems install by year end 2014 reported by Barbose, et al. [4], but within the recently reported range by Green Tech Media [8]. For the same time frame, commercial systems smaller than 500kW had a reported cost of $3.90/W, while systems larger than 500kW had a reported cost of $2.80/W [4]. Our total reported average is between $2.65 – $2.70/W with a range of $1.85 – $3.50/W, This corresponds well with the $2.25 - $3.50 range reported by SEPA.[9] Utility scale total costs averaged between $1.70 – $1.76/W, with a range of $1.10 – $3.00/W. This data is at the low end of the 1-10MW utility scale range ($1.75 - $2.50) and high end of the 10MW+ installation ($1.40 - $1.75) reported data. [9]

[1] A box plot is a descriptive display used for continuous data. The lower edge of the box is the 25th percentile, the upper edge the 75th percentile, and the horizontal line within the box the 50th percentile, or median of the data set. Any points that fall beyond the lines extended from the boxes (i.e., points not connected to the box) of the boxplot may be considered as potential outliers for the data set. Note that the largest, high-end total cost for the utility segment may be an outlier for that set of estimated total costs.

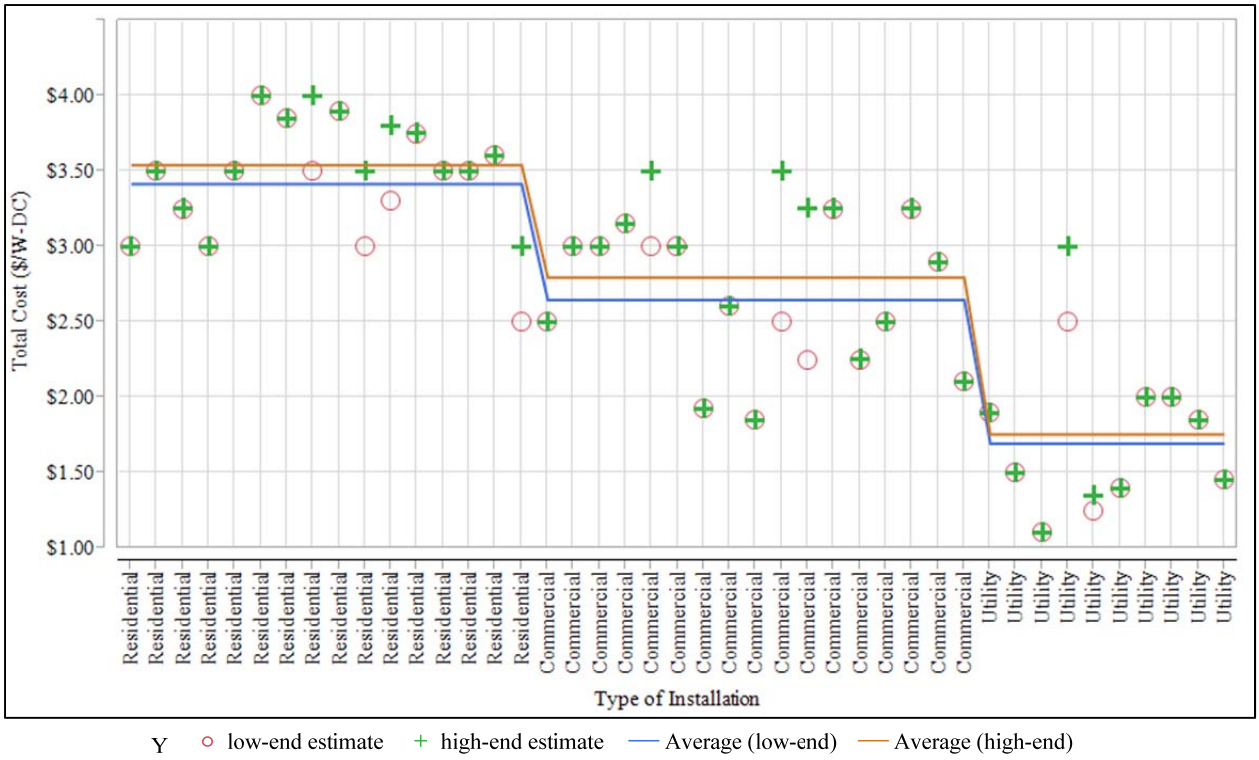


Figure 3-3. Cost of PV Installations in $/W-DC, by Respondent.

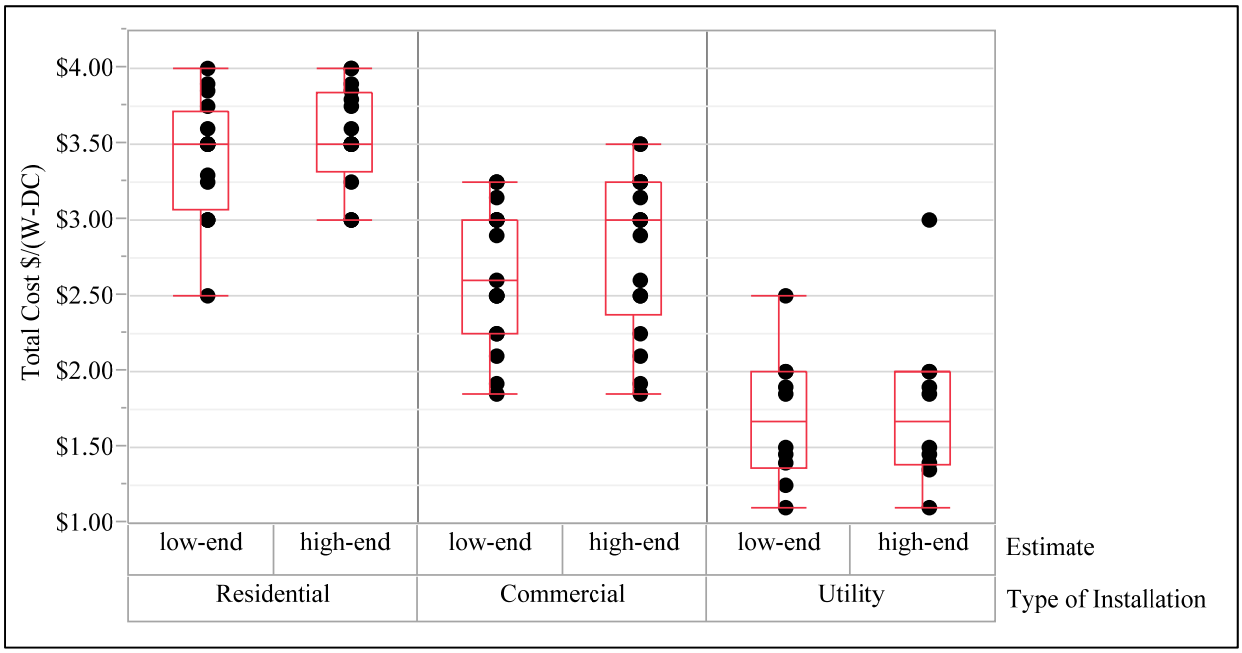


Figure 3-4. Variability Plot for Total Cost Data in $/W-DC.

Data was further analyzed in order to determine if there is a direct correlation between the reported average size of the installation and the reported average cost. More specifically, is there any indication of

a trend in these values suggesting a lower estimated total cost as installation size increases? To explore this issue with the available data, the low-end and high-end values for the installation size were averaged for each respondent and the low-end and high-end total cost estimates were averaged for each respondent. The average total cost was then plotted versus the installation size for each type of installation. The resulting plot, along with a linear regression of the cost values fitted to the size values, is provided in Exhibit B1 of Appendix B for each type of installation. The results for the utility segment are repeated in Figure 3-5. There does appear to be a downward trend in the utility data. To judge the statistical significance of the trend, the p-value, indicated below the **Prob>|t|** column for the SC Size – Utility (kW-DC) avg row of the Parameter Estimates table, may be used. If this value is 0.05 or smaller, then the trend is statistically significant at a 5% level. This is the case for the results in Figure 3-5, which show a p-value for the slope of 0.0209. Since this value is less than 0.05, the trend for the utility results is statistically significant. The p-values for the residential and commercial results (Exhibit B1) are 0.5803 and 0.1973, respectively. Thus, there is no indication of a statistically significant downward trend for those sectors.

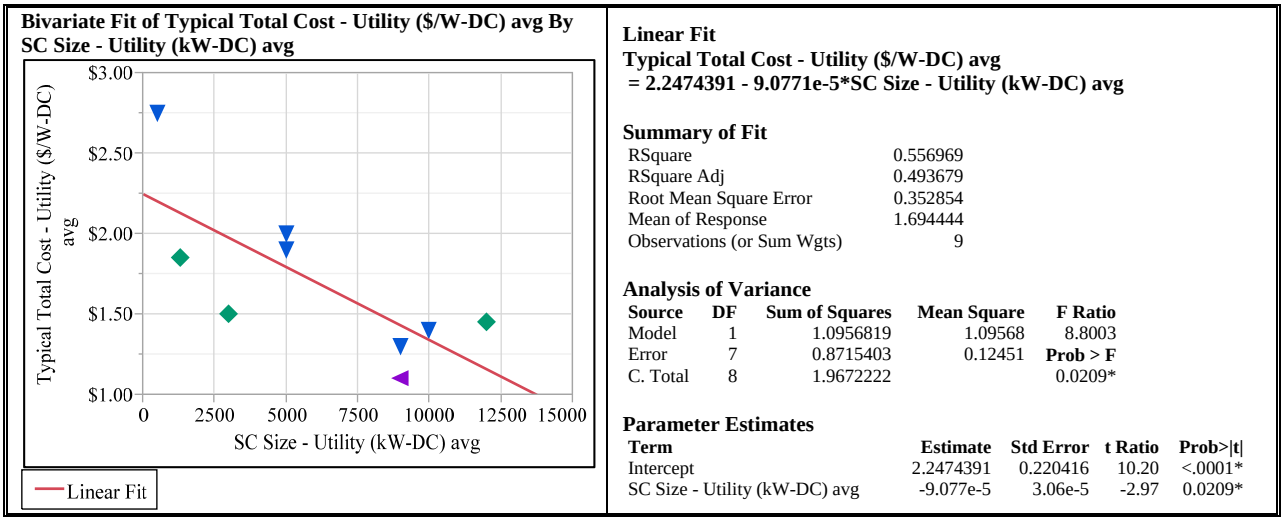


Figure 3-5. Total Cost (avg) versus Installation Size (avg) for Utility Segment.

3.4 Average Hardware Cost ($/W-DC) by Type of Installation

Respondents were asked to provide the percent of the total cost attributable to hardware by installation type. The resulting estimated costs of hardware as a percentage of the total costs are provided in Figure 3-6. The average cost of hardware is 61-63% of the total cost for residential systems, 62-63% for commercial systems, and 69-70% for utility scale systems. A 2013 report from NREL reports an inverse relationship, where soft costs represent 64% of the system cost for residential systems, and 57-52% for commercial systems. [10] This would represent a nearly 24% drop in soft costs over a three year period. Data from SC was not reported in [10], so it is difficult to confirm if the State's soft costs have indeed dropped that quickly.

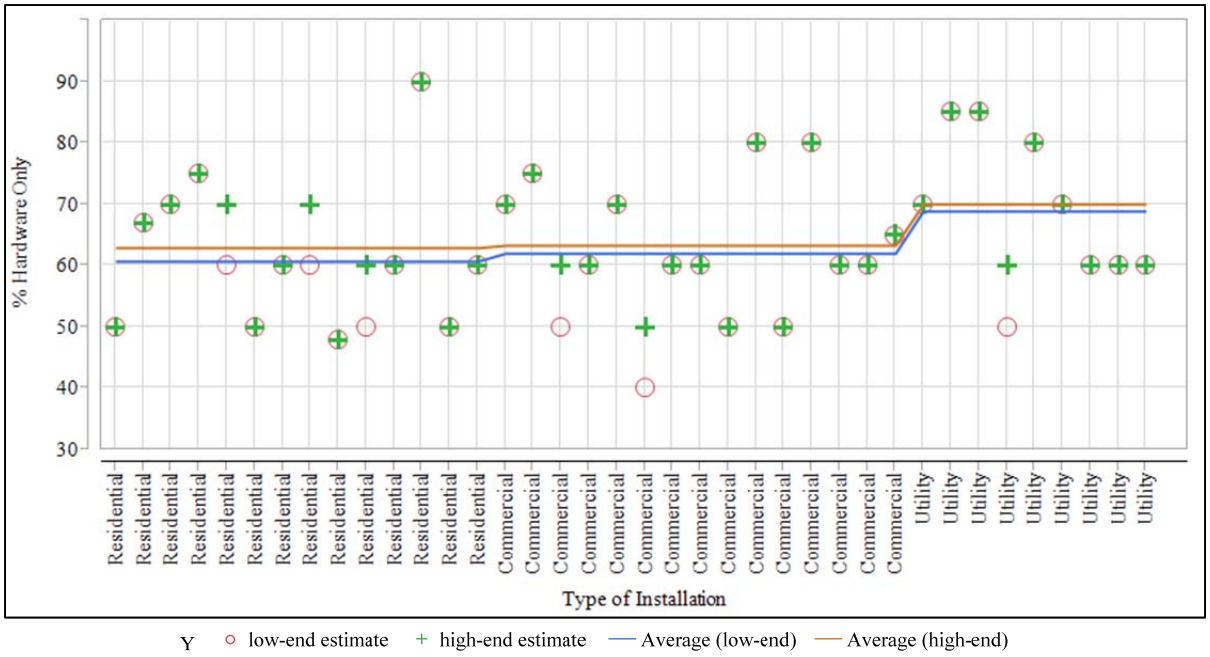


Figure 3-6. Reported Percent of Total Cost Attributed to Hardware Only, by Respondent.

The results from this investigation into hardware costs indicate that soft costs are approximately 40% of the total costs for residential and commercial systems and about 30% of the total costs for utility scale. A comparison of the hard versus soft cost, in $/W-DC, is presented in the variability chart in Figure 3-7 and in Table B1 of Appendix B. These show that the average soft costs for the residential, commercial, and utility segments are approximately $1.38, $1.02, and $0.58, respectively, based upon these survey results.

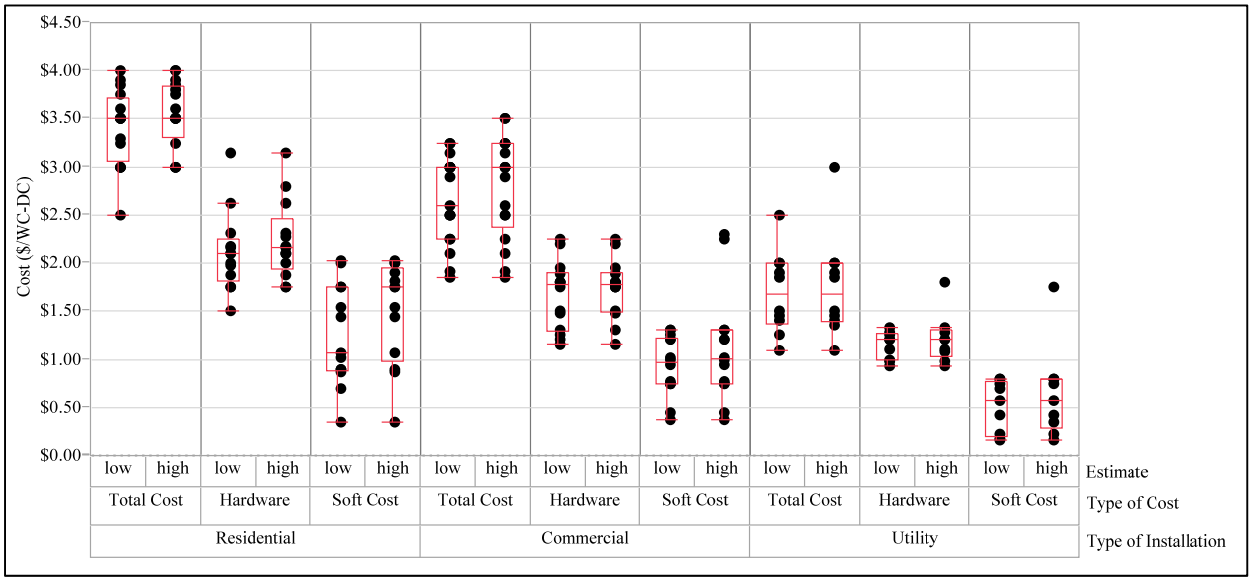


Figure 3-7. Total Cost Separated into Hardware and Soft Costs.

3.5 Average Soft Cost ($/W-DC) by Category by Type of Installation

Respondents were asked to provide information on the percent of the total cost attributable to several soft-cost categories by installation type. Four categories of soft costs were considered: 1) marketing, lead generation, and sales, 2) permitting and interconnection, including all fees and administrative labor costs, 3) installation, including design, engineering, and construction labor, and 4) profit, overhead, and taxes. These percentages of the total costs were developed into estimates of soft costs in $/W-DC as given in Figure 3-8 for those respondents that provided this information to complement their total cost estimates. Summary statistics for these soft costs are provided in Table B2 of Appendix B. In all industry segments, installation is the highest portion of soft costs followed by overhead > marketing > permitting.

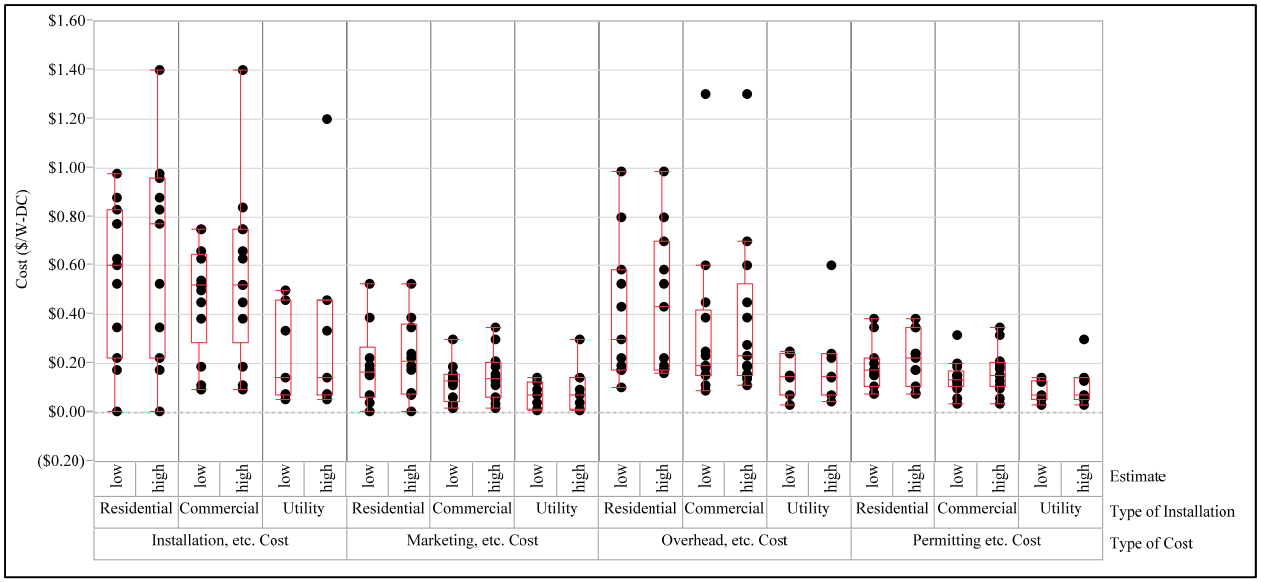


Figure 3-8. Breakdown analysis of soft costs in four categories, per sector.

For residential installations, the average cost in dollars by soft cost category is given in Table 3-2[2]. Once again, permitting is the smallest of these costs, on average about 14% of the soft cost attributed to installation of the system.

Table 3-2. Average Cost ($/W-DC) by Soft Cost Category for Residential Installations

Type of Soft Cost	Mean(Cost ($/W-DC))	% of Total Soft Cost
Installation, etc.	$0.59	41%
Marketing, etc.	$0.21	15%
Overhead, etc.	$0.43	30%
Permitting, etc.	$0.20	14%
Total	$1.43	100%

[2] It should be noted that the estimate of total soft cost determined by combining the costs over these categories differs from the estimate of the previous section due to incomplete information being provided by some of the respondents. Specifically, some respondents did not provide the information necessary to investigate their soft cost by the categories of this table.

3.6 Workforce Needs

South Carolina was determined to have the second largest growth in the solar industry in 2015 and projected to have a 20.2% growth in jobs sector wide over the next year[3]. [5] In order to better understand near and long-term growth in the industry, respondents were asked about hiring needs, by job type in full time equivalent (FTE). The results from the survey for the short- and long-term needs are summarized in Table 3-3.

Table 3-3. Short and long-term job needs by job type, total reported

	Short-term, six months		Long-term, three years	
Type of Job	Low	High	Low	High
design, engineering	31 (16%)	32	56 (12%)	61
electrician & installer	69 (35%)	77	151 (32%)	155
gen. business	29 (15%)	32	52 (11%)	54
sales & marketing	70 (35%)	76	212 (45%)	217
Total	199	217	471	487

In the near term (time period of 11/15 – 6/16) between 199 – 217 new positions were expected to be created. Of these, the largest need is in installers (69 positions or 35% of the total) and sales and marketing (70 positions or 35% of the total). Engineering and general business needs were expected to add 31 (16%) and 29 (15%) positions, respectively. This value corresponds well with projected 2016 growth[4]. [5] Over the next three years, the total number of solar jobs is expected to grow to between 471 – 487 new employees. This growth is concentrated largely in the sales and marketing category (45%) followed by installation (32%), with engineering and general business expecting nearly equivalent growth (12% and 11%, respectively). This indicates that a burst of job growth is expected over the next six months (42%) with a stabilization of the market as utility incentives either phase out or are expended. This is further exemplified when the projected (total) job growth for each respondent (indicated by an open red circle, o) is analyzed by sector served (see Figure 3-9 and Figure 3-10). A majority of the job growth (the average over all of the respondents is given by the blue bar) is expected by businesses serving the residential sector. This is true for short-term needs as well as long-term needs.

[3] Job categories used by The Solar Foundation include: installation, manufacturing, sales & distribution, project development, and other. This study does not cover the manufacturing and other categories.

[4] The Solar Foundations report 1,764 SC solar jobs in 2015. A 20.2% job growth would add an additional 357 jobs in 2016. This report does not include manufacturing and other categories, which is 30.4% of their reported solar jobs in South Carolina. Adjusting for projections for sectors covered under this work indicates that 248 new jobs will be created in 2016 under their model.

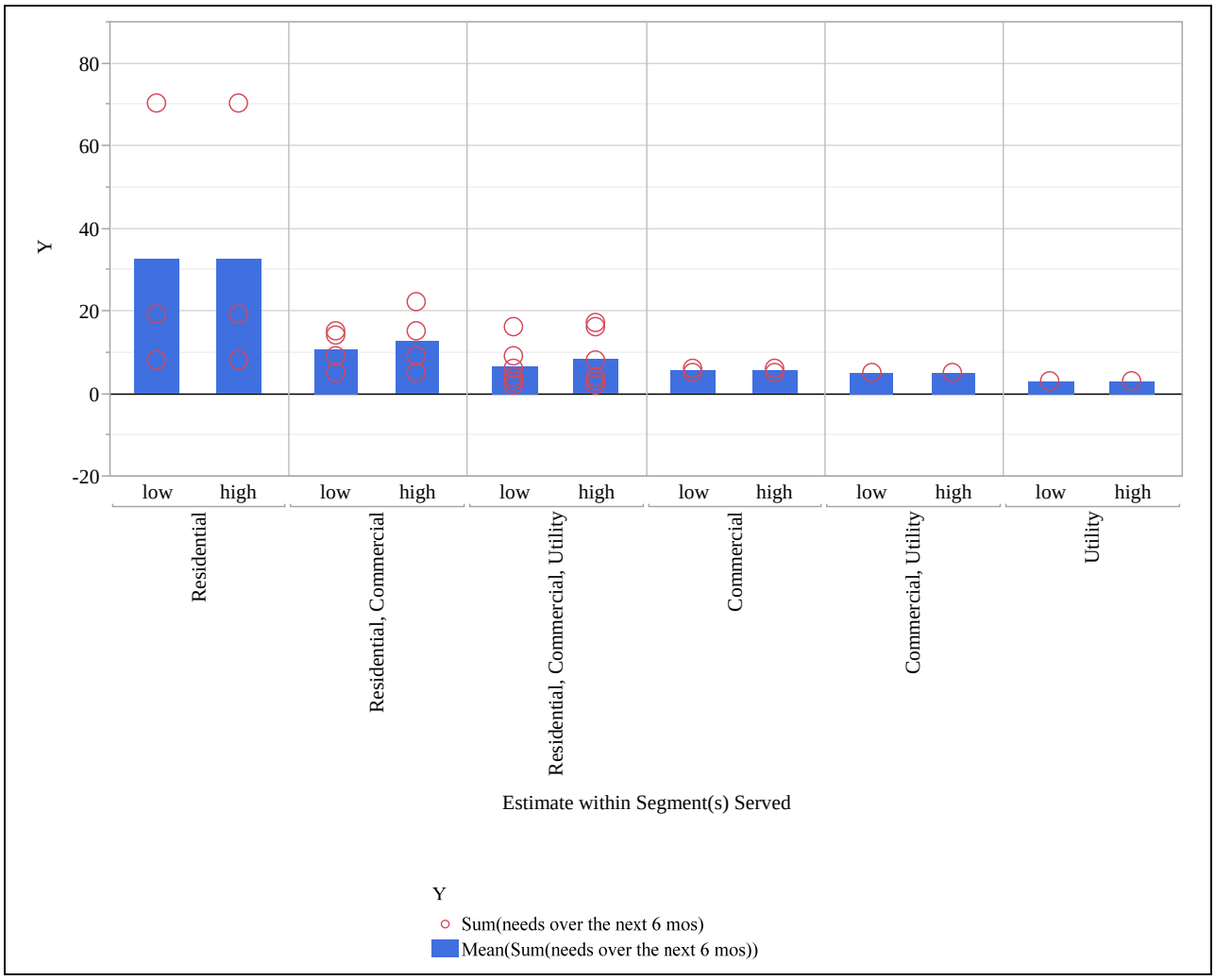


Figure 3-9. Expected near term job needs (next six months) as reported by sector served.

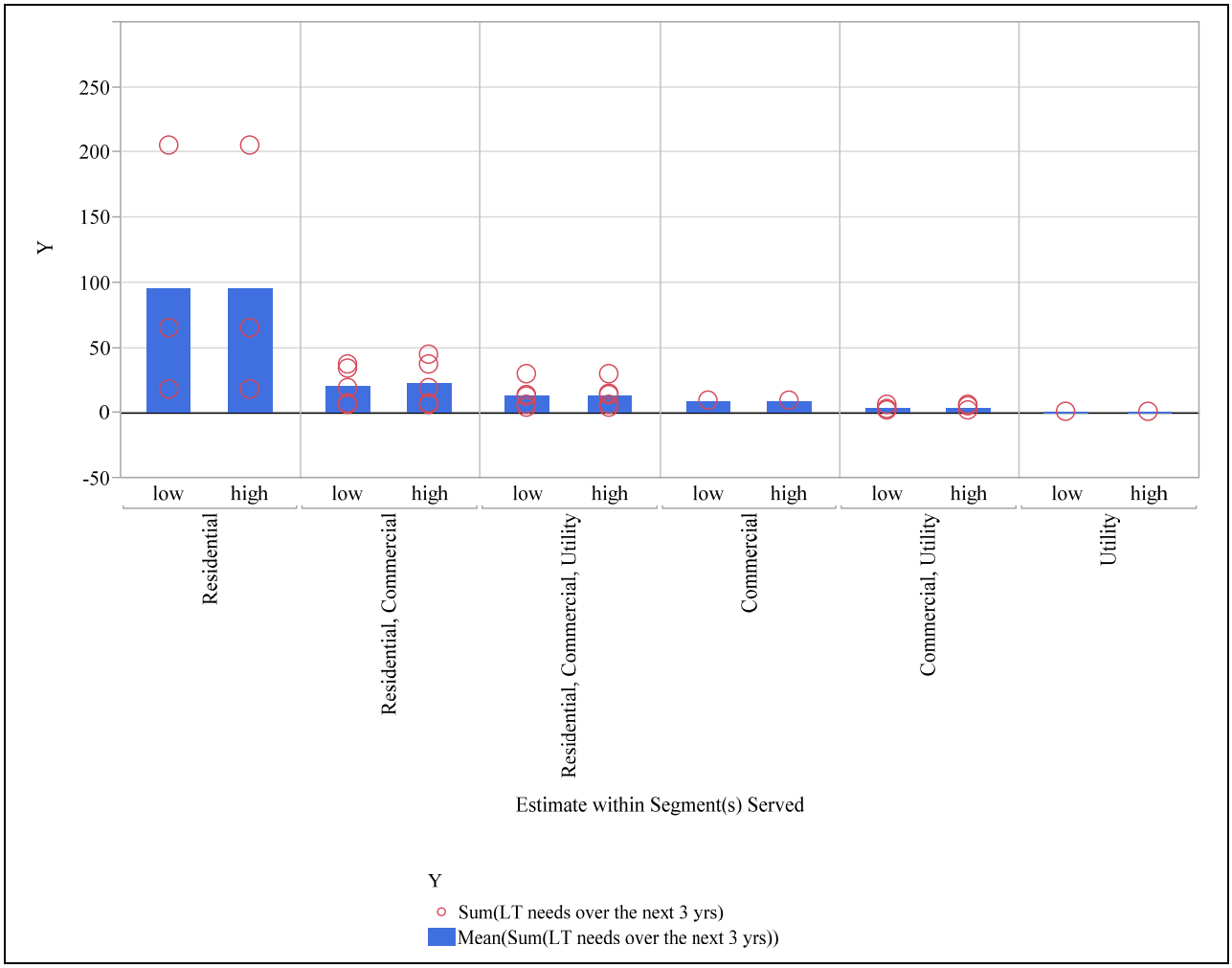


Figure 3-10. Expected long term job needs (next three years) as reported by sector served.

3.7 Workforce Training Needs

When rapid job growth is expected in a non-traditional workforce sector, a shortage of appropriately skilled workers can severely impact business growth. [11, 12] As of March 22, 2016, SC had only eighteen NABCEP PV Professional Installers representing fifteen companies or individuals. [13] NABCEP does not currently provide information on Entry Level certification to the public, but they are willing to confirm status of individuals. [14] There were an additional three individuals with NABCEP Technical Sales certification representing three different companies. Duke Energy Progress and Duke Energy Carolinas are requiring that solar projects completed in 2016 be commissioned **[15]** by a NABCEP PV Entry Level or PV Professional Installer in order to qualify for rebates and installed by SC Department of Labor, Licensing, and Regulation licensed electrician. Beginning in 2017, solar projects are required to be installed by a SC licensed NABCEP PV Entry Level or PV Professional installer to qualify for rebates.

In order to better understand how businesses are meeting these requirements, survey respondents were asked if funding were available to support job training, what type of training they would recommend for four different job categories. The lack of available hands-on training can impede the growth of qualified

PV installers. [12] The choices were NABCEP Entry Level, NABCEP Technical Sales, NABCEP PV Professional, and Other. Respondents were allowed to choose more than one option per job type. Figure 3-11 provides a plot showing the percent of the 27 respondents recommending each of the training levels within each of the position types. Technical Sales training for sales and marketing was recommended more than any other type of training in any job category. This could indicate a disconnection between immediate business needs and efforts by utilities to ensure a safe, quality installation on grid connected systems. PV Professional training was recommended most for crew chiefs, followed by installers and design/engineering. Entry Level training was recommended highest for installers. There were several recommendations for "Other" for all job types, but specification on the definition of other was not provided by any of respondents.

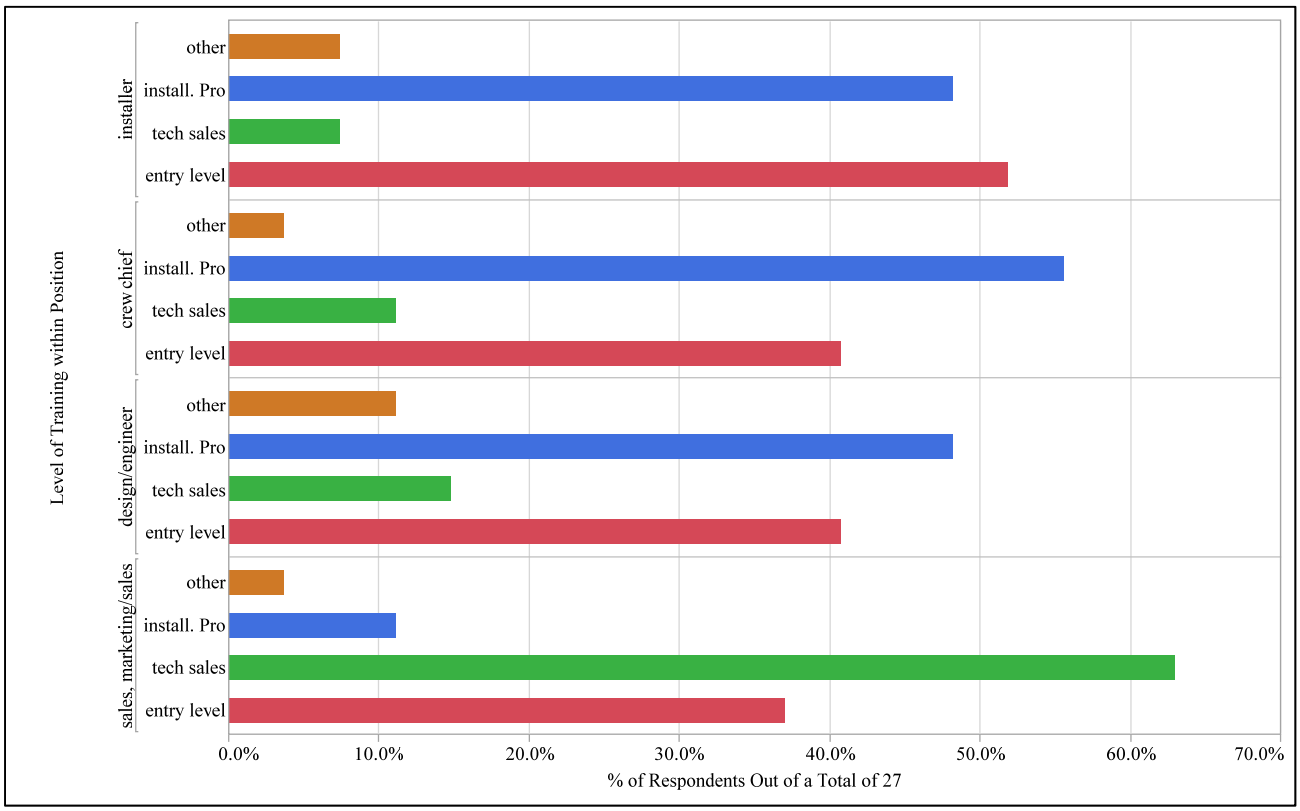


Figure 3-11. Training recommendation, by job type.

3.8 Biggest Opportunity to Reduce SC Soft Costs

Survey respondents were asked an open ended question on what they thought was the biggest opportunity to reduce soft costs in the state. The responses are copied word for word below:

1. Standardization of the permitting process & design considerations. All of solar components are already engineered; requiring stamps here and not there, different review processes & market potentials creates a lot of uncertainty & time & cost commitments. Standard permit process & elimination of secondary engineering & stamping.
2. Soft costs are low, but workers comp is a challenge.
3. Efficiency
4. Ease of permitting & retaining good employees
5. Permitting standards

6. Permit & interconnection process varies too much – have 1 process for all
7. Do not do NABCEP – installers should be regulated through L & R
8. Customer acquisition – awareness campaigns – permitting – consistent application across jurisdiction – inspection – self inspection/video inspection
9. Process clarity
10. Zip codes for each utility that has solar program
11. PPA negotiations, interconnection turn around
12. Trained labor, depreciated installation equipment, client flow, market uncertainty
13. Help with quality installation and performance to help growth
14. Permitting cost, lead generation/marketing
15. Expedite permitting & interconnect, labor/workforce development
16. Help to standardize the permitting process and application response time. City/county permitting requirements need aligning
17. Permit time

Permitting is cited more times than any other as a significant opportunity for soft cost reduction. This is likely due to the varying requirements across municipalities and counties. This can add considerable personnel time and additional waiting time to projects. Efforts are currently underway to investigate preferred methods to assist municipalities in streamlining their existing permitting processes.

3.9 Customer Focus in the Southeastern US

Only respondents that currently have business in SC were included in this analysis. In order to determine business demographics of those companies, the respondents were asked in which other states in the Southeastern US they currently have business. The results from this question are provided in Figure 3-12. 59% of the respondents have a business presence in North Carolina. The next highest is SC's bordering neighbor to the southeast, Georgia at 26%. This is likely due to the more mature solar industry in North Carolina, which is largely due to its existing renewable portfolio standard (RPS). Although the recent approval of third party sales through leases and power purchase agreements (PPA), along with the approval of utility owned rooftop solar [16] may help to increase the numbers in Georgia. As one moves to states farther from SC, those percentages of respondents conducting business at these more distant locations further dwindle. Over 40% of the respondents only serve SC.

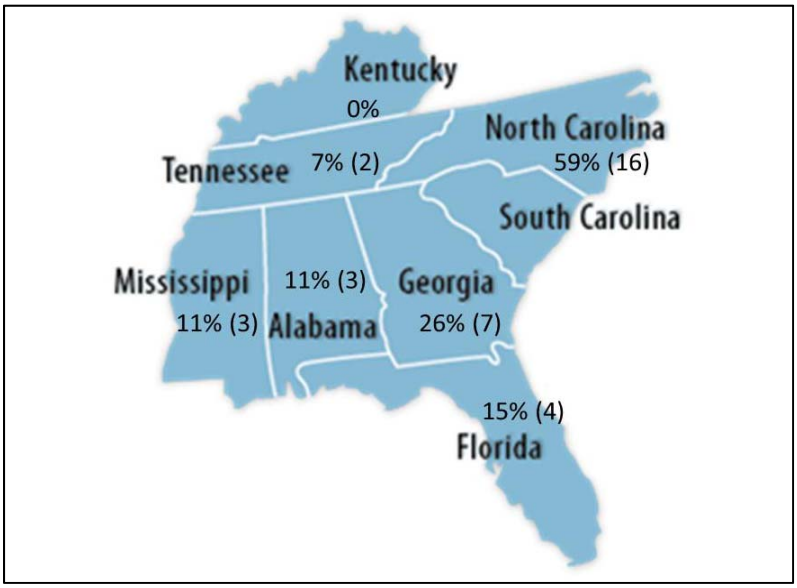


Figure 3-12. Service territories in the Southeastern US of companies surveyed.

3.10 Customer Focus in South Carolina

It is also important to understand the distribution of these businesses across the state. The respondents were also asked which regions in SC they currently have business. Figure 3-13 graphically displays the results provided by the survey. The largest focus is in the Coastal region, in the most southern part of the state. The number of companies slowly drops as you move into more northern territories. Of the 27 respondents, 12 companies (or ~44%) serve all regions of the state.

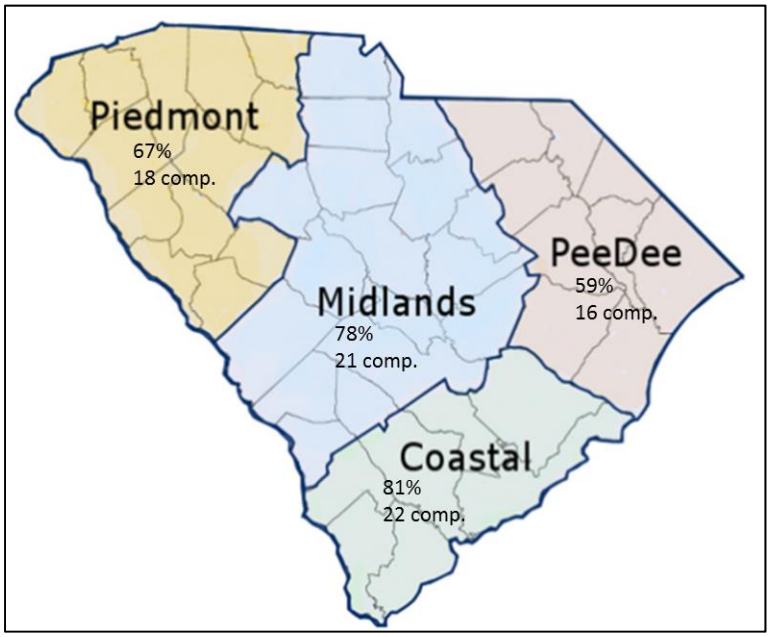


Figure 3-13. South Carolina business service territories of respondents.

The business distribution was compared with population data compiled from the U.S. Census Bureau for 2014 and the S.C. Energy Office installation data from August 2015. The county information was combined into a set of summary information for each region of the state. This information along with information at the state level is provided in Table 3-4. The complete population and installation data are provided by county in Table B3 in Appendix B. Exhibit B2 in Appendix B provides a plot of the number of installations by county but also indicating the county's population size and its region within the state. Four counties (Dillon, Marion, Marlboro, and Williamsburg) in the PeeDee region, two in the Midlands (Lee and Clarendon), and one in the Coastal region (Jasper) did not have a single customer owned installation as of August 2015. Exhibit B3 in Appendix B provides similar county plots by region with colors indicating the county's median income. Exhibit B4 in Appendix B provides correlations between the population and installation data for the counties within each of the SC regions: Coastal, Midlands, PeeDee, and Piedmont. For all of the regions, there are positive correlations between the number of installations and the total capacity of the installations and negative correlations between the median income and the percent of the county's population in poverty. Both of these sets of correlations are as would be expected.

Table 3-4. Population and customer owned PV systems by region

	# of Counties	[1]Population	[1]Average Median Income	[1]Average Percent living in poverty	[2]Number of customer owned installations	[2]Total capacity/kW-AC
Piedmont	13	1,466,007	$43,845	17.4%	249	1520.25
Midlands	17	1,641,149	$46,448	18.1%	235	1288.66
Coastal	7	954,887	$52,501	15.2%	269	1934.56
PeeDee	9	736,539	$38,685	21.4%	81	363.06
State Total	46	4,798,582	$45,033	18.0%	834	5,107

1. Calculated from U.S Census Bureau Data, 2014; median income and % in poverty were determined using a weighted (by population) average
2. Calculated from S.C. Energy Office Data, August 2015

When a comparison is made between the SC population of the regions served and the states served, see Figure 3-14, the companies that only serve the state of SC are more likely to serve areas of lower total population: suggesting that larger companies with larger service territories are limiting business to areas with high population densities. This indicates that small, SC focused businesses will be key to development in rural and low income areas, which typically are serviced by the electric cooperative system.

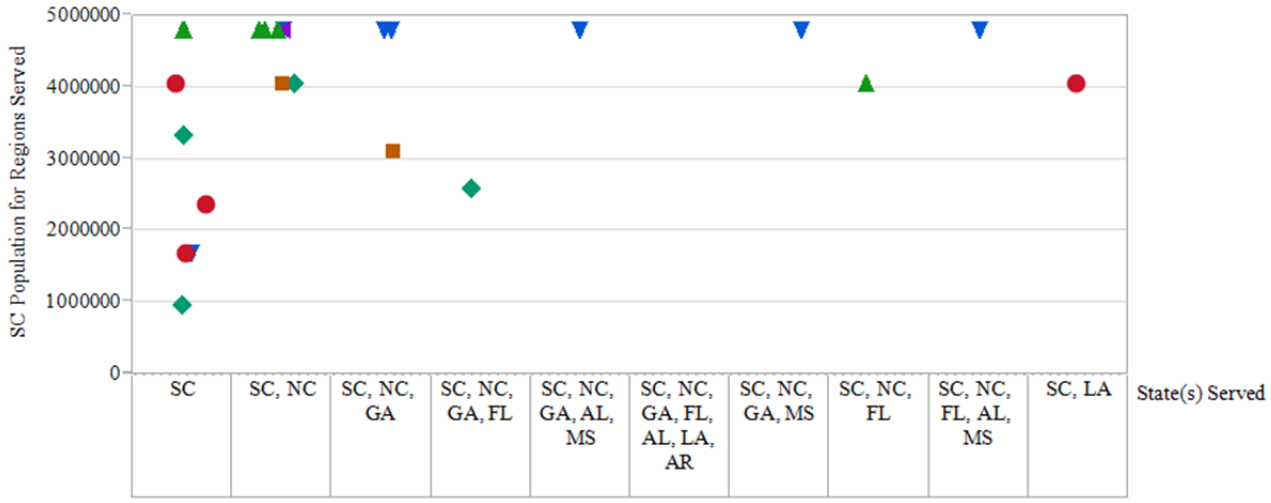
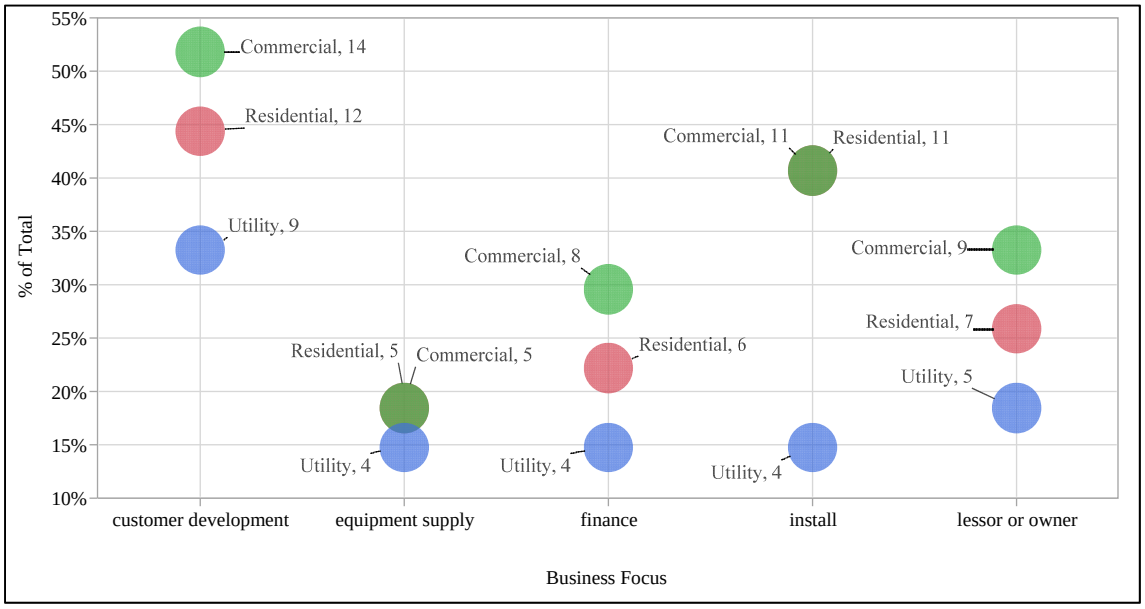


Figure 3-14. States served versus population of regions served.

3.11 Business Focus

Respondents were asked to identify their specific business focus in each sector. Figure 3-15 provides the results from the survey. The largest business focus for all responding companies was in customer development and/or site acquisition. Equipment supply is not a large focus, indicating that solar installers either purchase from the few companies in the state or through contracting out of state. Residential and commercial installation is a business focus of 40% of responding companies. These companies will be most directly impacted by a shortage of qualified electricians, construction workers, and installers.



(# of businesses are shown)

Figure 3-15. Business Focus Areas by Industry Segment Served.

Additional information can be found in Exhibit B5 in Appendix B, which provides information for the number of respondents serving SC and surrounding states along with the business focus areas. This information is arranged by type of business, as indicated in the header information of each plot. As an example, the first plot of Exhibit B5 covers those respondents whose type of business is residential. For the 10 respondents that serve only SC, customer development/site acquisition and installation is the primary focus areas for their business.

3.12 Installation Experience: Overall Career and within SC

Respondents were asked to define experience in terms of total installed kW as a career total and in SC. Figure 3-16 provides the results from the survey. The percentages provided are in relation to the total of 27 respondents. No respondents have installed over 5MW in SC**.** This is not surprising given that as of 12/31/15 approximately 9 MW total were installed within the state. However, when their entire career was considered, over 37% of the respondents have installed over 5MW. When SC total installations were compared with the states and regions served, see Figure 3-17, SC only businesses had amassed the largest total capacity installed state wide, with the addition of one respondent who also serves NC. This indicates that there is a rapidly growing interest in the state by regional and national companies, but that the SC small businesses continue to have an edge on business within the state.

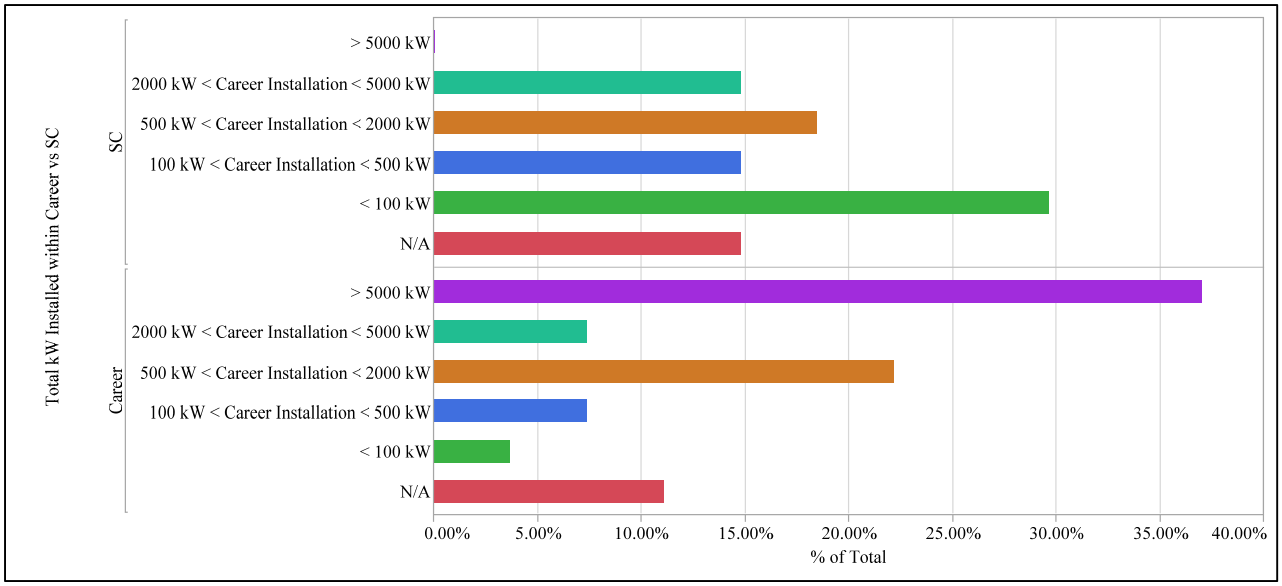


Figure 3-16. Installation history in SC and in career.

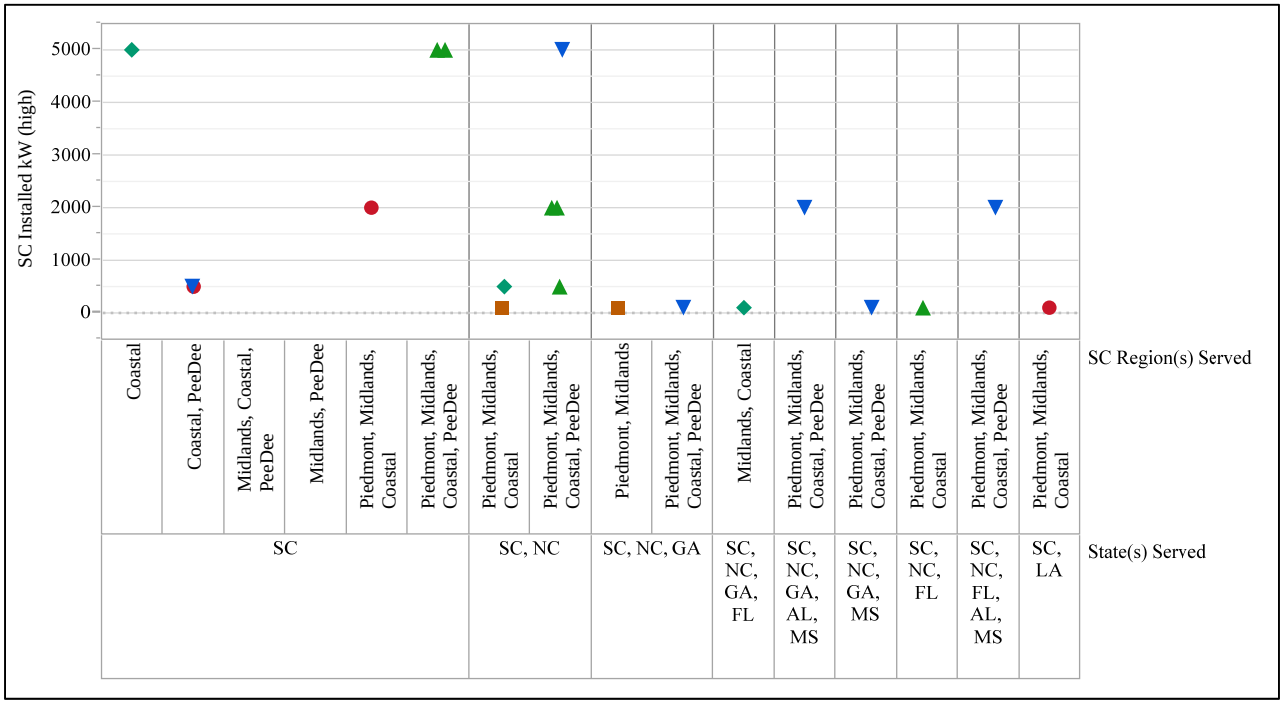


Figure 3-17. Total SC installed (high) based on state and regions served.

4.0 Conclusions

In order to provide a basic understanding of the economic growth due to Act 236, and to help identify methods to reduce soft costs, the current state of practice must be defined. With the assistance of small businesses and industry across the state, this report has been able to determine bench mark hard and soft costs for solar across the state and areas where recommendations could have the biggest impact on streamlining the process, in particular, permitting. In addition, short and long term job growth projections

have been provided which will help determine the best training methods to enable a competent and strong workforce.

Before this analysis was completed, it was estimated that the soft costs in SC could be up to 25% higher than the rest of the country, consequently, driving up total costs for the system. However, our results show the total cost of a residential system averages between $3.42 - $3.54/W, while commercial and utility scale systems average $2.65 - $2.70/W and $1.70 - $1.76/W, respectively, which is on par for recently reported costs nationwide. Additionally, soft costs within the state were found to be approximately 40% of the total cost for residential and commercial systems and 30% for utility scale systems. The largest portion of these costs was attributed to labor associated with installation. While permitting accounted for approximately 14% of the reported soft costs, it was the area of largest concern for respondents.

The solar workforce in SC is expected to grow rapidly in the six month period from October 2015-April 2016. Nearly 200 additional jobs, primarily in installation and sales, are expected to be added. Growth is anticipated to slow down, but continue over the three year period of October 2015 – October 2018, where approximately 480 new jobs are expected. Workforce shortages in both of these areas have already been identified along with training gaps and qualifications that will need to be filled in order to support the growth of the industry within the state. Local businesses continue to thrive, but have increasing competition from regional and national companies. However, it is the local businesses that are most likely to install in lower population and income areas, indicating that these businesses will be integral to increasing the adoption of distributed resources across the state, particularly within those regions.

5.0 Recommendations, Path Forward or Future Work

During this survey formation and analysis it became apparent that a more in-depth discussion on the business climate and costs was needed. Part 2, which will focus on in-depth one-on-one interviewers with a careful selection of the respondents, is in progress. This follow-up document will be also be used for clarification of reported hard and soft costs. Part 2 will also carefully examine changes in employment that have occurred over the past six months, focusing on short term hiring.

6.0 References

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Appendix A. Survey Completed in October 2015

South Carolina PV Soft Cost and Workforce Development Survey

Savannah River National Laboratory™
OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

The Savannah River National Laboratory (SRNL) has received funding from the Department of Energy's SunShot Initiative to help reduce PV soft costs in South Carolina over the next three years. South Carolina's solar PV installed costs are currently estimated to be at least 25% higher than the rest of the nation. In order to help develop cost reduction strategies and recommendations, we must first adequately define current estimates. Your assistance will help us identify your most pressing needs along with recommended solutions. Please direct questions or concerns about this survey or this project to Elise Fox at SRNL (elise.fox@srnl.doe.gov or 803-507-8560). *All information provided will be kept confidential and is considered business sensitive. Thank you for your assistance with this survey.*

Part I. Estimation of Soft Costs

1. What segment of the solar PV industry does your company serve? Circle all that apply.

   Residential Commercial Utility Not Applicable

2. What is the typical size of type of installation in South Carolina now?

watts-DC	watt-DC	watt-DC
Average Residential	Average Commercial	Average Utility-Scale

3. What is the typical total installed cost (in dollars per watt-DC) for each segment in South Carolina now?

$ per watt-DC	$ per watt-DC	$ per watt-DC
Residential	Commercial	Utility-Scale

4. What percent of the typical installed cost is attributable to hardware only, now?

%	%	%
of Residential installed cost is hardware	of Commercial installed cost is hardware	of Utility-Scale installed cost is hardware

5. Of the remaining, non-hardware costs, what percent of the cost is:

%	%	%	%
of non-hardware cost is marketing, lead gen, and/or sales	of non-hardware cost is permitting, inter-connection (incl. fees and admin. labor cost)	of non-hardware cost is installation (incl. design, engineering, and construction labor)	of non-hardware cost is profit, overhead, tax

Part II. Workforce needs, workforce training needs

1. What are your short term business needs over the next six months? Specifically, how many <u>additional full-time hires</u> do you expect to need in the following areas to meet business expectations <u>over the next six months</u>:

#	#	#	#
a. Additional sales and marketing FTEs needed in six months	b. Additional electrician and installer FTEs needed in six months	c. Additional general business admin FTEs needed in six months	d. Additional design, engineering FTEs needed in six months

2. What are your longer term business needs over the next three years? Specifically, how many <u>additional full-time hires</u> do you expect to need in the following areas to meet business expectations <u>in 3 years</u>:

#	#	#	#
a. Additional sales and marketing FTEs needed in 3 years	b. Additional electrician and installer FTEs needed in 3 years	c. Additional general business admin FTEs needed in 3 years	d. Additional design, engineering FTEs needed in 3 years

3. If funding were available to support training of the South Carolina solar workforce, what type of training would you recommend for the following positions

	Type of certification or training you would recommend if funding were available to train your employees (check all that apply):			
Employee type	NABCEP entry level	NABCEP PV Technical Sales	NABCEP PV Installation Professional	Other
Sales, marketing				
Designer, engineer				
Crew chief				
Installer				

4. What do you see as the biggest opportunity to reduce soft costs in South Carolina? Please explain.

Part III. Tell us about your business today

1. In what Southeastern states have you focused your business so far? Circle all that apply.

2. In what regions of South Carolina have you focused your business so far? Circle all that apply.

3. What is your company's business focus? What segment of the PV market do you concentrate your time on today? Please shade the areas that apply to your current business.

Business Focus				
	Long-term PV lessor or owner			
	Project finance			
	Install, EPC			
	Customer development and/or site acquisition			
	Equipment supply			
		RESIDENTIAL	COMMERCIAL	UTILITY-SCALE
		Segment focus		

4. How much solar PV capacity have you installed in your career? Circle one.
    a. Not applicable, I do not install PV
    b. Less than 100 kW
    c. At least 100kW, not more than 500 kW
    d. At least 500kW, not more than 2,000kW
    e. At least 2000kW, not more than 5,000 kW
    f. 5,000 kW or more

5. How much solar PV capacity have you installed in South Carolina? Circle one.
    a. Not applicable; I do not install PV
    b. Less than 100 kW
    c. At least 100kW, not more than 500 kW
    d. At least 500kW, not more than 2,000kW
    e. At least 2000kW, not more than 5,000 kW
    f. 5,000 kW or more

6. Please provide your contact information so that we may contact you in the future. Again, all information provided will be kept confidential and is considered business sensitive. Thank you for your assistance with this survey.

Name _____

Company _____

Title/Role _____

Mobile # _____

Email _____

All information provided will be kept confidential and is considered business sensitive.
Thank you for your assistance with this survey.

Appendix B. Supplemental Information

Table B1. Breakdown and Summary Statistics of Total Cost ($/W-DC)

Type of Installation	Type of Cost	Mean(Cost) low-end	Mean(Cost) high-end	Min(Cost) low-end	Min(Cost) high-end	Max(Cost) low-end	Max(Cost) high-end	Median(Cost) low-end	Median(Cost) high-end
Residential	Total Cost	$3.42	$3.54	$2.50	$3.00	$4.00	$4.00	$3.50	$3.50
Commercial	Total Cost	$2.65	$2.80	$1.85	$1.85	$3.25	$3.50	$2.60	$3.00
Utility	Total Cost	$1.70	$1.76	$1.10	$1.10	$2.50	$3.00	$1.68	$1.68
Residential	Hardware Cost	$2.11	$2.24	$1.50	$1.75	$3.15	$3.15	$2.10	$2.16
Commercial	Hardware Cost	$1.67	$1.74	$1.15	$1.15	$2.25	$2.25	$1.78	$1.78
Utility	Hardware Cost	$1.14	$1.21	$0.94	$0.94	$1.33	$1.80	$1.20	$1.20
Residential	Soft Cost	$1.26	$1.49	$0.35	$0.35	$2.03	$2.03	$1.07	$1.75
Commercial	Soft Cost	$0.93	$1.11	$0.37	$0.37	$1.30	$2.30	$0.97	$1.01
Utility	Soft Cost	$0.51	$0.65	$0.17	$0.17	$0.80	$1.75	$0.57	$0.57

Table B2. Breakdown and Summary Statistics of Soft Costs ($/W-DC)[f]

Type of Installation	Type of Cost	Mean(Cost) low-end	Mean(Cost) high-end	Min(Cost) low-end	Min(Cost) high-end	Max(Cost) low-end	Max(Cost) high-end	Median(Cost) low-end	Median(Cost) high-end
Residential	Installation, etc.	$0.54	$0.64	$0.00	$0.00	$0.98	$1.40	$0.60	$0.77
Commercial	Installation, etc.	$0.47	$0.56	$0.09	$0.09	$0.75	$1.40	$0.52	$0.52
Utility	Installation, etc.	$0.23	$0.33	$0.06	$0.06	$0.50	$1.20	$0.14	$0.14
Residential	Marketing, etc.	$0.19	$0.23	$0.00	$0.00	$0.53	$0.53	$0.17	$0.21
Commercial	Marketing, etc.	$0.12	$0.15	$0.02	$0.02	$0.30	$0.35	$0.13	$0.14
Utility	Marketing, etc.	$0.07	$0.10	$0.01	$0.01	$0.14	$0.30	$0.07	$0.07
Residential	Overhead, etc.	$0.41	$0.45	$0.11	$0.16	$0.99	$0.99	$0.30	$0.43
Commercial	Overhead, etc.	$0.33	$0.38	$0.09	$0.11	$1.30	$1.30	$0.19	$0.23
Utility	Overhead, etc.	$0.15	$0.21	$0.03	$0.04	$0.25	$0.60	$0.15	$0.15
Residential	Permitting, etc.	$0.19	$0.22	$0.08	$0.08	$0.39	$0.39	$0.18	$0.23
Commercial	Permitting, etc.	$0.14	$0.17	$0.04	$0.04	$0.32	$0.35	$0.14	$0.15
Utility	Permitting, etc.	$0.09	$0.11	$0.03	$0.03	$0.14	$0.30	$0.07	$0.07
Residential	Soft Cost Total	$1.36	$1.58	$0.70	$0.70	$2.03	$2.80	$1.32	$1.57
Commercial	Soft Cost Total	$1.08	$1.28	$0.33	$0.43	$2.08	$2.80	$1.05	$1.28
Utility	Soft Cost Total	$0.54	$0.75	$0.15	$0.17	$1.00	$2.40	$0.57	$0.57

[f] Note: there were 5 respondents that provided a total cost for residential installations but no information on the breakdown of their soft costs into the information captured in this table.

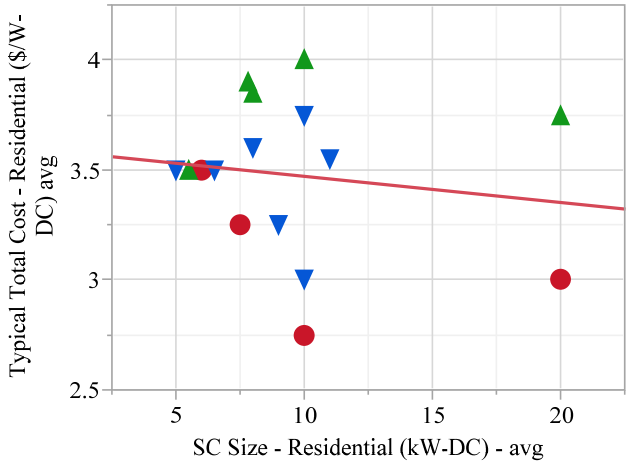
Table B3. South Carolina Population and Installation Information by County

County	Region	2014 population	median income	persons in poverty/%	number of installations (15-Aug)	capacity/kW AC (15-Aug)	avg capacity/kW AC per installation
Beaufort	Coastal	175,852	$57,295	12.9	37	271.7	7.34
Berkeley	Coastal	198,205	$51,844	13.7	40	196.83	4.92
Charleston	Coastal	381,015	$52,083	16.8	144	1169.31	8.12
Colleton	Coastal	3,771	$32,224	23	12	94.08	7.84
Dorchester	Coastal	148,469	$54,452	12.8	28	132.74	4.74
Hampton	Coastal	20,405	$34,494	23.8	8	69.9	8.74
Jasper	Coastal	27,170	$37,801	24.5	.	.	.
Aiken	Midlands	164,753	$45,597	16.6	32	133.35	4.17
Allendale	Midlands	9,695	$25,495	39.9	2	30.05	15.03
Bamberg	Midlands	15,182	$32,738	29.7	1	7.53	7.53
Barnwell	Midlands	21,959	$33,639	27	5	13.86	2.77
Calhoun	Midlands	14,878	$41,727	19.3	7	34.63	4.95
Chester	Midlands	32,337	$33,151	22.5	6	27.42	4.57
Clarendon	Midlands	34,113	$32,243	27	.	.	.
Fairfield	Midlands	22,976	$36,213	23.1	7	20.03	2.86
Kershaw	Midlands	63,161	$43,203	17.4	6	33.88	5.65
Lancaster	Midlands	83,160	$42,906	19.7	8	58.97	7.37
Lee	Midlands	18,343	$30,939	19.7	.	.	.
Lexington	Midlands	277,888	$54,170	13.8	66	314.06	4.76
Newberry	Midlands	37,783	$41,971	19.4	9	83.63	9.29
Orangeburg	Midlands	90,090	$33,615	30.8	3	38	12.67
Richland	Midlands	401,566	$48,674	16.1	47	252.5	5.37
Sumter	Midlands	107,919	$40,662	23.2	5	62.63	12.53
York	Midlands	245,346	$53,568	14.6	31	178.12	5.75
Chesterfield	PeeDee	46,125	$31,692	26.4	11	85.87	7.81
Darlington	PeeDee	67,799	$35,494	25.3	2	13.2	6.60
Dillon	PeeDee	31,127	$28,847	29.8	.	.	.
Florence	PeeDee	139,231	$42,321	19.5	1	1.72	1.72
Georgetown	PeeDee	60,773	$41,578	19.6	11	39.8	3.62
Horry	PeeDee	298,932	$42,322	17.6	56	222.47	3.97
Marion	PeeDee	31,933	$29,884	30.1	.	.	.
Marlboro	PeeDee	27,924	$28,765	31.4	.	.	.
Williamsburg	PeeDee	32,695	$27,485	28.3	.	.	.
Abbeville	Piedmont	24,965	$35,409	21.4	11	38.27	3.48
Anderson	Piedmont	192,810	$41,822	16.7	19	73.96	3.89
Cherokee	Piedmont	56,024	$34,766	22.3	12	45.92	3.83
Edgefield	Piedmont	26,553	$44,704	17.5	6	16.82	2.80
Greenville	Piedmont	482,752	$49,968	14.7	79	654.85	8.29
Greenwood	Piedmont	69,520	$36,045	22.1	9	46.41	5.16
Laurens	Piedmont	66,533	$38,300	21.1	11	45.95	4.18
McCormick	Piedmont	9,846	$39,919	24.6	5	14.33	2.87
Oconee	Piedmont	75,192	$41,197	17.5	11	97.66	8.88
Pickens	Piedmont	120,368	$41,501	19.5	18	150.5	8.36
Saluda	Piedmont	20,026	$38,216	20.6	5	18.22	3.64
Spartanburg	Piedmont	293,542	$43,555	17.7	56	280.55	5.01
Union	Piedmont	27,876	$35,221	19.6	7	36.81	5.26

Appendix B (continued)

Exhibit B1. Total Cost versus Installation Size by Type of Installation

Bivariate Fit of Typical Total Cost - Residential ($/W-DC) avg By SC Size - Residential (kW-DC) - avg



Linear Fit

Typical Total Cost - Residential ($/W-DC) avg = 3.5928273 - 0.011894*SC Size - Residential (kW-DC) - avg

Summary of Fit

RSquare	0.022373
RSquare Adj	-0.04746
Root Mean Square Error	0.35941
Mean of Response	3.478125
Observations (or Sum Wgts)	16

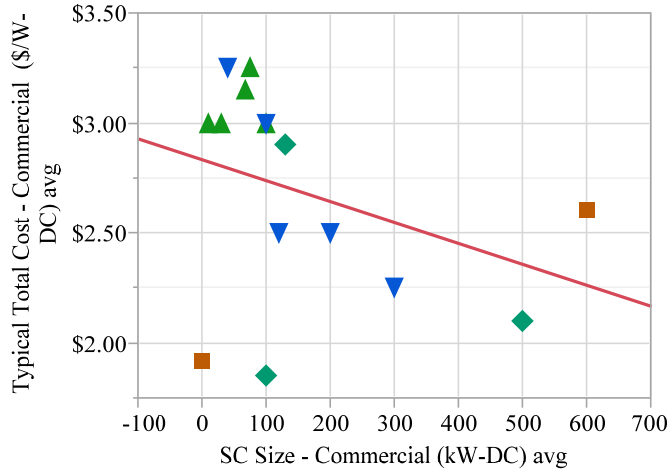
Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	0.0413872	0.041387	0.3204
Error	14	1.8084565	0.129175	**Prob > F**
C. Total	15	1.8498438		0.5803

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	3.5928273	0.221669	16.21	<.0001*
SC Size - Residential (kW-DC) - avg	-0.011894	0.021013	-0.57	0.5803

Bivariate Fit of Typical Total Cost - Commercial ($/W-DC) avg By SC Size - Commercial (kW-DC) avg



Linear Fit

Typical Total Cost - Commercial ($/W-DC) avg = 2.8350713 - 0.0009507*SC Size - Commercial (kW-DC) avg

Summary of Fit

RSquare	0.12438
RSquare Adj	0.057025
Root Mean Square Error	0.463343
Mean of Response	2.684667
Observations (or Sum Wgts)	15

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	0.3964466	0.396447	1.8466
Error	13	2.7909268	0.214687	**Prob > F**
C. Total	14	3.1873733		0.1973

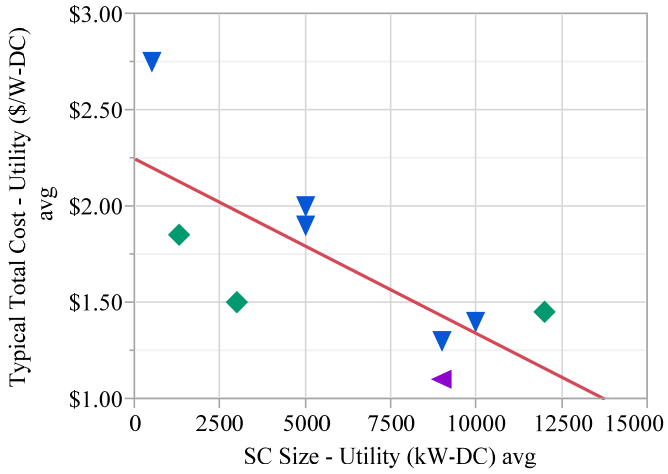
Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	2.8350713	0.16298	17.40	<.0001*
SC Size - Commercial (kW-DC) avg	-0.000951	0.0007	-1.36	0.1973

Appendix B (continued)

Exhibit B1. Total Cost versus Installation Size by Type of Installation

Bivariate Fit of Typical Total Cost - Utility ($/W-DC) avg By SC Size - Utility (kW-DC) avg



Linear Fit

Typical Total Cost - Utility ($/W-DC) avg = 2.2474391 - 9.0771e-5*SC Size - Utility (kW-DC) avg

Summary of Fit

RSquare	0.556969
RSquare Adj	0.493679
Root Mean Square Error	0.352854
Mean of Response	1.694444
Observations (or Sum Wgts)	9

Analysis of Variance

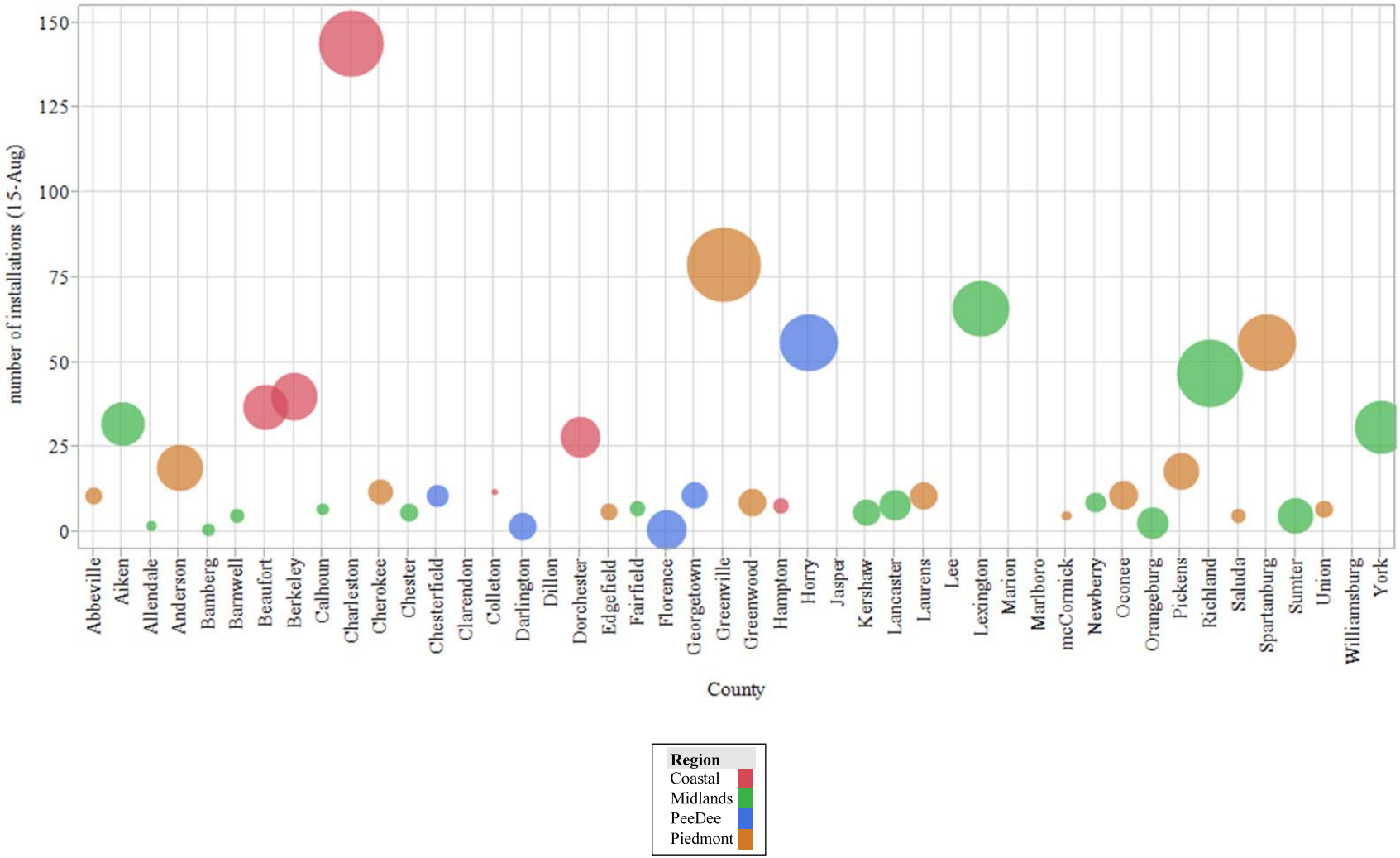
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	1.0956819	1.09568	8.8003
Error	7	0.8715403	0.12451	**Prob > F**
C. Total	8	1.9672222		0.0209*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	2.2474391	0.220416	10.20	<.0001*
SC Size - Utility (kW-DC) avg	-9.077e-5	3.06e-5	-2.97	0.0209*

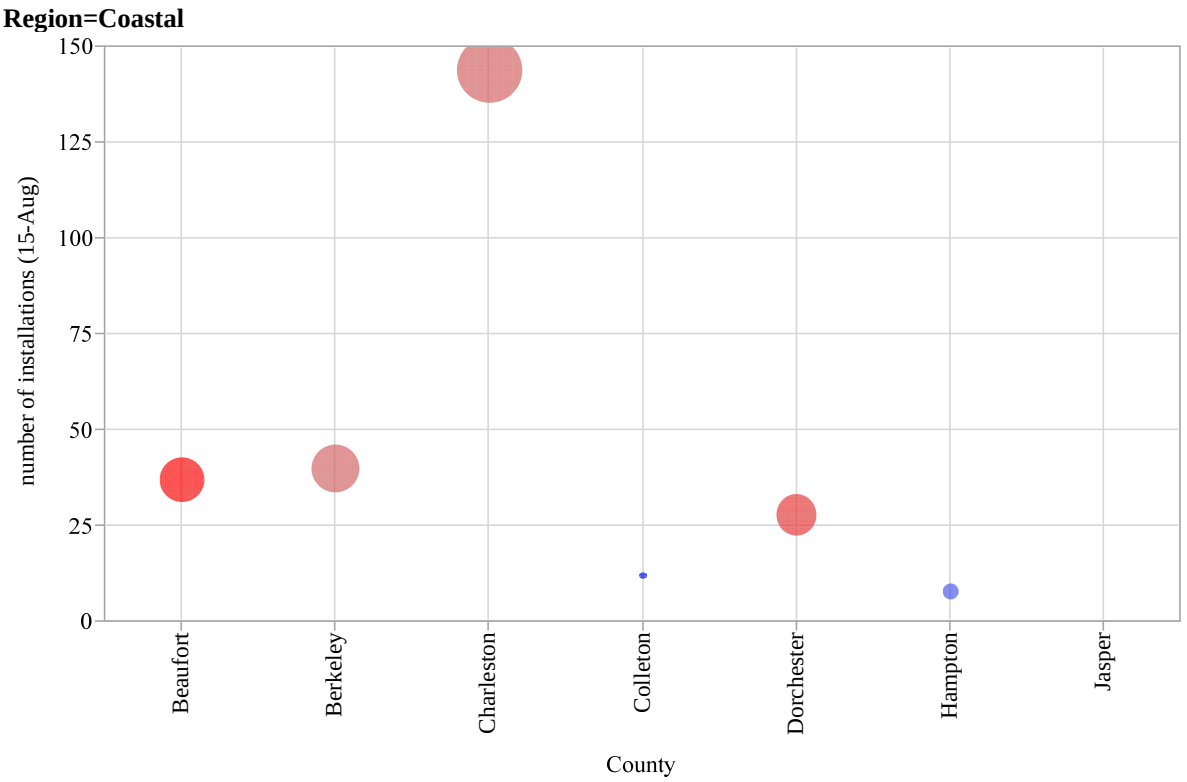
Appendix B (continued)

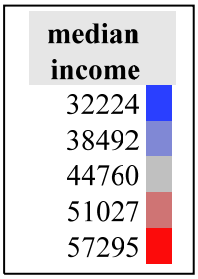
Exhibit B2. Plot of Number of Installations (15-Aug) by County (Sized by 2014 population)



Appendix B (continued)

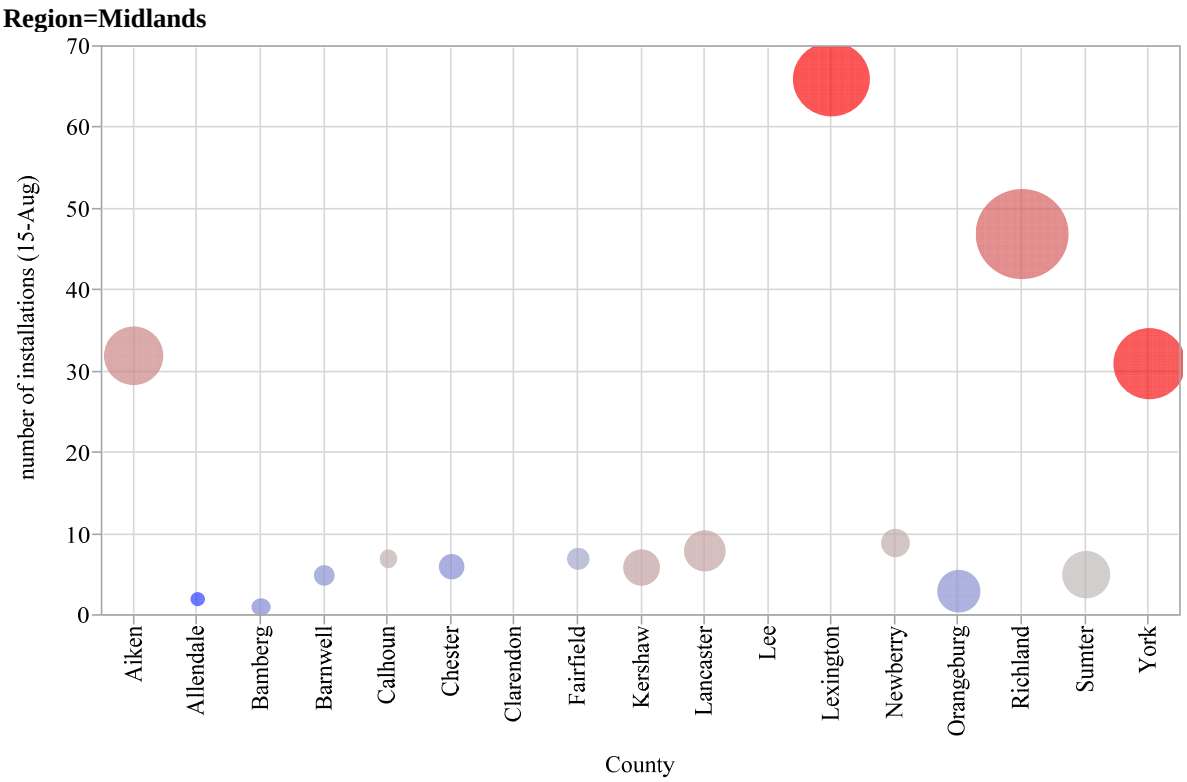
Exhibit B3. Plot of Number of Installations (15-Aug) by County within Region (Sized by 2014 Population)

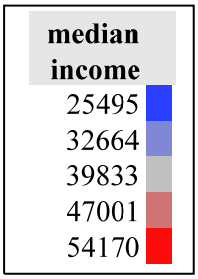




Appendix B (continued)

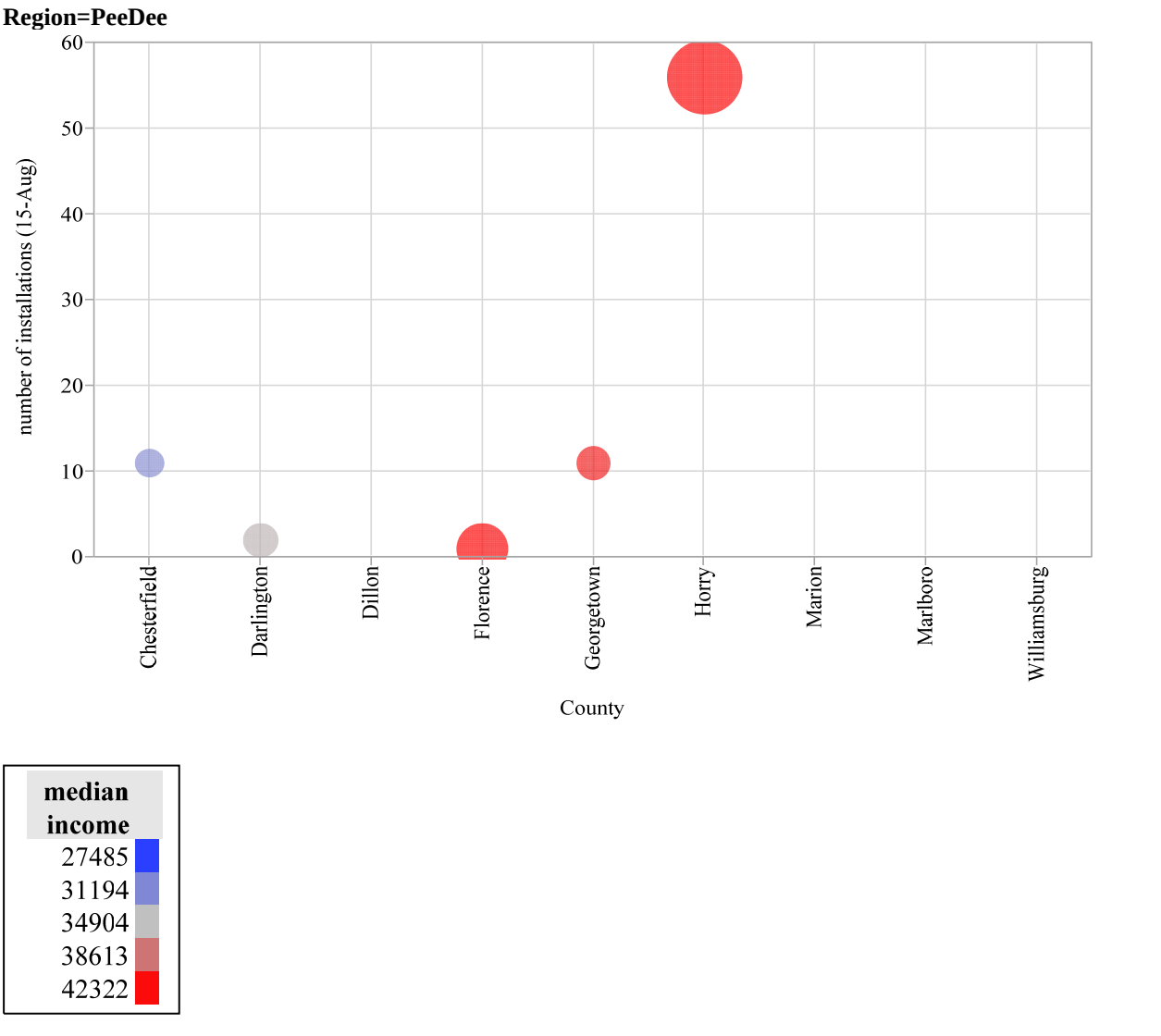
Exhibit B3. Plot of Number of Installations (15-Aug) by County within Region (Sized by 2014 Population)





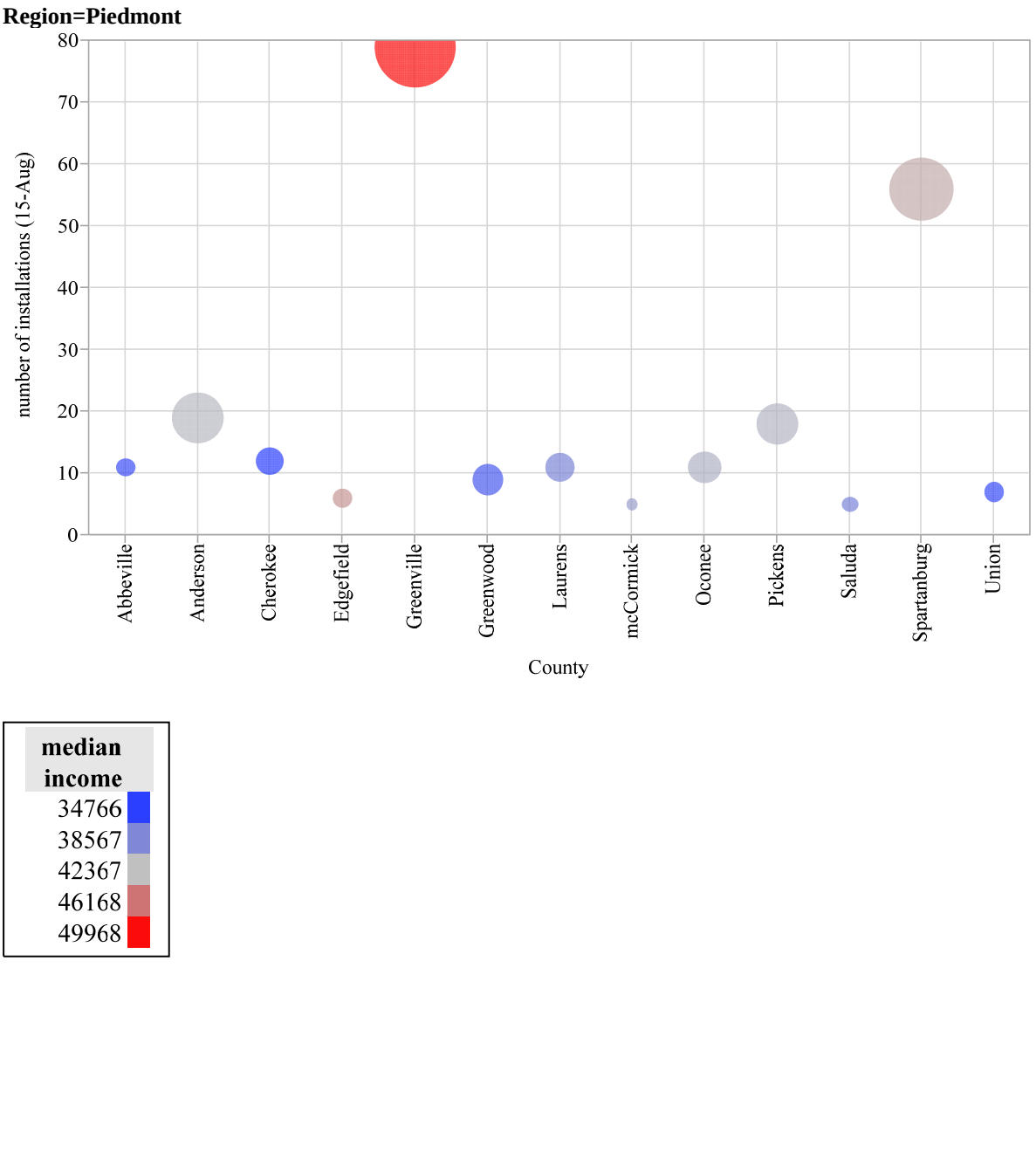
Appendix B (continued)

Exhibit B3. Plot of Number of Installations (15-Aug) by County within Region (Sized by 2014 Population)



Appendix B (continued)

Exhibit B3. Plot of Number of Installations (15-Aug) by County within Region (Sized by 2014 Population)



Appendix B (continued)

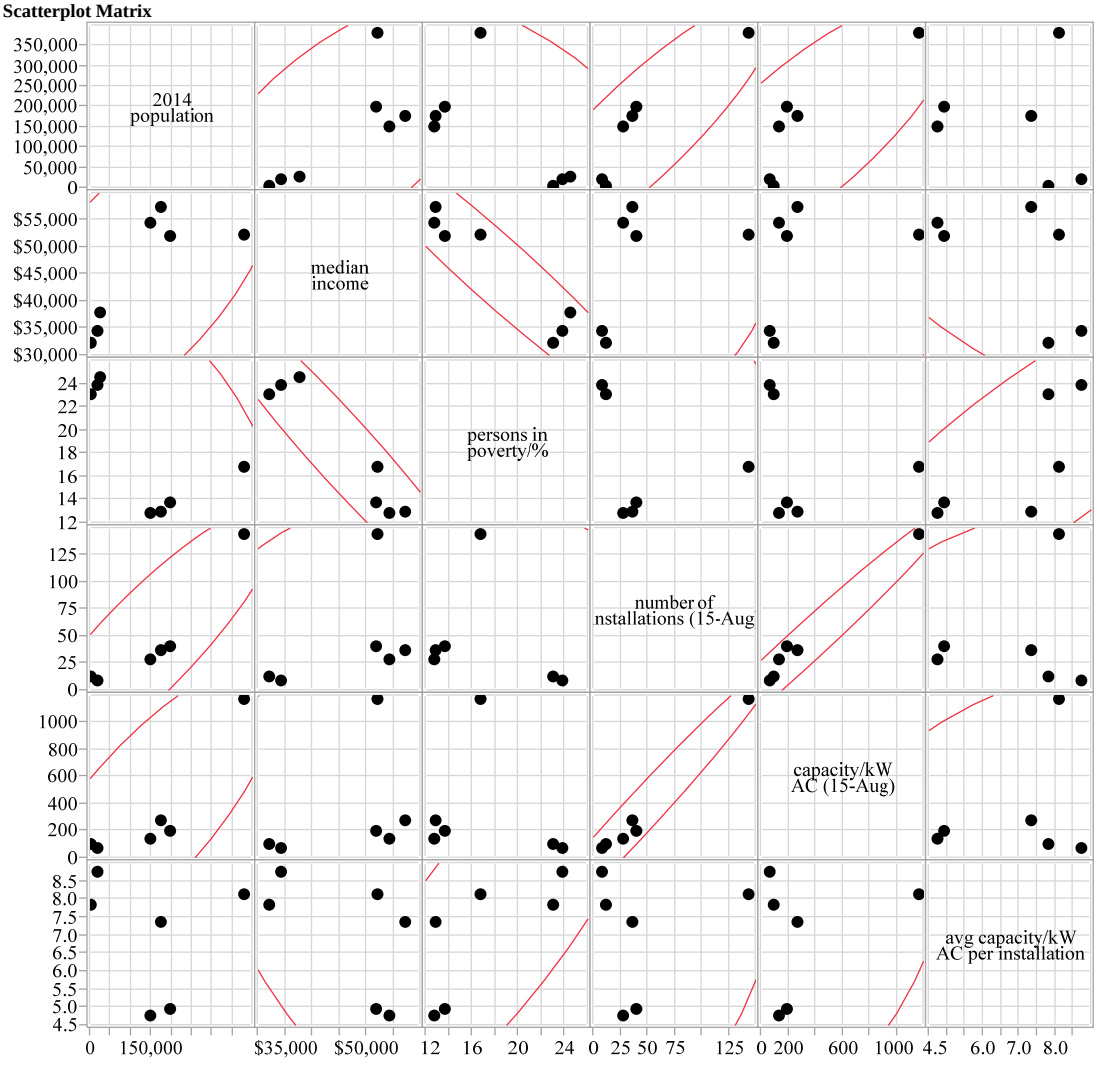
Exhibit B4. Correlations Between County Population and Installation Data by State Region

Multivariate Region=Coastal
Correlations

	2014 population	Median income	persons in poverty/%	number of installations (15-Aug)	capacity/kW AC (15-Aug)	avg capacity/kW AC per installation
2014 population	1.0000	0.6369	-0.4936	0.8785	0.7889	-0.1639
median income	0.6369	1.0000	-0.9606	0.2182	0.0849	-0.6598
persons in poverty/%	-0.4936	-0.9606	1.0000	-0.0343	0.1186	0.8327
number of installations (15-Aug)	0.8785	0.2182	-0.0343	1.0000	0.9839	0.2673
capacity/kW AC (15-Aug)	0.7889	0.0849	0.1186	0.9839	1.0000	0.4326
avg capacity/kW AC per installation	-0.1639	-0.6598	0.8327	0.2673	0.4326	1.0000

There are 1 missing values.
The correlations are estimated by REML method.

Scatterplot Matrix



Appendix B (continued)

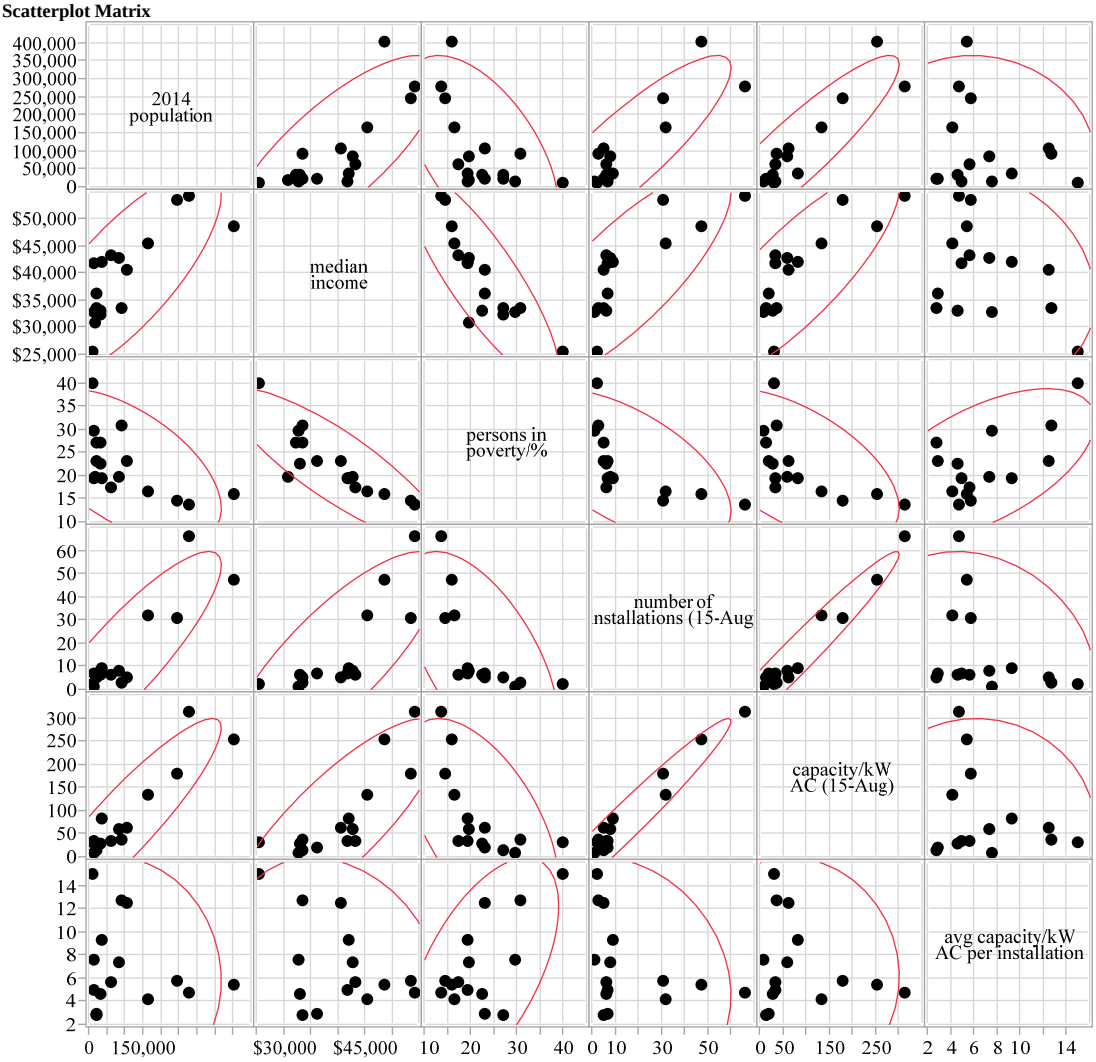
Exhibit B4. Correlations Between County Population and Installation Data by State Region

Multivariate Region=Midlands
Correlations

	2014 population	Median income	persons in poverty/%	number of installations (15-Aug)	capacity/kW AC (15-Aug)	avg capacity/kW AC per installation
2014 population	1.0000	0.7753	-0.5644	0.8726	0.9092	-0.0771
median income	0.7753	1.0000	-0.8494	0.7983	0.8269	-0.2141
persons in poverty/%	-0.5644	-0.8494	1.0000	-0.5980	-0.5676	0.5816
number of installations (15-Aug)	0.8726	0.7983	-0.5980	1.0000	0.9753	-0.2098
capacity/kW AC (15-Aug)	0.9092	0.8269	-0.5676	0.9753	1.0000	-0.0430
avg capacity/kW AC per installation	-0.0771	-0.2141	0.5816	-0.2098	-0.0430	1.0000

There are 2 missing values.
The correlations are estimated by REML method.

Scatterplot Matrix



Appendix B (continued)

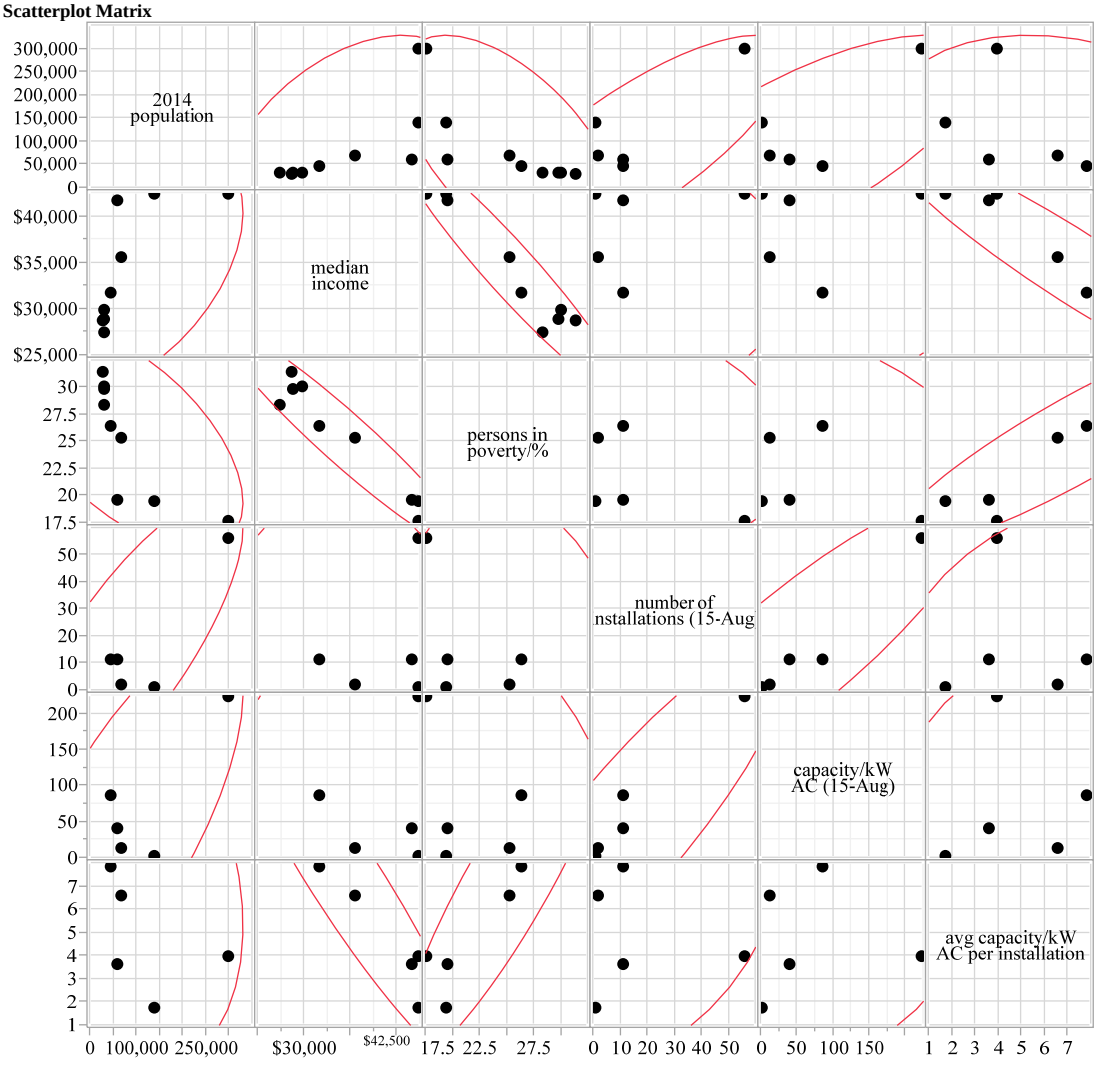
Exhibit B4. Correlations Between County Population and Installation Data by State Region

Multivariate Region=PeeDee
Correlations

	2014 population	median income	persons in poverty/%	number of installations (15-Aug)	capacity/kW AC (15-Aug)	avg capacity/kW AC per installation
2014 population	1.0000	0.4671	-0.5809	0.7902	0.7180	-0.2611
median income	0.4671	1.0000	-0.9540	-0.0464	0.0441	-0.9412
persons in poverty/%	-0.5809	-0.9540	1.0000	-0.1591	-0.3083	0.9027
number of installations (15-Aug)	0.7902	-0.0464	-0.1591	1.0000	0.8776	0.2671
capacity/kW AC (15-Aug)	0.7180	0.0441	-0.3083	0.8776	1.0000	0.0566
avg capacity/kW AC per installation	-0.2611	-0.9412	0.9027	0.2671	0.0566	1.0000

There are 4 missing values.
The correlations are estimated by REML method.

Scatterplot Matrix



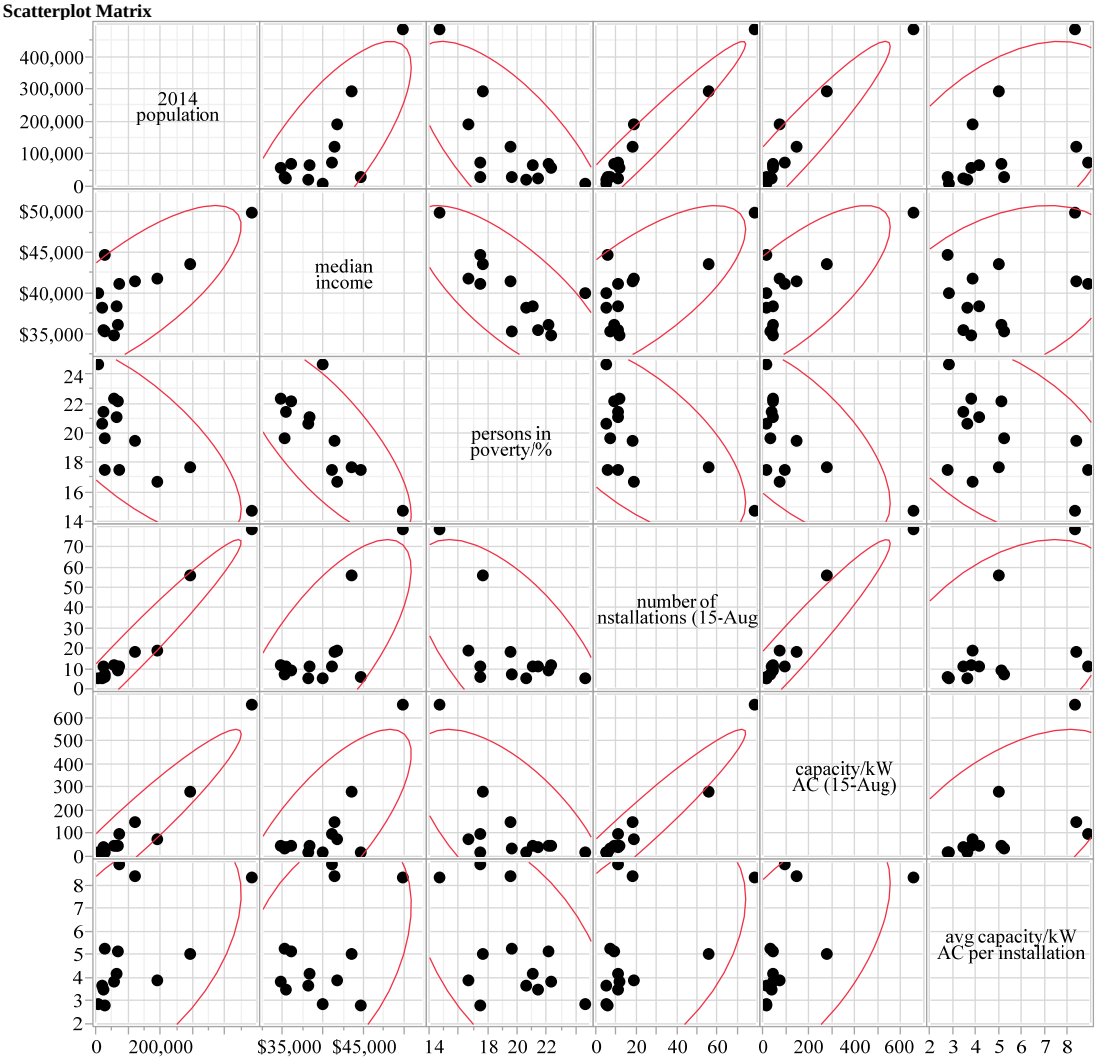
Appendix B (continued)

Exhibit B4. Correlations Between County Population and Installation Data by State Region

Multivariate Region=Piedmont
Correlations

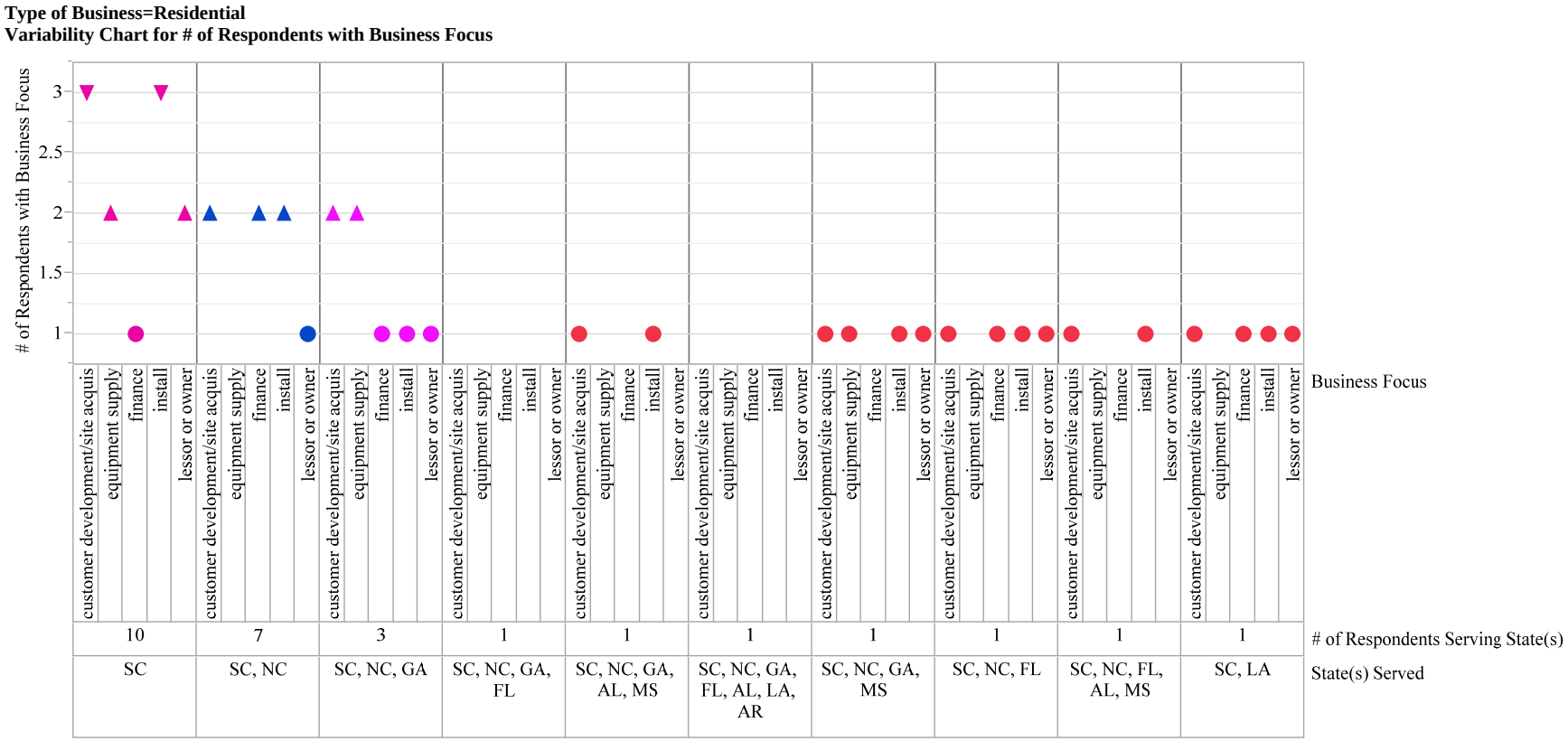
	2014 population	median income	persons in poverty/%	number of installations (15-Aug)	capacity/kW AC (15-Aug)	avg capacity/kW AC per installation
2014 population	1.0000	0.7649	-0.7153	0.9748	0.9533	0.5018
median income	0.7649	1.0000	-0.7616	0.7308	0.7576	0.4035
persons in poverty/%	-0.7153	-0.7616	1.0000	-0.6453	-0.6529	-0.5108
number of installations (15-Aug)	0.9748	0.7308	-0.6453	1.0000	0.9639	0.4612
capacity/kW AC (15-Aug)	0.9533	0.7576	-0.6529	0.9639	1.0000	0.5888
avg capacity/kW AC per installation	0.5018	0.4035	-0.5108	0.4612	0.5888	1.0000

Scatterplot Matrix



Appendix B (continued)

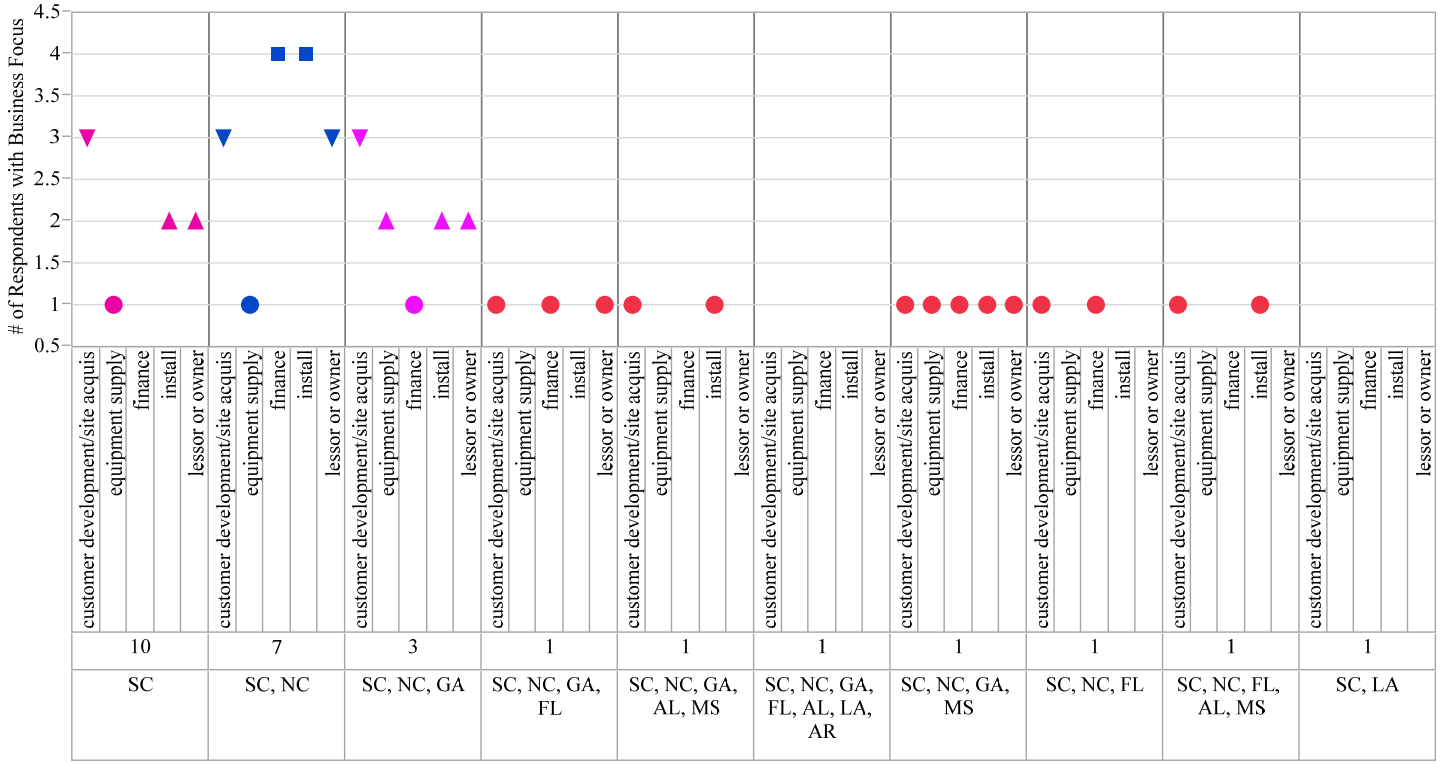
Exhibit B5. Business Focus by State(s) Served and Type of Service



Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

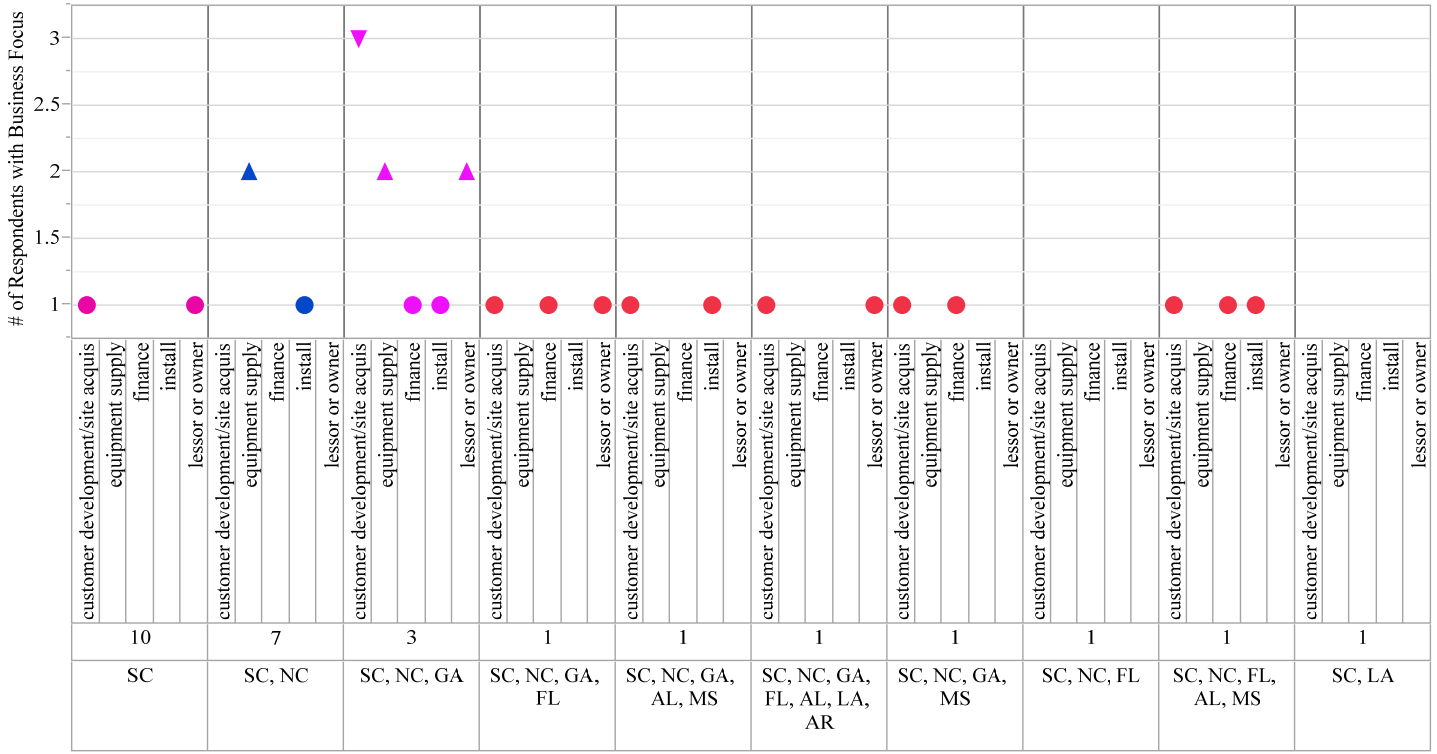
Type of Business=Commercial
Variability Chart for # of Respondents with Business Focus



Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

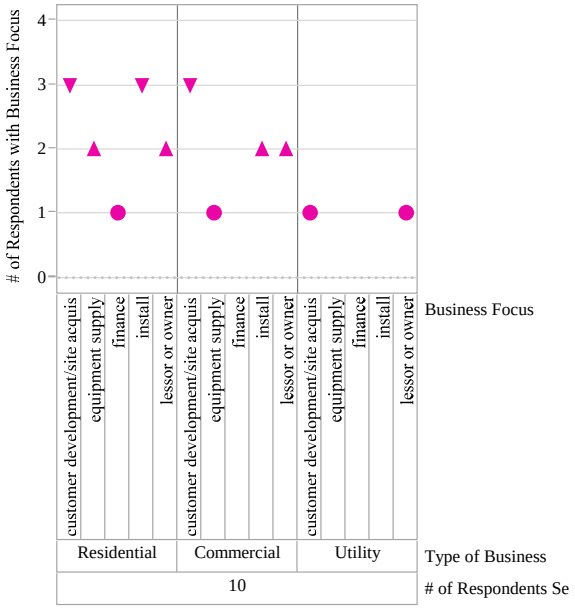
Type of Business=Utility
Variability Chart for # of Respondents with Business Focus



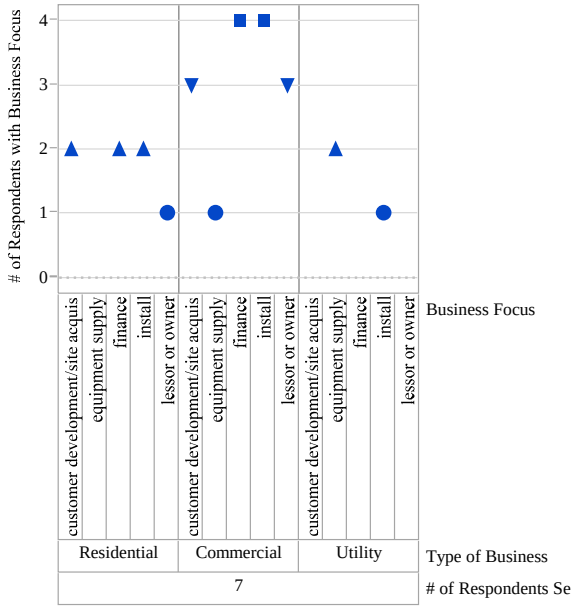
Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

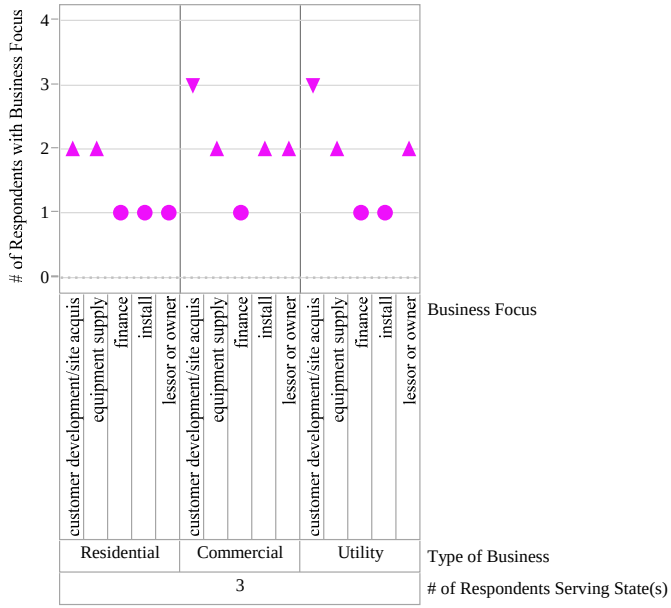
State(s) Served=SC
Variability Chart for # of Respondents with Business Focus



State(s) Served=SC, NC
Variability Chart for # of Respondents with Business Focus



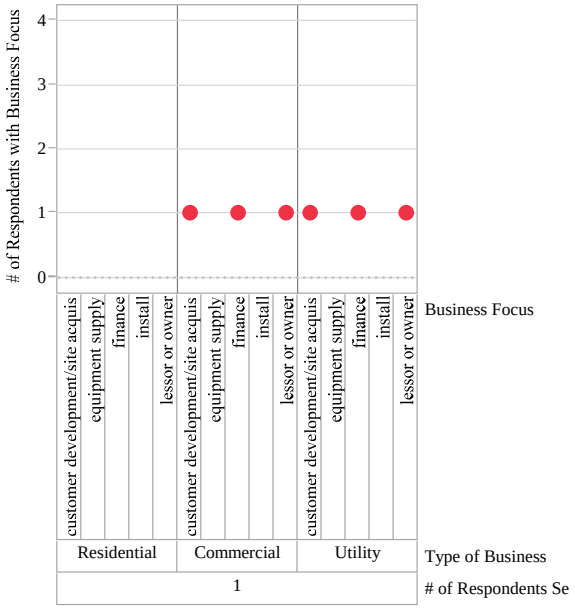
State(s) Served=SC, NC, GA
Variability Chart for # of Respondents with Business Focus



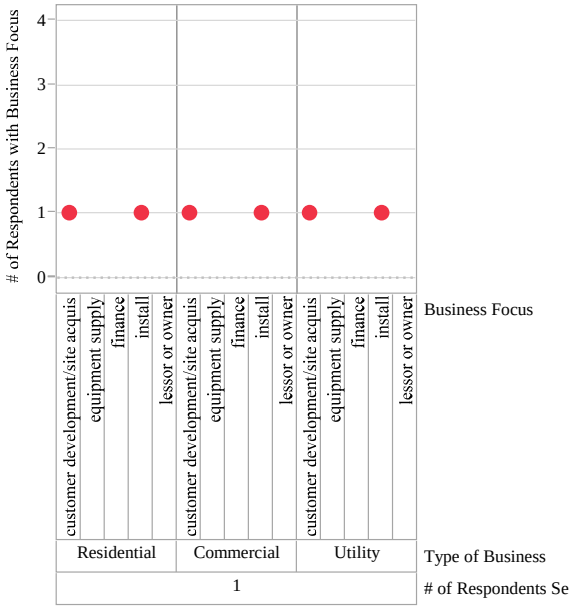
Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

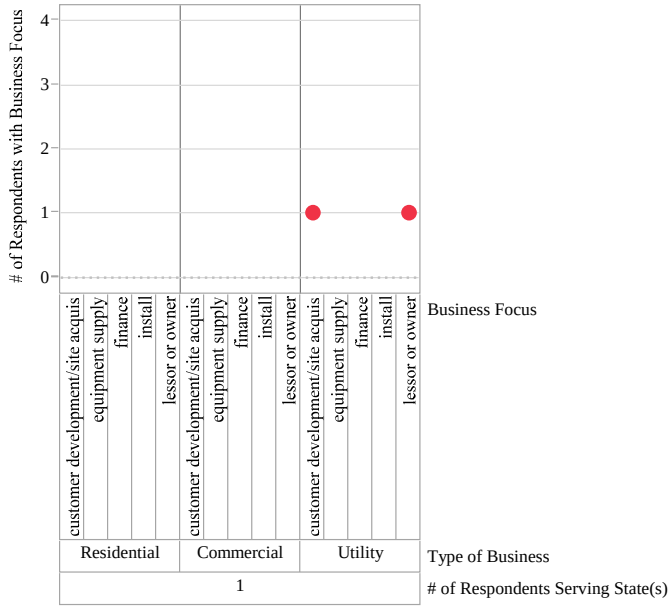
State(s) Served=SC, NC, GA, FL
Variability Chart for # of Respondents with Business Focus



State(s) Served=SC, NC, GA, AL, MS
Variability Chart for # of Respondents with Business Focus



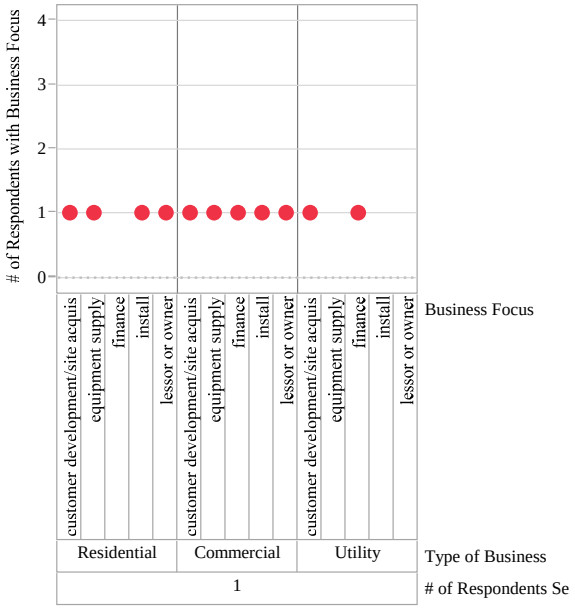
State(s) Served=SC, NC, GA, FL, AL, LA, AR
Variability Chart for # of Respondents with Business Focus



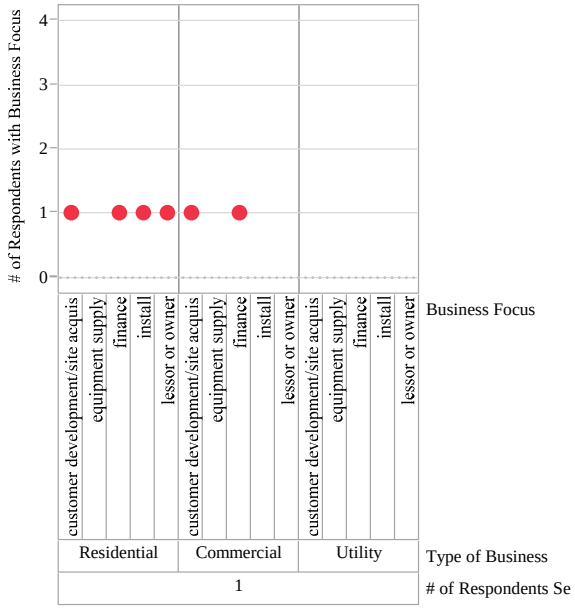
Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

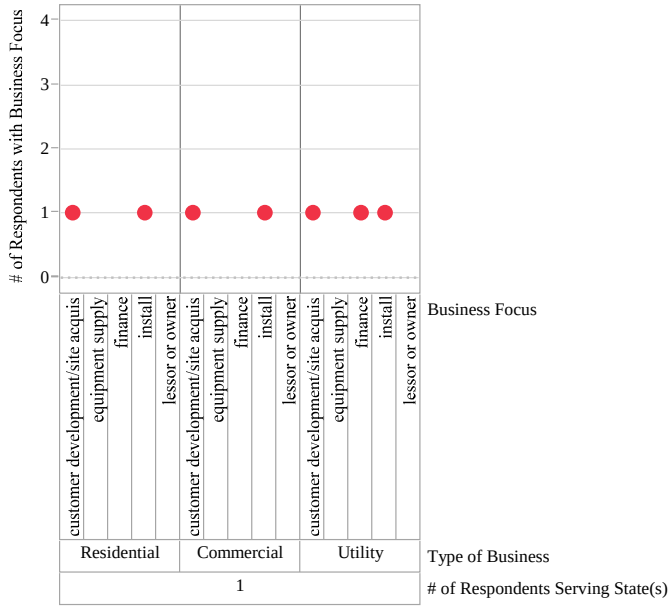
State(s) Served=SC, NC, GA, MS
Variability Chart for # of Respondents with Business Focus



State(s) Served=SC, NC, FL
Variability Chart for # of Respondents with Business Focus



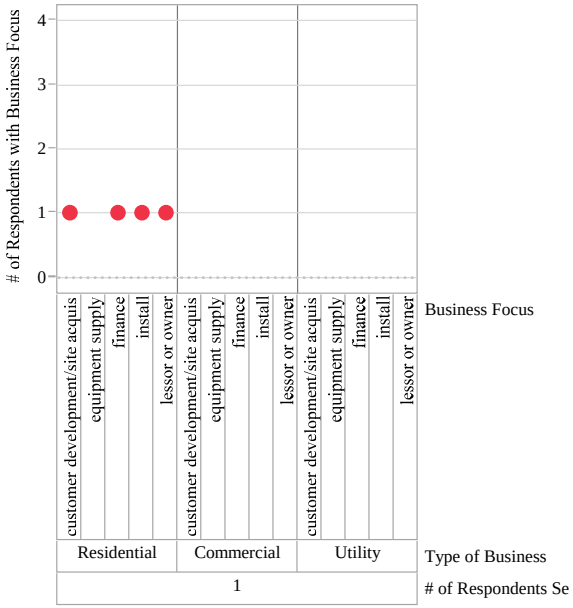
State(s) Served=SC, NC, FL, AL, MS
Variability Chart for # of Respondents with Business Focus



Appendix B (continued)

Exhibit B5. Business Focus by State(s) Served and Type of Service

State(s) Served=SC, LA
Variability Chart for # of Respondents with Business Focus



Distribution:

E. Felt, Duke Energy
J. Merino, Duke Energy
J. Raftery, SCE&G
M. Furtick, SCE&G
E. Kress, SanteeCooper
S. Spivey, SanteeCooper
P. Greenway, SanteeCooper
M. Smith, CEPCI
S. Hammond, CEPCI
T. Jerman, ORS
H. Davis, Coastal Conservation League
D. Zimmerman, Alder Energy
L. Rakusin, NCCETC
T. Cleveland, NCCETC

O. Mucha, DOE-EERE
C. Nichols, DOE-EERE

T. Michalske, 773-A
R. James, 773-A
B. Calloway, 999-2W
A. Murray, 773-A
K. Zeigler, 773-41A
J. Halverson, 999-2W
S. McWhorter, 999-2W
Records