NYSERDA's On-Site Power Conference

Dec 7th, 2016

Scale for Potential Growth of Hybrid/Integrated On-Site Power Systems

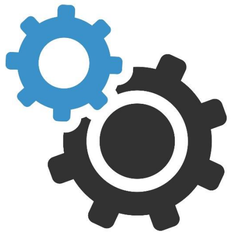
Will hybrids result in more installations?

About GridMarket

GridMarket offers digital tools and support to accelerate the deployment of clean, distributed energy assets.

The platform links **pre-vetted distributed energy projects** and **critical development data** to a network of trusted solutions providers.

Benefits of DER Stacking



Reduced renewable intermittency

Optimized discharge and energy use

Demand reduction on both sides of the meter

Increased property value

The Opportunity

- ✓ Tax credits, programs
- ✓ Declining system and technology costs
- ✓ Increased economic feasibility
- ✓ Evolving policy, regulations, tariffs
- ✓ Resilience

Reforming the Energy Vision

Technologies, policy, and business models for DER aggregation

Utility involvement for resiliency and reduced demand

Aggressive clean energy goals

Creating Financially Viable Projects

What works…

What doesn’t...

What next!

Current Way…

- ITC
- Targeted utility demand reduction programs
  - DMP, BQDM
- Statewide technology specific rebates

New Way…

- Demonstration projects and Interventions
- Rate and Tariff Evolution
- Biggest opportunity – Valuing D, Ultimately C/E, and NEM Modifications

Market Barriers

New York presents a unique set of technical and economic project hurdles.

Rates and tariffs

Accurate project modeling

Availability of necessary infrastructure

Permitting and interconnection complexities

Confusing Market Signals

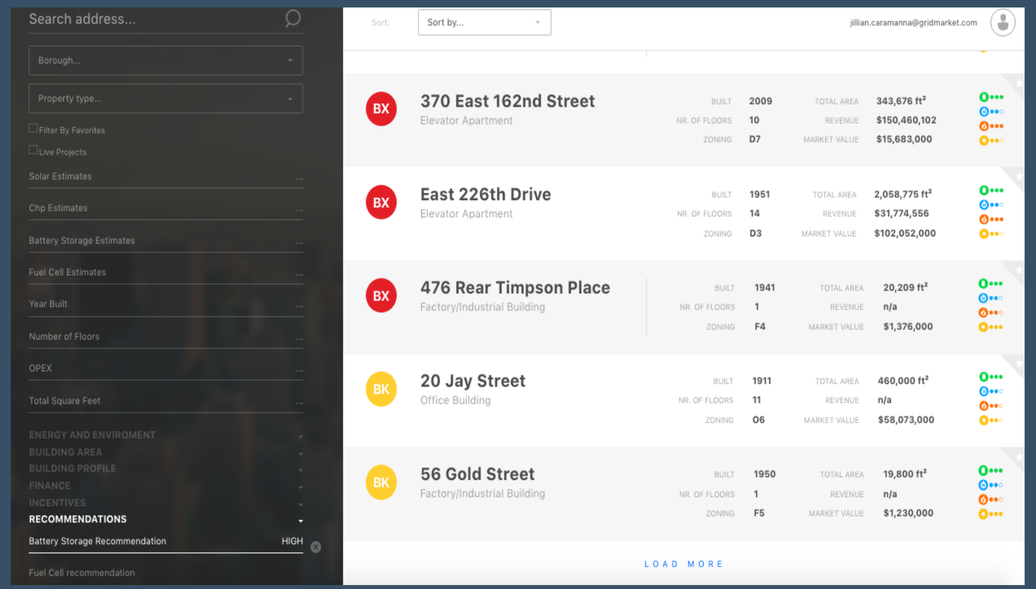
Strategies for Success

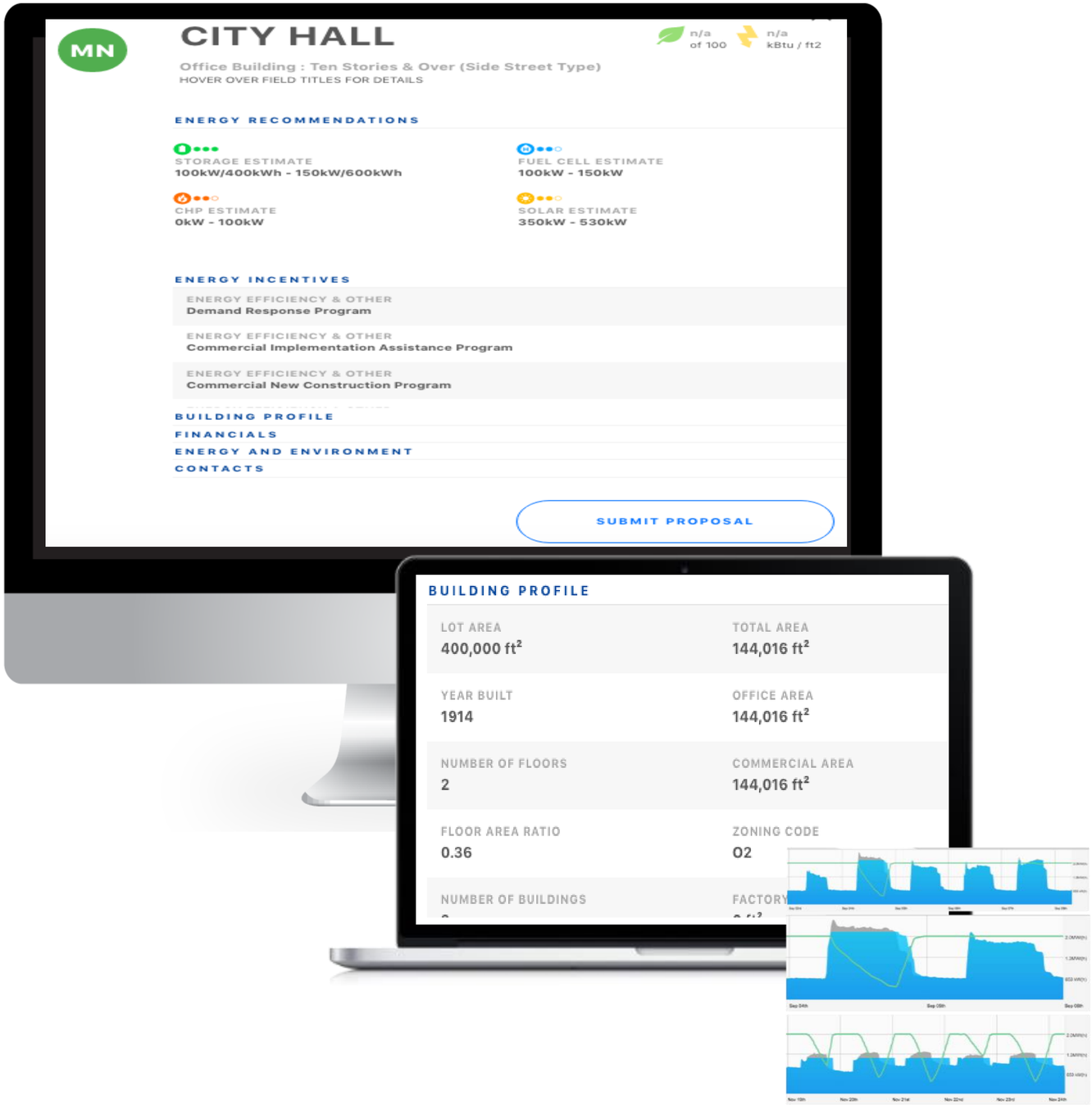
- ✧ Stacked revenue streams
- ✧ Reduced project soft costs
- ✧ Updated rate/tariff policy & externality accounting
- ✧ The 24-hour deployment

Evaluating the Hybrid Opportunity

We counseled our oracle, or our data tool with millions of properties in New York, sized and scoped for DER (solar, storage, fuel cells, chp):

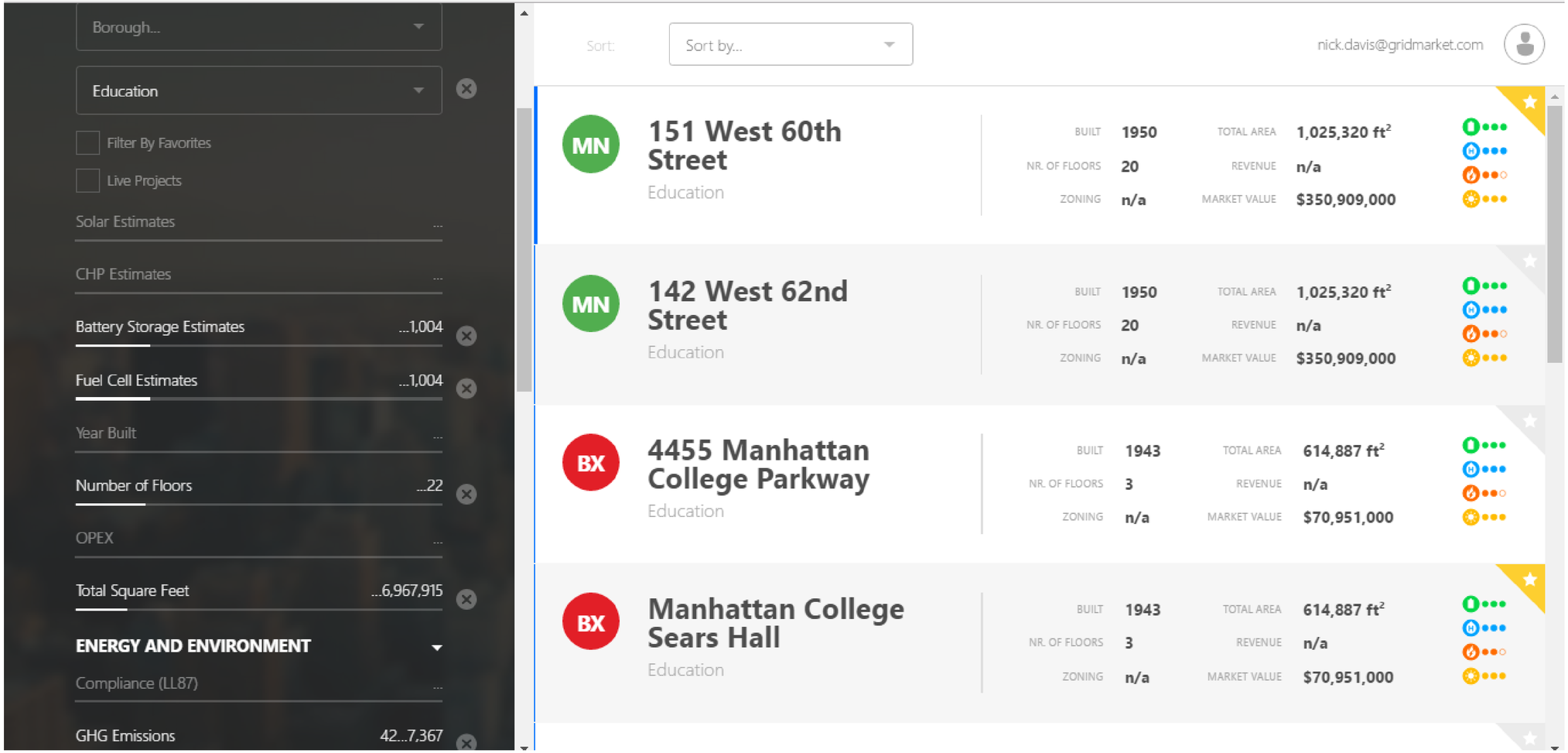
- Property Characteristics
- Technology Recommendations
- Energy and Environment
- Financials and Ownership
- Incentives and Tariffs
- Permitting and Interconnection

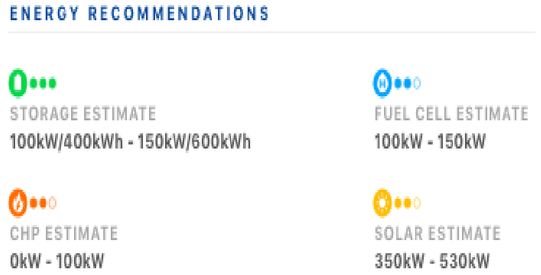




Technology and Project Recommendations

We created an app to cross-reference hybrid suitability and tested the results based on current market realities



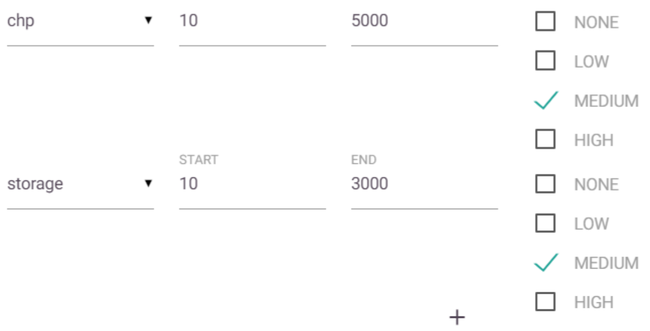


CHP + Storage Downstate

Current Market Realities –
Best Case Candidates

275 PROPERTIES
103989 - 152731 KW
104 - 153 MW

Encouraging hybrids
makes medium-viable
opportunities accessible



6921 PROPERTIES
2327576 - 3299028 KW
2328 - 3299 MW

CHP is sized to the thermal or electric load, rarely both. If sized to thermal load, a project could miss the electric opportunity

Storage can increase CHP suitability and sizing

Solar + Storage Downstate

Current Market Realities –
Best Case Candidates

1386 PROPERTIES
959055 - 1382583 KW
959 - 1383 MW

Encouraging hybrids
makes medium-viable
opportunities accessible

14388 PROPERTIES
8371083 - 11343560 KW
8371 - 11344 MW

Storage will go up when NEM changes and market requires added grid buffer

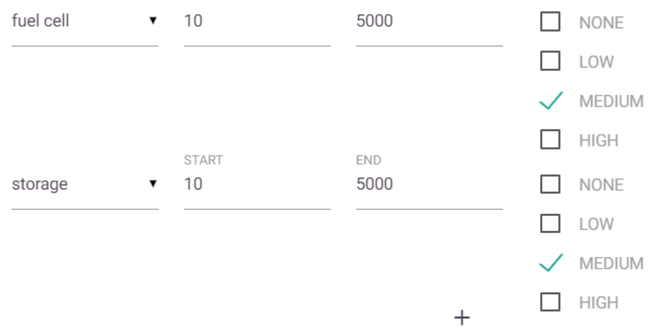
Circuits may not handle mass exporting - stacking onsite generation with batteries will be critical

Fuel Cell + Storage Downstate

Current Market Realities –
Best Case Candidates

498 PROPERTIES
795998 - 1109278 KW
796 - 1109 MW

Encouraging hybrids makes medium-viable opportunities accessible



11662 PROPERTIES
4900349 - 6806367 KW
4900 - 6806 MW

Fuel cells sized to baseload, undersized relative to what could be installed with battery if they have less night time or seasonal load

Battery can also hedge against energy efficiency dropping baseload

Hybrid Opportunity?

- ✓ Storage will go up when NEM changes and market requires added grid buffer
- ✓ Circuits may not handle mass exporting - stacking onsite generation with batteries will be critical
- ✓ Lessons: NEM Policy can spark the market for hybrids, but onsite gen also becomes more viable (more installations) and larger (more installed MW) when paired.

Anatomy of a Project

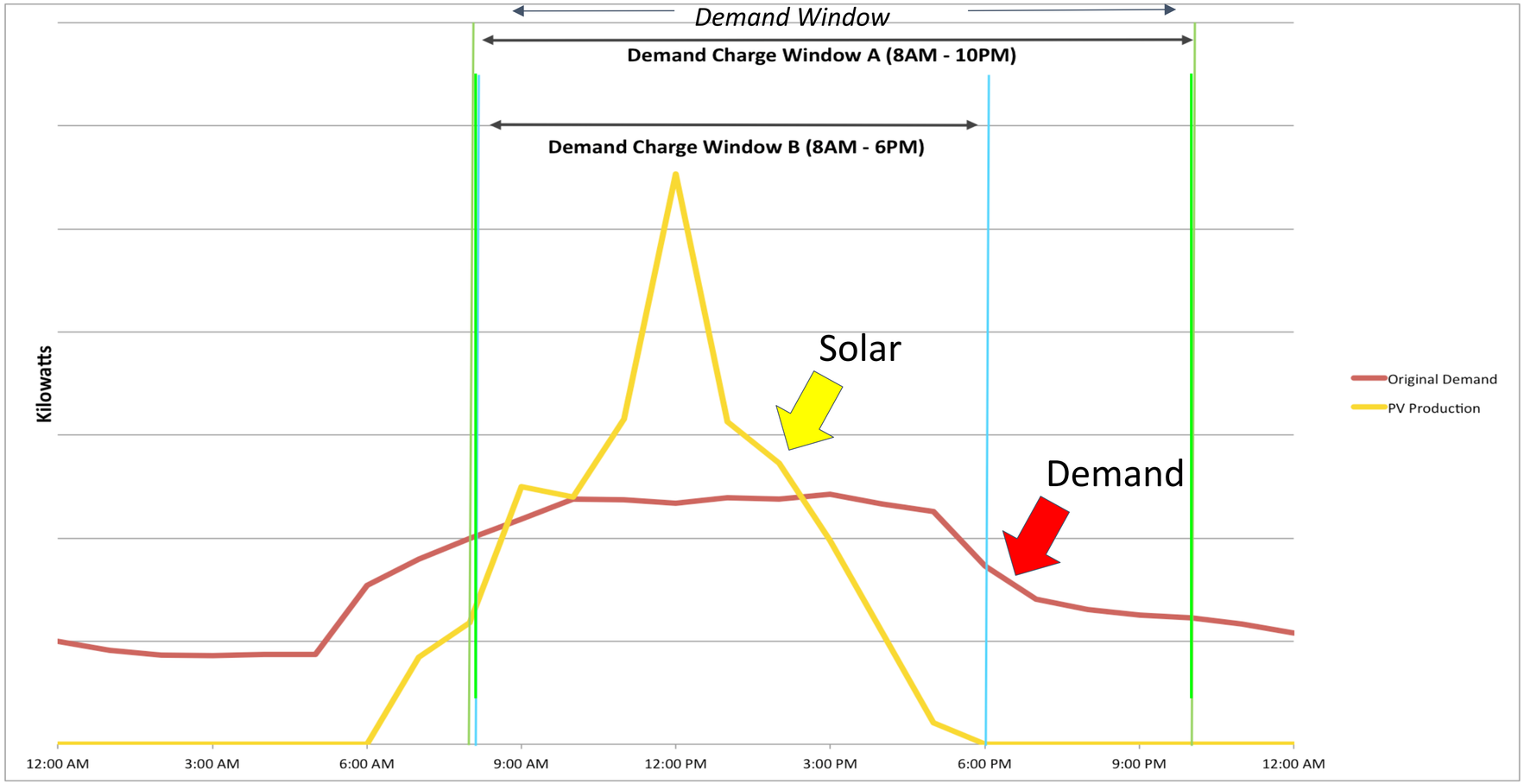
Single Asset Benefits

- ✓ Solar
  - ✓ Drives cost savings on supply side of electric bill ***($/kWh)***
  - ✓ Reduces GHG emissions profile of building
  - ✓ Qualifies for Federal Tax incentives (ITC)

- ✓ Battery Storage
  - ✓ Enables peak shaving for demand charge management ***($/kW)***
  - ✓ Enables participation in Demand Response without disrupting tenant comfort/operations
  - ✓ Provides limited measure of resilience

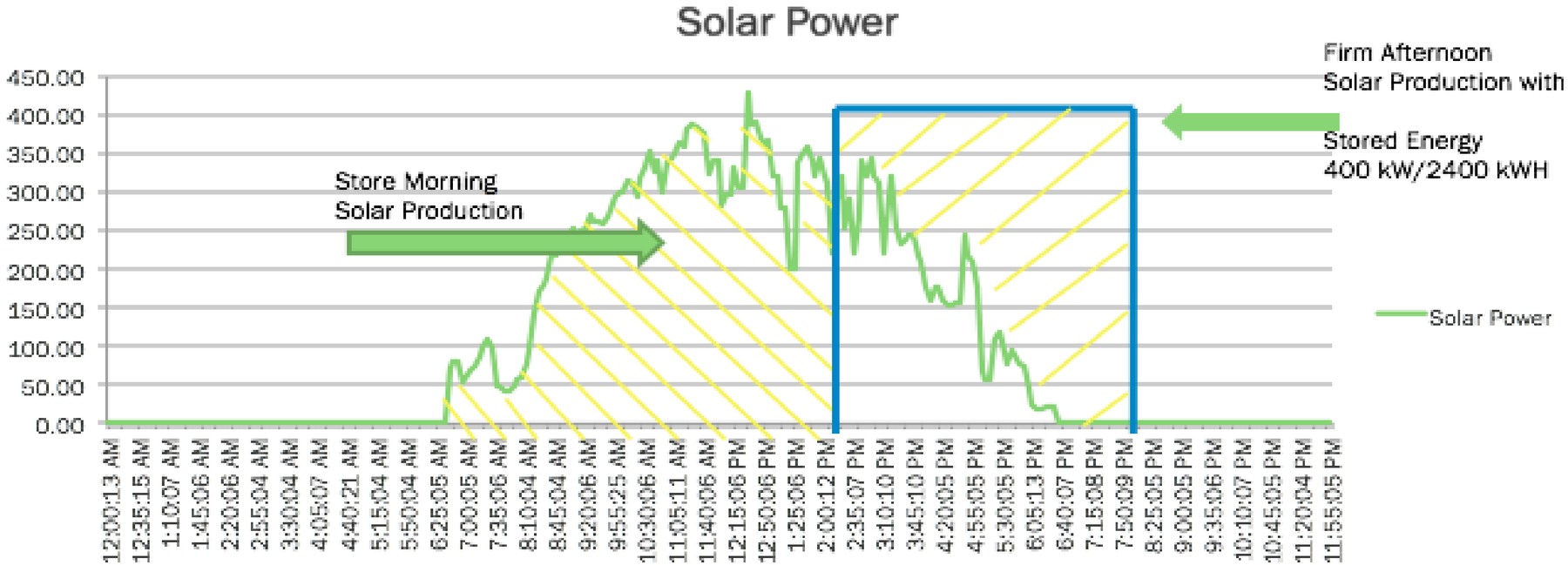
Demand Charge Window & Solar Production Alignment

Under ConEd service classification SC9-II, the customer is billed per kW of maximum demand between the hours of 8 AM to 10 PM, Monday through Friday. While solar may reduce demand during daylight hours, residential consumption peaks typically when the sun has already set.



To reduce the demand charge, one would want to reduce the amplitude of the system peak during this 8 am to 10 pm demand window.

Hybrid Solar + Storage → Buildings become Micro Solar Peaker Plants



- Solar Production- Time shifted to period of highest benefit
- All intermittent performance removed
- Allows the resource to be scheduled and dispatched

Hybrid Opportunity: Solar + Storage Case Study

Building Profile

- ✓ Master metered commercial high-rise
- ✓ SC9-II Electric Tariff
- ✓ High Electric Bill → High OpEx
- ✓ GHG Reduction Goals
- ✓ Power Quality Issues

Hybrid DER Solution

- ✓ **300 kW Solar PV**
  - ✓ Produces between380,000kWh to 410,000kWh annually
  - ✓ Reduces annual electric energy purchase ~ 6%

- ✓ **200kW/800kWh Battery Storage System**
  - ✓ Time-shifts solar PV production to help manage demand charges (~40% of ConEd Delivery Bill
  - ✓ Reduces ICAP tag on Supply Bill
  - ✓ Enables increased flexibility when choosing supply rate structure
  - ✓ Provides resilient blackstart capability to PV; can offset reliance on diesel generator

Solar + Storage: Operating Assumptions

- ✓ 75% of energy supplied to battery most originate from renewable generation to claim 75% of ITC
  - ✓ Proposed 300kW PV serves as renewable source
- ✓ 200kW/800kWh Battery sized to accommodate Peak Shaving and Demand Response applications
- ✓ Current tariff: SC9-II

Approx Month	Energy Use kWh	Demand 1	Demand 2	Demand 3	Fixed Charges	Energy	Demand	Total
01/01/15 - 02/01/15 W	682,925	1,200	1,194	-	$103	$55,940.00	$33,750.00	$89,793.00
02/01/15 - 03/01/15 W	655,973	1,353	1,353	-	$103	$53,732.00	$38,209.00	$92,044.00
03/01/15 - 04/01/15 W	606,448	1,106	1,090	-	$103	$49,675.00	$30,866.00	$80,644.00
04/01/15 - 05/01/15 W	509,572	954	948	-	$103	$41,740.00	$26,803.00	$68,646.00
05/01/15 - 06/01/15 W	569,143	1,212	1,212	-	$103	$46,620.00	$34,227.00	$80,950.00
06/01/15 - 07/01/15 S	588,760	1,143	1,110	1,143	$103	$48,227.00	$57,611.00	$105,941.00
07/01/15 - 08/01/15 S	656,374	1,135	1,109	1,124	$103	$53,765.00	$57,179.00	$111,047.00
08/01/15 - 09/01/15 S	645,452	1,115	1,112	1,112	$103	$52,870.00	$56,738.00	$109,711.00
09/01/15 - 10/01/15 S	605,988	1,200	1,155	1,200	$103	$49,638.00	$60,277.00	$110,018.00
10/01/15 - 11/01/15 W	523,086	984	984	-	$103	$42,847.00	$27,788.00	$70,738.00
11/01/15 - 12/01/15 W	496,042	1,013	1,013	-	$103	$40,632.00	$28,607.00	$69,342.00
12/01/15 - 01/01/16 W	523,895	1,117	1,117	-	$103	$42,913.00	$31,544.00	$74,560.00
TOTALS	**7,063,658**	**13,532**	**13,397**	**4,579**	**$1,236**	**$578,599.00**	**$483,599.00**	**$1,063,434.00**
AVERAGE	***$588,638***	***$1,128***	***$1,116***	***$1,145***	***$103***	***$48,217***	***$40,300***	***$88,620***

Rate II - General - Large - Time-of-Day - Continued

Delivery Charges, applicable to all Customers *

Demand Delivery Charges, per kW of maximum demand for each specified time period

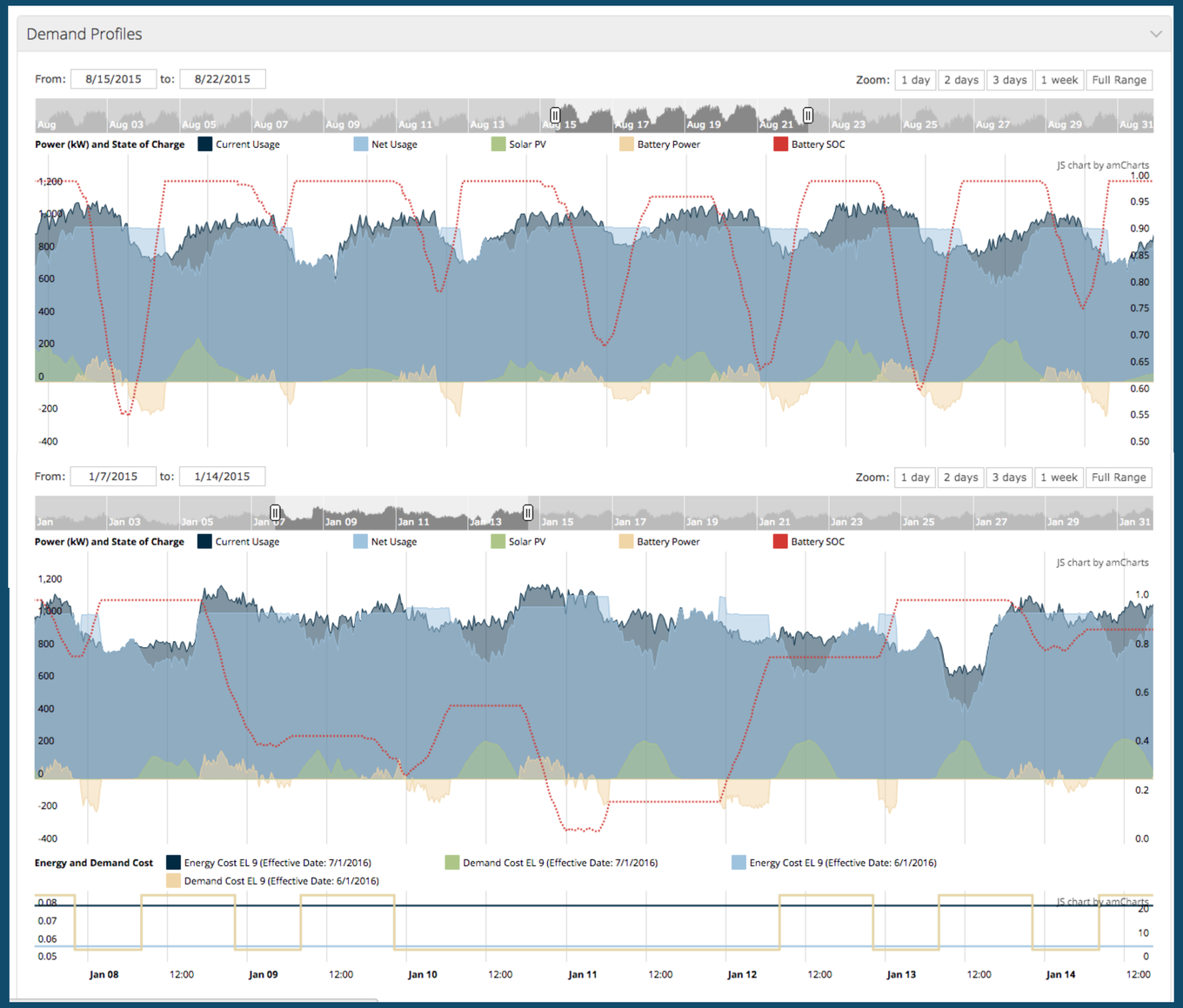
Charges applicable for the months of June, July, August, and September

Monday through Friday, 8 AM to 6 PM (high/low tension service)	$8.03	per kW
Monday through Friday, 8 AM to 10 PM (high/low tension service)	$15.03	per kW
All hours of all days (low tension service only)	$16.12	per kW

Charges applicable for all other months

Monday through Friday, 8 AM to 10 PM (high/low tension service)	$11.08	per kW
All hours of all days (low tension service only)	$5.17	per kW

Solar + Storage: Impact on Building Load



Solar + Storage: Pro Forma

PROJECT PROFORMA

	Year	1	2	3	4	5	6	7	8	9	10
CASH											
System Cost	-$2,050,000										
NYSERDA Incentive	$189,000										
Income											
PV Savings (loss)		$32,449	$33,098	$33,760	$34,435	$35,124	$35,826	$36,543	$37,274	$38,019	$38,780
Battery Demand Response Revenue			$34,960	$34,960	$35,659	$36,372	$37,100	$37,842	$38,599	$39,371	$40,158
Battery Supply Savings							$32,449.05	$32,449.05	$32,449.05	$32,449.05	$32,449.05
Battery Delivery Bill Savings		$68,356.22	$69,723.34	$71,117.81	$72,540.16	$73,990.97	$75,470.79	$76,980.20	$78,519.81	$80,090.20	$81,692.01
Total Savings/Revenue		$100,805	$137,781	$139,838	$142,635	$145,487	$180,846	$183,814	$186,841	$189,929	$193,079
Expense											
Operations & Maintenance / Service Warranty			$0	$0	$0	$0	-$13,400	-$13,668	-$13,941	-$14,220	-$14,505
Insurance		-$2,050.00	-$2,091.00	-$2,132.82	-$2,175.48	-$2,218.99	-$2,263.37	-$2,308.63	-$2,354.81	-$2,401.90	-$2,449.94
Total Expenses		-$2,050	-$2,091	-$2,133	-$2,175	-$2,219	-$15,663	-$15,977	-$16,296	-$16,622	-$16,955
Total Net Revenue:		$98,755	$135,690	$137,705	$140,459	$143,268	$165,183	$167,837	$170,545	$173,307	$176,124
TAX BENEFITS											
Federal ITC:		$540,000									
Depreciation (MACRS 5-year):		$429,701	$114,587	$68,752	$41,251	$41,251	$20,626				
Total Credits:		$969,701	$114,587	$68,752	$41,251	$41,251	$20,626	$0	$0	$0	$0
Net Project Cash Flow:	-$1,861,000	$1,068,456	$250,277	$206,457	$181,710	$184,520	$185,808	$167,837	$170,545	$173,307	$176,124
Total Annual Net Project Cash Benefits	-$1,861,000	$1,068,456	$250,277	$206,457	$181,710	$184,520	$185,808	$167,837	$170,545	$173,307	$176,124
Total Cumulative Net Project Benefits	-$1,861,000	-$792,544	-$542,267	-$335,810	-$154,100	$30,420	$216,228	$384,065	$554,611	$727,918	$904,042

Non-Discounted Payback (yrs)	**4.84**
Net PresentValue (NPV, 0.06)	**$956,692**
20-year IRR	**15.79%**

Marcus Garvey Village: Template for Stacking DERs for Cost Savings, Resilience, Lower GHG emmissions

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PRESS RELEASE

Demand Energy to Deploy Battery Storage System for Advanced Microgrid at Apartment Complex in NYC

Company's DEN.OS™ Software Control Platform Drives Multiple System Benefits and Aligns with Con Edison BQNP Demand Reduction Initiative

New York City, New York – December 6, 2016 – Demand Energy, a leader in intelligent energy storage systems, today announced that it will design and deliver a lithium-ion battery system as part of the first microgrid to be deployed under Con Edison's Brooklyn-Queens Neighborhood Program (BQNP). The multi-resource microgrid will be implemented at the 625-unit Marcus Garvey Apartments in Brooklyn, owned by L+M Development Partners, a large owner/developer of affordable housing.

NYCEEC
BUILDING FINANCIAL SOLUTIONS

FOR IMMEDIATE RELEASE

NYCEEC Brings the Battery to Brooklyn, Financing Energy Storage for a Low-Income Housing Microgrid

The loan marks a new line of business for NYCEEC as the efficiency and clean energy finance organization enters the energy storage market

NEW YORK, December 6, 2016 —The New York City Energy Efficiency Corporation has made a 10-year project loan of more than $1 million to the energy storage company Demand Energy, bringing large-scale battery storage technology to a privately owned low-income housing development in Brooklyn, NY. Demand Energy's lithium-ion battery system will be used to store power generated onsite by the Marcus Garvey housing complex's solar panels and fuel cell systems—or lower-cost off-peak Con Edison power—dramatically reducing power demand when electricity is at its highest cost. It will be the first battery storage microgrid installation at a low-income property in greater New York.

The 625-unit Marcus Garvey Apartments, located in the Brownsville section of Brooklyn, is owned by L+M Development Partners, a large owner/developer of low-income housing. L+M has already installed 400 kW of solar and committed to adding 400 kW of fuel-cell generating capacity as part of a major property renovation. The energy storage and distributed energy resources will be integrated into a microgrid managed by Demand Energy's DEN.OS™ software platform, which will optimize the value of L+M's energy

Marcus Garvey: Project Drivers

- 625 Unit complex spanning 8 blocks in Brownsville
- Campus master metered
- Electric heating yields ~3MW winter peak demand

- Comprehensive re-development w/ $50mm in construction costs
- 50% Project-Based Mitchell-Lama
- 100% of units will remain under 60% AMI
- Rehab scope includes:
  - Facades, building envelope
  - Landscape
  - Mechanicals
  - Electric feeder system

Marcus Garvey: Project Drivers

- Electric feeder system was in dire need of replacement
- Feeder upgrade enabled broader renewables integration

Project Drivers: Site Location in the heart of BQDM

Program Overview

As part of Con Edison's Brooklyn Queens Demand Management (BQDM) program, we plan to reduce peak load by 52 MW in the BQDM area (see map below) through a combination of customer sided solutions (41 MW) and non-traditional utility sided solutions (11 MW).

Among a variety of solutions that will comprise the portfolio of resources in the BQDM program, Con Edison plans to rely on Demand Response (DR) resources in the BQDM area to provide critical load relief during hours when the system could become overloaded on peak summer days.

Marcus Garvey: Project Overview

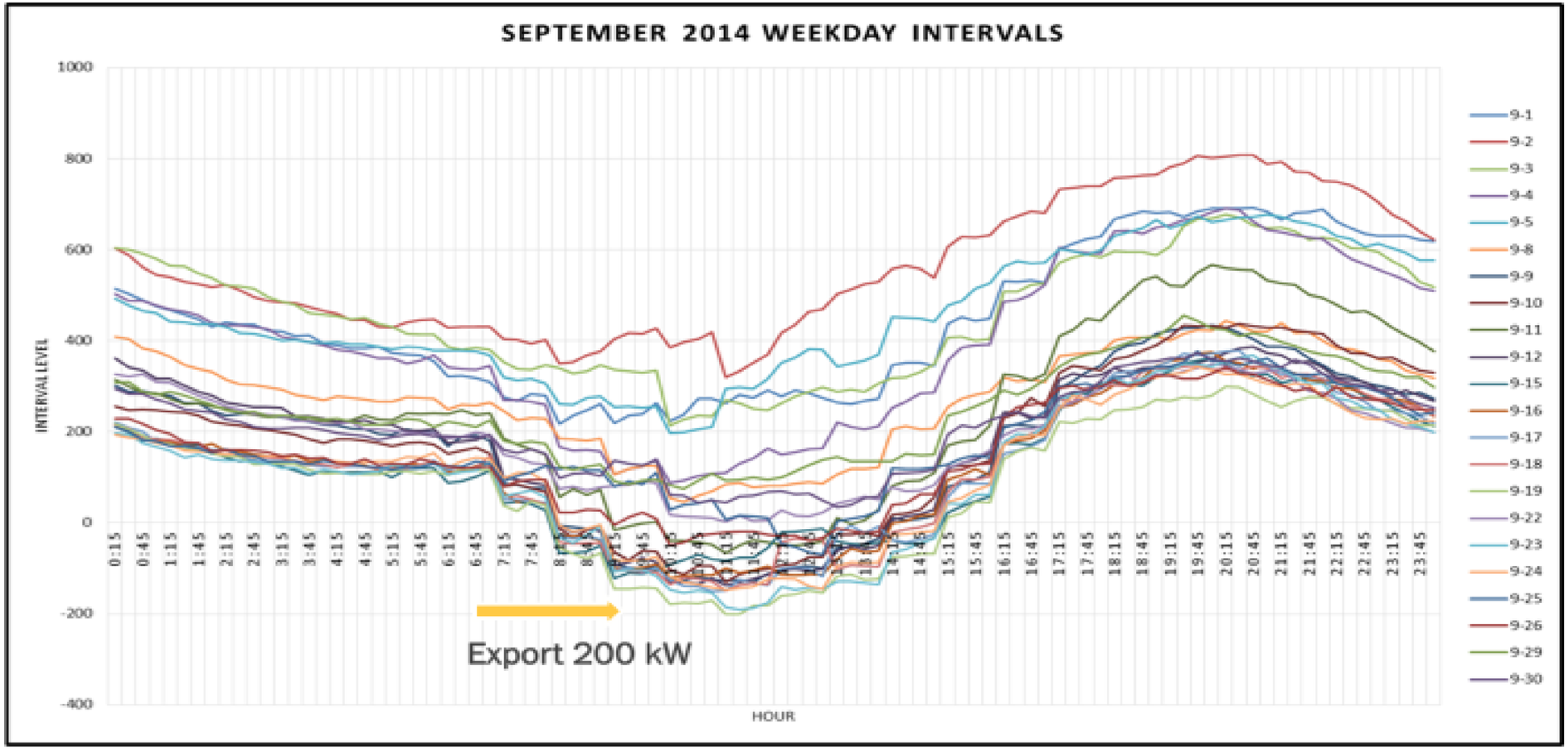
Distributed Energy Resources Project Components:

- 489 kW Solar PV
- 400 kW Fuel Cell
- 300 kW/1200 kWh Battery Storage

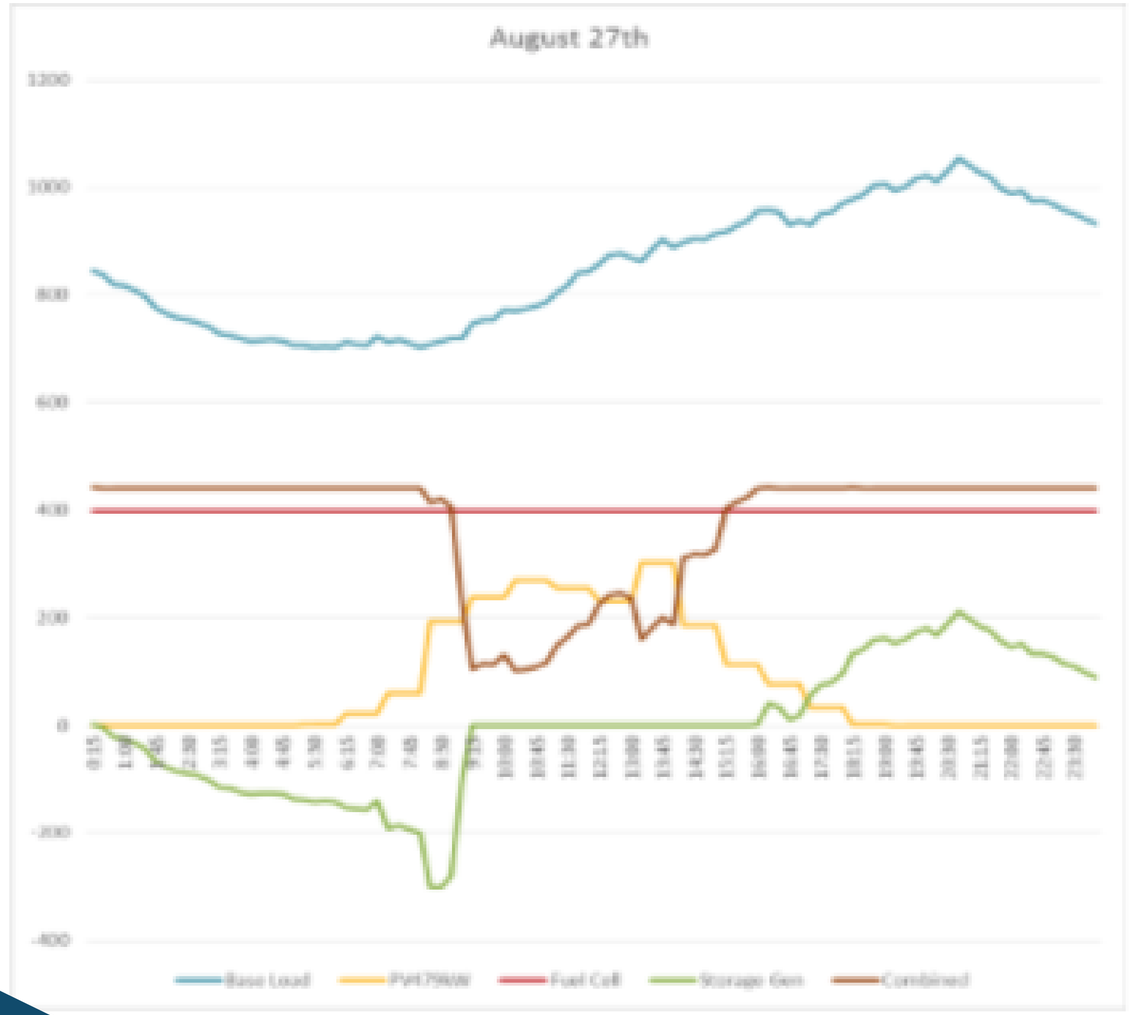
Marcus Garvey: Integrated DER Systems Benefits

- Customer portion of combined Energy Savings estimated in the multi-million dollar range over 20 year contract
- Project owned/operated by vendor; property owner has zero exposure if asset underperforms
- Battery storage asset enables PV and Fuel Cell assets to co-exist as proposed; without battery storage, additional generation would create a 200kW net-export and trip ConEd network protectors
- Battery storage can enable resilient operation of community center space during grid outages
- Trio of DER assets permanently drop load locally in area and provide tangible benefit to community by mitigating likelihood of brownouts and blackouts

Project Drivers: Generation Assets Must be Balanced with Grid



Marcus Garvey: DER Integration Effect on Campus Load Summer



Solar

Building Load

Resulting Load

Fuel Cell

Storage

Marcus Garvey: Development Timeline Detail

- Battery Storage Component -- Project timeline ~20 months from identification to installation
  - Summer 2015: Customer identification/opportunity scoping
  - Winter 2015/2016: Contracting & Utility Investment negotiation
  - Spring/Summer/Fall 2016: Permitting & Inter-connection process undertook; 3rd party financing sourced
  - Winter 2016: Project Announcement
  - Spring 2017: Project completion (Anticipated)
  - Summer 2017: System operational; provides grid services, customer savings, GHG emissions reductions

Marcus Garvey: Key Takeways

- Unique DER assets stack to meet multiple stakeholder needs:
  - Grid services: Targeted load relief under BQDM/BQNP
  - Customer energy bill savings: $/kWh savings; $kW savings
  - Community benefits: Resilient power during grid outages
  - Social benefits: GHG reduction of power supply
- Opportunity to reduce project development timelines
  - Transition to turnkey approach for hybrid DER solutions
  - Develop streamlined hybrid DER interconnection/permitting
- Hybrid DER solutions mitigate economic risks – addressing all value streams
  - Pipeline of proof points can expand financial sector appetite.

Thank You!

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Try the platform demo at

www.GridMarket.com