

Clean Cut Quarterly

NJARNG Sustainability Newsletter

In collaboration with Rowan University



March 2017 Volume 3 - Issue 1

An innovative concept for rooftop solar is almost here. Find out more on Page 10.



In this issue....

A Rowan Update



Learn about Rowan University's building modeling progress on **page 6**.

New Year, New Competition



The FY17 NJARNG Energy Reduction Competition is now underway! Find out more on **pages 2 and 3**.

Which type of fireplace is best?



We break down the advantages and disadvantages of three kinds on **page 9**.

Clean Cut Competition

Overview

As part of the Clean Cut Campaign, the NJARNG Energy Team has created the Clean Cut Competition for all NJARNG facilities. This competition is a yearlong energy and water reduction program with the purpose of incentivizing participation in energy and water reduction initiatives. Ultimately, the goal is to encourage employee participation and to cut utility usage and costs.

How it works...

- ❖ Throughout the 2017 fiscal year, energy and water consumption for each NJARNG facility will be tracked and recorded.
- ❖ The progress will be displayed in each issue of the *Clean Cut Quarterly*.
- ❖ Each facility will have a goal of reducing energy use by 2.5% and water use by 2.0% by the end of the year.
- ❖ Facilities that meet their goals will receive a certificate of achievement to display in the facility and will be recognized in the *Clean Cut Quarterly*.
- ❖ The facility that reduces energy and water consumption by the greatest percentage will win the title of "biggest loser" and will be given the Clean Cut Competition Trophy to display at their facility for 1 year.

Important Dates

- Competition *starts*
10/1/2016
- Competition *ends*
9/30/2017
- Checkpoints will be every 3 months
- Progress will be posted in the *Clean Cut Quarterly* newsletter



What to do...

There are many actions that building occupants can take to reduce energy and water use as well as the costs associated with these utilities. For example, turning off lights when leaving a room. Lighting accounts for 25%-30% of a building's energy use and minimizing unnecessary lighting is an easy way to reduce energy consumption. Each issue of the *Clean Cut Quarterly* will contain tips and strategies that occupants can follow to reduce their building's consumption.

In addition, the NJARNG Green Building Management Handbook is available at:

<http://www.nj.gov/military/installations/docs/CLEAN-CUT-Green-Management-Handbook.pdf>

What is EUI?

EUI, or *Energy Use Index*, is a key metric for an energy manager to benchmark facilities with. Typically, EUI is used to express a building's energy use as a function of its size.

In terms of size, the Newark Armory is one of the largest NJARNG buildings at over 100,000 square feet of gross floor area. But, in terms of energy use, it ranks in the middle of the pack, resulting in the lowest EUI in fiscal year 2015.

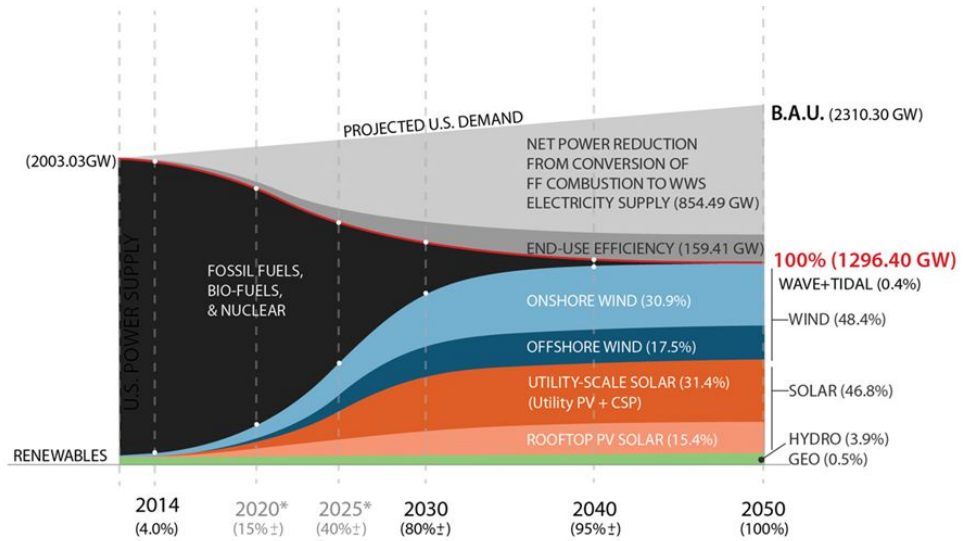
In this issue, we have the First Quarter results (October, November, and December). The NJARNG goal for annual energy reduction is 2.5%, and every facility is needed to help reach (and hopefully exceed) that goal. Look right to see where your facility stacks up!



Facility Name	FY16Q1 EUI	FY17Q1 EUI	% Reduction
Lawrenceville Armory	10.4	4.7	55
Vineland Armory	11.4	7.2	37
Bordentown WTC	8.2	5.5	34
Mt. Holly Armory	5.6	4.1	28
Dover Armory	3.1	2.4	23
Atlantic City Armory	3.0	2.3	23
Woodstown Armory	35.3	27.8	21
Fort Dix - T3BL	8.9	7.1	20
Tuckerton Armory	0.8	0.7	15
Freehold Armory	10.7	9.5	12
Trenton Mercer AASF	12.3	10.9	12
Hackettstown Armory	14.1	12.8	9
Flemington Armory	16.6	16.4	1
Hammonton Armory	2.1	2.2	-4
Jersey City Armory	4.4	4.6	-4
Lakehurst CLTF	6.6	7.1	-7
Picatinny - FMS #7	1.9	2.1	-8
West Orange Armory + CSMS	3.3	3.7	-10
Lawrenceville, USPF&O	5.3	5.9	-13
Morristown Armory	2.3	2.7	-18
Riverdale Armory	3.3	3.9	-19
Westfield Armory + OMS	4.1	5.0	-22
Sea Girt Training Center	9.6	11.8	-24
Fort Dix - Headquarters	8.6	10.9	-27
Teaneck Armory	3.7	4.7	-28
Woodbury Armory	2.2	2.8	-30
Toms River Armory	2.7	3.6	-34
Woodbridge Armory	1.9	2.6	-39
Somerset Armory + DTMB	5.5	7.7	-40
Lawrenceville DMAVA	16.8	23.8	-41
Cape May Armory	16.2	25.6	-59
Newark Armory	0.7	1.4	-84
Cherry Hill Armory	4.7	13.3	-180
Washington Armory	5.5	23.7	-329

The Solutions Project

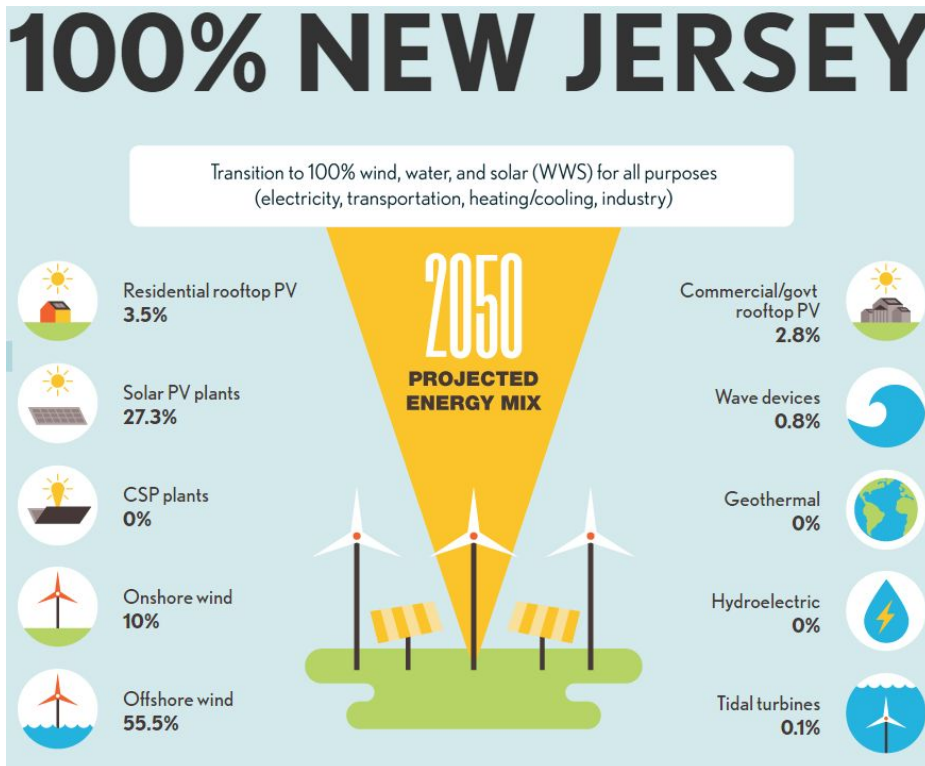
The mission of the Solutions Project is to unite science, business, culture and community to speed up the transition towards 100% clean energy for all. The project also provides grants to community organizations making 100% happen. Organizations in the United States can apply for grants from the Leadership Fund and the Fighter Fund.



Projected Energy Supply & Demand, **United States**

Solutions Project, 2015

The ultimate goal of the Solutions Project, also called the 100% Campaign, is to provide everyone across the country to new, safe, and affordable energy produced by renewable sources such as the wind, water, and sun. Often, utility bills can spiral out of control for consumers, leading to no power at all. The old ways of energy production helped build our cities and industries, but it is polluting our air and water and is holding us back from advancing.

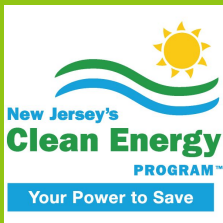


The NJARNG must always be mission-ready, and having power resiliency will assist in their mission. Having a diverse energy mix will help to increase power resilience. The NJARNG and the Army have initiatives to increase renewables and become Net Zero. Currently the NJARNG utilizes an energy mix of grid electricity, natural gas, fuel oil, propane, and solar photovoltaics and solar thermal.

To see what the awesome future of 100% clean energy looks like across the the US and the world, visit 100.org/possible

Rebates

Throughout Volume 3, we will be discussing various rebates pertaining to both homeowners and businesses. Rebates not only reduce, return, or refund what has been paid, but can also reward you for being energy efficient. Let's take a look at two possible rebates.



Performance with Energy Star

New Jersey Clean Energy Program is offering a rebate called Home Performance with Energy Star. Home Performance with Energy Star both can help you reduce your energy cost by 30% and cut down your carbon footprint production. The first step is to contact a contractor to assess your heating and cooling system, conduct a combustion safety test on appliances, check insulation levels and look for air sealing opportunities. After the assessment, you will receive a report explaining the recommended updates. June 30, 2017 marks the deadline to receive up to to \$4,000 in financial incentives. Some homeowners can take advantage of 0%-4.99% financing to help pay for the energy upgrades. This rebate is only applicable for certain cities and home requirements. To see if you eligible to apply, visit the link below.

To find out more on how to save energy and money go to:

<http://www.njcleanenergy.com/multifamily>



COOLAdvantage Program

The New Jersey Clean Energy Program is offering a rebate called COOLAdvantage Program. The COOLAdvantage Program provides a rebate for energy efficiency systems related to central air conditioners and heat pumps. All new systems that meet the qualifications for minimum energy efficiency and size in the residing areas are available to apply. The rebates include:

Central A/C (Tier 1): \$300

Central A/C (Tier 2): \$500

Ductless mini split A/C: \$500

Heat pumps: \$500

Air source heat pump (Tier 1): \$300

Air source heat pump (Tier 2): \$500

Geothermal heat pumps: \$500

To Find out more on how to improve energy efficiency and save money go to:
<https://energy.gov/savings/cooladvantage-program>

Or

<http://njcleanenergy.com/Cool>

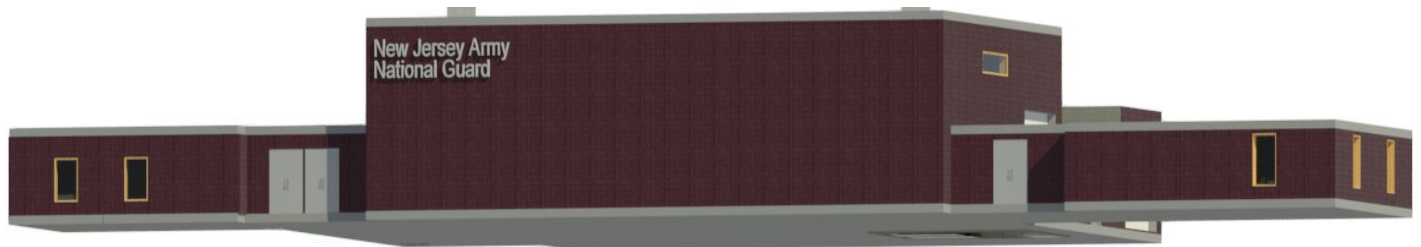
BIM Update

By: Jeff Dib

In the March 2016 issue of the CCQ (Volume 2 Issue 1), the pilot study for Building Information Modeling (BIM) at the Woodstown Armory was discussed. This pilot study, conducted by students at Rowan University, consisted of taking 3D laser scans at the Woodstown Armory and using those scans to create a virtual building model. This model would then be used to improve collaboration, asset management, and decision making in the Construction Facilities Maintenance Office (CFMO). Construction costs and time, in addition to annual operation and maintenance costs can be reduced.

For the Woodstown Armory, all scans, both indoor and outdoor, were completed by June. This gave summer interns in the program roughly two months to work on the model before the start of school in the fall. Within a couple weeks of the fall semester, the model for Woodstown was completed and presented to National Guard. The model, as viewed from the outside, can be seen in the image below, with the photo of the armory on the bottom and the virtual model on the top.

While the finishing touches were put on the Woodstown model, Rowan University was tasked with completing this process for a second armory, this time in Newark. This armory would hold new challenges, such as incorporating multiple floors as well as creating the model without the help of outdoor scans. Scans were completed over the summer by the interns and the modeling of the building was left for the fall clinic team, which consisted of larger group of students completely new to the technology and project, but eager to accomplish the goals set forth.



This clinic team consists of a variety of engineering disciplines, with Civil & Environmental Engineering (CEE) being the most prevalent, while Mechanical (ME) and Electrical & Computer Engineering (ECE) are each represented by a student on the clinic team. This eclectic group is able to work hand-in-hand with each other, focusing on the aspects of the building they have a better understanding and more experience with, while learning from their partners about areas they had not known before. The team can be seen below.

Top Row L-R:

**Thao Tran (ME),
Sean Raday (CEE),
Jacqueline Aimino (CEE),
Tri Nguyen (CEE)**

Bottom Row L-R:

**Steven Spirn (CEE),
Nicolas Natale (ECE),
Jeffrey Dib (CEE),
Stephen Luppino (CEE),
Anthony Feeney (CEE)**



The Newark Armory model is still in progress, and the team hopes to have it completed by the end of the spring semester. It will be more advanced than the Woodstown model in a number of areas, such as the sophistication of an HVAC system, electrical, and plumbing system. The continued growth in experience and skillsets for the team members allow for the model to be increasingly accurate and ultimately more beneficial for the National Guard to use.

At the start of this spring semester, the clinic team was given two more armories to model: Lawrenceville and Hammonton. These armories, located closer to Rowan than Newark, would be able to be scanned multiple times, both indoor and outdoor, and would be worked on simultaneously with the Newark model. This allowed the BIM team of nine students to split up into teams of three in order to work most efficiently.

There will be extra emphasis on the Hammonton Armory, as that is also undergoing an energy audit by Rowan students. It will be an objective for both the BIM team and energy audit team to work together to incorporate the virtual model into the energy audit. This partnership has the potential to provide a more accurate and worthwhile analysis of the Hammonton Armory for the NJARNG to use and base decisions on.

New Products On The Way: From Accessory to Main Event

By: Jacqueline Aimino

It starts with an idea and some brilliant minds, to make new cutting edge technology change from a dream, to a reality. Oak Ridge National Laboratory and General Electric are currently collaborating to create a new refrigerator that uses magnets as its sole source of cooling. The system, known as the Magnetic Refrigeration System (MRS), works through the magnetocaloric Effect and can be seen in the image on the bottom right. The MRS can change the temperature of a material by exposing that material to a magnetic field. The magnetocaloric material goes through a cycle of magnetization and demagnetization, during which, a water coolant is pumped through the system to transfer the heat from the inside of the refrigerator to the outside air.



For over 100 years, refrigerators have used a process called vapor compression as the primary method of cooling. Vapor Compression uses coolants which are not only harmful to the environment, but also account for a large portion of the global electric consumption, up to 17%. The magnetocaloric refrigerator is a revolutionary technology that takes advantage of a water-based cooling fluid, making it safer for the environment and more efficient, which ultimately means lower energy bills and less carbon pollution for the consumers. Due to the lack of a gas compression system, the MRS consumes only half the energy of a standard fridge, produces less noise and vibration, and, even, requires less maintenance.



For more information please visit:

<http://newatlas.com/cooltech-commercial-magnetic-cooling/43874/> or
<https://www.insidescience.org/news/fridge-magnets-magnetic-fridges>

Green Product Showdown:

Fan the Flames: The Battle for Best Fireplace

By: Jacqueline Aimino

This issue's Green Product Showdown compares a commonality in many households: fireplaces. When deciding which fireplace to invest your time and money into, you need to consider some of the main aspects. Below shows a comparison between wood fireplaces, pellet stoves, and gas fireplaces and discusses the advantages and disadvantages of all three products.

		Wood Fireplace	Pellet Stove	Gas Fireplace
Installation Cost		\$3000 - \$5000	\$3500 - \$4000	\$2000 - \$5000
Fuel Cost		6.5 tons of Wood/\$1235 per Season	7.5 tons of Wood/\$1425 per season	\$0.93/therm/\$930 per season
Energy Required		0 kWh/\$0 per month	100 kWh/\$9 per Month	17.5 kWh/\$360 per month
Environmentally Friendly	Smoke Produced	2 to 7.5 grams per hour	<1 gram per hour	0 grams per hour
Max Performance		70%	83%	75%

Maintenance and safety are other important factors to consider when deciding which product to use. For example, wood fireplaces should be cleaned annually by a professional while gas fireplaces should be cleaned regularly to remove dust, soot, and carbon buildup. Pellet stoves require the most maintenance because they need to be cleaned once a week by the homeowner, with at least one professional that comes to clean annually. As for safety, wood fireplaces need a heatproof safety gate to protect pets and children from embers. Gas fireplace glass panels become very hot so flammable objects should not be placed near the fire. However, pellet stoves are the most safe because they remain relatively cool while burning. All three of the products discussed have their advantages and disadvantages which accommodate each homeowner's needs. Ultimately you get to decide which is best for your lifestyle.

For more information go to:

<https://www.highschimney.com/articles/wood-stoves-vs-pellet-stoves/>
<http://www.northshorefireplace.com/about-us/fireplace-options/>

SolarCity's Solar Roofs

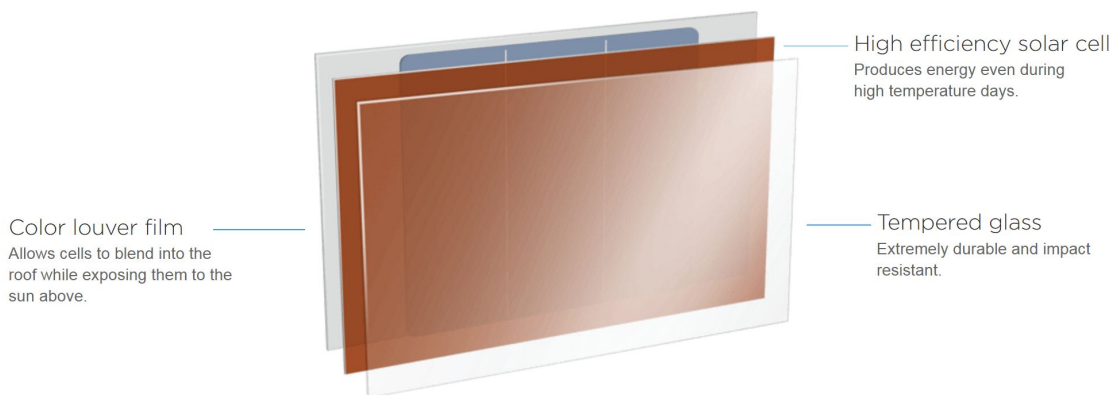
By: Jeff Dib

Late in 2016, SolarCity made an announcement that could revolutionize the way we design our houses and generate electricity. The co-founder and chairman of SolarCity, Elon Musk, who is also the CEO and CTO of SpaceX as well as the CEO and co-founder of Tesla Inc, announced that SolarCity would soon introduce the concept for a new product: a solar roof.

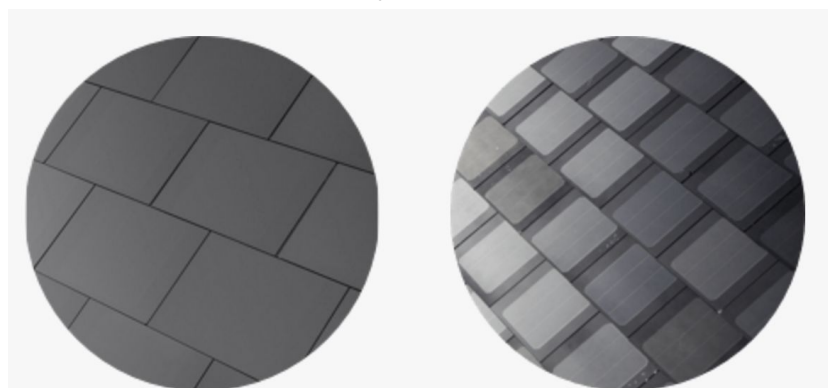
This solar roof, seen below in various configurations, is essentially roof shingles with a solar panel built into them. This solar roof is just another example of Musk's perpetual goal to change the world and humanity with these three companies. Examples of this include innovative Tesla car models, his goal of setting up colonies on Mars with SpaceX, his continued emphasis on sustainable energy production and consumption in order to reduce global warming, and now, the introduction of solar roofs.



Anatomy of the Solar Roof



These roofing tiles are made of a number of layers, including a durable glass layer that has been tested to outperform typical roof materials, a layer of films to help the tile appear like a typical roof, and a solar cell to produce electricity. The composition of the solar roof can be seen above. This configuration allows the solar roof to maximize its efficiency while maintaining the appearance of a normal roof, as the cells are nearly invisible from the street (as seen in the image to the right).



From the street
The cells are not visible to the eye.

From above
Cells are exposed to the sun.

Musk has stated that SolarCity's Solar Roof with "have an installed cost that is less than a normal roof plus the cost of electricity". This claim has been analyzed by a number of people, and Barry Cinnamon at Greentech Media estimates between \$33,000 and \$37,500 for a retrofit system to be put into place, which includes an annual cost of electricity for 10 years. He suggests that the solar roof will have a slightly longer payback period than a typical solar panel installation. This may scare away some homeowners, but for people who want both the high-caliber aesthetics combined with the high efficiency of the solar system, SolarCity's solar roof could be an attractive approach. The largest market for these solar tiles may be for homeowners who previously did not want to instal solar panels on an aging roof and can now both upgrade and update their roofing system.



The solar roof is being designed in four styles to fit homeowners liking: Tuscan, Slate, Textured, and Smooth (all of which can be seen above).

SolarCity is not the first to introduce the idea for a solar roof. Competitors also with solar roof shingles include CertainTeed, Suntegra, and Atlantis. While these companies have more experience and are more vetted, SolarCity has an extremely aesthetically pleasing design, as well as a higher efficiency and lower installation costs. Time will tell if the Musk's dream to change the world and humanity will come to fruition through his solar roof, which he hopes will be powerful, beautiful, and affordable,

SolarCity's solar roof is expected to begin production in mid-2017 in conjunction with Panasonic. No timetable is available yet for when this solar roof will be widely available to the public, but estimates have mid-2018 as the earliest time.

For more information and to receive updates on the product, please visit the following:

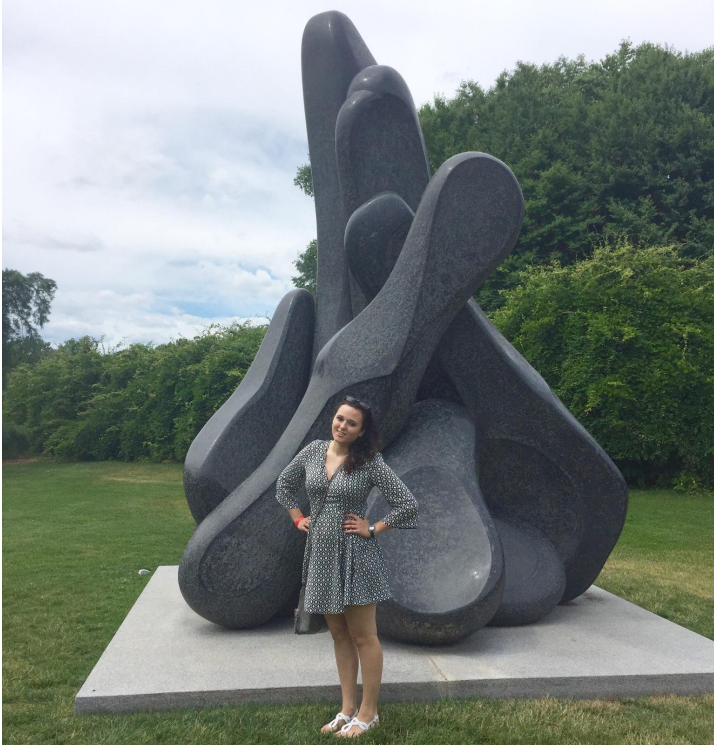
<https://www.tesla.com/solar>

<http://www.solarcity.com/residential/solar-roof>

<https://www.greentechmedia.com/articles/read/the-economics-of-teslas-solar-roof>



Meet The Interns!



Jacqueline Aimino

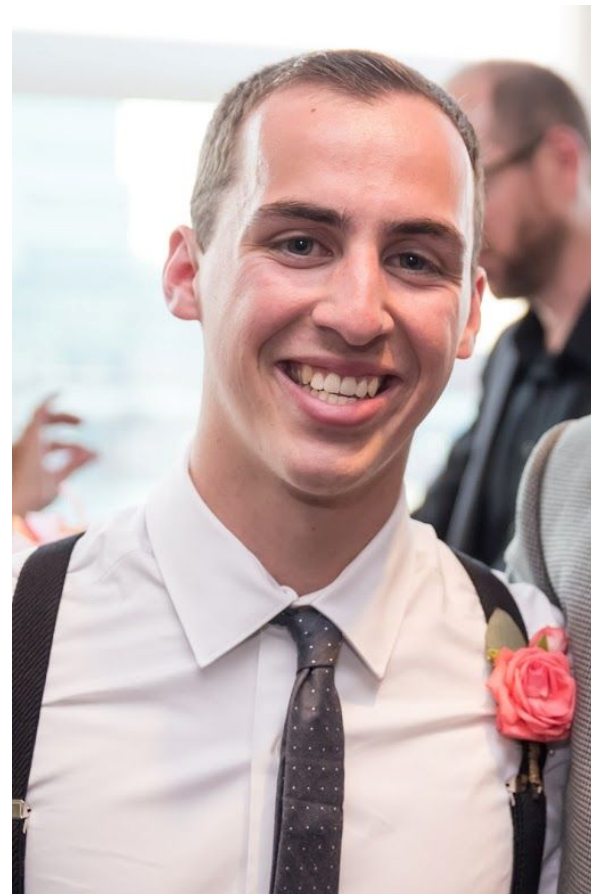
Civil & Environmental Engineer, Junior

“Hello! My name is Jackie and I love to draw, hike, and play sports. Some goals of mine would be to learn sign language, hike the Appalachian Mountains, and run a marathon. My dream would be to live in Ireland for a few years and travel back to Germany.”

Jeff Dib

Civil & Environmental Engineer, Senior

“Hey! My name is Jeff and I enjoy playing sports with my friends and when I’m not playing, I’m watching my favorite teams, the Yankees, Knicks, and NYCFC. I also enjoy going on vacation to Disney World and on Disney Cruises with my family. I’m an Ordained Minister and will officiate my brother’s wedding this May in Disney World.”



NJARNG Energy Team

Want to know more?

❖ Contact the Energy Team!



Christopher Moore

Chris received his Bachelor's Degree in Civil Engineering from Rowan University and his Master's Degree in Sustainable Design from the Boston Architectural College. He has over 5 years of energy management and sustainability consulting experience with non-profit, private, and government organizations. Chris enjoys biking, drawing, and gardening.

Samantha Valentine

Sam received her Bachelor's Degree ('12) and Master's Degree ('14) in Civil Engineering from Rowan University. Her academic interests include sustainable design, low impact development, and climate science. Sam enjoys cooking, boating, and adventuring in the great outdoors.



For more information, please contact:

Christopher Moore

DMAVA Energy Manager

Please contact Chris if you would like to learn more about the *Clean Cut Campaign* at:

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Samantha Valentine

NJARNG Energy Intern Manager

If you would like to learn more about how Rowan University is helping NJARNG's sustainability efforts or to make suggestions for future issues of *Clean Cut Quarterly*, please contact Sam at:

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