2015

Duke Energy Florida

Solar Energy in Florida –

FPSC Request for **Comments**

Enhancing the development of solar technologies in Florida

INTRODUCTION

Duke Energy is committed to providing safe, reliable, affordable and increasingly clean electricity to our 1.7 million customers that depend on us every day. We are a strong supporter of solar and committed to helping grow solar in our state in a sustainable and balanced way for all Floridians. We recognize the energy market is evolving and that customers want more renewable energy options. Duke Energy Florida's rates are below the national average and our 2014 system average interruption duration index is at its lowest since we began recording reliability performance goals. Now is the opportunity to build on this performance as we know some of our customers want the option to use solar at their home or business, but understandably don't want to compromise their electric reliability or affordability. That is why Duke Energy Florida supports transparent and comprehensive energy policies that are developed fairly to advance renewable energy with consideration for all Floridians. Because we believe that promoting the growth of solar power must be part of a comprehensive energy policy, Duke Energy Florida is providing input to Staff's questions in a unified manner rather than answering the individual questions separately. We want to ensure that a comprehensive solar advancement plan is balanced, considers the long-term impact and opportunity for all electric consumers who rely on the power grid, and advances solar technology in a responsible and sustainable way.

We believe policies and programs that are most effective at promoting more solar energy systems in Florida would have clear objectives based on identified principles and have specific criteria to measure success.

The policies established today to promote more solar energy systems, (such as solar photovoltaics, solar thermal systems, and concentrated solar) at their current efficiency levels and costs, should also be designed to adjust as these technologies, their costs, and their associated markets are rapidly evolving.

PRINCIPLES

Duke Energy believes the following principles should guide our objectives to advance effective solar policies:

- All stakeholders interested in advancing solar in a sustainable way for Florida must be committed to safety first. Public safety, health, and power grid reliability should never come second to advancing any energy resource
- Each state will be unique in its approach to promoting solar, and solar technology will co-exist and interact with central station generation as an integrated power grid, which is and will be required to manage these resources
- Solar advancement policies should be transparent to all stakeholders, especially consumers and recognize different consumers will want different solar and non-solar options
- A variety of interested groups can work toward comprehensive solar policies that should incorporate existing renewable subsidies, utility electric rates, solar costs, and the solar market

- Solar subsidies should include protections from excessive financial costs to Floridians and be defined in scope, amount, and duration
- Consumer education and awareness is needed about solar technology and the solar market, and there is still a significant need for solar related R&D that is collaborative

CURRENT SOLAR AND RENEWABLE LANDSCAPE

When establishing comprehensive policies that would be effective in promoting solar energy systems in Florida, it is important that customers and stakeholders understand what solar subsidies are available today, the amount of solar generation that currently exists in Florida, and what solar developments are being planned for the state. When Duke Energy Florida is meeting with our customers in our communities, we have found that many are either unaware or unfamiliar about the solar environment in Florida today.

- Florida ranks first in the nation for the amount of installed solar generation when compared to states without Renewable Portfolio Standards. Thirty seven states lag behind Florida in the amount of installed solar.

- Today, Duke Energy Florida could already meet a 3% Renewable Energy Portfolio standard which aligns with approximately 25% of the states across the nation that have mandated standards in place.

- Florida businesses or residents currently have access to the following regulatory or financial subsidies that are designed to promote solar energy systems:
  - STATE: Solar Sales Tax Exemptions, Property Tax Exclusions for Residential Renewable Energy Property, Solar Contractor Licensing, Energy Conservation in Public Buildings including Solar Technologies, Commercial Sector Renewable Energy Production Tax Credits, Net Metering, Interconnection Standards, Renewable Energy Easements & Rights Laws, Qualifying Renewable Facility Guarantees, Renewable Energy Credit, (REC) sales into out-of-state REC markets, and various local, city and county financing, rebate and loan programs.
  - FEDERAL: Business Solar Energy Investment Tax Credits, a Corporate Modified Accelerated Depreciation Cost-Recovery System, Residential Renewable Energy Tax Credits, Energy Goals and Standards for the Federal Government including a Green Power Purchasing Policy mandating federal agencies to obtain a percentage of their electric needs from renewables, PURPA Guarantees, and various federal loans and grants.

- Since 2011, Duke Energy Florida's SunSense Solar Photovoltaic Programs, (residential and commercial) have funded more than $11 million in upfront subsidies to assist home owners and businesses install their own solar PV generators. Our proposed 2015 plan would fund about $4,150,000 to our customers, in upfront subsidies to promote the installation of solar PV generators and this program will be closing this year.

- Duke Energy Florida has more than 2,200 customers using rooftop solar and our new Solar Service Center is supporting solar interconnection requests at the rate of 50 to 70 customers per month, this is over an 1,100% increase from 2008 levels. We've expanded the amount of local

solar energy generation in our service area from less than 1 MW of solar in 2008 to more than 21 MW of solar interconnected today.

- Please see Attachment A for more Florida solar programs and projects in place today.

Although the cost of solar PV technology has decreased by more than 60% in the past five years, solar technology is not currently the lowest cost way to generate electricity in Florida when compared to traditional generation. However, Duke Energy believes that the cost of solar will continue to decline and customers with a strong personal or business environmental goal will continue to adopt solar technologies at the current cost of solar and with the current subsidies that exist today. Over the long-term, we want to ensure that we effectively integrate solar on our system and provide fair offerings we know our customers want. That is why we are taking proactive measures to reasonably prepare for this technology progression on the power grid. Duke Energy Florida has announced **plans to add up to 500 MW of solar by 2024** in the Florida territory. Construction of the first site, up to 5 MW will begin in late 2015, with 35 MW to be completed by 2018. Duke Energy Florida will be gaining valuable experience in solar integration, operations, and understanding solar cost components. Currently, utility-scaled and ground-mounted solar PV facilities are at about half the cost of individual residential rooftop solar PV generators.

New policies and programs that would be most effective at promoting more solar energy systems will need additional subsidies to incent solar installations beyond current levels and solar adoption rates.

POLICY DEVELOPMENT TO PROMOTE MEASURABLE SOLAR OBJECTIVES IN FLORIDA

Duke Energy advocates for a transparent and comprehensive process to set reasonable, measurable, and achievable objectives for promoting more solar in Florida. These specific objectives will not only provide a standard against which the effectiveness of policies can be measured, but will also provide milestones at which these policies can be reviewed and as necessary adjusted to incent further growth or limit cost impacts to consumers as needed.

Effective programs (either cost-effective or otherwise) have typically tried to maximize the outcome, while minimizing the cost. If the Legislature or Commission seeks to grow large amounts of solar energy in Florida today, then choosing a program that develops solar energy systems one rooftop at a time would not be the most effective way. Currently, the most efficient and lowest cost way to advance a large amount of solar generation to benefit the most customers is through larger-scaled ground mounted solar PV facility deployment. *Solar technology when deployed in a principled manner may contribute to fuel diversity efforts that are generally consistent with other non-firm generation that maintain capacity factors of about 20%, (see Attachment B – the solar production area defined by yellow shading).* As solar PV generation costs continue to decline, however, we anticipate that large amounts of various sized rooftop installations will be included moving forward.

To reasonably prepare today for a future with solar, Duke Energy Florida advocates for implementing a broader legislative approach to respond to various consumer interests and further promote solar energy systems in our state.

Duke Energy believes distributed energy resources will continue to grow on our system. We support responsible policies that consider the cost to integrate and manage such distributed resources (e.g., grid technologies, energy storage, solar, etc.) as well as the grid services and associated costs we will continue to provide to all grid-connected customers. We believe all customers should have the opportunity to benefit from renewable or clean energy resources, but all customers should also pay for the grid services they receive.

A transparent and comprehensive state solar advancement policy can and should support multiple solar related programs for many stakeholders that promotes solar in a safe, reliable and affordable way.

SUBSIDIES FOR A COMPREHENSIVE APPROACH TO PROMOTE SOLAR

Duke Energy Florida believes that a one-off solar policy will not effectively address Florida's complex energy needs.

Duke Energy endorses a solar promotion method that aligns with the current regulatory compact and the state's practice for producing, distributing and sharing in the electric reliability of the state. Above all, under no circumstances should any distributed energy technology advancement come before the safety of all Floridians. Solar advancement policies may include subsidies, but Duke Energy believes

these subsidies need to be defined, transparent, and designed to evolve with the energy market, so that customers using the power grid simply pay for what they use.
Duke Energy believes a comprehensive legislative solar advancement policy that considers the demand for both smaller solar PV generation/thermal systems and larger scaled systems ***simultaneously*** will be the most effective at promoting solar in Florida. This type of transparent, comprehensive, and collaborative approach to solar promotion appropriately balances the value of solar and power grid resources.

Duke Energy Florida advocates for a comprehensive, reasonable and measurable goal with both consumer and grid protections.

One example of this policy would be to -
Safely and responsibly advance the amount of installed solar in Florida over the next five years through a subsidy mechanism. After taking into account existing subsidies, a Florida solar advancement fund would be established into which all Floridians contribute. The fund would be limited to protect all Floridians from excessive financial costs. Subsidies would be allocated from the fund to various solar programs where many stakeholders participate and measurably promote solar in Florida including both small solar and large-scale solar facilities. The goal would be reviewed annually to make needed adjustments prospectively, and to keep a focus on grid reliability. After five years, the goal and the use of the subsidy mechanism would be revisited in conjunction with the Florida solar landscape and market.

Other policies may target additional objectives, but having a comprehensive package of programs that focus on safety, electric reliability, and affordability with a means to measure success is critical to any policy. (Examples of other objectives may include, installing a specific amount (MW or Btu equivalent) of solar in Florida, or reducing Florida's carbon dioxide emissions).

Duke Energy Florida believes that a legislatively mandated Florida solar advancement fund that is borne by all Floridians is fair, just, and reasonable for all. Contributions to the fund would be fairly noticed in scope, amount and duration to all parties, and structured with protections from excessive financial costs on Floridians who do not choose to install solar.

Examples of the "*various solar programs"* that may receive subsidies from a state solar advancement fund (the subsidies may cover program costs above traditional avoided costs as applicable) could include: a transparent solar energy purchasing program, a grid service or stand-by charge off-set program, qualified income solar programs, solar PV/thermal supply and infrastructure acquisition programs, solar education programs, and grid reliability programs. Furthermore, a community solar program or a green tariff offer can further promote solar energy systems. The National Renewable Energy Laboratory (NREL) found that less than 30% of residential rooftops are actually oriented for optimal solar installations. Shared solar programs can optimally orient solar facilities and mitigate large up-front costs for participants. Finally, enhanced shared savings programs around solar related energy

efficiency and conservation programs can be included, where customers and the utility share equally in those benefits.

Another method to enable transparent and comprehensive solar promotion would be to modernize the existing net metering and billing incentive program under FPSC Rule 25-6.065. The existing net metering billing methodology continues to promote the "customer side of the meter" solar PV generators.

Duke Energy Florida is projecting to interconnect over 700 customer-owned solar PV generators this year and we are encouraged by the amount of customers now using solar PV generation as they are helping drive down the cost of this technology for all Floridians. Some of our net metering customers were very aware of our upfront solar rebates since the entire rebate fund of about $4M for 2015 was completely assigned to applicants after only 10 minutes. However, Duke Energy Florida has also encountered customer skepticism when it comes to solar subsidies imbedded in a billing method. Many customers do not recognize that net metering under the Commission's Rule that provides full retail electric price credit for their solar energy used on site and credited and accumulated to use in subsequent months is employed. This doubt or skepticism creates uncertainty and may make customers hesitant to make clean energy decisions and commit to investing in a solar PV generator. In addition, this subsidy program is not clearly defined in amount or duration.

Duke Energy Florida's customers have diverse expectations and we recognize different customers will want different solar options and some will not want to participate in solar at all. Because Duke Energy Florida's customers that have solar PV generators generally use the power grid continuously and in a different way, (see System Reliability section), it is only fair, just, and reasonable to expect them to pay for the balancing power, back-up power, and grid services they use. As solar PV technology costs continue to decrease and the amount of customers using solar PV generation increases, Florida's existing net metering program will need to be addressed. The existing net metering policy can be legislatively modernized now, by including a transparent solar energy purchasing program, similar to a buy-all/sell-all arrangement. This type of program, coupled with appropriate subsidies, would offer a customer transparent solar PV energy price certainty, encourage consumer confidence, and facilitate greater financing options.

Another legislative policy that can be structured comprehensively includes a Florida modified Renewable Portfolio Standard or "RPS." State Renewable Portfolio Standards have been established in about 29 states and were adopted when renewable technology pricing was high and mandates were used to create renewable or clean energy projects or markets. Within these broad policies, not all states with an RPS have solar carve-outs and even fewer have small solar facility carve-outs.

RPS policies are transparent in that they provide the utility, non-utility, and customer clarity around their clean energy decisions that are necessary to make investments in new energy infrastructure. Renewable Portfolio Standards also need to be fair, reasonable, well timed, and affordable. As mentioned, the cost of solar PV technology has decreased significantly already, so a modified Florida solar-only RPS may

need a comprehensive design to meet defined solar objectives. A comprehensive design would account for various solar technologies and system sizes, the subsidies that are currently available, the current solar market, and the expected changes in solar costs and solar industry growth. Furthermore, incorporating a REC market typical of many state RPS programs to comply with a Florida solar RPS would add cost and burden to all stakeholders.

An alternative legislative approach to an RPS may simply include the phasing-in of solar requirements for various sizes and types of solar energy systems as the price of solar PV technology continues to decrease. This would allow for the efficient deployment of capital and infrastructure to meet the new solar energy requirements, while protecting consumers from excessive price spikes and REC administration costs. Electricity providers should be allowed timely recovery of costs, plus an allowable return on new supply and infrastructure acquisitions that are used to meet solar compliance obligations. Incorporating cost caps, solar adoption limits, and conducting periodic reviews to assess impacts to customers, economic development and grid infrastructure may ensure there would be very few unintended consequences.

SYSTEM RELIABILITY

There are grid reliability challenges with any large increase of intermittent and variable generation sources that deliver non-dispatchable, non-firm energy to the grid.
Operational principles will need to evolve to effectively integrate this important resource.
This includes understanding its capabilities in greater detail relative to its interconnection level within the balancing authority, system control, and distribution system operations. Duke Energy Florida continues to study, learn, and gain experience with solar integration, installations, and facility operations.

A few examples include:

- Generally, our customers utilizing solar PV generators at their homes and businesses use the power grid continuously and in a different way. Duke Energy Florida provides firm quality power and grid services around the clock to a customer that uses a solar PV generator. Most of our solar PV customers have installed non-firm solar PV systems with no storage and standard inverters, which are non-regulating customer side generators with solar production that is variable and intermittent. These systems do not remove the utility's complete obligation at the premise. Furthermore, Duke Energy Florida's continuous grid services provides the customer with: reactive supply, voltage control, regulation, frequency response, and instantaneous energy balancing and back-up power at a response rate that must continuously and instantaneously match the customer's solar PV generator output (see Attachment C). This instantaneous matching ensures the customer has appropriate power quality at their premise
  - "Smart" inverter functionality can perform limited grid services like specific automated and independent grid-balancing functions

- Solar PV generation on the customer side of the meter tends to "cluster" along the distribution system perhaps based upon customer demographics. Deliberate locational planning for solar would minimize disruptions to the distribution system. Additionally, Solar PV generation on the customer side of the meter may not ensure geographically distributed solar generation. Distributed solar generation has deliberate locational diversity to dilute its varied and inconsistent production based on isolated weather events or system disturbances when compared to a balancing authority's load centers and allows this technology to be optimally integrated on the grid
  - Guided solar PV installations can ensure geographical diversity

- A non-firm solar PV generator in Duke's Florida service territory has limited demand reductions
  - There is zero expected output of a Florida solar PV facility at 7:00 a.m. during winter months, (Duke Energy Florida's time of expected annual peak usage by their customers)

- The expected output of a Florida solar PV facility at 6:00 p.m. in August is at about 22% of the generator's size rating
- There is a need to explore ways to extend and enhance energy deliveries from solar PV systems through Florida's summer peak demand periods perhaps through energy storage, sun tracking systems, or west-facing orientation installations

- Large increases of non-dispatchable/non-curtailable solar PV generation in peninsular Florida will require controlled adoption principles tied to the balancing authority's expected annual minimum load daylight hour

- Duke Energy's experience has shown that solar energy system inspections after grid interconnection and parallel operation have begun may be needed to ensure public safety and continued compliance to standards

OTHER PROGRAMS

Exploring other programs to promote more solar will bring additional awareness of the technology and further expand the technologies capabilities. Experimental programs can focus on solar, but should also integrate other forms of distributed energy resources. Experimental pilots or investigational programs can be costly and could include: panel location and orientation, tracking systems, smart inverters, battery integration, thermal storage, interfacing solar panel controls with web based platforms, electric vehicle integration, entire community solar pilots, time-of-use rates with solar pilots, dispatchable multi-system solar, solar for critical systems/emergency response, and portable solar PV power stations.

CONCLUSION

Transparent and comprehensive policies that have sound principles with measurable outcomes will best address Florida's complex clean energy solutions. Comprehensive policies that incorporate the interests of various stakeholders and current renewable subsidies will be the most effective and sustainable over a longer period of time.

Duke Energy is committed to a cleaner energy future for Florida. Solar policies must be adaptable to the changes in the energy industry and market. Duke Energy Florida is dedicated to finding fair and innovative ways to balance consumer expectations among different customer segments with varied renewable options and prudent subsidy management.

More on the current landscape related to solar – Attachment A

- Duke Energy Florida's Photovoltaics for Schools Program has funded more than $8 million in solar PV system installations at over 50 (K-12) schools across our service territory to help foster renewable energy education and environmental stewardship. Almost half of these schools serve as emergency shelters, so their solar PV systems have been integrated with battery storage for critical on-site back up power.

- Duke Energy Florida's solar water heating with energy management program includes upfront rebates designed to reduce the large upfront cost of renewable energy systems and then offer a recurring monthly bill credit. This pilot program goal is to add about 300 solar energy systems to homes each year.

- Since 2011, Duke Energy Florida has installed about 90 solar thermal water heating systems in low-income family homes.

- Duke Energy Florida is partnering with major universities, including the University of South Florida, University of Florida, St. Petersburg College and University of Central Florida, to install 100-kilowatt solar photovoltaic systems to be used for educational research and development.

- Duke Energy Florida has partnered with the University of South Florida in St. Petersburg to fund a $1 million solar PV installation that is integrated to an advanced energy storage system on the school's campus.

- Since 2005, Duke Energy Florida has reduced its sulfur dioxide emissions by 79%, nitrogen oxides by 76% and carbon dioxide emissions by 20%.

- In the past two years, Duke Energy Florida worked with more than 50 companies as they considered expanding or locating to Duke Energy's Florida service territory. These efforts resulted in about 20 business expansions that will help produce about $180 million in capital investments and add more than 2,300 jobs in the 35 counties we serve.

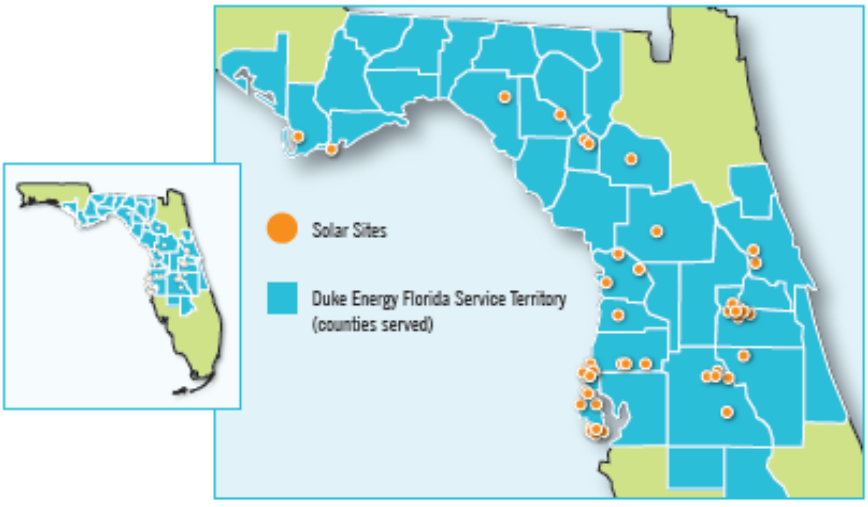
Helping to power schools with solar

Duke Energy Florida has helped fund solar installations at schools and universities across its service area.

Since 2003, Duke Energy Florida has funded more than $8 million in solar photovoltaic (PV) installations at approximately 50 K-12 schools and universities. When the sun is shining, the solar panels generate electricity for the schools although they still depend on Duke Energy Florida for most of their electricity needs. The installations help foster renewable energy education. Hands-on learning provides a strong focus on renewable energy and energy efficiency that can be expanded into the community.

Solar site locations:

Admiral Farragut Academy (St Petersburg)
Alta Vista Elementary School (Haines City)
Anclote High School (Holiday)
Apalachicola Bay Charter (Apalachicola)
Branford Elementary School (Branford)
Campbell Park Elementary School (St Petersburg)
Celebration School (Celebration)
Chasco Elementary School (Port Richey)
Citrus High School (Inverness)
Citrus Springs Middle School (Citrus Springs)
Davenport School of the Arts (Davenport)
Debary Elementary School (Debary)
F K Marchman High School (New Port Richey)
Forest High School (Ocala)
Fort White High School (Fort White)
Gulfport Elementary School (Gulfport)
Gulf Trace Elementary School (Holiday)
Harmony High School (St Cloud)
High Springs Community School (High Springs)
Homosassa Elementary School (Homosassa)
Horizons Elementary School (Davenport)
Joseph L Carwise Middle School (Palm Harbor)
JW Mitchell High School (New Port Richey)
Lake Sybelia Elementary School (Maitland)
Lakewood High School (St Petersburg)
Lealman Intermediate School (St Petersburg)
Lyman High School (Longwood)
Nature Coast Technical High School (Brooksville)
Olympia High School (Orlando)
Palmetto Elementary School (Poinciana)
Palm Harbor Middle School (Palm Harbor)
Paul R Smith Middle School (Holiday)
Pineview Elementary School (Land O' Lakes)
Polk Avenue Elementary School (Lake Wales)
Port St Joe High School (Port St Joe)
RB Stewart Middle School (Zephyrhills)
River Springs Middle School (Orange City)
Safety Harbor Middle School (Safety Harbor)
Sanderlin Middle School (St Petersburg)
Seven Springs Middle School (New Port Richey)
St Petersburg College (Clearwater/Largo)
St Petersburg High School (St Petersburg)
Tuskawilla Montessori Academy (Oviedo)
The University of Florida (Gainesville)
University of Central Florida (Orlando)
University of South Florida St Petersburg (St Petersburg)
Waterford Elementary School (Orlando)
Winter Springs High School (Winter Springs)
Withlacoochee Technical Institute (Inverness)



Solar and Non-Solar Customers Rely on the Electric Grid – Attachment B

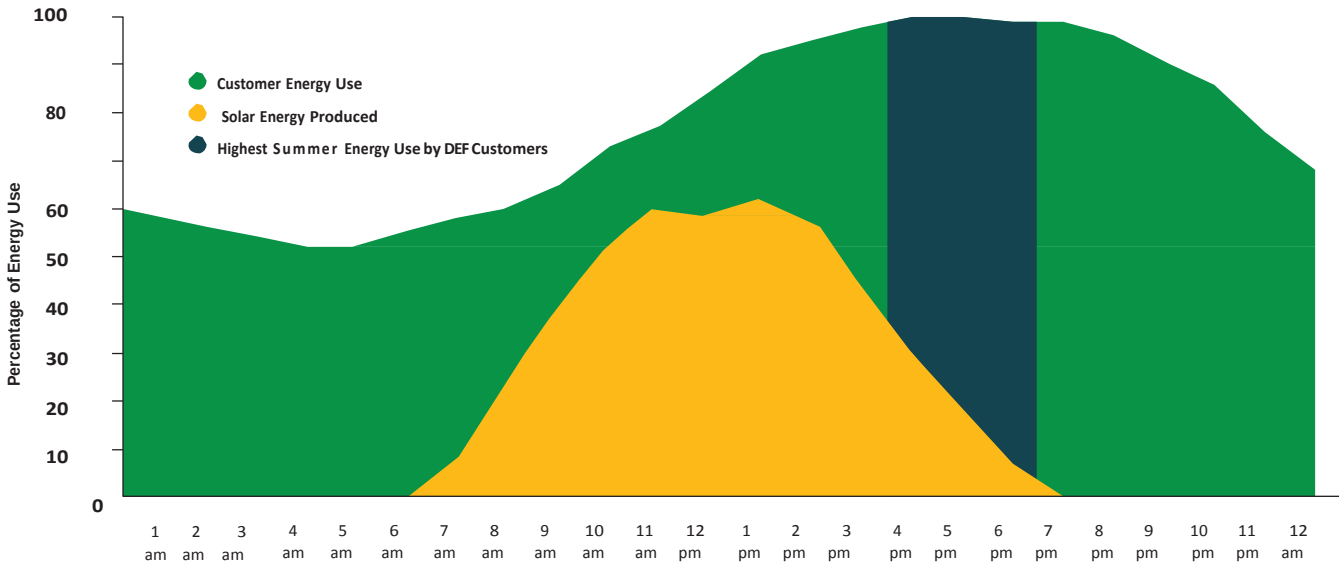
Maintaining a high level of reliable electricity is important to our customers. Duke Energy maintains the electric power grid so our customers receive instantaneous, quality electricity to power their homes and businesses 24 hours a day, seven days a week.

Our infrastructure, which includes facilities that make and transmit electricity as well as distribute the power, is built to serve our customers during the hottest days of the summer as well as on cold winter days. When a customer installs solar PV panels, the panels, combined with our electric power grid, continuously work together to provide the customer with safe, reliable, and dependable electric service all day, every day.

Residential Summer Electricity Use Compared with Solar Panel Production

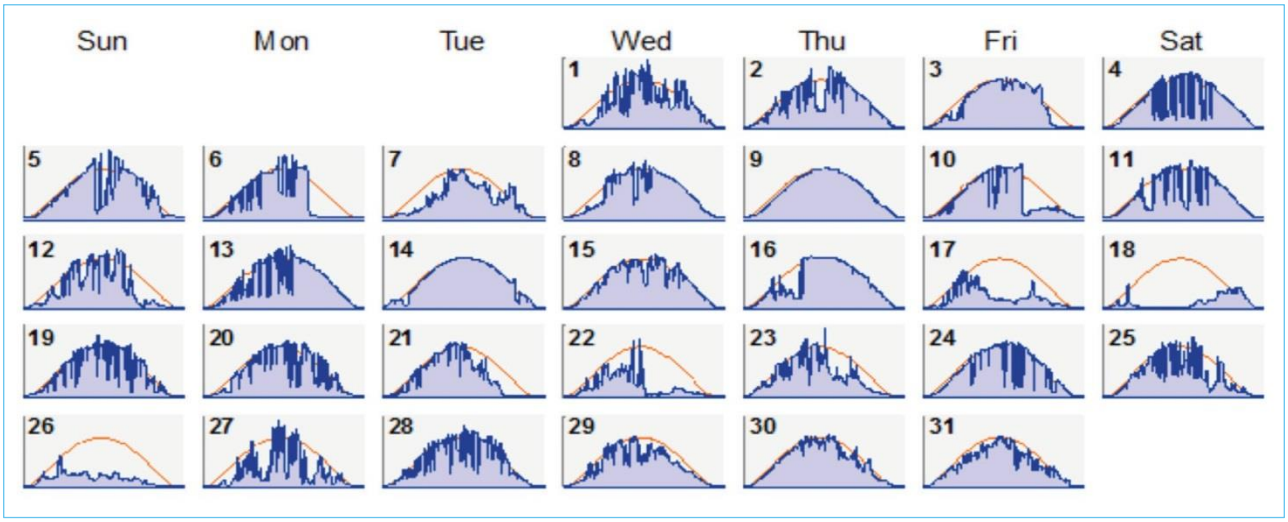
During the summer months, our customers use the most electricity between 3:30 and 6:30 p.m. as shown in the chart below.

Solar panels typically produce the most electricity between 11 a.m. and 1 p.m.



The amount of electricity from a solar panel is dependent on the amount of direct sunshine it receives from the sun, the panel's source of "fuel." When the sun is not shining, solar panels typically do not produce electricity. When solar panels are operating, rain, humidity, and even cloud movement can interrupt direct sunshine and the interruption then affects the amount of solar electricity being produced by the panels.

As seen in the chart below, Aug. 9 and Aug. 14 were mostly sunny days with little cloud cover and no rain, which contributed to very good days for solar electricity production. On Aug. 4, Aug. 19 and Aug. 28, solar production was affected by cloud movement that interrupted the direct sunlight needed to power the panels. On Aug. 6 and Aug. 10, the sudden drop in solar production was caused by afternoon rain showers that affected the amount of available solar energy.



Data collected from a typical August month in St. Petersburg, Fla.