

**Contract No:**

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## REPORT SUMMARY

**1. Project Title / Sub-program:** Promotion of PV Soft Cost Reductions in the Southeastern US / BOS

**2. FOA / Award#:** SuNLaMP / #30426

**3. Principal investigator:** Elise Fox, Savannah River National Laboratory, 301 Gateway Drive, Aiken, SC 29803, (803)507-8560, elise.fox@srnl.doe.gov

**4. Other Participating Organizations:** Duke Energy, Central Electric Power Cooperative, Santee Cooper, The South Carolina Energy Office, SC Solar Council, Solar Business Alliance, Coastal Conservation League, Electric Cooperatives of South Carolina

**5. Project Schedule:**

1. Initiation Date: 10/1/15
2. Dates of Intermediate Phase Completions or Go/No-Go Points: 9/30/16, 9/30/17
3. Expected Completion Date (Original and Current Plan, if different): 9/30/18

**6. Project Scope:**

From 2016-2021, the installed solar capacity in South Carolina will mushroom from less than 20 megawatts to more than 300 megawatts. Concurrently, the number of customer-sited, load-centered solar generation is expected to grow from less than 500 statewide to as many as 10,000 by 2021. This growth is anticipated to be the direct result of a landmark state policy initiative, Act 236, passed by the South Carolina General Assembly and signed into law by the Governor in June of 2014. Local policy makers in South Carolina are ill-equipped to handle the onslaught of solar permitting and zoning requests expected over the next five years. Similarly, the state's building inspectors, first responders, and tax assessors know little about photovoltaic (PV) technology and best practices. Finally, South Carolina's workforce and workforce trainers are 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 translates into higher "soft costs" of installed solar PV in South Carolina. Currently, we estimate that the installed costs of residential rooftop solar are as much as 25 percent higher than the national average. The Savannah River National Laboratory (SRNL), together with almost a dozen electricity stakeholders in the Southeast, proposes to create a replicable model for solar PV soft cost reduction in South Carolina through human capacity-building at the local level and direct efforts to harmonize policy at the inter-county or regional level. The primary goal of this effort is to close the gap between South Carolina installed costs of residential rooftop solar and national averages. The secondary goal is to develop a portable and replicable model that can be applied to other jurisdictions in the Southeastern US.

**7. Project Goals:**

This integrative team will work together to (1) identify and track the real impacts of the DER act on the cost of solar, the labor workforce, state's economy, and energy utilization, (2) significantly reduce the soft costs associated with PV installation from current projections of \$1.56 - \$0.64/W of total installed cost to less than \$0.65/W for all types of installations (utility and distributed) by working with installers, state and local governments, and utilities to identify issues pertaining to supply chain costs, installation labor, customer acquisition, indirect corporate costs, permitting, taxation, and interconnection (3) educate local municipalities and the public about the DER and how to participate and (4) train first responders and certified local installers by developing a solar installer apprentice program.

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### 8. Project Objectives:

This work will address the knowledge gap of the impacts of SC Act 236, and also begin addressing training shortages and other needs of the SC solar market preparing to emerge from its infancy and apply those lessons throughout the SE US. This study offers a unique perspective on and understanding of the real impact of the rapid integration of solar energy starting at a 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, we will develop a baseline of the current market, identify the major obstacles in soft cost reduction, and cooperatively develop stakeholder centric strategies. The proposal provides a comprehensive solution to make solar deployment faster, cheaper, and significantly easier in the region.

### 9. Project Organization and Responsibilities:

Our team is comprised of stakeholders from all areas: utilities, power generators, small and large businesses, non-profits, and environmental groups, many of which helped craft Act 236. Their working knowledge, expertise, and access to information are vital to ensure that this project reaches its full potential. It is also important for a project of this magnitude and complexity to be led by an independent research organization, and there is no other organization in South Carolina with the needed credibility and expertise. SRNL is able to provide a fully dedicated staff of scientists and engineers to track, push forward, and analyze the data on a scale and complexity that would not be possible otherwise. The scope of this project is larger than can reasonably be accomplished by one entity alone. Utilities and businesses have a larger focus on day to day operations and cannot dedicate the required time and funding needed to accomplish such a study. In addition, the seasoned relationships between all involved parties will help ensure full cooperation and usefulness of the end products.

#### *Energy metrics (Q1FY16- Q4FY18)*

A complete picture of the current status of solar installations, including costing, number of installations, and distribution across the state is not well defined. In order to understand economic growth and the potential for solar cost reduction, we must first determine the current state of practice. After the baseline is established, quarterly reporting based on data collected through surveys and roundtables will determine current solar costs and process times, while also tracking market growth and identifying emerging issues. Progress will be carefully tracked in order to better determine and project work force needs, economic impact of the DER, impact of cost reduction efforts of this proposed effort, and emerging issues.

#### *Soft cost reductions (Q1FY16- Q4FY18)*

The state's IOU's, power generators, and Co-ops will work with project partners, as well as installers and local governments, to identify problems they can help address such as taxation and permitting, indirect corporate costs, installation costs, and customer acquisition costs. We will evaluate the effectiveness of existing incentives, while also examining current disincentives, such as home owner association and architectural review board solar prohibitions. In the short term, recommendations and guides will be put in place to help individual users identify the correct permitting process in their area. Recommendations will be crafted from the Solar ABCS Expedited Permit process for installers, counties, and municipalities and opportunities to unify local permitting will be proposed. Recommendations will also be put forth with non-profits on any legislative action that may be needed to facilitate the process to address longer-term issues, such as tax abatement and incentives, and to unify the permitting process. Quarterly reporting and round tables will identify additional needs and challenges to be addressed, as well as track progress on permitting streamlining. These soft cost reduction strategies will be communicated with the local governments through both the SCEO and the Municipal

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Association.

### *Public Education (Q1FY16- Q4FY18)*

A one-stop-shop for the region will be established to help increase and speed up customer access to installation information (i.e. solar.SC.gov). Ready access to this sort of trusted quality information has the potential to take much of the educational burden off the installer and thus reduce their customer acquisition cost. This will expand upon and include existing informational packets already developed by the SCEO, utilities, and others which include a Solar 101 guide and homeowners guidelines. This website will include informational bulletins on the following areas: 1) how to identify a legitimate quote and installer and evaluate the value of the system 2) understanding solar electricity and the related rules and regulations 3) what reporting needs to be completed to the power company and how to do it 4) how the DER program individually impacts them, including how to participate 5) a public database of licensed solar installers and installation companies in the state by county 6) tracking of utility scale and distributed scale installations and 7) financially focused homeowner solar guides.

### *Workforce training (Q1FY16-Q4FY18)*

A vital component to help meet quality standards and cost reduction goals is the training of licensed and qualified installers. We anticipate training a minimum of three to six trainers and 30 installers by the end of FY18. Another important and often overlooked component will be training first responders. This will expand upon an already existing State Fire Marshall program and it will also be offered to the state electric cooperatives, IOU's, and power providers. We anticipate training an additional 200 first responders by the end FY18.

## 10. The Challenges:

Act 236 changed the trajectory of power generation within the state and its implementation is being carefully watched across the country by state and local governments, industry leaders, and educators to help determine what impact similar legislation may have on their constituents and economy. Act 236 has brought a state and an economy that have been increasingly ignored by the renewables community to the center of their attention. Lessons learned from the rapid integration of solar energy in the state can have broad reaching impact across the nation and the Southeast. Yet, there is no clear understanding of the actual impacts of Act 236. The stark reality of obscure permitting processes that vary from county to county, city to city, and from neighborhood to neighborhood, and increasing installation and inspection times has a very real likelihood of stifling the intended effect of the distributed generation requirements of Act 236. This inherently inefficient scenario coupled with significant knowledge and training gaps for installers, first responders, local governments, and end users provides an opportunity that does not exist elsewhere to tackle the SunShot Initiative Grand Challenges in soft cost reduction (customer acquisition, permitting, financing, installer costs, taxation, supply chains, training gaps) from the ground up.

## 11. Milestone Status:

Due Date	Major Milestone or Deliverable	Deliverable Details	Status
9/30/16	Help coordinate the creation of a centralized public resource on solar	<a href="http://www.solar.sc.gov">www.solar.sc.gov</a> hosted at SCEO	COMPLETE
9/30/16	Complete workforce assessment, baseline costs, and action plan	SRNL-STI-2016-00168	COMPLETE
3/30/17	Submit Apprentice DOL paperwork to ApprentishipCarolina	Paperwork submitted	COMPLETE

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9/30/17	Complete annual soft cost analysis and determine baseline cost pre-Act 236	Two in-depth technical reports issued	COMPLETE
9/30/17	Increase visibility of work	One blog and one conference proceeding published	In Progress
9/30/17	25% reduction in soft cost and 25% increase in participation in rural, low-middle income areas	Currently on target	In Progress

### 12. Scalability / Replicability / Impact:

SC and the SE US is predicted to have soft costs that are at least 25% higher than those in other regions of the country. A steep reduction in these costs is needed, not only to meet nationwide parity, but also grid parity. In order for Act 236 to successfully reach its goals of 1% utility scale and 1% distributed scale solar power by 2021, without rate basing solar incentives, steep cost reductions must be realized. High solar soft costs combined with the low electricity rates and low average income level of consumers, make the target distributed levels harder to achieve than similar penetrations in other states. This project aims to not only reduce the costs associated with solar, but also decrease the time and educational barriers associated with doing so. This study offers a unique perspective on and understanding of the real impact of the rapid integration of solar energy starting at a 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. This work encompasses a comprehensive solution to make solar deployment faster, cheaper, and significantly easier in the region.

The overarching goal of this effort is to close the gap between South Carolina and other Southeastern states installed costs of residential rooftop solar and national averages, while developing a portable and replicable model that can be applied to similar jurisdictions in the future. Through careful tracking and data analysis, we will develop a baseline of the current market, identify the largest issues in soft cost reduction, and cooperatively develop strategies to tackle them in a manner that works for all parties involved. This project will provide a financial analysis and model of PV soft costs that not only provide a detailed assessment of the costs, but will also provide portable, replicable models for workforce development, cost reduction, and policy development that may be used not only in the Southeast, but in other regions of the country with immature solar markets.

### 13. Major Project Results:

Major outcomes to date for this project include the five publicly available reports and publications listed below. In addition, this project has established a neutral third-party website ([solar.sc.gov](http://solar.sc.gov)), which is maintained and operated by the SC Energy Office. This website has been refocused to consumer protection and enables the public to make educated decisions on solar. Though this is hosted through the SCEO, its information can be applied to outside jurisdictions. In addition, this program has filed a solar installer apprentice program with the Department of Labor, which can serve as a model to small businesses across the US. This project is the first of its kind which specifically tracks the success of a major piece of state level renewable energy legislation and has focused on data driven analysis to understand its impact on the economy and deployment of distributed PV.

1. Fox, E.B., M. Drory, and T.B. Edwards, “A Tale of Two States: The Power of a Consensus based Approach”, Conference Proceedings of the American Solar Energy Society Solar 2017, p49-55. <http://proceedings.ises.org/paper/solar2017/solar2017-0006-Fox.pdf>

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2. E. B. Fox, “A Step-by-Step Guide for South Carolina Residential Solar Customers”, SRNL-STI-2016-00168 rev 2, Jan 2017. <https://www.osti.gov/scitech/biblio/1245740-step-step-guide-south-carolina-residential-solar-customers>
3. E.B. Fox and T.B. Edwards, “2015 South Carolina PV Soft Cost and Workforce Development, Part 1: Initial Survey Results”, SRNL-STI-2016-00177, May 2016. <https://www.osti.gov/scitech/biblio/1252420-south-carolina-pv-soft-cost-workforce-development-part-initial-survey-results>
4. E.B. Fox and T.B. Edwards, “2016 Alabama PV Soft Cost and Workforce Development”, SRNL-STI-2016-00717, Dec 2016. <https://www.osti.gov/scitech/biblio/1335827-alabama-pv-soft-cost-workforce-development>
5. E.B. Fox M.D. Drory, and T.B. Edwards, “2016 End of Year South Carolina PV Soft Cost and Workforce Development, SRNL-STI-2017-00474. <https://www.osti.gov/scitech/biblio/1377028-end-year-south-carolina-pv-soft-cost-workforce-development>

### 14. Budget Tables:

Approved budget along with expenditures are found in Table 1. Deviations to the planned budget are found in table footnotes. This project is on track at current rates to exhaust funds at the end of this fiscal year with only minor carry over funds expected.

Table 1. Budget projection and expenditures up to 9/30/17.

Budget Category	FY16		FY17		FY18		Cumulative	
	Approved	YE final	Approved	YE final	Approved	YTD	Approved	TTD
<b>Personnel</b>	\$323,208	\$48,967.70	\$219,621	\$114,546.70	\$187,588	*	\$730,417	\$163,514.40
<sup>1</sup> Fringe Benefits	\$0	\$22,961	\$0	\$54,225.78	\$0	*	\$0	\$77,186.78
<b>Travel</b>	\$5,024	\$5,505	\$5,343	\$5,652.86	\$5,082	*	\$15,449	\$11,157.86
<b>Equipment</b>	\$0	\$0	\$0	\$0	\$0	*	\$0	\$0
<b>Supplies</b>	\$0	\$2,446.73	\$0	\$330	\$0	*	\$0	\$2,776.73
<sup>2</sup> Contractual	\$115,000	\$166,608	\$75,000	\$35,901.72	\$40,000	*	\$230,000	\$91,608.00
<b>Construction</b>	\$0	\$0	\$0	\$0	\$0	*	\$0	\$0
<b>Other</b>	\$0	\$0	\$0	\$0	\$0	*	\$0	\$0
<b>Total Direct</b>	\$443,232	\$246,488	\$299,964	\$210,652.06	\$232,670	*	\$975,866	\$457,140.49
<b>Indirect</b>	\$206,768	\$123,001.28	\$175,036	\$315,021.15	\$122,330	*	\$504,134	\$438,022.43
<b>Total Charges</b>	<b>\$650,000</b>	<b>\$393,490</b>	<b>\$475,000</b>	<b>\$531,673.21</b>	<b>\$355,000</b>	*	<b>\$1,480,000</b>	<b>\$925,162.92</b>
<b>DOE Share</b>	\$650,000	\$393,490	\$475,000	\$525,673.21	\$355,000	*	\$1,480,000	\$859,162.92
<b>Cost Share</b>	\$24,000	\$24,000	\$0	\$6000	\$0	*	\$24,000	\$30,000

1. Fringe Benefits were not an internal separated cost at the time of project negotiations. These funds became a separate internal reporting cost in FY16.

2. FY16 YE Final for contractual includes fully encumbered funds for the subcontracts for the first year of project. Contracts were not awarded until FY17 and only then for the SCEO. Key team members left NCSU at the beginning of FY 17 and the subcontract was cancelled. SRNL was able to use these funds for a new hire to complete the scope of work. The new total encumbered amount for subcontracts equals \$91,608, which is reflected in the cumulative total. Actuals in FY17 are executed funds to the SCEO.

\*FY18 Q1 expenditures were not available at the time of report submission.