

# Clean Cut Quarterly

## NJARNG Sustainability Newsletter

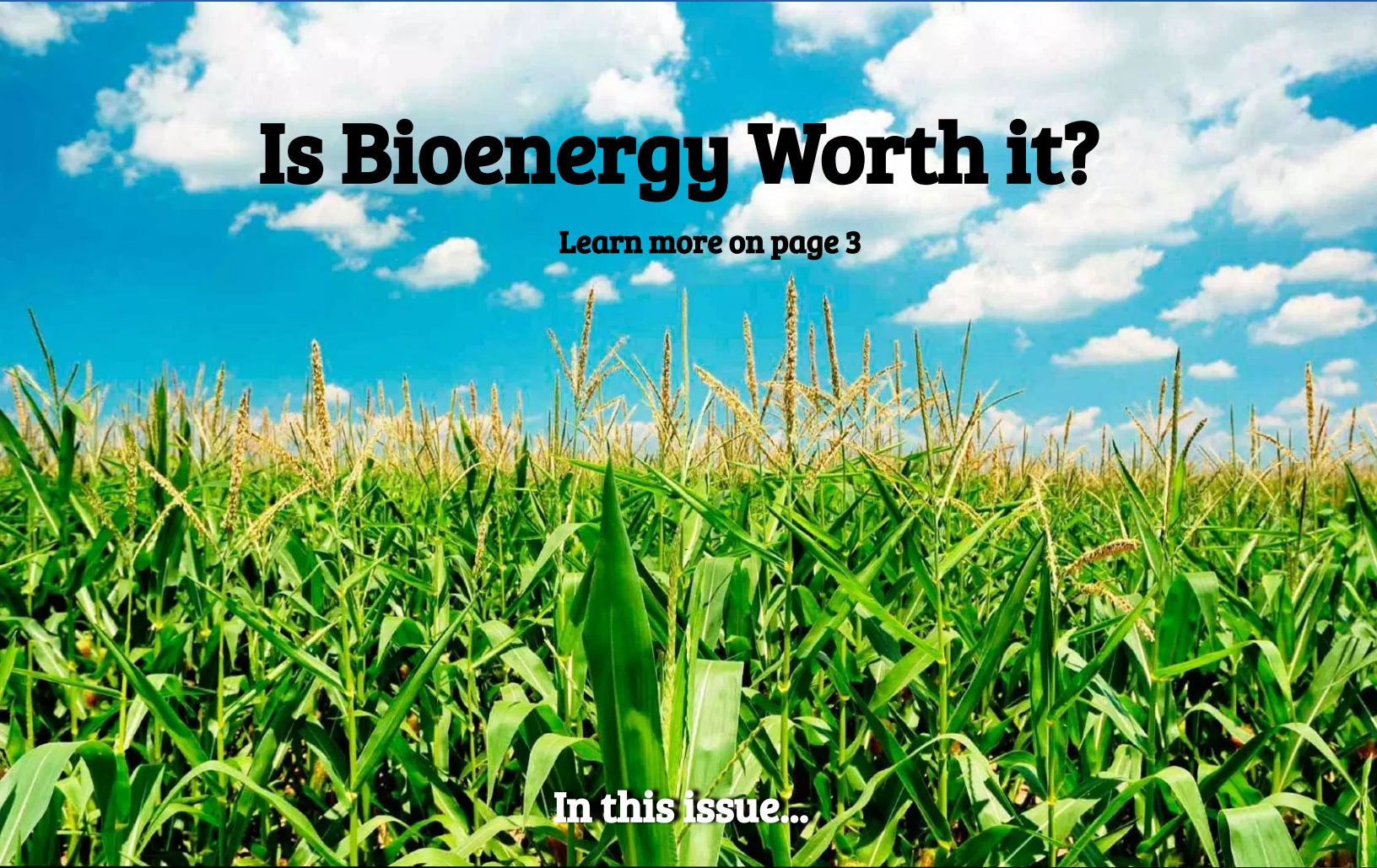
*In collaboration with Rowan University*



September 2019 Volume 4 - Issue 4

## Is Bioenergy Worth it?

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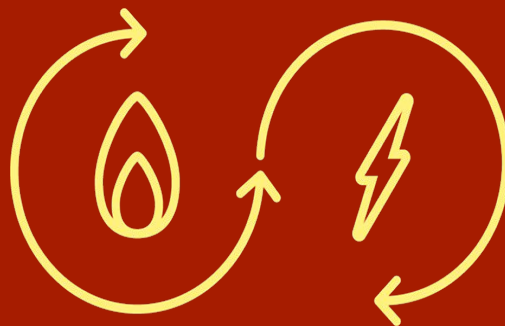
In this issue...

### The Relationship Between the Military and the Environment



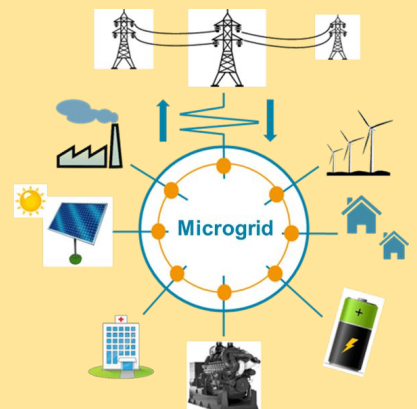
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# Summer Rowan Sustainable Facilities Center Activities

The Sustainable Facilities Center at Rowan University has been working hard to assist the Planning and Programming Branch at NJDMAVA. Our 12 interns are putting their best effort into implementing the BUILDER SMS program.

BUILDER™ Sustainment Management System (Builder SMS) is an asset management database developed by ERDC's Construction Engineering Research Laboratory (CERL), aimed to help manage the US Army's 165,000 buildings totaling more than 1.1 billion square feet and is intended to enable superior mission readiness and improved allocation of resources. In order to obtain this, NJDMAVA is required to input detailed systems information (walls, roofs, floors, doors, plumbing, hvac, etc.) into the database for 20% of its armories each year, for the next five years. In order to meet this requirement, Rowan University (in cooperation with NJDMAVA) visited three facilities over the summer:



Summer 2019 Rowan Facilities Interns

- ★ Sea Girt
- ★ Freehold
- ★ Lakehurst CLTF

These visits are typically between one and three days in length, depending on the size and complexity of the site, and generally involve access to the entirety of the facility, including roofs access and other buildings. Sea Girt was a large multi-week effort and a great experience for the interns.

The Builder Interns are working on making an inventory list and a preliminary assessment of each facility and inputting the proper data into the Builder SMS software in order for the Construction and Facilities Management Office to be able to keep track of maintenance needs at each NJARNG facility. This software will help the NJARNG to know when something needs to be updated/replaced and roughly how much it will cost. The software will also help the National Guard prioritize what needs to be fixed at each facility.

# Summer Rowan Sustainable Facilities Center Activities

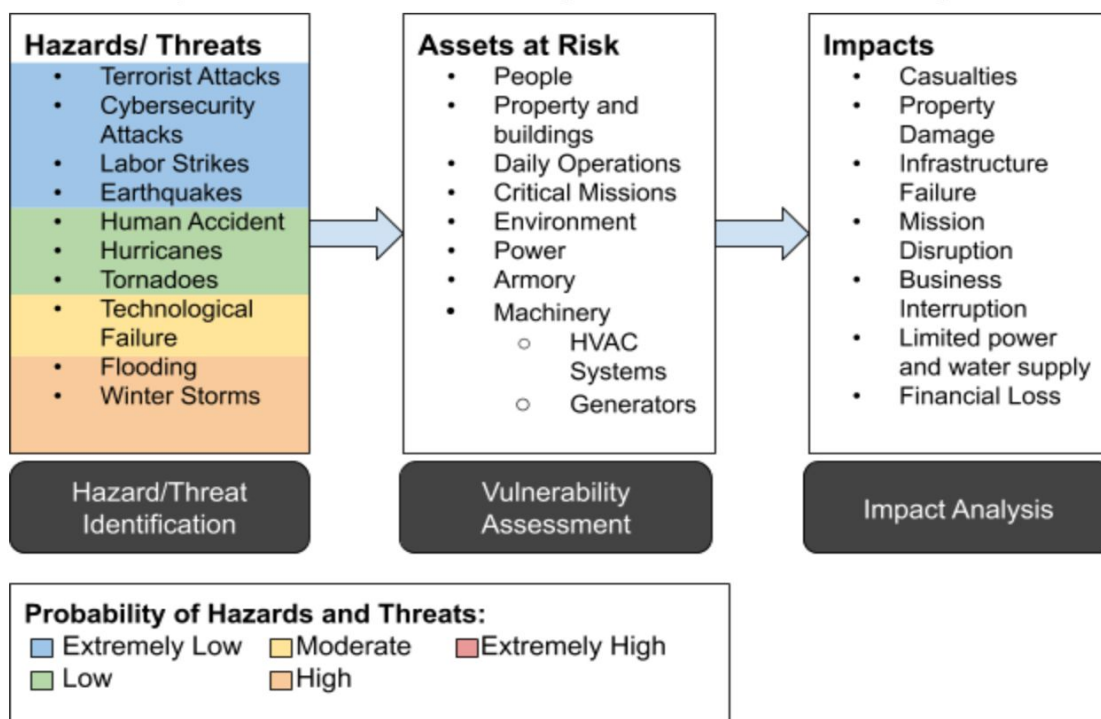


## BIM (Building Information Modeling)

The BIM Interns are working on taking scans of each facility using a 3D laser scanner and using the scans to create virtual models of the facility. BIMs can help make building information (such as BUILDER inventories) much easier to keep organized. Once everything is put into the BIM software, we will be able to run simulations for things such as energy, space utilization, physical security and more.

## Energy

The Energy Interns this summer have been working hard to finalize a NJARNG wide lighting assessment and assessing the potential for converting the remaining sites from fuel oil to natural gas. They have also been working on develop an Energy and Water Plan for the National Guard facilities located in New Jersey. This is being done by visiting sites and doing assessments on their security and current plans that are in place for situations such as loss of power. This also involves assessing sites for risks and opportunities for increased efficiency and conservation.



# Weighing the Benefits of Biofuels

**By: Abigail Goger**

In 2014 the U.S. Army undertook its largest renewable energy project to date when Fort Drum, in upstate New York, began running entirely on biomass energy. The ReEnergy Black River facility converts biomass, consisting of branches and shrubs, into energy that will totally power Fort Drum for at least the next 20 years.

This undertaking is largely due to a widespread initiative by the military to improve its energy security through the use of renewable sources. The project is also hoping to prove the viability of biomass as a form of renewable commercial energy. ReEnergy Holdings has invested in the development of low cost, short rotation shrubs and an efficient harvesting system to meet the needs of Fort Drum in an economically smart manner. Even with the success of Fort Drum the question still remains. Should the military keep moving forward with Bioenergy?



<https://www.energy.gov/eere/bioenergy/articles/biomass-powering-military-base-upstate-new-york>

Bioenergy is the use of living or recently deceased matter to produce electric energy, thermal energy, or transportation fuels, also known as biofuels. Some common forms of biomass include starch crops, agricultural waste, food waste, and biofuel feedstocks. In most cases, the biomass is burned to release the energy stored inside making it similar to using fossil fuels.



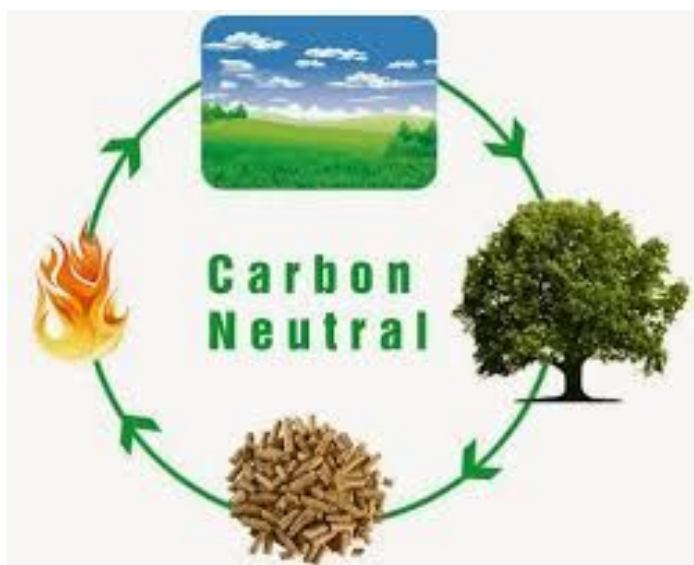
Even though it is renewable and not a fossil fuel, it still comes with drawbacks. Most bioenergy operations work by growing a woody crop as the source of biomass, just like Fort Drum is doing. This comes at a cost.

The first of which is that growing these crops uses land taking away from the amount of space available to grow food. The simple answer is to clear more land for the feedstock and leave the farmland be. The problem is that clearing land not only takes its own amount of energy and resources but, it's also a form of deforestation which is detrimental to local ecosystems and the environment as a whole.



There are also other things to consider such as the water, fertilizer, pesticides and energy needed to plant and harvest the crops. Finally, burning biomass is not necessarily a clean burn; it releases carbon and other emissions that in some cases can be just as bad as fossil fuels.

With that said, bioenergy does have positive characteristics. The carbon released from burning biomass is quickly recaptured by plants and is known as neutral carbon. This is different than the carbon released from fossil fuels. Unlike fossil fuels, bioenergy is renewable. Therefore, there is no concern about running out of it.



There is also the potential for bioenergy to help with waste management as animal, food, urban and agricultural wastes can all be used as biomass. Another big advantage of bioenergy is its versatile nature. Regions with different climates and constraints can find a bioenergy system that best fits their needs, unlike the rigid nature of solar or wind energy.

The versatility of bioenergy is one of the biggest draws for the military considering it has locations all around the world with different needs and challenges. The ease in which bioenergy can transport is also important to the military. Biofuels can be transported just as easily as oil and can be implemented into most existing petroleum-based infrastructure with only minor changes needed. Electrical energy produced by wind or solar plants can be transported by electric grids, but are not accessible to isolated sites.



TRANSPORTATION



POWER



HEAT

Bioenergy is not without risks and is far from a perfect answer to the military's desire to cut ties with fossil fuels. However, as Form Drum has proven with careful thought and responsible implementation, it can be an effective tool to help the military reach their energy goals.

Sources: <https://www.energy.gov/eere/bioenergy/articles/biomass-powering-military-base-upstate-new-york>  
<https://www.upi.com/Biomass-powering-US-military-base/1271494326228/>  
<https://www.eesi.org/topics/bioenergy-biofuels-biomass/description>  
<http://biofuel.org.uk/disadvantages-of-biofuels.html>

# The Relationship Between the Military & the Environment

**By: Grace Watson**

The military and the environment have a very important relationship. The military is a significant contributor to green energy, and is a major contributor of initiatives to minimize fossil fuel use. With the military being a proponent, it paves the way for minimizing pollution, helps boost the economy in the renewable energy sector, and brings awareness of green energy alternatives.

Climate change is often described to people as fossil fuel combustion raising temperatures and changing the Earth's climate due to excess carbon dioxide. However, this becomes not only an environmental issue, but a national security issue as well. In this case, the Department of Defense is at the forefront of this work. Resources will be more competitive than they are now, which could lead to conflict both locally and internationally. The military may be given the responsibility of quelling political violence that arises due to more natural disasters. Humanitarian missions will greatly increase in terms of sending aid to other countries. Many military facilities will face damages from environmental disasters that will lessen the military's readiness. The Department of Defense funds and sponsors programs to benefit these national security compromises, as well as the United States Global Research Program.

This program focuses on effects on humanity as well as the environment. It is evident that the military is not only helping to secure the country, but also looking outward to benefit the world as a whole.

The United States Army Corps of Engineers (USACE) also works to resist climate change. They face issues with erosion, overtopping of levees, excess sedimentation, changing snowmelt, storm resiliency issues, and more. In order to combat this, they are developing practical, cost-effective policies to protect the nation's hydrological infrastructure.



The Nature Conservancy is another organization that works closely with the military on environmental issues. They created the national Readiness and Environmental Protection Initiative (REPI) program. REPI helps to link the readiness of the military with appropriate spaces for their facilities. As the REPI website states, “If military installations are to remain active and contributing economic participants in their communities, the installations must have the space necessary to successfully accomplish their test and training missions.” In other words, in order to have a fully functioning military, as well as a safe and protected environment, the two must work together.



The Nature Conservancy and the Marine Corps have protected over 65,000 acres of land, and REPI saved the red-cockaded woodpecker species from extinction at Fort Bragg in North Carolina. Buffer zones around military bases are crucial to protect against climate change, which once again remains an issue. Camp Lejeune base already floods during high tides and faces potential damages from hurricanes. In this case, the military continues to work with REPI to minimize domestic threats to security and readiness.

The USACE also works with the Environmental Protection Agency (EPA) to clean hazardous waste, conserve cultural and natural resources, manage land usage, and restore natural ecosystems.

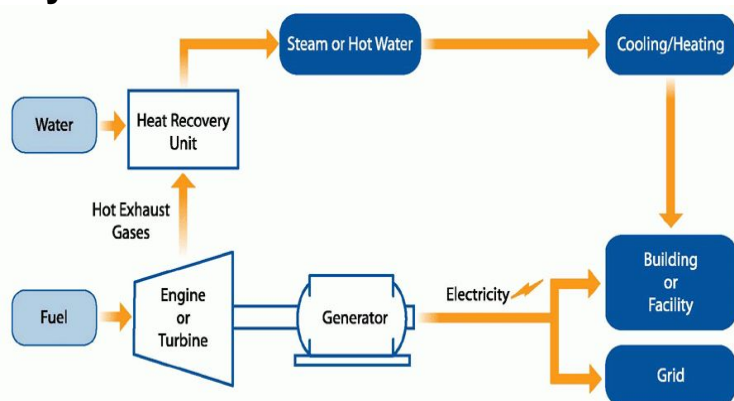
The military is involved with the renewable energy sector as well. Between 2011 and 2015, they tripled renewable energy projects and are on track to obtain over 25% of all energy from renewable sources by 2025. Being proactive in renewable energy uses benefits society as well. As mentioned before, military readiness is crucial to our safety and supporting renewable energy allows the military to be more independent in their energy production. It protects against public grid infiltration and saves millions of dollars. Clearly, the military and the environment work hand in hand. The military works to not only ensure readiness and safety of its own projects, which are often compromised by the environmental changes, but to help develop new policies and technologies for society. The REPI is crucial to protect habitats, but also to allow proper spaces and functionality for militaristic facilities. Finally, the military helps promote renewable energy, which increases public use, and allows for a better environment and more effective military.

**Sources:** <https://www.globalchange.gov/agency/department-defense>, <https://www.globalchange.gov/about/mission-vision-strategic-plan>, <https://www.energydigital.com/renewable-energy/us-military-winning-renewable-war>, <https://www.repi.mil/About-REPI/Frequently-Asked-Questions/>, <https://www.usace.army.mil/corpsclimate/>, <https://www.usace.army.mil/Missions/Environmental/>, <https://www.nature.org/en-us/about-us/where-we-work/united-states/north-carolina/stories-in-north-carolina/military-partnership/>, <https://www.cfr.org/report/climate-change-and-national-security>, <https://taskandpurpose.com/5-ways-climate-change-will-impact-the-u-s-military/>, <https://www.reuters.com/article/us-usa-military-green-energy-insight/u-s-military-marches-forward-on-green-energy-despite-trump-idUSKBN1683BL>, <http://knowledge.wharton.upenn.edu/article/military-environmental-protection/>, <https://www.energydigital.com/renewable-energy/us-military-winning-renewable-war>, <https://www.greentechmedia.com/articles/read/the-military-is-leading-the-march-toward-energy-independence#gs.IFeSLA>



# Combining Heat and Power

By: Remo DiSalvatore

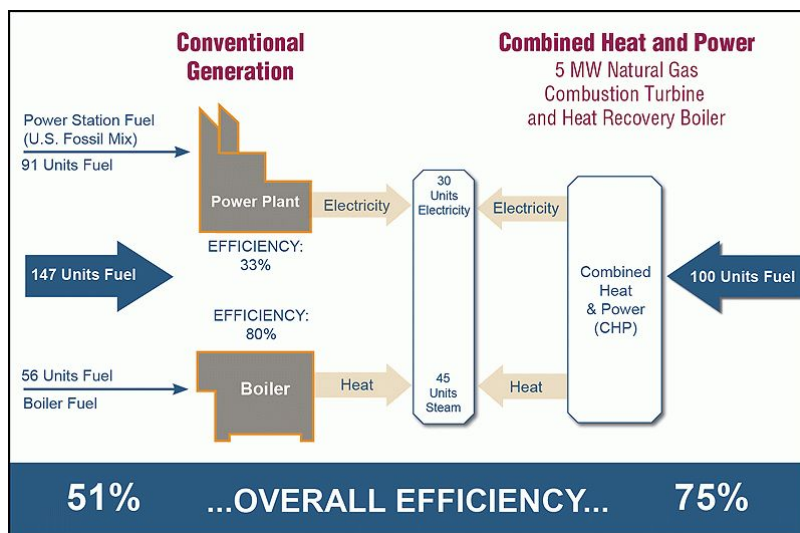


## How it Works

Combined heat and power (CHP) is an energy efficient alternative for producing electricity and heat simultaneously. Electricity and heat are produced from a generator, boiler, power plant, etc. In the diagram above, an engine provides power to a generator. Heat is a by-product from the engine or turbine powering the generator. More often than not, this heat is effectively thrown away by traditional generators. This occurs from the heat dissipating into the atmosphere from the system. CHP provides an alternative to letting all of that heat go to waste and instead, utilizes it; the hot by-products (in this case exhaust) are sent through a filter/heat exchanger (as seen above) to heat water or create steam. This results in a much more energy efficient system for those that require both electricity and heated water or steam.

## Applications

CHP has a variety of applications in multiple different industries and fields. These fields include: Commercial, Residential, Municipal, Institutional and Manufacturer buildings. CHP can effectively be applied to any place that requires electricity and heating. It is a more energy efficient way of providing necessities in today's world. As seen in the diagram below, CHP is approximately 24% more efficient than producing heat and electricity separately. This is a significant increase in efficiency and could save billions of dollars in resources if implemented nationwide. The National Guard is actually implementing this technology in Bangor, Maine. CHP saved them \$63,000 a year and prevented 100 metric tons of CO<sub>2</sub> from entering the atmosphere annually. CHP is a simple solution to our energy needs will hopefully gain more traction and become more affordable and mainstream in the coming years.



Sources:

<https://www.epa.gov/chp/what-chp>

<https://www.epa.gov/chp/chp-benefits>

<https://www.epa.gov/chp/energy-star-chp-award-winners>

<https://www.epa.gov/chp/chp-benefits>

<http://www.all-energy.co.uk/en/Exhibitors/5084266/Centrica/Products/1437706/Combined-Heat-and-Power>

# About Microgrids

**By Chris Rovelli**

Electricity is an essential commodity for everyday life. It provides comfort and convenience for billions of people around the world. It cannot be understated how important electricity is for everyday life. Without electricity, common utilities such as running water, refrigerators, and the internet could not exist. Which is also why it is so detrimental when a system gets disconnected from the grid. That is where microgrids come into the equation. This article will provide background information on microgrids, discuss the feasibility of implementing microgrids in New Jersey, and describe how the military can better utilize microgrids.

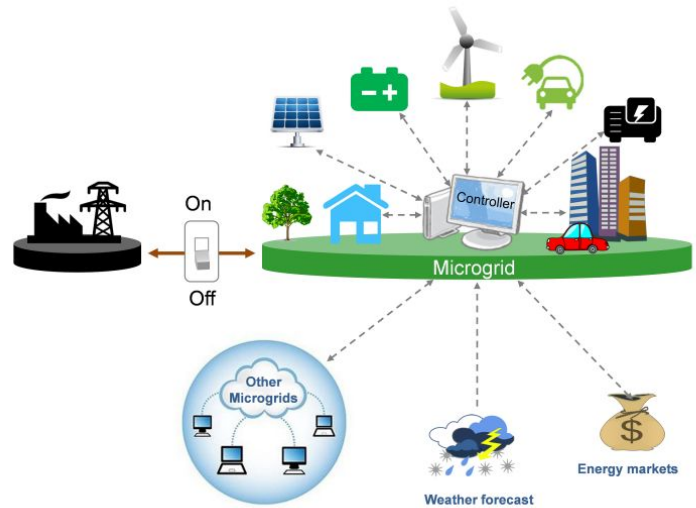


Photo: Berkeley Lab

Microgrids are a group of electricity sources that can connect to the larger electric grid or disconnect from the grid and act as an electrical island. This means microgrids can disconnect from the grid during times of emergency and provide power to those connected to it. They do this by disconnecting from the main grid, then connecting to its own power source, most commonly solar panels or gasoline generators.

There are three main types of microgrids: customer microgrids, community microgrids, and remote power systems. Customer microgrids are the most common type of microgrid, and typically involve powering a single building. These types of microgrids are used by businesses or facilities which need power during a state of emergency, such as hospitals. Community microgrids are microgrids which can provide power to a number of facilities. This can include shopping centers or neighborhoods. Remote power systems are systems that can be activated and deactivated remotely, without the need to be connected to the grid. Remote power systems are technically not considered microgrids, as they are not able to operate grid-connected. However, the technology used in these systems so closely resembles that of microgrids that they are commonly referred to as such.





Photo: National Renewable Energy Lab

In 2014, a study was conducted by New Jersey Institute of Technology to examine the feasibility of implementing microgrids throughout the state of New Jersey. The study examined areas of New Jersey which are frequently impacted by heavy storms. From this study, it was concluded that 24 town centers in 17 municipalities would greatly benefit from the introduction of a large scale

microgrid, as it would allow the town centers to power public facilities. Public facilities require large amounts of energy during times of emergency. Currently, various microgrid designs are being presented to several of the town centers identified in NJIT's study, with additional studies being conducted to examine the feasibility of implementing microgrids in other municipalities. Throughout the state, microgrids are mostly still in the planning phase, but early adopters have already begun work, so it will not be long before the rest of the state follows suit.

Microgrids could also prove to be an indispensable asset to the military. Military facilities must be operational at all times, but it is especially important that these facilities remain operational during times of emergency. Should the grid lose power, the base's microgrid could provide power to its buildings far more efficiently than individual generators. If alternate forms of energy such as solar power or biofuels are incorporated, it can help cut overall energy costs, as microgrids do not need to be turned on strictly during a time of emergency.

When examining the United States as a whole, microgrids are a fairly niche concept. However, when looking at towns which are constantly affected by power outages and facilities which need power at all times, microgrids are an indispensable asset. Work is currently being done to implement microgrids to areas that need them most, and it will not be long before they start appearing across the nation.

Sources:

<https://www.energy.gov/articles/how-microgrids-work>

<https://building-microgrid.lbl.gov/about-microgrids>

[http://www.njcleanenergy.com/files/file/Technical%20Memo\\_Oct\\_31%20\(2\).pdf](http://www.njcleanenergy.com/files/file/Technical%20Memo_Oct_31%20(2).pdf)

# Meet The Authors



**Abigail Goger**

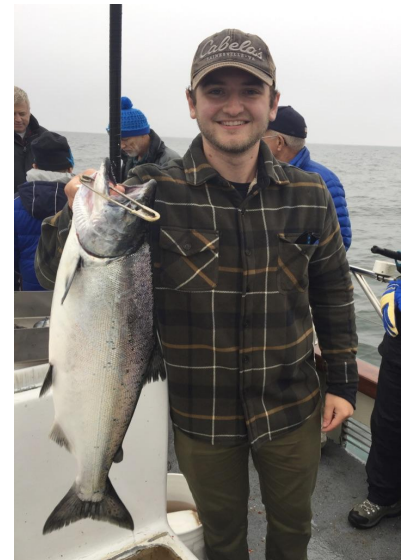
*Civil & Environmental Engineer, Junior*

Loves surfing, snowboarding, rock climbing and anything outdoors. Soccer fanatic and Co-writer of the blog [Lost Girls Living](#). Aspires to one day see the world.

**Remo DiSalvatore**

*Civil & Environmental Engineer (Junior)*

Enjoys outdoor activities such as fishing, biking, hiking, shooting, etc. Loves animals and traveling. Hopes one day to do work on the Pacific Garbage Patch and/or alternative forms of energy.



**Grace Watson**

*Civil & Environmental Engineer, Junior*

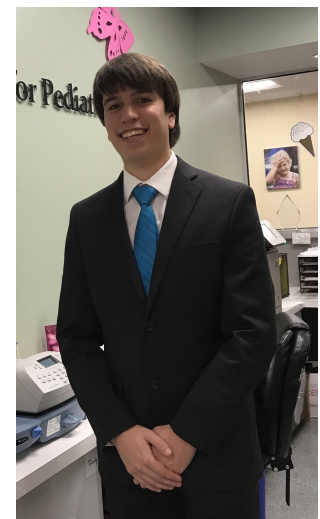
Partakes in hiking, photography, music, video games, writing, and all things beach related. Hopes to continue my passion of travelling by road tripping across the United States.



**Chris Rovelli**

*Civil and Environmental Engineer, Junior*

Enjoys activities such as relaxing on the beach, bicycle riding, traveling, and unwinding with the occasional video game. Wants to greater understand how our actions affect the environment and what can be done to fix it.





## Meet The Grad Students



### **Ryan Loeh**

*Graduate Student, Civil and Environmental Engineering*

Received his Bachelor's Degree in Civil Engineering from Rowan University in May of 2018, while also achieving a minor in Mechanical Engineering and being an active member of the Honors Concentration. Now pursuing a Master's Degree in Civil Engineering while working with the NJARNG BIM Team. Enjoys fishing, kayaking and playing soccer in his spare time.

### **Nicholas Nocco**

*Graduate Student, Civil and Environmental Engineering*

Graduated with a Bachelor's Degree in Mechanical Engineering from Rowan University in May 2018, with a concentration in Automotive Engineering. Currently working alongside the NJARNG Energy Audit teams while pursuing his Master's Degree. Competed for Rowan University Cross Country and Track & Field teams for 4 years receiving Academic All-American honors twice, and now helps out as a volunteer assistant coach.



# NJARNG Energy Team

*Want to know more?*  
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