RESILIENT POWER

A project of CleanEnergyGroup

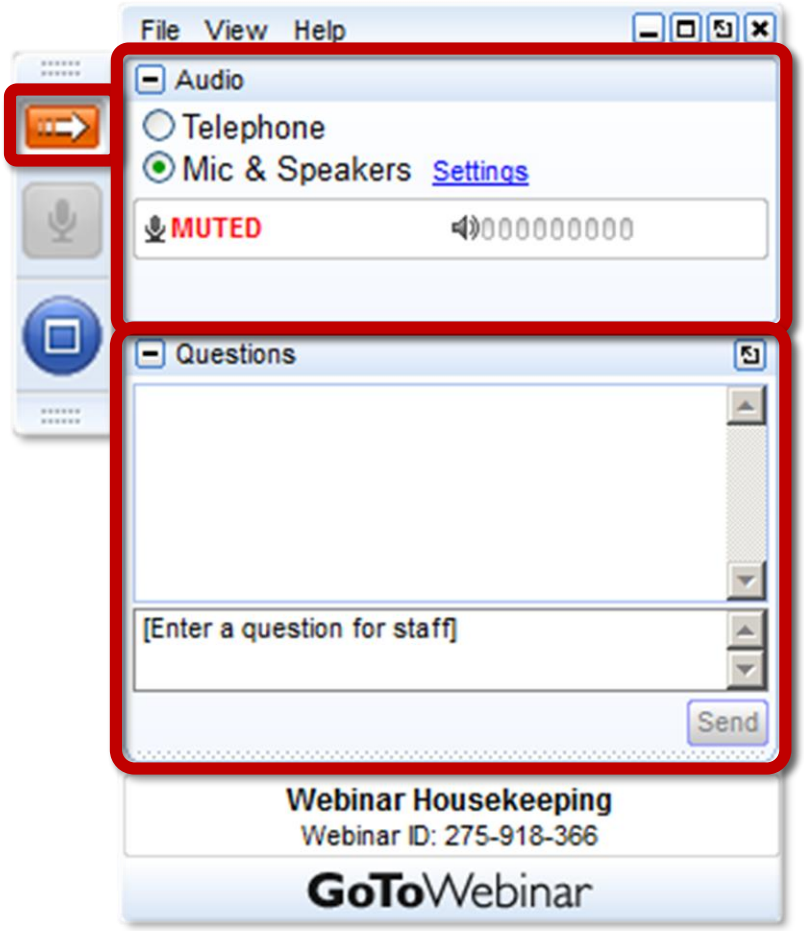
Marcus Garvey Apartments: A Solar+Storage Microgrid for Affordable Housing in Brooklyn, NY

CleanEnergyGroup

Innovation in Finance, Technology & Policy

November 16, 2017

Housekeeping



Use the red arrow to open and close your control panel

Join audio:

- Choose Mic & Speakers to use VoIP
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Submit questions and comments via the Questions panel

This webinar is being recorded. We will email you a webinar recording within 48 hours. Resilient Power Project webinars are archived online at: www.resilient-power.org

Panelists

- **Seth Mullendore**, Clean Energy Group
- **Rob Sanders**, Clean Energy Group
- **Josh Weisstuch**, L+M Development Partners
- **Doug Staker**, Demand Energy
- **Erangi Dias**, NYCEEC

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L+M

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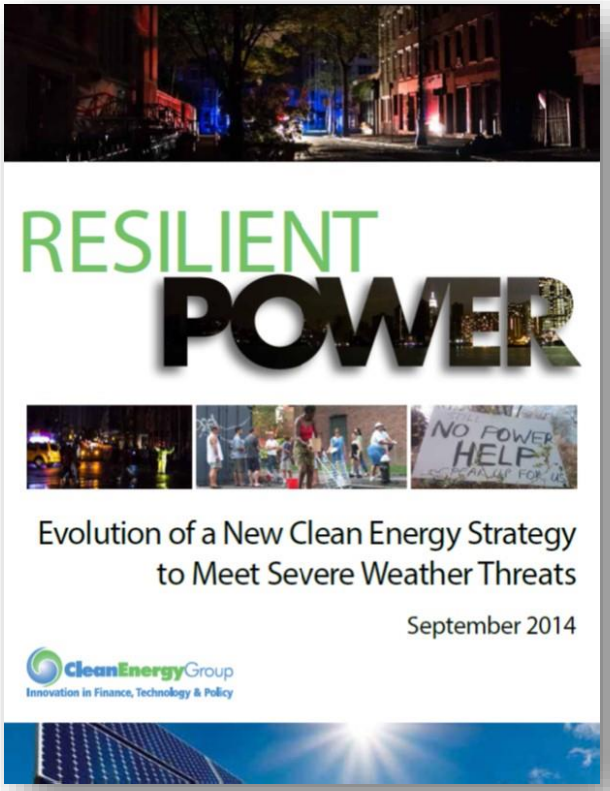
Who We Are



www.cleanegroup.org

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Meridian Institute
Connecting People to Solve Problems

CleanEnergy States Alliance

THE JPB FOUNDATION

11TH HOUR PROJECT
THE SCHMIDT FAMILY FOUNDATION

Barr Foundation

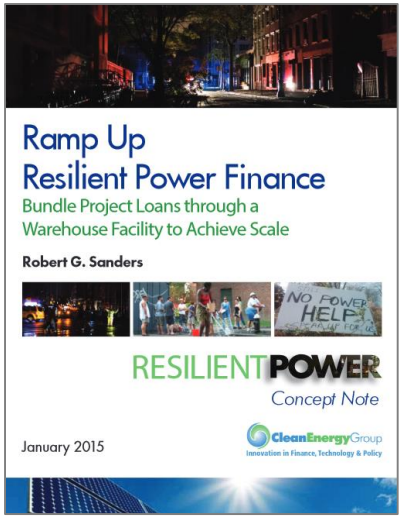
THE NATHAN CUMMINGS FOUNDATION

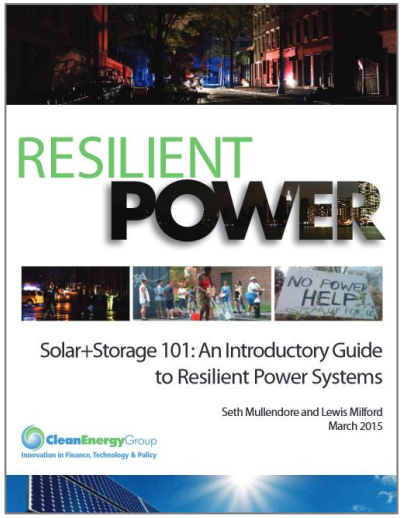
THE KRESGE FOUNDATION

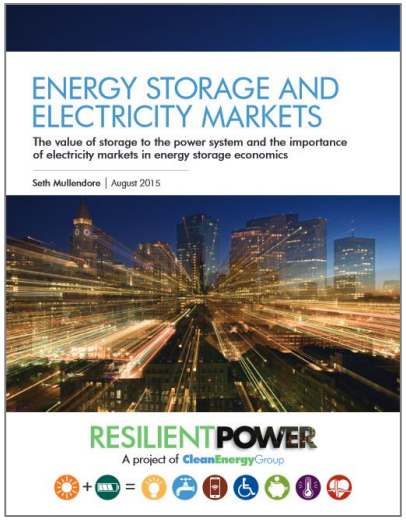
SURDNA FOUNDATION
Fostering sustainable communities in the United States

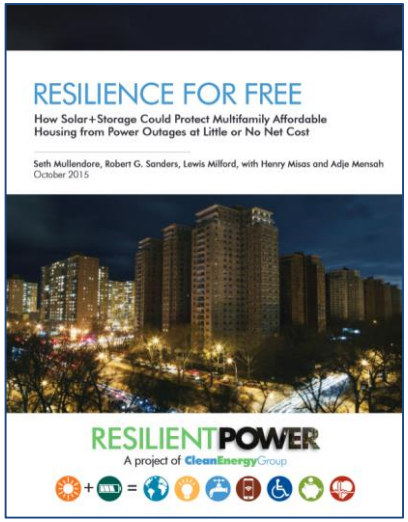
Resilient Power Project

- Increase public/private investment in clean, resilient power systems
- Engage city officials to develop resilient power policies/programs
- Protect low-income and vulnerable communities
- Focus on affordable housing and critical public facilities
- Advocate for state and federal supportive policies and programs
- Technical assistance for pre-development costs to help agencies/project developers get deals done
- See www.resilient-power.org for reports, newsletters, webinar recordings









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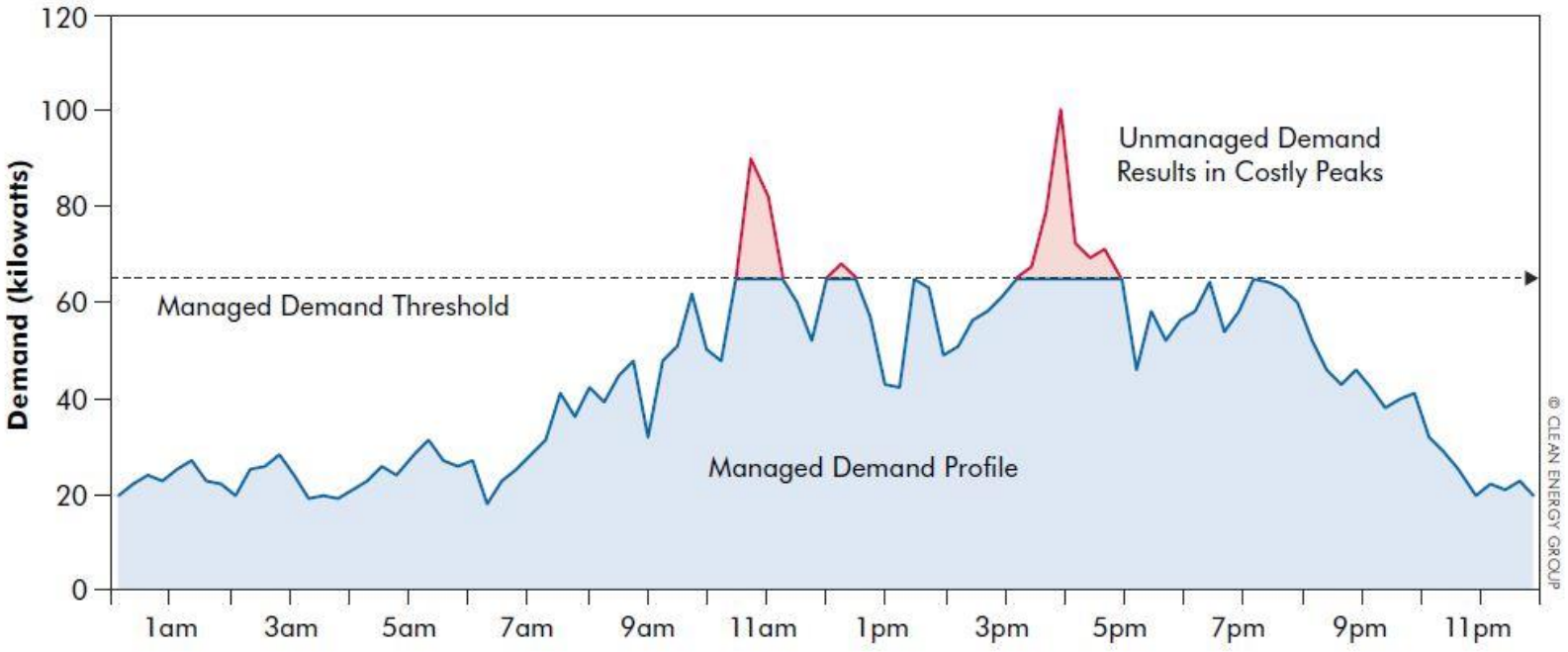
The Clean Energy Divide

- Hundreds of solar and storage projects
- Mainly to reduce electric bills
- Tesla/SolarCity and others target this sector
- Will grow exponentially like solar

- Too few projects in housing/communities
- Need greater than in high end
- Unequal distribution of incentives
- Need targeted LMI strategies

Solar+Storage Value: Demand Charge Management

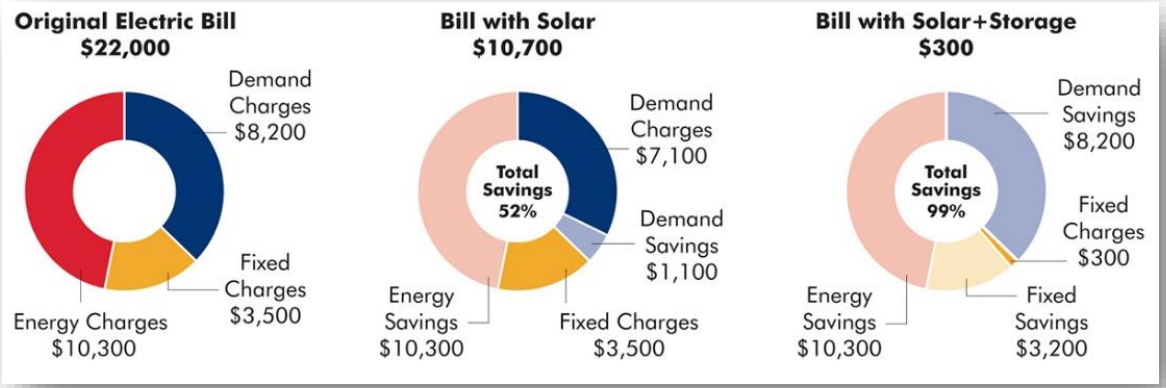


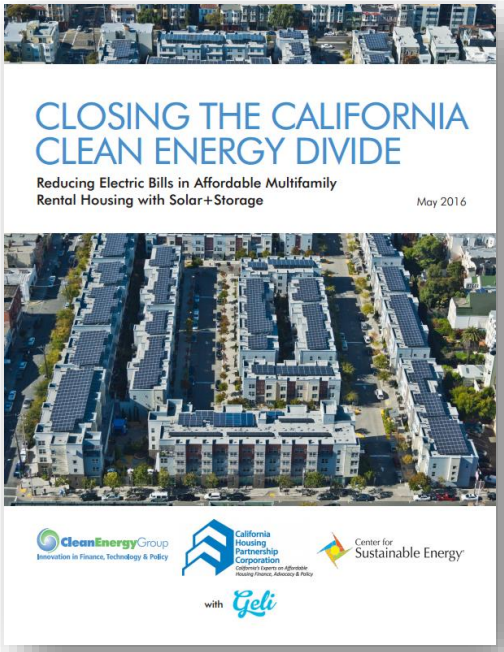
Peak reduced from 100 kW to 65kW = **35 kW reduction**

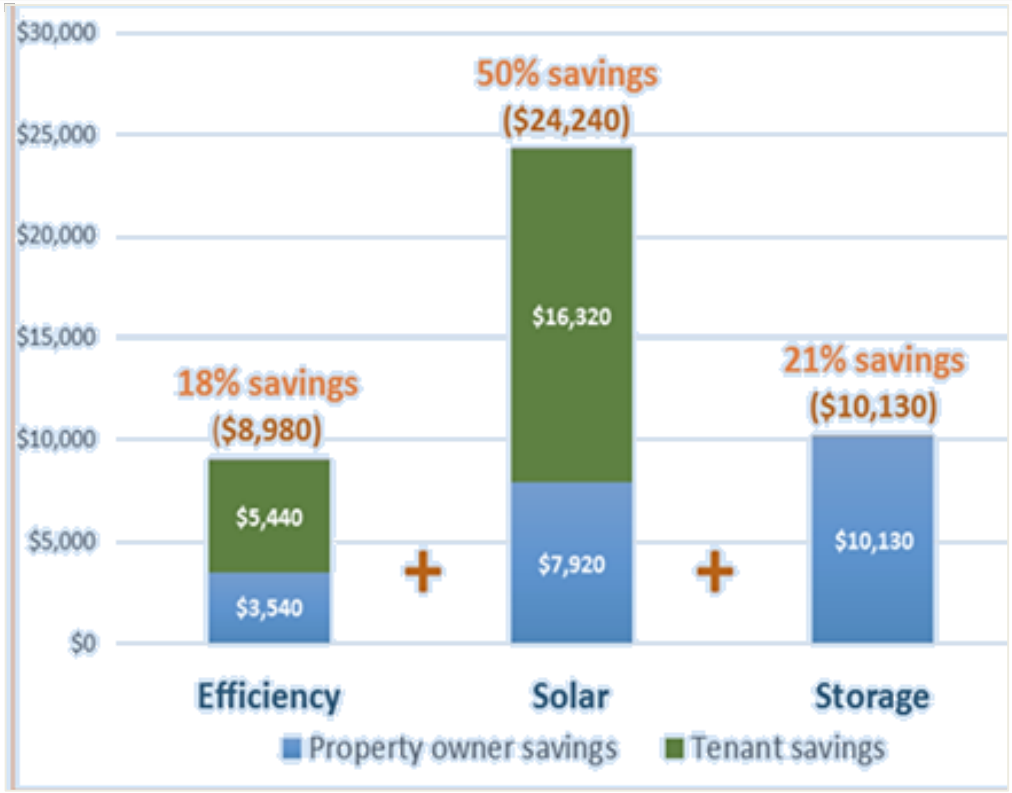
@ $10/kW = **$4,200 annual savings**

@ $20/kW = **$8,400 annual savings**

Economic Case for Battery Storage







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L+M Development Partners

Affordable Housing and Resiliency

Reinforcing the Rockaways + Building a Microgrid in Brownsville

L+M DEVELOPMENT PARTNERS

11.16.2017

Arverne View:

Far Rockaways

- Practical design solutions for the ARCHITECTURE through the use of transformative materials and forms.

- Transform the LANDSCAPE through organic shaping and large planted surface areas.

BEFORE *(2012: Post-Hurricane Sandy)*


AFTER

BEFORE


AFTER

Marcus Garvey Apartments: $50mm Rehabilitation Project

- 625-unit complex covering 8 blocks in Brownsville
- 50% Project-Based Mitchell-Lama
- 100% units under 60% AMI
- $50mm in construction hard costs ($75,680 per unit)
- Rehab scope included:
  - Apt Kitchens/Baths
  - Façades, Building Envelope
  - Landscape
  - Mechanicals
  - Complete Replacement of Electric Feeder System
- **Project is master metered**

L+M Development Partners

BEFORE


AFTER
329
331

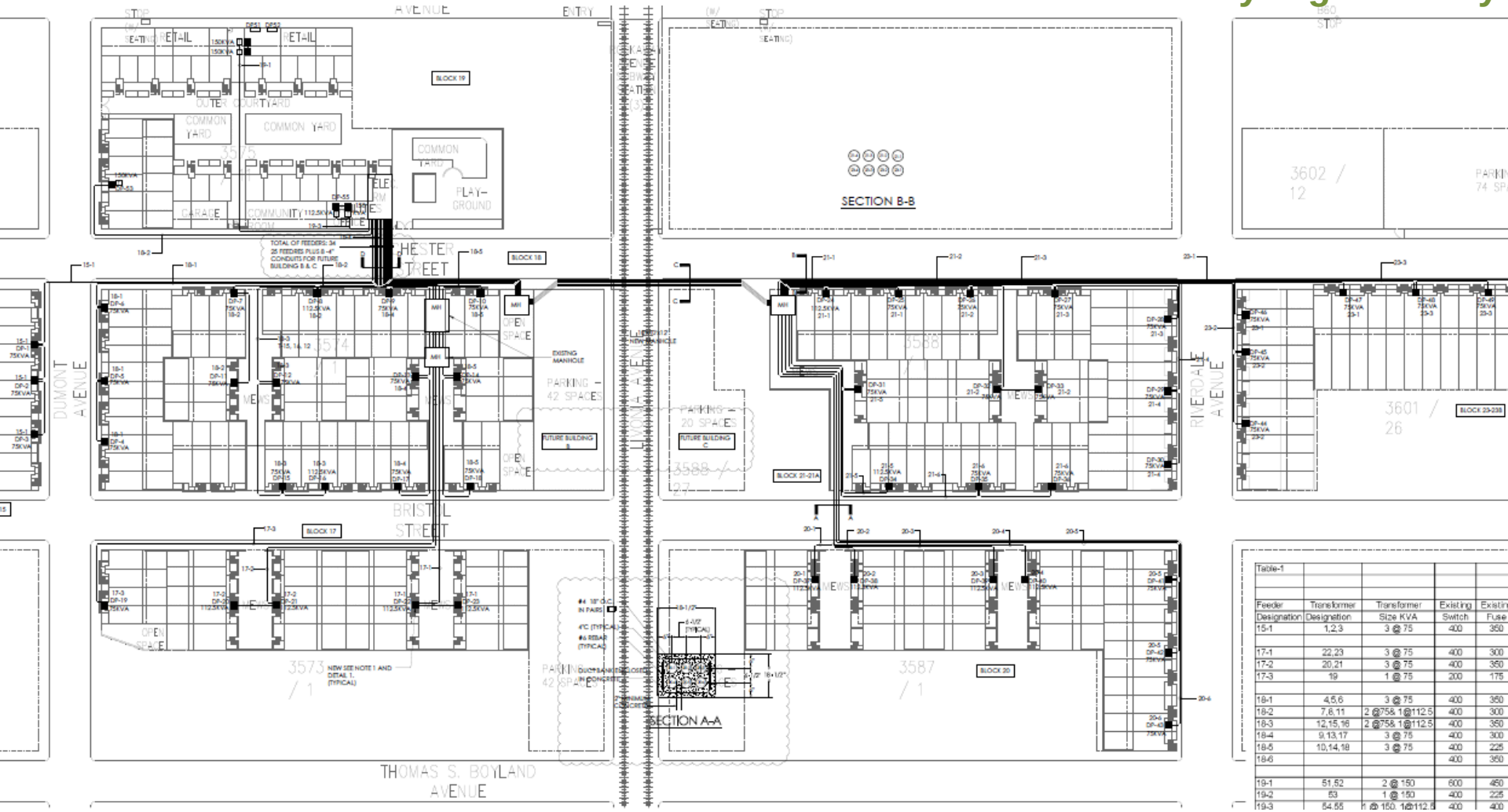
New lighting at the Project enhanced safety.

Electric Infrastructure was in dire need of replacement.

Development Partners

Replacing feeders allows for solar installation and alternate location for the batteries.

- 1 ConEd POE
- Feeders in City Right of Way

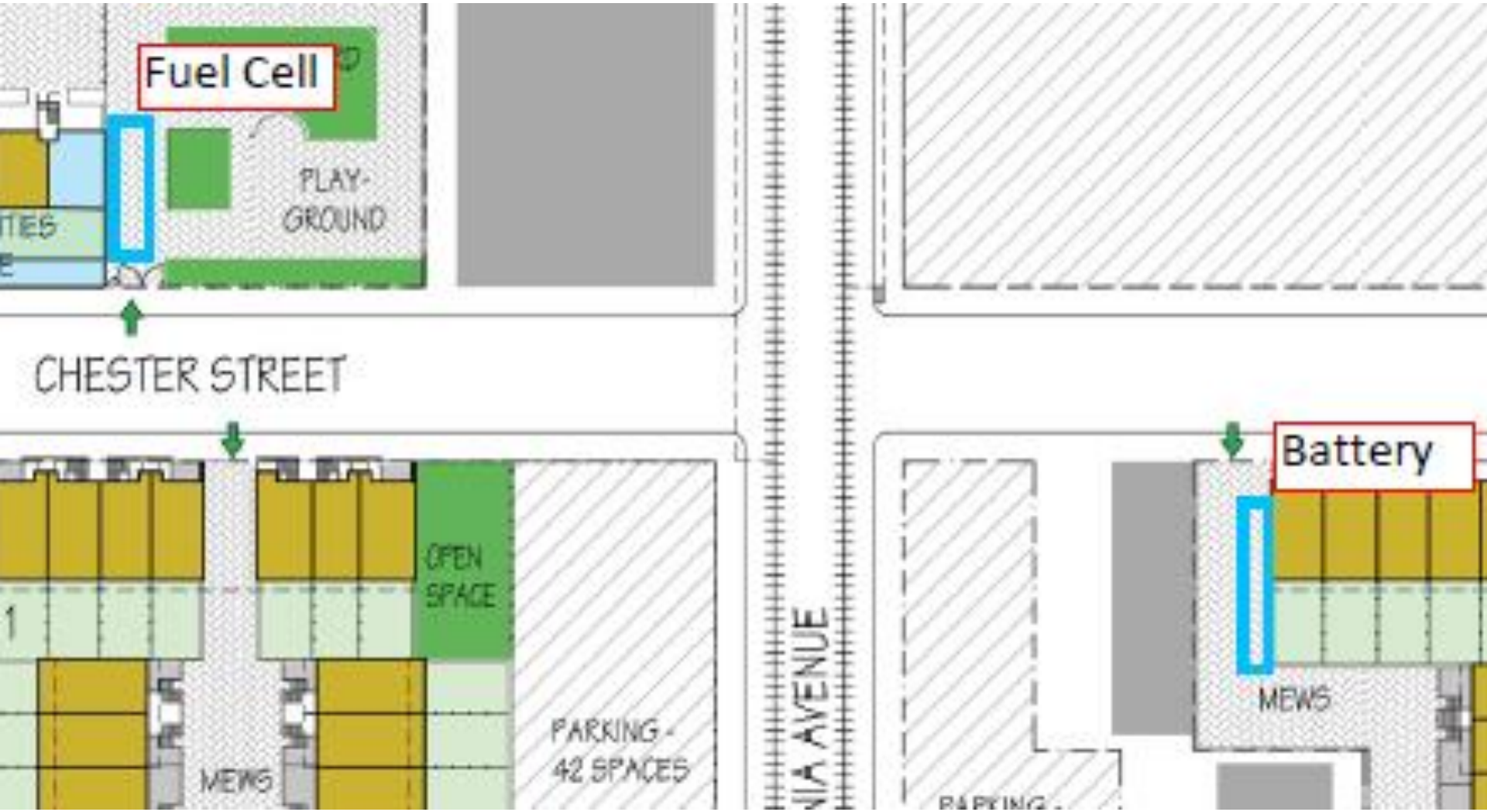


Development Partners

Marcus Garvey

- Solar
- Fuel Cells
- Batteries

7 City Blocks with Fuel Cell and Battery Integration


Fuel Cell
PLAY-
GROUND
CHESTER STREET
OPEN
SPACE
PARKING -
42 SPACES
MEWS
Battery
MEWS

The 400 kW Solar Installation is largest array on an affordable housing complex connected to one meter.

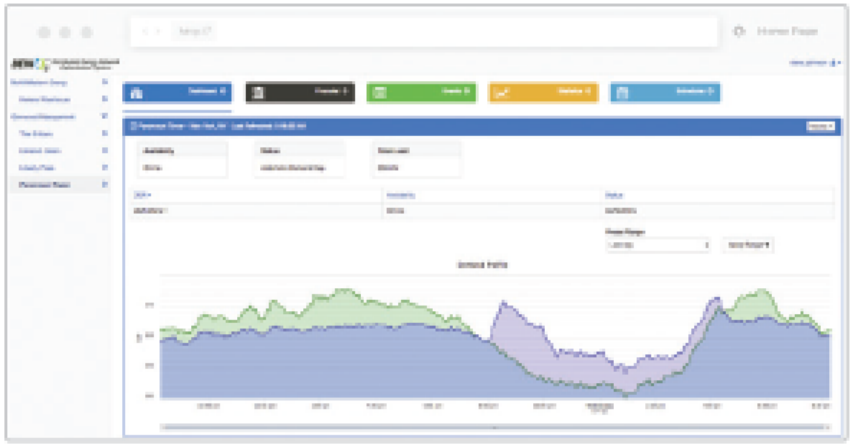
- Installation by Bright Power
- Commence Operations December 2016
- Panels on 70% of complex's structures

First Fuel Cells installed in NYC residential zoned area.

- Design/Install by Bloom Energy
- Provides baseline energy production 24/7—400kW System
- Located adjacent to switchgear
- Originally sized at 500kW, it was reduced to accommodate the other energy components and energy efficiency upgrades at site.

Batteries provide Marcus Garvey with the technology and storage to eliminate net metering.

- Demand Energy has the software to manage the input of these three systems and control export.
- The 300kW lithium ion battery is sized to cover a 100kW buffer for peak solar periods during shoulder months.
- Demand will be lead engineer for ConEd interconnection application.



L+M Development Partners

Since April 2016, Marcus Garvey has been producing resilient low-carbon energy.

System Type	Size
Solar	400kW
Fuel Cell	400kW
Battery	300kW
TOTAL Annual	**4 MWh/yr**

Key Features of Microgrid Feasibility

- Master Metered Project – Landlord pays full utility bill
- Electric heat and cooling
- Incentives:
  - NYSERDA Solar and MPP
  - ConEd BQDM
- Having the space and infrastructure
  - Feeder replacement paved way for battery location

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It takes a Microgrid:

Powering Marcus Garvey Village and Transforming New York's Electricity System

Marcus Garvey Village - Redevelopment

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2013

The New York Times

N.Y. / Region

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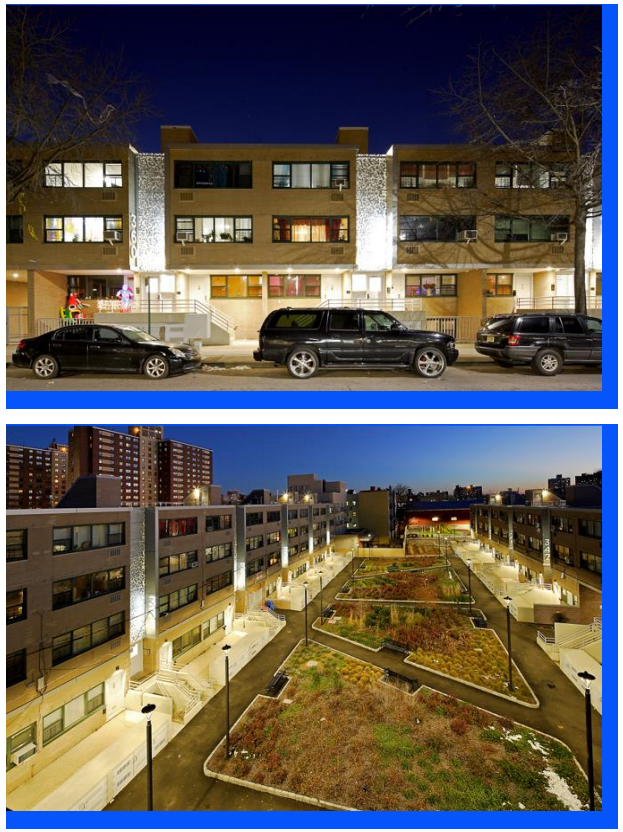
BIG CITY

A Housing Solution Gone Awry

Todd Heisler/The New York Times

2017



Doing The Right Thing Is Always The Right Thing To Do

Brooklyn Queens Demand Management (BQDM)

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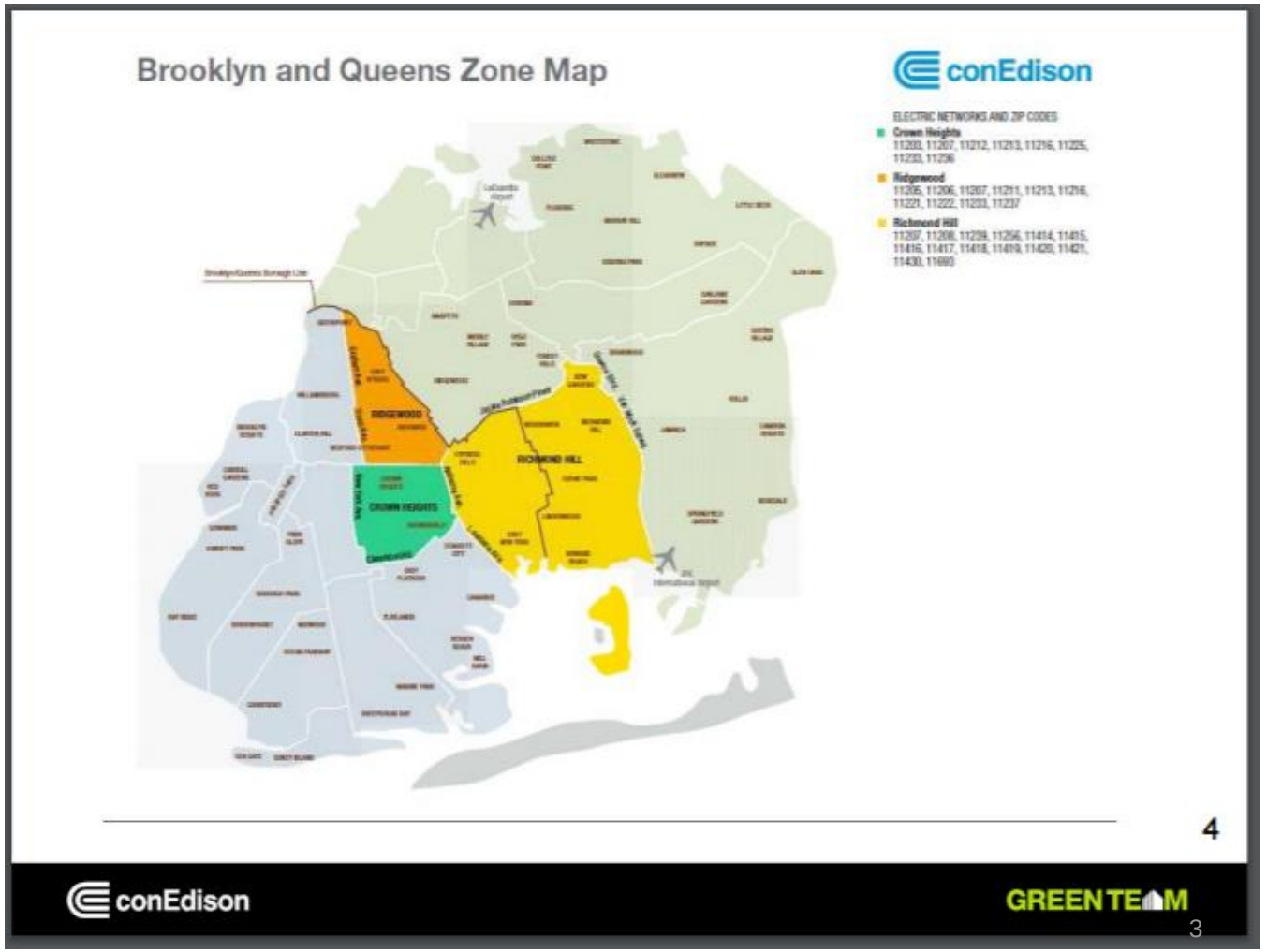
- Substation Upgrade Deferment= $ 1.2 B
- PSC Approved $200M Non-Wires Alternative (NWA)
- Program cost allowed in Rate Base
- Reverse Auction- Drove Market Based Response > $1992/kW-2 year program
- Drives Better system utilization
- Framework for future market based – ***Non Wire Solutions***



Micro-Grid Solution

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DENS™

- 375 kW/ 1.565 MW Battery Storage System

BRIGHT POWER

- 400kW Distributed PV Power

Bloomenergy®

- 400 kW Energy Server Fuel Cell

A Blend Of DER Resources - Enhances Success

Shared Savings Revenue Streams

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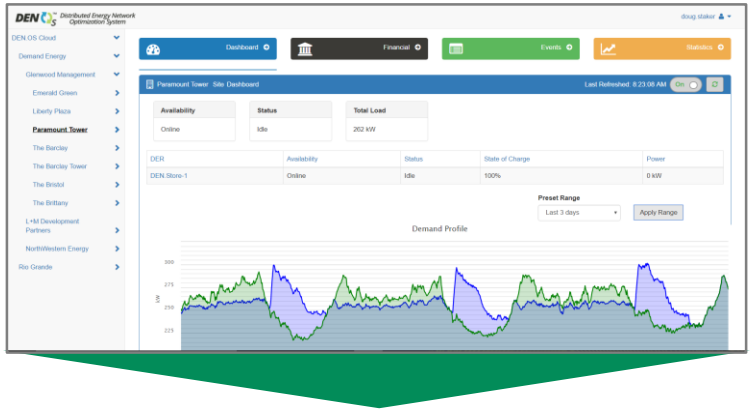

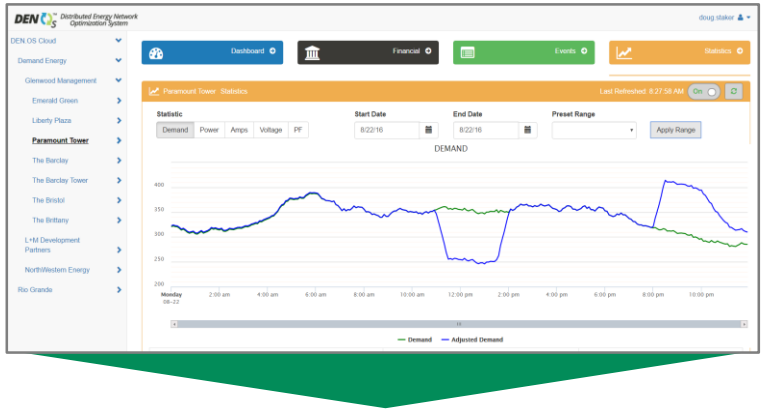

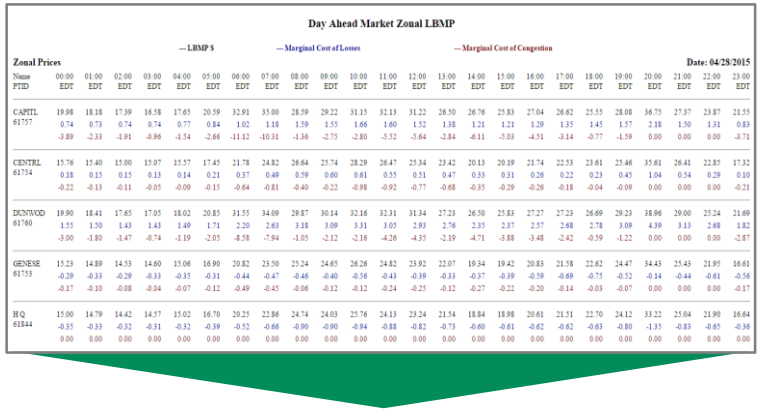

Demand Charge Management

- Optimized load management from the combined Solar + Fuel Cell + Building Load + Battery Operations

BQDM Load Relief Compliance

- Called when the Day-Ahead forecast is projected to be 93% of the Summer forecasted Peak

Market Participation

- Day Ahead Hourly Pricing
- NYISO Winter DR
- Con Edison DLRP Program

It Is All About Deriving Value!

Shared Savings Model

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Storage as a Service

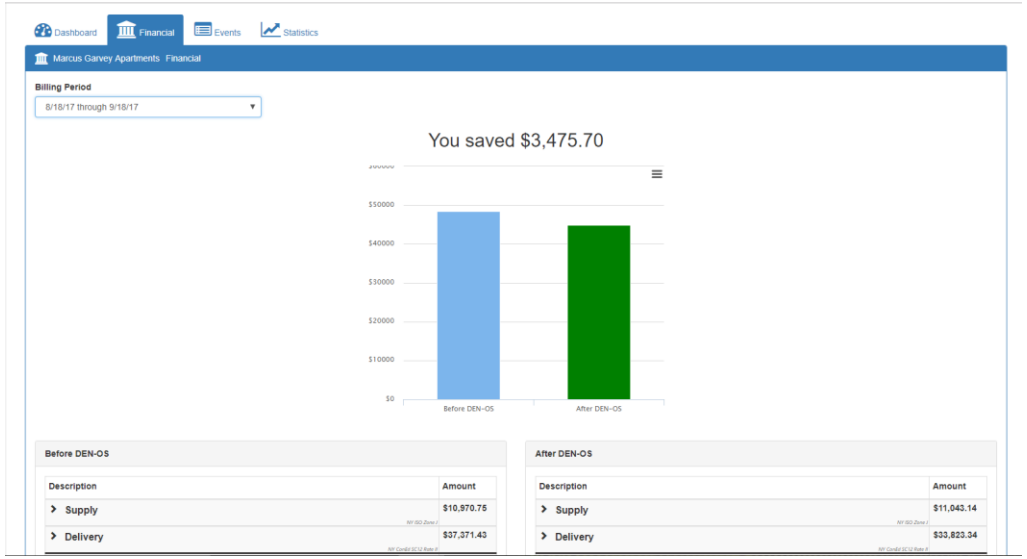
DEN OS™

- Demand Energy owns the system and operates the micro-grid to drive savings from various energy programs.

L+M

- L+M pays monthly service fee and then there is an annual reconciliation to split the equitable amount of Savings derived.

Solution



Shared Savings Model Built On A Win/Win Commitment

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Resiliency

Backup Power

- Provides Backup Power for Management and Security Office
- Community Room power for extended Outages

7

Summary

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Utilities are catching on to microgrid value

- More sensible than building to the peak
- Adds flexibility and resiliency
- Enables DERs w/aggregated control
- Cost-effective non-wire solution

C&I users can realize major benefits

- Provide resiliency
- Improve supply quality
- Boost sustainability
- Reduce delivery cost
- Scalable solution
- Simplified operation

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FINANCING BATTERY STORAGE: MARCUS GARVEY APARTMENTS

NOVEMBER 16, 2017

WHO WE ARE

- NYCEEC is a 501(c)3 non-profit created in 2010 by the NYC Mayor's Office

- Focus is exclusively on financing clean energy and energy efficiency projects in buildings; primary geographic focus to date is New York City

- We're more than just a lender – we're a non-profit "R&D" center for clean energy financing, bringing innovative solutions into this emerging market

- We're flexible, innovative and market-responsive

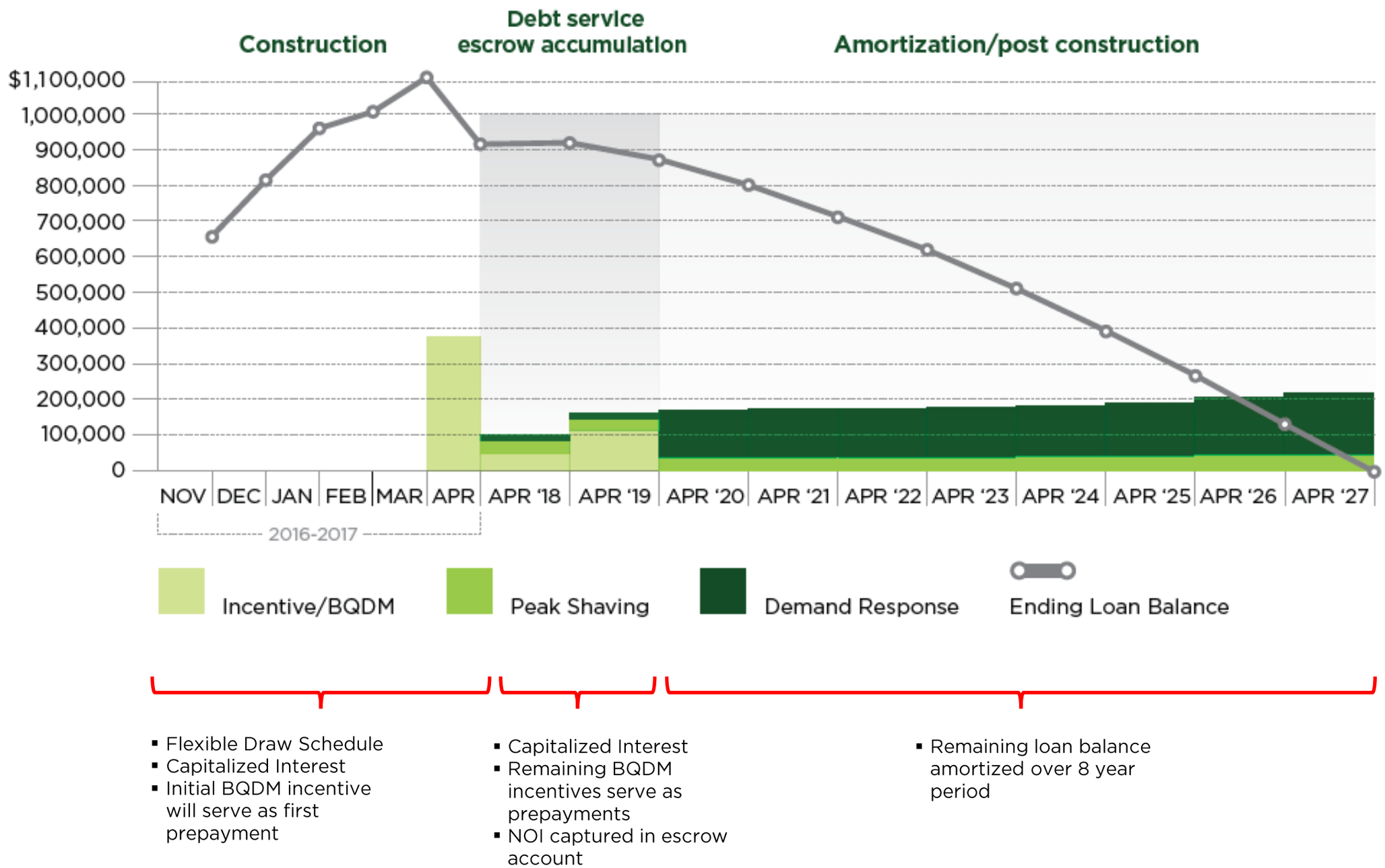
OVERVIEW OF NYCEEC'S FINANCING SOLUTION

Project Loan Summary	
Borrower:	Demand Energy Special Purpose Entity (SPE)
Property Location:	Brownsville section of Brooklyn, NY
NYCEEC Product:	Direct Loan
Total Project Cost:	$1.32MM
NYCEEC Loan Amount:	$1.25MM
Incentive Amount & Provider:	$0.54MM from Con Ed
Construction Period:	6 months
Duration of Loan:	10.5 years (including Construction Period)
Security:	All equipment, incentives, and equity in SPE

KEY REVENUE STREAMS

Name	Description	Details
1) Brooklyn Queens Demand Management (BQDM) Program Incentives	Incentives provided under Con Ed's BQDM Program for load reduction	▪ Total of $540,000 in BQDM incentives to be paid in three installments: ○ 70% upon commissioning ○ 10% in first year after commissioning ○ 20% in second year after commissioning
2) Demand Response	Payments for providing load reduction when called upon by either Con Ed or NYISO	▪ Project qualifies for four demand response programs: ○ ConEd Commercial System Relief Program (CSRP) ○ ConEd Distribution Load Relief Program (DLRP) ○ NYISO Installed Capacity-Special Case Resource (Summer) ○ NYISO Installed Capacity-Special Case Resource (Winter) ▪ However, project does not qualify for ConEd Demand Response programs while receiving BQDM Incentives
3) Peak Shaving	Dollar savings from the reduction in the 'Demand Charge' on L+M's monthly utility bills	▪ Peak shaving revenues are shared between Demand Energy SPE and Marcus Garvey Partners LLC (set up by L+M) in accordance with an Energy Services Agreement ○ Demand Energy SPE to receive 55% and Marcus Garvey Partners 45%

THREE PHASE LOAN STRUCTURE



- Flexible Draw Schedule
- Capitalized Interest
- Initial BQDM incentive will serve as first prepayment

- Capitalized Interest
- Remaining BQDM incentives serve as prepayments
- NOI captured in escrow account

- Remaining loan balance amortized over 8 year period

CONCLUSIONS

- Shortly after the battery system was installed at Marcus Garvey, Demand Energy was acquired by Enel, which prepaid NYCEEC's loan

- This transaction required a structured, three-phase approach due to the timing of the various streams of revenues that were received by the SPE

- Uncertainty of revenues posed the biggest underwriting challenge:
  - Demand Response and Peak Shaving revenues are subject to potential future price fluctuations
  - Construction delays could jeopardize receipt of the BQDM Incentives

- NYCEEC's successful financing of the battery storage system at Marcus Garvey serves as a template for similar transactions, and we look forward to a thriving market for battery storage financing

Thank you for attending our webinar

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