

Residential Microgrid Case Histories



**In Support of 572 Van Ranst
By Aris Renewable Energy, LLC**

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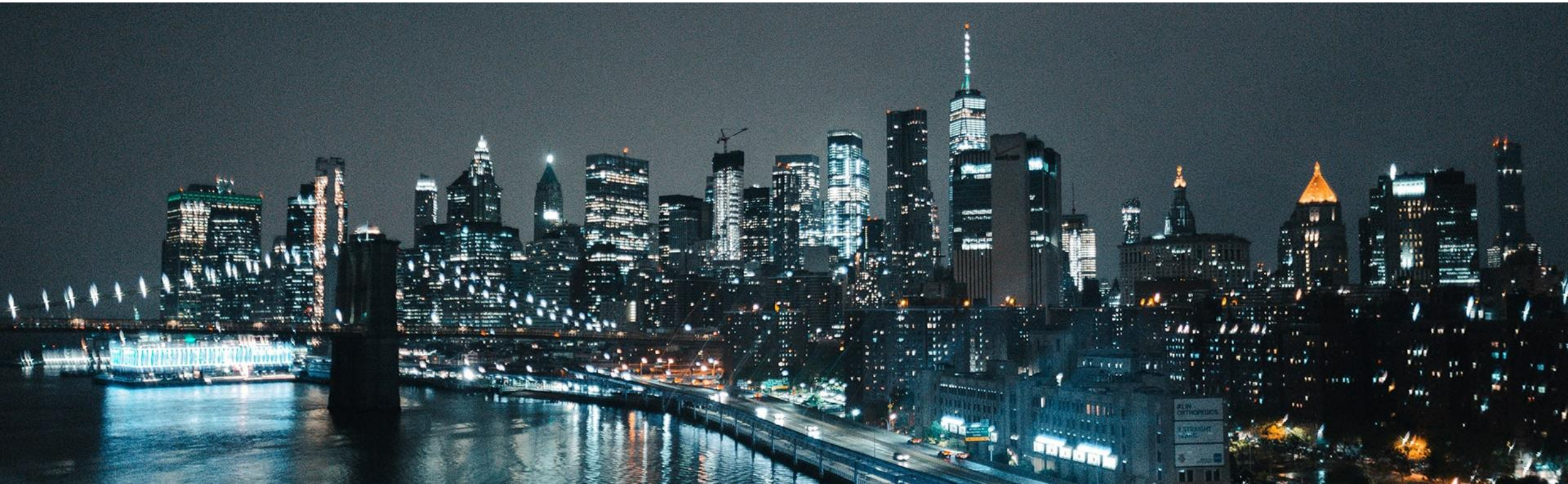
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ABOUT US

Founded in 2013, Aris Renewable Energy provides affordable, resilient, and sustainable energy solutions that serve to enhance the communities we serve. Aris Renewable Energy deploys innovative energy solutions that not only meet market demands but also benefit society.





MICROGRIDS

AMERICA'S GRID CONCERNS

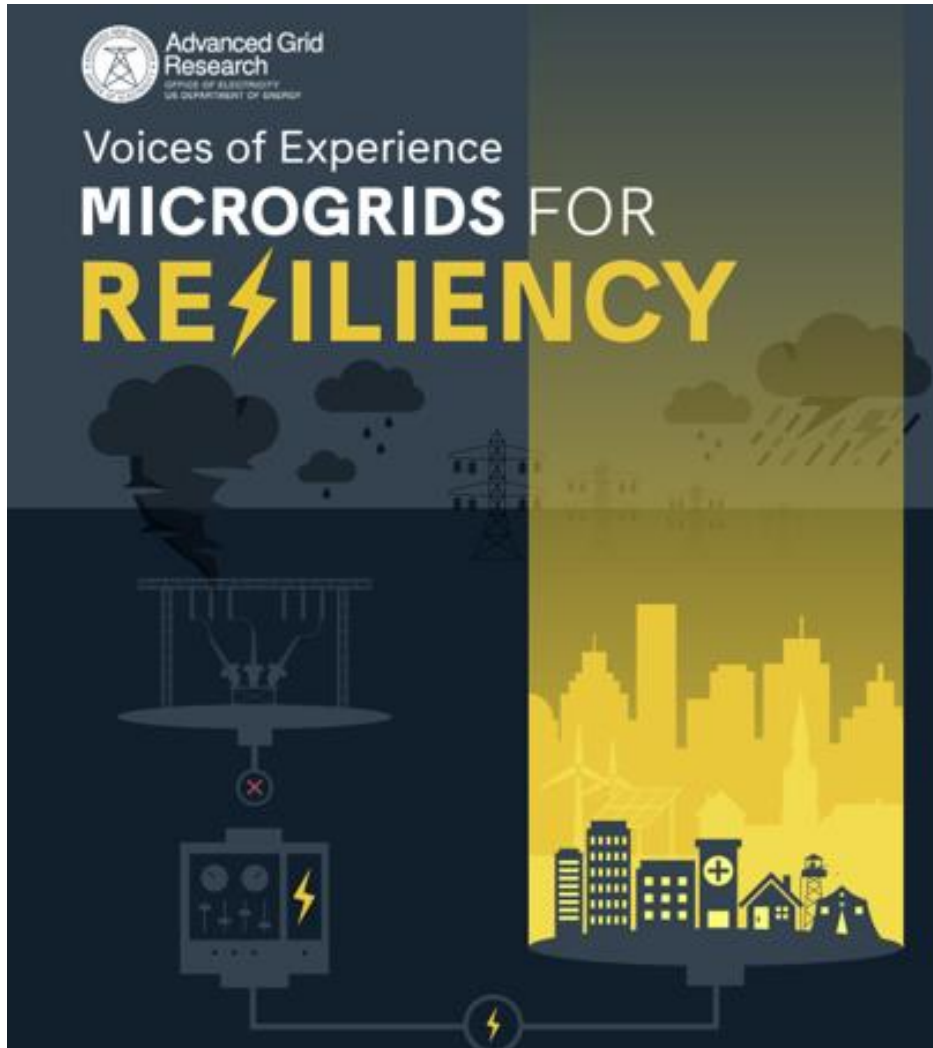
- Increasing presence of climate-change related concerns (severe weather events, flooding, wildfires, hurricanes) and grid infrastructure failures highlight the need for backup generation for critical and essential loads
- Up to 15% of electricity generated is lost in transmission

NEW YORK'S GRID CONCERNS

- Resource adequacy and transmission security margins tightening due to changes in generating capacity
- Without emergency assistance from neighboring ISOs, New York would not have sufficient energy resources to service demand

MICROGRIDS

- Generate local power partly or completely detached from the grid
- Offer more reliable power, lower costs, typically substantially reduce greenhouse gases, improve air quality, and level out power demands on the grid



Source: US DOE Office of Electricity

PROPONENTS OF MICROGRIDS

GOVERNMENT SOURCES

- US Department of Energy:
 - “Cut carbon emissions, other waste, and pollution”
 - “Back-up power for critical community infrastructure”
 - “Improve grid security and system efficiency”
- State of New York
 - Public safety, health, and security benefits, which include reductions in fatalities, injuries, property losses, or other damages and costs that may be incurred during prolonged power outages. Such outages are generally attributable to major storms or other events beyond the control of the local utility.
 - Microgrids for Critical Facility Resiliency in New York State
 - <http://nyssmartgrid.com/wp-content/uploads/Microgrids-Report-Summary.pdf>
- DOE Oakridge National Laboratory
 - Hospitals, military bases, and campuses have traditionally been the primary users for microgrids given their needs for critical energy loads. However, microgrids are increasingly being included in community resiliency planning due to their ability to provide continuous power to critical infrastructure and limit the impact of outages by localizing power generation close to critical services. <https://dg.resilienceguide.ornl.gov/microgrids>



PROPONENTS OF MICROGRIDS

LEADING INDUSTRY/UTILITY SOURCES

- Eaton: “Microgrids have emerged as an ideal solution to assure energy resiliency, independence from utilities, islanding, load control, and optimized energy usage”
- San Diego Gas & Electric (SDG&E): Announced that four microgrids will be added to meet high energy demand
- International District Energy Association: Serve[s] its surrounding community by providing a platform to support critical services... providing key services and emergency shelter”
- Schneider Electric: Microgrids offer advantages that can address a range of facility goals. With the right combination of on-site distributed energy resources (DERs) and controls, your organization can gain resilience to keep your operations running—even when the grid is down.



Town of Mamaroneck Microgrid Feasibility Study

Microgrid Project Results and Final Written Documentation

Prepared for:

New York State Energy Research and Development Authority (NYSERDA)
Jim Hastings, Project Manager
17 Columbia Circle
Albany, NY 12203-6399

Prepared by:

Booz Allen Hamilton Inc.
8283 Greensboro Drive
McLean, VA 22102

Date Submitted: March 31, 2016

Contract Number: 65093, Task 5

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MAMARONECK HAS STUDIED MICROGRIDS

NYSERDA PROGRAM “NY PRIZE”

- NY State awarded 83 x \$100k Municipal Microgrid Phase 1 Feasibility Studies
- Multi-buildings required utility involvement, more complex than the Van Ranst single building microgrid
- Both the Village of Mamaroneck and the Town of Mamaroneck won grant awards
- 11 Other Westchester municipalities performed Phase 1 studies
- The NY Prize goal was to generate local power partly or completely detached from the grid
 - Offer more reliable power, lower costs, typically substantially reduce greenhouse gases, improve air quality, and level out power demands on the grid



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TOWN OF MAMARONECK: MICROGRID FEASIBILITY STUDY

TOWN OF MAMARONECK, NY

5.2.2 Benefits to Local Government - The Town government will benefit from the expansion of local, distributed energy resources that will **help create a more resilient grid in the area**. In the short term, the proposed microgrid will supply electricity to three facilities that provide critical and important services to the community, including the Town government and police, a large shelter in the local high school, and an elderly residential facility. The availability of these facilities in an emergency situation will provide numerous public safety benefits to the Town. The Project Team met by phone with the community on March 10, 2016 to provide a summary of the project analysis and recommendations for a path forward.

5.2.3 Benefits to Residents of Mamaroneck - **Residents of Mamaroneck stand to gain from access to shelter and emergency and municipal services during an outage on the grid**. In addition, life-support services at the Sarah Neuman Center will be supported by the microgrid. Supporting the resiliency of an elder care facility is in the social good, even though this facility is not public. At present, these services are partially or wholly unavailable during outages; the proposed microgrid provides for unencumbered electrical service to the aforementioned facilities during a grid outage.

VILLAGE OF MAMARONECK: MICROGRID FEASIBILITY STUDY

VILLAGE OF MAMARONECK, NY

Village Mayor Norman Rosenblum is a member of the VOM Micro-Grid team. "The Village of Mamaroneck has long been pursuing efforts to strengthen our community and **make our businesses and residents more resilient to the impacts of hurricanes, Nor'easters and other major storms**, particularly as it relates to power outages and damages," said Mayor Rosenblum. "**Since large portions of the Village are within FEMA mapped flood plains, with impacts from both tidal and riverine flooding, it is important to maintain power** for these areas in order for them to operate sump pumps and other emergency equipment to protect structures".

<https://www.mamaroneckselfstorage.com/single-post/2015/07/08/mamaroneck-double-winner-in-ny-prize-microgrid-contest>





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TOWN OF MAMARONECK: MICROGRID FEASIBILITY STUDY

TOWN OF MAMARONECK, NY

- Overview: Awarded \$100,000 by NYSERDA to conduct microgrid feasibility study via the *New York Reforming the Energy Vision* (REV)
 - Mamaroneck is a flood prone area that has suffered damaging effects from several severe weather events since 2007
- Equipment: 200 kW backup diesel generation at Sarah Neuman Nursing Facility; Proposed 1,500 kW natural gas-fired engine located behind Mamaroneck High School; Proposed 125 kW PV array system located behind Mamaroneck High School
 - Supplies 100% of electricity requirements for critical facilities during emergency outage conditions – providing relief to residents in and around the town of Mamaroneck
 - Ensures that in an event of a power outage, those in the Sarah Neuman Nursing Facility will still receive life-supporting services



MARCUS GARVEY APARTMENTS

BROOKLYN, NY – 2017

- Overview: LMI housing complex with 625 units; First solar + storage microgrid at an affordable housing property in New York City
 - Neighborhood experiences rolling blackouts more frequently than other areas in New York City
- Equipment: 400 kW Solar; 300 kW lithium-ion battery storage; 400 kW Bloom Energy fuel cell
- Energy Storage System: Supplies emergency power for the building's security office, management office, and community room during power outages
 - Supports up to 100 kW of critical loads (heating, lighting, cell phone charging, and refrigeration for sensitive medicines)
- Microgrid Benefits: Reduces the complex's peak demand by 25%; Reduced Con Edison's peak demand in the area by 207 kW; Provides up to 12 hours of backup power for designated spaces

Wright, K., & Hanley, W. (n.d.). *RESILIENT SOLAR CASE STUDY: The Marcus Garvey Apartments Microgrid COMPLETED PROJECT* By Smart Distributed Generation Hub -Resilient Solar Project. https://nysolarmap.com/media/1844/marcus-garvey_casestudy_917.pdf

THE BREVOORT BUILDING

GREENWICH VILLAGE, NY – 2010



The Brevoort three nights into the Hurricane Sandy blackout with lights shining powered by four Tecogen InVerde CHP units.

- Overview: 1950s-era Cooperative housing apartment; Features 277 apartments
- Equipment: Includes four 100 kW natural gas combustion Combined Heat and Power systems
 - Able to seamlessly transition between grid tie and remote islanding modes in the event of a power outage
- Benefits:
 - Able to power the entire building including the central boilers, domestic water pumps, elevators, and all apartments
 - Maintained power, water, and heat during Superstorm Sandy when most buildings were without power, heat, and water



111 EAST 172ND STREET

BRONX, NY – 2018

- Overview: LMI housing apartment with 126 units
 - Provides on-site social services by Community Access staff with New York State's Office of Mental Health funding
- Equipment: Bright Power's Resilient Power Hub with 53 kW of solar photovoltaic panels, 18 kW of battery storage, and 10 kW of cogeneration capabilities
- Microgrid Benefits: Reduces costs of electricity bills year-round while maintaining power during an electric grid disruption
 - Powers an elevator, water pumps, lighting to corridors and exit stairwells, and the fire alarm system during power outages

111 East 172nd Street Solar Design & Installation. (n.d.). Bright Power. Retrieved April 5, 2023, from <https://www.brightpower.com/project/111-east-172nd-street/>



VILLAGE EAST TOWERS

MANHATTAN, NY – 2019

- Overview: Co-operative housing property with 434 units
 - Experienced substantial flooding during Hurricane Sandy
 - Wanted to foster a more resilient community without having to worry about the impacts of grid blackouts
- Equipment: 130 kW of cogeneration units
 - Uses natural gas to provide onsite power to both electrical and domestic hot water systems
 - Captures waste heat created during the generation process and preheats domestic water
- Benefits: Generates electricity from natural gas; Better protected during an electrical grid blackout (lights, pumps, and elevators can still be operational)



ARCHER GREEN

JAMAICA, NY – 2021

- Overview: Affordable multifamily housing property with over 380 units; Set to achieve LEED Gold Status due to sustainability efforts
- Equipment: Bright Power's Resilient Power Hub
 - Resilient Power Hub: Equipped with 73 kW of solar generation, 140 kW of cogeneration, and 250 kW of battery energy storage systems
- Benefits: Provides onsite resiliency and protection against power outages; Provides ongoing savings through shaving peak demand

Walton, R. (2021, December 7). *StackPath*. [www.energytech.com](https://www.energytech.com/energy-efficiency/article/21183111/new-387unit-archer-green-residential-housing-includes-chp-solar-battery-storage-in-new-york). <https://www.energytech.com/energy-efficiency/article/21183111/new-387unit-archer-green-residential-housing-includes-chp-solar-battery-storage-in-new-york>



777 MAIN STREET

HARTFORD, CT – 2016

- Overview: Total area of 507,000 SF; 295,000 SF allocated for residential use (285 units); 35,000 SF allocated for ground level retail
- Equipment: 115 kW rooftop solar array; 400 kW fuel cell
 - Utilizes a hydrogen fuel cell to obtain heat, electricity, and water through electrochemical processes
 - First commercial microgrid to be financed through C-PACE
 - Fuel cell will also power 11 EV charging stations in the building
- Benefits:
 - Allows the building to “island” itself from the grid
 - May operate independently from the grid in an event of natural disaster
 - Over \$300,000 in energy savings over the course of its first year in operation

Curtin, S., & Gangi, J. (2015). *The Business Case for Fuel Cells 2015: Powering Corporate Sustainability*. Energy.gov. <https://www.energy.gov/eere/fuelcells/articles/business-case-fuel-cells-2015-powering-corporate-sustainability>



BACKUS HOSPITAL

NORWICH, CT – 2014

- Overview: 213 bed, not-for-profit acute care community hospital providing state-of-the-art medical services with personalized attention and care
 - Extreme outages during Tropical Storm Irene which left the hospital without any air conditioning during the summer heat (the windows of the hospital are also unable to be opened)
- Equipment: 10 MW of Internal Combustion Engines
 - Consists of four generating units (2.5 MW each) which utilizes oil to provide onsite power
- Testimonial by Keith Fontaine – Backus’s Vice President and Chief Administrative Officer
 - “It provides critical redundancy to us and essentially means there will never be a power failure at the hospital.”

Benson, A. (2012, December 18). *\$1.5M microgrid proposed for Backus Hospital*. Norwich Bulletin.
<https://www.norwichbulletin.com/story/news/local/2012/12/19/1-5m-microgrid-proposed/64951874007/>



SHOPRITE SUPERMARKETS

NEW JERSEY AND NEW YORK – 2019

- Overview: Provides critical community resource with continuous operation during extreme weather events
 - Hurricane Sandy: Many stores across New Jersey and Long Island lost power and millions of dollars of spoiled food goods went to waste
- Equipment: 6.5 MW of installed electric capacity across nine ShopRite stores in New Jersey and Long Island
 - Natural gas engines have been sized to meet each site's peak summer demand
 - Built-in load following and automatic island mode capabilities
- Benefits: 19 outages avoided in 2019 through on-site generation and automatic islanding
 - Reduced each store's carbon footprint by 57% in Long Island and 31% in New Jersey

Microgrid Island Mode Events | Unison Energy, LLC. (n.d.). Unison Energy. Retrieved April 4, 2023, from <https://unisonenergy.com/resources/blog/anatomy-of-a-microgrid-island-mode-event/>



MONTGOMERY COUNTY

MONTGOMERY COUNTY, MD – 2018

- Overview: Local government with 9,000 employees and 400 buildings totaling 9 million square feet – represents 16% of the state's economy
 - 2012: Fast-moving line of tornadoes, lightning, wind, and rain devastated the area – leaving over 250,000 Montgomery County residents and 71 county facilities without power
 - Aging electrical infrastructure with average age of 30 to 50 years
- Equipment: Generates over 11 million kWh of electricity at two microgrid facilities; Reduces greenhouse gas emissions by 6,800 metric tons each year
 - Public Safety Headquarters: 2 MW of solar parking canopies, 800 kW of natural gas-powered CHP systems
 - Montgomery County Correctional Facility: 240 kW of natural gas-powered CHP systems



RED HOOK COMMUNITY

BROOKLYN, NY – PLANNING

- Overview: Capacity of 10 MW for Brooklyn's community; Serves 2,800 residential apartments in Red Hook houses
- About the Red Hook Community:
 - Experiences more power outages on average than most of the NYC grid
 - Old transformers were exposed to extreme weather events; many exploded in February 2022
 - Superstorm Sandy's waters corroded many power lines in the neighborhood, and many have not been repaired or replaced
- Plan: Microgrid planned to serve low-income neighborhoods in Brooklyn
 - Target communities that were devastated by hurricanes Sandy and Irene which suffered power outages that lasted weeks
 - Will supply residents with between 2 MW and 10 MW of power
 - Currently assessing the sustainability of local distributed generation sources (cogeneration, wind, and solar energy)

PROJECT DESCRIPTION. (2015, August 18). Red Hook Community Microgrid.
<https://redhookcommunitymicrogrid.wordpress.com/project-description/>