Clean Cut Quarterly

NJARNG Sustainability Newsletter

In collaboration with Rowan University

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IMAGE: **Courtesy of Patrick Sellers**

Coastal Resilience

How New Jersey's Climate Change Resilience Strategy will protect our coasts for years to come. Read all about it on **pages 2 and 3**.

IMAGE: **U.S. DOE**

New Jersey leads the way as construction begins on the largest turbine port in the nation. Learn about the project on **page 4**.

Do nuclear power plants have a place in a clean energy future? See **pages 5 and 6**.

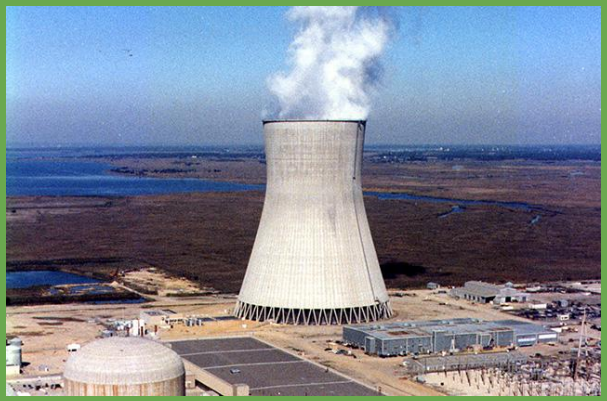


IMAGE: **THE STATE OF NEW JERSEY**

Climate Change Resilience Strategy and the Future of New Jersey's Coasts

By: Patrick Sellers

In October 2019, seven years after Superstorm Sandy hit the shores of New Jersey, Governor Phil Murphy signed executive order No. 89, calling for the creation of a statewide Climate Change Resilience Strategy (CCRS) [1].

The strategy, to be published in September, will be based on data gathered by the NJ Department of Environmental Protection (DEP). It will detail the course of action that the state must take to reduce the impact of climate change. The strategy will prepare New Jersey to face the challenges of climate change through the promotion of mitigation, adaptation, and resilience throughout the state. Also included in CCRS will be a Coastal Resilience Plan (CRP), which is designed to specifically address issues that will affect New Jersey's coastal areas. Here we take a look at some elements of the plan, ahead of its debut this fall.

THE NATIONAL GUARD

Casino Pier in Seaside Heights was partially destroyed when Hurricane Sandy hit the New Jersey Coast in 2012.

The roadmap for facing climate change

According to the United Nations, an effective strategy to fight climate change must include the following three foundational elements:

- Mitigation: Reducing the rate and impact of climate change.
- Adaptation: Learning how to live with current climate change impacts.
- Resilience: Preparing and planning for when the effects of climate change occur.

Specifically, NJ's CCRS will include the following recommendations:

- Methods to strengthen the resilience of New Jersey's communities, infrastructure, economic sectors, and natural resources.
- Guidance and strategies for executive departments, agencies, municipalities, etc., to implement resiliency measures.
- Promotion of long-term water and energy resource security.
- Practices to reduce the risk of wildfires in state forests.
- Procedures to decrease climate change-based health risks to New Jersey residents and visitors.
- Means to support sustainable and resilient economic development.
- Techniques to identify opportunities to support climate resilience measures, mitigation, and adaptation.

Protecting NJ's Shores

Nearly 53% of New Jersey's population lives within a 3,218 square mile area designated as "coastal zone". This area also hosts hundreds of thousands of visitors every year and is a pillar of the state's tourism industry. Yet, the cities, towns, beaches, historical sites, and parks that make up this area are in danger.

[1] "Official Site of The State of New Jersey," *Climate Change Resilience Strategy*. https://www.nj.gov/governor/news/news/562019/20191029a.shtml

NJDEP

A flooded residential street.

Rising sea levels among other climate change related impacts are making this area more vulnerable than ever to an economic, environmental, or urban disaster. It is for this reason that the DEP is set to develop a Coastal Resilience Plan to prepare New Jersey to withstand the effects of sea level rise and coastal storms that are increasing in frequency and strength. The CRP will reevaluate current policies and programs in order to reduce risk factors, increase coordination and awareness, and support local municipalities in achieving adaptation. By assessing the current vulnerabilities in the area, the plan seeks to help communities plan for rising sea levels, flooding increases, and tidal storm surges by 2050. From these assessments, the CRP will then recommend methodologies and actions to be taken by the state to assist in the preparation and prevention of climate change and its effects. Also included in the plan will be a list of investments and financing strategies that will assist in the building of resistance structures and other resilience and adaptation measures. The CRP will not necessarily be the end-all solution for every part of New Jersey's coast, but it is the first step towards a more ready and resilient state. ■

Initiative to Boost Agricultural Production, Lower Emissions By: *Luke Molnar*

Earlier this year, the United States Secretary of Agriculture Sonny Perdue announced a proposal aimed to boost agricultural production while lowering greenhouse gas (GHG) emissions. The Agriculture Innovation Agenda (AIA) sets the goal to achieve a 40% increase in agricultural production, while lowering the GHG emissions from the agricultural sector by 2050.

Feeding a growing population

While the Earth's expanding population is driving an increase in demand for food, the land available to cultivate that food is diminishing. Alternatives to traditional agriculture such as vertical farming and indoor farming have had success in some urban settings, but scaling these practices globally is cost prohibitive. To offset the reduction in land space, existing agricultural infrastructure must produce crops and support livestock more efficiently. The AIA will raise sustainability standards and strive to improve agricultural practices in the United States.

USDA

A canola field in the distance.

Cutting Emissions

The AIA has outlined several pathways to achieve reductions in emissions. The AIA set the goal of a 50% reduction in food waste by 2030. Additionally, the plan sets to expand the market for biofuels and biomass. Reducing the amount of food waste and fossil fuel being burned results in less methane and carbon dioxide gas produced. Achieving these two goals will contribute significantly to the emission objectives of the AIA, setting the U.S. agricultural industry on a more sustainable path. ■

NJ to Build Largest Turbine Port in the Nation

By: Amanda Zabielski

A step towards reaching clean energy goals

The state of New Jersey has proposed a plan to construct a 200+ acre wind turbine port in Salem County, as part of an initiative to promote the growth of offshore wind farms on the East Coast and along the Jersey shoreline. The turbine port will be situated near the Hope Creek Nuclear Power Plant and the Salem Nuclear Power Plant on an artificial island in the Delaware River. The New Jersey Economic Development Authority (NJEDA) will be leading the construction of this project and will be partnering with other public, private, or public-private entities. This project will complement Governor Phil Murphy's Energy Master Plan, which outlined steps to reach 100% clean energy in New Jersey by 2050 and generate a total of 7,500 megawatts (MW) of offshore wind energy by 2035.

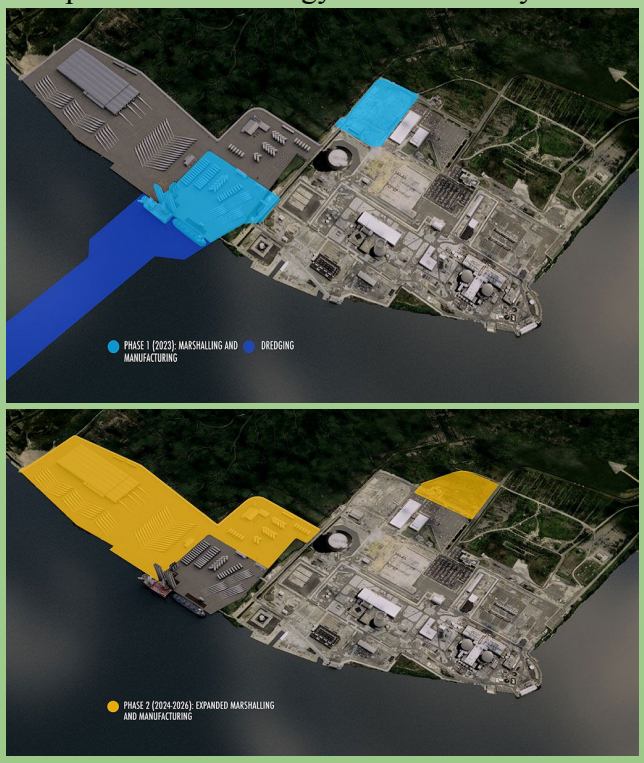
The New Jersey Wind Port will serve as a location where wind turbines can be constructed and loaded onto ships that will transport them into the Atlantic Ocean where they will be installed provide clean energy for New Jersey and the East Coast. .

Two-phase construction

The construction of the turbine port will be completed in two phases [1].

Phase 1 will begin in 2021 and be completed in 2023. This phase will include the following projects: dredging of the Delaware River, the installation of a wharf with delivery and installation berths, the creation of a marshalling area for turbine component assembly and staging, the creation of a manufacturing site, and the construction of a corridor that will accommodate heavy-haul land transportation.

Phase 2 construction will take place between 2024 and 2026. This phase will include the following projects: the addition of more space and berths for marshalling and manufacturing that can support investments from turbine-related equipment manufacturers, and the construction of additional space for Tier 2 suppliers and on-site manufacturing.



THE STATE OF NEW JERSEY

Phase 1 (top) and 2 (bottom) of construction of The New Jersey Wind Port.

Positive Impact on NJ's Economy

With the devastating impacts that the pandemic has had on NJ's economy, the construction and completion of the New Jersey Turbine Port will create a positive surge of economic prosperity for Salem County and the entire state. From the construction and operation of this facility, this project has the potential to create up to 1,500 jobs, including operations, assembly, manufacturing, management, engineering, transportation, and many other occupations that will support the completion and growth of this project. The state of New Jersey has estimated that it will cost between $300-$400 million to complete both phases of the project, but the port will generate an additional $500 million for the state every year of operation . ■

[1] "Official Site of The State of New Jersey," *New Jersey Wind Port*. https://nj.gov/windport/

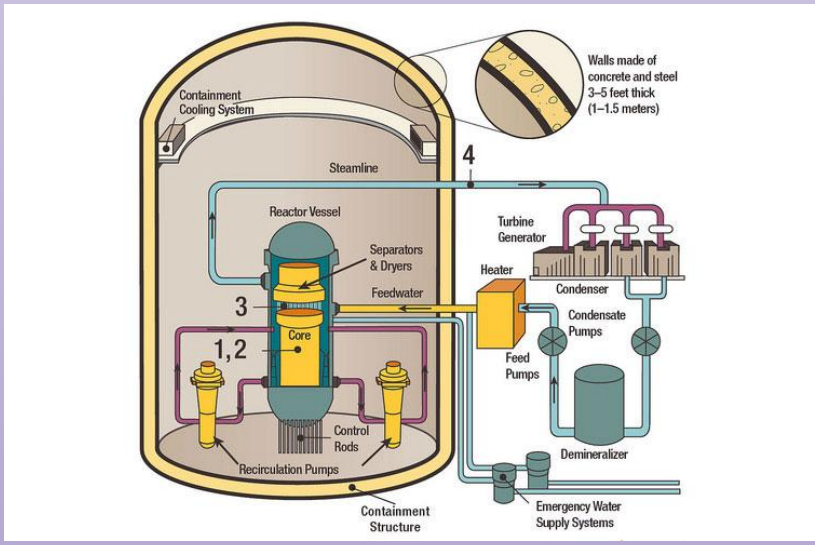
Nuclear in a Clean Energy World

By: Luke Molnar

For the public, there is a lot of mystery surrounding nuclear energy. Past nuclear failures have created a misconception that nuclear power plants are harmful and unstable. Here, we will address common questions about nuclear energy— how do nuclear reactors work? are nuclear power plants safe? are there clean energy alternatives other than nuclear energy? could nuclear power plants exist in a clean energy future?

Mechanics of a Reactor

This article will focus on the boiling water reactor (BWR) as they are one of the most commonly used reactors used in the United States. The mechanics of producing power through a nuclear reaction can be simplified into just a few steps. First, uranium atoms are split in a vessel that is submerged in a pool of water. This is a highly exothermic process, which means that it causes a large release of heat. This heat warms the submerged vessel causing the pool of water to begin evaporating into steam. The rising steam causes a turbine at the top of the reactor to spin, generating electricity. The electricity enters the electric grid and is carried by transmission lines over long distances and is ultimately transferred to homes and buildings through distribution lines. Through the electric generation process, a nuclear reactor emits an amount of radiation such that a person within 50 miles of the reactor will absorb approximately 0.01 millirem of radiation annually. For context, the average person absorbs around 300 millirem from background sources of radiation each year. This means that the amount of radiation a person absorbs from the operation of a nuclear power plant is not any more substantial than the radiation that humans experience from their cell phones.



USNRC

A diagram of a boiling water reactor.

A Clean, Efficient Source of Energy

When planning for an energy future it's important to consider the amount of physical space the power plants occupy, the environmental impacts of the energy generation, and the overall efficiency of the power output. Nuclear power plants have an extremely small physical footprint. For instance, a 1000-megawatt (MW) facility takes up as little as one square mile, while a solar park of the same output capacity can take up about 9 square miles. In 2019, nuclear power plants generated 809 billion kilowatt-hours of energy— approximately one fifth of all electricity produced in the United States.

There are currently 7.6 billion individuals living on Earth. As the population increases, so does the demand for resources. With a diminishing supply of land each year to meet these needs, it is important for engineers to make the best use of the land available. Nuclear energy presents an opportunity to produce a large amount of energy with limited space required. However, there are barriers that currently prevent more nuclear power plants from being built that we'll discuss in the next section.

Realistic Application

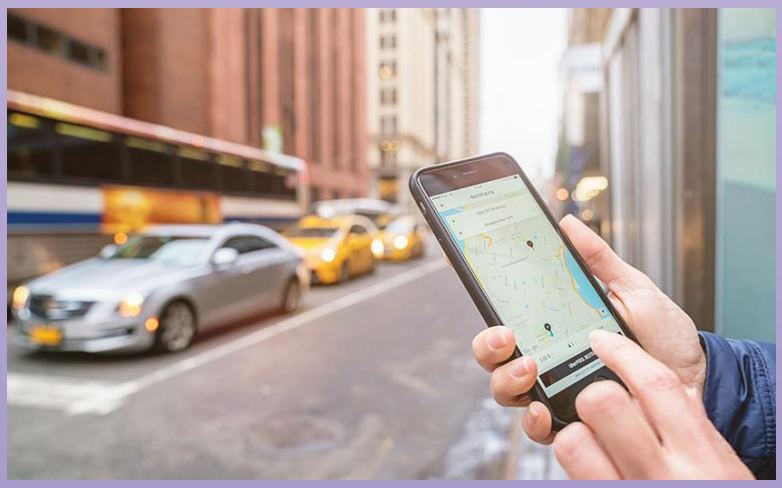
The largest drawback of nuclear energy is the cost of construction of these facilities. While nuclear power plants are able to produce more energy in a given unit of area than other renewable energy sources, the cost of the construction of a nuclear facility is very high. Additionally, nuclear power plants have a higher potential for environmental damage than other renewable energy generators. This risk is factored into the design of the plant, ensuring that there is a safety system that will prevent meltdowns. While this measure is expensive, it is a critical implementation into every nuclear power plant that prevents massive meltdowns such as those at Chernobyl in 1986 and Tokaimura in 1999. ■

A Closer Look: The Surprising Impact of Ride-Hailing *By: Samuel Ramos*

Air pollution has quickly become one of the greatest concerns in the past few decades. Air pollution not only can lead to negative public health outcomes, but also contributes to the earth's changing climate. According to the U.S. Environmental Protection Agency (EPA), the largest source of CO_2, a potent greenhouse gas (GHG), in the U.S. in 2018 was the transportation sector. Even though the data shows that the transportation of goods and people is a significant source of pollution, the sector can not just disappear, but it can reform. In recent years, the support for greener forms of transportation such as electric vehicles (EVs), public transportation, carpooling, and on-demand ride-hailing services have surged. Here we take at the impact of one of the alternatives to single passenger vehicles, ride-hailing.

Ride-hailing: Green or not?

Ride-hailing has become extremely popular in the last few years. According to a Pew Research poll, 36% of U.S. had used a rideshare in 2018, up from 15% in 2015. With a similar concept to carpooling, ride-hailing companies, such as Uber and Lyft, provide their users with the option to eliminate their need to own a personal vehicle or reduce their use of their personal vehicle. With the number of people that rely on personal vehicles for transportation reduced, you might expect that has lead to a measurable decrease in CO_2 emissions.



NREL

A rider using a ride-hailing app to get a lift on-demand.

Despite the many benefits, such as less traffic congestion, on-demand flexibility for riders, and fewer raw materials used to manufacture new cars, new data has shown that these services actually increase CO_2 emissions. From a certain perspective, it makes sense that eliminating single-driver vehicles would benefit the environment if ride-hailing is truly the same as carpooling but it isn't. Assuming that replacing a personal vehicle trip with a ride-hailing trip is a 1-1 replacement, ride-hailing produces more emissions because of the extra distance that it must travel in between clients. This action had been dubbed "deadheading". The average ride from Lyft or Uber generates 47% more CO_2 emissions than if that same individual were to simply drive their personal vehicle, assuming both vehicles have similar fuel mileage. Additionally, ride-hailing services in general generate an average of 69% more emissions when compared to the trips that they end up replacing. So, the form of transportation that suddenly has become very popular actually generates more air pollution than the original form of transportation it replaces.

With all these issues, can ride-hailing services become more green? Since ride-hailing services rely on drivers who use their own personal vehicle, companies can incentivize the purchase of EVs. Programs in San Francisco and Pittsburgh reward drivers with an extra $1 per trip if they use an EV. However, the wide-scale adoption of EVs is not going to be any time soon. ■

Meet the Editors

Amanda Zabielski

Civil & Environmental Engineering, Senior

As a two-year summer employee of the Sustainable Facilities Center at Rowan University, Amanda has been able to increase her understanding of the importance of sustainability of our NJARNG readiness centers across the state by completing Building Information Modeling (BIM) projects. Her interests in environmentalism and seeing projects until completion will hopefully lead her to a Project Management position at an engineering firm.

Luke Molnar

Civil & Environmental Engineering, Junior

This is Luke's first summer interning at the Sustainable Facilities Center at Rowan University. He has previously worked as an undergraduate research fellow at Rowan University's Center for Research and Education in Advanced Transportation Engineering Systems. His interests include cooking, watching movies, and golf. He hopes to return to school after his undergraduate studies to obtain a PhD in Engineering.

Patrick Sellers

Mechanical Engineering, Senior

Currently working his first summer internship for the Sustainable Facilities Center at Rowan University and preparing to head into his Senior year, Patrick is very excited to move on to his professional engineering career. Passionate about magic, movies, and mechanical engineering, he hopes to one day combine all three into a career working in the amusement park industry for Walt Disney Imagineering.

Meet the Editors

Samuel Ramos

Civil & Environmental Engineer, Junior

Growing up reading comic books and watching action movies like S*tar Wars*, Sam was placed on a path toward environmentalism by trying to be like the same heroes he idolized, at least in his own way. He has always wanted to contribute to society by making it more environmentally friendly in any way possible, namely through researching sustainable energy technology. In short, he wants to save the world.

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Learn more about the Rowan University Sustainable Facilities Center **here** or scan our QR code!

SCAN ME

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