Solar HBCU Innovation in Microgrids & Resiliency with Solar + Storage

Chris Nichols

Groundswell, Inc

NREL Technical Monitor: Sara Farrar

NREL is a national laboratory of the U.S. Department of Energy
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NREL/SR-7A40-90011
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NOTICE

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BREAKING BARRIERS

Solar HBCU Innovation in Microgrids & Resiliency with Solar+Storage

Solar Energy Innovation Network, Round 2

August 2021

Photo: Jeroen Van de Water

Groundswell
COMMUNITY POWER

Atlanta University Center Consortium · Morehouse College · Spelman College – A Choice to Change the World · Partnership for Southern Equity – Together We Prosper · Georgia Power

FINAL REPORT
BREAKING BARRIERS
Solar Energy Innovation Network (SEIN) Round 2

Photo: Manny Becerra

A. Prime Contract..**DE-AC36-08GO28308**

B. Contract Name..**AGR-2020-10206 (SEIN R2)**

C. Project Title ....**Breaking Barriers: Solar HBCU Innovation in Microgrids & Resiliency with Solar+Storage**

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H. Sub-Award...**SUB-2020-10342**

ACKNOWLEDGMENTS

Breaking Barriers early on identified COVID as the biggest risk for our project – both to the vulnerable communities and students our team represented, and to the large group of partnering organizations – none of whom had met prior to this project.

Despite being physically separated for the duration of this project, partnering organizations remained focused. Each organization committed additional resources of time toward this innovative effort to overcome the challenges of isolation caused by the COVID pandemic. Throughout this project, partners met virtually; community leaders discussed visions for a resiliency center via Zoom and the eight SEIN project teams convened for three separate12-hour virtual working sessions.

The Breaking Barriers team is grateful for the patience, discipline, and resilience of our partners and SEIN colleagues. We are especially grateful, and acknowledge, the team of professionals at NREL who supported the project with technical guidance and modeling in multiple stages. Georgia Power Corporation (GPC) also committed generous staff resources from several divisions. We thank Bentina Terry, SVP of GPC, Metro Atlanta, for her commitment to this project and to this vision.

Breaking Barriers was supported by the **Solar Energy Innovation Network**. The Innovation Network supports teams across the United States that are pursuing novel applications of solar and other distributed energy resources by providing critical technical expertise and facilitated stakeholder engagement. This support gives the teams the wide range of tools necessary to realize their innovations in real-world contexts.

Teams are composed of diverse stakeholders to ensure all perspectives are heard, key barriers are identified, and the resulting solutions are robust and ready for replication in other contexts. The Innovation Network is a collaborative research effort led by the National Renewable Energy Laboratory and supported by the U.S. Department of Energy's Solar Energy Technologies Office.

This work was authored by Groundswell under Subcontract **No. SUB-2020-10342** as part of the Solar Energy Innovation Network, a collaborative research effort administered by the National Renewable Energy Laboratory under Contract **No. DE-AC36-08GO28308** funded by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office. The views expressed herein do not necessarily represent the views of Alliance for Sustainable Energy, LLC, the DOE, or the U.S. Government.

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PROJECT OVERVIEW

BREAKING BARRIERS: MAJOR OBJECTIVES

The Breaking Barriers project was designed to improve electricity resilience at four Historically Black Colleges and Universities (HBCUs) in West Atlanta, as well as within the surrounding energy-burdened community. To do so, the project undertook work to design and construct innovative urban energy resiliency hubs integrating microgrid technology, solar generation, and energy storage in these West Atlanta colleges and communities. The hubs will help Atlanta HBCUs and the energy-burdened broader community be more resilient, in addition to informing new course curricula at Atlanta University Center campuses and inspiring similar efforts at other HBCUs and beyond.

BREAKING BARRIERS: PROJECT HIGHLIGHTS

- Established a strong partnership with the incumbent investor-owned utility (Georgia Power Corporation). This is a critical, positive relationship. GPC was willing to engage to learn more about microgrids and solar from the national lab, and to truly support the HBCU community with innovation – a new team at GPC is moving the utility forward, despite a low-cost electricity market, and no regulatory or legislative requirements to generate solar or community solar.
- Connected the incumbent utility to NREL modeling staff, and to SEIN, for further collaboration. (GPC participated in October 2020 and March 2021 SEIN network meetings.)
- Brought together three distinct university campus administrations. Secured curricula that cross university teaching siloes.
- Organized rational ownership assumptions for the microgrid, solar installation, and battery – across accounts and physical distribution systems.
- Held six community meetings on a technical subject remotely – explaining resilient energy concepts and getting buy-in from residents who have never seen a solar panel, let alone a resiliency center. The Chair of Atlanta's Neighborhood Planning Unit T (NPU-T), Kimberly Scott, formally joined Breaking Barriers for each monthly meeting as a community representative.
- Received support for the project from the Mayor's office, the City Office of Sustainability, and the local Congressional Representative.
- Secured "site control" agreements in principle from three community facilities in West Atlanta with promising solar and resiliency center meeting spaces.
- Initiated funding requests with several large corporate and foundation sources who have approached Groundswell with interest *(funding and implementation follow the conclusion of this planning award)*.

BREAKING BARRIERS: PARTICIPANTS & COLLABORATORS

See Appendix B for full list of participating stakeholders in the Breaking Barriers project

Breaking Barriers was formally created as a working collaboration between Groundswell, Partnership for Southern Equity, Spelman College, Georgia Institute of Technology (Georgia Tech) and the Atlanta University Center Consortium, which included the Historically Black Colleges and Universities in central Atlanta: Morehouse College, Morehouse College of Medicine, Spelman College and Clark Atlanta University. Georgia Tech moved to an advisory capacity prior to the project start and remains friendly but not formally involved.

It was hoped that the project would be able to encourage participation and support from Georgia Power Corporation (GPC), the incumbent utility. Without this support, the project would run the risk that the vision for developing a microgrid leveraging solar and battery storage would not reach closure – since utility participation is crucial to energy projects of this scale. Groundswell appealed to GPC to participate as a technical guest and collaborate with national laboratory colleagues in the project – the National Renewable Energy Laboratory (NREL) and Lawrence Berkeley National Laboratory (LBNL). GPC executives approved staff participation from GPC's Resiliency Division and Distributed Energy and Renewables Division (DER) as collaborative members to Breaking Barriers, beginning in September 2020.

BREAKING BARRIERS: PRODUCTS

- Site control agreement: solar + battery systems at Morehouse College for a microgrid supporting campus resiliency center at Spelman College's Manley College Center
- Schematics for campus resiliency center design and interconnection approach – AUCC (Spelman, Morehouse)
- Business plan describing the preferred options and costs for establishing the campus resiliency center
- Modeling estimates of project costs and optimized system usage for grid-tied and direct purchase of the AUC campus resiliency center microgrid system with solar and storage using NREL's Renewable Energy Optimization (REopt) tool (forthcoming NREL publication)
- Agreement to pursue solar + battery systems to power a community resiliency center, with capabilities determined in close consultation with the West Atlanta community, at one of four candidate sites: three controlled by the Atlanta Public Schools system, and one independent facility
- New course curricula at AUC institutions incorporating resilient energy concepts, using the campus resiliency center as a case study, and creating pathways to renewable energy careers

BREAKING BARRIERS: CHALLENGES

We identified the following challenges throughout the project:

- **Organizing during COVID**
    - Bringing together collaborative partners and maintaining momentum
    - Educating and coalescing the community on resilience design without gathering in person
    - Reaching stakeholders for support and technical contributions
    - Health, safety, and motivation challenges for individuals arising from the distractions and suffering in the pandemic
- **Aligning with the incumbent utility (GPC's concerns)**
    - Maintaining reliability and understanding impacts on equipment
    - Cost scenarios for new technologies, possible service challenges
    - Limited experience with solar-powered microgrids
    - Assessing project feasibility in context of regulatory framework
- **Designing affordable project elements**
    - Storage prices still high
    - Uncertain benefits to the incumbent utility
    - Savings for solar site hosts are marginal in low-cost energy environment

In our kick-off meeting with NREL and other Solar Energy Innovation Network (SEIN) teams, Breaking Barriers identified restrictions from COVID, with its isolation and limits on our ability to physically meet, as the paramount risk to this project. This proved to be true. Through additional staffing, time, resources and sheer will, the team has persevered to complete our project work and prepare for implementation.

Bringing the project to the point of engineering for both campus and community resilience systems under the constraints of the pandemic proved even more difficult than the project team imagined. The additional time required to communicate, secure information, form relationships and design systems as a collaborative far exceeded our expectations. We are grateful to all project partners for investing extraordinary amounts of time and skill in this project in order to complete the planning process successfully.

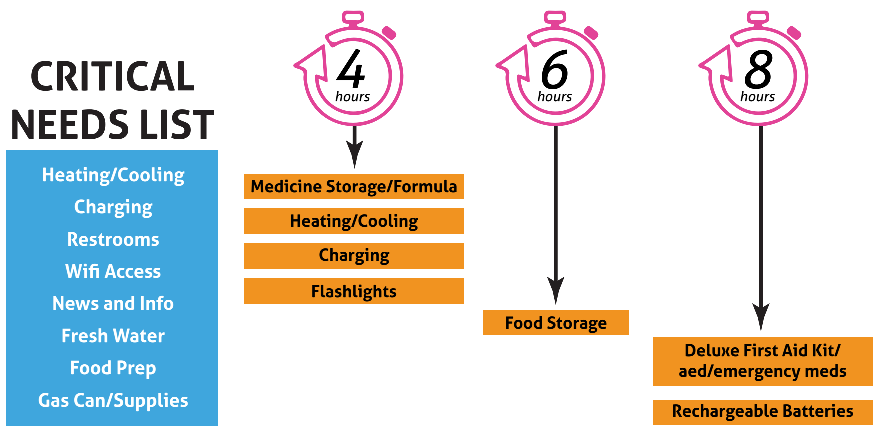
WORK PRODUCTS

COMMUNITY VISION PROCESS & RESILIENCY CENTER

West Atlanta is changing and gentrifying, as are many neighborhoods in Atlanta. Currently, residents of West Atlanta suffer among the highest energy burdens in the state of Georgia (Brown, 2019). With land and housing prices skyrocketing while income stagnated, many residents have been pushed out of their neighborhoods while development overlooked the needs of West Atlanta residents for emergency services. The area is also a food desert – lacking sizable or affordable grocery stores with easy access to fresh produce. While the City of Atlanta established several "cooling centers" across the city to serve residents' emergency needs on high-heat days, no such facilities are located in West Atlanta.

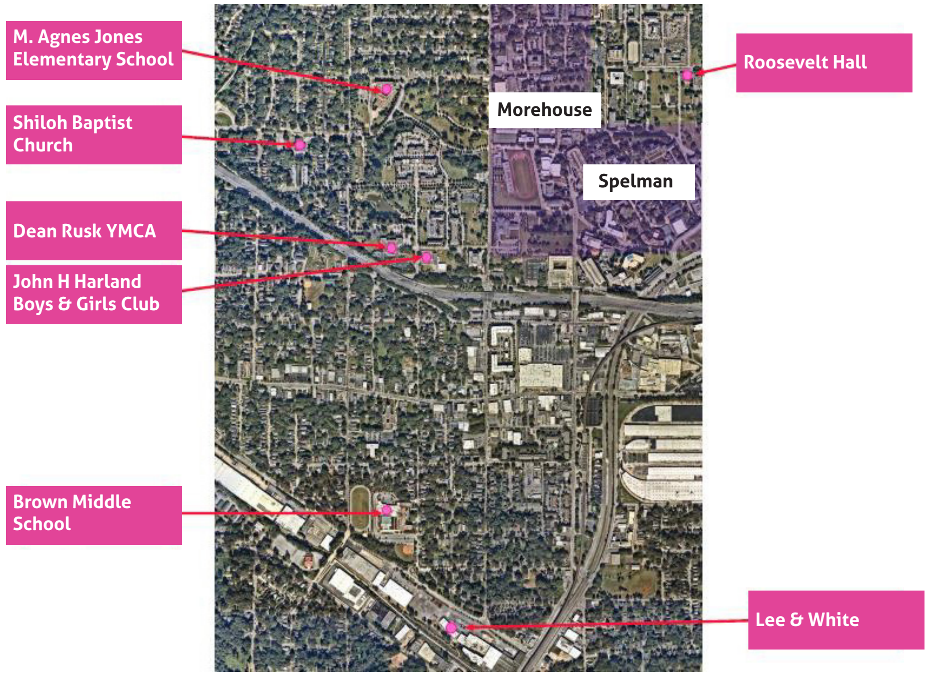
Breaking Barriers proposed to bring residents of West Atlanta together to plan and design an energy resiliency center to meet their needs for critical services during power outages. Between July 2020 and October 2020, Partnership for Southern Equity (PSE) convened six "community vision" sessions in Atlanta. Due to COVID, these were held virtually via Zoom. Community meetings attracted between 8 and 21 participants in each session. Participants included representatives from City Council and the Mayor's office and active members of the Atlanta Neighborhood Planning Units for area T and area V (NPU-T, NPU-V), which include the blocks immediately to the west and south of the AUCC campus complex. Groundswell suggested parameters and provided technical direction for community resiliency hub discussions, based on Groundswell's experience in developing similar community resiliency centers throughout Baltimore, MD, under a grant supported by the Maryland Energy Administration. PSE developed educational flyers and videos to help the community understand the opportunity and limits of resiliency center facilities. (See Appendix C.)

Community members debated which services they most needed from a menu of "critical load" choices generated by the group: temporary shelter, heating or cooling, ability to charge phones or other devices, access to drinking water and bathrooms, storage for medicine or baby food, food service or storage and more.



In three of the final community meetings, Eric Lockhart from NREL participated to answer technical questions from community members regarding how resiliency centers worked, or how solar power might generate the electricity for a battery to keep energy services going during potential outages.

Initially, the project team hoped to physically link the AUC campuses' microgrid to the community resiliency hub facility for shared power storage/delivery. Due to Georgia regulations regarding distinct metering service and the use of distribution feeder lines for energy delivery (which could have required that the micro-grid serve every intervening meter between the campus and the community facility), this solution proved untenable. ***Even if this approach were feasible, relying on existing above-ground distribution wires to route electricity across a given distance would necessitate reliance on the very lines that are currently vulnerable to disruption during severe weather.*** Similarly, the team determined that a dedicated feeder line connecting the AUC microgrid with the community hub was an unattractive option due to concerns about the legality of crossing multiple property lines as well as overall cost. In December, the project team formally abandoned a shared facility design and instead pivoted to develop ***both a campus resiliency center*** (as part of the microgrid, with solar and storage) ***and an independent community resiliency center in West Atlanta*** supported by solar PV generation and a right-sized battery. ***The connection between the on-campus and off-campus resiliency centers thus changed from physical/electrical to conceptual.***



Ultimately, the community chose to seek a resiliency center with:

- Maximum 8-hour battery storage
- Water and bathroom access, energy to pump water/circulate water and air
- HVAC services, in a common space large enough to hold a minimum of 50 people
- Charging services for cell phones, computers, and other small devices
- Refrigeration space for medicine and baby supplies
- Temporary shelter with timed rotation (depending on demand) to be set by the community once the facility is built
- Parking and ADA accessibility

In addition, the Community established principles for service delivery coordination at the Hub:

- Non-perishable food may be delivered to and distributed from the Resiliency Center.
- Medical services: The resiliency center would ideally officially serve as a central coordination point for medical services during emergencies.

Through community support and working with leaders from NPU-T, four candidate host sites were identified for technical exploration. Depending on roof condition, efficiency of the current building, and electrical connections/physical energy maintenance conditions, among other things, Breaking Barriers will choose one of the following candidate sites for development as a community resiliency center. Georgia Power has supplied electricity load data for all four facilities, and Groundswell has secured solar capacity estimates through HelioScope views of each facility's roof.

The candidate host sites and potential benefits to that host site are as follows:

1. **Shiloh Ministries Baptist Church:** community participates in the life of the church and the connected private school; facility gains solar rooftop generation.
2. **Dean Rusk YMCA:** community center hosting a Head Start program and many classes for the community (facility leased from Atlanta Public Schools). Solar power would shave peak and power most school functions.
3. **M. Agnes Jones Elementary School:** Large local public elementary school, adjacent to AUCC. Spelman, Morehouse, and Clark Atlanta students already provide formal tutoring to students at Jones. Connects campus to community. Solar rooftop would also reduce energy purchases for the school. (Atlanta Public Schools controls facility use.)
4. **Brown Middle School:** Closest junior high to AUCC, also serves families in West Atlanta. Solar rooftop would also reduce energy purchases for the school. (Atlanta Public Schools controls facility use.)
5. Back-up candidate facility: **"New" Boys & Girls Club**

COMMUNITY RESILIENCY CENTER: IMPLEMENTATION PLAN

From early HelioScope analysis, Groundswell has estimated solar installation costs of $210,000-$300,000 for whichever candidate site is chosen.

Battery storage costs (depending on facility and duration) range from $150,000-$420,000.

1. Groundswell has approached partners (Georgia Power, business entities with locations in Atlanta, foundations) for funds to install solar and purchase and install the appropriate energy storage device (Lithium-ion battery assumed, though flow or other battery design may ultimately be considered).
2. Georgia Power's existing team (Resiliency Division staff and DER Division staff, overseen by Ms. Bentina Terry, SVP- Atlanta Metro Area), may provide resiliency center design engineering, in concert with a solar developer for the rooftop solar array portion.
3. The City of Atlanta would maintain and staff the resiliency center during future potential energy outages, similar to its support of City-designated 'cooling centers'[1]
4. All candidate sites have been informed that the Project Team will fundraise to develop the resiliency center (rooftop solar, battery, engineering, interconnections and utility upgrades). All have pledged to make current facility staff available to open/close the resiliency center when needed during outages. Other staffing needs and resources to pay facility staff would be negotiated and include considerations that protect school children and facility staff from access by the general public – emergency conditions and resiliency center use will be negotiated between the facility, the City, and the Project Team once project development advances.

[1] There are no City cooling centers in West Atlanta. Mayor Keisha Lance-Bottoms closed all pools and cooling centers in summer 2020 due to COVID. https://www.atlantaga.gov/Home/Components/News/News/3701/1338?seldept=11&arch=1&npage=3&selcat=18

MICROGRID DESIGN AND BUSINESS PLAN

Microgrid Design

Microgrids are an emerging approach to deploying solar and energy storage for a variety of purposes, including providing resilience benefits in the event of an outage. A microgrid can allow a defined geographic area to be separated ("islanded") from the electric grid if outages occur, and to utilize independent generation sources to support critical services until systemwide grid service is restored.

For the four HBCUs in central Atlanta, a microgrid will provide far more than resilience. The design allows ongoing student learning in engineering and related fields, while filling a critical gap in service for HBCU students – and demonstrating the value of solar energy generation.

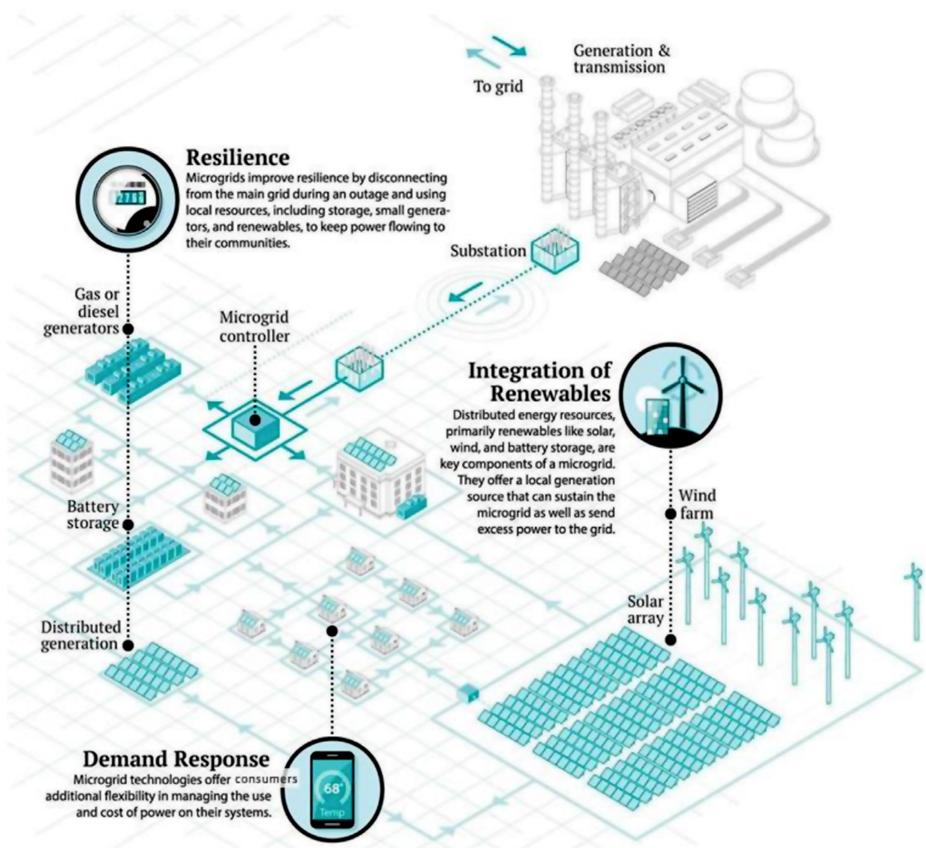
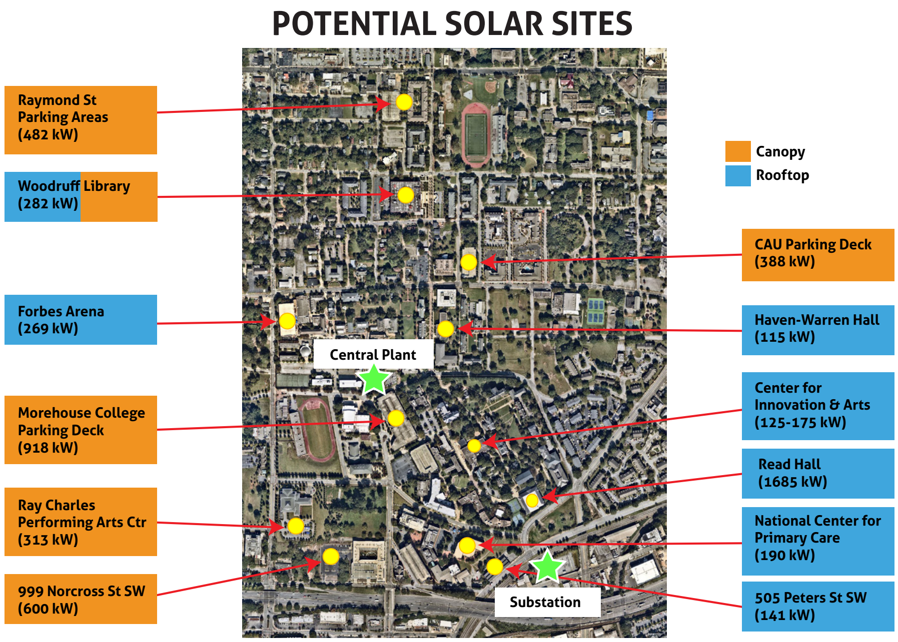


Figure 1: What is a Microgrid?
Source: NREL

Solar Array

- The Breaking Barriers team initially spent roughly two months identifying potential solar locations throughout the AUC, including rooftops, parking lots, and open spaces on the Morehouse College, Spelman College, Morehouse School of Medicine, and Clark Atlanta University campuses. Facilities Directors at Spelman and Morehouse provided critical information about selected buildings and rooftops, including age of the structure, physical condition, ownership, and related campus master planning-related considerations. This discussion illuminated barriers to developing solar arrays on certain candidate sites. For example, the Spelman parking deck is owned by a group of bond holders, each of whom would need to individually approve any enhancements (such as solar) installed on the structure. The Breaking Barriers team opted to steer clear of facilities that entailed complicated approval processes.

Figure 2: Potential Rooftop Solar Installation sites within the AUCC Campus Footprint



- Ultimately, the team chose the Morehouse parking deck as the optimal location for a solar PV installation, due both to its extensive surface area (allowing for a canopy-style solar installation of approximately 918 kW DC) and its central location within the heart of the AUC, adjacent to Spelman's Manley College Center (which would become the designated on-campus resiliency center, as discussed below). Despite the higher cost of parking lot canopy installations compared to standard rooftop solar installations, other solar candidate sites that the group identified throughout the AUC were of significantly smaller capacity and were geographically disparate. Networking multiple distributed clean energy assets into a single microgrid, while technically possible, was going to be much more complex than orienting around a single, central solar array.

- According to the Atlanta Office of Zoning and Development, the Morehouse parking deck is located in Zone O-I (Office-Institutional), in which solar energy generation systems are allowed as a "permitted accessory use."

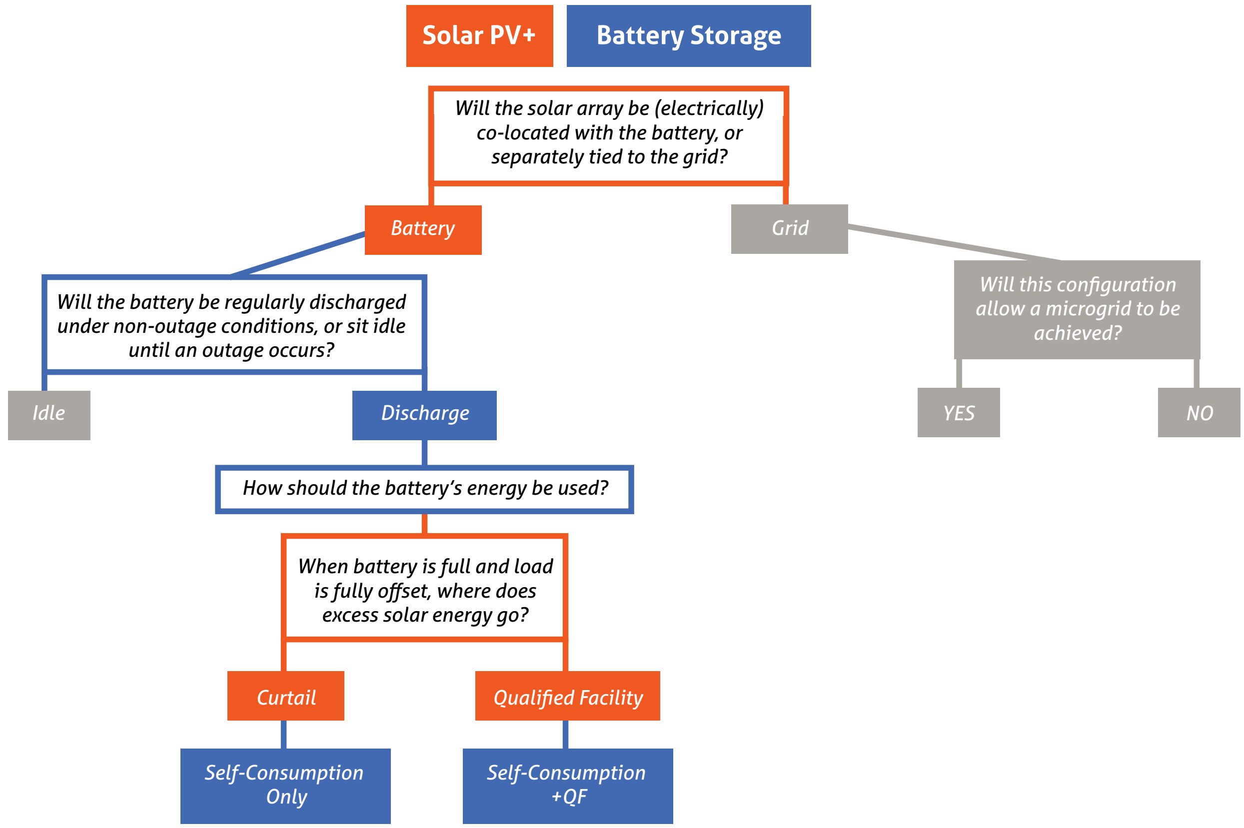
Resilient Load Identification

- **A critical component of microgrid design was identifying the nature and size of existing loads across the AUC that would be connected to backup power through the microgrid during "islanded mode" operations.** Neither Spelman nor Morehouse had developed formal climate change adaptation or resiliency plans that identified critical facilities or specific loads to connect to backup power to ensure continuity of operations during severe weather or other disruptive events that could trigger a regional grid failure. Although Spelman, Morehouse, and the Morehouse School of Medicine shared the locations and sizes of their existing backup diesel generators, upon further discussion it became clear that each institution's life-safety measures (such as emergency exit lighting), data centers, and sensitive laboratory equipment were already connected to backup generators. Although the run-time of these backup diesel generators could be extended by connecting them to the microgrid, all existing life-safety systems were designed to get building occupants to vacate buildings as quickly and safely as possible. A key insight was that the AUC did not have a designated resiliency hub for the academic community to gather for heating and cooling, backup power, and other needs in the event of a regional grid power failure.
- **The group chose the Manley College Center due to its geographic location at the heart of the AUC, as well as the range of services it provides currently.** Manley currently houses a dining hall, food court, and student lounges. The facility has its own chillers that operate independently from the Shepherd Central Plant. Like most buildings on the Spelman and Morehouse campuses, Manley is not independently metered, and quantifying discrete equipment loads within the building at a granular level would have required additional time and expense.
- **Because Manley is not independently metered, the team engaged in a modeling exercise to extrapolate the building's electrical load.** An electrician installed temporary sensors on the facility's current transformers (CTs) that collected 2-minute interval data from 3/25/2021-4/1/2021. NREL compared this data set to interval data for the entire Spelman campus during this period, using metered Georgia Power data from the utility's *EnergyDirect* platform, to estimate the portion of overall campus load attributable to the Manley Center. During this week, the Manley Center comprised 10.4% of the overall campus load.
- **NREL then synthesized a full year's estimated load profile for the Manley Center** by comparing 2019 (pre-COVID) Spelman campus load to the 2020 (COVID) Spelman campus load and observed a 14.3% decrease in load from 2019 to 2020. NREL scaled up the 2021 monitoring data to account for the expected post-COVID overall increase in load and monthly variations in load profile.

Design Process

- Facing **myriad possible microgrid design configurations**, each of which would result in different functionalities and system benefits, the technical team at first struggled to address key design decisions because of the complexity and interrelated considerations of the overall project and its many components.
- In January 2021, NREL developed a **"decision tree"** to enable the team to focus on a single decision at a time, and to clearly connect design decisions to the subsequent technoeconomic analyses. **Key assumptions for the decision tree as discussed in the working group included:**
    - Resiliency is the primary *motive* for the microgrid.
    - The campuses would like to *consume* at least some of the generated solar power, not export it all to the grid.
    - The battery owner will want to *capture* value streams during blue-sky conditions
    - The decision tree is for a single solar array and battery system; additional solar and battery locations will need to be considered in the context of the initial, microgrid-enabling system under later phases of project expansion
    - The system must have *full microgrid capabilities,* including:
        - Islanding from the grid
        - PV able to charge batteries when islanded

Figure 3: Sample Snapshot from NREL Decision Tree Framework



Proposed Microgrid Layout

- The PV and battery systems are primarily intended to support resilience against electric grid outages while also potentially providing energy cost savings during normal grid-connected operations.
  - **During normal grid-connected operations,** the system will serve loads on the Morehouse College 2400 Cluster circuit.
  - **During a grid outage,** the system would be intended to provide backup power to the Manley Center at Spelman College.
- **Microgrid interconnection**
  - The team considered multiple pathways for "internal" interconnection of the microgrid, solar, and battery within the AUCC campus footprint
  - The team developed distinct "Course of Action" (COA) scenarios.
  - Spelman has both 2.4 kV (older) and 19.8 kV (newer) electrical distribution systems. Manley College Center is currently connected at 2.4 kV.
  - **Among the four options developed by NREL, the recommended interconnection option is Course of Action (COA) 1B:** interconnecting PV/BESS output to 19.8 kV and converting Manley Center to a 19.8kV circuit.
    - This configuration has several benefits:

- Most stable microgrid voltage
- Allows for the greatest future growth potential for incorporating additional, potential future solar PV generation on the Spelman campus.
- It is also the highest-cost option that the group considered. See NREL's analysis for details, including the required components. (NREL, forthcoming)

○ Breaking Barriers is also considering COA 3, which includes a new underground circuit to Manley College Center.

○ A separate "non-export" Interconnection Agreement with Georgia Power will be needed, governing the terms of the microgrid's interconnection to the Georgia Power grid behind Morehouse meter #3581.

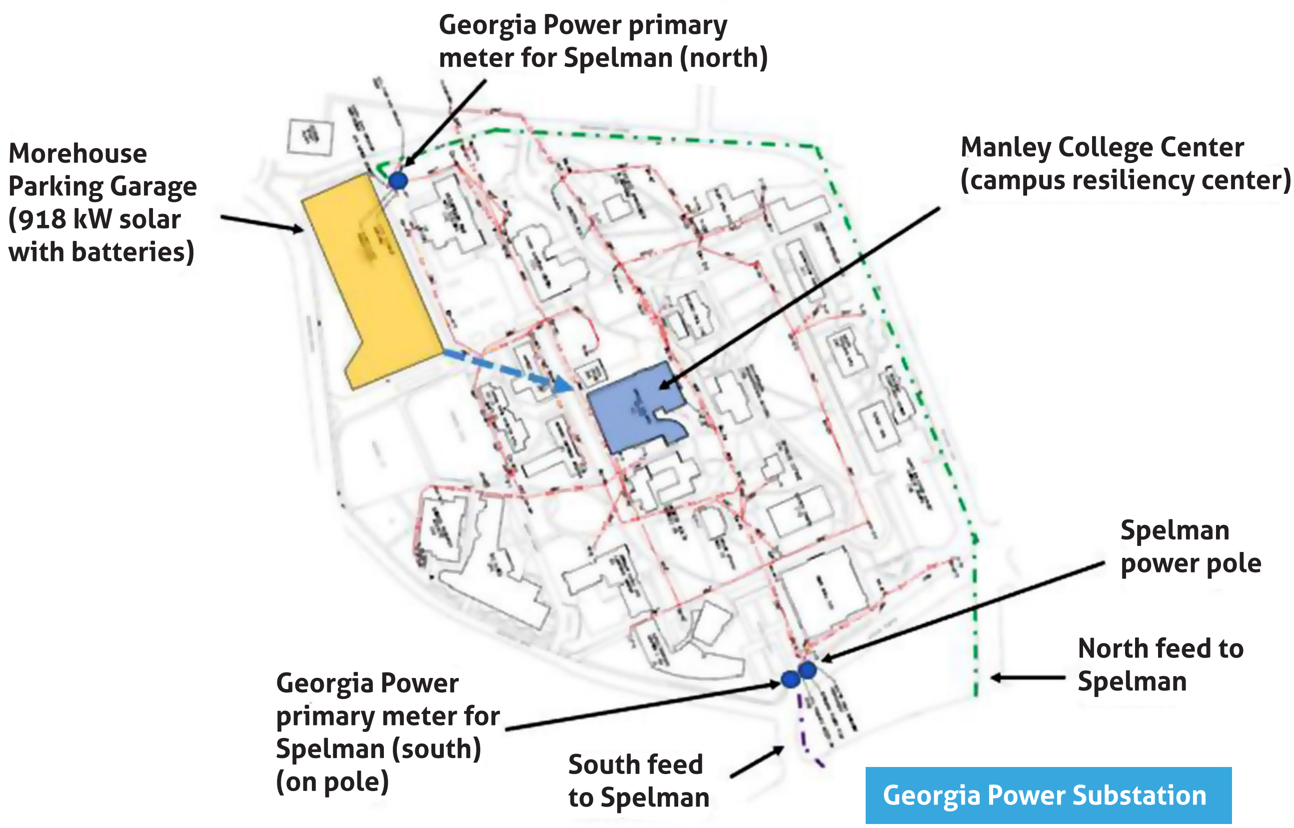
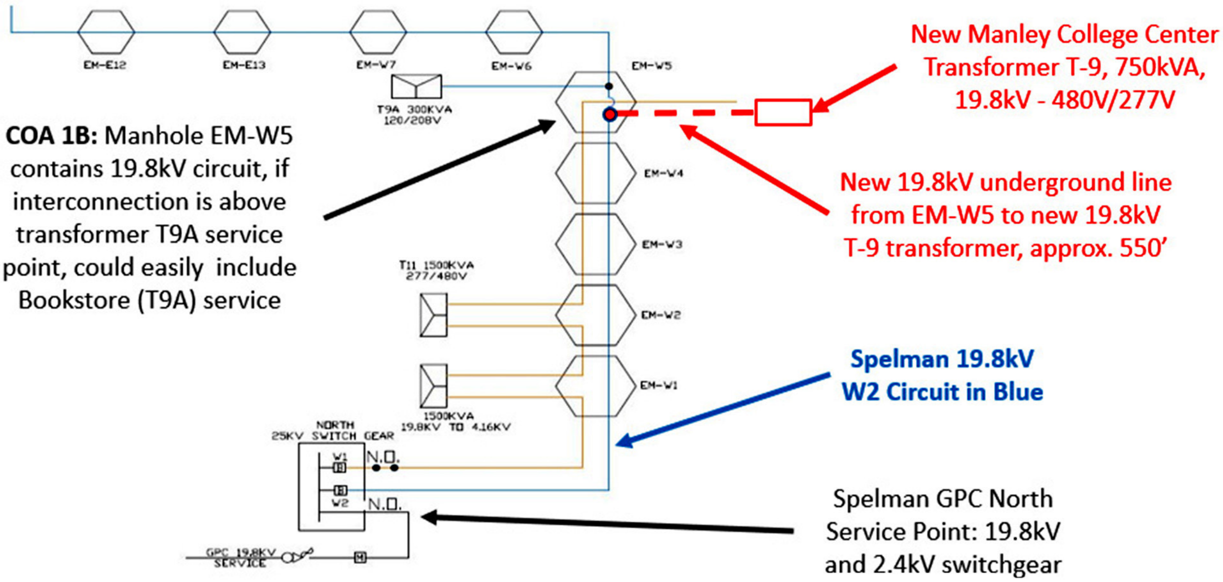


Figure 4: Proposed layout for solar array, battery storage system, and microgrid.

Figure 5. Preferred interconnection approach (adapted from forthcoming NREL report)



MICROGRID PROCESSES & IMPLEMENTATION PLAN

Even before final cost modeling estimates from NREL were completed in May 2021, Breaking Barriers had pursued funding, engineering, site control, ownership agreements, and operation protocol planning. The following table summarizes the elements of an implementation plan for this effort; the final column uses a common project management framework to identify those who are: **responsible, accountable, consulted and informed (RACI)**

Preliminary Processes/ Roles for Project Implementation by Breaking Barriers Partners:

Microgrid component	Considerations	Cost range; Actions	RACI
Financing: Solar and installation Battery and installation Controllers, switchgear, line extensions/upgrades	• Phased approach • Ownership split between campuses • Solar additions would supply power to respective campus accounts	Full system + engineering ~$9M with all components and microgrid controllers	R: Groundswell A: Groundswell C: Spelman, Morehouse I: Georgia Power
Engineering, technical design	• Bid for services • Utilize REopt modeling performed by NREL in scope of bidding requests	Est. at 10-15% of total microgrid component project cost (Antic. $200,000-350,000) *Bidders will be asked to cost share as a demonstration of this HBCU pilot*	R: Engineering firm (TBD) A: Groundswell C: Spelman, Morehouse I: Georgia Power
System Grid Interconnection (GPC) *NOTE: No power is anticipated to be net metered to the system grid.*	• Excess generation will be used within Morehouse facilities • Periodic Battery discharge controlled by Spelman	GPC estimates up to $5,000 for interconnection fees if charged	R: Groundswell A: Georgia Power C: Spelman, Morehouse I: AUCC leadership

Microgrid component	Considerations	Cost range; Actions	RACI
Site control and permitting	• Morehouse to be permitted by GPC for solar generation • Battery (located at Spelman) controllers set by Spelman (engineer contractor firm)	Cost included in overall engineering and design totals	R: Morehouse / Spelman A: Georgia Power C: Groundswell I: AUCC leadership
Operations & maintenance: planning	• Estimates for solar and microgrid O&M accounted in REopt • Revise cost and schedules over time against actual needs	Planning: O&M services: 1.5% of project cost over years 1-10 Annual O&M: inspection Battery replacement estimated for year 10	R: Groundswell (as engineering developer lead) A: Spelman, Morehouse C: Georgia Power I: AUCC leadership
Ownership assumptions	• Solar and excess generation: Morehouse • Battery: Spelman • Controllers and switchgear: Spelman • Developer: Groundswell	Financial firm will ‘own’ for tax equity purposes for years 1-5 IRR on financed piece: <3% Discount rates anticipated 3.5-5%	R: AUCC Leaders/ Groundswell A: Financial investors C: Spelman, Morehouse I: Georgia Power
Roll-out of resiliency service to AUCC	• Blue sky, islanded protocols in place • Battery operation begins in concert with solar generation • Time with college media and education	Solar generation supplies Morehouse ‘Tests’ of resiliency service: built into start schedule	R: Spelman, Morehouse A: Groundswell (developer) C: Georgia Power I: AUCC leadership

The Business Plan (a separate Breaking Barriers report) provides details of each element of the project, with design considerations, costs and benefits.

In parallel with the Business Plan, Groundswell and our Breaking Barriers partners propose to seek funding for both the community resiliency center and the HBCU campus resiliency center/microgrid. Further, Groundswell and the organizational partners in Breaking Barriers plan to collaborate through a process of seeking bids for engineering/design services for the microgrid, with component plans for phased solar PV installation (beginning with the Morehouse parking deck for Phase I), dedicated lines and switchgear to charge the battery, and sizing and installation of the battery serving the Manley Student Center. Planning for the community resiliency center will include partners from among the community (NPU-T and V), the City of Atlanta, the host facility, Partnership for Southern Equity, and Atlanta businesses. Georgia Power has pledged to remain engaged in community resilience center engineering at minimum.

RESILIENCY CENTER/MICROGRID-RELATED CURRICULUM DEVELOPMENT

(see Appendix D for course descriptions and syllabi)

Deans and faculty of Spelman College, Morehouse College, Clark Atlanta University and the educational coordinator for the Atlanta University Center Consortium met throughout the project period to consider what student learning (courses, labs, certifications, Fellowships) might be beneficial and possible in connection with the Campus Resiliency Center.

With restrictions from COVID, undergraduates did not return to the campus complex until April 2021, and were given the option to continue to study virtually. Faculty and college staff similarly worked remotely through much of the project period. This disruption impacted many aspects of the project, including the ability to convene and support momentum in curriculum planning. However, faculty remain enthusiastic and now wish to consider adding solar-related certifications (NABCEP) as non-credit options for students enrolled in related courses or with related majors – environmental studies, engineering, or even health sciences.

The Breaking Barriers project team has connected faculty with potential corporate funders for longer-term support of engineering, data science and technical degree expansion, in line with a desire to bring engineering training into undergraduate degrees alongside the dual degree program (which is supported through a fifth year of engineering training on the campus of the Georgia Institute of Technology).

AUCC and college faculty formally developed two courses and one module expressly for use of the microgrid as a training focal point:

- Spelman College faculty and deans created a general studies full credit course within the Environmental Science and Studies Program that will leverage this project's approach and outputs.
    - Course: **Introduction to Energy Sustainability** (Instructors: Dr. Armita Davarpanah, Dr. Nirajan Dhakal)
- Clark Atlanta University's Dean of Engineering and Dual Degree professor, with Spelman's Dual Degree director, created a module and course for undergraduate grid-engineering, for students from all AUCC campuses enrolled in the Dual Degree Engineering Program (DDEP). The intent is to use the AUCC microgrid as a living-learning lab for DDEP.
    - Course: **Introduction to Engineering Design** (Instructor: Dr. Olugbemiga Olatidoye)
    - Module: **Clean Energy/Mini-Grid Power Generation** (Instructor: Dr. Olugbemiga Olatidoye)

APPENDICES

A. BUSINESS PLAN

The Breaking Barriers Business Plan is a proprietary document at this time, while funding is secured to construct both the **campus** and **community** resilience centers.

Please contact Groundswell directly to discuss your interest in the Business Plan: Chris.Nichols@Groundswell.org

APPENDIX B:

B. BREAKING BARRIERS COLLABORATORS AND PARTNERS

Institution	First Name	Last Name	Title
Partnership for Southern Equity	Chandra	Farley	Director, Just Energy
Partnership for Southern Equity	Wan	Smith	Organizer, Just Energy
Partnership for Southern Equity	Michael	MacMiller	Student organizer, Just Energy
Spelman College	Arthur	Frazier	Director, Facilities Management & Services
Spelman College	Tasha	Inniss	Associate Provost for Research
Morehouse College	Andre	Bertrand	Associate Vice President for Capital Improvement and Campus Planning
Aramark (contractor to Morehouse)	Courtney	Mayes	Energy Manager
AUCC	Tamala	Fortson	Director of Operations
Georgia Tech	Marilyn	Brown	Regents' and Broo Byers Professor of Sustainable Systems
Groundswell	Michelle	Moore	CEO
Groundswell	Lenwood	Coleman	Chief Program Officer
Groundswell	Chris	Nichols	Senior Program Director
Groundswell	David	Wright	Director, Project Development
Groundswell	Nicole	Sonderegger	Solar Program Operations Manager
Georgia Power	Eric	Hurst	Director, Resiliency Division
Georgia Power	Ryan	Poole	Resiliency Project Manager, GPC
Georgia Power	Sam	Wills	Account Manager, AUCC campuses
Georgia Power	Kelsey	Rooks	Account Manager, AUCC campuses
Georgia Power	Andrew	Ingram	Senior Research Engineer, R&D (Power Delivery)

Georgia Power	Bentina	Terry	SVP, Metro Atlanta and Corporate Relations
Georgia Power	Brooke	Haman	DER for BTM, GP
Georgia Power	Trayvon	Leslie	DER Division, Director of Corporate Affairs
NPU-T	Kim	Scott	President, NPU-T (Atlanta Neighborhood Planning Unit)
Curriculum Design			
Spelman	Nirajan	Dhakal	Assistant Professor and Vice Chair of Environmental and Health Sciences Program
Spelman	Leyte	Winfield	Spelman College, Dual Degree coordinator
Spelman	Armita	Davarpanah	Professor, Environmental Science
Spelman	Rosalind	Gregory-Bass	Associate Professor, Environmental and Health Sciences Program and Director, Health Careers Program
Spelman	Retina	Burton	Director, Dual-Degree Program, Spelman
Clark Atlanta	Olagebeme	Olatidoye	Director of Engineering, Dual Degree Program
AUCC	Chris	Ellis	Director, AUCC Education
NREL – Labs: SEIN support			
NREL - SEIN Director	Eric	Lockhart	Director, SEIN program; Lead BB project support
NREL	Scott	Belding	Co-lead, BB project support
LBL	Joe	Rand	Analyst, microgrids
NREL	Richard	Armstrong	Microgrid interconnection assessment
NREL - modeling	Kathleen	Krah	REopt modeling
NREL - modeling	Dan	Olis	REopt modeling
NREL - modeling	Emma	Elgqvist	REopt modeling

C. COMMUNITY VISION: SUMMARY AND MATERIALS

Partnership for Southern Equity created electronic flyers, videos and more to educate community residents in NPU-T and NPU-V. Once the community understood the services and limits of a "community resilience center" for critical support, participants could make choices to fit their needs.

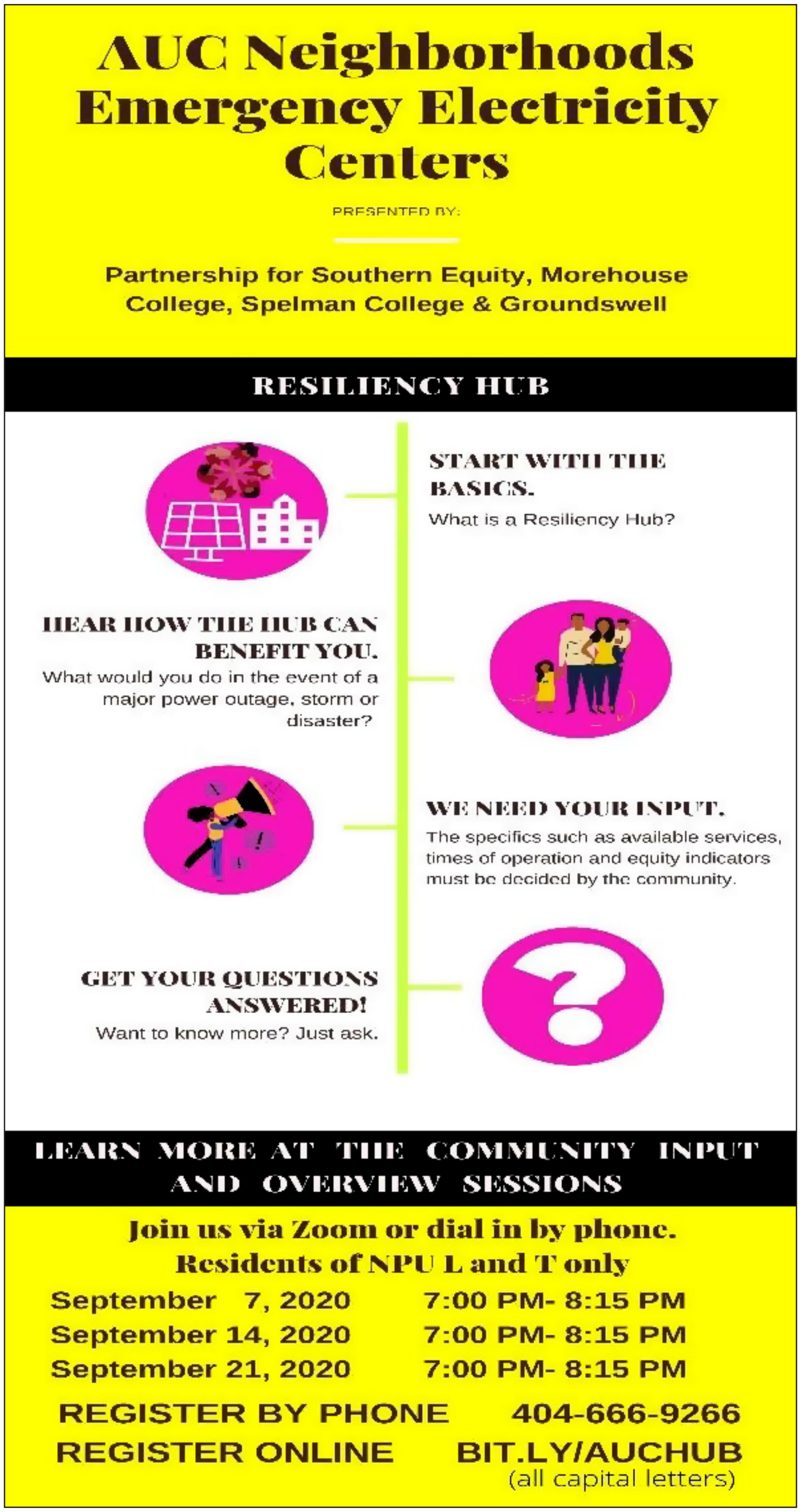
From August 2020 through November 2020, Partnership for Southern Equity led:

- 2 NPU-T meetings with more than 100 participants total
- 11 Neighborhood association meetings with 84 participants total
- 4 Community vision sessions with 22 participants

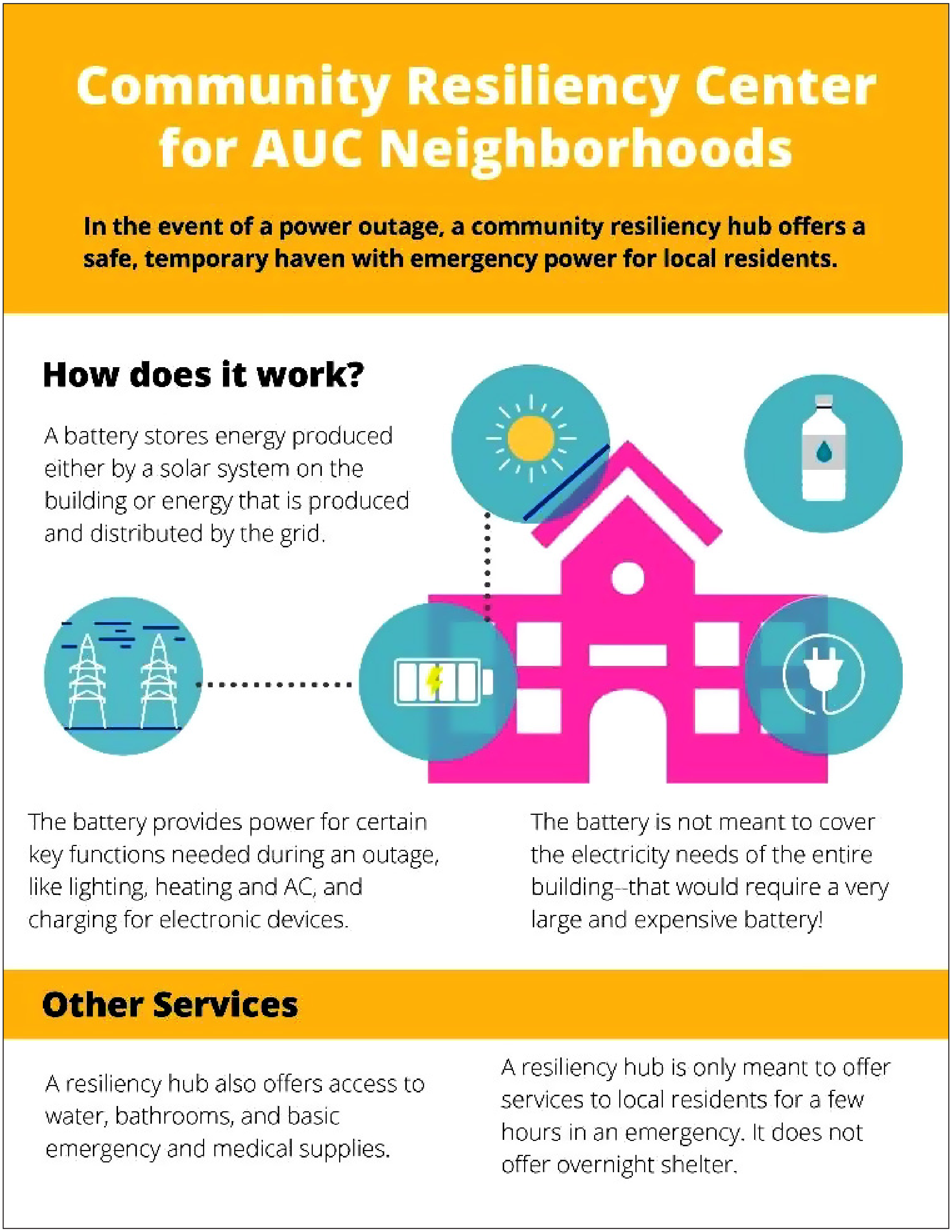
Materials:

1. **Video (MP4):** AUC Neighborhood Resilience Hub Intro: https://vimeo.com/558279784

2. **Flyer** to announce the series of Community Visioning discussions:



3. Resiliency Brochure – sent electronically to full NPU list of neighborhood members:



Community Resiliency Center for AUC Neighborhoods

In the event of a power outage, a community resiliency hub offers a safe, temporary haven with emergency power for local residents.

How does it work?

A battery stores energy produced either by a solar system on the building or energy that is produced and distributed by the grid.

The battery provides power for certain key functions needed during an outage, like lighting, heating and AC, and charging for electronic devices.

The battery is not meant to cover the electricity needs of the entire building--that would require a very large and expensive battery!

Other Services

A resiliency hub also offers access to water, bathrooms, and basic emergency and medical supplies.

A resiliency hub is only meant to offer services to local residents for a few hours in an emergency. It does not offer overnight shelter.

Frequently Asked Questions

***How much will the Resiliency Center cost?**

The Resiliency Center is a free public service. There is no charge to use Resiliency services during an energy outage.

The host site is not responsible for financing the construction of the backup power source (potentially solar) or the energy storage system (a battery) for the Resiliency Center. The host site will not bear development costs either.

During a power outage, the Resiliency Center may need to provide staff who can open and manage resiliency services for the community. Ongoing costs for staffing and maintenance are now in planning stages.

***Who can use the Resiliency Center?**

Anyone! Resiliency is offered to residents of West Atlanta (households & individuals) who need energy services temporarily, for their most immediate critical needs, during power outages that may last more than a few hours.

***What services are available at the Resiliency Center?**

The Resiliency Center will offer AC or heating (depending on the weather), drinking water, non-perishable food items (ex: snack bars), bathrooms, a safe, well-lit interior room with seating, and energy charging access for cell phones and small electronic devices (laptops, tablets, etc.).

There may be refrigeration offered to protect medicines and baby formula or other critical perishables. The Resiliency Center will be accessible (lighted entrance areas) and offer parking space. There will be staff on hand to manage services and assist the community in using the space wisely.

***How long can I stay there? Will I be able to sleep there?**

You may stay at the Resiliency Center for a few hours to charge your electronic devices and enjoy some heating/cooling. Overnight accommodations and sleeping space will not be provided.

***When will the Resiliency Center open?**

We are in the planning stages now. Depending on design and funding, we anticipate opening a Resiliency Center in West Atlanta within two years.

***Where will the Resiliency Center be located?**

We are currently in the process of determining a central, accessible location in West Atlanta.

***Can I keep my medicine there? I need a refrigerator.**

The Resiliency Center is considering how to offer secure space to refrigerate critical medical supplies as necessary for guests in the center during outages. More information will be available as the Center is launched.

***Will there be food available at the Resiliency Center?**

Drinking water will be provided. Non-perishable foods may be available as emergency supplies. Full meals or hot food services/cooking is not planned at this time.

***What if my house is flooded? Can I get help from the city there?**

Organizers are discussing how critical services may be included or offered to residents through the Resiliency Center as a 'hub' location for help during crises. These services may be offered by the City of Atlanta or other providers and will depend on the nature of the energy outage/crisis.

***Can I get medical help at the Resiliency Center?**

As a critical 'hub' for shelter and protection, the Resiliency Center facility will be listed for medical intervention support as appropriate, depending on the nature of the energy outage/crisis. Medical services will be provided by medical authorities separately from the energy services offered by the Resiliency Center.

D. CURRICULUM DESCRIPTIONS

Renewable Energy and Dual Degree Engineering Course & Module

Academic teams and faculty from Spelman, Clark Atlanta and the AUCC contributed to the development of curricula that would support HBCU student learning centered on the microgrid project.

1. Spelman College faculty and deans created a general studies full credit course within the Environmental Science and Studies Program.
    a. Course: Introduction to Energy Sustainability (Instructors: Dr. Armita Davarpanah, Dr. Nirajan Dhakal)
2. Clark Atlanta University's Dean of Engineering and Dual Degree professor, with Spelman's Dual Degree director, created a module and course for undergraduate grid-engineering, for students from all AUCC campuses enrolled in the Dual Degree Engineering Program (DDEP). The intent is to use the AUCC microgrid as a living-learning lab for DDEP.
    a. Course: Introduction to Engineering Design (Instructor: Dr. Olugbemiga Olatidoye)
    b. Module: Clean Energy/Mini-Grid Power Generation (Instructor: Dr. Olugbemiga Olatidoye)

Introduction to Energy Sustainability

ES-#TBD, Syllabus
Environmental Science and Studies Program
SPELMAN COLLEGE

Instructors:
Armita Davarpanah, PhD
Email: adavarpa@spelman.edu

Nirajan Dhakal, PhD
Email: ndhakal@spelman.edu

Credit Hours: 4.00
Prerequisite: None

Course Title: Energy Sustainability

Course Description: ES-#TBD is an interdisciplinary, four credit hour, elective course. It introduces the concept of sustainability with a focus on innovative and just technological and scientific solutions to sustain energy resources. The course emphasizes on socio-ecological aspects of energy system transitions in the context of the urban environment and climate change.

Textbook (tentative) Sustainable Energy Transitions: Socio-Ecological Dimensions of Decarbonization 1st ed. 2020 Edition. Author: Dustin Mulvaney.

Course Goals: Upon successfully completing the course, students should:

- Discuss the environmental benefits of new sources of energy compared to fossil energy
- Explain the concept of sustainability and its principles
- Discuss ways to sustain different sources of energy
- Explain energy challenge and relation to societal, environmental, and climate issues

Course Objectives:

By the end of this course, students should be able to:

- Identify the renewable, replenishable, and non-renewable sources of energy
- Define affordable, reliable, sustainable, and modern energy and its economic benefits
- Explain energy sustainability in relation to energy principles and efficiency
- Discuss carrying capacity and exponential population growth
- Explain how future growth can be achieved with less energy intensity for food and water supply
- Explain the mutual relation between use of energy resources and climate change
- Discuss ways to sustain energy in an urban environment
- Evaluate and plan energy needs for an urban resilience hub
- Apply Protégé ontology development editor to build ontologies for the hubs

Justification for four credit hours: The course meets three hours each week, yet students receive four hours of credit. To earn the fourth credit, you are required to engage in outside activity that fulfills the goals of the class, generally 15 additional hours of parallel or out of class assignment (see the assignment section).

Prerequisite: SES XXX is an elective course, offered by the Environmental and Health Sciences Program (EHSP), and available to any student in any department or major at any level.

Course Rationale: Population growth, urbanization, changing consumption and production patterns, and current climate change call for innovative scientific and technological advances to sustain energy resources and optimize their use. This requires identifying and modernizing the energy intensive processes for food (e.g., irrigation, tilling, food production), water (e.g., withdrawal of water, sanitation, wastewater treatment, desalination), and cities (e.g., home cooling and heating, power plant cooling, refining, transportation). Ensuring just access to affordable, reliable, sustainable, and modern energy is among the main agenda items of the United Nations Sustainable Goals (UNSDG 7). UN's 2030 document also emphasizes on other efforts in relation to the sustainability of energy in Goals 6, 7, 9, 11, 12, and 13 that focus on cities, climate change.

Method of instruction: This course is taught through both *Lectures and Labs.* However, whenever possible we will have sessions with focused student activities and short films related to the course subjects. PowerPoint slides, class and small group discussions, in-class activities, and social media posts will be used during lectures. Lectures will be administered in the regular classroom during normal meeting times. PowerPoint slides presenting the theoretical content and audio-video learning and tutorial material for designing and developing ontologies in Protégé are available on Moodle. The course requires students to install the Protégé ontology editor and use it to develop their ontology with the OWL language. It also includes exercises for understanding interdependencies among population growth and energy supply, energy intensity and food and water production. All course-related material are available in the Spelman's Moodle learning system!

Assessment: The course requires students to learn the principles of sustainability from lectures and related learning content. Two exams assess students' learning of the theoretical parts. The course also involves students in hands-on research on (i) global energy sustainability and (ii) local energy analysis for the resilience hubs in the Atlanta area. For the global sustainability research, each student models the knowledge of one aspect of energy sustainability described in the selected UNSDG 6, 7, 9, 11, 12, or 13 with the free Protégé ontology development editor (https://protege.stanford.edu/). For the resilience hubs projects, each student applies the energy sustainability knowledge, acquired in the first project, to the energy assessments in each of the five phases of site selection for one of the resilience hubs, for the normal, outage, and recovery conditions1. In both of these types of projects, students develop ontologies to represent the knowledge of the UNSDGs and resilience hubs. Teams of two or more students work together to instantiate their resilience hub ontologies with data from four proposed facilities (Dean Rusk YMCA, Ray Charles Performing Arts Center, John H Harland Boys & Girls Club, and Fulton County Central Training). Each student will write and submit a paper related to her UNSDG model and resilience hub projects to Moodle, and virtually (using Zoom) present the SDG or resilience hub ontology to the class during the last week of the semester.
1Resilience Hub, 2019. USDN Resilience Hubs Guidance-1, 47p.

Assessment Scheme and Schedule of Lectures and Assignments available from Groundswell.

CEGR 102 - Introduction to Engineering Design Syllabus at CAU, with the Grid Course Project Module

CLARK ATLANTA UNIVERSITY
DUAL DEGREE ENGINEERING PROGRAM
CEGR 102: Introduction To Engineering Design - Spring 2021

Instructor:
Dr. Olugbemiga Olatidoye - Room – SRC 3037
Phone: 404-880-6940 email: oolatidoye@cau.edu

Lecture Time: TF 2:00pm to 3:00pm SGB: 317

Office Hours: MWF 5:00pm – 6:00pm

Recommended Text: *Introduction to Engineering Design & Problem Solving,* David Burghart, Published: McGraw-Hill. (See attached Course Project Module for additional reference materials.)

Course Description: Welcome to CEGR102. The course content would be taught in parallel with relevant Engineering Design Module exercises, and regular references would be made to practical applications. Each student should fully participate and regularly review presented materials. Constant practice using the Set Tutorial Problems will also help you to build needed confidence in the course. Above all, you will be expected to fulfill all the requirements set out at the end of this Syllabus in order to fully satisfy the course objectives. Please check the CANVAS for further Zoom meeting instructions. Good luck.

Course Objectives: To help beginning engineering students gain a better perspective on engineering, particularly the creative and innovation aspects of engineering design coupled with the rigors of analysis. To provide an introduction to the history of engineering design, development of various branches of engineering, the design process, the profession of sustainable engineering and engineering calculations. Thus, we expect to motivate engineering students during their first year when exposure to engineering subject matter is limited; provide them with experience in solving problems in both SI and customary units while presenting solutions in a logical manner; introduce students to subject areas common to most engineering disciplines, such as Climate Innovation, Sustainability, Energy, etc., that require the application of fundamental engineering concepts and develop students' s ills in solving open-ended design problems.

Learning Outcomes: This course would help beginning engineering students gain a better perspective on the engineering profession, particularly the creative and design aspects of engineering. Students would be provided with a fundamental understanding of how engineers function in today's technological environment.

Teaching and Learning Methods: Where possible, Field Trips to local design and manufacturing industries, power plants, and invitation of practicing engineers/speakers would be implemented during this course. Well narrated videos of field practice and some Web enhanced training methods would also be important parts of this training strategy. Introduction to profession organizations and student membership channels would be explored with all students. Students will be encouraged to participate in Industrial Competition such as JUMP into STEM, etc.

Course Outline & Schedule:
Weeks 1 - 3 .... Understanding The Human-Made World (Chapter I)
Exam 1

Weeks 4 – 7 .... The Design Process (Chapter II)
Exam 2

Weeks 8 – 11 .... Design Documentation; Engineering Analysis & Design (Chapters III & IV)
Exam 3

Weeks 12 – 14 .... Problem Solving Techniques (Appendices)

Week 15 – 16 .... Review, Presentation of Design Project

CLARK ATLANTA UNIVERSITY
DUAL DEGREE ENGINEERING PROGRAM
CEGR 102 - Introduction to Design

Student Project Module: Clean Energy / Mini-Grid Power generation

Lead Instructor: Dr. Olugbemiga A. Olatidoye

Course Description: This course/module is to develop conceptual designs that support a clean power generation within a Sustainable Environment that supports Grid interactive efficient buildings. The course examines modern energy usage, consequences and options to support sustainable energy development from a variety of fundamental, applied and cultural perspectives. The course will cover topics such as analysis of drivers for energy conservation and alternative energy source development and usage (microgrid, solar, wind, hydro, Bio-fuel), climate change, energy efficiency and energy storage strategies. This course enables students to examine existing energy systems and global energy options via readings, discussion, progress assessments, lab exercises, virtual, in-class and take-home assignments and individual and/or group presentations on selected energy topics.

Learning Objectives: At the end of the course, students will be able to:
- Demonstrate understanding of the physical and simulation factors underlying functionality and performance in technologies that utilize renewable energy sources (Solar, Wind, Hydroelectric, Geothermal, etc).
- Gain a quantitative knowledge of the main sources of renewable energy, the origins of those sources, and the means by which the sources can be exploited for energy generation
- Articulate the complete framework within which renewable energy and microgrid is studied, including the economic, socio-economic, cultural, historical and environmental context that are relevant.
- Identify, locate and critically evaluate information on renewable energy and energy storage systems. Include aspects of environmental ethics when evaluating.
- Intelligent method that optimize the operation of building’s active and passive systems to maximize energy efficiency.
- Whole-building-level interoperable and low cost automation systems that enable communication with building equipment and appliance to optimize operation to provide grid services. Include aspects of Cybersecurity, Artificial Intelligence, Internet of Things and Advance Manufacturing.

References & Resources:

1) *Renewable and Efficient Electric Power Systems* by Gilbert M. Masters, Wiley-IEEE Press, 2013, second edition.
2) For solar energy: https://pveducation.org (really excellent!!)
3) *The Solar Decision Book – Your Guide to Making a Sound Investment,* Richard H. Montgomery with Kim Budnick – Dow Corning Corporation, Midland, Michigan 48640
4) *Power Plant Engineering 2nd Ed.* By P.K. Nag, McGraw-Hill

Additional readings will be provided in Canvas to support various class topics.

DESIGN SCHEDULE

Periods	Content
1	Introduction & Overview of Design Problem DUE: Student's general research on Alternative Renewable Energy Microgrid, Building Envelopes and Sustainable Environment......................5% Credit
2	Introduction of Project Statement 1. General Information 2. Economics of Power Generation 3. Solar Energy (Passive and Active) 4. Microgrid Power generation 5. Forecasting (Smart weather system) 6. Energy Storage DUE: Student's evaluation of site requirements / carbon calculator. Bubble Diagrams to scale Present research on Clean Energy / Mini-Grid / Energy Hub Design ....5% Grade
3	Introduction to Evaluation Criteria DUE: Site Bubble Diagrams Schematic Building Diagrams Programming Information Site Model / 3D print ....5% Grade DUE: Schematic Plans and Elevations
4	Final Presentation Layout ....5% Grade
5	Presentation Techniques and Final Presentation Layout ....5% Grade
6	Pre-Jury ....5% Grade

How to make a Professional presentation. All final Programs must be submitted.

NOTE: Homework, Labs and Lab Reports: Homework will be assigned approximately weekly. While discussion of the homework assignments with other students is encouraged, each student must complete their own assignment. Exceptions to this rule are team-based exercises such as the carbon calculator (first assignment), any lab reports and the Final Project Milestones assignments. Small-team laboratory exercises examining aspects of solar power and wind power may be included in the class.

However, the labs this year may be simulation only or the instructors may provide the experimental data measured for the report. The Final Project Milestones assignments allow student teams to research and prepare contextual information in advance of the Final Project due date. Project teams will meet individually with the instructors to formally present and defend their Final Project content and structure.

Progress assessments: Topical quizzes will provide students the opportunity to check their comprehension of important concepts and will inform instructors about the effectiveness of the course material to date. Quizzes will be taken outside of class time and will be administered remotely through Canvas.

Final project: The course will culminate in assignment of a comprehensive, team-based final project that will consider resources and options to furnish energy for a location in Atlanta or Nigeria. Teams will be assembled by the instructors to create an effective mix of skills and backgrounds. Detailed instructions concerning the project will be provided mid-semester to allow teams sufficient time to develop their ideas. Final Projects are due during Finals Week on the day and time that the final exam is scheduled. There is no final exam scheduled for this course.

Grading: Grades are given on the basis of the components explained in the syllabus: (See attached Course Syllabus).

E. LETTERS OF SUPPORT FROM PARTNER ORGANIZATIONS

Partner organizations in Brea ing Barriers have provided "Letters of Support" to Groundswell for use in fundraising and securing project financing toward both the community resilience center and the AUCC Resiliency Center (microgrid, solar + storage).

Letters provided from: *[Available on request, but not provided here to reduce overall report length]*

- Partnership for Southern Equity
- Spelman College
- Morehouse College
- Atlanta University Center Consortium
- Georgia Power Corporation
- City of Atlanta Office of Sustainability ***(letter provided here in full)***

CITY OF ATLANTA
OFFICE OF THE MAYOR
55 TRINITY STREET, SW
ATLANTA, GEORGIA 30303-0324 OFFICE (404) 330-6789

May 18, 2021

To Whom it May Concern,

I am writing to confirm that The Mayor's One Atlanta Office of Resilience is excited to wor with Groundswell and other project partners to develop a community resiliency center in West Atlanta. We are eager to support innovation for this badly needed resiliency resource, demonstrating both care for our communities and climate justice through the use of solar power and advanced battery storage to power resilience services.

The City of Atlanta supports the use of a publicly accessible building such as the Dean Rusk YMCA or M. Agnes Jones Elementary School as the chosen location for this community resiliency center. The City currently operates several "cooling centers" already throughout Atlanta, but more community resources can always be helpful in this quadrant of the City. We welcome an innovative and sustainable design that brings critical services to some of the poorest neighborhoods in our city.

Installing a solar PV system with battery storage as a community resilience 'hub" in West Atlanta offering a safe shelter, a space to charge devices, store medicine, cool off or warm up in extreme weather, and access drin ing water and bathrooms for example extends critical services to a neighborhood that currently is one of the most energy burdened in Georgia. This project is also aligned with the City's goals for climate impact wor , resiliency, equity, and sustainability. We appreciate that the project design is being built from the beginning with the community as a partner.

The City of Atlanta understands that additional funding is required to bring this project to fruition, beyond what the City budget can now provide. We stand ready to explore support ongoing operations of the community resilience center and assist in planning and budgeting for the project as it unfolds.

Sincerely,

Shelby Busó, Chief Sustainability Officer
Mayor's One Atlanta Office of Resilience

Groundswell
COMMUNITY POWER

www.groundswell.org