New York City Housing Authority (NYCHA) Renewable Energy and Storage Feasibility Study Support

Cooperative Research and Development Final Report

CRADA Number: CRD-21-18244

NREL Technical Contacts: Jonathan Morgenstein and Jal Desai

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Technical Report
NREL/TP-7A10-96204
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Cooperative Research and Development Final Report

Report Date: June 24, 2025

In accordance with requirements set forth in the terms of the CRADA agreement, this document is the CRADA final report, including a list of subject inventions, to be forwarded to the DOE Office of Scientific and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

Parties to the Agreement: New York Power Authority

CRADA Number: CRD-21-18244 (Project 1)

CRADA Title: New York City Housing Authority (NYCHA) Renewable Energy and Storage Feasibility Study Support

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Sponsoring DOE Program Office(s):

Office of Energy Efficiency and Renewable Energy (EERE), Solar Energy Technologies Office

Joint Work Statement Funding Table showing DOE Commitment:

No NREL Shared Resources

Executive Summary of CRADA Work:

To support New York Power Authority (NYPA)'s execution of a renewable energy and storage feasibility study on behalf of two NYCHA multi-family residential buildings in Brooklyn, New York.

CRADA benefit to DOE, Participant, and US Taxpayer:

- Assists laboratory in achieving programmatic scope
- Enhances the laboratory's core competencies
- Uses the laboratory's core competencies

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Summary of Research Results:

NREL provided support to NYPA's assessment of the potential installation of a solar photovoltaic (PV) and battery energy storage system (BESS) at two multi-family residential buildings in Brooklyn, New York. These buildings are owned by NYCHA and are referenced as "Borinquen Plaza I" (Moore St.) and "Borinquen Plaza II" (110 Humboldt Street). The PV+BESS systems were assessed to address power quality issues due to voltage fluctuations. NREL also supported NYPA's exploration of additional energy resiliency benefits that these systems could provide, both by themselves and together with existing combined heat and power backup generation.

The final analysis was delivered to NYCHA via a slide deck and NYCHA published a report based on NREL's work, giving credit to NREL and NYPA, on March 25, 2022: "New York City Housing Authority: Borinquen Plaza I & II Reliability Project Final Report." https://climate.cityofnewyork.us/wp-content/uploads/2024/06/Rikers-Report.pdf

Purpose

To support NYPA's execution of a renewable energy and storage feasibility study on behalf of two New York City Housing Authority multi-family residential buildings in Brooklyn, New York.

Scope of Work

NREL will provide the following support to NYPA's assessment of the potential installation of a solar photovoltaic (PV) and battery energy storage system (PV+BESS) at two multi-family residential buildings in Brooklyn, New York, owned by the New York City Housing Authority (NYCHA): Borinquen Plaza I (Moore St), and Borinquen Plaza II (110 Humboldt Street). The PV+BESS is being assessed to address power quality issues (voltage fluctuations). NREL will also support NYPA's exploration of additional energy resiliency these systems could provide, either by themselves, or together with combined heat and power (CHP) backup generation. Along these lines, tasks include:

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Task 1: NREL will provide NYPA with a PowerPoint slide deck with proprietary cost-benefit analyses of:

a. PV+BESS based on site conditions and sized to support power quality issues, covering variable scenarios such as if the system is:
    i. Owned and operated by NYCHA
    ii. Owned and operated by a third party
b. Other NREL-identified potential revenue streams
    i. e.g., demand-response (DR) programs or wholesale market opportunities.
c. Building energy use optimization systems
    i. On dispatch end--
        1. This could be combined with a larger BESS if it helps offset some of the costs through greater revenue
    ii. For load management
        1. Including energy conservation measures
d. Natural gas fueled CHP generator for backup power and particularly for resiliency
    i. A standalone natural gas CHP system
    ii. A CHP system paired with PV+BESS
    iii. What is the long-run emissions impact/value in consideration of NYC's "net-zero by 2040" goals?

Using several tools, NREL experts conducted an analysis of 15 PV+BESS scenarios for Buildings 3 and 4 of Borinquen Plaza I as well as its Community Center. For each of the scenarios evaluated, NREL experts evaluated two 'cases': a financial case (systems optimized for financial benefit) and a resilience case (systems optimized for resilience benefits). Each of these scenarios modeled PV system size, outage duration, financing, and other factors. To align with NYCHA's goals, resilience cases were given priority in analysis.

To estimate PV potential, NREL experts used Project Sunroof,[1] the NY SolarMap,[2] and Helioscope[3] to provide a comprehensive view. Using this combination of models, experts were able to compare quick, streamlined estimates with site-specific details (such as obstructions, shading, etc.) to get an actionable assessment of each location. Additionally, experts conducted BESS feasibility analysis using NREL's Renewable Energy Integration and Optimization (REopt) [4] modelling platform to estimate cost-optimal BESS installations and lifestyle costs of lithium-ion BESS installations.[5] The resulting PV+BESS assessments were combined for

1 Project Sunroof. https://sunroof.withgoogle.com
2 NY Solar Map. https://nysolarmap.com
3 Helioscope. https://helioscope.aurorasolar.com
4 REopt. https://reopt.nrel.gov/tool
5 REopt model outputs for BESS capacity are theoretical and may not reflect commercially available BESS offerings.

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resilience and financial cases. For financial cases, REopt analysis generated the most cost-effective BESS size given the PV size generated by the tools. For the resilience cases, value of lost load was taken into consideration to determine cost-effectiveness of the systems. Analyses in the latter cases determined that if the value of lost load were set at $250/kWh, resilience scenarios became cost-effective.

NREL experts also conducted analysis of several other factors including purchase methods and other energy saving measures. Analyses of incentives and financing measures considered state and federal options that affect both direct purchase and third-party ownership of systems. For other energy saving measures, experts considered ground source heat pumps, combined heat and power, and other measures such as retrofit windows, lighting, sensors, and efficient appliance upgrades.

All of these findings were compiled into a set of slides and provided to NYPA and NYCHA.

Task 2: NREL will assist NYPA in its full report development

a. Contributing a write-up of the NREL analysis process

Of the 30 cases NREL assessed (15 financial, and 15 resilience), ultimately only 2 financial cases were cost-effective without incorporating the value of lost load. However, these two cases consisted of small PV systems that were deemed unable to tangibly contribute to NYCHA's resilience goals. Of the resilience cases evaluated, the value of lost load was required to play a significant role in determining cost-effectiveness. Based on NREL's analysis, NYPA recommended that NYCHA pursue the purchase of a PV+BESS system that would power the Streamlined Critical Load over a 24-hour outage for the evaluated buildings. NYPA determined that this system would support NYCHA's resilience goals while also minimizing the value of lost load costs necessary to be cost-effective. NREL analysis also determined that direct purchase would be the most effective given the incentives available to NYCHA. However, NYPA noted that if capital was not available for direct purchase, third party ownership would also be a viable option.

Following the completion of this analysis, NYCHA incorporated all of NREL's work into their published report, with assistance from NYPA and NREL. This report continues to serve as a resource for decision making as NYCHA considers measures to take in the pursuit of its resilience goals.

The report can be found here:
https://climate.cityofnewyork.us/wp-content/uploads/2024/06/Rikers-Report.pdf

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Task 3: NREL will provide separate, follow-up assistance to NYPA in completion of the "Strategic Guide to Deploying Energy Storage in NYC Enhancing Renewable Energy, Resiliency, and Reliability" report (ESS Report).

a. NREL will provide assistance to NYPA in responding to future questions and comments from the NYC's Department of Citywide Administrative Services (DCAS) on the ESS Report, until its final publication.

DCAS did not request follow-up assistance with regard to the ESS Report that NREL drafted for them under a previous NREL-NYPA contract. Therefore, NREL never provided any support under this Task.

Task 4: Other assistance as requested by NYPA that is consistent with the existing scope and with NREL's decarbonization and energy expertise. Any changes to the scope in #1, or #2, will require changes to the timeline in #3.

NYPA requested no further follow-up assistance, so NREL did not provide any further assistance.

Task 5: CRADA Final Report: Preparation and submission in accordance with Article X.

This report serves to meet the requirement for the CRADA Final Report with preparation and submission in accordance with the agreement's Article X.

Subject Inventions Listing: None.

ROI#: None

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