DIRECT STATEMENT OF
JOHN H. RAFTERY
ON BEHALF OF
SOUTH CAROLINA ELECTRIC & GAS COMPANY
DOCKET NO. 2015-362-E

My name is John H. Raftery. I am employed by South Carolina Electric & Gas Company ("SCE&G"), where I currently serve as the General Manager of Renewable Products/Services and Energy Demand Management. I have held this position since October of 2014. In this capacity, I am responsible for all of SCE&G's renewable initiatives, from residential rooftop solar programs, to utility-scale solar farms, to its recently announced community solar initiative. I am also in charge of energy efficiency programs available for our customers such as industrial lighting, heating and cooling, residential HVAC rebates, and low income neighborhood energy efficiency improvements to name a few.

The purpose of my statement is to present the current status of SCE&G's DER programs to include participation rates, next steps, and some general challenges experienced within the industry in our state.

SCE&G DER Customer Programs

SCE&G's DER programs are all designed to be performance-based by which the customer incentives are tied to the amount of energy actually produced by the installed solar system. In this manner a performance-based system rewards properly-sited, properly-installed, and properly-maintained systems that deliver the desired clean energy.

SCE&G's first incentive program is called Net Energy Metering Plus. As its "Plus" name indicates, it is an incentive on-top of the core Net Energy Metering incentive program. Net Energy Metering Plus allowed customers to apply on a first-come, first-served basis to receive extra performance-based incentives (PBIs). These PBIs are placed on customers' bills via a separate line item, valuing each kilowatt-hour (kWh) their systems produce monthly. In order to promote the program and create excitement, the PBIs were organized into steps, meaning that early adopters got the highest incentive per kWh (4 cents) while the later adopters received reduced incentives (i.e., 3 cents, 2 cents, 1 cent) as certain participation levels were achieved. All amounts once approved for the customer are fixed for a term of 10 years. It is this price certainty that allowed installers to present to customers the value in the program.

SCE&G's Net Energy Metering Plus program was very well received, with the total allotment goal of 9 megawatts (MW) being reserved by 1,268 customers in just 6 months. Of this amount, 7.8 MW is interconnected as of October 31, 2016, with the remainder to be built shortly. Although the extra incentive is no longer available for new customers, the core Net Energy Metering incentivized program has proven to be very attractive as well in the marketplace. In fact, an additional 10.4 MW of Net Energy Metering has been interconnected to SCE&G's system as of October 31, 2016. Combining these two interconnected numbers along with the amount of systems approved to be built (9.1 MW), shows that SCE&G and its customers are tracking towards 27.3 MW of Net Energy Metering (7.8 + 10.4 + 9.1) and making great progress within Act 236's capped limit of 2% of the five year average retail peak demand (84.4 MW for SCE&G).

Another performance-based system offered by SCE&G is its Bill Credit Agreement (BCA) program targeting commercial customers as well as certain non-profits including churches, schools and municipalities. The BCA program operates similarly to the residential PBI program in that all of the energy produced by the system is assigned a credit rate and presented each month on the customer's SCE&G bill as a credit line item. Unlike Net Energy Metering, however, in the BCA program all of the energy is physically connected to the utility side of the meter, and therefore provided to the grid directly. Many people call this a grid-connected or "in-front-of the meter" system, while all of the customer's energy needs are metered and billed as they normally were before the system was installed. As of October 31, 2016, SCE&G had interconnected approximately 1.0 MW of BCA systems and approved another 2.4 MW of systems to be built.

The three systems just described are considered customer scale according to Act 236's definition of systems under 1 MW. Adding Net Energy Metering Plus, Net Energy Metering and Bill Credit Agreements from an interconnected systems standpoint places SCE&G at 19.2 MW, or 45% of Act 236's customer scale goal of 1% of the five-year average retail peak demand (42.2 MW for SCE&G). Adding in the approved and to-be-built systems to this total places SCE&G at 30.7 MW, or 73% of Act 236's goal.

Community Solar

One of SCE&G's most exciting programs is its Community Solar offering. SCE&G recognized that the majority of customers cannot physically place solar on their roofs due to certain prohibitions in homeowner association covenants, tree and building shading, renting of apartments or homes, poor quality of the roof structure, bad orientation of the

1 roof line to the north, high upfront costs, or simply because they don't find the systems to
2 be attractive. Community solar is the perfect answer for customers in this category who
3 want to participate in solar. Community solar also improves on many of the challenges
4 faced by rooftop solar: community allows for the best orientations for power production,
5 the best price point because of economies of scale, and portability if you move within our
6 electric system (it goes with you) or transferability if you move outside of our area under
7 the ownership model (you can sell/gift it).

8 SCE&G has selected nationally recognized Clean Energy Collective to be its
9 authorized community solar developer who will contract and construct up to 16 MW of
10 solar farms in the SCE&G electric service territory. The first of these farms is expected to
11 be operational in the summer of 2017, with the sales of panels to customers occurring as
12 early as January 2017. Panel prices are expected to be $2.00-$2.50 per watt, which is much
13 less than what is attainable in a residential rooftop setting. The term of the arrangement is
14 20 years, thereby allowing a credit rate at less than what is necessary for Net Energy
15 Metering. In order to further make solar power available to its customers, SCE&G is
16 actively designing with Clean Energy Collective the opportunity for customers to make a
17 much lower upfront payment in return for a reduced credit amount each month. This
18 financing method and the elimination of the upfront fee is also being viewed as the best
19 program to offer low-income and economically disadvantaged customers. SCE&G
20 believes combining this with upfront participation in SCE&G's energy efficiency programs
21 will provide the superior product to this important customer segment. Details for these
22 offerings are being finalized for Commission consideration shortly.

1

2 **Utility Scale Solar Farms**

3 Following its August 2015 request for solar farm proposals, SCE&G signed 46.6
4 MW of Power Purchase Agreements for solar farms located throughout its electric service
5 territory. These farms surpass Act 236's utility scale goal of 1% of the five-year average
6 retail peak demand (42.2 MW for SCE&G). As well, they are expected to be operational
7 by the end of 2017, well ahead of Act 236's 2021 deadline. The first DER solar farm came
8 online in December of 2015 at SCE&G's Jerry Zucker Solar Park / Leeds Avenue location.

9 **Putting Teams and Processes in Place**

10 Over the past two years, the SCE&G team has moved quickly to not only design the
11 programs mentioned above, but to develop the necessary support for them from the
12 perspectives of Customer Service, Information Technology, Bill Print, Interconnection
13 Applications, Metering, Vendor Relationships, Transmission Support, Electric Operations,
14 Business Systems Management, Relaying, Accounting, Substations, Land, Environmental,
15 Strategic Sourcing, Resource Planning, Distribution Planning and many others. As the
16 internal and external education and training have taken place, several new processes were
17 developed and several new systems were designed in order to maximize the benefits and
18 efficiencies for our customers, SCE&G employees, and the solar installers or lessors.

19 One of the most recent of these examples was in improvement to the "< 20 kW"
20 interconnection process. In early October 2016, this process was moved from the
21 traditional paper based set of applications to a new online interconnection application
22 powered by nationally recognized Clean Power Research. This tool, PowerClerk, allows

1 the online entry of applications, electronic signatures, immediate submission to the
2 SCE&G Renewables team, as well as real-time visibility by the customers, installers and
3 lessors to their applications. This improvement in the application process has been very
4 well received by all parties.

5 Also, in November of 2016, SCE&G will begin routing solar inspection work orders
6 along with meter set work orders through its automated routing application, Click. This
7 ensures that the orders are completed in the most efficient sequence, reduces the number
8 of visits to a customer's home from 2 to 1, and eliminates the wait in-between those two
9 orders.

10 **Residential Consumer and Industry Challenges**

11 Even with highly trained employees in its Call Centers as well as over 100
12 community meetings held by SCE&G, customers still fall prey to less than reputable actors.
13 These actors sell or lease systems to homeowners that seek financial payback or green
14 attributes, but their homes and roofs simply are not suitable for solar deployment or the
15 terms and consideration in the contract are not in the customer's best interest. Often these
16 individuals go door-to-door representing themselves as being SCE&G contractors and state
17 "SCE&G is giving away free panels." In each of these incidents SCE&G educates the
18 customer on what is and what is not being done and recommends customer contact with
19 the Better Business Bureau or the South Carolina Office of Regulatory Staff if it is leasing
20 related. In many cases customers share the contracts they have been presented with, and
21 those contracts have a 20-year term and reference SCE&G's Net Energy Metering program
22 as being a requirement. SCE&G's Net Energy Metering program is currently only

approved through 2025 for those interconnected by 2020, so a term mismatch of over 10 years is both misleading and inaccurate.

SCE&G also sees the quality of the interconnection electrical work completed by some installers or lessors to be unsatisfactory. SCE&G hosts numerous meetings on its standards in order to educate and be specific about metering electrical requirements. SCE&G routinely turns down solar inspections or meter sets if the standards are not met. When this occurs, it is not only an unproductive trip for the SCE&G field personnel, but it is troubling for the customer that is anxious to get their system interconnected and working.

In order to make first responders, fire chiefs and training officials aware of solar, SCE&G distributed in 2014 and again in 2016 almost 500 letters and brochures to these individuals reminding them of the growing solar industry in the state, and what to look for in identifying a solar system's safety features at a home or business.

It is with constant outreach and being fully accessible that SCE&G feels it will continue to be successful in avoiding unsafe practices on our system. Additional industry support by organizations such as the South Carolina Solar Business Alliance and South Carolina Solar Council must provide emphasis on this as well.

Lake Murray Research Center

Finally, SCE&G is excited to begin the examination and coordination of a potential 500 kW solar farm on top of its capped coal ash landfill across from the McMeekin Station site. This site also allows for several grid-level battery storage systems and the existing interconnection with SCE&G transmission and distribution training facilities. The ability for SCE&G to evaluate these technologies and integration in real world scenarios under a

1 microgrid setup could be invaluable for the company in developing practical knowledge to
2 the most economical and productive designs, how energy storage and solar firming behave,
3 how to reduce costs and improve reliability, as well as hands-on technical training
4 opportunities. SCE&G is considering academic partnerships in this endeavor to further
5 promote these technologies in our schools.

South Carolina Electric & Gas Distributed Energy Resource Update

December 15th, 2016

Public Service Commission of South Carolina

SCE&G SOLAR Energy

Review Areas

DER Program Participation Updates

- Residential Performance Based Incentives
- Net Energy Metering
- Customer Scale Offerings

Community Solar Notes

Utility Scale Solar Farms Update

Process Improvements

- Online Solar Interconnection Application
- Streamlining Routing, Inspection and Meter Set

Residential Consumer and Industry Challenges

- Marketing & Safety

Upcoming Considerations

- Lake Murray Research Center / Microgrid

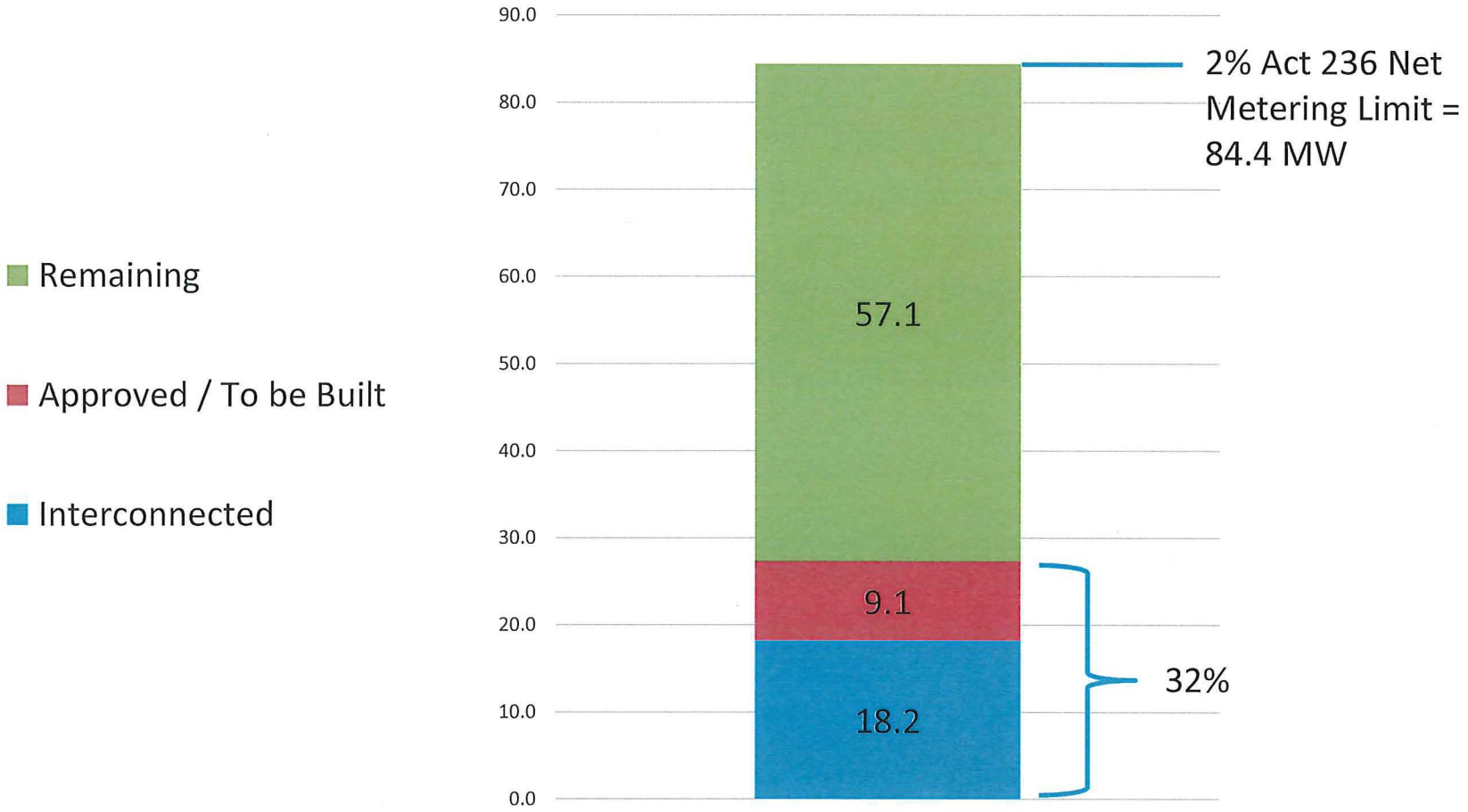
Residential Performance Based Incentives

- Performance Incentive offered first-come, first-served
- With Net Energy Metering, cuts payback period by 2-3 years
- Stepped progression promoting early adopters

Step	Cumulative Capacity (MW) for all SCE&G Customers	PBI per kWh	Date Fully Reserved
1	0 < cumulative capacity(s) <= 2.5	$0.04	1/13/16
2	2.5 < cumulative capacity(s) <= 5	$0.03	2/12/16
3	5 < cumulative capacity(s) <= 7.5	$0.02	3/21/16
4	7.5 < cumulative capacity(s) <= 9	$0.01	4/21/16

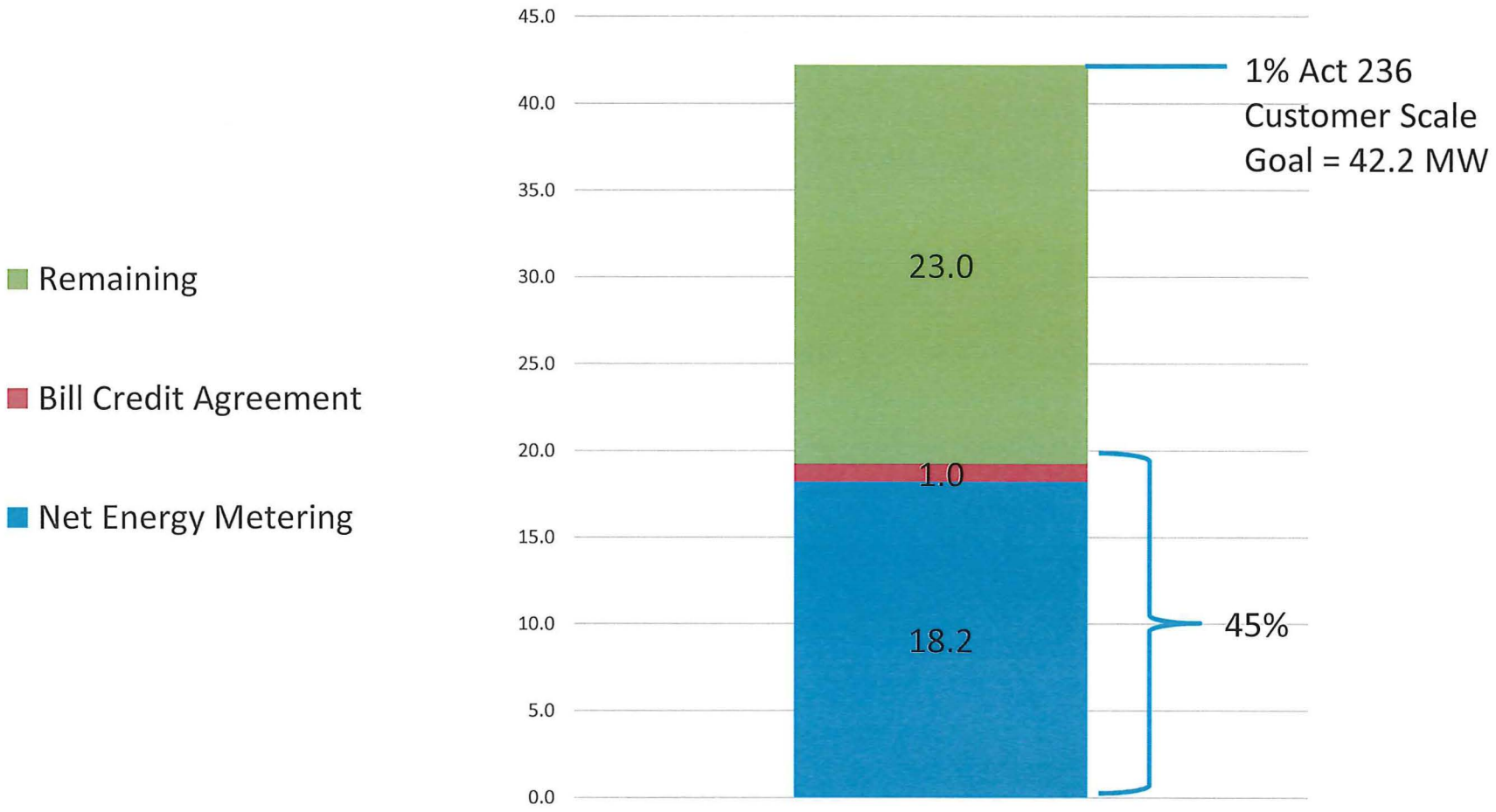
- Total: 1,268 Customers with PBI Reservation
- 7.8 MW Interconnected as of 10/31/2016
- 1.6 MW Reserved / Remaining To be Built

Net Energy Metering Capacity (MW)



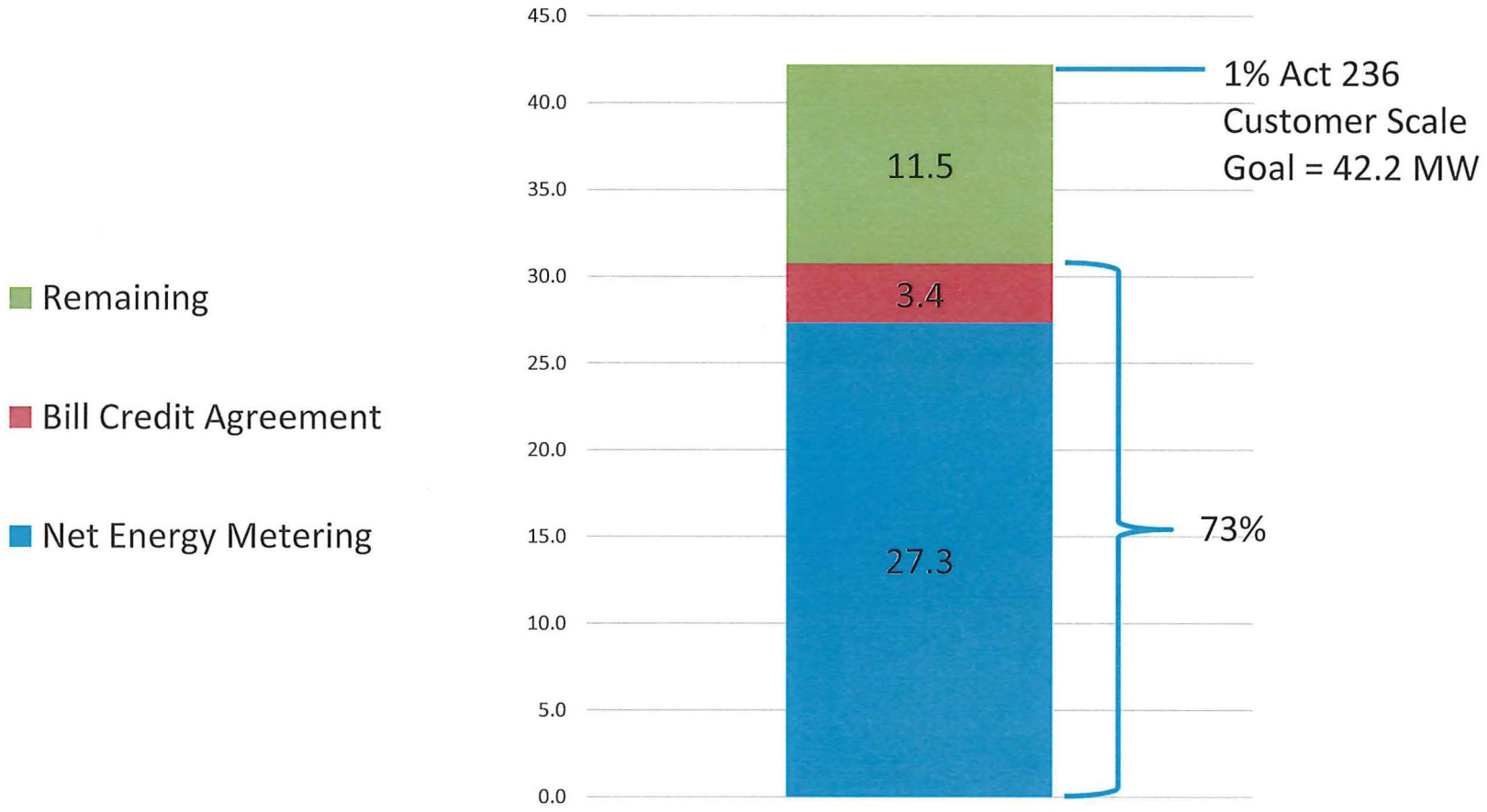
* As of 10/31/2016

Customer Scale - Interconnected Capacity (MW)



* As of 10/31/2016

Customer Scale – Interconnected and Approved / To be Built Capacity (MW)



* As of 10/31/2016

Community Solar Notes
"Roofless Solar"

- Clean Energy Collective, SCE&G's Authorized Community Solar Developer
- Multiple farms up to 16 MW
- Paths for True Ownership including a Low Income Model in development
- Full transferability (sell/give to another customer)
- Full portability (take to another SCE&G account)
- Estimated prices between $2.00-$2.50/watt based on EPC being negotiated
- Equates to approximately $200-$250 for a 100 watt panel
- Sales expected beginning of 2017 with farms operational starting mid-2017

Clean Energy COLLECTIVE®

Utility Scale Solar Farms Update

- 46.6 MW under PPA contract via August 2015 RFP
- 42.2 MW represents Act 236's 1% Utility Scale goal for SCE&G
- Jerry Zucker Solar Park was Act 236's first operational Utility Scale farm
- Expect to interconnect 100% of Act 236's goal by the end of 2017

Solar Farm	City/Town	County	Size (MW)	Status / Operations Date
Jerry Zucker / Leeds Avenue	N. Charleston	Charleston	0.5	Interconnected / Dec 2015
Saluda Solar I	Saluda	Saluda	6.8	Under Construction / Dec 2016
Otarre	Cayce	Lexington	1.5	Under Negotiation / Jun 2017
Saluda Solar II	Saluda	Saluda	3.4	Signed Contract / Jun 2017
Barnwell Solar	Barnwell	Barnwell	5.4	Signed Contract / Jun 2017
Cameron Solar II	Cameron	Calhoun	4.1	Signed Contract / Jun 2017
Ridgeland Solar	Ridgeland	Jasper	10.0	Signed Contract / Jun 2017
Odyssey Solar	Pelion	Lexington	8.2	Signed Contract / Sep 2017
Haley Solar	Allendale	Allendale	8.2	Signed Contract / Oct 2017
		Total Utility-Scale Solar:	48.1	

JERRY ZUCKER SOLAR PARK

500kw - 2,014 panels - 3+ acres

Owned and operated by TIG SUN ENERGY III, LLC
A member of The InterTech Group.

TIG SUN ENERGY

The InterTech Group

In collaboration with

SCE&G
A SCANA COMPANY

All inquiries to:

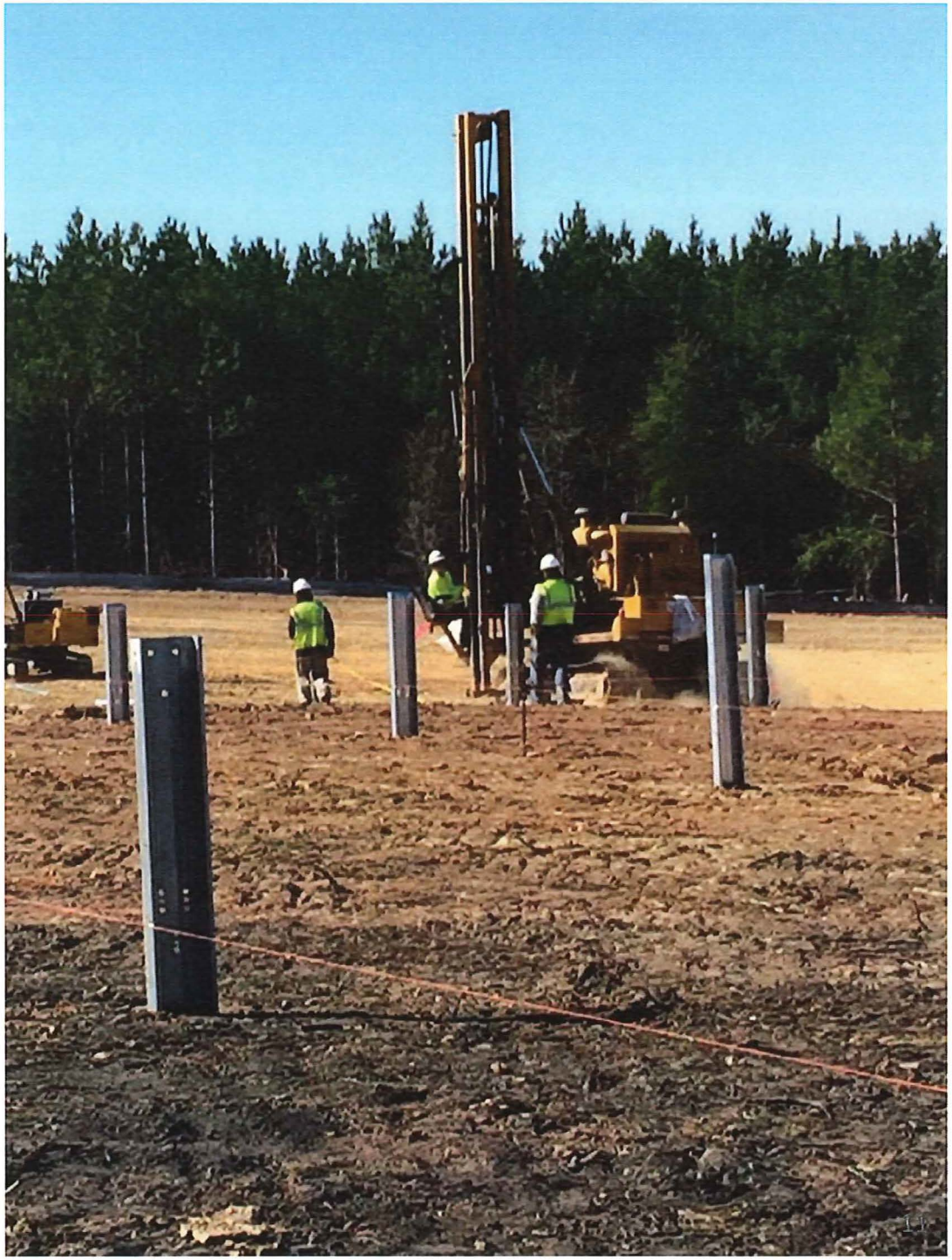
TIG SUN ENERGY III, LLC
4838 Jenkins Avenue
North Charleston, SC 29405

843.744.5174

SCE&G SOLAR Energy

[redacted]

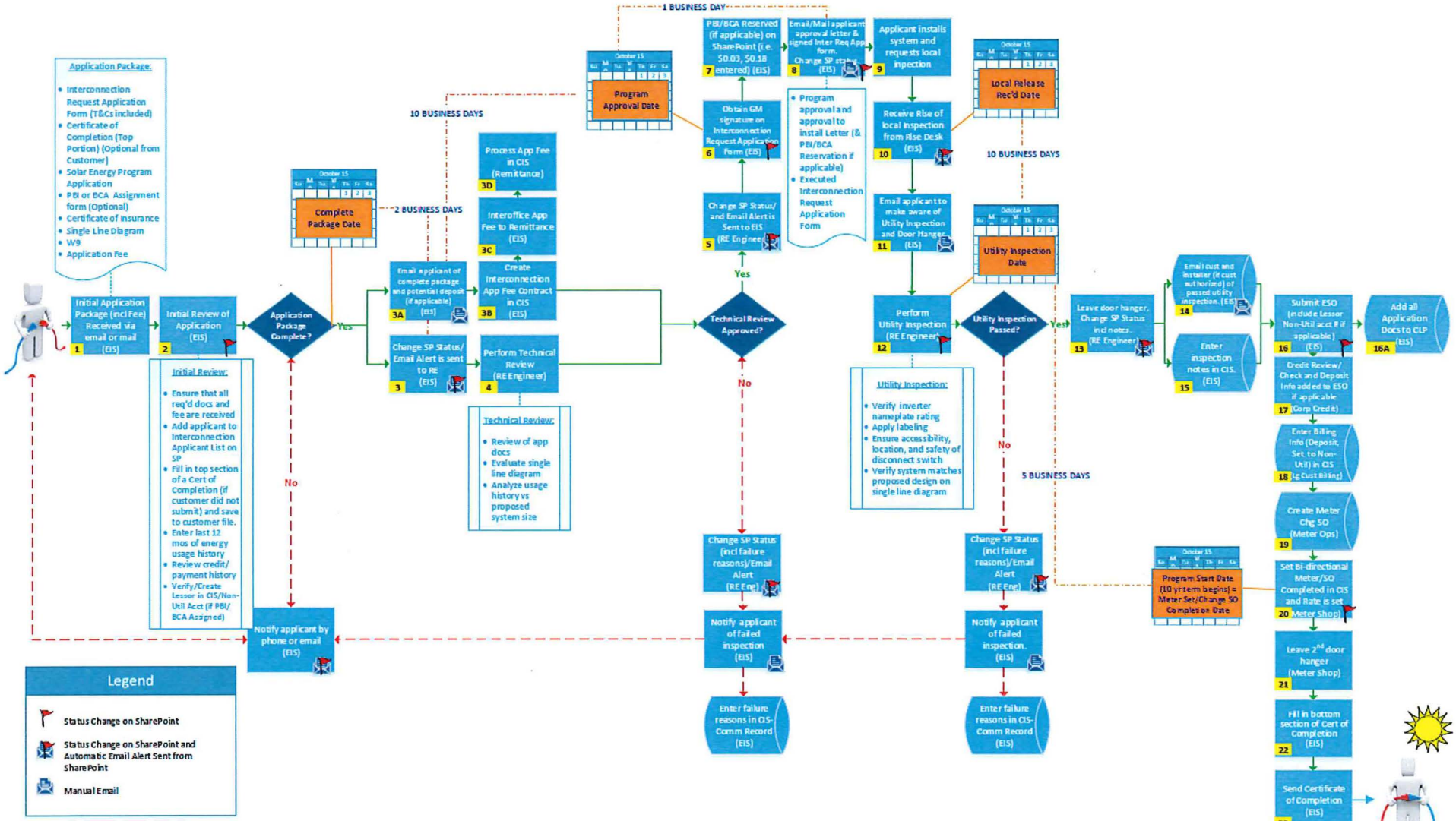
Saluda Solar Farm
6.8 MW (AC)
Under Construction



Saluda Solar Farm
31,000+ panels over 60+ acres
Energy equivalent for 1,300 homes

Process Improvements

SCGIP Interconnection Process, No Larger than 20 kW
Residential and Nonresidential Accounts



Version 2.5
March 9, 2016

PowerClerk Online Interconnection Application

- Streamlined interconnection process
- Real-time visibility into project status and alerts
- Automated electronic application submission

SCE&G A SCANA COMPANY

PowerClerk®

PowerClerk 2

SCE&G Interconnection Request Application for Generating Facilities No Larger than 20 kW

Begin by logging in or registering for an account.

You or your installer will need to provide:

- SCE&G electric account number
- PV system information, including inverter and array brands, models, installation details and single-line diagram
- Proof of property (liability) insurance

Please review the **Installer User Guide** for information about SCE&G's application process via PowerClerk.

Special Note to Our Customers:

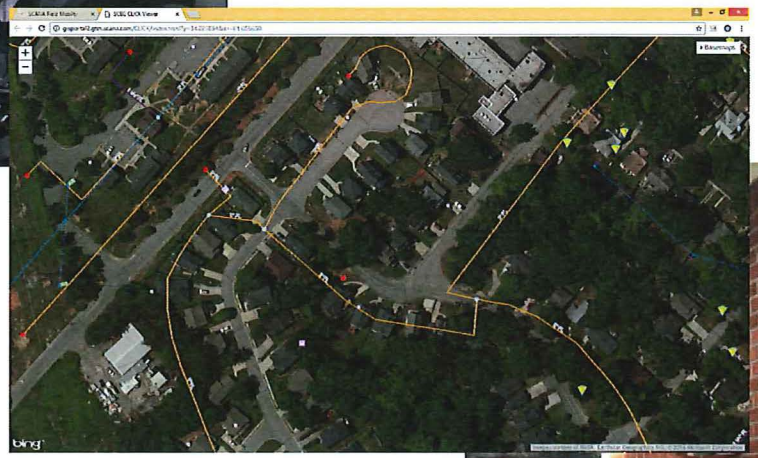
When you provide your installer with access to your online application, be aware that interconnection agreements are between you and SCE&G, and all application documents will require your electronic signature.

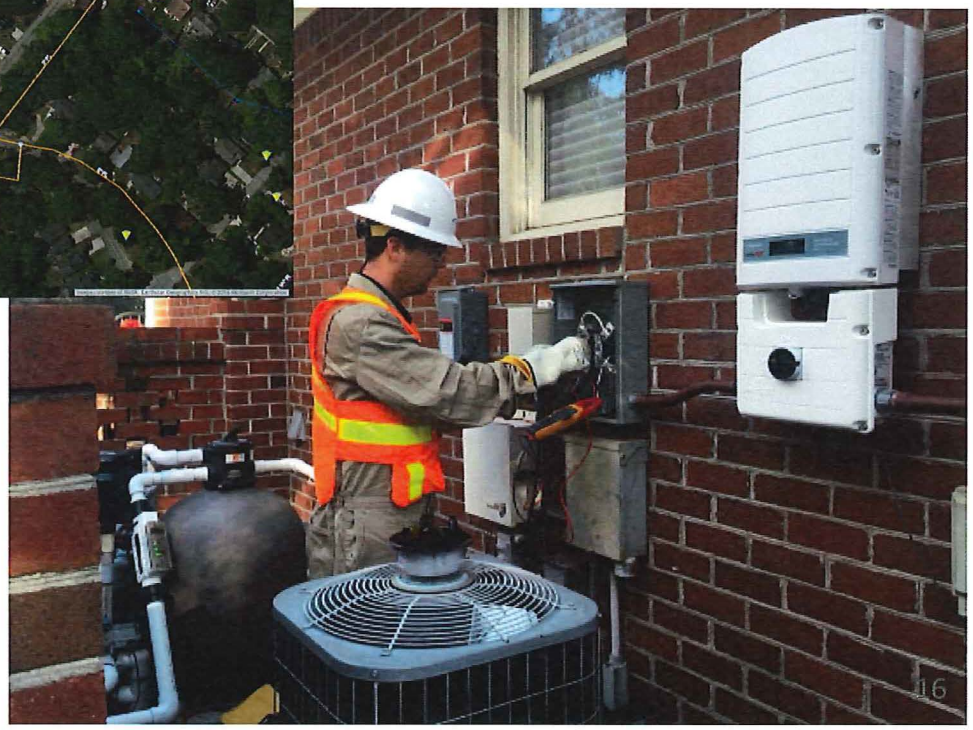
If you have any questions, please contact us at:

RenewableEnergy@scana.com
1-866-660-3705

Log In
Username:
example@company.com
Password:
Forgot Password?
Log In
Register a new account.

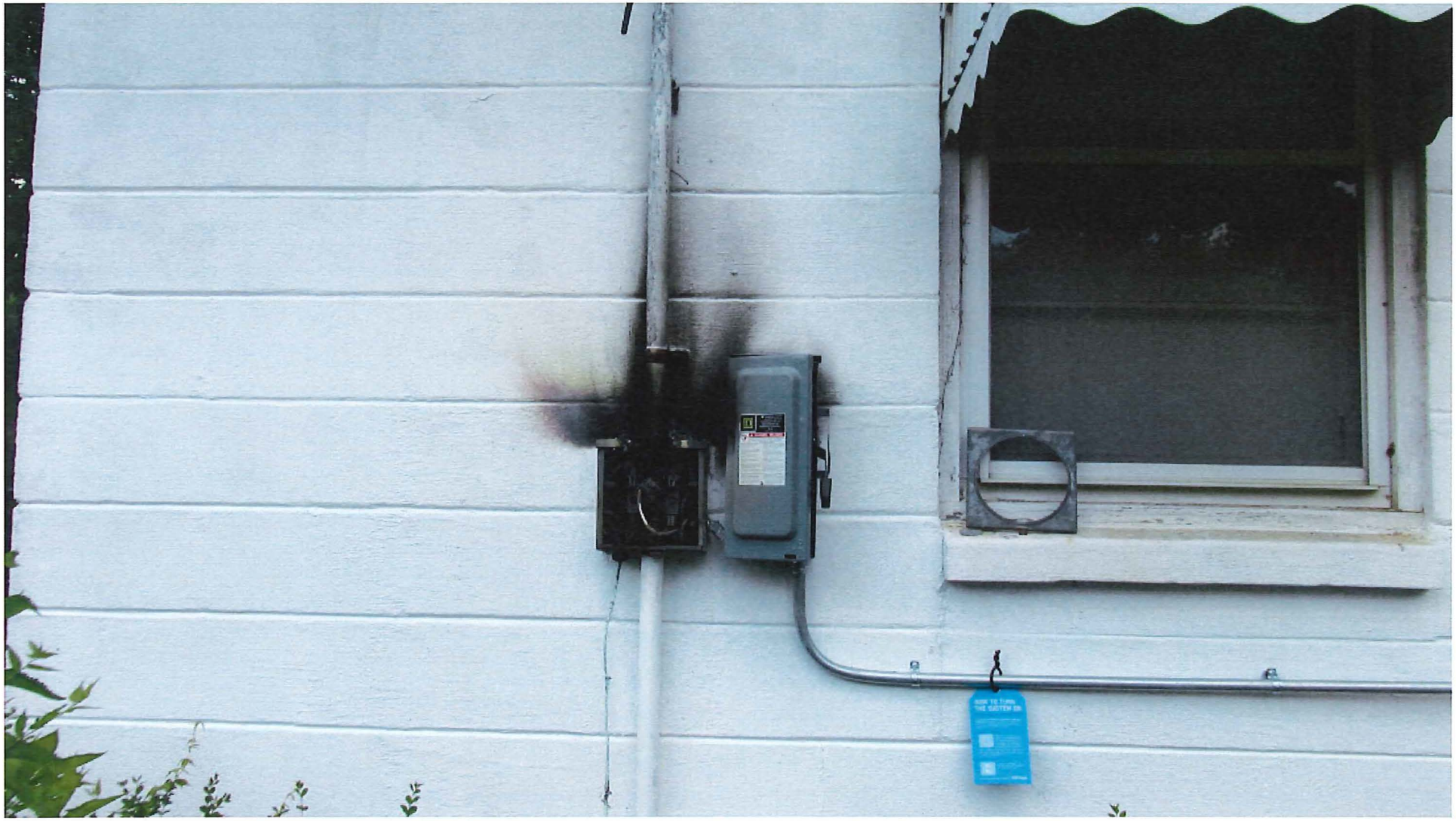
Automated Routing, Combined Solar Inspection and Meter Set





Consumer Marketing Challenges

Industry Safety Challenges



Dear Fire Chief or Training Officer:

With October designated to increase awareness for National Fire Prevention, SCE&G's commitment to public safety remains constant. The enclosed brochure is intended to raise awareness among fire personnel responding to structures equipped with solar (photovoltaic or PV) systems. The brochure outlines some of the key safety issues and potential electrical hazards to be considered when responding to solar-related fires.

You may recall, on June 2, 2014 Governor Nikki Haley signed into law Act 236, also known as the SC Distributed Energy Resource Program Act, aimed to increase solar energy production across our state. Since that time, interest and participation in SCE&G's solar programs has risen significantly. Some of the highlights include:

- Expansion of our existing renewables portfolio, interconnecting more than 1,600 customer solar systems including homes, businesses, churches and municipalities – as part of our goal to develop 42 megawatts (MW) of customer-scale solar by 2020. Currently, more than a thousand applications are in the pipeline.
- Plans for seven new solar generating facilities to support utility-scale solar on our system, also by 2020. When completed, these sites will produce nearly 48 MW of solar power in total.
- A community solar partnership with the Clean Energy Collective (CEC), giving SCE&G customers the opportunity to subscribe to or purchase panels in solar farms located throughout our service area. CEC will develop, construct, own, and operate the 16 MW community solar portfolio, the largest utility-driven program in the state and one of the largest in the country.

As PV systems become more and more prevalent on our system, we encourage you to take time to learn more about how these systems might impact the important work that you do. We thank you for your commitment to our customers and all that you do to keep our communities safe.

Sincerely,

Bill Turner

William (Bill) J. Turner, III
Vice President, Electric Operations
SCE&G

Solar PV Systems Can Pose Hazards

Interest in solar energy and photovoltaic (PV) systems is growing among homeowners and businesses. Under normal operating conditions, PV systems are safe. But, structural fires in residences and commercial buildings with rooftop or ground-mounted PV systems can pose serious safety concerns for emergency personnel.

Firefighters combating these types of fires are exposed to hazards beyond those associated with conventional fires, including:

- **Potential shock hazard** caused by spraying water onto a PV system and touching or cutting into PV modules, conduit or equipment.
- **Roof hazards** caused by weakened structural integrity due to the weight of the PV system.
- **Inhalation exposure** to hazardous chemicals such as cadmium telluride, gallium arsenide and phosphorus dissipated in the smoke plume.
- **Increased risk of backdraft** because roof venting is restricted by PV system.
- **Ground hazards** due to uneven terrain where ground mounted arrays are located.
- **Battery hazards** especially when fumes and gases are generated by batteries exposed to fire.

mc_RRNW16T9266 10/16

To learn more about SCE&G's commitment to solar energy, visit sceg.com/solar.

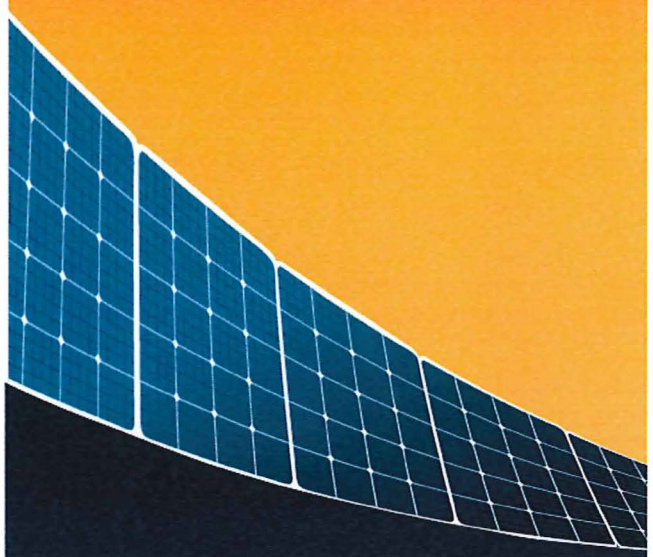
For assistance during an emergency, call: 1-800-251-7234.

SCE&G

SCE&G is providing this information to assist in the awareness of potential hazards. Emergency responders must determine if/how this may apply to "Safe Fireground Operations."

Rooftop and Ground-Mounted Solar Photovoltaic (PV) Systems

Fire Safety for Emergency Responders

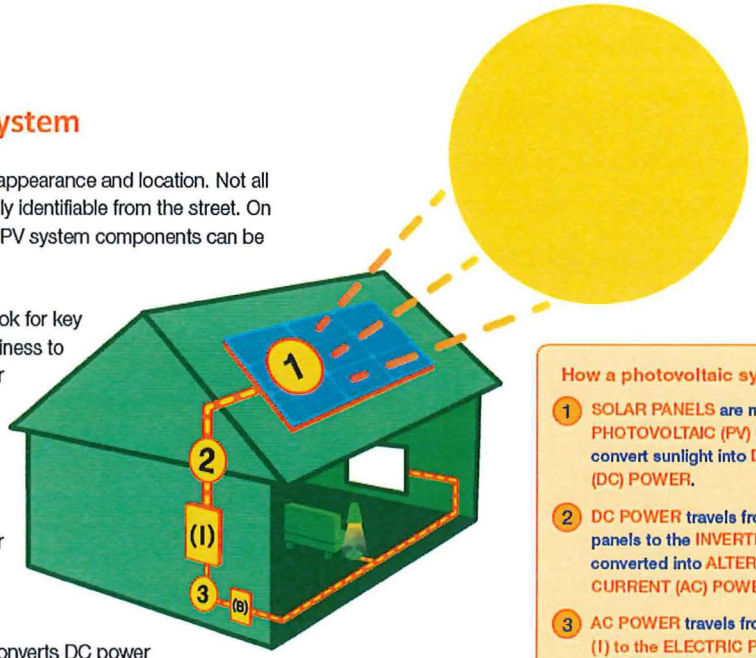


This information is intended for fire personnel responding to a fire involving homes or commercial buildings where rooftop and/or ground-mounted solar photovoltaic (PV) systems are installed.

Identifying a Solar Photovoltaic (PV) System

PV systems can differ in design, appearance and location. Not all homes with a PV system are easily identifiable from the street. On commercial buildings, identifying PV system components can be much more difficult due to size.

Emergency responders should look for key components on the home or business to determine the presence of a solar PV system.



Photovoltaic or Solar Panels: Typically mounted on the roof, these panels convert sunlight instantly into DC power. The solar panel array may be rooftop or ground mounted.

Inverter Cabinet: The inverter converts DC power into standard household AC power. Do not assume that the inverter cabinet will be located adjacent to the electric meter. The inverter may be in another location, such as inside a garage, attic or basement.

Associated Components: Includes DC conductors, DC combiner box, DC conduit, bi-directional meter and DC disconnect.

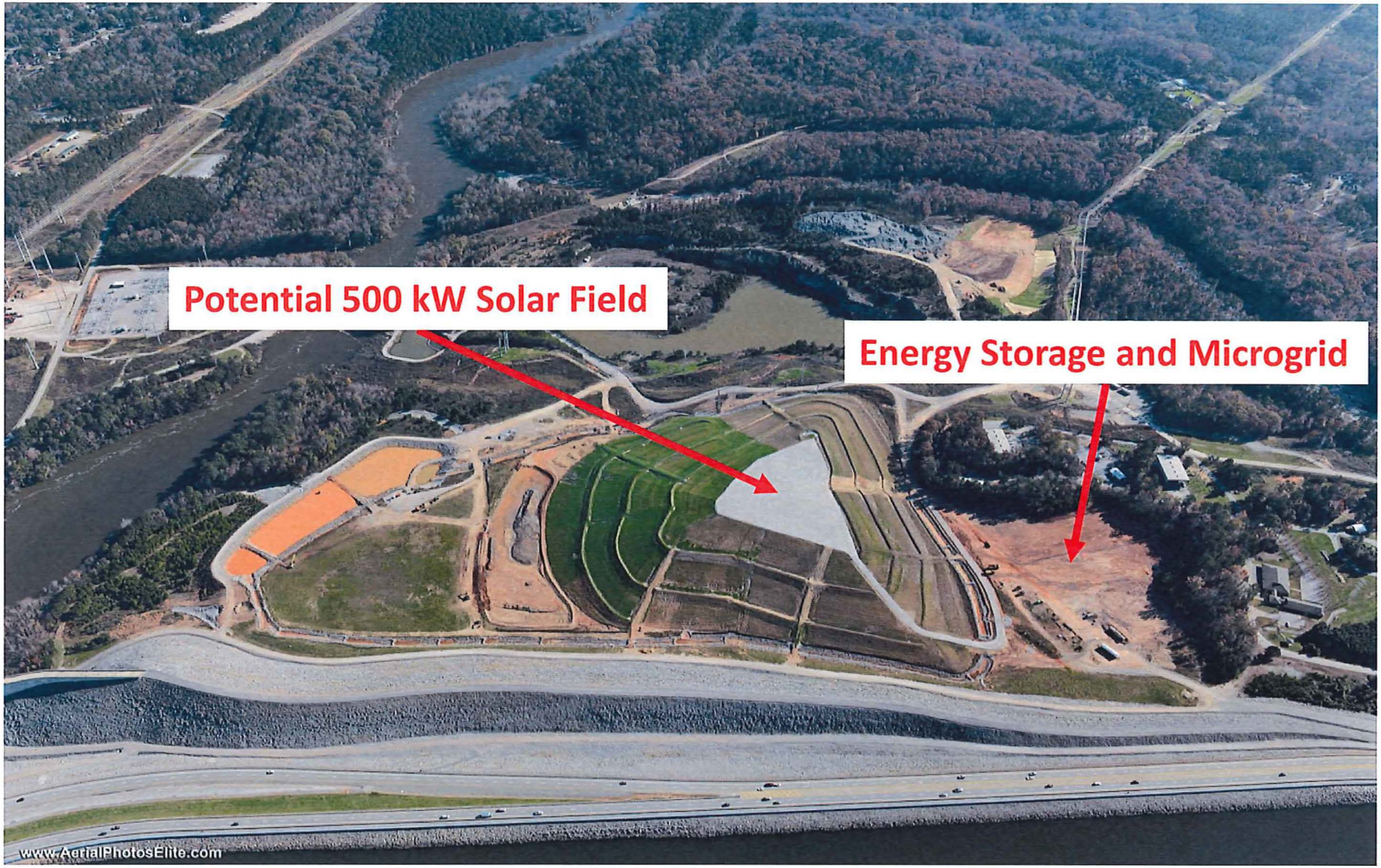
SCE&G Meter Label: Look for a caution label on the electric meter for all **approved** onsite generation on SCE&G's system.

How a photovoltaic system works:

1. **SOLAR PANELS are made up of PHOTOVOLTAIC (PV) CELLS that convert sunlight into DIRECT CURRENT (DC) POWER.**
2. **DC POWER travels from the solar panels to the INVERTER (I) and is converted into ALTERNATING CURRENT (AC) POWER.**
3. **AC POWER travels from the INVERTER (I) to the ELECTRIC PANEL or BREAKER BOX (B) and is now ready to power any thing in the home that uses electricity.**

Conducting Safe Firefighting Operations

Be aware solar panels generate DC voltage at all times regardless of connection to any other equipment. The generation of electricity cannot be turned off. **Disconnecting the service, inverter, meters, disconnects or wire DOES NOT stop the panel from creating DC power.**

- First and foremost, evacuate the building.
- Wear SCBA (Self-Contained Breathing Apparatus) and full protective clothing.
- Once the PV system is identified, look for warning labels on electric disconnects. Lock-out and tag-out all electric disconnects, isolating the PV system at the inverter.
- Turn off the main electric service as soon as practical. When the main electric panel is shut off, be aware there is still DC power from the rooftop to the inverter box.
- Disconnecting power to a building will not de-energize the DC power from the solar panel. The disconnection of an electric service to a building should only be performed by SCE&G employees or other authorized personnel. A firefighter should never attempt to disconnect electric service by removing the electric meter.
- Consider all PV equipment and wires to be energized. Do not touch or cut into or through PV modules, conduit or equipment.
- Do not open the combiner box (usually only on large commercial units). All energized wires from the solar panels are fed into the combiner box then combined with two large high-current wires. These boxes are normally locked.
- In roof operations, consider how the weight of the PV system may compromise a weakened roof structure. Although International Fire Code (IFC) and National Fire Protection Association (NFPA) Codes and Standards require roof access for roof ventilation, some solar panel installations may not allow access to the roof over the fire. Consider cross ventilation.
- Do not walk on or break PV modules. This can cause the simultaneous release of all the energy in the system.
- Foam or salvage cover cannot block sunlight from the solar panels. Foam will slide off the array. A salvage cover will significantly reduce sunlight, but electricity can still be generated through the salvage cover.
- Be aware that moonlight, street lights and flood lights, as well as scene lighting, may be bright enough for the PV system to generate electricity.

Lake Murray Research Center