South Carolina Solar Development - Tracking the Effects of Act 236 (2014-2017)

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EXECUTIVE SUMMARY

Since 2014, the installed solar capacity in South Carolina (SC) has mushroomed from 5.5 megawatts to more than 354 megawatts today. Concurrently, the number of customer-sited, load-centered solar generation was expected to grow from less than 600 statewide to as many over 10,000 today. This growth was the direct result of a landmark state policy initiative, Act 236, passed by the SC General Assembly and signed into law by the Governor in June of 2014. Local policy makers in SC were ill-equipped to handle the onslaught of solar permitting and zoning requests expected by 2021. Similarly, the state's building inspectors, first responders, and tax assessors know little about photovoltaic (PV) technology and best practices. Finally, SC's workforce and workforce trainers were underprepared to benefit from the tremendous opportunity created by the passage of Act 236. Each of these deficits in knowledge of and preparedness for solar PV translated into higher "soft costs" of installed solar PV in SC. The Savannah River National Laboratory (SRNL), together with almost a dozen electricity stakeholders in the Southeast, has studied the ability of Act 236 to serve as replicable model for solar PV cost reduction.

In 2015, this study began with a focus on the effects of Act 236 to offer a unique perspective and understanding of the actual impact of rapidly integrating solar energy into the electric grid. This study would analyze the impact of starting at a solar PV penetration of 0.1% and increasing to over 2%, while expanding access, developing regional specific training and educational materials, and developing datasets to support expanding solar markets. Through targeted tracking and analysis, the team developed a baseline of the current market, identified the major obstacles in soft cost reduction, and cooperatively developed stakeholder-centric strategies. This work has enabled us to directly track and report on the growth and effects of recently enacted solar legislation on the industry. This report marks the final in a series of reports examining the effects of Act 236 on the solar economy in SC since 2014.

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LIST OF ABBREVIATIONS

AC	Alternating current
DC	Direct current
DEC	Duke Energy Carolinas
DEP	Duke Energy Progress
DOE	U.S Department of Energy
EOY	End of year
GA	Georgia
IOU	Investor Owned Utility
kW	Kilowatt
MW	Megawatt
NC	North Carolina
NABCEP	North American Board of Certified Energy Practitioners
PPA	Power Purchase Agreement
PURPA	Public Utilities Regulatory Policies Act
PV	Photovoltaic
R^2	Coefficient of Determination
SE	Southeast Region of the United States
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions
SC	South Carolina
SCEG	South Carolina Electric & Gas
SuNLaMP	SunShot National Laboratory Multiyear Partnership
U.S.	United States
W	Watt

1.0 Introduction

In July 2014, South Carolina (SC) Governor Nikki Haley signed Act 236 into law.[1] This legislation, which was considered landmark at the time, required that the state's investor owned utilities (IOUs) produce 2% of their 5-year average peak power production from the sun by 2021. Most significantly, this legislation directed the 2% be split into equal parts for utility scale systems and distributed energy systems, with 0.25% set aside for systems smaller than 20 kW. At the time of its signing, the State had fewer than 500 customer-sited systems statewide. In order to meet Act 236's targets, the utilities would have to interconnect an estimated 10,000 individual systems in a six-year period.

In 2015, the U.S Department of Energy (DOE) funded this study to understand the impacts of SC's Act 236 on the economy and how the penetration of solar in a state with relatively few solar installations would grow. This report, covers the fourth and final survey in the series to track changes throughout the state, which is based on end of year (EOY) 2017 data. Previously released reports examine the solar industry within SC, dating back to 2014. Although Act 236 was signed into law in 2014, it was not enacted until 2015. [2-4] The survey covered herein consisted of four parts of questions on soft costs, descriptions of installer business regions and segments, training and hiring needs, and several open-ended topics designed to better understand the barriers to further growth of the solar industry.

2.0 Experimental Procedure

2.1 Data Collection

Surveys were distributed in the Fall meeting of the SC Solar Council on December 6, 2017. The survey was also made available electronically and closed in January 2018. A copy of the survey is provided in Appendix A. One response was recorded per business and eleven completed surveys were received, the lowest participation rate to date. Data were analyzed using the statistical program JMP Pro Version 11.2.1 [5] and compared with previous survey results, where applicable. This enabled direct comparisons with the previous studies for this project to detect trends in the SC solar market since the enactment of Act 236 beginning in 2015.

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

3.1 Solar Sector Served by Respondents

Due to the sudden increase in demand created by Act 236 for the solar sector, it was important to track local industry's ability to meet market needs. The breakdown of sectors served in 2017 can be found in Figure 3-1 and a comparison since 2014 can be found in Table 1. In 2017, 40% of respondents served the residential sector and 10% served only the residential sector. This is a decline from 2015, when 71% of all respondents served the residential sector and 17% served only the residential sector. There has been slight growth in companies serving the commercial and utility scale sectors, which could indicate the expansion of business opportunities in these sectors.

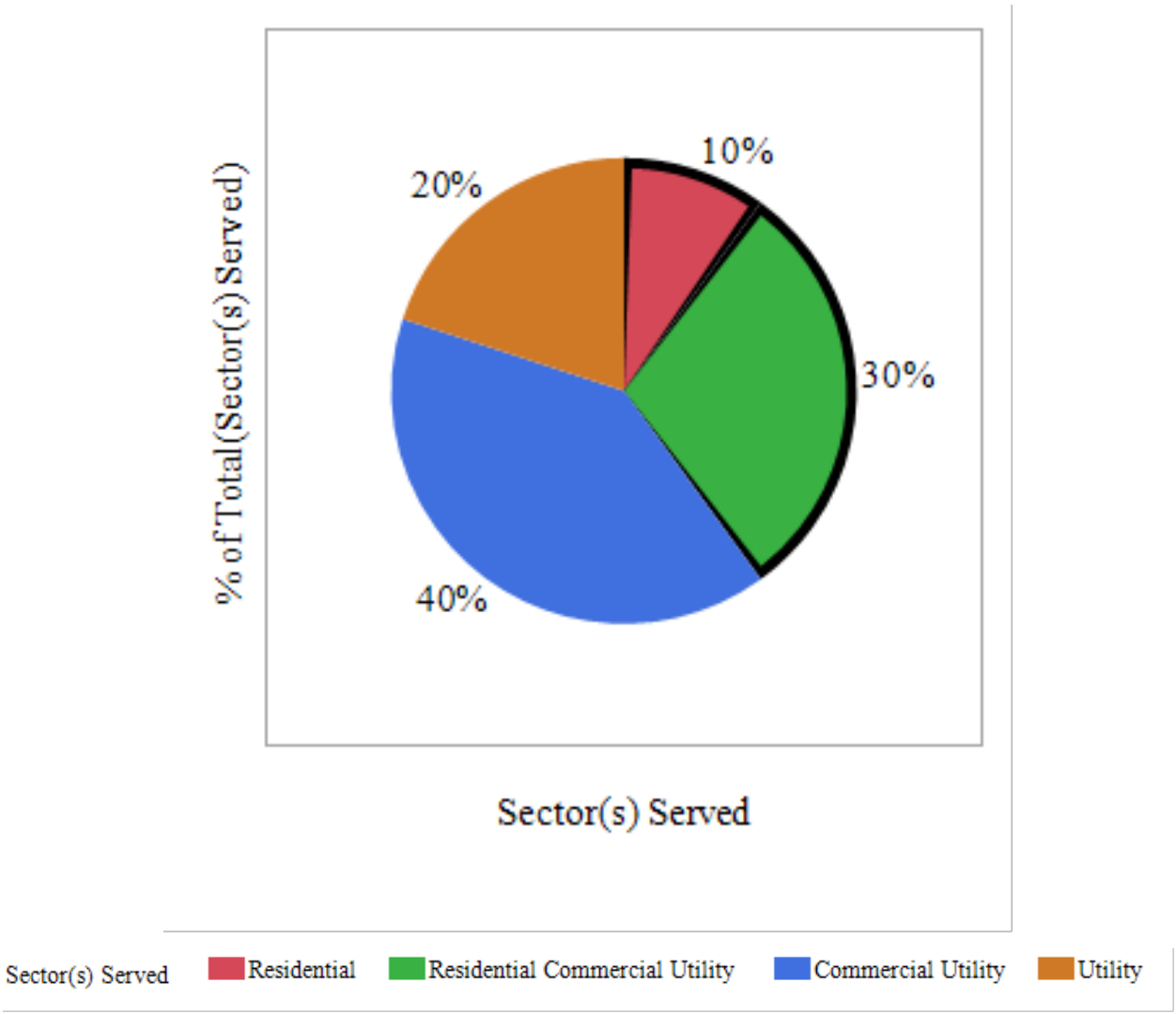

Figure 3-1. Solar PV Segments Served by Respondents at the end of 2017.

Table 1. Percentage of Respondents that serve each solar PV segments.

Segment Served	2014	2015	2016	2017
Residential	82%	71%	70%	40%
Commercial	63%	62%	81%	70%
Utility	52%	50%	52%	90%

3.2 Typical Size of Installation by Type

Prior to 2015, there was very little residential solar penetration in SC. This was due to high costs, lack of net metering agreements, and lack of understanding about solar technology and its potential benefits. As a part of Act 236, the IOUs developed programs to help spur residential development. This included

performance-based incentives at South Carolina Electric & Gas (SCEG) and direct rebates from Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP). One clear and immediate effect is in the increase in residential installation size right after the legislation was signed into law. In 2014, the average installation size was 5kW. This average installation size immediately almost doubled to 9kW in 2015, as seen in Figure 3-2 in boxplot form[1]. This size has essentially stayed stable since then with the average installation size decreasing to 8 kW in 2017. This decrease could be attributed to few installations installed above 10 kW, but less than 20 kW as reported by the survey respondents, the State's limit for residential net metering.

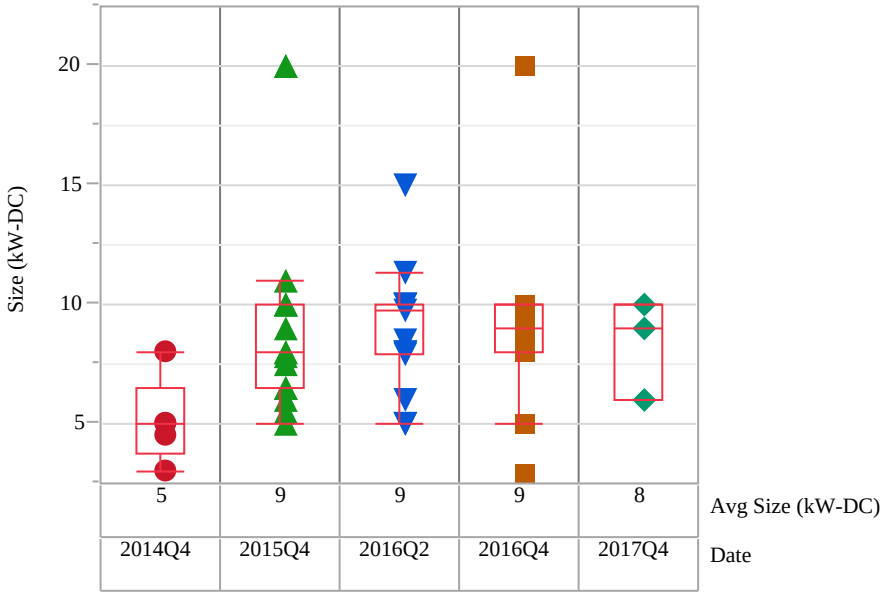

Figure 3-2. Residential PV Installation Size (kW-DC) from 2014 through Year-End 2017.

[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.

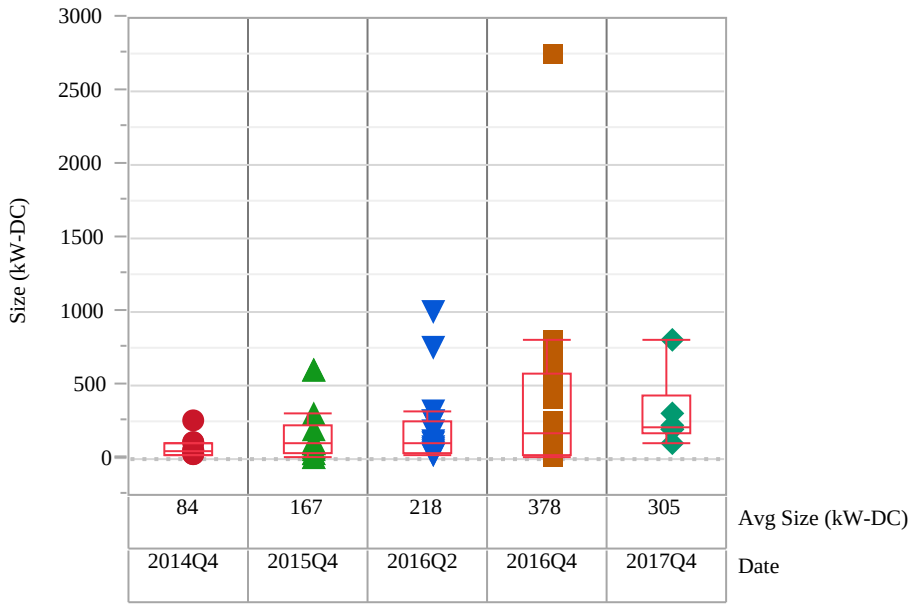

Figure 3-3. Commercial PV Installation Size (kW-DC) from 2014 through Year-End 2017.

Like residential installation, the average size for commercial and utility-scale installations also increased since 2014, see Figure 3-3 and Figure 3-4, respectively. Commercial installations continued a steady increase in size, year by year, and are currently an average size of 305 kW versus 84 kW in 2014. Utility-scale installations have also steadily grown in average size from 2.3 MW to 29 MW in 2017. These numbers are over 10 times the size of the average size utility scale installation before Act 236 was enacted. It is clear that Act 236 indicated to the solar industry that SC was open for business as larger and larger utility-scale installations continue to be installed.

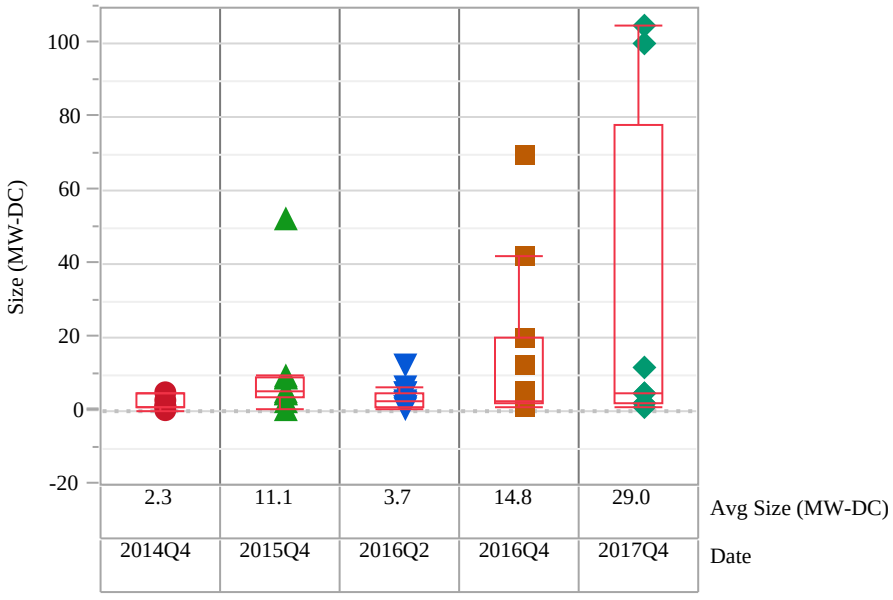

Figure 3-4. Utility PV Installation Size (kW-DC) from 2014 through Year-End 2017.

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

The cost of residential installations remains an impediment to access to solar energy, particularly in poor and rural communities. However, simply the action of signing Act 236 had a direct, immediate impact on the cost of solar energy in SC in the residential, commercial, and utility sectors. In 2014, residential systems installed for an average of $4.40/W-DC, see Figure 3-5. This immediately dropped by $0.87/W-DC to $3.53 in 2015 before Act 236 was fully implemented. In 2016, when third party leasing became available, the average cost decreased another $0.19/W-DC, and the estimated cost at the end of 2017 was $3.38/W-DC, for a total decrease of $1.02/W-DC since 2014. Overall, total cost dropped 23% in the three-year period. Continuing to track the costs at the end of each year until 2021, the deadline for Act 236 implementation, could provide additional insight into the effects of the imposed solar tariffs, the effect of reaching the initial net metering cap of 2% on the state's solar industry, and the effect of the phase-out of the federal investment tax credit for residential installations.

The cost of residential and utility scale installations dropped $0.48/W-DC for commercial installations and $0.65/W-DC for utility-scale installations between 2014 and 2015, see Figure 3-6 and Figure 3-7, respectively. Overall, the cost of commercial installations dropped by 39% over the three-year period, while the cost of utility-scale installations dropped by 43%. This large drop in price has allowed several power purchase agreements (PPAs) to be signed with the utilities for below avoided cost.

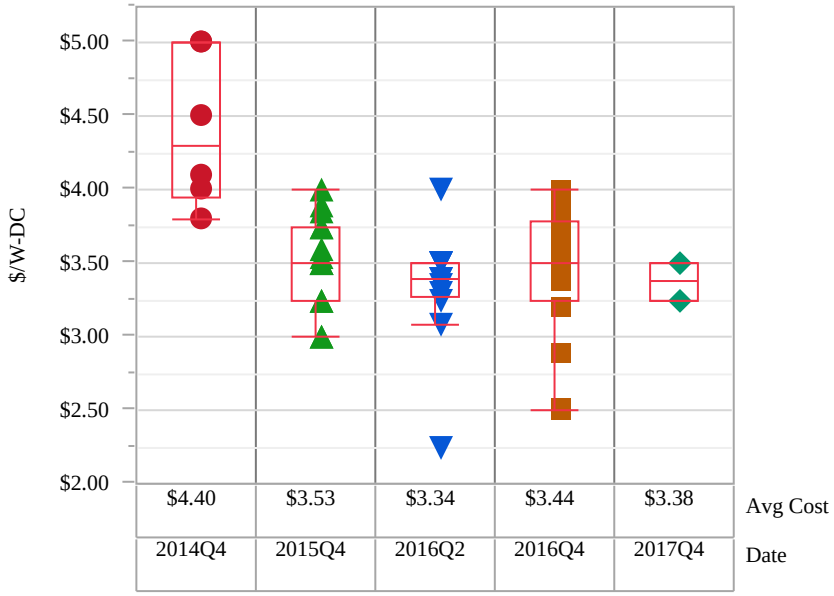

Figure 3-5. Total Cost of Residential PV Installations in $/W-DC from 2014 through 2017.

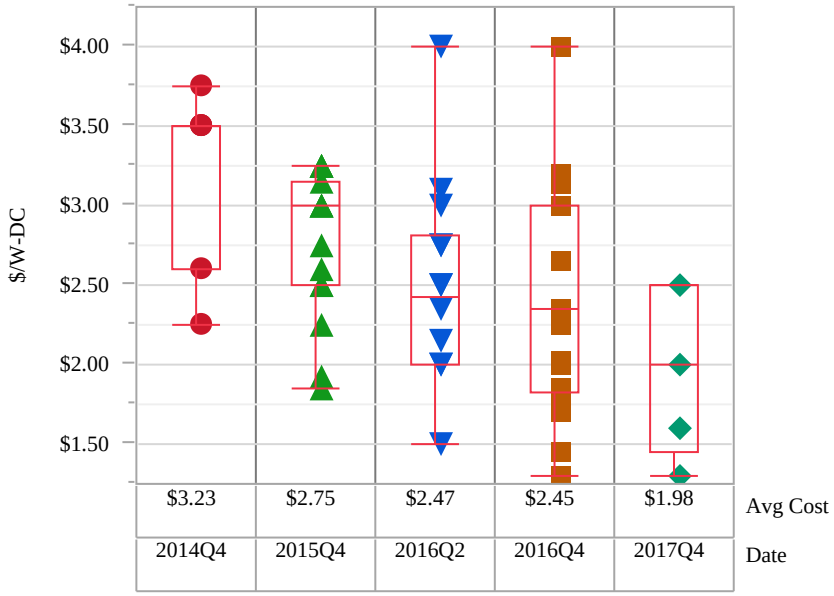

Figure 3-6. Total Cost of Commercial PV Installations in $/W-DC from 2014 through 2017.

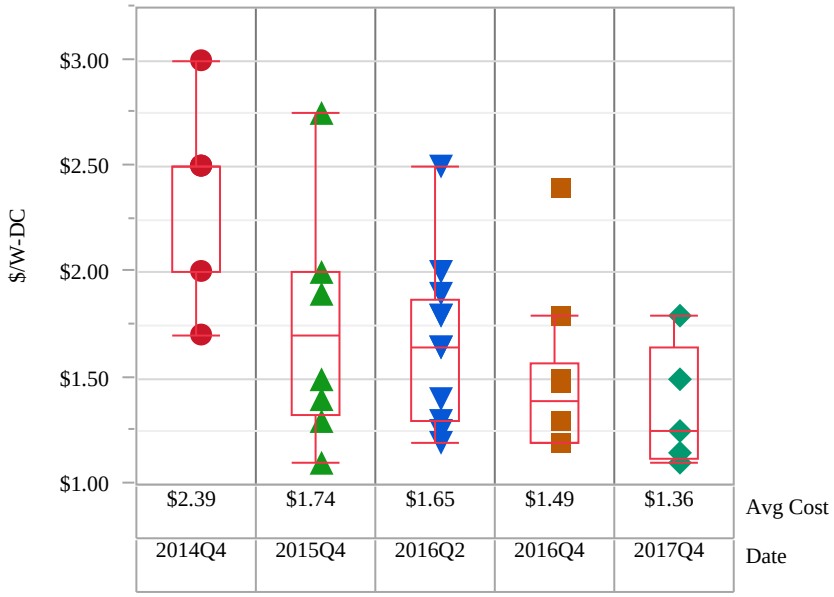

Figure 3-7. Total Cost of Utility PV Installations in $/W-DC from 2014 through 2017.

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

To better understand changing costs, the percentage of the cost of installation in each sector has been tracked over the three-year period. In each sector, the total percentage of cost attributed to hardware has essentially remained flat since 2014, see Figure 3-8, Figure 3-9, and Figure 3-10 for residential, commercial, and utility sectors, respectively. Hardware remains 60% for residential systems, 59% for commercial systems, and 65% for utility-scale systems.

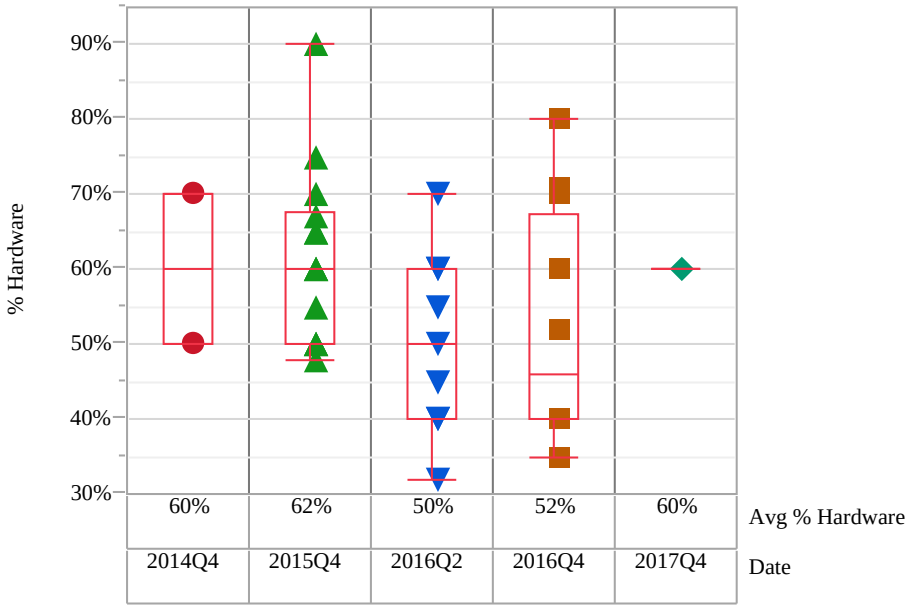

Figure 3-8. Percent hardware cost for residential solar by date.

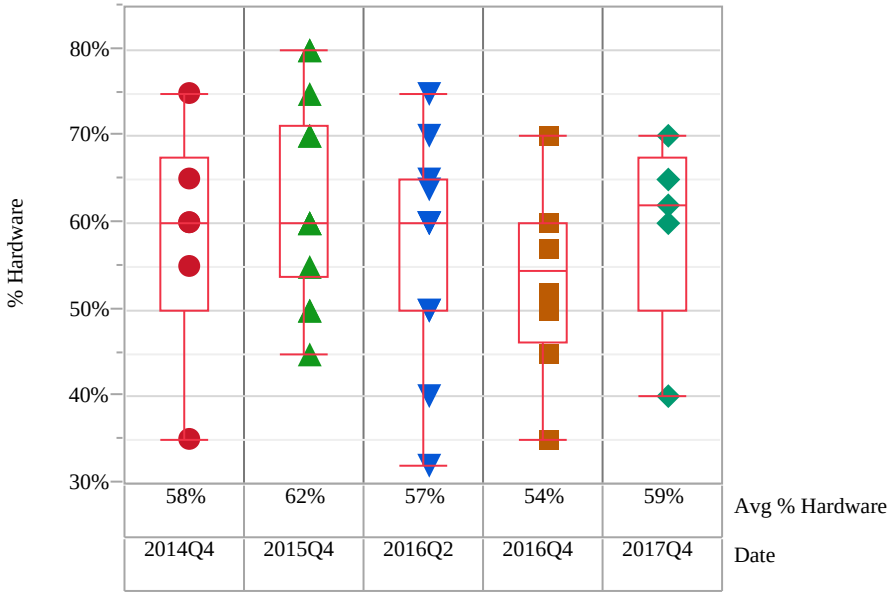

Figure 3-9. Percent hardware cost for commercial solar by date.

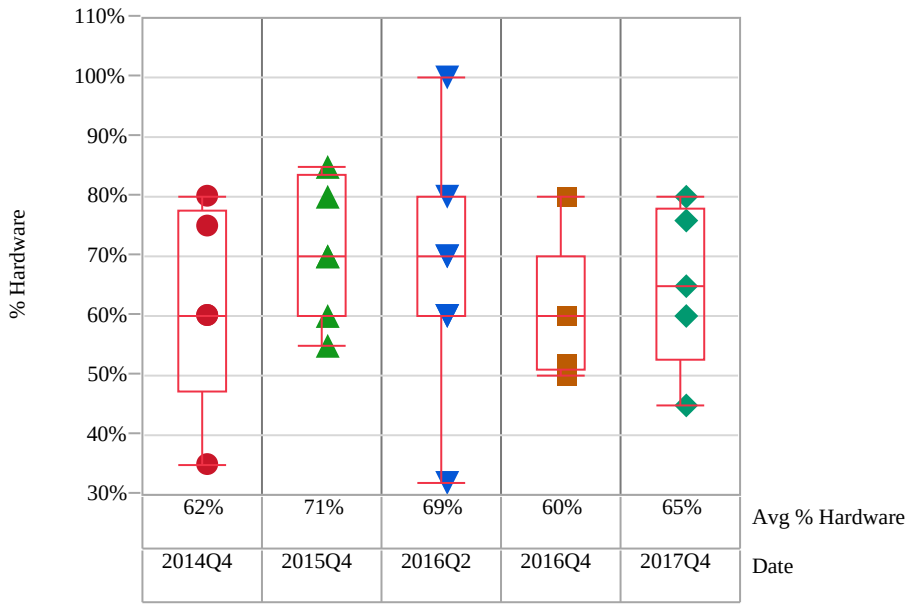

Figure 3-10. Percent hardware cost for utility-scale solar by date.

When calculated on a $/W-DC basis (see Table 2), the hardware costs for residential systems have dropped $0.50/W-DC in three years. Commercial systems hardware dropped by $0.71/W-DC in the same period, while utility-scale systems hardware dropped by $0.55/W-DC. Impacts of recently imposed solar tariffs, which began in early 2018, are expected to lead to increases in the cost of about $0.10/W-DC in 2018 but only about $0.04/W-DC in 2022. [6] This would represent a 5% increase in hardware costs for residential systems, a 9% increase for commercial systems, and a 12% increase in hardware for utility scale systems.

Table 2. Average cost for hardware in $/W by sector at the end of each calendar year 2014-2017.

Segment Served	2014	2015	2016	2017
Residential	$2.53	$2.17	$1.76	$2.03
Commercial	$1.85	$1.69	$1.35	$1.14
Utility	$1.41	$1.18	$0.86	$0.86

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

Total soft costs for each sector are calculated from the reported total cost and hardware costs and tabulated in Table 3. In addition to tracking percentage of hardware and soft costs for the three different solar sectors, soft costs are further broken down into four categories: 1) marketing, sales, and lead generation, 2) permitting, interconnection, and associated labor costs with those efforts, 3) installation, and 4) profit, overhead, and taxes. The variability plot for these costs in 2017 can be found in Figure 3-11.

Table 3. Average total soft cost for each sector at year end 2014-2017.

Segment Served	2014	2015	2016	2017
Residential	$1.63	$1.38	$1.68	$1.35
Commercial	$1.33	$1.02	$1.16	$0.84
Utility	$0.93	$0.56	$0.56	$0.50

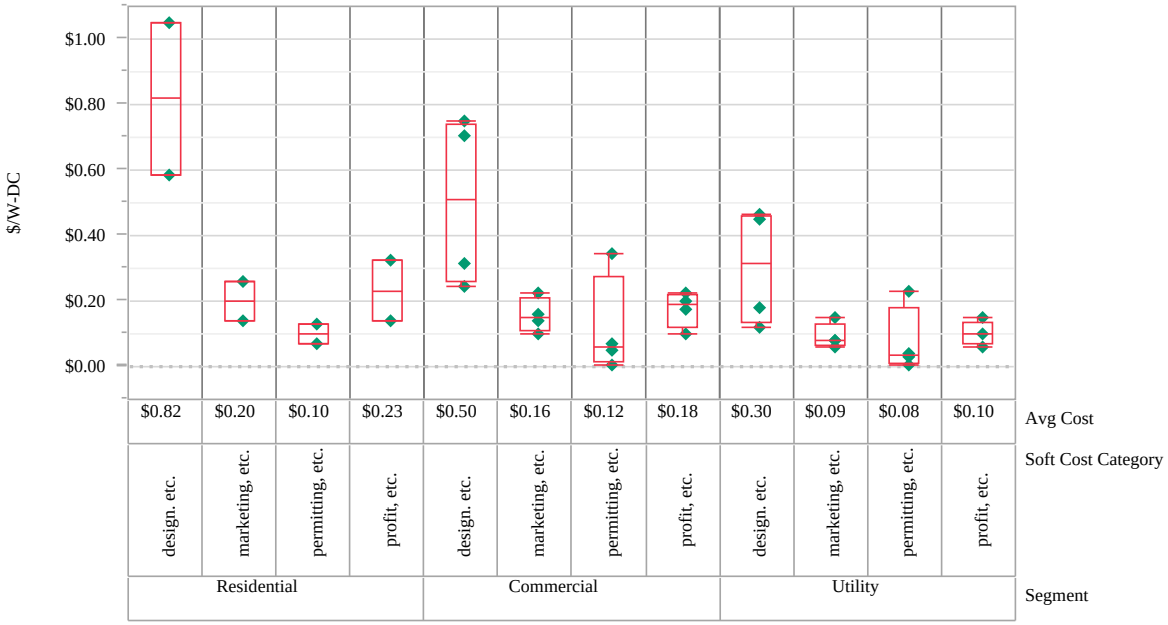

Figure 3-11. Variability chart for soft cost by sector in $/W-DC in 2017.

A comparison of changes in each category for all three sectors can be found in Figure 3-12, Figure 3-13, Figure 3-14, and Figure 3-15 below. In all three sectors, costs for installation and design have tended to increase since 2014 — though most dramatically for the residential sector. It is not clear why installation costs almost doubled for the residential sector between 2014 and 2015, though it may be due to wage incentives to promote a rapid increase in hiring. The price increase for installation was more moderate for commercial and utility scale systems at close to $0.10/W-DC for each sector.

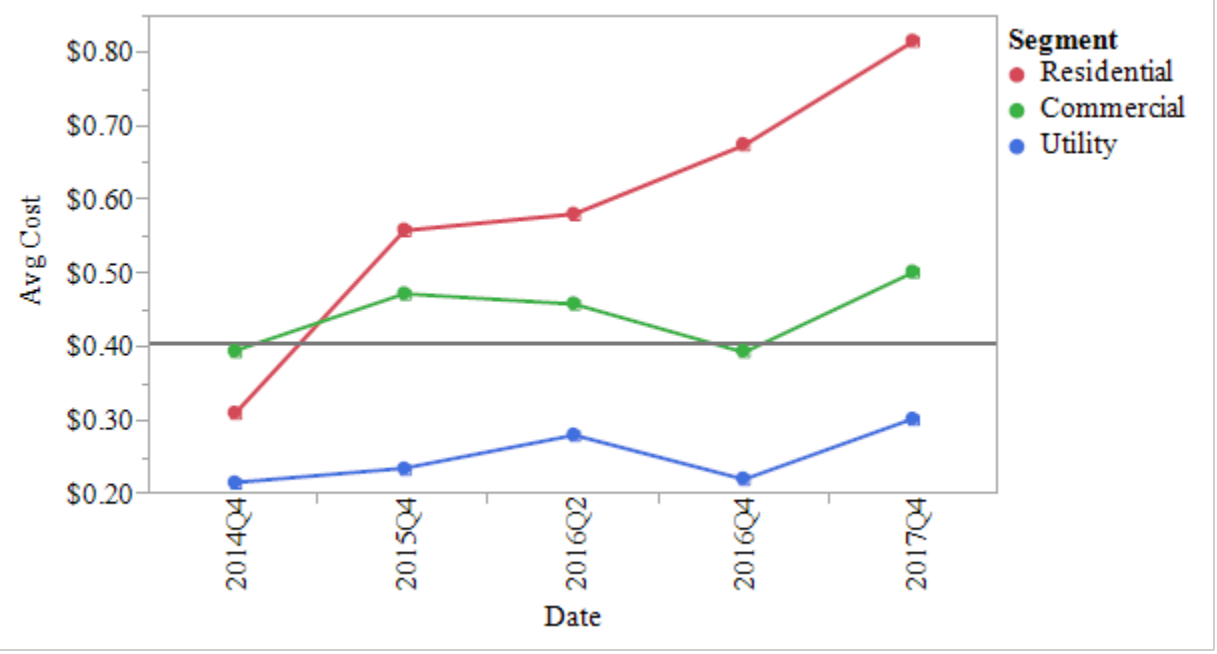

Figure 3-12. Installation, Design, Engineering, and Construction Labor Soft Cost In $/W-DC.

One very clear, immediate effect of signing Act 236 was the decrease in costs associated with marketing and sales between 2014 and 2015, see Figure 3-13. These costs remain low and were cut in half merely by signing the legislation. This would be due to increased customer awareness and education levels. The programs developed by the IOUs educated their customers on the benefits of solar, and the positive press that was generated by the enabling legislation added to awareness. Marketing and sales costs remain from 60-75% lower in 2017 from associated costs in 2014. This soft cost category has had the largest contribution to decreasing the overall system cost for all three sectors.

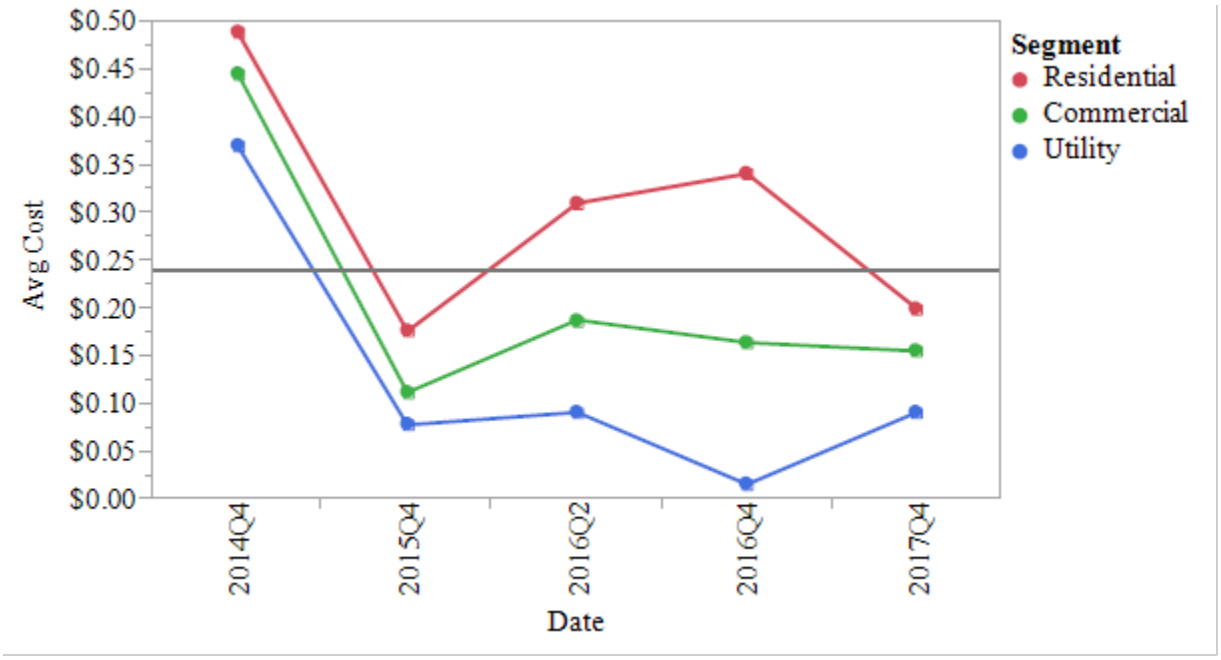

Figure 3-13. Marketing, Lead Generation, and Sales Soft Cost in $/W-DC.

Costs associated with permitting and interconnection cause the greatest headache for installers, yet remain the lowest overall cost category, see Figure 3-14. These costs have remained the same for utility-scale installations, but increased by $0.02/W-DC for commercial systems, while dropping by $0.08/W-DC for residential systems since 2014. The fees associated with each type of installation have remained unchanged since 2014, so all changes in cost would be due to labor contributions for the permitting and interconnection process.

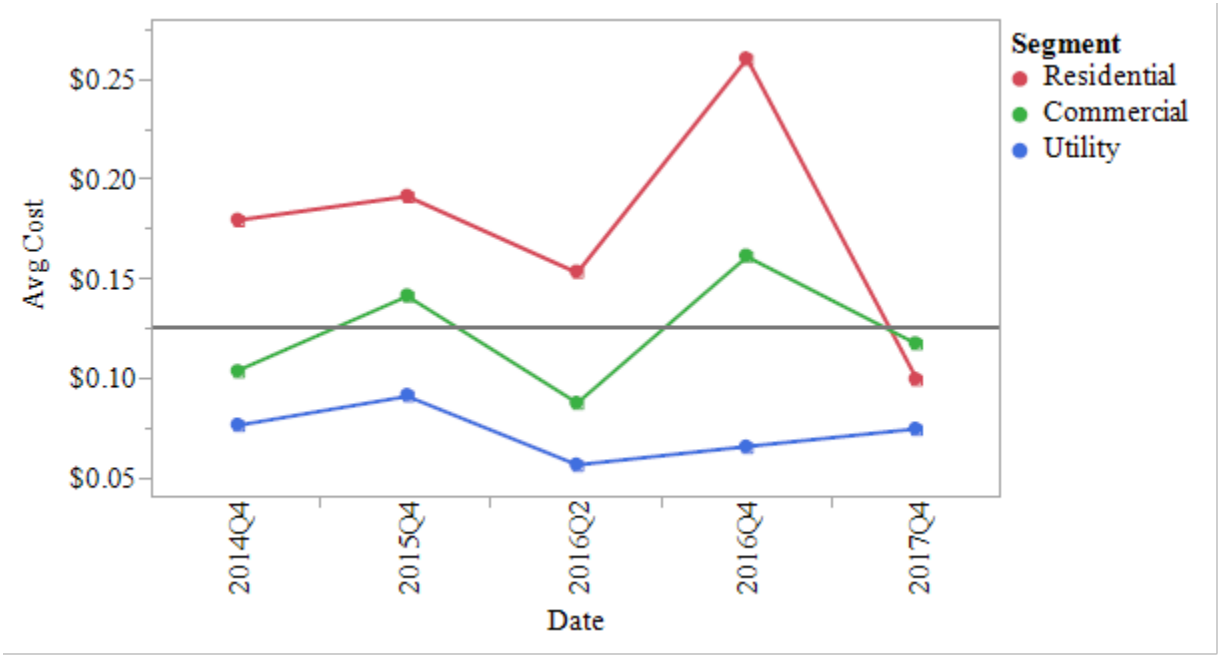

Figure 3-14. Permitting, Interconnect Fees, and Administrative Labor Soft Costs in $/W-DC.

Profit, overhead, and taxes have also decreased on a $/W-DC basis for all three sectors since 2014, see Figure 3-15. In 2015, the costs associated with this category took a dramatic drop before increasing again in 2016. Based on discussions with installers, this is due to dramatic cuts in profit the installers put in place to help drive a market share and business growth, in many cases with installers installing below cost. These cuts were unsustainable and resulted in increases to at or above 2014 costs in 2016. Since then, these costs have continued to decline by 65% for the residential sector, 54% for the commercial sector, and 62% for the utility sector. As taxation rates have remained unchanged in that time frame, the cost decreases are associated with trimming overhead costs and profits.

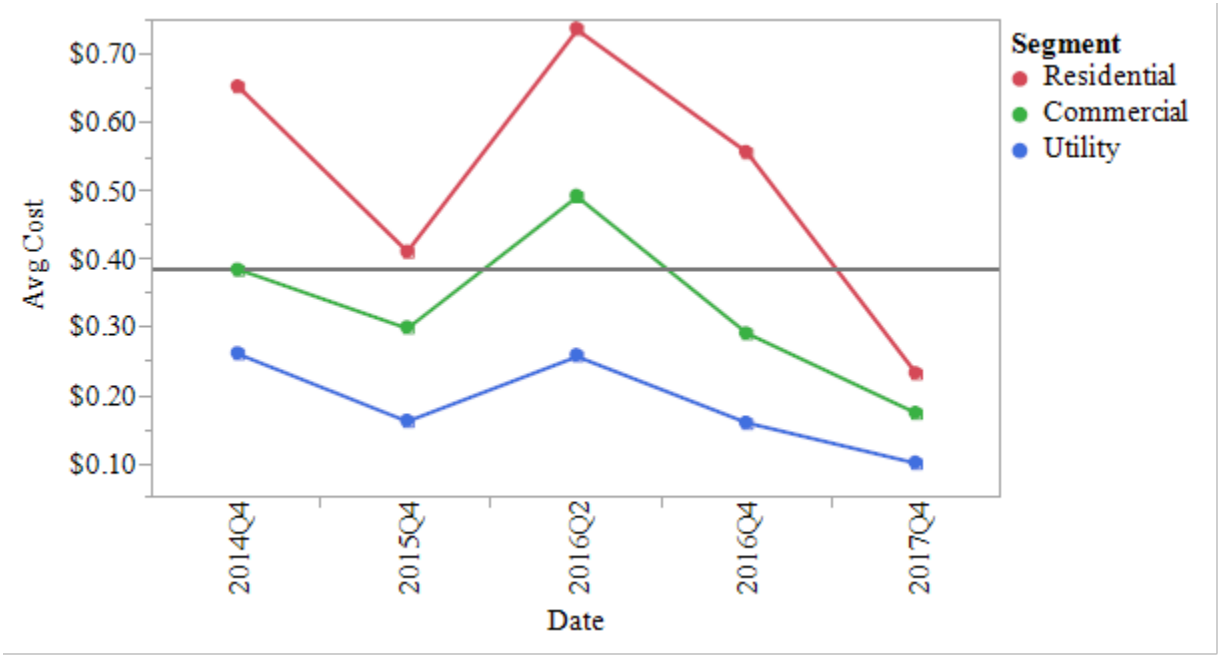

Figure 3-15. Profit, Overhead, and Taxes Soft Cost in $/W-DC.

3.6 Workforce Needs and Business Demographics

Throughout the course of this work we have tracked job hiring expectations and company size as an indicator of market strength. In 2016, the average size reporting installation company had 27 employees, primarily in installation and sales. The average size of the reporting companies decreased to 14 employees in 2017, suggesting that there could be growth in small startup companies within the state. Notably, two large leasing companies, Vivant and SolarCity[7], left the state in 2017. However, total expected hiring in 2018 per company remains the same as 2017 expected hires. One difference is more hires expected in design and general business and a drop in expected hiring for sales and marketing. The state's solar businesses continue to struggle to find qualified hires in all areas.

Table 4. Hiring Trends in South Carolina Solar PV

	2016 mean per employer	Average Expected Hires in 2017, per employer	Average % Increase expected per employer in 2017	2017 mean per employer	Average Expected Hires in 2018, per employer	Average % Increase expected per employer in 2018
designer & engineer	2	1	50%	2	2	100%
electrician & installer	11	4	36%	5	4	80%
general business	3	1	33%	3	2	67%
sales & marketing	11	3	27%	4	1	25%
total	27	9	33%	14	9	64%

In addition to tracking job growth, the service territories of installers have been tracked throughout the course of this project. Since 2015, the reach of SC's installers has expanded to all southeastern states and in growing proportions. In 2015, 40% of the respondents only served SC. In 2017, all the respondents installed in other southeastern states. The reach of SC installers continues to grow in Georgia (GA) and North Carolina (NC), though previously more installers installed in NC than GA.

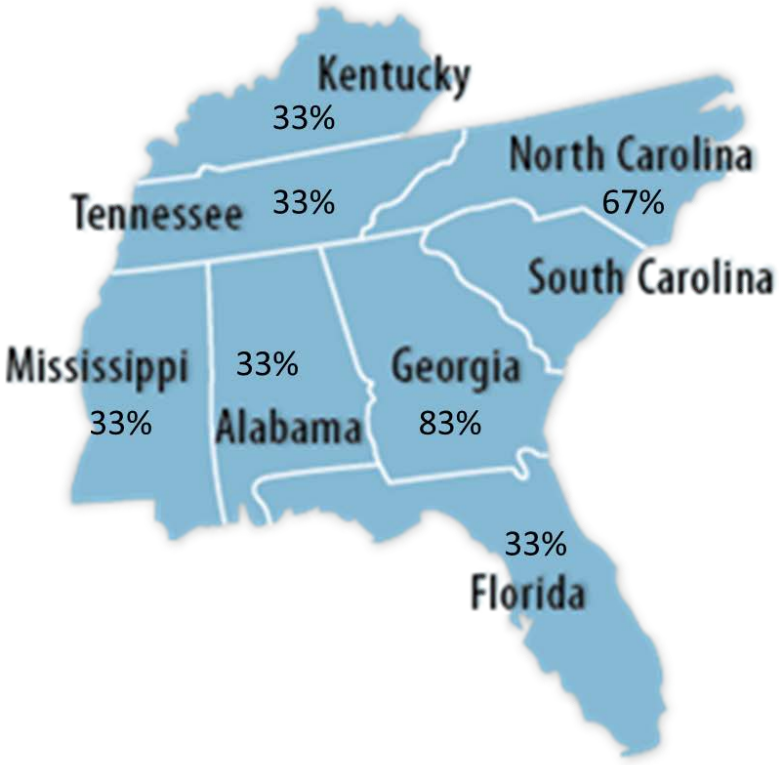

Figure 3-16. Southeastern Service territories of surveyed companies.

This series of surveys has also tracked the service territories of solar installers in SC. For the first time, all respondents serve three of SC's regions: the Midlands, the PeeDee, and the Coastal region. The Piedmont region is served by only 80% of the respondents. Most surprising is the expansion into the PeeDee region, which is the poorest and most rural of SC. This region historically was a large tobacco farming region and remains a heavily agricultural-based economy, with the exception of the coastal communities. The expansion into the PeeDee region is likely due to increasing installations in Horry County, home to Myrtle Beach.

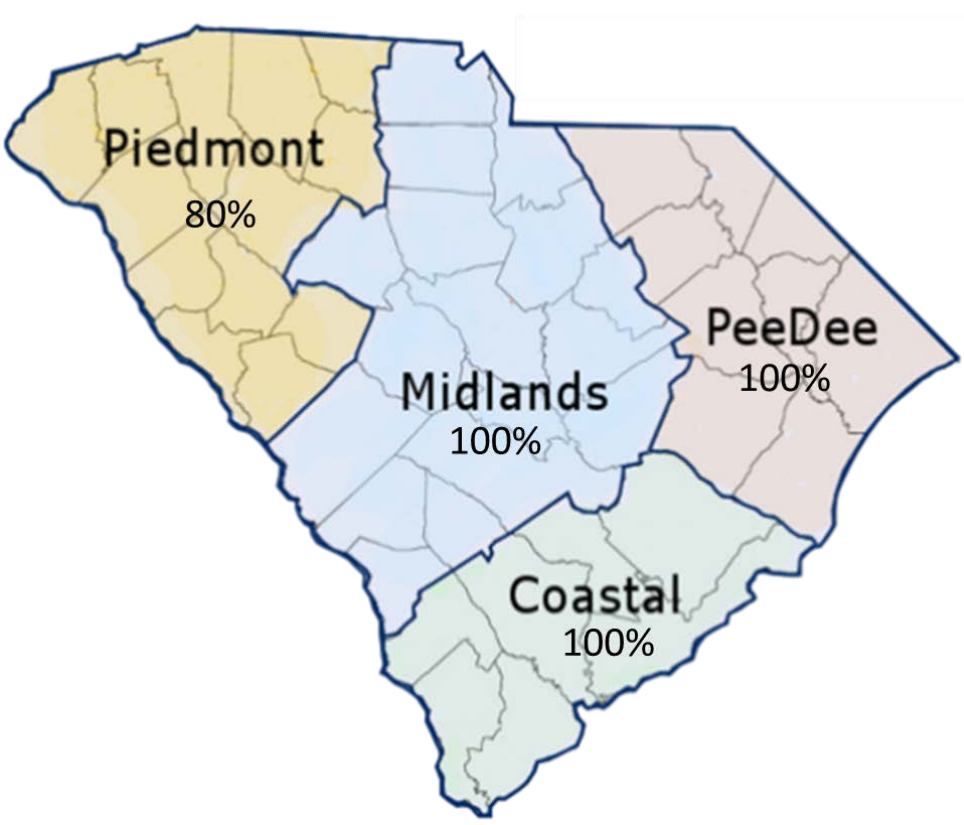

Figure 3-17. South Carolina Business Service Territories of Respondents.

Since the initial survey, we have been tracking the career and SC installation history of responding installers, see Figure 3-18 and Figure 3-19, respectively. The career installation experience of respondents has increased since 2015. In that year, 57% of respondents had installed less than 5000 kW in their entire career. The portion of respondents that have installed more than 5000 kW has increased from 43% to over 80%. No respondents have installed under 2000 kW in their career. This is mirrored in the SC install experience of respondents. In 2015, 47% had installed less than 100kW in SC and no one had installed more than 5000 kW. One third of all respondents have now installed more than 5000 kW within SC.

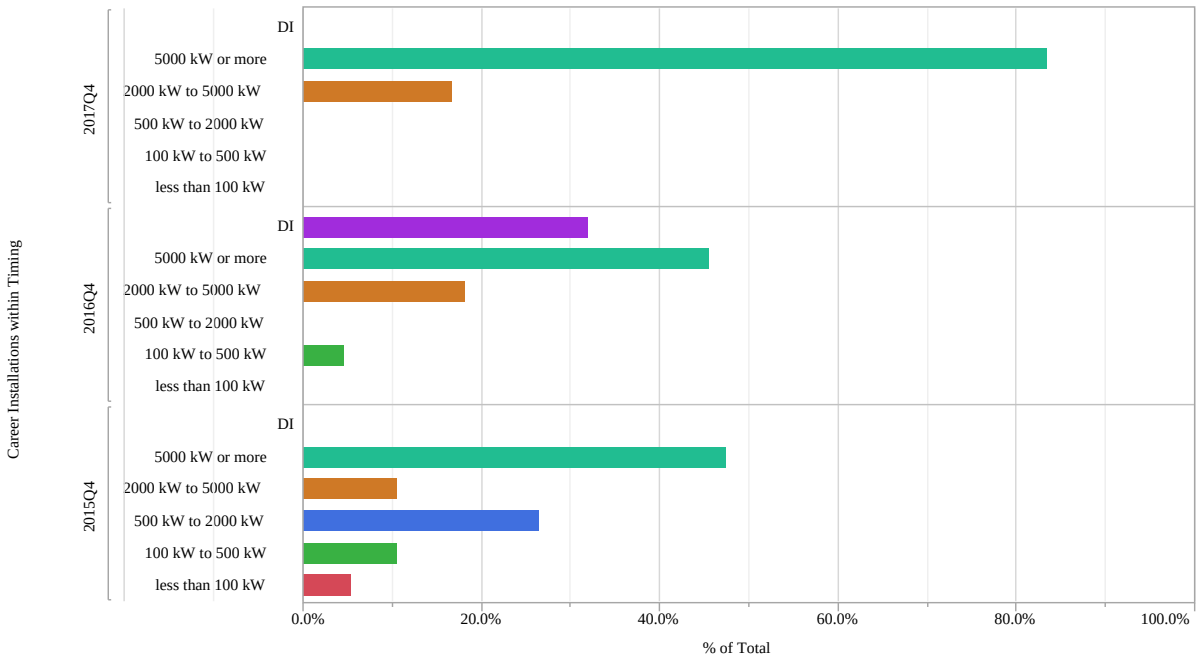

Figure 3-18. Career Installation History of Responding Installers from 2015-2017.

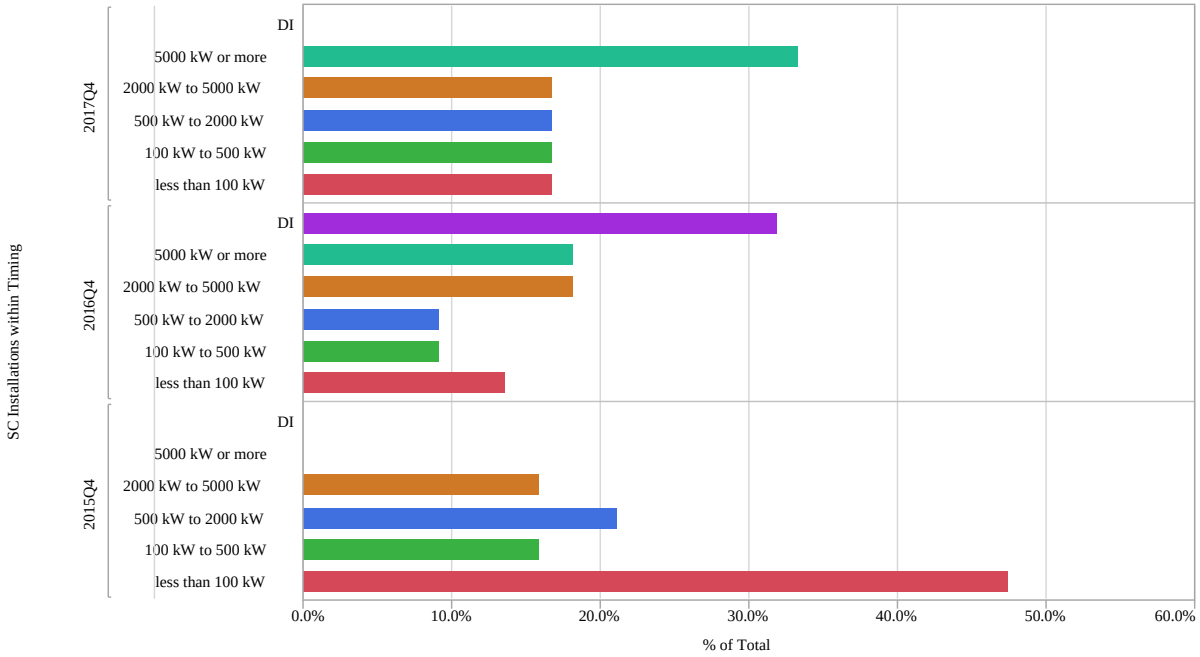

Figure 3-19. SC Installation History of responding Installers from 2015-2017.

New to this year's survey was a question asking installers if they also sell energy storage or energy efficiency products to their customers. The results showed that 57% of respondents sell energy storage or energy efficiency products in addition to installing PV systems. All those respondents stated that they sell battery storage products as an additional option for homeowners.

3.7 Residential Installed Capacity Trends Statewide

In 2014, there were less than 3MW total solar energy in SC. By 2015, there were over 5MW of distributed energy systems alone. That number ballooned to over 25 MW of distributed systems in 2016. There are currently over 83 MW of distributed systems sized 20 kW or less in SC[2]. The installation data are further broken down by region in SC. A comparison for each region based on population, income, and capacity is found in Table 5. To provide additional comparison, the installed watts per person in each region was also calculated.

Table 5. Demographics of Each Region in SC as Compared to Installed Capacity.

	# of Counties	[1]Population	Median Income	Percent living in poverty	[2]Percent capacity customer owned installations	[2]Total capacity/kW-AC	W per person
Piedmont	13	1,516,456	$45,485	14.6	56%	28,592	18.9
Midlands	17	1,692,996	$48,335	15.9	54%	28,414	16.8
Coastal	7	1,048,346	$54,194	13.4	65.3%	23,487	22.4
PeeDee	9	766,571	$40,758	18.4	100%	3,380	4.4
State Total	46	5,024,369	$47,541	15.3	56.4%	83,873	16.7

1. Calculated from U.S Census Bureau Data, 2017; median income and % in poverty were determined using a weighted (by population) average
2. Calculated from S.C. Energy Office Data, August 2017 for installations under 20 kW in size. In the PeeDee Region there are two large commercial systems over 200kW that are leased. These were incorrectly captured in [4] as small-scale systems.

For additional comparison, the number of installations in a county was plotted against the percentage of that county living in poverty. There is a clear cut off for the number of installations in a county when the poverty level is above 17%. Only six of SC's forty-six counties have poverty rates lower than the national average of 12.7%

[2] During the same period, commercial and industrial installations rose from 0.79MW in 2014 to 39.3 MW in 2017, while utility scale installations rose from 2.5MW in 2014 to 233.6MW in 2017.

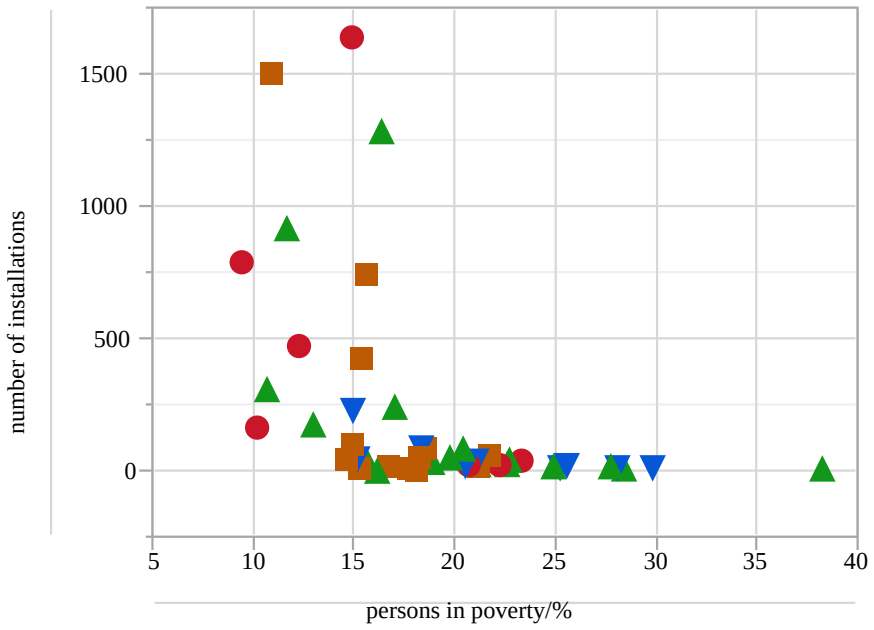

Figure 3-20. Comparison of Number of Installations in a County and the Percent Poverty for 2017.

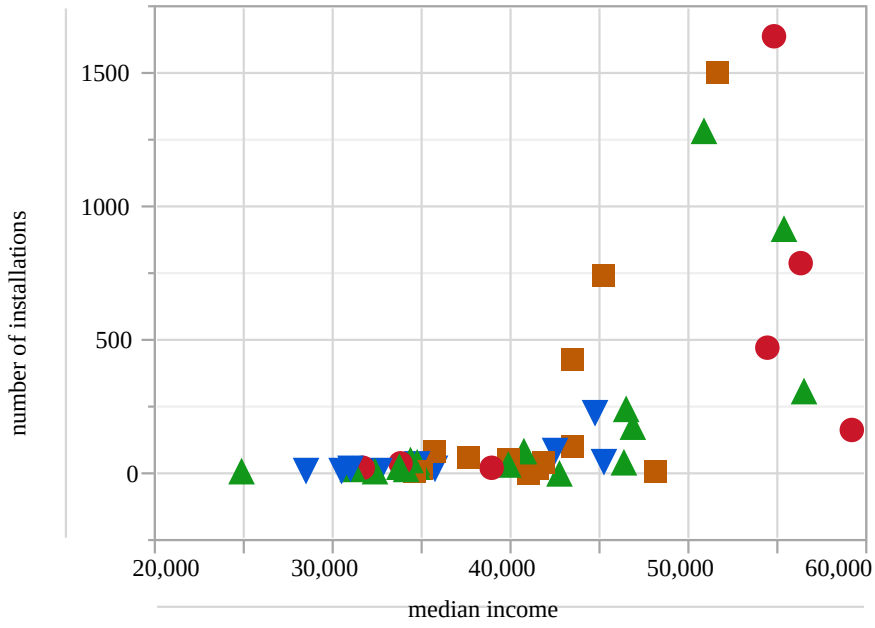

Figure 3-21. Comparison of Number of Installation Versus Median Income for 2017.

Leasing had a clear and immediate effect on residential installations, as indicated by the large jump in installations in 2016, when third party leasing became available to homeowners and businesses in the state. Since data on leased installation were available beginning in 2016, we have been monitoring trends on purchasing and leasing behavior. There is a clear correlation between the number of systems in a given county and the percentage of those systems that are leased, see Figure 3-22. There is a strong correlation

between the number of installations and poverty level, and correlation with median income. There is a slight correlation between median income and the number of systems leased, see Figure 3-24, which suggests that rural areas with lower populations could benefit from access to leased installations.

In 2016, the majority of installations in the Midlands region were leased. The Midlands region also had the highest installed capacity in the state. In 2017, the percentage of leased systems dropped slightly, but the total installed capacity in the region increased by 278%. The Midlands also have fallen behind the Piedmont region on total installed capacity. The PeeDee region continues to struggle to install capacity, likely affected by the lack of leased systems in the community. There are currently no residential leased systems in the PeeDee region, though there are a few cases of commercial systems installed under a lease. Theoretically, leasing can increase access to communities that cannot qualify for the large loans needed to purchase a PV system or do not have the upfront capital for down payments on a system. Leasing companies are also reluctant to install in cooperative territories, which show decreased installation rates in their more rural areas over the IOU territories, which tend to be more urban.

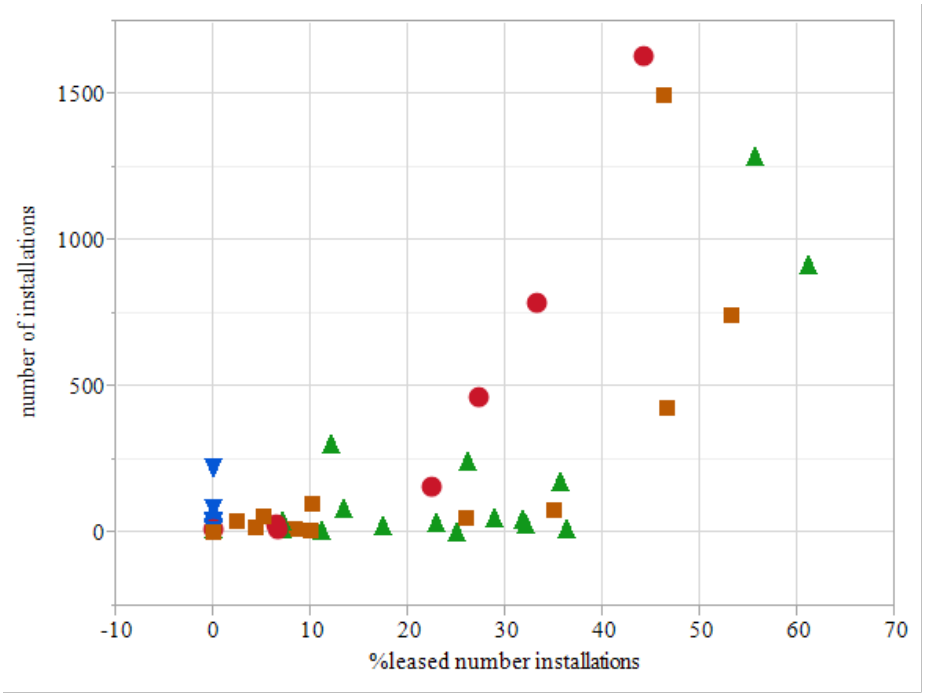

Figure 3-22. Percentage of Residential Installations that are Leased, by County.

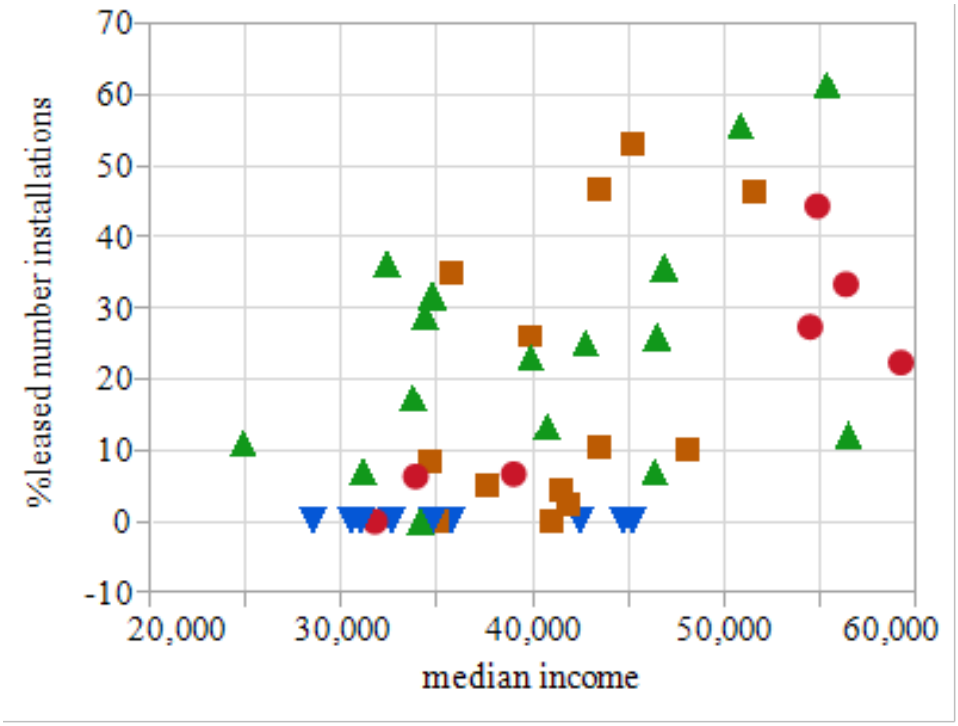

Figure 3-23. Percent of leasing installations versus median income, by county.

3.8 Soft Cost Reductions

Consumer protection is an important aspect of an emerging solar economy. Of the surveyed installers, 57% felt there was a need for increased consumer protections, 28% weren't sure, and 14% indicated that additional consumer protections were not needed. After discussion and a brief investigation, it was determined that there is a misconception on what licensing is required to install solar in SC and who needs to hold the license for installations in all sectors. All leasing companies are required to be registered and certified by the SC Office of Regulatory Staff. [8] For commercial installations, the prime contractor must hold a license that covers 40% of the complete work, though for residential systems, the installer must be licensed for all aspects of the work. The Office of Regulatory Staff - Energy Office was able to develop a flow chart to help installers ensure that they are complying with State regulations, see Figure 3-24. SC does provide licensing reciprocity with neighboring states, but a reciprocity agreement must be filed with the SC Department of Labor, Licensing and Regulation (LLR). Of the surveyed companies that provide residential installation, only two provided responses on the licenses they hold. One company subcontracts all residential installations and does not hold any licenses. The second respondent subcontracts and self-installs, but holds general contractors license, an electrical license, a structural framing license and an unlimited mechanical license. Of the commercial installer responses, two subcontract all work, one self-installs and has an electrical license, and two both subcontract and self-install. Those two companies hold both a general and electrical license. Additional efforts are needed to ensure that companies installing solar in SC are covered under the appropriate licenses and registrations.

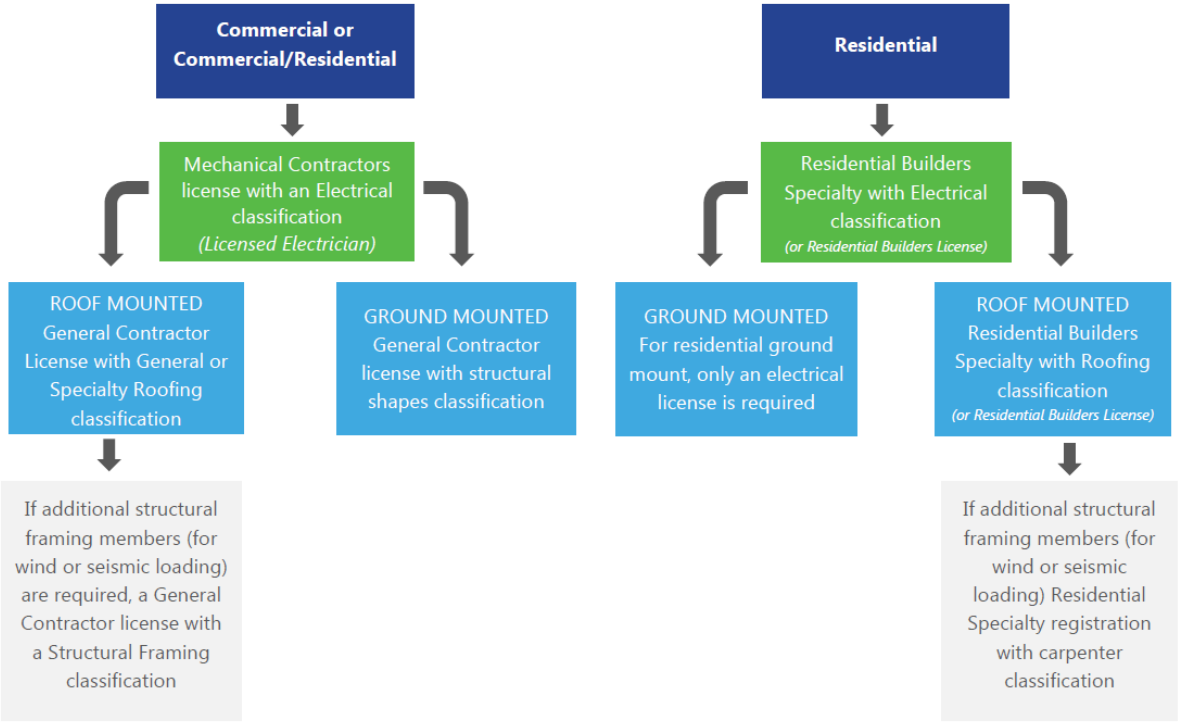

Figure 3-24. Required licenses for installing solar in South Carolina. [9]

4.0 Conclusions

Even though it did not fully go into effect until early 2016, SC's Act 236 had a clear and immediate effect on the business climate for solar installers during the summer of 2014 when it was signed into law. In the first year, residential solar costs dropped by $0.87/W-DC and have continued to slowly decline by $1.02/W since 2014. Similarly, commercial and industrial prices have fallen by $1.25/W-DC to $1.98/W-DC and utility scale installation costs have fallen by $1.03/W-DC to $1.36/W-DC. This decline in cost helped contribute to an additional 85.1 MW of residential solar to the grid since the end of 2014. Commercial and industrial installations have grown 38.5 MW and utility-scale installations have grown 231.1 MW in the three-year period. This explosion of growth has meant that SC will meet the requirements of Act 236 in 2018, more than three-years earlier than required by law. This growth has not come without hiccups or delays. Consumer protection continues to be a concern as marketing and sales increase within the state. It also means that the net metering cap will have to be addressed far sooner than expected.

The growth of the residential sector would not have been possible without the targeted segmentation of the agreement. As the state moves beyond Act 236 discussions will need to begin on the value of solar and how net metering will be handled moving forward. Discussions will have to include how low-to-moderate income communities can benefit from solar, whether at the residential scale, through community solar, or through an increase in utility-scale installations. The successful implementation of Act 236 could serve as a model to neighboring states in the Southeast that still have very low solar penetration, including Alabama and Mississippi. Act 236 is also a demonstration of how effective policy can transform and grow a near nonexistent State industry into one that flourishes.

5.0 References

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Appendix A. Follow-up Survey Completed in December 2017

2017 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. This is our final year of the three year study. Your assistance will help us identify your most pressing needs along with recommended solutions along with proving hard data that can be used to support future policy initiatives. 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

Appendix A (continued)

Part II. Workforce needs, workforce training needs

1. How many employees do you currently have:

#	#	#	#
a. sales and marketing FTEs	b. electrician and installer FTEs	c. general business admin FTEs	d. design, engineering FTEs

2. What are your longer-term business needs over the next year? Specifically, how many additional full-time hires do you expect to need in the following areas to meet business expectations in one year:

#	#	#	#
a. Additional sales and marketing FTEs needed in 1 year	b. Additional electrician and installer FTEs needed in year	c. Additional general business admin FTEs needed in 3 years	d. Additional design, engineering FTEs needed in 3 years

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.

Appendix A (continued)

3. **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

4. **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

5. **Do you currently sell energy storage and/or energy efficiency products? Circle one.**

   Yes No

6. **If, yes, please describe the type of products you provide:**

   _____

   _____

   _____

7. **Do you install or do you subcontract installations? Circle one.**

   Self Install Subcontract Both

8. **Which of these licenses does your business hold? Circle all that apply.**

   General contractor Electrical Residential Builder

   Specialty Roofing General roofing Structural Framing

   Other _____

Appendix A (continued)

9. **Which licenses does your subcontractor hold? Circle all that apply.**

General contractor Electrical Residential Builder

Specialty Roofing General roofing Structural Framing

Other _____

10. **Would you like information on an apprentice program for solar installers?**

Yes No Maybe

11. **Do you think there is a need for additional consumer protections?**

Yes No Maybe

12. **Please provide your contact information so that we may contact you if clarification is needed in your response. 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 Data and Figures

Table B-1. Soft Cost by Survey, Segment and Category

Installation Type	Timing	installation (incl. design, engineering, and construction labor)	marketing, lead generation, and/or sales	permitting, interconnection (incl. fees and admin. labor cost)	profit, overhead, tax
Residential	2014Q4	**$0.31**	**$0.49**	**$0.18**	**$0.65**
Residential	2015Q4	**$0.53**	**$0.17**	**$0.19**	**$0.40**
Residential	2016Q2	**$0.58**	**$0.31**	**$0.15**	**$0.74**
Residential	2016Q4	**$0.68**	**$0.34**	**$0.26**	**$0.56**
Residential	2017Q4	**$.82**	**$0.20**	**$0.10**	**$0.23**
Commercial	2014Q4	**$0.40**	**$0.45**	**$0.10**	**$0.39**
Commercial	2015Q4	**$0.42**	**$0.10**	**$0.12**	**$0.25**
Commercial	2016Q2	**$0.42**	**$0.18**	**$0.09**	**$0.48**
Commercial	2016Q4	**$0.39**	**$0.16**	**$0.16**	**$0.29**
Commercial	2017Q4	**$0.50**	**$0.16**	**$0.12**	**$0.18**
Utility	2014Q4	**$0.22**	**$0.37**	**$0.08**	**$0.26**
Utility	2015Q4	**$0.18**	**$0.07**	**$0.07**	**$0.12**
Utility	2016Q2	**$0.28**	**$0.09**	**$0.06**	**$0.26**
Utility	2016Q4	**$0.35**	**$0.02**	**$0.07**	**$0.16**
Utility	2017Q4	**$0.30**	**$0.09**	**$0.08**	**$0.10**