CHATHAM UNIVERSITY

(EDEN HALL CAMPUS)

(Silver Certified under PEER v2)

CASE STUDY

September 2021

"Chatham's Eden Hall Campus is designed to be a living lab for sustainability and resiliency, and it made perfect sense to do PEER as a student-led real-world project, where students can drive progress while developing their skills. We were very happy that several of our students chose to pursue their PEER Pro badge as part of this project."

- Dr. Mary Whitney, Director of University Sustainability, Chatham University

Opened in 2014, Eden Hall Campus of Chatham University is the world's first academic community built from the ground-up for the study and design of sustainable living, learning, and development. Chatham University's office of sustainability is the administrative home of all campus sustainability projects, working to initiate change on campus with the goal of achieving 'Net Zero Carbon Emissions'.

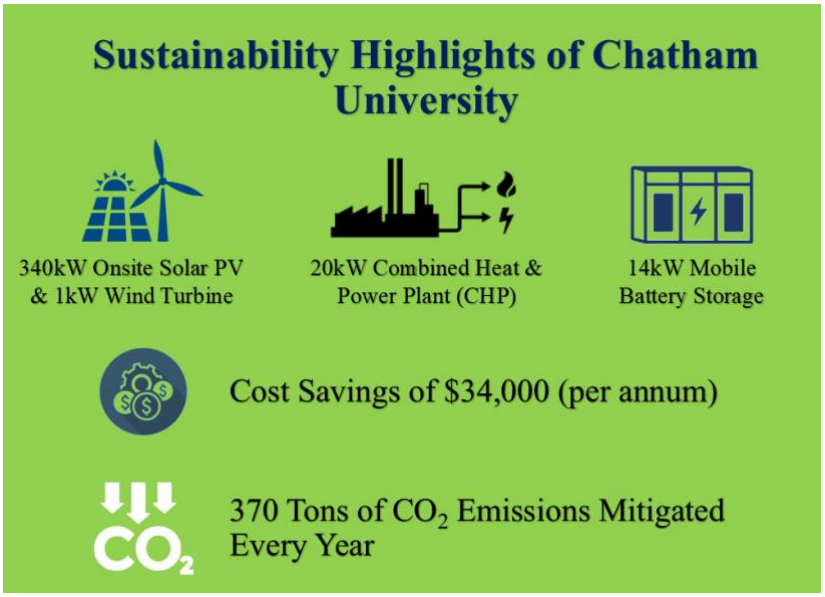

Figure 1: Sustainability Highlights of Eden Hall Campus, Chatham University

Chatham University is consistently ranked as one of the top schools for sustainability by AASHE STARS (Sustainability, Tracking, Assessment, and Rating System), and the Princeton Review Green Honor Roll. Chatham University's office of sustainability coordinates with different departments, faculty, and student groups to take steps to a more sustainable living, learning, and working environment for the campus community.

Eden Hall Campus is a nearly 400-acre academic community dedicated to sustainable living and the modeling of sustainable approaches to energy, water and soil, food and agriculture, air quality and climate. To assess the energy infrastructure of their campus and to empower their students with the knowledge, skills, and values on energy sustainability, Chatham

University's Eden Hall Campus pursued PEER Certification, 'led by their own students' with the guidance from professors, and achieved Silver rating after undergoing a rigorous certification and review process.

THE JOURNEY TOWARDS NET-ZERO EMISSIONS

Through its rating system , PEER emphasizes renewable energy uptake and storage technologies for campuses to reduce their environmental impact and minimize losses associated with their operations.

Figure 2: Aerial view of solar PV panels installed at Eden Hall Campus, Chatham University

Eden Hall Campus has local generation capacity of 341kW which includes multiple solar PV installations on the entrance canopy, field lab, Dairy Barn Café, Barazzone Center, and Orchard Hall (Figure 2). In addition, the campus has two natural gas cogeneration turbines, a geothermal energy loop (for heating needs) which connects all buildings on campus, and a mobile battery energy storage system (BESS) of 14kW. Together, these supply 50% of the total energy needs of the campus.

Further, the campus has purchased renewable power through RECs (Renewable Energy Certificates) since 2002, and now purchases 9000 RECs (equivalent to 9000 MWh) from a Green-E Certified mix of renewable energy.

The Eden Hall Campus also owns a 2.5kW microgrid system with two solar PV panels (1.5kW) and a vertical axis wind turbine (1kW), supported by the mobile BESS in its Elsama Field (as shown in Figure 3). This microgrid can generate power to feed their outdoor classroom and can support their farm needs. Presently the microgrid is only tied into the Windstax turbine and solar panels, but the campus envisions that it will become a testing ground for alternative energy sources. This off-the-grid energy source will not only reduce Eden Hall's carbon footprint but also establishes a wonderful learning platform for individuals of all ages.

Figure 2: Microgrid with Windstax Vertical Axis Wind Turbine, Solar PV, and Battery Storage.

These renewable energy initiatives support Chatham University's goal of achieving 'Net-Zero Emissions' by 2025. Further these measures helped achieve a PEER Energy Efficiency and Environmental (EE) Index score of 91, higher than the Pennsylvania State's EE Index score of 45.

RESILIENT, SMART & SECURE ENERGY INFRASTRUCTURE

The campus has implemented all the necessary preventive measures to avoid damage to their energy infrastructure and/or power interruption from external risks such as tree contact, animal or bird contact, human or vehicle interference, and fire hazards. As a measure of protection from floods, the campus has hardened its power system with rain gardens and drainage systems which direct water away from all the critical assets. Power distribution cables are undergrounded to eliminate their susceptibility to wind, ice, falling trees, and lightning damage.

To enhance their power system performance and the ability to manage their energy usage, Eden Hall Campus has incorporated advanced metering infrastructure (AMI) in all buildings connected to the central communication infrastructure of the campus. They have also installed an energy management system (EMS) to monitor and control their lighting, heating, and cooling loads. This helps them to keep the building's climate within a specified range, illuminate rooms based on the occupancy schedule, monitor performance and device failures in all systems, and alert operators to any malfunctions.

The campus has strengthened its energy system through the implementation of necessary risk mitigation & emergency response plans, cybersecurity measures, and data encryption

methods to protect their energy systems, smart meters, and communication systems from disaster, deliberate cyber-attacks, and/or inadvertent errors. All these measures have helped in strengthening the reliability and resiliency of the energy infrastructure in Chatham University's Eden Hall Campus.

INSPIRING AND EMPOWERING THE NEXT GENERATION

This is the first project where students have involved in the PEER certification process. The role of gathering data, analyzing results, and identifying measures and strategies helped them train as professionals who can shape the future grid modernization. Chatham's student and faculty-led certification indicates that PEER is an effective tool to use, quick to learn, and easy to practice and implement. With the application of PEER strategies and measures at Chatham, students gained knowledge in smart grids, and their practical applications will bring value to the community.

PEER CERTIFICATION

PEER is a certification program that measures and improves power system performance and electricity delivery systems. The rating system evaluates the campus performance across six categories that include:

- Reliability and Resiliency (RR)
- Energy Efficiency and Environment (EE)
- Operations, Management and Safety (OP)
- Grid Services (GS)
- Regional Priority (RP) &
- Innovation (IN)

PEER Certification for Campus Projects

Certified 10 August 2021

Total Points Achieved	**56**
Reliability and Resiliency	10
Energy Efficiency & Environment	22
Operations, Management & Safety	11
Grid Services	08
Innovations & Regional Priority	05
Total Possible Points	110

Out of a possible 110 points, Eden Hall Campus, Chatham University earned 56 points and achieved PEER v2 Silver certification. As part of the process, the project identified opportunities for continuous improvements such as:

- Hardening their power system against natural disasters such as storms and earthquakes & ensuring more reliable service by implementing distribution redundancy and auto-restoration strategies.
- Improving power quality through regular power quality assessments, and by implementing necessary monitoring and control strategies.
- Enhancing power system operations through the implementation of preventive and predictive maintenance strategies which also helps in reducing operational costs.

About PEER

Performance Excellence in Electricity Renewal (PEER) is a rating system and certification for defining, assessing and verifying the overall sustainable performance of electricity delivery system design & operations. PEER is designed to deliver sustainable, resilient, and reliable energy around the globe. Learn more: peer.gbci.org