

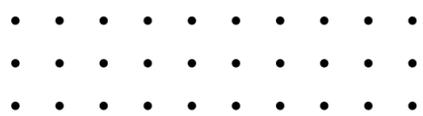
Playground at Rockaway Community Park.
Adapted from photo by Esto/Albert Vecerka

ENERGY AND TECHNOLOGY

Community-Based Resilience Solutions

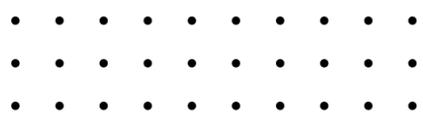
Mathias Berthelot
Cassandra Pin
Sophie Chen





OUTLINE

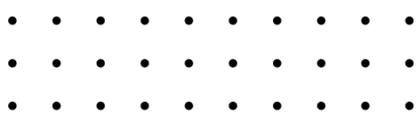
1. Executive Summary
2. Infrastructure Resilience Challenges
3. Community-based Solutions
4. The Rockaways and Response
5. Microgrid Basics
6. Funding Sources and Financing
7. Integrating Resilience Assets
8. Comparable Projects
9. Cost Estimate and Insights
10. Recommendations and Next Steps
11. Q&A



EXECUTIVE SUMMARY

This project explores the concept of community-based infrastructure solutions in response to growing resilience needs and the traditional top-down approach to infrastructure funding.

Through a case study of a potential microgrid in the Rockaways, we demonstrate how community-driven initiatives can effectively address the challenges faced by underserved communities.



INFRASTRUCTURE RESILIENCE CHALLENGES

CLIMATE CHANGE

Increasing frequency and severity of extreme weather events and natural disasters

FUNDING

- **~50%** of BIL/IIJA still unspent
- **33%** of IRA energy and climate funding unspent
- Unclear how much of Biden appropriations are shielded from repeal, but further funding increases are unlikely

Energy and Technology

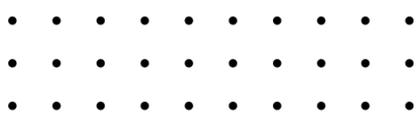
INFRASTRUCTURE CONDITION AND CAPACITY

60% of U.S. distribution lines are surpassing their 50-year life expectancy, while demand is forecasted to increase **20-40% by 2050**

REGULATION

Interconnection procedures and queuing (FERC), NEPA permitting, and local permitting and zoning all hamper transmission expansion and grid modernization





COMMUNITY-BASED SOLUTIONS

LOCAL ENGAGEMENT AND ADVOCACY

- Communities advocate based on local risks and needs
- Creative, unique solutions tailored to specific areas

PUBLIC-PRIVATE PARTNERSHIPS

- Collaboration with private companies & local governments to secure additional funding

ECONOMIC ACTIVITY

- Training and employing residents in grid maintenance boosts the local economy
- Workforce supports ongoing maintenance & upgrades



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THE ROCKAWAYS

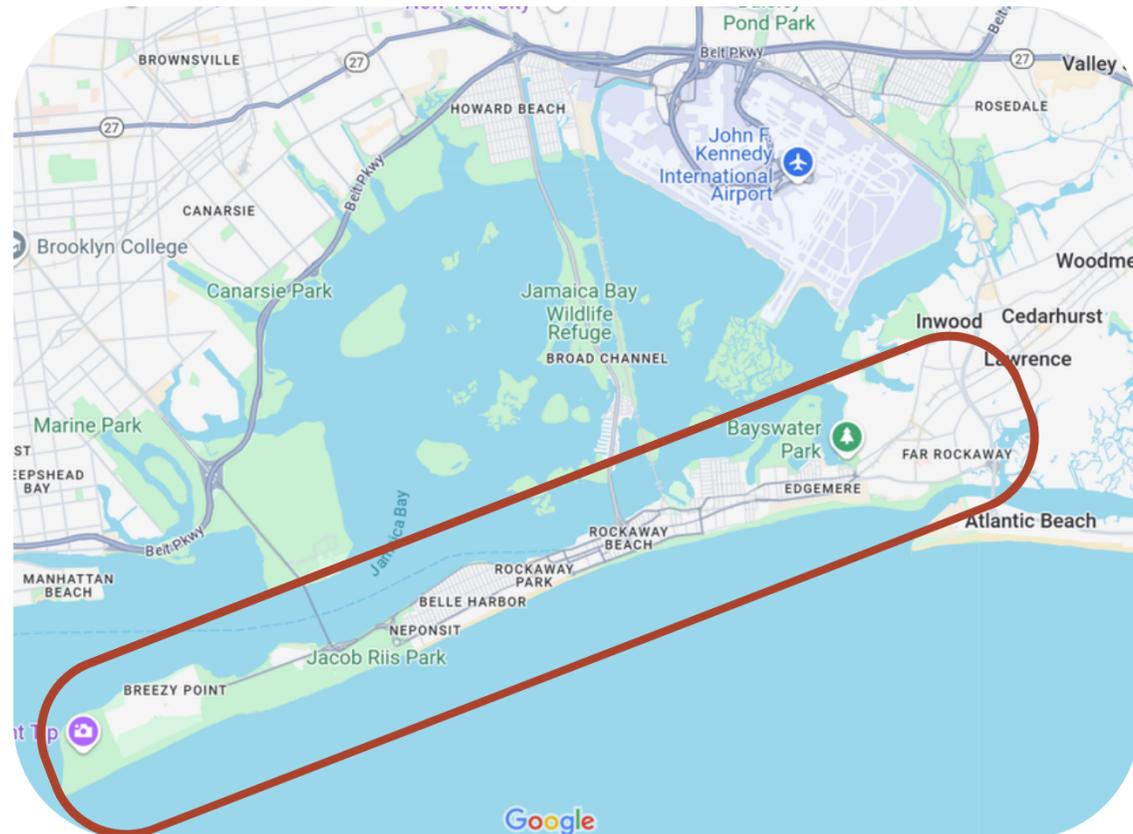
Case Study

HURRICANE SANDY IMPACTS

- **100,000+** residents affected
- Power outages, critical failures (hospitals, water pumps) lasting for **3 weeks**



Photo: WNYC - NOV 12: Destroyed homes after Hurricane Sandy in Breezy Point, Far Rockaway



PROPOSED MICROGRID SOLUTION

GENERATION

Distribute local wind & solar

STORAGE

Stabilize supply off peak or during storms

INTEGRATION

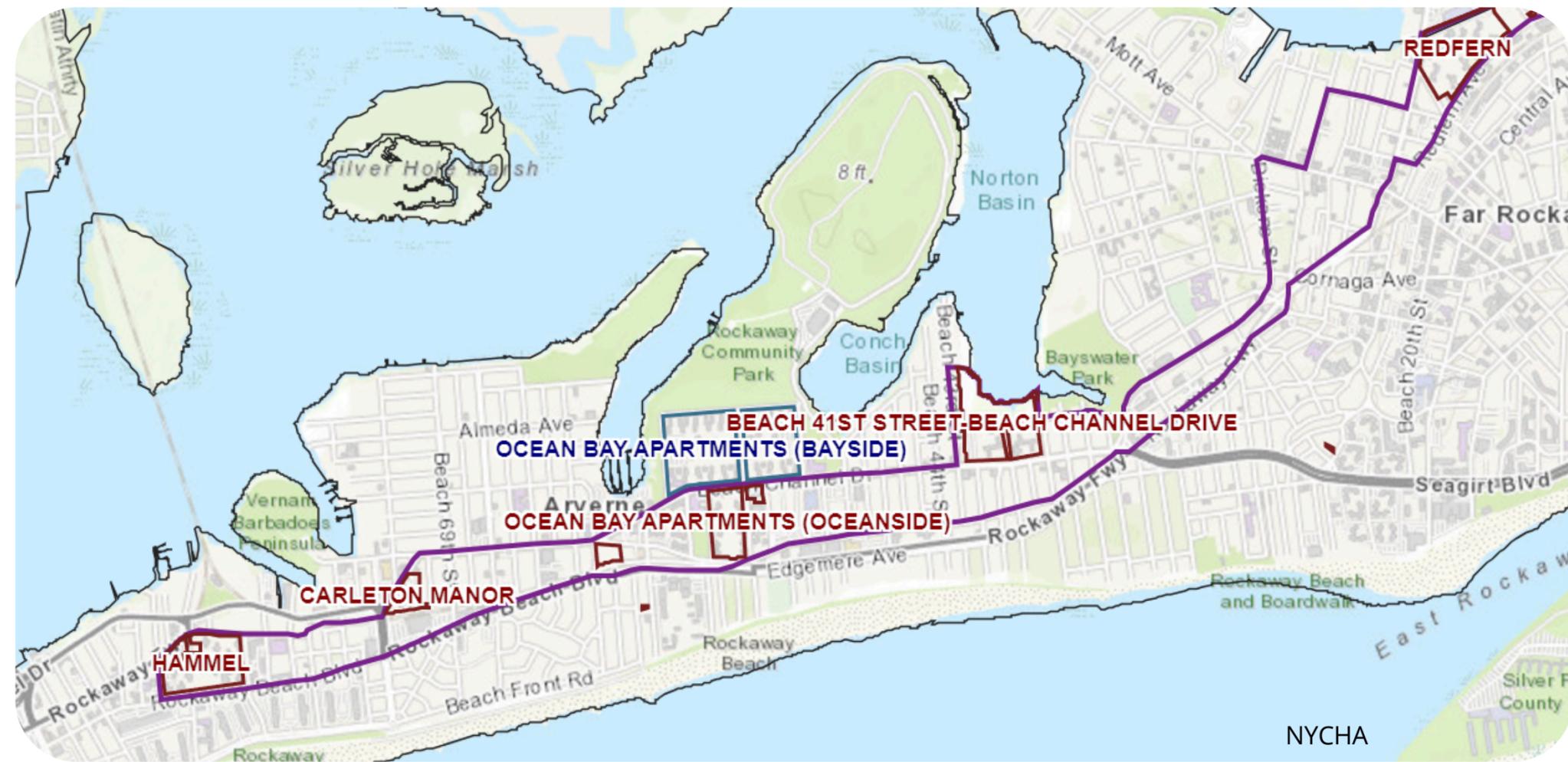
Reliability with or without main grid

THE ROCKAWAYS

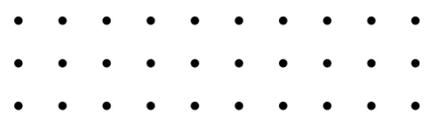
Case Study

Transportation

- 2 lines: metro A and S



QS03 BOROUGH
OCEAN BAY APARTMENTS: 1,400 UNITS



RESPONSE

STAGNATION

- 12 years of neglect on energy outage solutions
- Focus has been on urban forestry, shoreline restoration and flood management, and transit

ENGAGEMENT

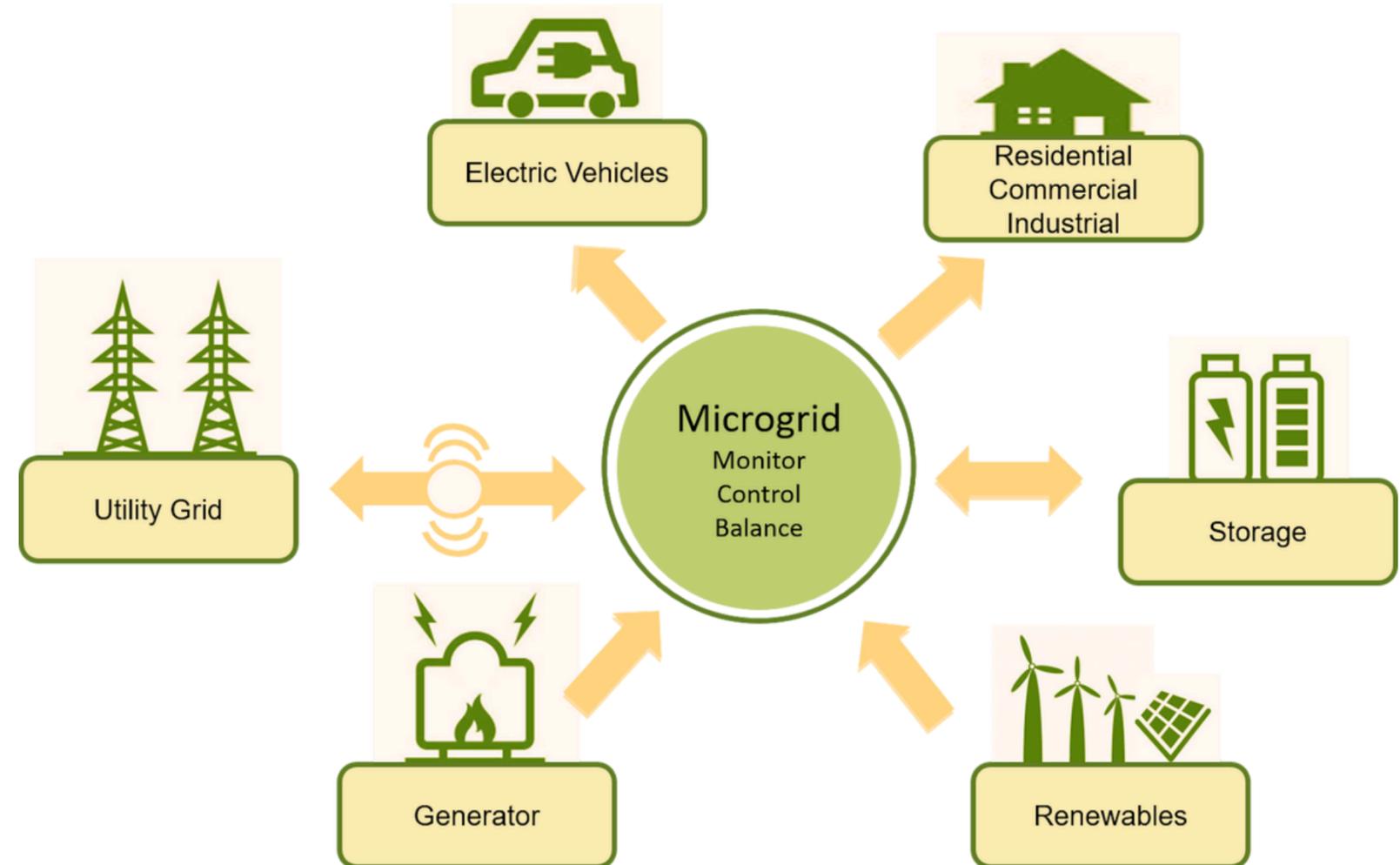
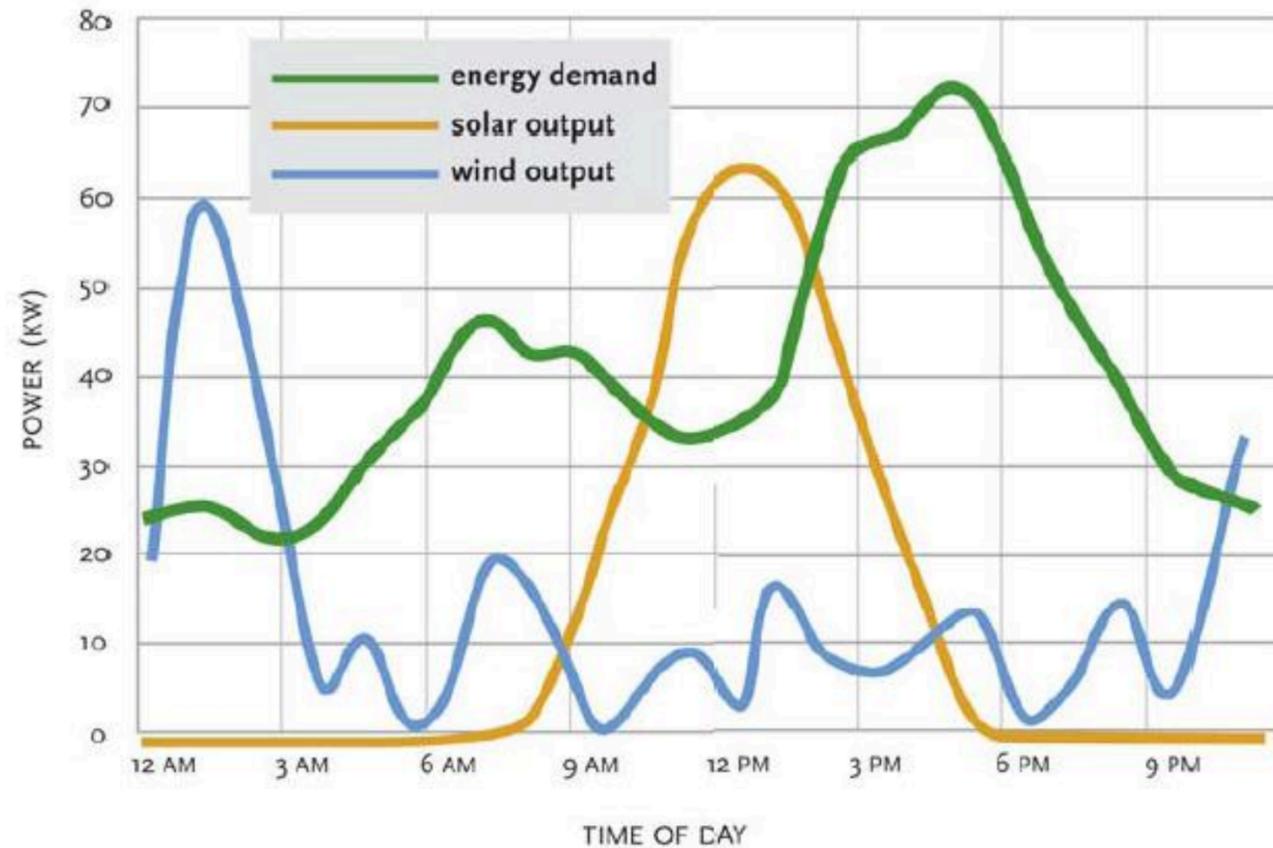
- Businesses have welcomed investing in a resilient grid, but residents in the area lack awareness and fear uncertainty

NEW DEVELOPMENT

- Uncoordinated, high-density housing developments have emerged since destruction
- Other infrastructure, like parking and schools, is inadequate for increased density



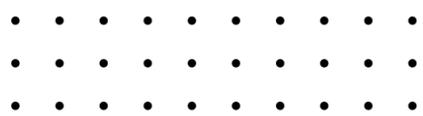
MICROGRID BASICS



MICROGRID

A localized energy grid and control system

- Matches demand by managing intermittent resources (wind, solar), batteries and main grid
- Can seamlessly disconnect from the main grid in outages
- Strategically designed and hardened against storm impacts
- Prioritizes critical loads during emergencies



FUNDING SOURCES AND FINANCING

PUBLIC-PRIVATE PARTNERSHIPS

Long Island Power Authority
Other utilities working for CLCPA compliance
Grid technology companies
Private developers

FEDERAL FUNDING

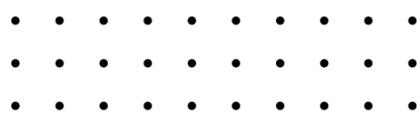
Previous DOE Microgrid Funding, FEMA, HUD
Current **tax credits** for clean generation, storage, and microgrid control (up to 30% of investment + 20% for a low-income zone)

STATE AND CITY FUNDING

NYSERDA and NY Power Authority (NYPA)
NYCEDC and Mayor's Office of Resiliency
Green bond financing

REVENUE STREAMS

Net metering: sell excess power to main grid
Peak shaving: sell net demand management by battery system
Ancillary services: sell frequency regulation and voltage support
Avoid losses associated with grid disruptions



INTEGRATING RESILIENCE ASSETS

OFFSHORE WIND INTEGRATION

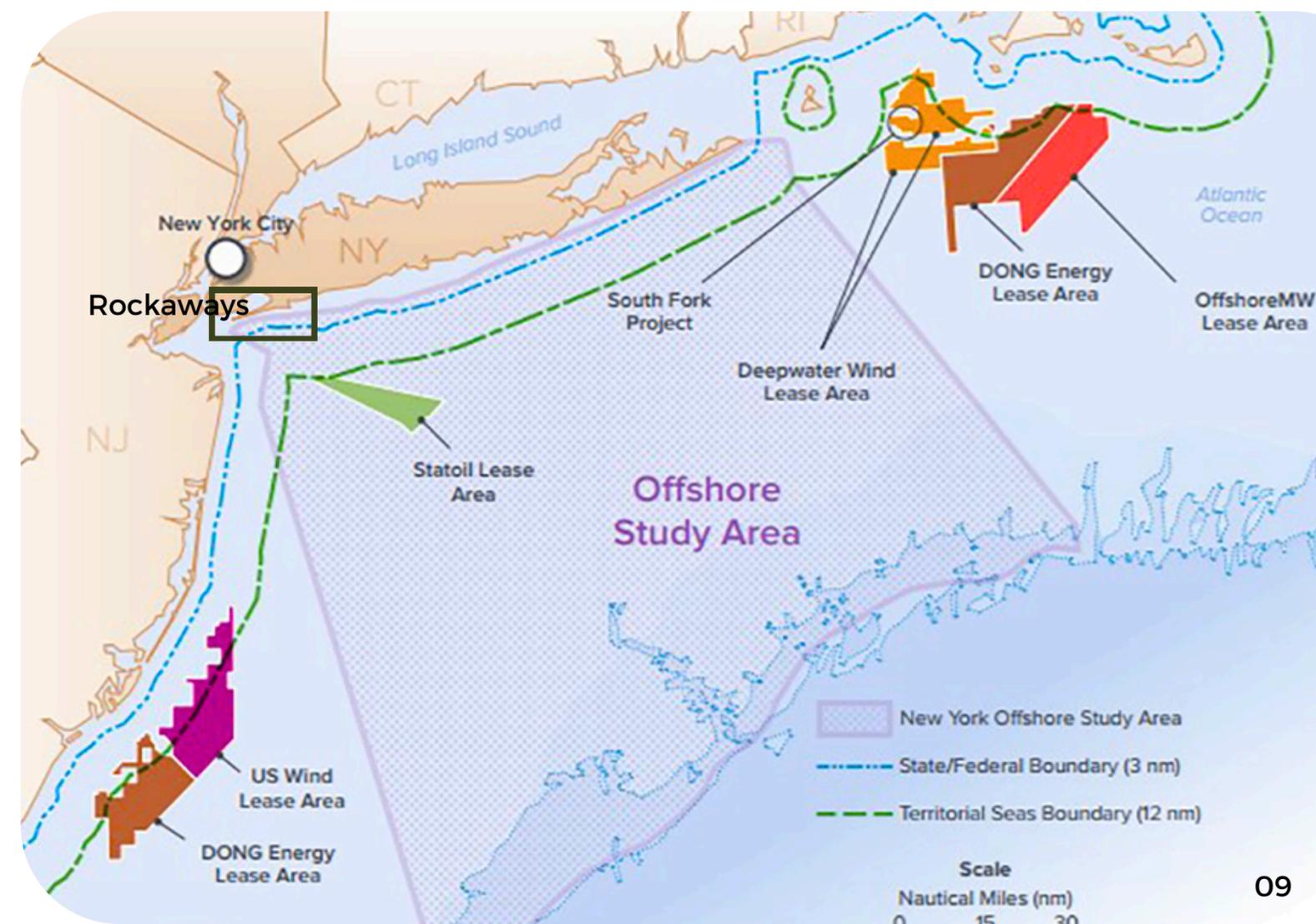
- Grant integration and control of new wind power assets to Rockaways microgrid
- Direct peak shaving revenue towards maintenance

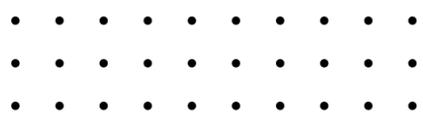
MTA A-LINE REPAIR AND RECONSTRUCTION

- Install medium voltage distribution cables along the fortified aboveground viaducts



"A" train crossing the North Channel Bridge towards Hamilton Beach.
Photo by Jose Garrido, November 2016.





INTEGRATING RESILIENCE ASSETS

Offshore Wind

Statoil

- Statoil Wind US wins New York offshore wind lease sale across from Rockaways
- USD 42.5 million for rights to build an offshore wind farm at the 79,350-acre area.

Ørsted

- 25 year offshore wind farm lease with a capacity of 880MW. Operational by 2024.
- \$700 million invested.
- They are also involved with Revolution Wind to power Rhode Island and Connecticut.



Sunrise project New York, US. Image courtesy of Neil Stevenson



COMPARABLE PROJECTS
Brooklyn Microgrid

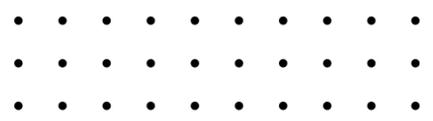


Impetus: Park Slope residents wanted to trade rooftop solar energy

- Blockchain-based trading on “virtual grid” (using existing ConEd grid)
- Partnership with Siemens and Lo3 Energy
- Smart meters installed in participating housing
- Small physical grid installed for essential facilities like hospitals
- Regulatory sandbox status
- “Simple and successful”
- Planned battery storage

Resilience? monitoring? longevity?

Lo3 Energy



COST ESTIMATE AND INSIGHTS

Based on NREL “Microgrid Cost Study 2019”

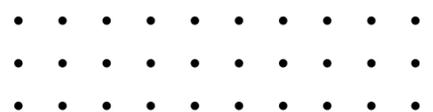
- \$/MW capacity increases with grid complexity (more renewables and higher “soft costs”)
- Grid control units and smart devices are becoming more affordable
- Utility-scale microgrids connect at medium voltage level, increasing infrastructure costs

Microgrid with DERs: Cost Estimate by Scale

Residential	\$10,000 - \$50,000/MW
Community Microgrid	\$500,000 - \$2 million/MW
Large Commercial/Utility-Scale	\$2-4.5 million/MW

Estimated Rockaways utility-scale demand: 100 MW

**Rockaways Microgrid cost estimate: \$250-500 million,
depending on extent and design**



RECOMMENDATIONS AND NEXT STEPS

DEMONSTRATIVE MODELING AND SIMULATION

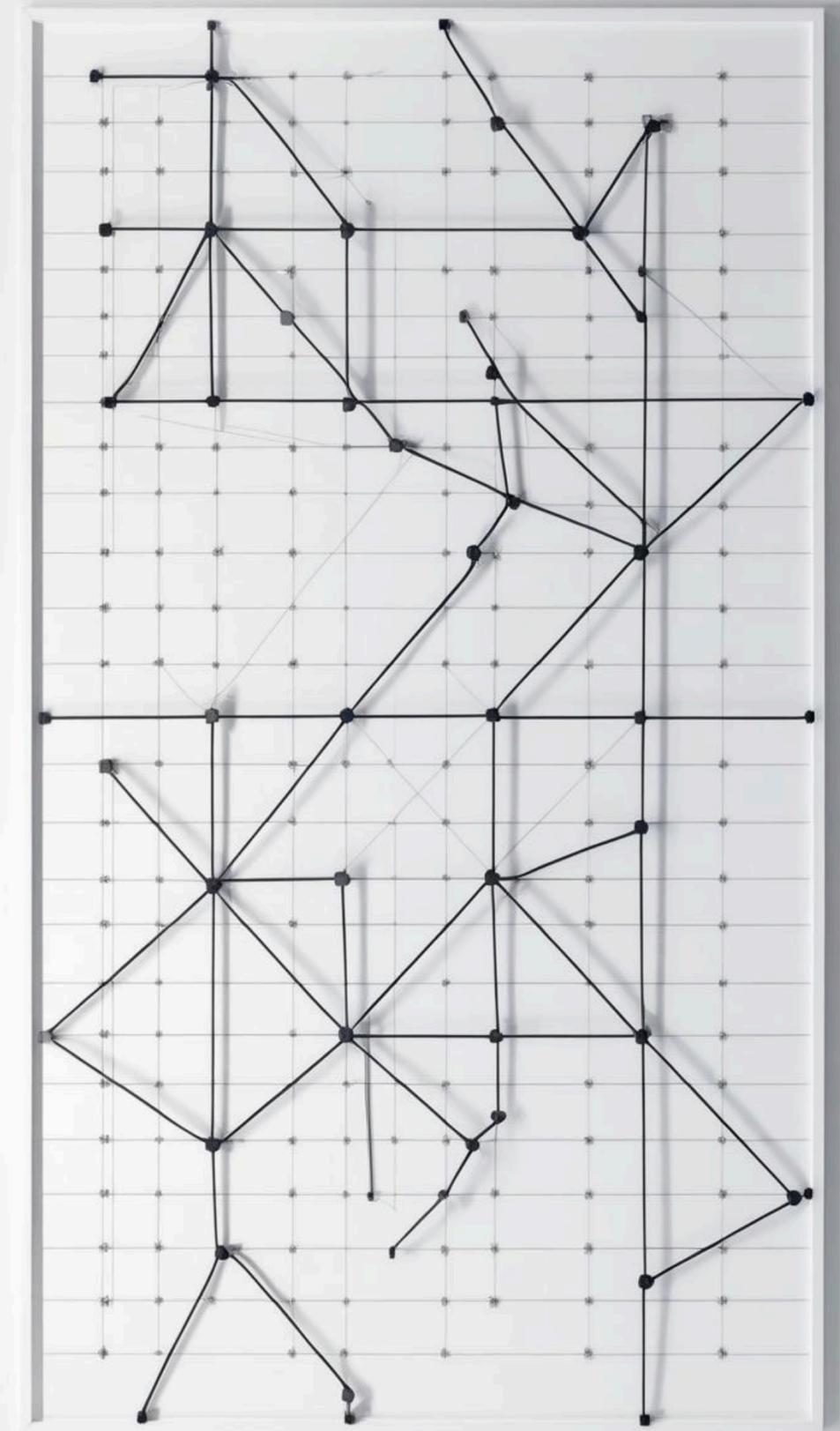
Model potential climate impacts and a microgrid system
Make a compelling case for implementation, including cost savings and revenue structures

COMMUNITY ENGAGEMENT

Formation of a named entity to combat lack of awareness
Partnership with a firm with subject matter expertise to increase accountability

WIDER ADVOCACY

Explore avenues for buy-in from larger agencies and private entities



Q&A



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Photo: Paola +Murray

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