Distributed Solar Generation for Duke University Employees: Using Rooftop Solar to Promote Climate Neutrality

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Introduction

As part of Bass Connections in Energy, our collaborative research team of five students researched the current residential solar landscape in the USA and North Carolina and subsequently conducted a solar marketing campaign. Working closely with the Duke Carbon Offsets Initiative, Sanford School of Public Policy, Nicholas Institute for Environmental Policy Solutions and Duke Law, we set out to determine the potential for residential solar to benefit employees, Duke's environmental leadership and climate neutrality commitment.

We researched the technical, policy and economic aspects of residential solar, attending conferences, collaborating with Duke administrators, interviewing community stakeholders and partnering with local solar installers. We discovered historically low prices and a narrowing window of opportunity to take advantage of North Carolina's renewable energy investment tax credit, which prompted us to act on our research. We then created and conducted a solar marketing campaign, Solarize Duke, targeting Duke employees. By providing access to quality information, qualified local installers, a limited-time discounted pricing structure, and attractive financing options, our research team have streamlined employees' ability to take full advantage of residential solar while providing social and economic benefits to the Duke community.

Learning Objectives, Program Objectives

Our research team set out to gain a thorough understanding of residential solar landscape's many aspects, by investigating the following areas:

1. Solar technology,
2. Solar markets & economics,
3. Renewable energy policy, and
4. Customer barriers to entry

Through the Solarize Duke program we aimed to accomplish three major objectives:

1. Engage the Duke community in a coordinated and consistent manner to provide online and in-person educational tools that will inform employees about residential solar installation options
2. Provide Duke employees access to affordable residential solar through trusted local installers
3. Advance the University's climate neutrality goals and leadership

Methods

Methods of research:

1. **Conducted independent research** on technical, economic, and policy aspects of solar
2. **Interviewed community stakeholders** – previous residential solar customers, Duke employees, NC GreenPower, national solar company Geostellar, UNC Environmental Finance Center, community organizer Rob Pinder of the non-profit NextClimate
3. **Partnered with local solar installers** – Southern Energy Management, and Yes! Solar Solutions
4. **Attended conferences** – Clean Energy 4 Raleigh event, NC Clean Tech Summit 2015
5. **Collaborated with Duke administrators** – Duke University's Office of the Executive Vice President, Office of Counsel, Office of Communications

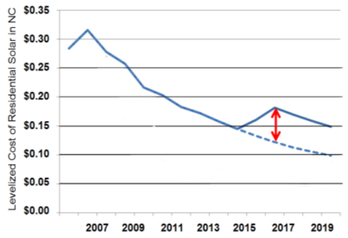
Methods of the program / Program components:

1. Education about the benefits of investing in residential solar
2. Access to the expertise of vetted local solar installers
3. Access to discount pricing for home solar system
4. Access to financing programs

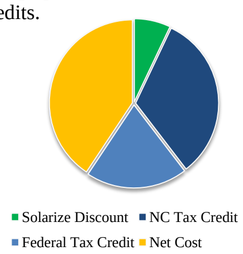
Research Development (1st Semester)

Solar Economics, Policy, and Technology Research
Four key points were gathered from our research:

1. Hard and soft costs had decreased substantially over the past few years and were continuing to fall.
2. Tax credits made solar much more affordable, but were at risk of expiring soon.
3. Group purchasing discounts were on the rise and contributed to lowering the cost of solar.



The graph above shows the cost of solar over the years both with and without the tax credits.



Jane Q/ Sample Customer Case Study
To further explore the economics of solar, a sample case study was created using a typical North Carolina resident. The tax credits could cover up to half of the cost of the overall system. Our research determined that the best time to get residential solar was now, before the expiration of the tax credits would make it far more expensive.

Program Development (2nd Semester)

National v. Local Solar Program Partner

Based on the criteria seen to the right, the team ultimately decided that working with local installers directly would provide the maximum benefit to the university and its employees. A Solarize program, which is a community solar program that operates based off of a group purchasing discount, would best help employees access residential solar.

Criteria	National Installer	Local Installer
Ability to Execute	Program structure established already, but unclear how it would translate into a smaller program	Direct relationship would provide a better fit, but program would have to be built from ground up
Program Management	Installer would be in charge of everything	Greater control over program direction and implementation
Deadline to Receive Tax Credits	Participants should be registered by October 31	Participants should be registered by June 30
Pricing Discount	$3.10/kW to $3.30/kW	$3.75/kW, potentially even lower
Marketing and Outreach	DCOI in charge of marketing and outreach	Rob Pinder would aid in developing materials
Reliability	Little experience in NC solar space; added a middleman where one was not necessary, dates and prices seemed incorrect	Had a lot of experience in group purchasing in NC; would be doing installations in either case

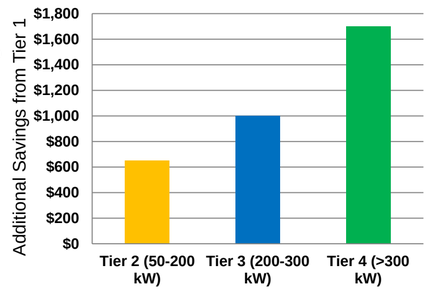
Solarize Program: Key Components

1. Information + online resources
2. Installer reliability
3. Free assessment
4. Discounted pricing

The Solarize Duke program operates on a group purchasing discount. As more and more people get residential solar, the price for the group as a whole lowers. The pricing strucutre for Solarize Duke can be found on the right

The Solarize Duke program provides education and access to qualified installers and a discount to Duke University employees. Through online resources and installers' expertise, employees have the opportunity to easily determine if residential solar is a good fit for them.

Tiered Discount Structure



Results

Though the program began only April 1, a few initial numbers are available:

1. 50+ people attended the first two kickoff events
2. 100+ employees have registered for the free home assessments, and a higher number than usual have passed the initial screening
3. The group discount will be 9 – 19%, and because the program will be pooling applicants with the local Solarize RTP program, the discount has the potential to be on the higher end of the spectrum

The program will continue to receive applications until June 30, and there is a possibility of additional kickoff events to further encourage participation in the program. Final results will be available at the end of the year, when all systems should be generating electricity.

Lessons Learned

1. *Do Your Research Thoroughly* – when choosing community partners, make sure to fully evaluate all options across a variety of criteria, ask tough questions, and demand honest answers.
2. *Establish a Clear Workflow* – make sure all members of the team, from undergrads to graduate students to faculty, are bought into the mission and have a clear understanding of goals and expectations.
3. *Adapt* – the end result of your two semesters on the Bass Connections project shouldn't be what you expected – it should be better.
4. *Synergy as a Team is Crucial to Success* – all each team member to use their unique skills to contribute effectively to the team.
5. *Be Decisive* – while it is important to be informed and not rush to judgment, this is not an excuse to waste time or procrastinate.

Other Important Lessons:

- It is unlikely that the program will have a substantial impact on the university's carbon neutrality efforts, due to Duke Energy policy concerning renewable energy certificates (RECs)
- The success of the initial launch of our program brought interest not only from potential participants, but also potential partners for the program. We could have negotiated a more generous discount if we had better expectations of demand for the program
- Never lose sight of the ultimate objective of your work (i.e. provide discounted residential solar to as many Duke faculty and staff as possible)

Future Work

In the near future, we will continue rollout of the program, which will chiefly be managed by Rob Pinder, YES! Solar Solutions, and Southern Energy Management.

In the long term, we have several potential next steps:

1. PERQ Program: discounted solar could be added as an employee benefit within the PERQ program
2. Data Analysis: university faculty and students could study data from solar generation, which could lead to important insights for future installations and solar programs
3. Solarize Pt. 2: program could be carried out again depending on community interest and availability of staff and students to manage the program

Additionally, there are major policy and legal questions that affect the future of the program

1. Will the state and federal tax credits be extended?
2. Will third-party sales be implemented in North Carolina?