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A Tale of Two States: The Power of a Consensus Based Approach

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Abstract

On June 2, 2014 South Carolina (SC) Governor Nikki Haley signed the SC Distributed Energy Resources Act (Act 236) into law. 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 allows 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. Of that, 0.25% is carved out for systems smaller than 10kW in size. Since Act 236 was enacted, residential and commercial interconnections in South Carolina have grown by 5X, while utility scale interconnections have grown by 3X. We will further analyze the growth of the solar industry in SC and compare it to another Southeastern state with similar demographics, Alabama. Discussion will include how the industry has change in a short time and provide lessons learned for an emerging solar economy.

Keywords: *Solar, Photovoltaics, Alabama, South Carolina, Southeast, Act 236, Soft Cost*

1. Introduction

Photovoltaic (PV) installations have dramatically increased in South Carolina since 2015. This is the result of falling hardware costs and specific policy choices made by South Carolina through the Distributed Energy Resources (DER) Act of 2014; known as Act 236 (www.energy.sc.gov; www.scstatehouse.gov). This legislation required the state's investor owned utilities (IOUs) to generate 2% of their energy capacity as renewable by 2021, enabled net-metering until 2025, and established a solar leasing program in SC. As a result, there has been a rapid increase in solar PV capacity since Act 236 enactment in mid-2015. Before Act 236, the state had little to no solar penetration, and as a result, there is the unique opportunity to track and monitor the solar industry supported by such state legislation and to compare those results to those in a similarly sized, but not similarly supported, state in the Southeast (SE) United States. As shown in Table 1, Alabama (AL) has a number of similarities to South Carolina in terms of population, household median income, and poverty rate.

Table. 1: 2016 Comparison of demographic data South Carolina and Alabama (www.census.gov).

Value (est. at End of 2016)	South Carolina	Alabama
Total Population	4,961,119	4,863,300
Household Median Income	$45,483	$43,623
Poverty Rate	16.6%	18.5%

Energy generation by type for AL, SC, and the US are represented on a percentage basis in Figure 1. SC and AL surpass the US average on nuclear power, with SC producing over 55% of its electricity from nuclear power.

This nuclear generation helps keep both SC and AL below the national average for coal produced electricity. SC has about 23%, while AL has about 27%. Alabama has a higher percentage of electricity production by gas-fired and petroleum plants than both SC and the national average. Both SC and AL lag behind the US average for renewables generation at almost half of the national average. It should be noted that AL has over twice the hydroelectric production of SC, which accounts for nearly all of its‘ renewable generation. Two differences between the AL and SC energy generation profiles are that Alabama shares resources with the Tennessee Valley Authority (TVA). TVA resources provide generation capacity to multiple states within the Southeast US with the exception of South Carolina. Within SC, a portion of the electricity produced is allotted to Duke Energy assests in North Carolina.

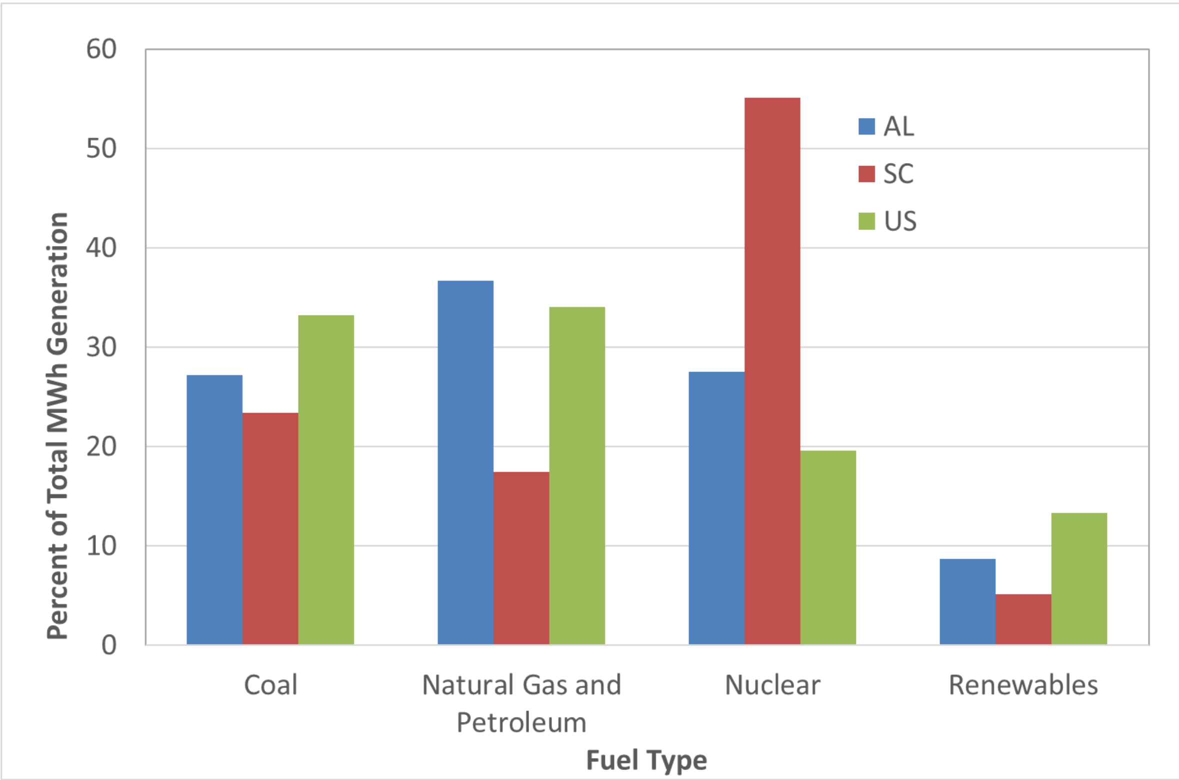

Fig. 1: Average percent electricity production in 2015 based on fuel type for SC, AL, and the US. Renewables includes hydroelectric, solar thermal and PV, biomass, and geothermal. (www.eia.gov)

The national trend in residential solar PV capacity from 2014 to 2016 is seen in Figure 2, indicating double digit increases each year for the past three years in US residential solar capacity. The residential PV solar capacity increased from 2.8 to 8.5 gigawatt (GW) in the three year time span. This has coincided with rapidly decreasing PV solar panel costs, which now are below one US dollar ($) per watt- direct current ($/W-DC) of electricity generation (Smets et al.).

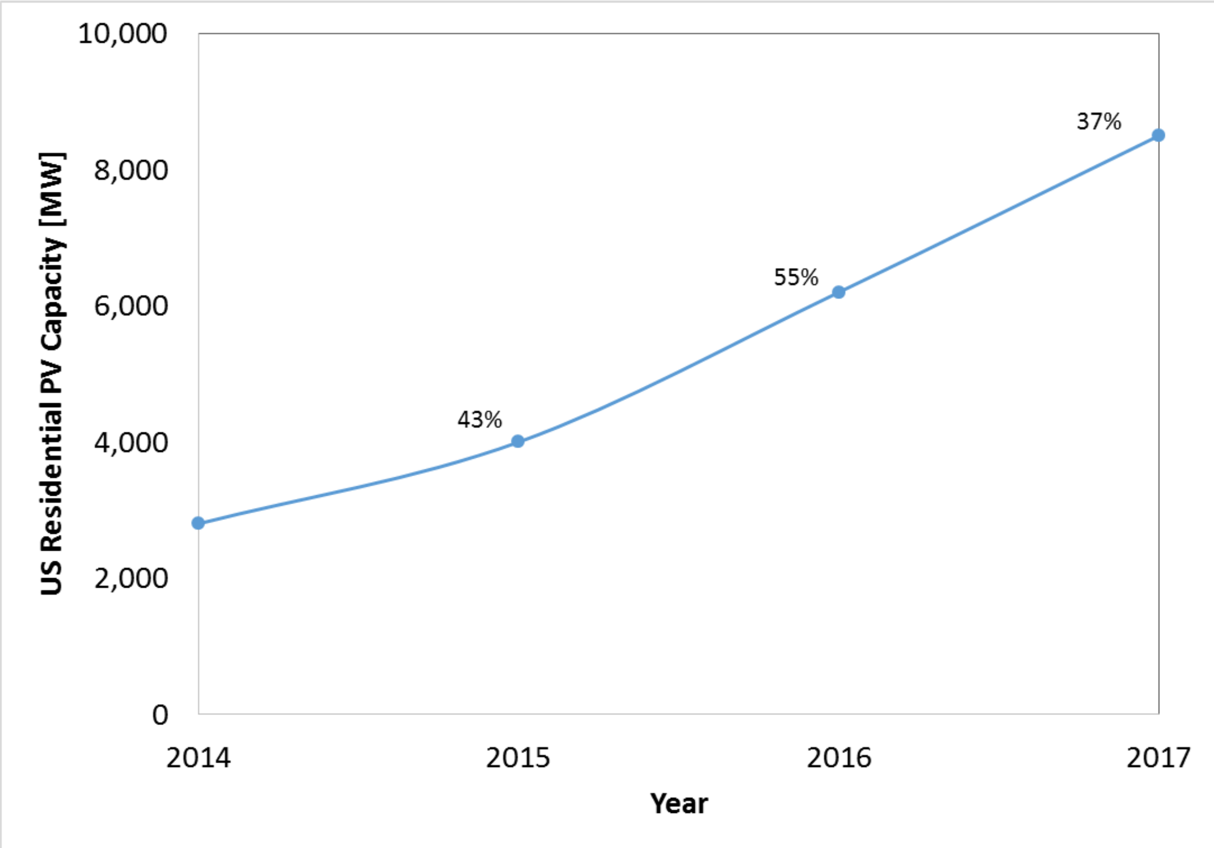

Fig. 2: Trends in US residential solar PV capacity since 2017, as measured every June. Percent increase inset in figure. www.eia.gov

Recent studies of globally installed solar PV power indicate over 100 GW capacity with an average system price of $3/W electricity generation (Smits et al.), with non-solar panel hardware costs accounting for nearly two thirds of the total system price. It is important to understand the details of soft costs (i.e., all non-hardware related costs) across regions, states, and market segments to discern effectiveness of soft cost reduction efforts.

2. Experimental Procedure

Surveys were performed in 2016 for solar PV installers in Alabama and South Carolina with similar questions but tailored for the state. The purpose of each survey was to assess PV solar installations in three parts: cost of solar hardware and soft costs, workforce and training needs, and installer market focus and experience. Individual analysis each state's survey is reported elsewhere (Fox et al; 2016, 2016a, 2017, 2017a). Data from each survey were analyzed by PC-workstation using JMP Pro Version 11.2.1 (SAS Institute). An important aspect of each survey was capturing comments and suggestions on how to best support the reduction of soft costs in each state.

3. Results and Discussion

In addition to having similar demographics, Alabama and South Carolina have very similar electricity cost profiles, as highlighted in Table 2. The average cost of electricity in ¢/kWh is below the US average. This is due to the large contribution of existing nuclear facilities in both states and large amounts of hydroelectric available in Alabama. However, both states have a higher than average electricity use, which drives the monthly electricity bills higher than the US average. It should be noted that in Alabama and South Carolina, electric heat pumps are the primary source of heat during the winter months. The Southeastern region of the US also has a lower median income than the US average, meaning a larger portion of monthly income goes towards electricity bills than in other regions and states across the US.

Table 2: Electricity cost and use for South Carolina and Alabama (www.eia.gov).

	AL	SC	US
Ave. Cost Electricity	11.07 ¢ /kWh	12.57 ¢ /kWh	12.65 ¢ /kWh
Ave. Monthly Consumption	1218 kWh	1146 kWh	901 kWh
Ave. Monthly Bill	$142.48	$144.04	$114.03

When state policies are compared, see Table 3, one large inhibitor to the growth of residential solar is the absence of comprehensive net metering policy for the state of Alabama. As a part of the settlement agreement for SC's Act 236, net metering is enabled to 2025 or until a 2% cap is met. This allows for some certainty in the market place, though anecdotal evidence suggests that net metering caps will be reached before the end of 2018. In addition, SC has a 25% tax credit for residential systems. Also, as part of Act 236, SC enabled third party leasing within the state. This has spurred rapid installation in major metropolitan areas as leasing companies have focused on installing in IOU territories (Fox 2017a).

Table 3: Incentives and installation data in 2016 for Alabama and South Carolina

	AL	SC
Net metering	No	Yes
Third Party Leasing	No	Yes
State tax credit	No	Yes (25%)
Utility incentives	TVA only	Duke, SCE&G
Sectors served	R, C	R, C, U

Res. Installations	~100	2991
Est. Installed Residential Cap.	~ 1 MW	25.2 MW
Average size of installation	6 kW	9.4 kW
Expected job growth in six months	38	210
Expected job growth in one year	93	480

Because of this legislation, SC had over 2900 residential installations at an average size of 9.4 kW per installation and a total residential compacity of 25.2MW, compared to less than one MW and an average size of 6 kW per installation in AL. It should be noted that in SC the IOUs are required to report net metered installations to the SC Energy Office and that the Cooperatives and Santee Copper, a state-owned utility, voluntarily comply with this effort. In AL, there is no centralized authority that aggregates this information and makes it available to interested parties. This lack of reporting inhibits understanding of the growth and impact of the solar industry on AL's economy. Another stark contrast between AL and SC is found when comparing the expected job growth within the industry. At the time of the surveys, SC was expected to add over five times the jobs in the solar industry both during the following six months and the following year.

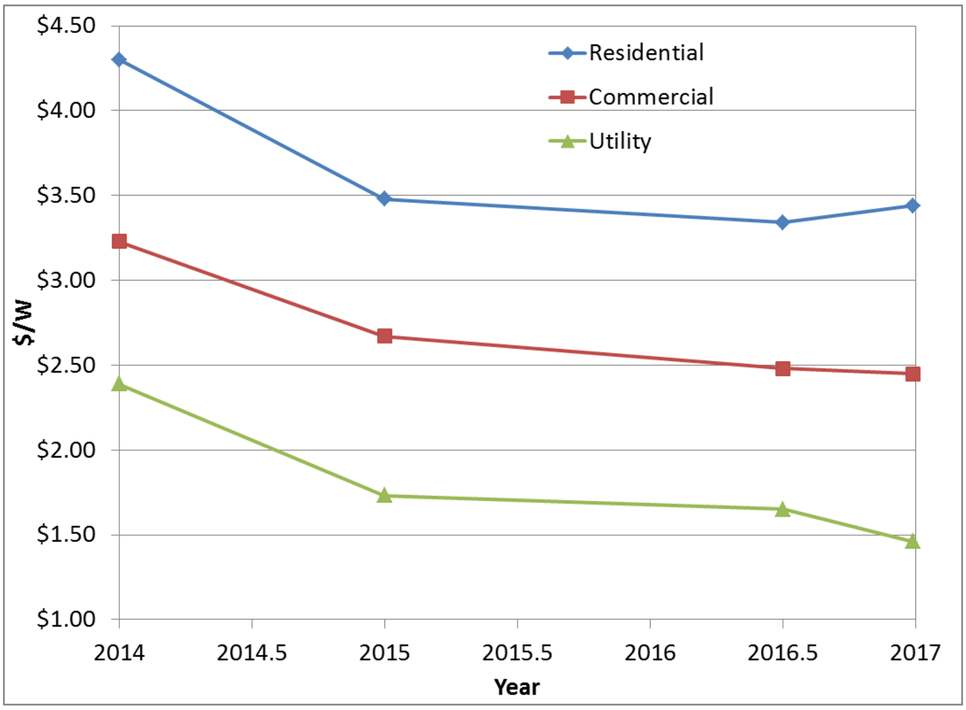

Figure 3: Changes in solar costs for the residential, commercial, and utility sectors from 2014 to the beginning of 2017.

Since Act 236 was signed in the summer of 2015, the cost of PV installations in all three sectors has fallen significantly, as seen in Figure 3. The effect of the legislation is most apparent between 2014 and 2015 when the market within the state opened, but the act was not fully implemented. Residential prices dropped by nearly $1/W, with the commercial and utility sectors experiencing similar drops. Between 2015 and the middle of 2016 costs declined only slightly. At the end of 2016, the cost of PV hardware dropped, but this was only observed in utility scale systems. In fact, the average cost of a residential system increased slightly between mid-year 2016 and the very beginning of 2017. However, these costs remain close to trends seen on the national market.

Further examination of 2016 costs in both AL and SCreveals very similar trends in hard and soft costs for the residential sector, see Table 4. AL had a wider range of total cost, $2.60/W to $5.00/W versus $2.50/W to $4.00/W for SC, and AL had a lower average cost than SC by 31¢/W. The lower cost in AL would result in an annual savings of $1,860 for a 6-kW system for residential homeowners, which should aid in affordability. Based on the responses from installers, both states have a very similar breakdown of costs for percents attributed to hardware and to four soft cost categories: installation, marketing, overhead, and permitting. Of note, is the percentage of costs attributed to hardware only. It was predicted that significantly larger soft costs existed for these immature markets and that these costs would serve as an impediment to increasing penetration of residential solar.

Table 4: Residential solar costs in 2016 for Alabama and South Carolina.

	AL	**SC**
Ave. cost residential/ $/W	$3.29 ($2.60-$5.00)	$3.50 ($2.50-$4.00)
Hardware	62% ($2.03)	59% ($2.07)
Installation	16% ($0.54)	17% ($0.59)
Marketing	8% ($0.26)	6% ($0.21)
Overhead	10% ($0.32)	12% ($0.43)
Permitting	4% ($0.14)	6% ($0.20)

4. Summary and Conclusions

A direct comparison of South Carolina and Alabama shows not only very similar demographics, but also very similar cost breakdowns for residential solar systems. Yet, a comparison of residential installations in the states indicates that factors outside of cost and demographics can have a profound influence on the rate of residential solar penetration and that seemingly modest policy changes can spur market growth. In SC, the carve out for small residential solar installations promoted by Act 236 and acomprehensive net metering are two policies that are responsible for a majority of the growth of solar in the state. These results suggest that states wanting to increase their residential solar penetration should pursue new state programs with similar carve outs and supporting policies.

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