

The Power of Synergy: PV Plus Energy Storage

Market Opportunities in New York State

November 13, 2018



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The Power of Synergy: **PV Plus Energy Storage**

Building the Market

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New York State's 2025 Storage Target

- **Deploy 1,500 megawatts** of energy storage by 2025
- Delivering roughly **\$2 billion in gross benefits** to New York customers
- **Avoiding more than one million metric tons of CO₂ emissions**, on a path to even greater benefits as larger levels of intermittent renewables are deployed
- **Adding resiliency** to the electric system by reducing impact of outages; for illustrative purposes, 1,500 MW of storage is the equivalent electric demand of one-fifth of all NYS homes
- **Adding flexible resources** that allow intermittent renewables like solar and wind to be available when needed, especially during peak demand
- Growing the energy storage sector in New York to create **30,000 jobs by 2030**



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Energy Storage Deployed

Today:

- Approximately 60 MW of advanced storage (batteries, flywheels, thermal)
- 1,400 MW pumped hydro

Additional storage to be added:

2025

**+1,500 MW
advanced storage
(technology agnostic)**

2030

**PSC to
establish target**



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Roadmap Recommendations that directly impact PV + storage project economics



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Roadmap Recommendations

Retail Rate Actions to provide more accurate compensation and increase the ability to finance projects

- Offer optional, **more granular daily as-used demand charges** as a pilot tariff for demand metered customers, as delivery charge rate designs continue to better reflect cost-causation among customer classes through time and location
- Re-examine **charging/discharging rules and rates** for energy storage connected at customer, distribution, and bulk levels
- Offer **multi-year load management contracts** through utilities for 3-5 year terms



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Roadmap Recommendations

Retail Rate Actions: Value of Distributed Energy Resources Compensation for Exported Electricity

- **Standalone storage** is eligible for VDER compensation
- **Extend DRV lock** under value stack from 3 years to 7 years and implement a call signal
- Create a 4-8 hour window for a “peak ‘E’” Value that varies by season to **recognize higher carbon emissions during peak periods**

Total VDER Compensation =

Energy value (LBMP)

Capacity value (ICAP)

Environmental (E)

Distribution value (DRV) *

High value distribution (LSRV)

** or Market Transition Credit for community solar projects*



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Roadmap Recommendations

Wholesale Market Actions to directly or indirectly access wholesale market values and **Distribution and Wholesale Market Coordination**

- Implement changes enabling **storage participation in capacity and ancillary services markets** in compliance with FERC Order 841; include storage as a **transmission resource in NYISO planning**
- **Remove impediments to pairing storage with bulk renewables** by re-examining how preferential treatment is applied for intermittent renewables that are partially firmed by storage
- Accelerate “**dual market participation**” by recognizing an asset may simultaneously provide distribution and wholesale system needs in the NYISO’s electric storage resource participation model Order 841 compliance tariff filing
- **Exempt DERs including distribution and bulk storage from Buyer Side Mitigation**
- Expand integrated **T&D planning to include storage**
- Develop **clear control, coordination and dispatch requirements** including visibility into asset state of charge to enable greater use of DERs including energy storage in meeting system customer, distribution and wholesale system needs



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Market Acceleration Incentive

- Approximately \$350 million recommended statewide from existing sources of funds
- Align with uncompensated system benefits and declining storage costs
- Establish critical foundations for a self-sustaining market without direct incentives
- Declining MW block for customer sited and competitive procurement for distribution/bulk, in partnership with utilities



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Roadmap Recommendations

NYS Leading by Example to expand the market and engage public entities in State energy objectives

- Leverage the State's purchasing power to **act as a catalyst** for early adoption of storage among municipal cooperatives, schools, public buildings, SUNY, OGS, MTA and others
- NYPA and NYSERDA to work with State Education Department to maximize deployment of **solar + storage at K-12 schools**
- **NYPA** to pursue storage project design and deployment, procurement, public/private partnerships, and data validation through its NYEM and EDGE platforms



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Roadmap Recommendations

Addressing Soft Costs including Barriers to Data and Finance

- **Leverage NYGB and commercial PACE financing** to achieve greater economies of scale and reduce the cost of capital / financing
- Utilities to provide developers and operators with **hourly load data** (actual and forecasted) for substations connecting the distribution and bulk systems (i.e., transmission nodes) with increasing granularity provided over time
- Develop, implement, and maintain a **searchable data platform** containing aggregated customer-related data through utility and NYSERDA coordination
- Build a skilled talent pipeline through workforce development



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Path Forward

1Q18

- Governor Andrew M. Cuomo announces 1,500 MW storage target
 - Acelerex Energy Storage Study completed
-

2Q18

- Stakeholder engagement
 - NYS Energy Storage Roadmap released for formal public input
-

3Q18

- Technical conferences held
 - Formal public comments on Roadmap
-

4Q18

- PSC establishes 2030 energy storage goal and deployment mechanisms and programs (Public Service Law Section 74).
 - Incentive implementation design
-

1Q19

- Anticipate compliance filings submitted to DPS for market acceleration incentives implementation
- Implementation of market acceleration incentives begins



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The Power of Synergy: **PV Plus Energy Storage**

NYSERDA PV Plus Storage Incentive Design

David Sandbank

Director of Distributed Energy Resources, NYSERDA



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Overview of New York State's Aggressive Goals

- 50% renewables by 2030
- GHG emissions 40% below 1990 levels
- 1.5GW of energy storage by 2025
- NY-Sun \$1 billion commitment for 3GW goal

NY-Sun

\$1 Billion Initiative to Deploy 3GW by 2023



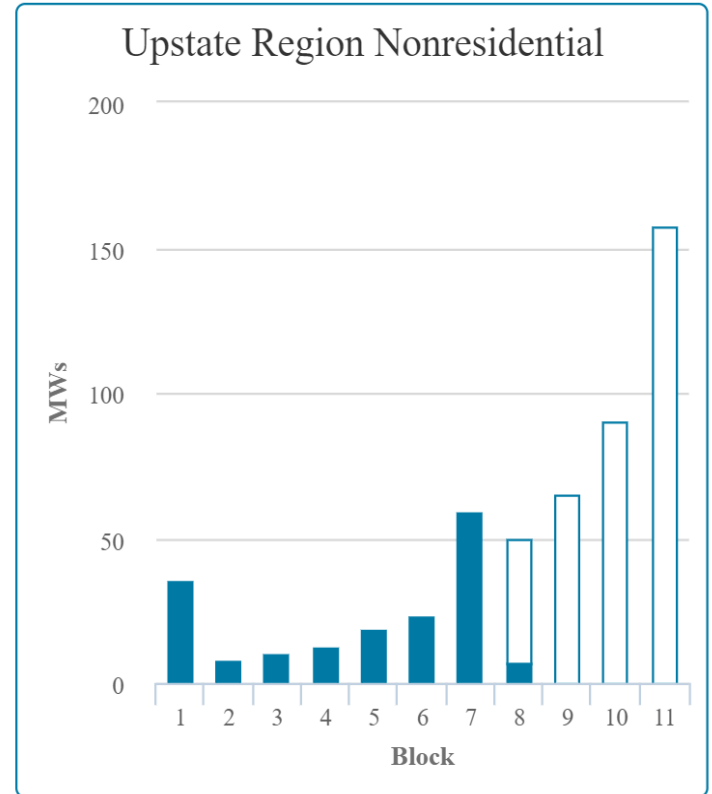
NY-Sun – MW Block Incentive Program

Three Regions:

- Con Edison
- Long Island
- Upstate (ROS)

Three Sectors:

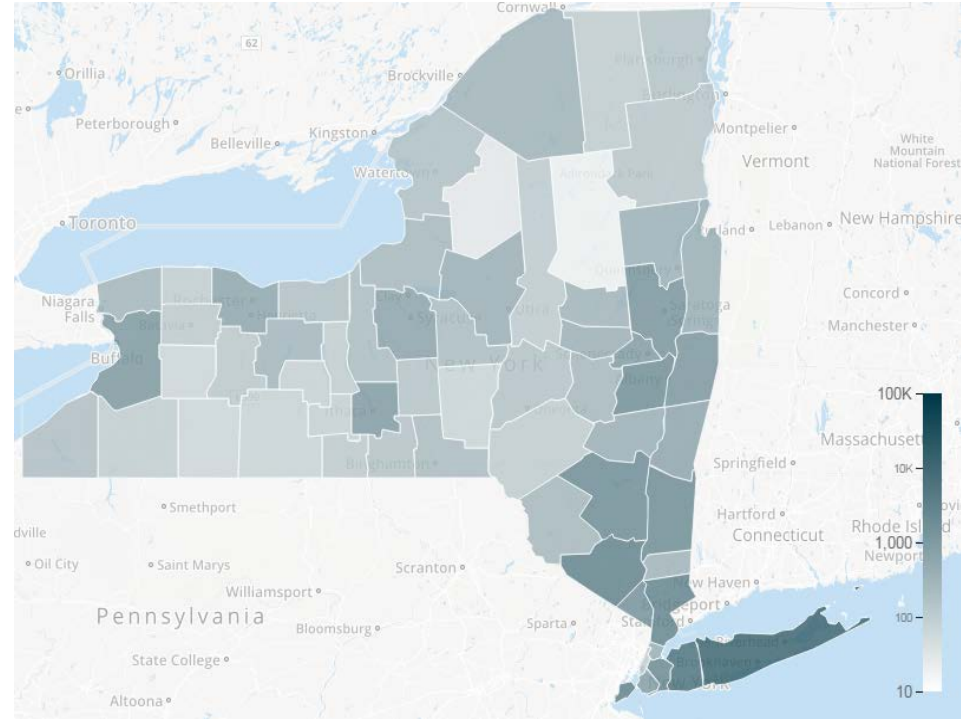
- Residential: up to 25 kW
- Nonresidential: ROS up to 750 kW & ConEd up to 7.5MW
- Commercial/Industrial: >750 kW – 7.5MW



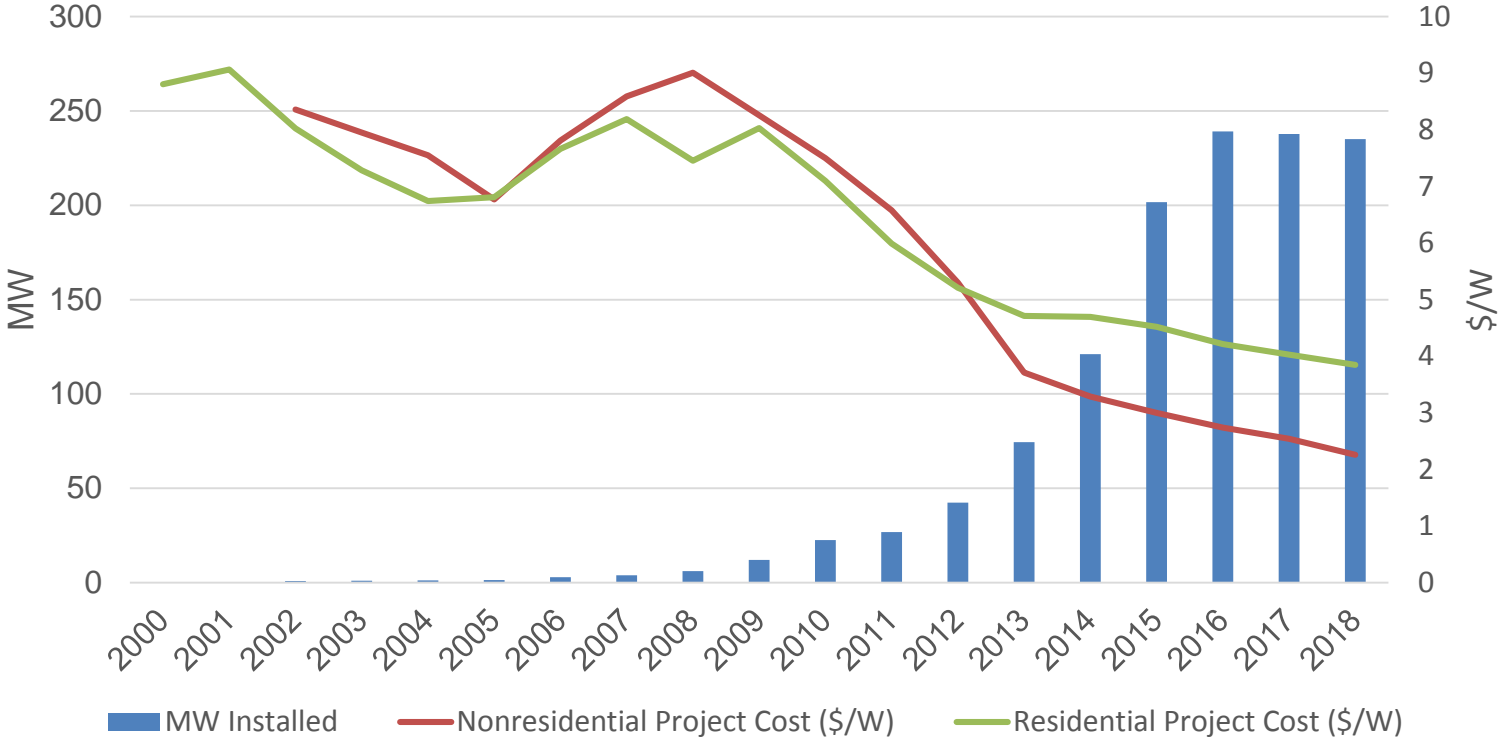
NY-Sun Program Activity to Date

- 1,229 MW installed statewide with NYSERDA support
 - 605 MW of residential PV (80,524 projects)
 - 624 MW of non-residential PV (5,572 projects)
- 926 MW currently in NY-Sun pipeline
 - 713 MW of Community Solar in the Pipeline

Completions by County



MW Installed and project costs Statewide by Year



NY-Sun Energy Storage Adder

The Power of Synergy: Solar Plus Energy Storage

Pairing Solar with energy storage holds significant benefits

- Leverage the NY-Sun momentum
- For the 1st time in New York storage is compensated through the value stack for grid benefits where it is the most valuable
- Capturing the federal Investment Tax Credit for Solar before it sunsets
- Use the NY-Sun approach to providing local government support with zoning and permitting
- Capture cost savings associated with combined siting/permitting and tax equity financing of paired systems
- NY Green Bank financing to demonstrate viability and drive scale
 - NY Green Bank seeks to invest at least \$200 million in storage-related projects and recently modified it's RFP 10 to include storage in CDG projects

Solar Plus Energy Storage Eligibility

Projects Eligible

- Nonresidential and Commercial & Industrial solar projects that qualify for NY-Sun incentives
- New NY-Sun project applications
- Existing NY-Sun project applications in Approved status
- Community and Remote solar under VDER
- On-site solar, with customer load for peak demand reduction and retail bill savings

Projects NOT Eligible

- Residential projects
- NY-Sun projects that have already been marked “Completed” in the NY-Sun portal
- PSEG and NYPA customers
- Any solar projects outside of NY-Sun - Off-grid and bulk generation (i.e. Large-Scale Renewables)

PV Plus Storage Incentive

- Incentive
 - Eligible energy storage projects will receive **\$350 per kWh** of installed energy storage capacity (AC). The storage incentive is 100% payment at PTO.
- Project requirements
 - The minimum eligible capacity of an energy storage system is 100 kWh AC
 - The capacity (kWh AC) eligible for incentive is limited to four times the rating (kW AC) of the associated inverter.
 - Projects requiring a storage capacity greater than four times the inverter capacity may submit justification that the larger storage capacity is appropriate and the incentive on the additional capacity may be granted at NYSERDA's discretion.
 - All projects seeking energy storage incentives must be submitted by a NY-Sun approved contractor



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The Power of Synergy PV Plus Energy Storage

David Sandbank

Director - Distributed Energy Resources

November 13, 2018

The Power of Synergy: **PV Plus Energy Storage**

Permitting and Siting

Jason Doling

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Kendra Kostek

Project Manager, NYSERDA

Michael Conway

Director of Business Development, Borrego Solar



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STATE OF
OPPORTUNITY.

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NYSERDA Power of Synergy Conference Clean Energy Siting Team

Kendra Kostek

November 13, 2018

NY Solar Guidebook for Local Government



Chapter 1 - Solar PV Permitting and Inspecting in NYS

Chapter 2 - Roof Top Access and Ventilation Requirements

Chapter 3 - State Environmental Quality Review (SEQR)

Chapter 4 - NYS's Real Property Tax Law § 487

Chapter 5 - Solar Payment-In-Lieu-of-Taxes Toolkit

Chapter 6 - Using Special Use Permits and Site Plan Regulations

Chapter 7 - Solar Installations in Agricultural Districts

Chapter 8 - Landowner Considerations for Solar Land Leases

Chapter 9 - Decommissioning Solar Panel Systems

Chapter 10 - Model Solar Energy Local Law

Chapter 11 – Municipal Solar Procurement Toolkit

Technical Assistance for Local Governments

NYSERDA offers local governments free one-on-one assistance on:

1. Adopting a Payment-In-Lieu-Of-Taxes (PILOT) law
2. Completing the SEQR process for large solar installations
3. Planning and Zoning for Solar
 - Adopting a Model Solar Energy Law
 - Siting PV in Agricultural Districts and agricultural areas
 - Updating master plans and zoning regulations
4. Municipal Solar Procurement
5. Permitting and Inspections
 - Adopting and implementing the Unified Solar Permit
 - Technical consulting to relieve administrative burdens



Clean Energy Siting Homepage

Clean Energy Siting for Local Governments

[New York State Solar Guidebook](#)

[New York Wind Energy Guide](#)

[Article 10](#)

[Technical Assistance and Support](#)

[Clean Energy Siting Email List](#)

Clean Energy Siting for Local Governments

NYSERDA offers several resources to help local governments understand how to manage responsible clean energy development in their communities. These resources include step-by-step instructions and tools to guide the implementation of clean energy, including permitting processes, property taxes, siting, zoning, and more. If you have a question on clean energy siting in your community, or need help with a chapter of the Guidebook, email cleanenergyhelp@nyserda.ny.gov and we'll respond to you within 24 hours. For more hands-on support, learn more about our free [training and technical assistance opportunities](#).

Stay up-to-date with the latest about Clean Energy Siting. [Join our email list](#) for local government officials.

The entire Solar Guidebook is available for download here

Ask the team any question by sending an email to cleanenergyhelp@nyserda.ny.gov

Municipalities can request technical assistance here



Thank you

For additional questions, please contact me at:

Kendra.Kostek@nyscrda.ny.gov



Introduction

NYSERDA “Power of Synergy” Conference

November 13, 2018

Permitting & Siting

Energy Storage & Borrego Solar

- Energy Storage & Borrego Solar
 - Launched energy storage division in 2016
 - Constructed first PV+ES site in 2017 (Charlton, MA)
 - ~20MWh constructed between CA & MA
 - ~153MWh in permitting, design, and/or construction
 - ~53MWh currently in permitting in NY



Permitting Considerations

Fire Suppression

Hazardous Materials

Containment

Visibility

Noise / Ambient

Interconnection Equipment

PILOT

Equipment Life & Decommissioning





Thank you

Michael Conway, PE

mconway@borregosolar.com

The Power of Synergy: **PV Plus Energy Storage**

Interconnection

Dave Crudele

Smart Grid Team Lead, NYSERDA

Elizabeth Grisaru

Policy Advisor and Co-Chair Interconnection Policy Working Group, DPS



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Distribution Level Interconnection in New York

New York SIR Overview

- Applies to distributed generation (DG) up to 5 MW_{AC} operating in parallel with the distribution system
- Recent changes added energy storage systems (ESS) subject to 5 MW limit
 - ESS may be stand-alone or combined with existing or new DG
- There is a fast track process for projects under 50 kW_{AC}
- Larger or more complex projects require impact studies (a.k.a. CESIR study)
- Rules set deadlines for both developer and utility
- www.dps.ny.gov/distgen

SIR - Basic Process Outline

Process for applications above 50 kW_{AC} that do not qualify for fast track

- Developer submits a complete application – DG requirements listed in Appendix F; additional requirements applicable to ESS are in Appendix K
- Utility conducts preliminary and supplemental screens
- Parties review results and make adjustments
- At each step, look for solutions that allow the project to move to construction
- If project does not pass to construction at screening stage, developer must either commit to full study or withdraw

SIR Part C - System Impact Study

Coordinated Electric System Interconnection Review (CESIR)

- SIR specifies data to be provided by the applicant
- Utility performs CESIR within 60 business days after receipt of applicant's data
- CESIR studies utility system impacts needed system modifications
- Utility provides cost estimates for system modifications
- Applicant has 180 business days to make payment or withdraw the application
- Following payment for system modifications, developer may construct and test

CESIR Deliverables and Next Steps

- Utility provides CESIR report and cost estimate
- Developer down payment (25%) due within 90 business days
- Parties sign standard interconnection contract for ESS projects
 - Contract incorporates the operating characteristics proposed by the applicant in Appendix K
- Utility provides letter confirming compensation and initial construction schedule
- Final payment is due within 120 business days
- Utility provides updated construction schedule within 30 business days of payment

Making Changes to an ESS Facility

- SIR Section E covers ESS
- Owner of the ESS may apply to change its operating characteristics
- Process starts with submission of a revised Appendix K
- Study and new interconnection agreement follow

NYS Interconnection Team

Interconnection Technical Working Group Leads:

Jason Pause (DPS)

518-486-2889

jason.pause@dps.ny.gov

Dave Crudele (NYSERDA)

518-862-1090

dave.crudele@nyserda.ny.gov

Interconnection Ombudsperson(s) & Policy Working Group Leads:

Elizabeth Grisaru (DPS)

518-486-2653

elizabeth.grisaru@dps.ny.gov

Houtan Moaveni (NYSERDA)

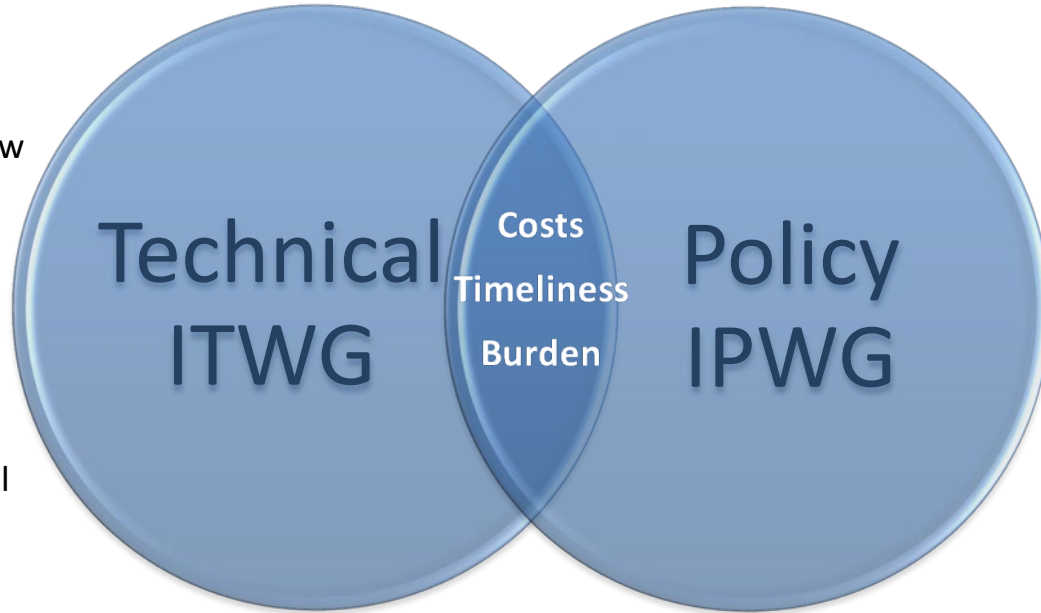
718 744-4106

houtan.moaveni@nyserda.ny.gov

Interconnection Working Groups

Technical

- Technical barriers & new technologies
- Consultants – EPRI & Pterra
- SIR screening
- Islanding Protection
- Monitoring and Control
- Voltage Flicker
- Energy Storage
- Metering Configurations



Policy

- Queue management methodology
- Communication
- Policy interpretation, timelines, and stage gates
- VDER / NEM grandfathering
- Cost sharing

Sources for More Information

[Department of Public Service – DG Page](#)

www.dps.ny.gov/distgen

More Info



Distributed Generation Information

New York State Standardized Interconnection Requirements

NYS Standardized Interconnection Requirements (Latest Version)
Equipment Certified Since 2011
Equipment Certified Prior to 2011

EPRI Report – Interconnection of DG in NY State (September 2015)
IOAP Report and Functional Specification (September 2016)
VDER Phase One CDG Tranches

Interconnection Technical Working Group Information

Interconnection Policy Working Group Information

Interconnection Ombuds Information

SIR Inventory Information

Utility Red Zone Maps and Other Useful Links

The Power of Synergy: **PV Plus Energy Storage**

Project Economics and Financing

Doug Staker

Vice President Global Business Development, Enel X

Ean Mulligan

Northeast Market Manager, Cypress Creek Renewables

Jason Moore

Director, NY Green Bank



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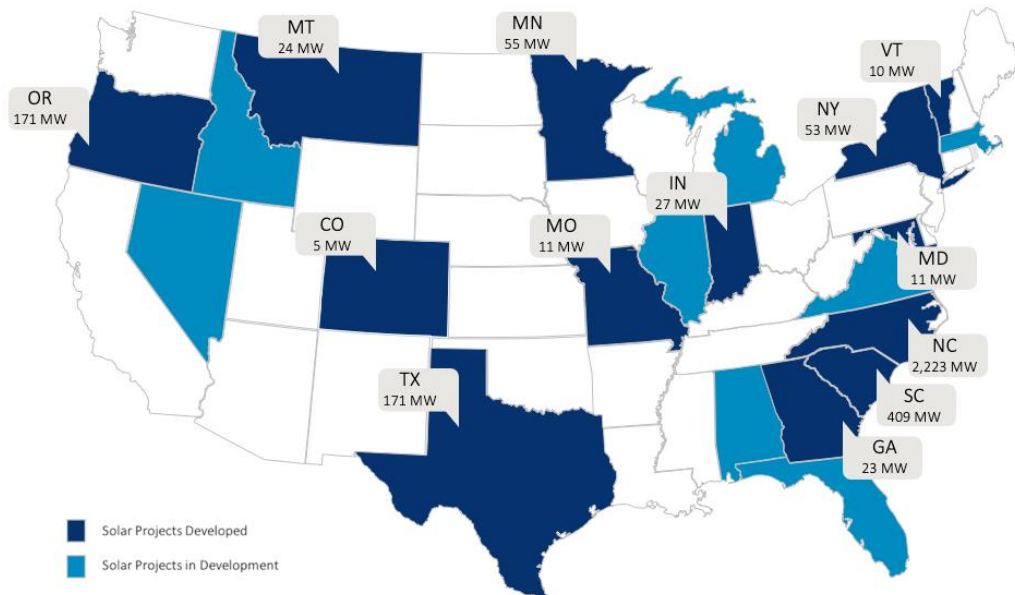
PV + Storage Economics and Financing

11/13/2018

CCR - Who We Are

Cypress Creek is an integrated solar company with a proven track record of developing, financing, building, & operating solar projects across the country.

We have developed 3.2 GW¹ to date and plan to build just under 1 GW in 2018. We have completed nearly 350 projects & raised \$2.6 billion in capital.



1. GW developed figure represents projects owned, operated, and sold.
2. A project is in development if it has site control and is dev-active.



CCR – PV + Storage

Cypress Creek believes storage is an essential part of the continued deployment of solar

1. 12 projects that have been in operation since December 2017
 - Application
 - Production shifted to meet ramping of morning peak (winter) & afternoon peak (summer)
 - Reduces Cooperative's capacity & transmission charges
 - Project
 - 8.5 MW of solar and 12 MWh of storage
 - AC-Coupled pre-scheduled dispatch per PPA
 - Financed with Tax Equity and USDA debt
2. 500 MW-hr of active solar + storage in development across 5 states
 - PPA signed with NV Energy for 101 MW of solar with 100 MW-hr DC coupled battery



Capacity Value – Alternative 2

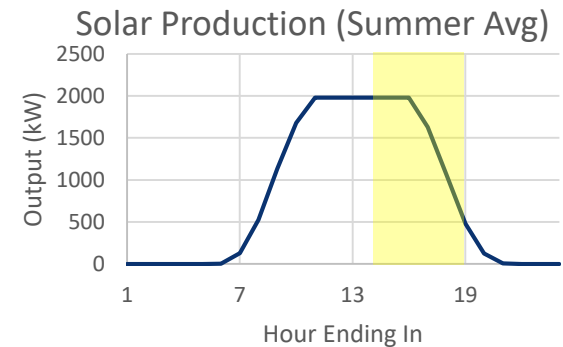
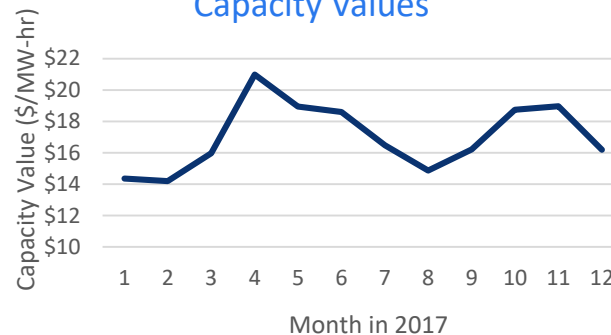
Converts Capacity Rate (\$ / kW-Month) into a VDER Capacity Value (\$ / kWh) that is only available during 460 summer hours (2-7 PM)

- More complex, but important piece of value stack. As implementation continues, risk associated with Alt 2 and 3 will decrease
- Alt 1 rate calculation is **adjusted** by utility based on service class peak load over 460 summer hours and summer capacity strip auction price. Denominator is utility service class sales over 460 summer hours.**



Value Stack +
MTC (CDG)

Zone G - J, 2017 Alternative 1
Capacity Values



460 adjustment**

Solar Only Production
in 460 hrs

$$\$240 / \text{MWh} \times 470 \text{ MWh} = \$112,800 / \text{year}$$

This can be increased significantly
through the addition of storage
and energy time shifting

**Approximate value

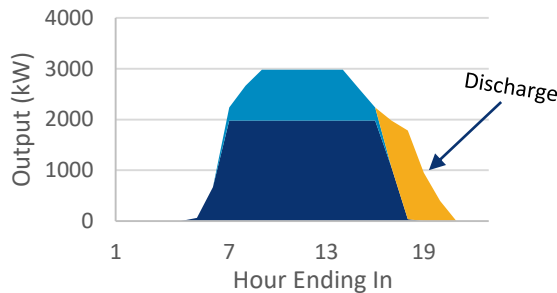
Solar + Storage Value Add

Batteries provide significant value – especially in Zone G - J, where Capacity Values are higher

1. Yield Increase through Clipping Capture

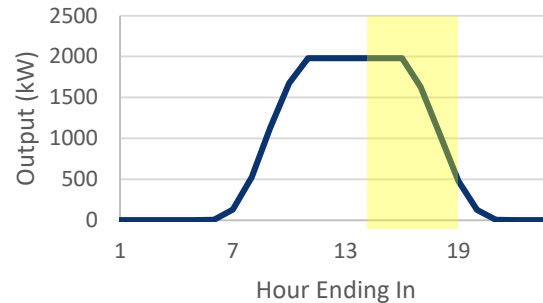
- DC-Coupled batteries are capable of capturing energy typically lost above inverter limit.
- On 1.5 DC – AC ratio systems we are seeing 3 – 5% increases in yield
- Further synergies with high wattage modules and single-axis trackers

Clipping Capture

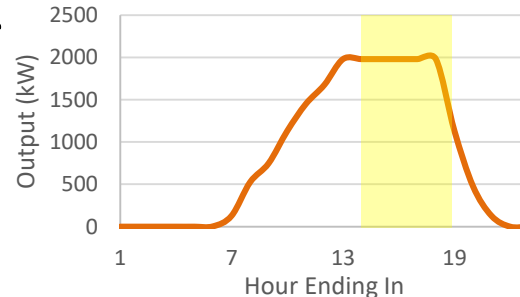


2. Capacity Value Increase by Targeting 460 hours

Solar Production (Summer Avg)



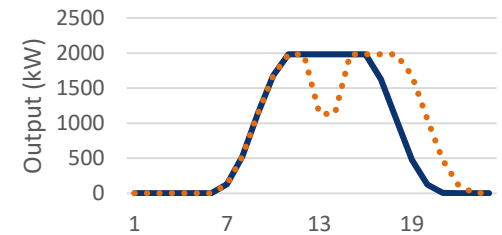
With Battery (Summer)



3. Time Shifting During LBMP Price Peaks

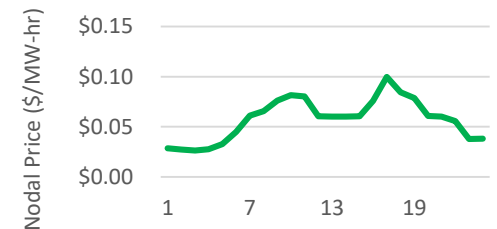
- Clipping Capture + Energy Shifting allows better utilization of solar during peak LMBP hours
- Minor impact compared to capacity, but essential for long-term valuation

Example Day



— Solar Only ····· Solar + Storage

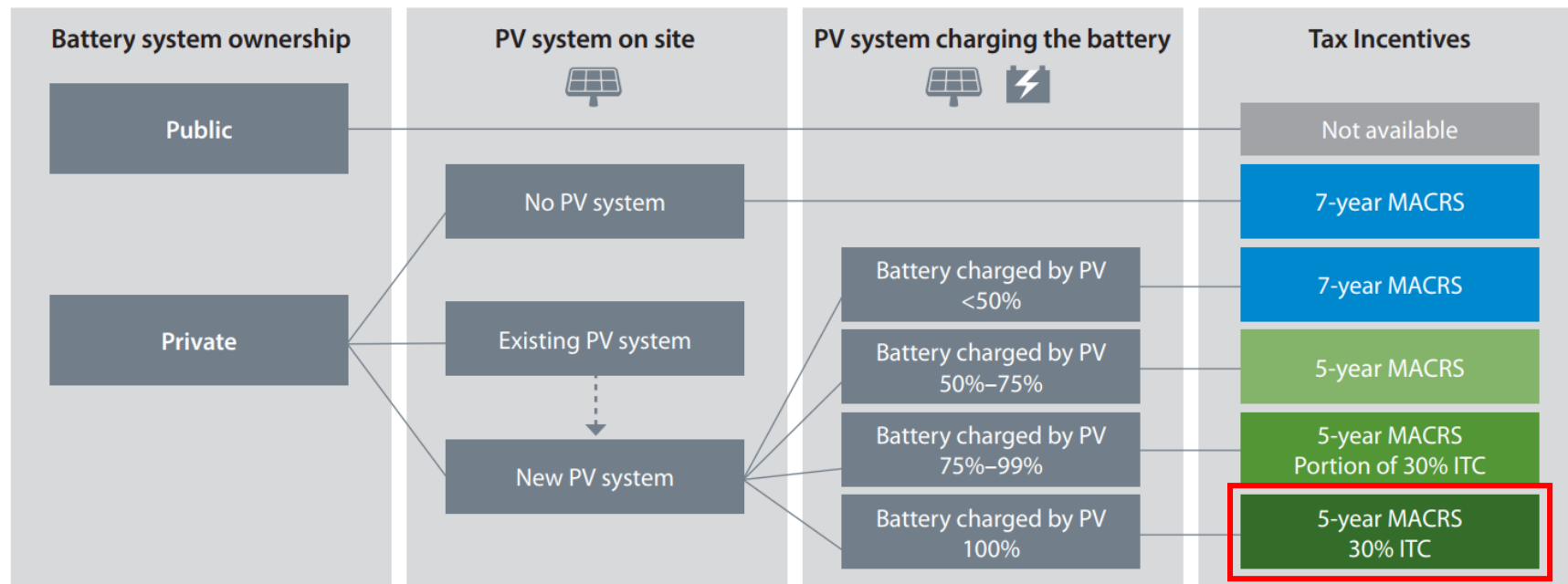
LMBP Price - Example Day



Solar + Storage Financeability

Low cost solar + storage will largely be facilitated through long-term, low cost of capital financing with debt and tax equity partners. Timing is critical for inclusion in the ITC.

Source: NREL



Requirements for Financeability:

- 10 year performance warranty minimum.
- Software integration with full SCADA controls to enable remote dispatch and performance monitoring.
- Proven track record of installations and performance of vendors storage technology and across entire value chain

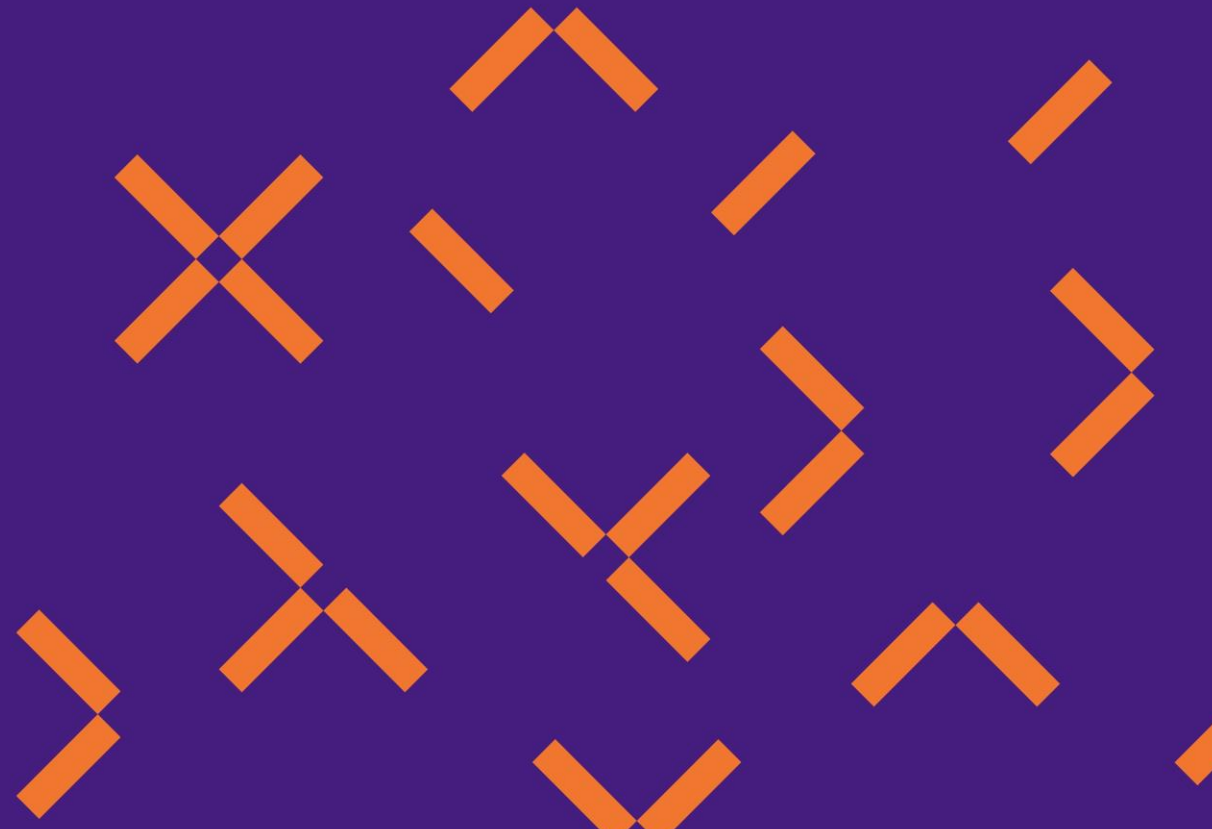




Enel X Solar + Storage Overview for NYSERDA

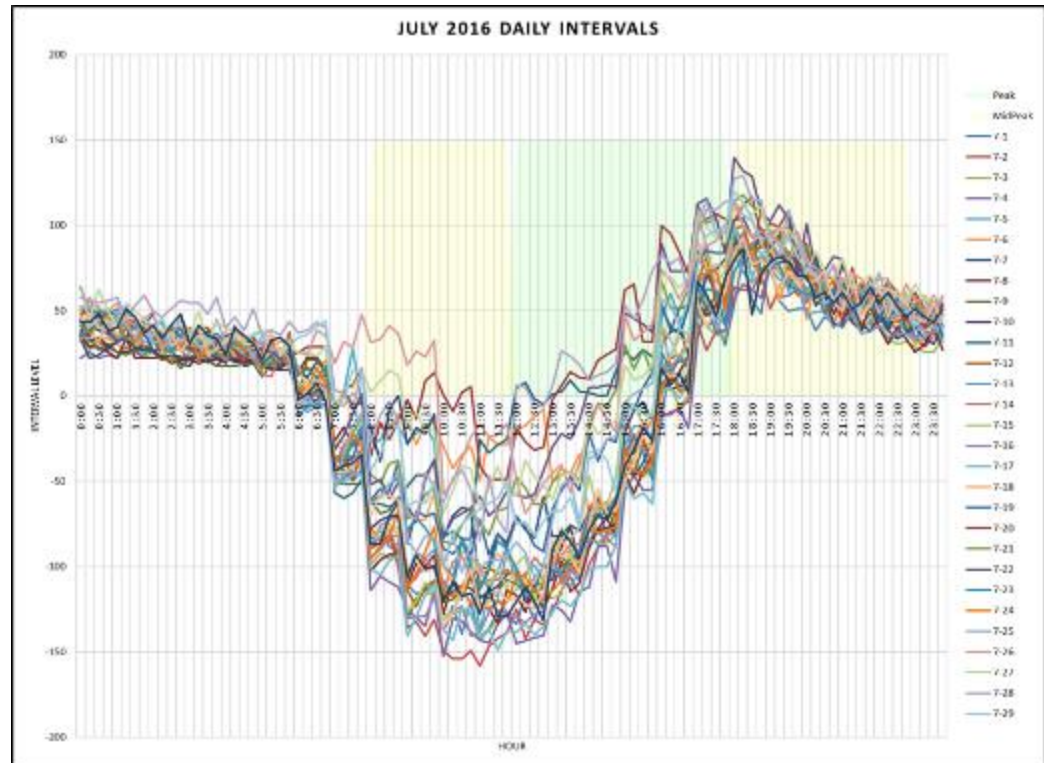
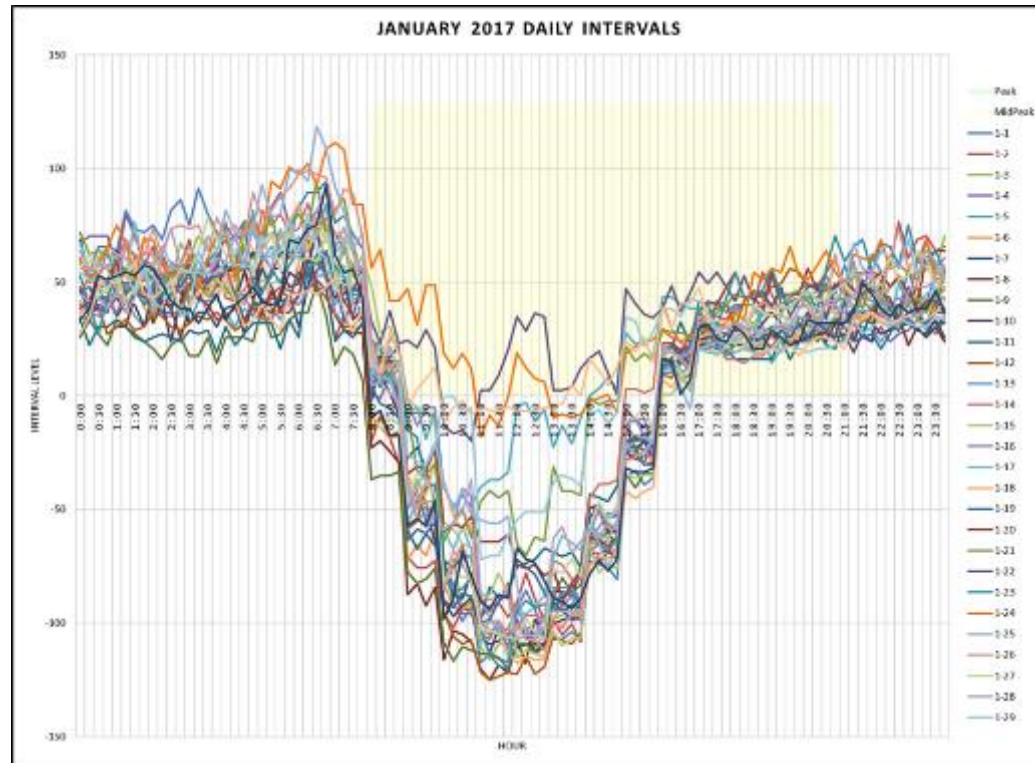
Doug Staker

Vice President, Utility Business Development
Flexibility Solutions
Enel X



January and July Base Load Profiles + Solar

Daily Intervals



Rate Evolution

We can't build a digital power grid based on an analog rate design



Electricity you used during this 29 day billing period from Apr 03, 2012 to May 02, 2012
 Rate: 1.3 General Large Meter: 9323904
 We measure your electricity by how many kilowatt hours (kWh) you use. One kWh will light a 100-watt bulb for 10 hours. The meter multiplier is the factor by which the meter reading difference is multiplied to determine your usage. Demand or kW is the highest amount of electric usage in any half hour during the billing period.

May 02, 12 actual reading	8227	18.88
Apr 03, 12 actual reading	-7987	-17.87
Reading difference	240	.49
Meter multiplier	3000	1000
Your electricity use	192,000 kWh	302.00 kW

Total delivery charges \$18,817.50
Total electricity charges \$18,817.50

Your supply charges
 These charges are for the delivery portion of your electricity bill. You will receive a separate bill for your electricity supply. If you have a question about your supply bill, please call CONEDSON SOLUTIONS at (800) 789-1566.

Your delivery charges
 Energy delivery 192,000 kWh \$0,000.73
 Charge for maintaining the system through which Con Edison delivers electricity to you.
 Demand delivery 302.0 kW \$0,802.26
 Charge for maintaining the system through which Con Edison delivers electricity to you.

Monthly

Name: BAYCLAY ST DEVELOPMENT LLC Account Number: 49-4113-029-010-0 Billing period ending: Aug 31, 2012 Page 3 of 4

As Used Daily Demand

DATE	WEDNESDAY or WE-Weather	PERIOD 1: MON - FRI 8 AM - 6 PM			PERIOD 2: MON - FRI 8 AM - 10 PM		
		DAILY DEMAND kW	STANDBY	MAX	DAILY DEMAND kW	STANDBY	MAX
04/03/12	WD	302.0	\$10.65	\$17.75	372.6	\$12.73	\$40.03
04/04/12	WD	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/05/12	WD	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/06/12	WD	316.9	\$10.65	\$18.67	363.9	\$12.64	\$39.78
04/07/12	WD	348	\$10.66	\$18.74	383.9	\$12.65	\$39.94
04/08/12	WD	372	\$10.66	\$17.89	383.6	\$12.65	\$41.76
04/09/12	WD	391.0	\$10.66	\$19.00	425.0	\$12.65	\$49.20
04/10/12	WD	432	\$10.66	\$20.00	475.0	\$12.65	\$59.25
04/11/12	WD	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/12/12	WD	387.0	\$10.66	\$19.00	425.0	\$12.65	\$59.25
04/13/12	WD	381.0	\$10.66	\$18.50	425.0	\$12.65	\$59.25
04/14/12	WD	338.0	\$10.66	\$16.50	425.0	\$12.65	\$59.25
04/15/12	WD	391.2	\$10.66	\$19.00	425.0	\$12.65	\$59.25
04/16/12	WD	398.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
04/17/12	WD	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/18/12	WD	368.7	\$10.66	\$18.00	425.0	\$12.65	\$59.25
04/19/12	WD	382.0	\$10.66	\$18.50	425.0	\$12.65	\$59.25
04/20/12	WD	394.0	\$10.66	\$19.00	425.0	\$12.65	\$59.25
04/21/12	WD	374.4	\$10.66	\$18.00	425.0	\$12.65	\$59.25
04/22/12	WE	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/23/12	WE	-	\$0.00	\$0.00	-	\$0.00	\$0.00
04/24/12	WD	374.0	\$10.66	\$18.00	425.0	\$12.65	\$59.25
04/25/12	WD	409.0	\$10.66	\$20.00	425.0	\$12.65	\$59.25
04/26/12	WD	408.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
04/27/12	WD	404.0	\$10.66	\$19.00	425.0	\$12.65	\$59.25
04/28/12	WD	410.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
04/29/12	WD	410.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
04/30/12	WD	410.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
05/01/12	WD	410.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25
05/02/12	WD	410.0	\$10.66	\$19.50	425.0	\$12.65	\$59.25

Daily

Day Ahead Market Zonal LMP
 --LSE \$ --Market/Cost/Low --Market/Cost/High Date: 6/26/2012

Zonal Prices

Zone	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
NY1	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
NY2	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
NY3	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
NY4	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25

Hourly

A Move to Daily Demand Charges

Convert from a monthly structure to a daily structure with TOU Locational value



Typical Commercial Utility Bill	
<u>Supply</u> - Flat Rate	¢/kWH
<u>Delivery</u>	
Customer Charge (Fixed)	\$
Energy Charge	¢/kWH
Demand Charge (based on highest peak in the billing period)	\$/kW
Monthly Adjustments	¢/kWH
Taxes	\$

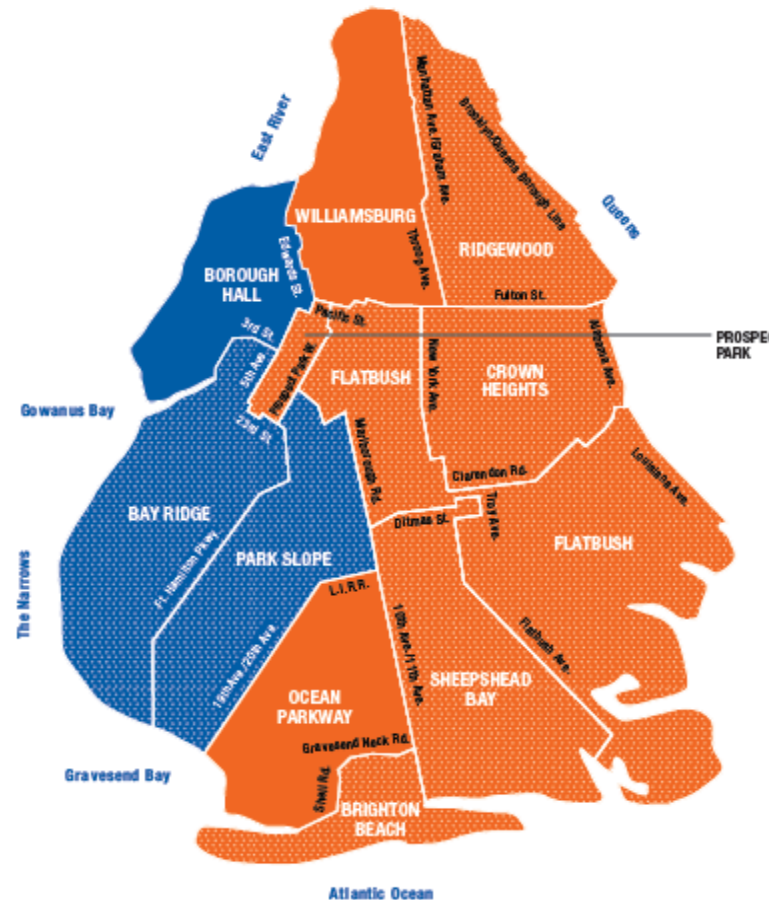
Standby- Con Edison Rider Q	
<u>Supply</u> - Day-Ahead Hourly	¢/kWH/H
<u>Delivery</u>	
Customer Charge (Fixed)	\$
Contract Demand (Fixed- Based on Historic Peak)	\$/kW
Demand Charge Daily Period 8 am to 10 PM (M-F) Locational 4 hour period based on Substation Peak	\$/kW
Monthly Adjustments	¢/kWH
Taxes	\$

Con Ed Brooklyn Locational Peak Periods

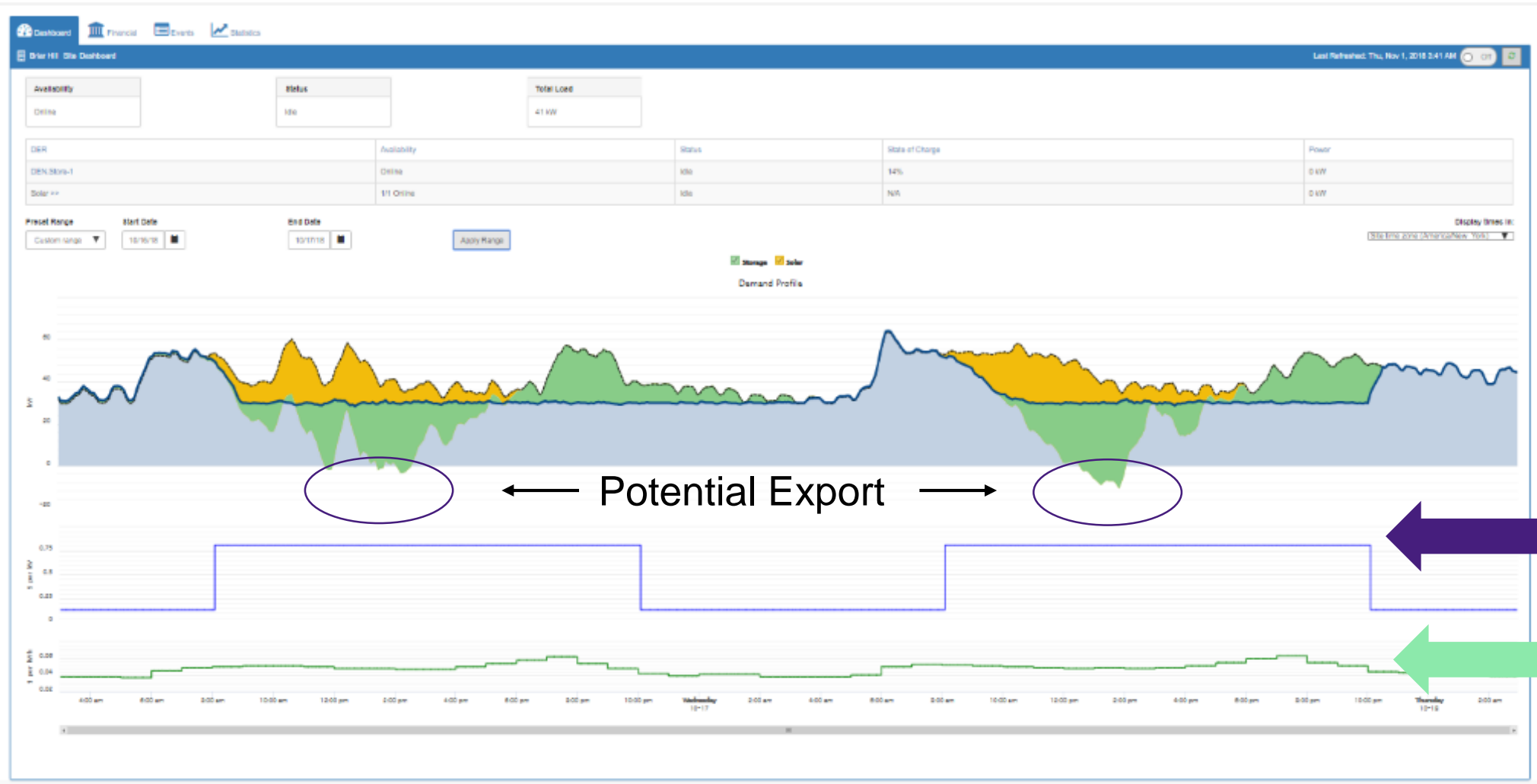


- ✓ Borough Hall
11 AM to 3 PM
- ✓ Bay ridge & Park Slope
2 PM to 6 PM
- ✓ Williamsburg & Ocean Parkway
4 PM to 8 PM
- ✓ Ridgewood, FlatBush, Crown Heights, Flatbush, Sheepshead Bay, Brighton Beach
7 PM to 11 PM

Brooklyn Map



Load Shaping Example- Briar Hill, Bronx NY



Blue Line- Load as seen by the utility

Yellow Shade- Load Reduced by solar

Green Shade- Below the line, storage of excess solar

Above the line, load reduced by Storage

Standby Daily Demand pricing 8 am to 10 pm

Day Ahead Hourly Supply pricing



Business Case



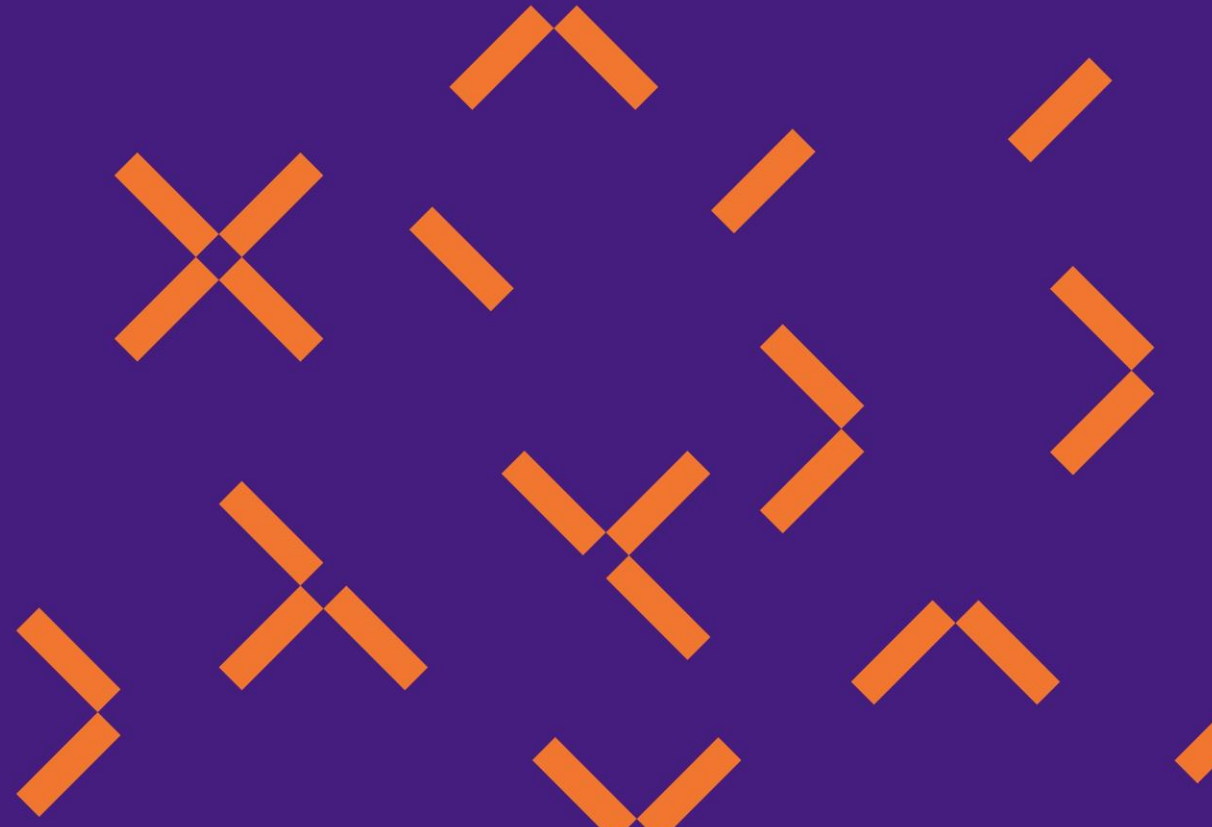
<i>Simple Business Case</i>			
<i>100 kW PV + 100 kW / 200 kWh Storage</i>			
<i>Solar Size</i>	100 kW DC		
<i>Install Cost</i>	\$ 3,500 \$/kW		\$ 350,000
<i>NYSUN</i>	\$ 600 \$/kW		(\$60,000)
<i>ITC</i>	30%		(\$105,000)
<i>Depreciation</i>	0%		
	Subtotal		\$ 185,000
<i>Storage</i>	200 kWh		
<i>Install Cost</i>	\$750 \$/kWh		\$150,000
<i>NYSERDA</i>	\$350 \$/kWh		(\$70,000)
<i>ITC</i>	30%		(\$45,000)
<i>Depreciation</i>	0%		
	Subtotal		\$35,000
	Total		\$ 220,000
<i>Demand Charge Management/Demand Response</i>			
<i>DCM (75%)</i>	\$300 \$/kW-year		\$22,500
<i>DR (75%)</i>	\$200 \$/kW-year		\$15,000
<i>Simple Payback</i>			5.9 Years



Thank you

Doug Staker

Vice President, Utility Business Development
Flexibility Solutions
EnerNOC, an Enel Group Company





NY Green Bank
A Division of NYSERDA

NY Green Bank

Jason Moore, Director | November 13, 2018

New York, NY

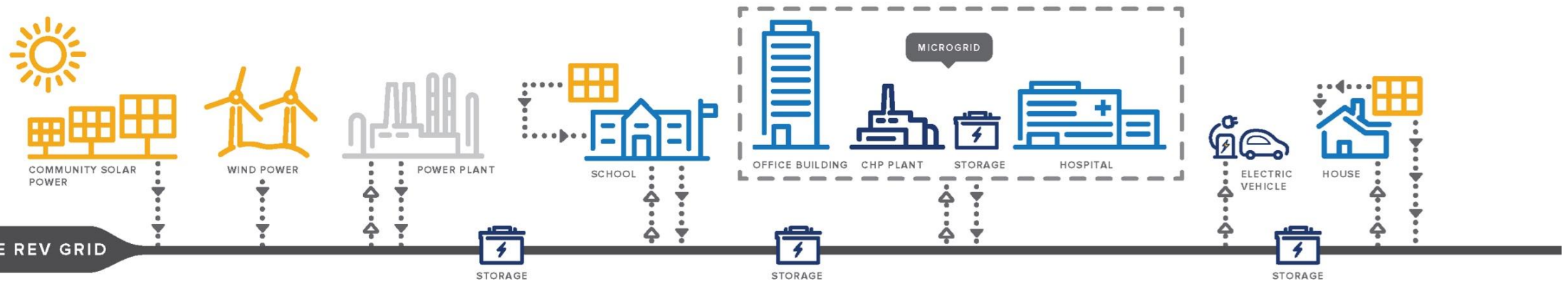
NY Green Bank Accelerates Clean Energy Deployment in NYS

Mission:

To accelerate clean energy deployment in New York by working in collaboration with the private sector to transform financing markets

- **What:** A \$1 Billion State-sponsored investment fund that is a division of NYSERDA
- **Why:** To alleviate financing gaps in New York's clean energy markets and create a cleaner, more resilient and affordable energy system
- **How:** By mobilizing greater private sector activity to increase the availability of capital for clean energy projects

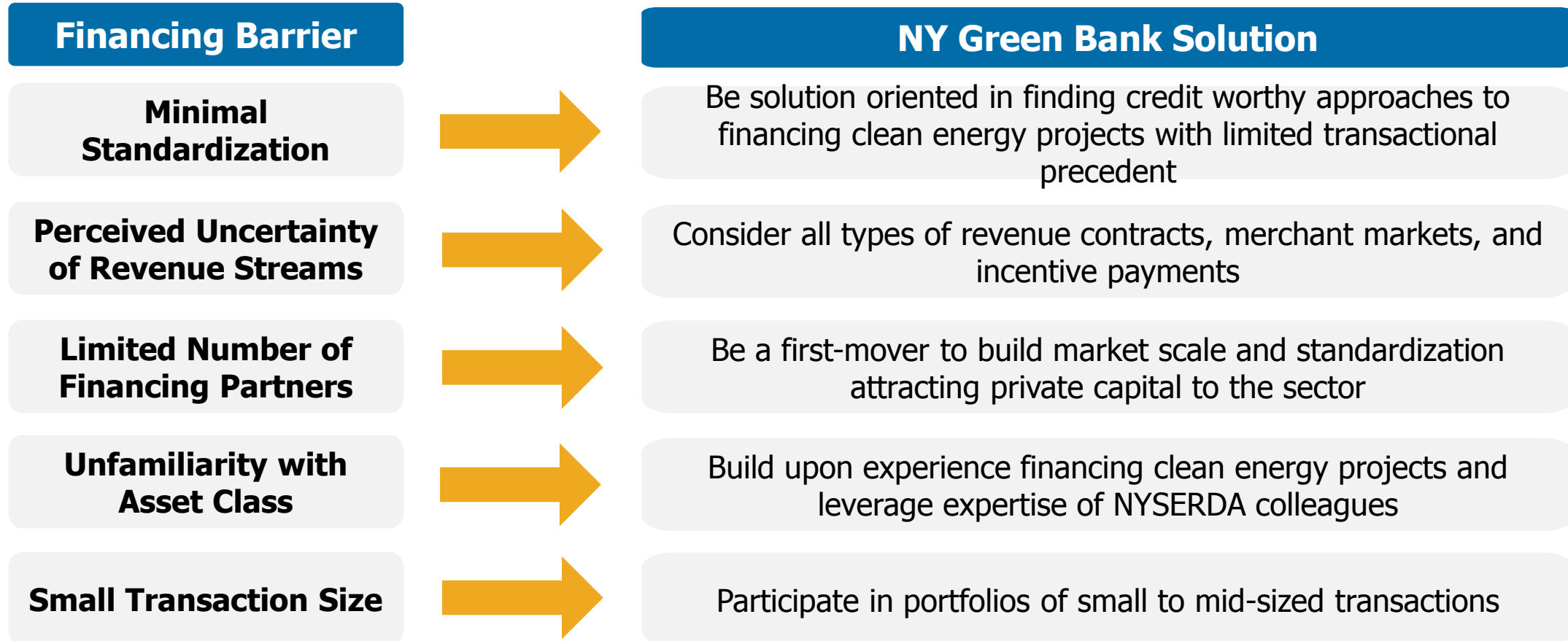
Advancing NYS Clean Energy Goals



Reforming the Energy Vision (REV):

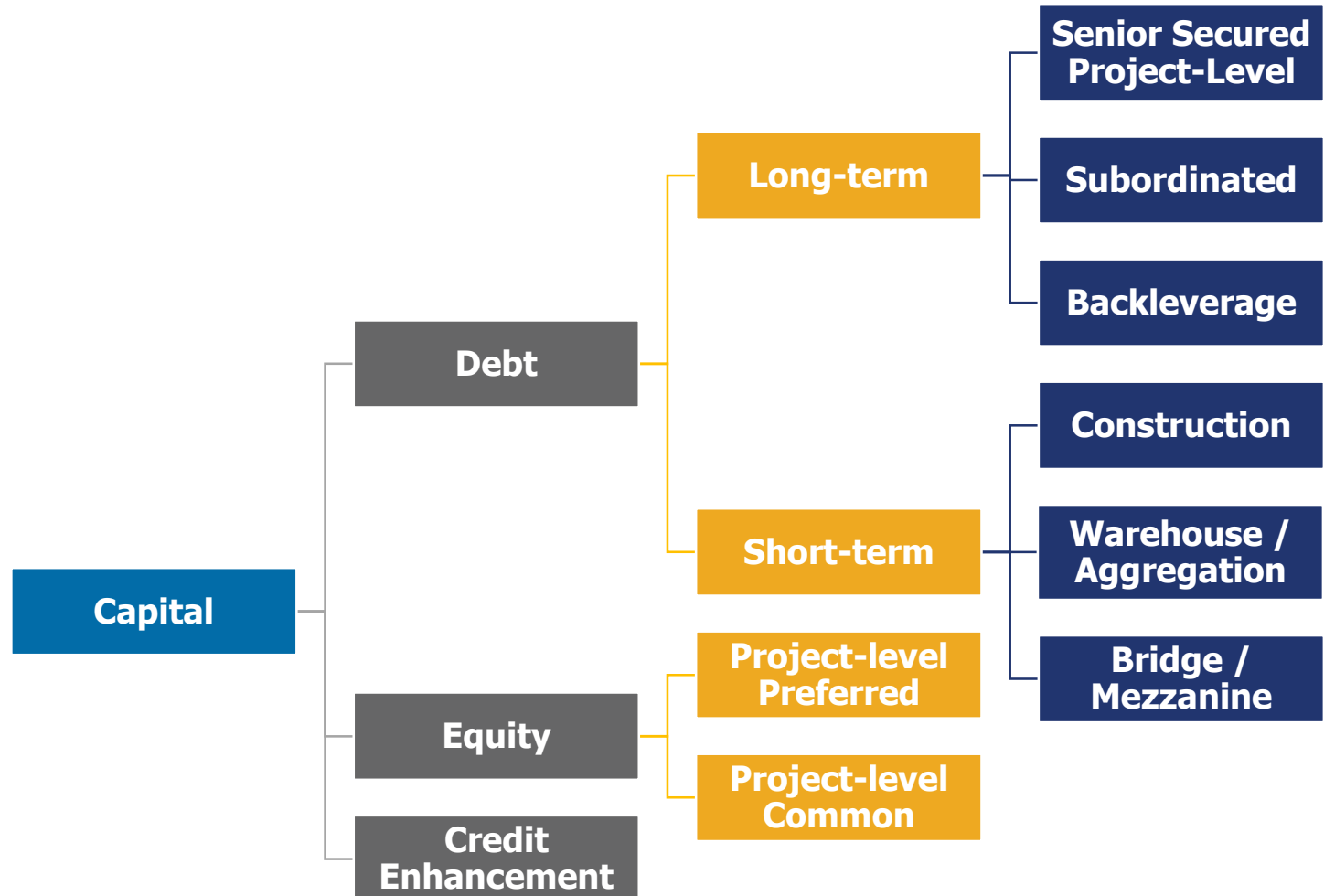
Governor Andrew M. Cuomo's comprehensive strategy to create an efficient, resilient, reliable, and affordable clean energy system in New York, that enhances environmental quality for all New Yorkers

Role in Overcoming Financing Barriers



Potential Roles in Project Finance Transactions

- NY Green Bank can invest at any level of the capital structure of a project
- Directly invests in projects and/or portfolios of clean energy assets rather than companies
- Can invest in multiple tranches of same project (*For example, senior secured and term loan B in the same deal*)



Contact NY Green Bank

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www.greenbank.ny.gov

- Sign up for our mailing list for periodic updates on our website [here](#)
- All additional information is available on the website, including all RFI and RFP opportunities: www.greenbank.ny.gov
- Follow us on social media:
 [@ny-green-bank](#)  #nygreenbank

Contact us at info@greenbank.ny.gov
to discuss potential investment ideas



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